Aquatic and Other Environmental Impacts of Roads:
The Case for Road Density as Indicator of Human Disturbance and Road-Density Reduction as Restoration Target;
A Concise Review

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by

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Abstract

Roads have well-documented, significant and widespread ecological impacts across multiple scales, often far beyond the area of the road “footprint”. Such impacts often create large and extensive departures from the natural conditions to which organisms are adapted, which increase with the extent and/or density of the road network. Road density is a useful metric or indicator of human impact at all scales broader than a single local site because it integrates impacts of human disturbance from activities that are associated with roads and their use (e.g., timber harvest, mining, human wildfire ignitions, invasive species introduction and spread, etc.) with direct road impacts. Multiple, convergent lines of empirical evidence summarized herein support two robust conclusions: 1) no truly “safe” threshold road density exists, but rather negative impacts begin to accrue and be expressed with incursion of the very first road segment; and 2) highly significant impacts (e.g., threat of extirpation of sensitive species) are already apparent at road densities on the order of 0.6 km per square km (1 mile per square mile) or less. Therefore, restoration strategies prioritized to reduce road densities in areas of high aquatic resource value from low-to-moderately-low levels to zero-to-low densities (e.g., <1 mile per square mile, lower if attainable) are likely to be most efficient and effective in terms of both economic cost and ecological benefit. By strong inference from these empirical studies of systems and species sensitive to humans’ environmental impact, with limited exceptions, investments that only reduce high road density to moderate road density are unlikely to produce any but small incremental improvements in abundance, and will not result in robust populations of sensitive species.

Aquatic and other environmental impacts of roads

Roads have well-documented, significant and widespread ecological impacts across multiple scales, often far beyond the area of the road “footprint”, with negative effects on biological integrity in both terrestrial and aquatic ecosystems (Forman & Alexander 1998; Gucinski et al. 2001; Trombulak & Frissell 2000).

These include direct mortality from road construction and vehicle collisions, modification of animal behavior, alteration of the physical environment, alteration of the chemical environment, spread of exotic species and increased human use of areas (Forman 2004; Forman & Alexander 1998; Gucinski et al. 2001; Trombulak & Frissell 2000). Road construction kills stationary and slow-moving organisms, injures organisms adjacent to a road and alters physical conditions beneath a road (Trombulak & Frissell 2000), often including direct conversion of habitat to non-habitat within the road and roadside corridor “footprint” (Forman 2004). Behavior modification depends on species and road size/type, but ranges from road corridor use to avoidance to complete blockage of movement, which fragments or isolates populations, often with negative demographic and genetic effects, and with potential consequences up to and including local population or species extinction and biodiversity loss (Forman 2004; Gucinski et al. 2001; Trombulak & Frissell 2000). Additional behavior modification includes changes in home range, reproductive success, escape response and physiological state (Forman & Alexander 1998; Trombulak & Frissell 2000).

Roads change soil density, temperature, water content, light levels, dust, surface waters, patterns of runoff, erosion and sedimentation, as well as adding heavy metals (especially lead), salts, organic molecules, ozone, and nutrients to roadside environments (Forman 2004; Gucinski et al. 2001; Trombulak & Frissell 2000). When delivered to streams, these road-derived contaminants reduce water quality (Gucinski et al. 2001). Increased road-derived fine sediments in stream gravel have been linked to decreased fry emergence, decreased juvenile densities, loss of winter carrying capacity, increased predation of fishes, and reduced benthic organism populations and algal production (Gucinski et al. 2001). Roads greatly increase the frequency of landslides, debris flow, and other mass movement (Gucinski et al. 2001). Roads promote the dispersal of exotic species and pathogens by altering habitats, stressing native species, and providing corridors and vehicle transport for seed/organism dispersal (Forman 2004; Gucinski et al. 2001; Trombulak & Frissell 2000). Roads also promote increased hunting, fishing, poaching, passive harassment of animals, use conflicts, lost solitude, lost soil productivity, fires, and landscape modifications (Forman 2004; Gucinski et al. 2001; Trombulak & Frissell 2000). Presence of roads is highly correlated with changes in species composition, population sizes, and hydrologic and geomorphic processes that shape aquatic and riparian systems and habitat (Gucinski et al. 2001; Trombulak & Frissell 2000), including severing connections between streams and adjacent floodplain networks, converting subsurface to surface flow by intercepting groundwater flowpaths and diverting flow to streams, thereby increasing run-off, “flashiness” and erosion (Forman 2004; Gucinski et al. 2001).

> In particular, roads have been consistently singled out as a primary cause of the reduced range and abundance of many aquatic species, not only in the West but also across the continent (CWWR, 1996; USFS and USBLM, 1997a; Trombulak and Frissell, 2000; Kessler et al., 2001; Angermeier et

> al., 2004). Czech et al. (2000) estimated that roads in the U.S. contribute to the endangerment of some 94 aquatic species. [Rhodes 2007, p. 7]

Road density as indicator of human disturbance to natural systems

Species and biological communities evolve through co-adapting to each other and the physical environment of their native ecosystems. The broad suite of significant road impacts just described often creates large and extensive departures from the natural processes, interactions and conditions to which organisms are adapted, which increase with the extent and/or density of the road network. Road density is also a useful metric or indicator of human impact at all scales broader than a single site because it integrates impacts of human disturbance from activities that are associated with roads and their use (e.g., timber harvest, mining, human wildfire ignitions, invasive species introduction and spread, hunting, fishing, poaching, etc.) along with direct road impacts (Lee et al. 1997; Quigley et al. 2001; Trombulak & Frissell 2000). Thus, an expectation that environmental degradation and associated biological impacts would increase with road density and, conversely, that remaining areas with very few or no roads would be strongholds of imperiled species and native biodiversity (in addition to providing other important ecosystem services such as clean water sources, carbon sequestration, recreation, and solitude) is both logical and obvious.

Objections have sometimes been raised to use of road density as an indicator of disturbance (or reductions in road density as a target for restoration) on grounds that all roads are not equal in ecological impact. However, while the latter is certainly true, validity and utility of road density as a robust indicator for watershed condition and aquatic impact – because of its integration of non-direct road-specific impacts as noted above – has been repeatedly demonstrated and is strongly confirmed by its extensive and repeated recommendation in the Forest Service’s guidance for Roads Analysis (USDA Forest Service 1999).

Expectation that road density would be associated with environmental degradation or species declines is further confirmed by empirical evidence finding significant correlations between population/community strength of Threatened, Endangered, Sensitive or other native species or other measures of ecological integrity and roadless proportion or road density. Together, this evidence strongly indicates that significant negative impacts can be detectable beginning with even the first one-tenth-mile of road per square mile of watershed (Lee et al. 1997). Multiple lines of evidence further indicate that substantial water quality declines, watershed degradation, and aquatic species impact must be expected at road densities higher than about 1 mile per square mile (0.6 km per square km) or less. This in turn suggests that – with limited, generally site-specific exceptions – because adverse impacts become evident even at quite low road densities, the greatest restoration efficiency with limited resources will result from targeting road reduction to high-value watersheds where low-to-moderately-low road densities can be brought below a mile per square mile or less, rather than where moderate-to-high road density would be reduced, but still remain moderate-to-high (exceptions might include a particular high-risk or high-impact road segment directly impacting a specific, high-value population or highly productive habitat of an at-risk species). These lines of evidence include:

- At the landscape scale, increasing road densities and their attendant effects are correlated with declines in the status of some non-anadromous salmonid species (Gucinski et al. 2001).
- For example, Frissell and Carnefix (2007) found a significant relationship between bull trout spawner abundance and proportion of subwatershed area within designated Wilderness or Inventoried Roadless Areas (IRAs) for 19 subwatersheds in the Rock Creek drainage, Granite and Missoula Counties, Montana, and disproportionately high occurrence of native salmonids, including genetically pure populations, associated with IRAs statewide.
- Ripley et al. (2005) surveyed 172 stream reaches located throughout the majority of the lower two-thirds (where industrial activities, mainly timber harvest and roads, are most predominant) of the Kakwa River basin in central western Alberta, Canada, and modeled relationships of bull trout presence and abundance with environmental factors. Bull trout were observed only at road densities (in the subbasin draining to the sampling reach) ranging from 0 to 0.6 km per square km (1 mile per square mile). Road density was generally related significantly and negatively to both bull trout occurrence and abundance in logistic and zero-inflated Poisson (ZIP) regression models. Notably, consistent, steepest decline in the modeled probability of bull trout occurrence fell between 0 and 0.4 km per square km (≈ 0.6 miles per square mile; see their Fig. 2 at right). This is consistent with other evidence (e.g., Lee et al. 1997, see below) that no truly “safe” threshold road density exists, but rather negative impacts begin to accrue and be expressed with incursion of the first road segment. Ripley et al. (2005) further used the modeled negative relation between bull trout occurrence

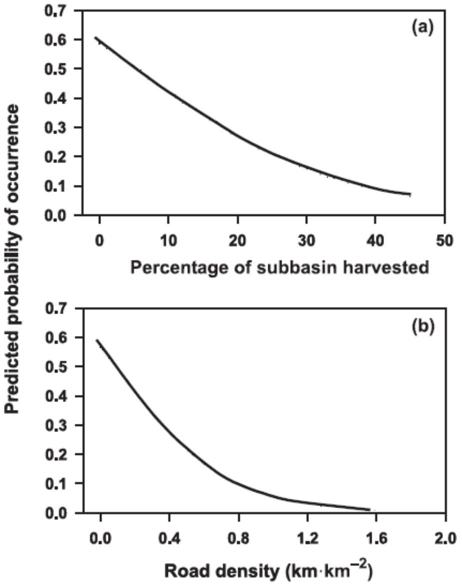

Fig. 2. Logistic regression models of the predicted probability of bull trout (*Salvelinus confluentus*) occurrence and (*a*) percentage of the subbasin subjected to forest harvesting and (*b*) density of roads in the Kakwa River basin. [Ripley et al. 2005]

and percentage of subbasin harvested (a primary driver of road construction) to forecast that forest harvesting over the next 20 years is projected to result in the local extirpation of bull trout from 24% to 43% of stream reaches that currently support the species in the basin.

- Similarly, bull trout redd numbers and changes in redd numbers with time were negatively correlated with density of logging roads in spawning tributary catchments in Montana's Swan River drainage (Baxter et al. 1999).
- U.S. Fish and Wildlife Service's Final Rule listing bull trout as threatened (USFWS 1999) states:

> A recent assessment of the interior Columbia Basin ecosystem revealed that increasing road densities were associated with declines in four non-anadromous salmonid species (bull trout, Yellowstone cutthroat trout, westslope cutthroat trout, and redband trout) within the Columbia River Basin, likely through a variety of factors associated with roads (Quigley & Arbelbide 1997). Bull trout were less likely to use highly roaded basins for spawning and rearing, and if present, were likely to be at lower population levels (Quigley and Arbelbide 1997). Quigley et al. (1996) demonstrated that when average road densities were between 0.4 to 1.1 km/km\2\ (0.7 and 1.7 mi/mi\2\) on USFS lands, the proportion of subwatersheds supporting "strong" populations of key salmonids dropped substantially. Higher road densities were associated with further declines.

- Lee et al. (1997) concluded, "Our [Interior Columbia Basin] results clearly show that increasing road densities and their attendant effects are associated with declines in the status of four non-anadromous salmonid species [bull trout, westslope cutthroat trout, Yellowstone cutthroat trout, and redband trout]. They are less likely to use highly roaded areas for spawning and rearing, and if found are less likely to be at strong population levels."
- Within colder subwatersheds, bull trout populations were reported as strong nearly seven times more frequently in those with less than 2.5 miles of road per square mile than those with more (Rieman et al. 1997, Table 5).
- Of five watershed integrity indicator variables used, the proportion of a subbasin composed of wilderness or roadless areas seemed most closely associated with subbasins having high integrity indices within the Interior Columbia basin; 81 percent of the subbasins classified as having the highest integrity had relatively large proportions of wilderness and roadless areas (>50 percent). Conversely, of subbasins with the lowest integrity, 89 percent had low proportions of roadless and wilderness areas, and 83 percent had relatively high proportions of at least moderate

road density (0.27 miles/square mile) (Gucinski et al. 2001, p. 8, citing Quigley et al. 1997).

- Lee et al. (1997) compared projected road densities against known aquatic conditions across the Interior Columbia basin and found that areas with estimated road densities of <0.06 km per square km (0.1 miles per square mile) were most generally associated with areas of low degradation and areas with estimated road densities of >0.43 km per square km (0.7 miles per square mile) were most generally associated with high degradation.
- Extensive habitat and population surveys on the Clearwater National Forest, Idaho, found that with few exceptions, native salmonid abundance was higher and exotic brook trout abundance lower or zero in unroaded versus managed landscapes (Huntington 1995). Differences were largest (often several-fold to an order of magnitude) and most consistent in the lower-gradient ("B" and "C") channel types, which are most sensitive to road and other management impacts, and were evident despite less-than-ideal stream habitat conditions in a large proportion of the stream segments in the unroaded landscapes, due to ongoing recovery from large fires within the past 50-150 years.
- Density of large wood (a crucial element of high quality aquatic habitat) in pools in tributaries to the Elk River, Oregon was negatively correlated with road density at intermediate ("network") spatial scales (Burnett et al. 2006). Road density was also negatively correlated with forest cover, which was likewise negatively correlated with large wood density, leading the authors to interpret the significant road density effect as an integrator or surrogate for impacts of the timber harvest associated with the road network.
- Frequency of large pools and all pools (crucial elements of aquatic habitat quality) declined with increasing road density in lower-gradient (<0.02) streams in the Interior Columbia River Basin (Lee et al. 1997).
- Thompson and Lee (2000) used existing data sets to model landscape-level attributes and snorkel count categories of spring-summer chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*) parr (juveniles) in Idaho. Resulting models predicted that chinook salmon parr would be in low count categories within subwatersheds with >1 $km{\cdot}km^{-2}$ (1.6 miles per square mile) geometric mean road densities and/or <700 mm mean annual precipitation.
- Inventoried roadless areas provide or affect habitat for over 55% of the Threatened, Endangered, or Proposed-for-listing species found on or affected by National Forest lands, representing approximately 25% of all animal species and 13% of all plant species listed under the Endangered Species Act within the United States, and for over 65% of Forest Service-designated sensitive species (Brown & Archuleta 2000).

Besides the perennial problem of resources insufficient to the overall restoration need, this prioritization issue takes on greater importance in the context of recent or current agency policies and legislative initiatives. Though intended to efficiently and/or collaboratively address multiple restoration objectives simultaneously, most existing policies/proposals risk the perverse outcome of directing restoration efforts or expenditures away from the locations of greatest need and most-certain benefit for aquatic/watershed restoration, especially in the absence of robust scientific sideboards circumscribing the decision space. For example, our reviews of recent projects and forest plans (corroborated by private testimony from Forest Service personnel) suggest that while Forest Service Region One's "Integrated Restoration Strategy" includes a high-profile aquatic/watershed component, in practice purported "forest health" and fire-risk concerns drive the planning process and determine locations of projects, with any aquatic/watershed restoration measures subordinated to and entirely dependent for support on those perceived terrestrial priorities. Urgently needed aquatic/watershed restoration is thus held captive to terrestrial considerations, and these terrestrial considerations are often of high public controversy and sometimes of dubious scientific validity. By contrast, the scientific basis for and ecological and cost-effectiveness of aquatic/watershed restoration measures such as road decommissioning or stormproofing and fish-passage barrier removal are thoroughly documented, straightforward, and uncontroversial. Such watershed restoration work is urgently needed to meet acute policy and legal mandates of the National Forest Management Act, Clean Water Act, and Endangered Species Act. The mandates of these environmental laws, and public demand for clean water and healthy fisheries, will not be met if rational road impact reduction programs are subjugated to controversial fuels reduction and salvage timber sales. This programmatic linkage by management agencies hinders the ability of the agency to restore watersheds and remediate roads effectively, creates unnecessary spending inefficiencies that jeopardize aquatic resources, and clearly constitutes bad public policy.

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QUAL2Kw
user manual
(version 5.1)

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A modeling framework for simulating river and stream water quality

by

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1 USERS MANUAL

1.1 OVERVIEW

The computer code used to implement the calculations for QUAL2K is written in Visual Basic for Applications (VBA). A Fortran executable is also available as an option. Excel serves as the user interface.

Color is used to signify whether information is to be input by the user or output by the program:

- **Pale Blue** designates variable and parameter values that are to be entered by the user.
- **Pale Yellow** designates data that the user enters. This data are then displayed on graphs generated by Q2K.
- **Pale Green** designates output values generated by Q2K.
- **Dark solid colors** are used for labels and should not be changed.

All worksheets include three buttons (Figure 1):

- **Open Old Files.** When this button is clicked, the file browser will automatically open to allow you to access a data file. All QUAL2K data files have the extension, *.q2k.
- **Run VBA.** This button causes Q2K to execute the VBA version of the model and to create a data file that holds the input values. The data file can then be accessed later using the **Open Old File** button.
- **Run Fortran.** This button causes Q2K to execute Fortran version of the model and to create a data file that holds the input values. The data file can then be accessed later using the **Open Old File** button. The Fortran and VBA versions give identical results except the Fortran version runs much faster because it is a compiled executable program.

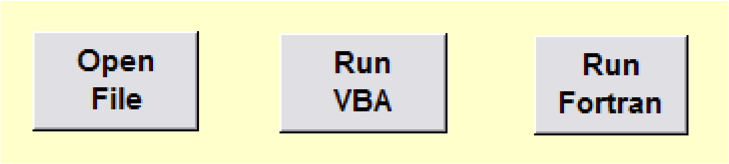


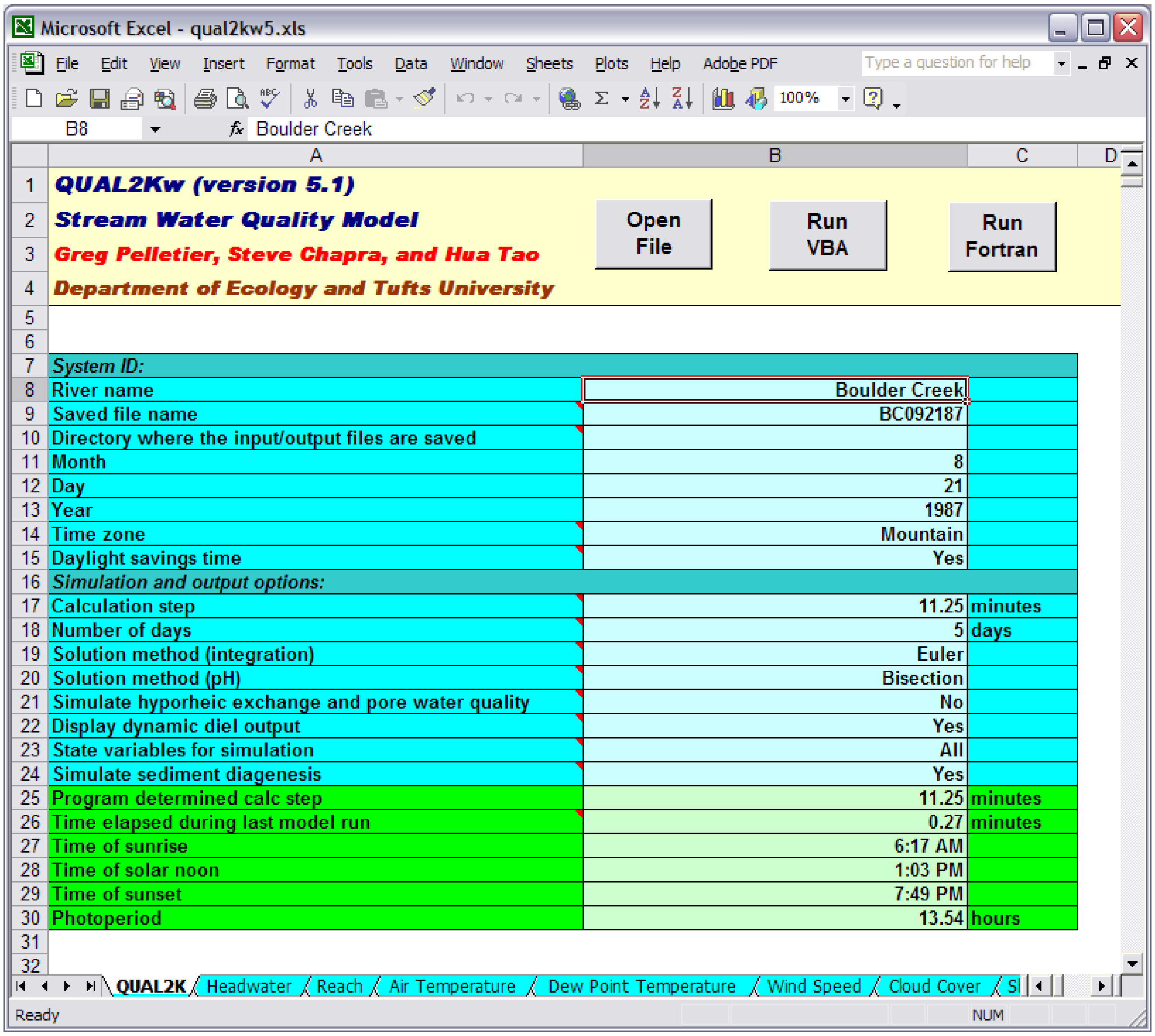
Figure 1. The buttons used in Q2K.

1.2 MODEL PARAMETER WORKSHEETS

A series of worksheets are used to enter parameters that are required to generate a model run. These are identified by turquoise tabs.

1.2.1 QUAL2K Worksheet

The QUAL2K Worksheet (Figure 2) is used to enter general information regarding a particular model application.



QUAL2Kw (version 5.1)
Stream Water Quality Model
Greg Pelletier, Steve Chapra, and Hua Tao
Department of Ecology and Tufts University

A	B	C
System ID:		
River name	Boulder Creek	
Saved file name	BC092187	
Directory where the input/output files are saved		
Month	8	
Day	21	
Year	1987	
Time zone	Mountain	
Daylight savings time	Yes	
Simulation and output options:		
Calculation step	11.25	minutes
Number of days	5	days
Solution method (integration)	Euler	
Solution method (pH)	Bisection	
Simulate hyporheic exchange and pore water quality	No	
Display dynamic diel output	Yes	
State variables for simulation	All	
Simulate sediment diagenesis	Yes	
Program determined calc step	11.25	minutes
Time elapsed during last model run	0.27	minutes
Time of sunrise	6:17 AM	
Time of solar noon	1:03 PM	
Time of sunset	7:49 PM	
Photoperiod	13.54	hours

Figure 2. The QUAL2K Worksheet.

River name. Name of the river or stream being modeled. After the program is run, this name along with the date, is displayed on all worksheets and charts.
Saved File name. This is the name of the data file generated when Q2K is run.
Directory where file saved. This specifies the complete path to the directory where the file is saved.

Month. The simulation month. This is entered in numerical format (e.g., January = 1, February = 2, etc.).
Day. The simulation day.
Year. The simulation year (e.g., 1993)
Time zone. A pull-down menu (Figure 3) allows you to select the proper U.S. time zone. For example, applications in the state of Washington will generally use the Pacific time zone. The user may also use cell B14 to enter any integer hour value for the time zone relative to GMT/UTC (e.g. the Pacific time zone is -8 hours, GMT/UTC is 0 hours, etc.). Leaving cell B14 blank will default to GMT/UTC for the time zone.

Time zone Mountain

Figure 3. The pull down menu for setting the time zone.

Daylight savings time. A pull down menu allows you to specify whether daylight savings time is in effect (Yes or No).
Calculation step. This is the time step used for the calculation. It must be selected from the pull down list.
Number of days. This defines the duration of the calculation. It must be an integer that is greater than or equal to 2 days. This constraint is imposed because the model is run in a time variable mode until it reaches a steady state. Therefore, the first day of simulation is by definition overwhelmingly dominated by its initial conditions. If the user enters a value less than 2 days, the program automatically sets the final time to 2 days. The final time should be at least twice the river's travel time. For streams with short travel times where bottom algae are simulated, it must usually be longer.
Solution method (integration). A pull down menu allows you to choose between three numerical methods for solving the differential equations for the state variables. These are (1) Euler's method, (2) the fourth-order Runge-Kutta (RK4) method, and (3) an adaptive time step method. The adaptive step method is only available if the Fortran executable is used. Detailed descriptions of these methods can be found in Chapra and Canale (2002). Euler's method is suggested as the default because it usually attains sufficiently accurate results at a moderate computational price. For cases where un-stable results occur with Euler's method or more accuracy is required, the more computationally burdensome RK4 method can be employed.
Solution method (pH). A pull down menu allows you to choose between two numerical methods for solving for pH using root location. These are (1) Newton-Raphson (the default) and (2) bisection. Detailed descriptions of these methods can be found in Chapra and Canale (2002). Newton-Raphson is suggested as the default because it is faster. However, there are some cases where it can go unstable. If this occurs, the bisection, although slower, may be preferable.
Simulate hyporheic exchange and pore water quality. Three options are available for simulation of hyporheic exchange and water quality:

- Choose 'No' to bypass calculation of mass transfer between the water column and the hyporheic pore water, and water quality kinetics in the hyporheic zone.
- Choose 'Level 1' to simulate mass transfer between the water column and the hyporheic pore water, with water quality kinetics in the hyporheic zone as an enhanced zero-order

or first-order oxidation rate of fast-reacting DOC with limitation from fast-reacting DOC and dissolved oxygen.

- Choose 'Level 2' to simulate mass transfer between the water column and the hyporheic pore water, with water quality kinetics with attached heterotrophic bacteria as a state variable in the hyporheic sediment zone with growth limitation from fast-reacting DOC, nitrate, ammonia, soluble reactive P, and dissolved oxygen.

Mass transfer between the water column and hyporheic pore water only occurs if there are positive values entered in column AL of the 'Reach' sheet for the hyporheic exchange flow. Kinetic model options and parameters are specified on the 'Rates' sheet.

Display dynamic diel output. Two options are available for displaying the dynamic output results:

- Select 'Yes' to display the dynamic diel results in output sheets and charts.
- Select 'No' to bypass writing of the dynamic diel results. This option will result in faster writing of the output files and charts and will save the users time if they are doing many runs and don’t need to look at the dynamic output. The longitudinal results and charts are not affected by this choice.

State variables for simulation. Select whether all state variables will be simulated or only temperature.

Simulate sediment diagenesis. Select 'Yes' to simulate sediment diagenesis. Prescribed SOD and nutrient fluxes on the ‘Reach’ sheet are added to the calculated fluxes when sediment diagenesis is simulated. Select 'No' to bypass the sediment diagenesis subroutine. This option will use only the prescribed SOD and nutrient fluxes on the 'Reach' sheet to determine sediment fluxes.

Program determined calc step (output). The program takes the **Calculation step** entered by the user and then rounds it down to the next lowest whole base-2 number. In order to use a lower time step, you must reduce the calculation step below this value.

Time of last calculation. The computer automatically displays the computer time required for the simulation.

Time of sunrise. This is the time of sunrise for the farthest downstream reach.

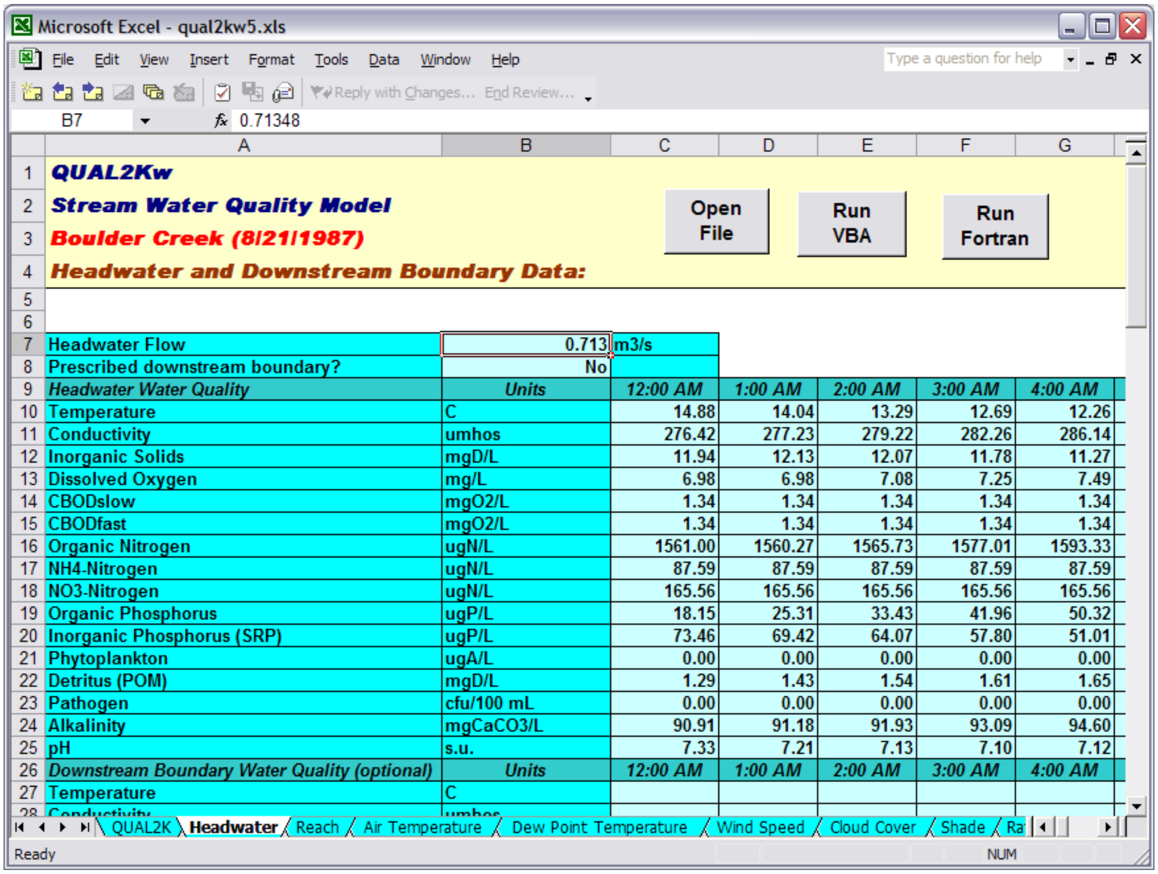
Time of solar noon. This is the time of solar noon for the farthest downstream reach.

Time of sunset. This is the time of sunset for the farthest downstream reach.

Photoperiod. This is the fraction of the day that the sun is up for the farthest downstream reach. It is equal to the time in hours between sunrise and sunset divided by 24.

1.2.2 Headwater Worksheet

This worksheet (Figure 4) is used to enter flow and concentration for the system's boundaries.



QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

Headwater and Downstream Boundary Data:

Headwater Flow	0.713	m3/s				
Prescribed downstream boundary?	No					
Headwater Water Quality	*Units*	*12:00 AM*	*1:00 AM*	*2:00 AM*	*3:00 AM*	*4:00 AM*
Temperature	C	14.88	14.04	13.29	12.69	12.26
Conductivity	umhos	276.42	277.23	279.22	282.26	286.14
Inorganic Solids	mgD/L	11.94	12.13	12.07	11.78	11.27
Dissolved Oxygen	mg/L	6.98	6.98	7.08	7.25	7.49
CBODslow	mgO2/L	1.34	1.34	1.34	1.34	1.34
CBODfast	mgO2/L	1.34	1.34	1.34	1.34	1.34
Organic Nitrogen	ugN/L	1561.00	1560.27	1565.73	1577.01	1593.33
NH4-Nitrogen	ugN/L	87.59	87.59	87.59	87.59	87.59
NO3-Nitrogen	ugN/L	165.56	165.56	165.56	165.56	165.56
Organic Phosphorus	ugP/L	18.15	25.31	33.43	41.96	50.32
Inorganic Phosphorus (SRP)	ugP/L	73.46	69.42	64.07	57.80	51.01
Phytoplankton	ugA/L	0.00	0.00	0.00	0.00	0.00
Detritus (POM)	mgD/L	1.29	1.43	1.54	1.61	1.65
Pathogen	cfu/100 mL	0.00	0.00	0.00	0.00	0.00
Alkalinity	mgCaCO3/L	90.91	91.18	91.93	93.09	94.60
pH	s.u.	7.33	7.21	7.13	7.10	7.12
Downstream Boundary Water Quality (optional)	*Units*	*12:00 AM*	*1:00 AM*	*2:00 AM*	*3:00 AM*	*4:00 AM*
Temperature	C					

Figure 4. The Headwater Worksheet used to enter the headwater and downstream (optional) boundary conditions

Flow. The headwater's flow rate in m^3/s.

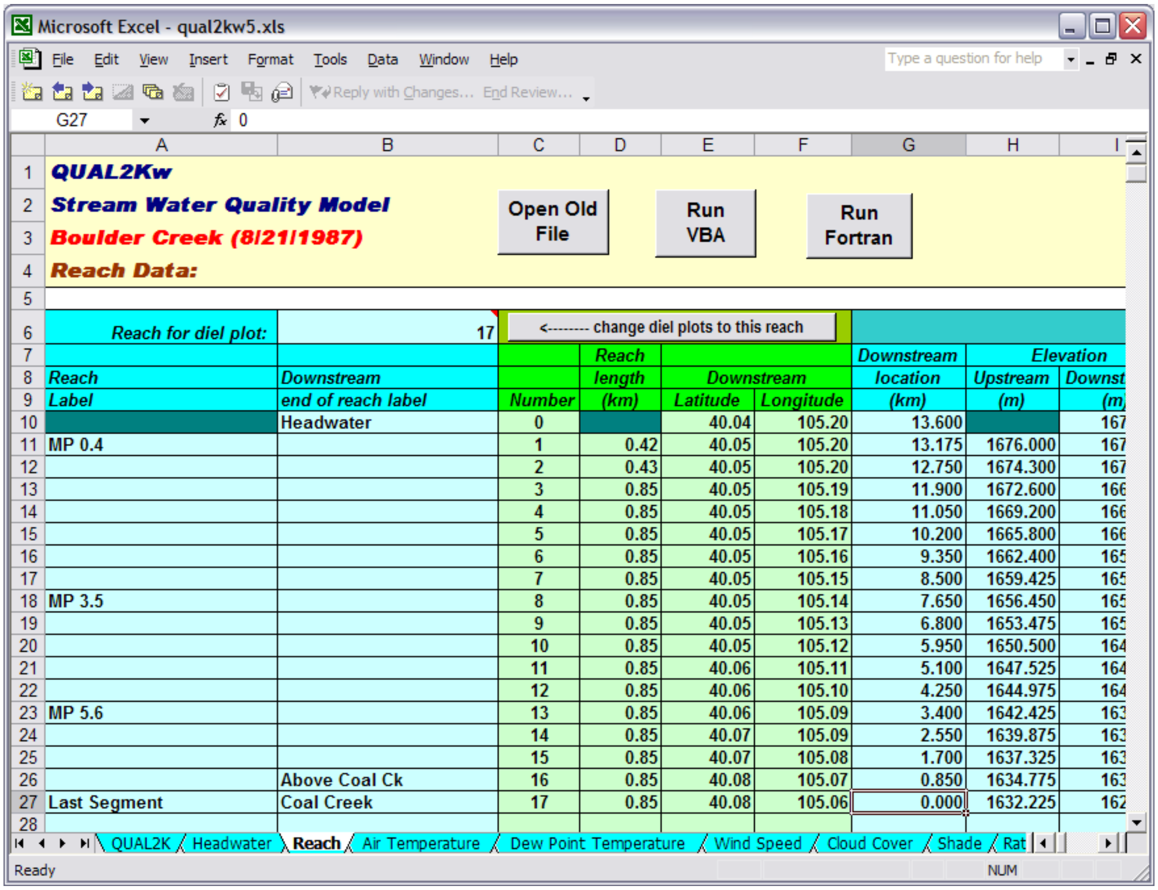
Prescribed Downstream Boundary? If the downstream boundary has an effect on the simulation, this option is set to yes. If this is done, the downstream boundary concentrations should be entered in cells D27:Z42.

Headwater Water Quality. This block of cells is used to enter the temperature and water quality boundary conditions at the river's headwater. For cases where the data varies in a diel fashion, Q2K allows you to enter values on an hourly basis. If the values are constant over the daily cycle, just enter the mean value in column D (that is, for 12:00 AM) and leave the other cells (columns E through Z) blank. Q2K will automatically apply the 12:00 AM value to the other times of day.

Downstream Boundary Water Quality. If the downstream boundary has an effect on the simulation, this block of cells is used to enter the temperature and water quality conditions at the river's downstream boundary. headwater. As was the case with the headwater, if the values are constant over the daily cycle, just enter the mean value in column D (that is, for 12:00 AM) and leave the other cells to the right blank (columns E through Z). Q2K will automatically apply the 12:00 AM value to the other times of day.

1.2.3 Reach Worksheet

This worksheet is used to enter information related to the river's headwater (Reach Number 0) and its reaches (Figure 5 through Figure 9).



QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

Reach Data:

Reach for diel plot:	17							
			Reach			Downstream	Elevation	
Reach	Downstream		length	Downstream		location	Upstream	Downst
Label	end of reach label	Number	(km)	Latitude	Longitude	(km)	(m)	(m
	Headwater	0		40.04	105.20	13.600		167
MP 0.4		1	0.42	40.05	105.20	13.175	1676.000	167
		2	0.43	40.05	105.20	12.750	1674.300	167
		3	0.85	40.05	105.19	11.900	1672.600	166
		4	0.85	40.05	105.18	11.050	1669.200	166
		5	0.85	40.05	105.17	10.200	1665.800	166
		6	0.85	40.05	105.16	9.350	1662.400	165
		7	0.85	40.05	105.15	8.500	1659.425	165
MP 3.5		8	0.85	40.05	105.14	7.650	1656.450	165
		9	0.85	40.05	105.13	6.800	1653.475	165
		10	0.85	40.05	105.12	5.950	1650.500	164
		11	0.85	40.06	105.11	5.100	1647.525	164
		12	0.85	40.06	105.10	4.250	1644.975	164
MP 5.6		13	0.85	40.06	105.09	3.400	1642.425	163
		14	0.85	40.07	105.09	2.550	1639.875	163
		15	0.85	40.07	105.08	1.700	1637.325	163
	Above Coal Ck	16	0.85	40.08	105.07	0.850	1634.775	163
Last Segment	Coal Creek	17	0.85	40.08	105.06	0.000	1632.225	162

Figure 5. The first part of the Reach Worksheet used to specify reach labels, distances and elevations.

Reach for diel plot. Cell B6 is used to enter the number of the reach for which diel plots will be generated. If a negative, zero or a value greater than the number of reaches is entered, the program automatically sets the value to the last downstream reach. Note that there is also a button to the right of cell B6 that allows the user to display a different reach on the diel plots if the model has been run with the option of displaying dynamic diel results.

Reach Label (optional). Q2K allows you to enter identification labels for each reach. Figure 6 provides an example to illustrate the naming scheme. The first two reaches of a river are shown. Because it includes the Jefferson City WWTP discharge, we might choose to enter the reach label "Jefferson City WWTP" for the first reach. Similarly we might label the second reach as "Sampling Station 27."

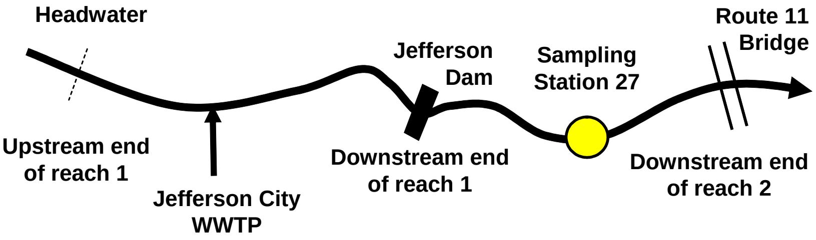
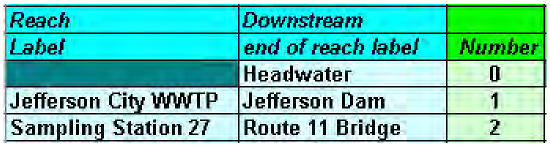


Figure 6. The first two reaches of a river system.

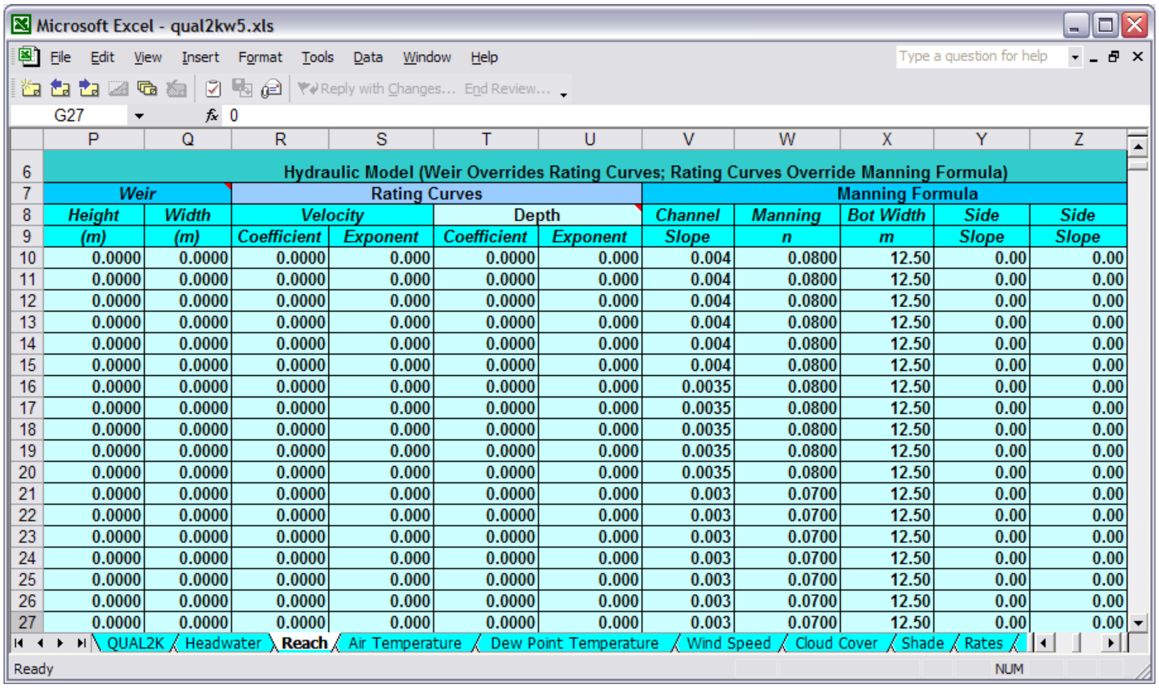
Downstream end of reach label (optional). Q2K allows you to enter identification labels for the boundaries between reaches. These labels are then displayed on other worksheets to identify the reaches. As shown in Figure 7, the downstream end of the first reach in Figure 6 could be labeled as "Jefferson Dam". Similarly, the downstream end of the second reach could be labeled as "Route 11 Bridge".



Reach Label	*Downstream end of reach label*	*Number*
	Headwater	0
Jefferson City WWTP	Jefferson Dam	1
Sampling Station 27	Route 11 Bridge	2

Figure 7. An example of the labels that could be entered for the reaches in Figure 6.

Reach numbers (output). The model automatically numbers the reaches in ascending order.
Reach length (output). The model automatically computes and displays the length of each reach.
Downstream Latitude and Longitude (output). The model automatically computes and displays the latitude and longitude of the downstream ends of each reach in decimal degrees.
Downstream location. The user must enter the river kilometer for the downstream end of each reach. Note that the reach distances can be in descending or ascending order.
Upstream and downstream elevation. The user must enter the elevation in meters above sea level for both the upstream and downstream ends of the reach. Note that this information is used for two primary purposes. First, it is used to detect an elevation drop due to a waterfall at the end of a reach. Second, it is used to correct oxygen saturation for elevation effects. **Note that it is not used to determine channel slope.** Channel slope is entered independently in column W.
Downstream Latitude and Longitude. The user must enter the latitude and longitude of the downstream end of each reach in degrees, minutes, and seconds. Alternatively, they can be entered in decimal degrees, in which case, the minutes and seconds entries would be left blank or zero.



	P	Q	R	S	T	U	V	W	X	Y	Z
6	Hydraulic Model (Weir Overrides Rating Curves; Rating Curves Override Manning Formula)										
7	*Weir*		Rating Curves				Manning Formula				
8	*Height*	*Width*	*Velocity*		Depth		*Channel*	*Manning*	*Bot Width*	*Side*	*Side*
9	*(m)*	*(m)*	*Coefficient*	*Exponent*	*Coefficient*	*Exponent*	*Slope*	*n*	*m*	*Slope*	*Slope*
10	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.004	0.0800	12.50	0.00	0.00
11	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.004	0.0800	12.50	0.00	0.00
12	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.004	0.0800	12.50	0.00	0.00
13	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.004	0.0800	12.50	0.00	0.00
14	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.004	0.0800	12.50	0.00	0.00
15	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.004	0.0800	12.50	0.00	0.00
16	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.0035	0.0800	12.50	0.00	0.00
17	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.0035	0.0800	12.50	0.00	0.00
18	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.0035	0.0800	12.50	0.00	0.00
19	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.0035	0.0800	12.50	0.00	0.00
20	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.0035	0.0800	12.50	0.00	0.00
21	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.003	0.0700	12.50	0.00	0.00
22	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.003	0.0700	12.50	0.00	0.00
23	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.003	0.0700	12.50	0.00	0.00
24	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.003	0.0700	12.50	0.00	0.00
25	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.003	0.0700	12.50	0.00	0.00
26	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.003	0.0700	12.50	0.00	0.00
27	0.0000	0.0000	0.0000	0.000	0.0000	0.000	0.003	0.0700	12.50	0.00	0.00

Figure 8. The part of the Reach Worksheet used to specify the system's hydraulics.

Hydraulic Model. Q2K allows two options for computing velocity and depth based on flow: (1) rating curves or (2) the Manning formula. **It is important to pick one of the options and leave the other blank or zero.** If the model detects a blank or zero value for the Manning *n*, it will implement the rating curves. Otherwise, the Manning formula will be solved.

Rating Curves:

Velocity coefficient. *a* for velocity (m/s) = $aQ^{\mathbf{b}}$ for Q in m^3/s

Velocity exponent. *b*

Depth or width coefficient. α for depth (m) or width (m) = αQ^{β}. Not that the pull down selection in cell T8 is used to select whether the depth or width will be described by the coefficients and exponents in columns T and U.

Depth or width exponent. β

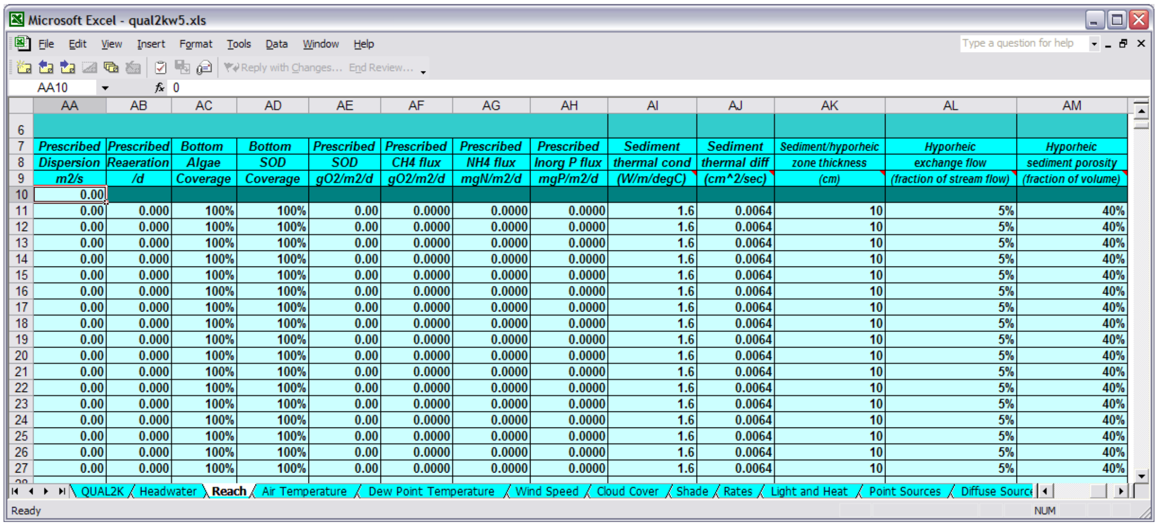
Manning Formula:

Bottom width. The reach's bottom width, B_0 (m).

Side slope. Number must be greater than zero. For example, a rectangular channel would have both side slopes equal to zero.

Channel slope. The slope of the channel in meter of drop per meter of distance.

Manning n. Dimensionless number that parameterizes channel roughness. Values for weedless man-made canals range from 0.012 to 0.03 and for natural channels from 0.025 to 0.2. A value of 0.04 is a good starting value for many natural channels.



	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
6													
7 8 9	Prescribed Dispersion m2/s	Prescribed Reaeration /d	Bottom Algae Coverage	Bottom SOD Coverage	Prescribed SOD gO2/m2/d	Prescribed CH4 flux gO2/m2/d	Prescribed NH4 flux mgN/m2/d	Prescribed Inorg P flux mgP/m2/d	Sediment thermal cond (W/m/degC)	Sediment thermal diff (cm^2/sec)	Sediment/hyporheic zone thickness (cm)	Hyporheic exchange flow (fraction of stream flow)	Hyporheic sediment porosity (fraction of volume)
10	0.00												
11	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
12	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
13	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
14	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
15	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
16	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
17	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
18	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
19	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
20	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
21	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
22	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
23	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
24	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
25	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
26	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%
27	0.00	0.000	100%	100%	0.00	0.0000	0.0000	0.0000	1.6	0.0064	10	5%	40%

Figure 9. The last part of the Reach Worksheet.

Prescribed Dispersion. If the dispersion at the downstream end of a reach is known, it can be entered in column Y of the Reach Worksheet. If this cell is left blank, the dispersion will be automatically computed by the program.

Weir Height. If a weir is located at the reach's downstream end, this is where the weir's height is entered. If the boundary is free-flowing, a zero or blank would be entered.

Prescribed Reaeration. If the reaeration for the reach is known, it can be entered in column AA of the Reach Worksheet. If it is left blank, the program will internally compute it based on entries on the Rates Worksheet.

Bottom Algae Coverage. In a river, the entire bottom of a reach might not be suitable for the growth of bottom algae. Therefore, Q2K allows the user to specify the percent of the bottom where plants can grow. For example, if only one fifth of a reach's bottom area has substrate suitable for plant growth, the bottom algae coverage would be set to 20%.

Bottom SOD Coverage. In a river, the entire bottom of a reach might not be suitable for the generation of sediment oxygen demand. Therefore, Q2K allows the user to specify the percent of the bottom where sediments accumulate and SOD (along with sediment nutrient fluxes) can occur. For example, if only three quarters of a reach's bottom area has accumulated sediment mud, the bottom SOD coverage for that reach would be set to 75%.

Prescribed SOD. Q2K simulates the sediment oxygen demand for a reach as a function of the amount of detritus and phytoplankton biomass that settles from the water to the sediments at steady state. Because the sediments may also contain additional organic matter due to runoff during prior non steady-state runoff periods, Q2K allows additional SOD to be prescribed for each reach in column AD of the Reach Worksheet.

Prescribed CH_4 (Methane) Flux. In a similar fashion to SOD, Q2K allows an additional flux of methane (reduced carbon) to be prescribed as an input to each reach in column AE of the Reach Worksheet

Prescribed NH_4 (Ammonium) Flux. In a similar fashion to SOD, Q2K allows an additional flux of ammonium nitrogen to be prescribed as an input to each reach in column AF of the Reach Worksheet

Prescribed Inorganic Phosphorus Flux. In a similar fashion to SOD, Q2K allows an additional flux of inorganic phosphorus to be prescribed as an input to each reach in column AG of the Reach Worksheet

Sediment thermal conductitivity. Table 4 of the model theory documentation provides some typical values. A default value of 1.6 W/(m °C) is suggested.

Sediment thermal diffusivity. Table 4 of the model theory documentation provides some typical values. A default value of 0.0064 cm^2/sec is suggested.

Sediment thickness. Typically about 10 cm if there is negligible hyporheic exchange and approximately 20-100cm if there is substantial hyporheic exchange. Bencala and Walters (1983) define A_s as the cross-sectional area of the transient storage zone. If the transient storage zone is considered to be equivalent to the pore water in the hyporheic zone and A_s is known from tracer studies (for example using the method of Hart 1995), then the sediment hyporheic zone thickness can be estimated as A_s / (width * porosity).

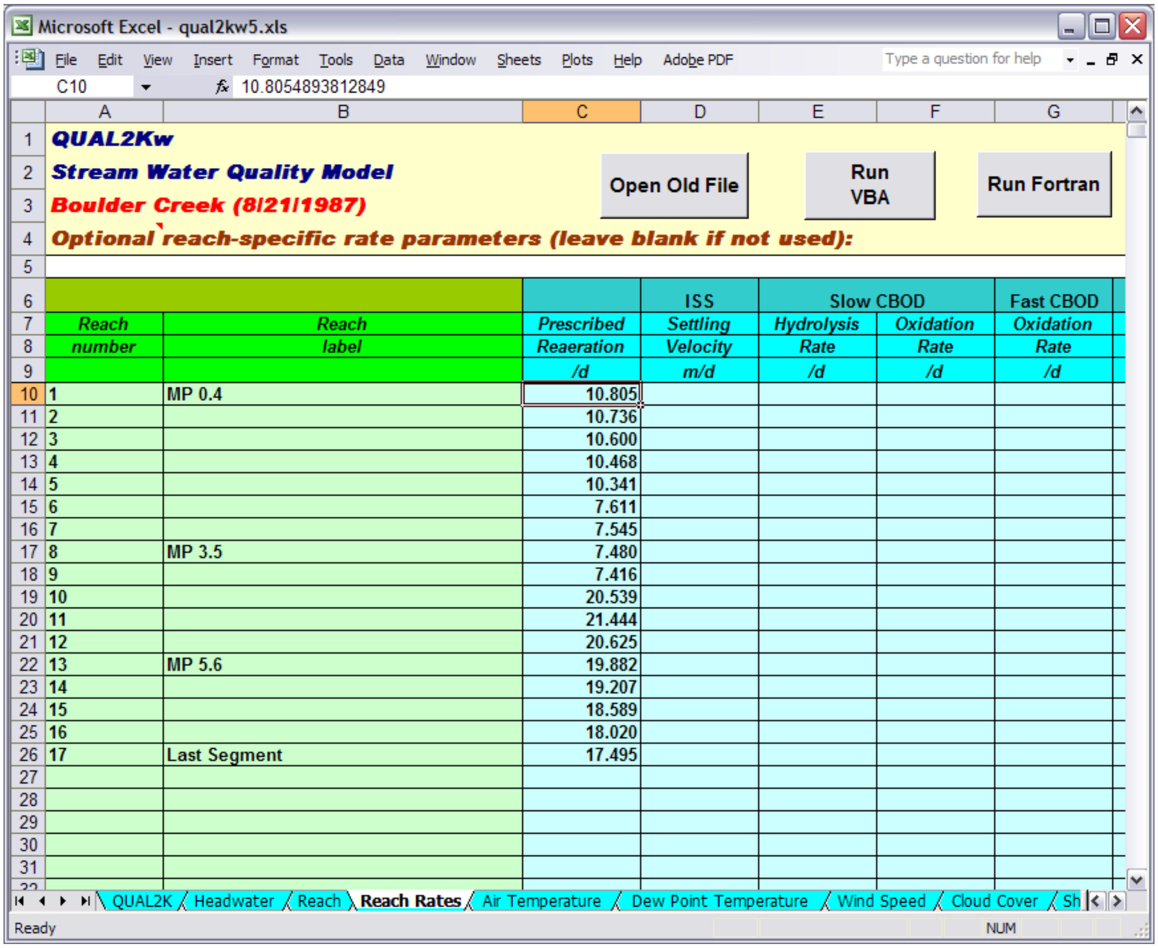
Hyporheic exchange flow. These values are only used if hyporheic exchange is simulated (if 'Level 1' or ‘Level 2’ is selected in cell B21 on the 'QUAL2K' sheet). The bulk hyporheic exchange flow is entered as a fraction of the total surface flow for the reach. For example, if 10 percent of the surface flow exchanges with the hyporheic zone within a reach, then a value of 0.1 (10%) is entered for the reach. An efficient method for estimating the parameters of the hyporheic exchange flow and the thickness of the hyporheic zone is provided by Hart (1995). An alternative to direct estimation of these parameters is to use the residual of the heat budget during the calibration of the temperature model to select appropriate values if all other heat exchange inputs are accurately estimated.

Hyporheic sediment porosity. These values are only used if hyporheic exchange is simulated (if 'Yes' is selected in cell B21 on the 'QUAL2K' sheet). Typical porosity of cobble, gravel, sand, silt sediments ranges from about 35% to 50%. A default value of 40% is suggested.

Sky opening for longwave. The sky opening fraction is used as a multiplier to adjust the downwelling (from atmosphere) and upwelling (from water) longwave radiation terms in the heat budget. A default value of 100% is recommended for no adjustment of the longwave radiation terms

1.2.4 Reach Rates Worksheet

This worksheet is optional to enter information related to reach-specific rate constants and parameters (Figure 9.5). The rate parameters in this sheet are optional. If they are specified, they over-ride the global rate parameters that are specified on the 'Rates' sheet (see below). Rate parameters that depend on temperature are input for 20 °C on the ‘Reach Rates’ sheet and are adjusted for in-situ temperature by QUAL2Kw. If reach-specific rates are not specified, then the global rate parameters on the 'Rates' sheet will apply. The user should leave the cells blank in the ‘Reach Rates’ sheet to use global values from the "Rates' sheet instead of specifying reach-specific values.



C10 10.8054893812849

QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

Optional reach-specific rate parameters (leave blank if not used):

Reach number	Reach label	Prescribed Reaeration /d	ISS Settling Velocity m/d	Slow CBOD Hydrolysis Rate /d	Slow CBOD Oxidation Rate /d	Fast CBOD Oxidation Rate /d
1	MP 0.4	10.805				
2		10.736				
3		10.600				
4		10.468				
5		10.341				
6		7.611				
7		7.545				
8	MP 3.5	7.480				
9		7.416				
10		20.539				
11		21.444				
12		20.625				
13	MP 5.6	19.882				
14		19.207				
15		18.589				
16		18.020				
17	Last Segment	17.495				

Figure 9.5. The first part of the Reach Rates Worksheet.

The following reach-specific rate parameters may be entered on the ‘Reach Rates’ sheet:

- Reaeration rates
- Inorganic suspended solids settling velocity
- Slow CBOD rates
    - Hydrolysis
    - Oxidation
- Fast CBOD oxidation rate

- Organic N rates
    - Hydrolysis
    - Settling velocity
- Ammonium nitrification rate
- Nitrate rates
    - Denitrification
    - Sediment transfer coefficient
- Organic P rates
    - Hydrolysis
    - Settling velocity
- Inorganic P settling velocity
- Phytoplankton rates
    - Maximum growth rate
    - Respiration
    - Death
    - N half-saturation
    - P half-saturation
    - Light constant
    - Ammonia preference factor
    - Settling velocity
- Bottom plant rates
    - Initial biomass
    - maximum growth rate
    - first-order carrying capacity
    - respiration
    - excretion
    - death
    - external N half-saturation
    - external P half-saturation
    - light constant
    - ammonia preference
    - subsistence quota for N
    - subsistence quota for P
    - maximum uptake rate of N
    - maximum uptake rate of P
    - Internal N half-saturation ratio
    - Internal P half-saturation ratio
    - N uptake from water column
    - P uptake from water column
- Detritus rates
    - Dissolution
    - Settling velocity
- Pathogen rages
    - Dieoff
    - Settling velocity
    - Alpha coefficient for light-enhanced dieoff
- Heterotrophic metabolism in the hyporheic zone
    - Maximum growth rate (level 1 and 2)
    - CBOD half-saturation (level 1 and 2)
    - O_2 inhibition (level 1 and 2)

    - Respiration (level 2)
    - Death (level 2)
    - external N half saturation (level 2)
    - external P half saturation (level 2)
    - ammonia preference (level 2)
    - first-order carrying capacity (level 2)
- Generic constituent rates
    - First-order decay rate
    - Settling velocity

1.2.5 Initial Conditions Worksheet

The initial conditions specified in this sheet are optional. If they are not specified then the initial conditions in the water column for each reach are assumed to be the same as the headwater, and initial plant biomass is assumed to be zero for zero-order growth and 1 gD/m^2 for first-order growth, with initial normalized intracellular N and P of 0. Entering realistic values for initial conditions allows for shorter simulation periods to reach equilibrium conditions for bottom algae. Leave the cells in this Worksheet blank if you want to use default headwater initial conditions and zero bottom algae biomass as the initial conditions.

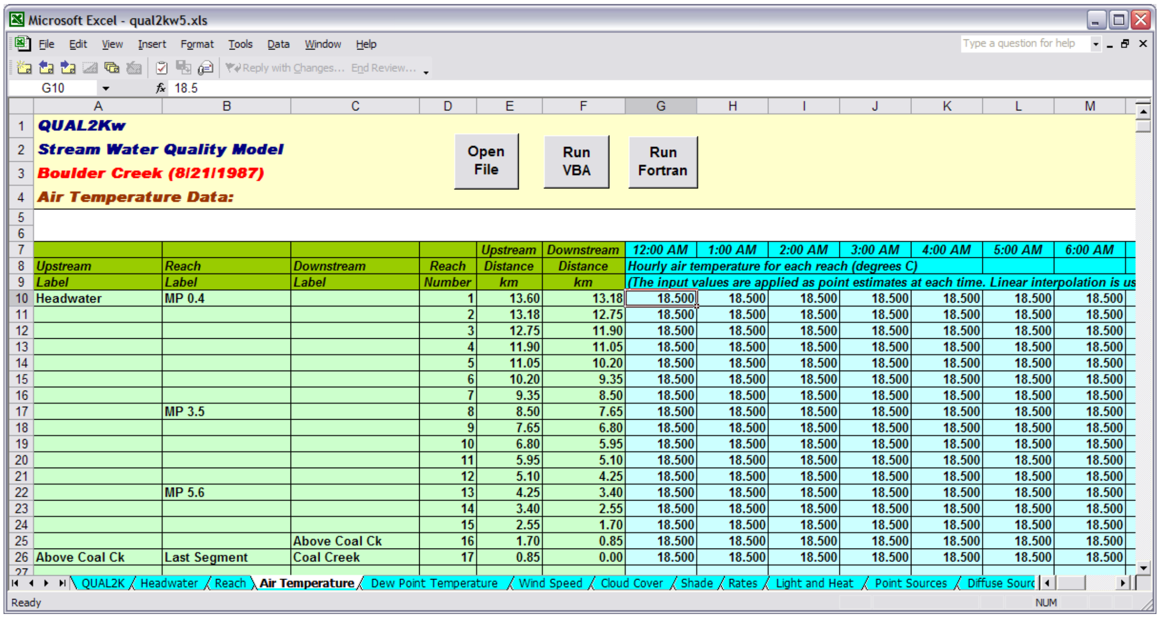
1.2.6 Meteorology and Shading Worksheets

Six worksheets are used to enter meteorological and shading data. All have the same general style as described below.

1.2.6.1 Air Temperature

This worksheet is used to enter hourly air temperatures in degrees Celcius for each of the system's reaches (Figure 10).

Labels and distances (output). The program automatically displays each reach's upstream label. reach label, downstream label, reach number, upstream distance, and downstream distance (previously entered on the Headwater and Reach Worksheets) in columns A through F.
Air Temperatures. Hourly air temperatures for each reach are entered in columns G through AD. If the values are constant over the daily cycle, just enter the mean value in column G (that is, for 12:00 AM) and leave the other cells (columns H through AD) blank. Q2K will automatically apply the 12:00 AM value to the other times of day.



QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

Air Temperature Data:

Hourly air temperature for each reach (degrees C)

(The input values are applied as point estimates at each time. Linear interpolation is us

Upstream Label	Reach Label	Downstream Label	Reach Number	Upstream Distance km	Downstream Distance km	12:00 AM	1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM
Headwater	MP 0.4		1	13.60	13.18	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			2	13.18	12.75	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			3	12.75	11.90	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			4	11.90	11.05	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			5	11.05	10.20	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			6	10.20	9.35	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			7	9.35	8.50	18.500	18.500	18.500	18.500	18.500	18.500	18.500
	MP 3.5		8	8.50	7.65	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			9	7.65	6.80	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			10	6.80	5.95	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			11	5.95	5.10	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			12	5.10	4.25	18.500	18.500	18.500	18.500	18.500	18.500	18.500
	MP 5.6		13	4.25	3.40	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			14	3.40	2.55	18.500	18.500	18.500	18.500	18.500	18.500	18.500
			15	2.55	1.70	18.500	18.500	18.500	18.500	18.500	18.500	18.500
		Above Coal Ck	16	1.70	0.85	18.500	18.500	18.500	18.500	18.500	18.500	18.500
Above Coal Ck	Last Segment	Coal Creek	17	0.85	0.00	18.500	18.500	18.500	18.500	18.500	18.500	18.500

Figure 10. The Air Temperature Worksheet.

1.2.6.2 Dew-Point Temperature

This worksheet is used to enter hourly dew-point temperatures (degrees Celcius) for each of the system's reaches.

Reach identifiers. Reach information (which was formerly entered on the Reach Worksheet) is displayed in Columns A through F.
Dew point Temperatures. Hourly dew point temperatures for each reach are entered in columns G through AD. If the values are constant over the daily cycle, just enter the mean value in column G (that is, for 12:00 AM) and leave the other cells (columns H through AD) blank. Q2K will automatically apply the 12:00 AM value to the other times of day.

1.2.6.3 Wind speed

This worksheet is used to enter hourly wind speeds (meters per second) for each of the system's reaches.

Reach identifiers. Reach information (which was formerly entered on the Reach Worksheet) is displayed in Columns A through F.
Dew point Temperatures. Hourly wind speeds for each reach are entered in columns G through AD. If the values are constant over the daily cycle, just enter the mean value in column G (that is, for 12:00 AM) and leave the other cells (columns H through AD) blank. Q2K will automatically apply the 12:00 AM value to the other times of day.

1.2.6.4 Cloud cover

This worksheet is used to enter hourly cloud cover (% of sky covered) for each of the system's reaches.

Reach identifiers. Reach information (which was formerly entered on the Reach Worksheet) is displayed in Columns A through F.
Dew point Temperatures. Hourly cloud cover for each reach are entered in columns G through AD. If the values are constant over the daily cycle, just enter the mean value in column G (that is, for 12:00 AM) and leave the other cells (columns H through AD) blank. Q2K will automatically apply the 12:00 AM value to the other times of day.

1.2.6.5 Shade

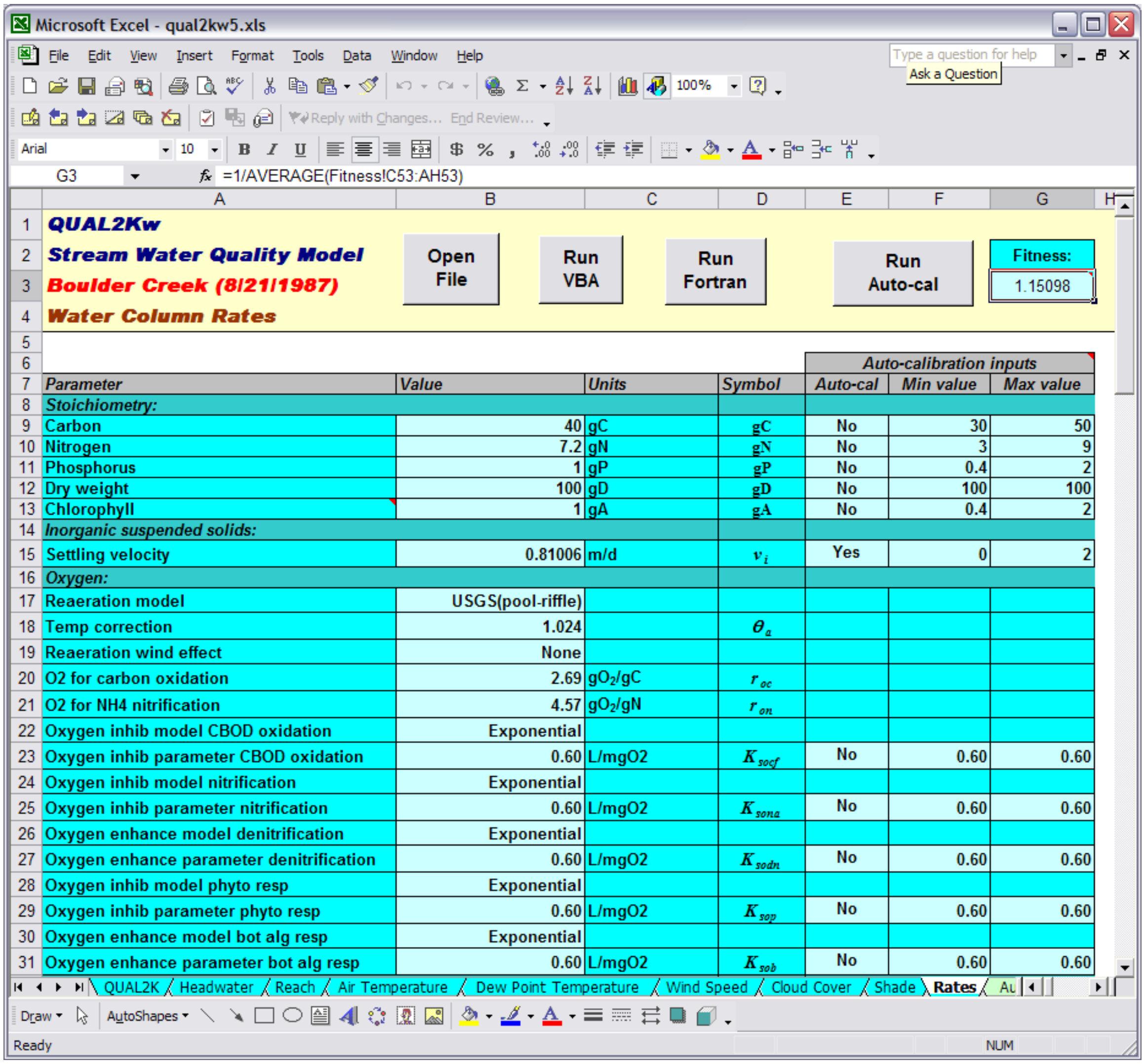
This worksheet is used to enter hourly shading for each of the system's reaches. Shading is defined as the percent of solar radiation that is blocked because of shade from topography and vegetation. If the values are constant over the daily cycle (full canopy or the river flows through a long culvert), just enter the mean value in column G (that is, for 12:00 AM) and leave the other cells (columns H through AD) blank. Q2K will automatically apply the 12:00 AM value to the other times of day.

1.2.6.6 Solar radiation

This worksheet is used to enter hourly solar radiation for each of the system's reaches. Use of this sheet is optional and the values entered will only be used if the user selectes "Observed" in cell B16 of the 'Light and Heat' Worksheet to use observed values for solar radiation instead of one of the choices for a solar radiation model.

1.2.7 Rates Worksheet

This worksheet is used to enter the model's rate parameters and choices for optional automatic calibration (Figure 11 through Figure 15).



G3 =1/AVERAGE(Fitness!C53:AH53)

QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

Water Column Rates

				Auto-calibration inputs		
Parameter	*Value*	*Units*	*Symbol*	*Auto-cal*	*Min value*	*Max value*
Stoichiometry:						
Carbon	40	gC	gC	No	30	50
Nitrogen	7.2	gN	gN	No	3	9
Phosphorus	1	gP	gP	No	0.4	2
Dry weight	100	gD	gD	No	100	100
Chlorophyll	1	gA	gA	No	0.4	2
Inorganic suspended solids:						
Settling velocity	0.81006	m/d	v_i	Yes	0	2
Oxygen:						
Reaeration model	USGS(pool-riffle)					
Temp correction	1.024		θ_a			
Reaeration wind effect	None					
O2 for carbon oxidation	2.69	gO_2/gC	r_{oc}			
O2 for NH4 nitrification	4.57	gO_2/gN	r_{on}			
Oxygen inhib model CBOD oxidation	Exponential					
Oxygen inhib parameter CBOD oxidation	0.60	L/mgO2	K_{socf}	No	0.60	0.60
Oxygen inhib model nitrification	Exponential					
Oxygen inhib parameter nitrification	0.60	L/mgO2	K_{sona}	No	0.60	0.60
Oxygen enhance model denitrification	Exponential					
Oxygen enhance parameter denitrification	0.60	L/mgO2	K_{sodn}	No	0.60	0.60
Oxygen inhib model phyto resp	Exponential					
Oxygen inhib parameter phyto resp	0.60	L/mgO2	K_{sop}	No	0.60	0.60
Oxygen enhance model bot alg resp	Exponential					
Oxygen enhance parameter bot alg resp	0.60	L/mgO2	K_{sob}	No	0.60	0.60

Figure 11a. The part of the Rates Worksheet used to input stoichiometry and rate parameters for inorganic suspended solids and oxygen.

Automatic calibration:

Q2K has the capability to automatically calibrate selected rate parameters. The user has the option of either specifying the values for each rate parameter that will be used, or allowing Q2K to auto-calibrate selected rate parameters. Column E is used to select either ‘Yes’ or ‘No’ to select whether a specific rate parameter will be automatically calibrated. If ‘No’ is selected in column E for a specific rate parameter, then the values entered in column B will be used for the simulation. The values in column B are always used when either the ‘Run VBA’ or ‘Run Fortran’ buttons are clicked. Columns E, F, and G are only used if Q2K's automatic calibration program is run using the ‘Run Auto-cal’ button on the ‘Rates’ Worksheet. Use column E to select whether to include a specific rate constant in the auto calibration.

Before automatic calibration can be run, the user must enter a formula in cell G3 of the ‘Rates’ sheet that calculates the goodness of fit of the model results compared with measured data. The user may enter any formula provided that the resulting value increases as the goodness of fit improves. For example, the inverse of the root mean squared error would be an acceptable choice since the RMSE decreases as goodness of fit improves, therefore, the inverse of the RMSE increases as goodness of fit improves. For more detailed information about how the goodness of fit is used by the genetic algorithm, the user is encouraged to consult the documentation fo the PIKIAI subroutine that is used in Q2K by Charbonneau and Knapp (1995).

The scratch area of the 'Fitness' worksheet is available for the user to construct a formula for the goodness of fit based on comparison of observed and predicted results. A formula must be entered in cell G3 such that fitness value is automatically recalculated for a new model run. The calculated fitness value in cell G3 must increase as the goodness of fit increases.

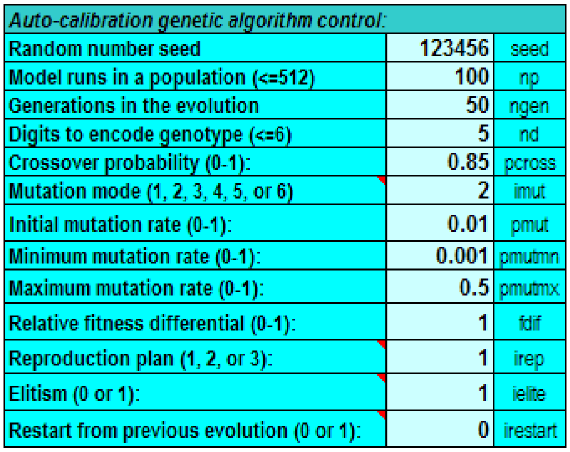
To run the automatic calibration, click on the 'Run Auto-cal' button above after making the appropriate selections in columns E, F, and G and constructing the fitness formula in cell G3. Control settings for the automatic calibration are available in cells J9:J21.

The genetic algorithm used by Q2K is PIKAIA. Detailed documentation of PIKAIA is available at the following link:

http://www.hao.ucar.edu/public/research/si/pikaia/pikaia.html

The genetic algorithm carries out its maximization task on a user-selected number of model runs to define a population (np). This population size remains constant throughout the evolutionary process. Rather than evolving the population until some preset tolerance criterion is satisfied, the genetic algorithm carries the evolution forward over a user-specified number of generations (ngen).

The control settings for the genetic algorithm are also entered in the ‘Rates’ sheet as shown in Figure 11b. The run time for the automatic calibration is determined by the number of model runs in a population (np) and the number of generations (ngen). The genetic algorithm will run the model at least np * (ngen + 1) times during the automatic calibration. Detailed documentation of the PIKAIA genetic algorithm is provided by Charbonneau and Knapp (1995).



Auto-calibration genetic algorithm control:		
Random number seed	123456	seed
Model runs in a population (<=512)	100	np
Generations in the evolution	50	ngen
Digits to encode genotype (<=6)	5	nd
Crossover probability (0-1):	0.85	pcross
Mutation mode (1, 2, 3, 4, 5, or 6)	2	imut
Initial mutation rate (0-1):	0.01	pmut
Minimum mutation rate (0-1):	0.001	pmutmn
Maximum mutation rate (0-1):	0.5	pmutmx
Relative fitness differential (0-1):	1	fdif
Reproduction plan (1, 2, or 3):	1	irep
Elitism (0 or 1):	1	ielite
Restart from previous evolution (0 or 1):	0	irestart

Figure 12b. The part of the Rates Worksheet used to input the control settings for the genetic algorithm for automatic calibration.

Random number seed. Any integer value may be entered for a seed value for the random number generator.
Number of model runs in a population. (default 100)
Number of generations in the evolution. This is the number of generations over which solution for the automatic calibration is to evolve (default is 50)
Number of digits to encode genotype - number of significant digits (i.e., number of genes) retained in chromosomal encoding (default is 5)
Crossover probability. must be <= 1.0 (default is 0.85). If crossover takes place, either one or two splicing points are used, with equal probabilities
Mutation mode. 1/2/3/4/5 (default is 2)

- 1=one-point mutation, fixed rate
- 2=one-point, adjustable rate based on fitness
- 3=one-point, adjustable rate based on distance
- 4=one-point+creep, fixed rate
- 5=one-point+creep, adjustable rate based on fitness
- 6=one-point+creep, adjustable rate based on distance

Initial mutation rate. Should be small (default is 0.005) (Note: the mutation rate is the probability that any one gene locus will mutate in any one generation.)
Minimum mutation rate. Must be >= 0.0 (default is 0.0005)
Maximum mutation rate. Must be <= 1.0 (default is 0.25)
Relative fitness differential. Range from 0 (none) to 1 (maximum). (default is 1.)
Reproduction plan. 1/2/3=Full generational replacement/Steady-state-replace-random/Steady-State - Replace – worst (Default Is 1)
Elitism flag. 0/1=off/on (default is 0) (Applies only to reproduction plans 1 and 2)
Restart from previous evolution. 0=random initial values, 1=use the last generation of previous run for the initial population

Stoichiometry:

The model assumes a fixed stoichiometry of phytoplankton and detrital matter. Recommended values for these parameters are listed in Table 1.

Table 1 Recommended values for stoichiometry.

Carbon	**40 gC**
Nitrogen	**7.2 gN**
Phosphorus	**1 gP**
Dry weight	**100 gD**
Chlorophyll	**1 gA**

It should be noted that chlorophyll is the most variable of these values with a range from about 0.5 to 2 gA.

Inorganic suspended solids:

Settling velocity

Oxygen:

Reaeration model. Recall that the Reach Worksheet (Figure 9) can be used to specify the reaeration rate for each reach. Note that when the reaeration is entered this way, all other options are overridden. If reaeration is not specified on the Reach Worksheet, a pull-down menu (Figure 12) is used to select among several options to determine river reaeration. The selected option will then be applied to all the cells that were left blank or zero on the Reach Worksheet. Note that the **Internal** option is the default and causes the reaeration to be computed internally depending on the river's depth and velocity.


17 Reaeration model USGS(pool-riffle)
18 Temp correction
19 Reaeration wind effect
20 O2 for carbon oxidation
21 O2 for NH4 nitrification
22 Oxygen inhib model CBOD oxidation

Figure 13. The pull-down menu for global reaeration rates.

Temperature correction (reaeration). Suggested value: 1.024.
Reaeration wind effect. As in Figure 13, three options can be used in the event that you want to include the effect of wind on the reaeration rate. The default is to not include the wind effect (None).


19 Reaeration wind effect None
20 O2 for carbon oxidation
21 O2 for NH4 nitrification

Figure 14. The pull-down menu to specify wind-induced reaeration.

O_2 for CBOD oxidation. Suggested value: 2.69 gO_2/gC.
O_2 for NH_4 nitrification. Suggested value: 4.57 gO_2/gC.

Several model rates are inhibited or enhanced (denitrification) at low oxygen concentration. The default for all these cases is the Exponential formula with a value of 0.6 L/mgO_2 for the inhibition parameter..

Oxygen inhibition C oxidation model. A pull-down menus is used to choose among the following options:

- Half-saturation
- Exponential
- Second order

Oxygen inhibition C parameter. This should be the proper parameter for the chosen oxygen inhibition model specified in cell B22.

Oxygen inhibition nitrification model. A pull-down menus is used to choose among the following options:

- Half-saturation
- Exponential
- Second order

Oxygen inhibition nitrification parameter. This should be the proper parameter for the chosen oxygen inhibition model specified in cell B24.

Oxygen enhancement denitrification model. A pull-down menus is used to choose among the following options:

- Half-saturation
- Exponential
- Second order

Oxygen enhancement denitrification parameter. This should be the proper parameter for the oxygen enhancement model specified in cell specified in cell B26.

Oxygen inhibition phytoplankton respiration. A pull-down menus is used to choose among the following options:

- Half-saturation
- Exponential
- Second order

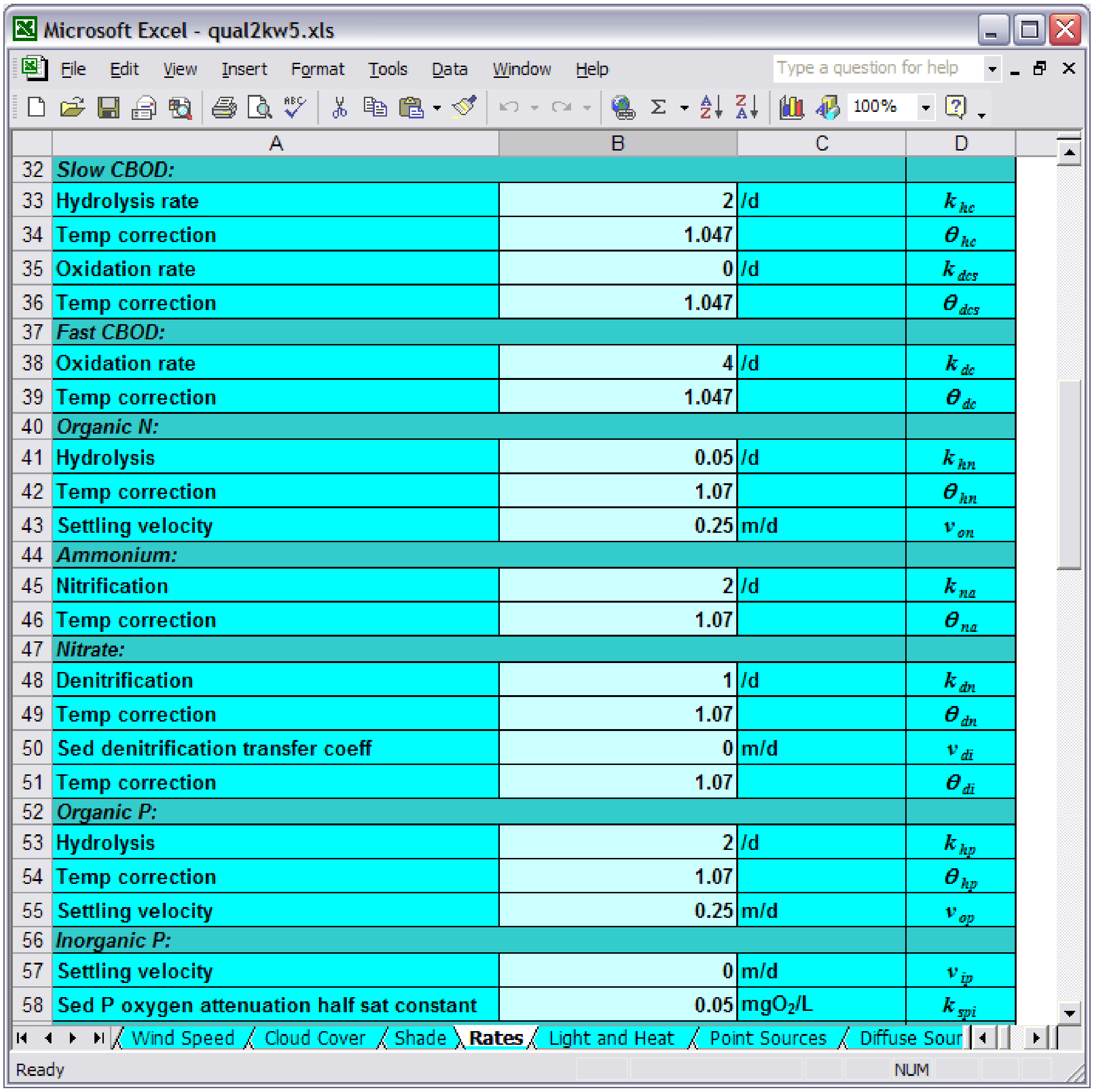
Oxygen inhibition phytoplankton respiration parameter. This should be the proper parameter for the chosen oxygen inhibition model specified in cell B28.

Oxygen inhibition bottom algae respiration. A pull-down menus is used to choose among the following options:

- Half-saturation
- Exponential
- Second order

Oxygen inhibition bottom algae respiration parameter. This should be the proper parameter for the chosen oxygen inhibition model specified in cell B30.

Figure 14 shows the part of the Rates Worksheet used to input rate parameters for slow CBOD, fast CBOD, organic N, ammonium, nitrate, organic P and inorganic P.



	A	B	C	D
32	*Slow CBOD:*			
33	Hydrolysis rate	2	/d	k_{hc}
34	Temp correction	1.047		θ_{hc}
35	Oxidation rate	0	/d	k_{dcs}
36	Temp correction	1.047		θ_{dcs}
37	*Fast CBOD:*			
38	Oxidation rate	4	/d	k_{dc}
39	Temp correction	1.047		θ_{dc}
40	*Organic N:*			
41	Hydrolysis	0.05	/d	k_{hn}
42	Temp correction	1.07		θ_{hn}
43	Settling velocity	0.25	m/d	v_{on}
44	*Ammonium:*			
45	Nitrification	2	/d	k_{na}
46	Temp correction	1.07		θ_{na}
47	*Nitrate:*			
48	Denitrification	1	/d	k_{dn}
49	Temp correction	1.07		θ_{dn}
50	Sed denitrification transfer coeff	0	m/d	v_{di}
51	Temp correction	1.07		θ_{di}
52	*Organic P:*			
53	Hydrolysis	2	/d	k_{hp}
54	Temp correction	1.07		θ_{hp}
55	Settling velocity	0.25	m/d	v_{op}
56	*Inorganic P:*			
57	Settling velocity	0	m/d	v_{ip}
58	Sed P oxygen attenuation half sat constant	0.05	mgO$_2$/L	k_{spi}

Figure 15. The part of the Rates Worksheet used to input rate parameters for slow CBOD, fast CBOD, organic N, ammonium, nitrate, organic P and inorganic P.

Slow CBOD:

Hydrolysis rate
Temperature correction

Fast CBOD:

Oxidation rate
Temperature correction

Organic N:

Hydrolysis

Temperature correction
Settling velocity

Ammonium:

Nitrification
Temperature correction

Nitrate:

Denitrification
Temperature correction
Sediment denitrification transfer coefficient. This parameter can be used to simulate the diffusion of nitrate into the sediments where it is denitrified to nitrogen gas.
Temperature correction

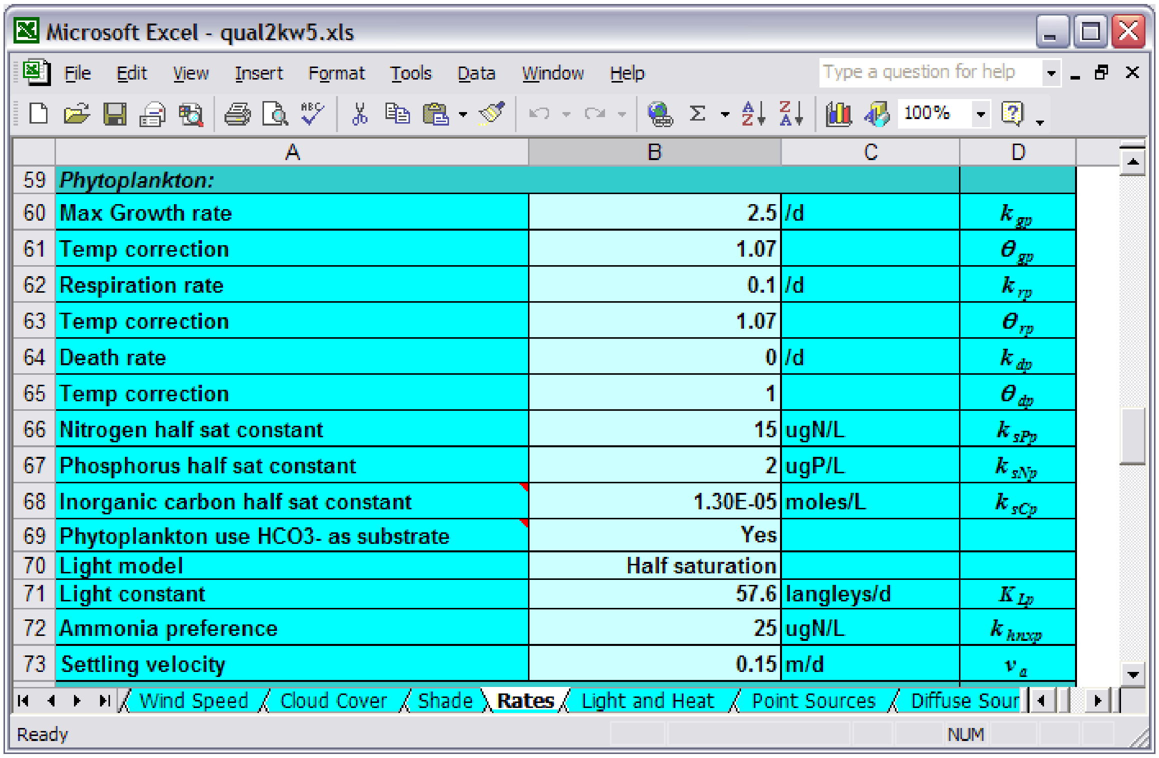
Organic P:

Hydrolysis
Temperature correction
Settling velocity

Inorganic P:

Settling velocity. This parameter is used to simulate enhanced loss to the sediments for cases where inorganic phosphorus sorbs to settling particulate matter.
Sed P oxygen attenuation half sat constant. This parameter is used to attenuate sediment feedback of phosphorus as a function of dissolved oxygen levels in the water. In the event that phosphorus is only released from the sediments at low oxygen levels, this parameter should be set to a value of 0.05 mgO_2/L.

Figure 15 shows the part of the Rates Worksheet used to input rate parameters for phytoplankton.



	A	B	C	D
59	*Phytoplankton:*			
60	Max Growth rate	2.5	/d	k_{gp}
61	Temp correction	1.07		θ_{gp}
62	Respiration rate	0.1	/d	k_{rp}
63	Temp correction	1.07		θ_{rp}
64	Death rate	0	/d	k_{dp}
65	Temp correction	1		θ_{dp}
66	Nitrogen half sat constant	15	ugN/L	k_{sPp}
67	Phosphorus half sat constant	2	ugP/L	k_{sNp}
68	Inorganic carbon half sat constant	1.30E-05	moles/L	k_{sCp}
69	Phytoplankton use HCO3- as substrate	Yes		
70	Light model	Half saturation		
71	Light constant	57.6	langleys/d	K_{Lp}
72	Ammonia preference	25	ugN/L	k_{hnxp}
73	Settling velocity	0.15	m/d	v_a

Figure 16. The part of the Rates Worksheet used to input rate parameters for phytoplankton.

Floating Plants (Phytoplankton):

Maximum Growth Rate
Temperature correction
Respiration
Temperature correction
Death
Temperature correction
Nitrogen half saturation constant
Phosphorus half saturation constant
Inorganic carbon half saturation constant. A brief summary of the literature suggests these guidelines for half saturation for $CO_2/HCO3^-$:

- Hein (1997) suggests a mid range value of CO_2 half-saturation for phytoplankton of about 13e-6 moles/L with a possible range of 0.1e-6 to 170e-6 moles/L for 25 freshwater species of phytoplankton (this range includes a mix of species that are restricted to CO_2 and species than can use $HCO3^-$).
- Maberly and Spence (1983) summarize a range in the literature of 80e-6 to 706e-6 moles/L for the CO_2 half-saturation for macrophytes(this range includes a mix of species that are restricted to CO_2 and species than can use $HCO3^-$).
- Maberly and Madsen (1998) report a range of 22e-6 to 170e-6 moles per liter for the half-saturation for species that are restricted to CO_2, and 175e-6 to 550e-6 moles per liter for species that can use CO_2 and $HCO3^-$. This paper suggests that species that can use $HCO3^-$ have significantly higher half-saturation constants compared with species that are restricted to CO_2. The authors suggest that "... macrophytes that are restricted to CO_2

have a higher affinity for uptake of CO_2 than species that have an additional ability to use $HCO3^-$", although the mechanism for the difference is not clear.

If $HCO3^-$ use is indicated in cell B69, then the half-saturation constant is applied to the sum of HCO3 and CO_2 instead of only CO_2.

Phytoplankton use $HCO3^-$ as substrate. Two options are available from the pull down list:

- 'Yes' if phytoplankton can use both HCO3- and CO2 as a substrate.
- 'No' if phytoplankon are restricted to CO2 as a substrate.

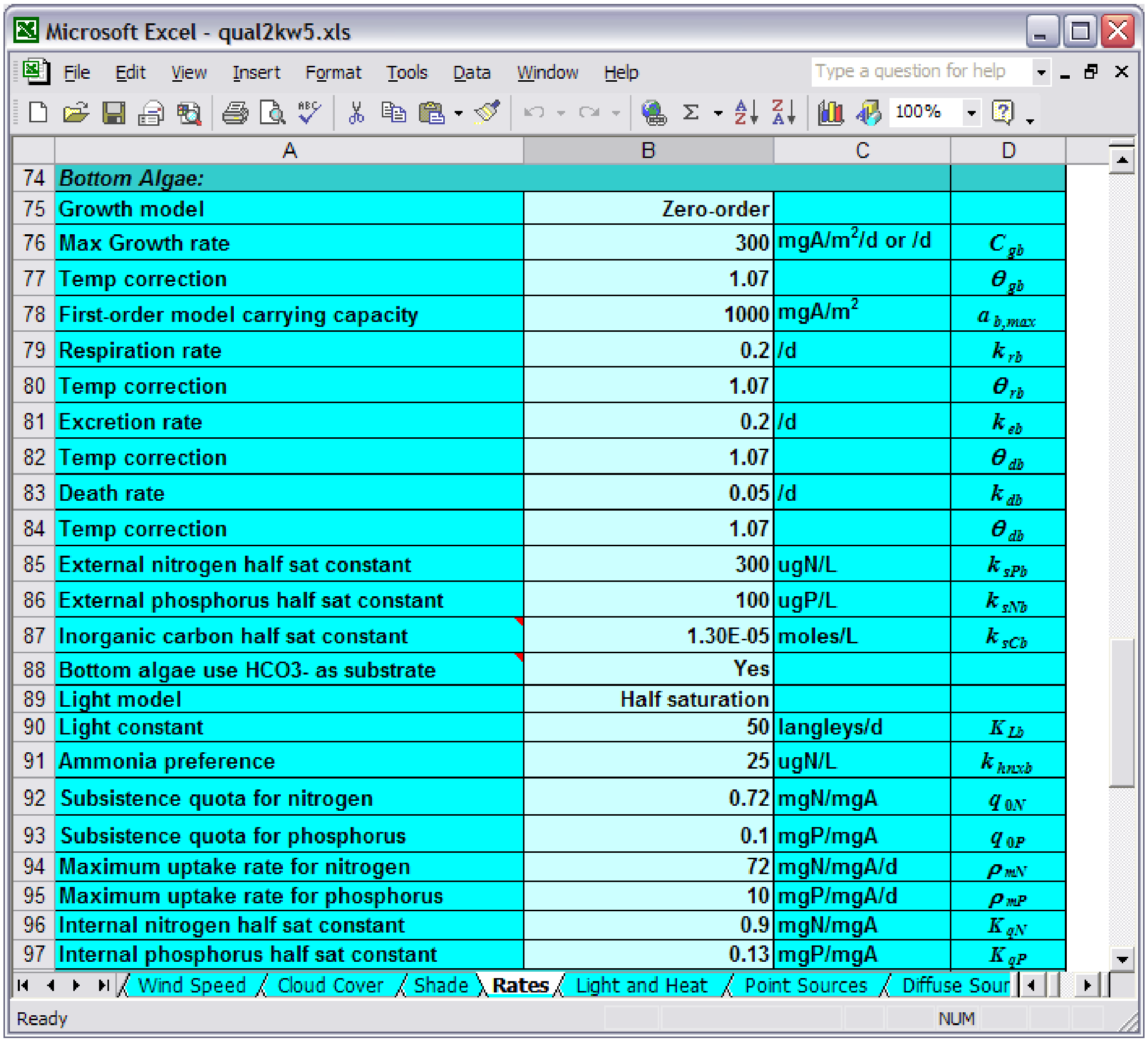
Light model. A pull-down menu is used to select among three light models: Half saturation, Smith and Steele. The Half saturation model is the default.

Light constant

Ammonia preference

Settling velocity

Figure 16 shows the part of the Rates Worksheet used to input rate parameters for bottom algae.



	A	B	C	D
74	***Bottom Algae:***			
75	Growth model	Zero-order		
76	Max Growth rate	300	$mgA/m^2/d$ or /d	C_{gb}
77	Temp correction	1.07		θ_{gb}
78	First-order model carrying capacity	1000	mgA/m^2	$a_{b,max}$
79	Respiration rate	0.2	/d	k_{rb}
80	Temp correction	1.07		θ_{rb}
81	Excretion rate	0.2	/d	k_{eb}
82	Temp correction	1.07		θ_{db}
83	Death rate	0.05	/d	k_{db}
84	Temp correction	1.07		θ_{db}
85	External nitrogen half sat constant	300	ugN/L	k_{sPb}
86	External phosphorus half sat constant	100	ugP/L	k_{sNb}
87	Inorganic carbon half sat constant	1.30E-05	moles/L	k_{sCb}
88	Bottom algae use HCO3- as substrate	Yes		
89	Light model	Half saturation		
90	Light constant	50	langleys/d	K_{Lb}
91	Ammonia preference	25	ugN/L	k_{hnxb}
92	Subsistence quota for nitrogen	0.72	mgN/mgA	q_{0N}
93	Subsistence quota for phosphorus	0.1	mgP/mgA	q_{0P}
94	Maximum uptake rate for nitrogen	72	mgN/mgA/d	ρ_{mN}
95	Maximum uptake rate for phosphorus	10	mgP/mgA/d	ρ_{mP}
96	Internal nitrogen half sat constant	0.9	mgN/mgA	K_{qN}
97	Internal phosphorus half sat constant	0.13	mgP/mgA	K_{qP}

Figure 17. The part of the Rates Worksheet used to input rate parameters for bottom algae.

Bottom algae:

Growth model. The bottom algae can be simulated with either a zero-order or a first-order model. The default is zero order.

Maximum growth rate. Depending on the order model chosen, this is the maximum growth rate at 20 ^{o}C in units of gD/m^2/d (zero order) or d^{-1} (first order).

Temperature correction. Coefficient for temperature adjustment of the maximum growth rate.

First-order model carrying capacity. In the event that a first-order model is chosen, a carrying capacity is required in order to bound growth.

Basal respiration rate. Laws and Challup suggest a default basal respiration rate of 0.042 d^-1 per Chapra (1997) equation 33.40.

Photo-respiration rate parameter. Laws and Challup suggest a default of 0.389 per Chapra (1997) equation 33.40 to correspond to growth-related respiration of about 39% of the growth rate. To use a single basal respiration rate without consideration of photo-respiration enter a value of 0.

Temperature correction. Coefficient for temperature adjustment of the basal respiration rate.

Death rate

Temperature correction. Coefficient for temperature adjustment of the death rate.

External nitrogen half saturation constant

External phosphorus half saturation constant

Inorganic carbon half saturation constant. A brief summary of the literature suggests these guidelines for half saturation for CO_2/HCO3$^-$:

- Hein (1997) suggests a mid range value of CO_2 half-saturation for phytoplankton of about 13e-6 moles/L with a possible range of 0.1e-6 to 170e-6 moles/L for 25 freshwater species of phytoplankton (this range includes a mix of species that are restricted to CO_2 and species than can use HCO3$^-$).
- Maberly and Spence (1983) summarize a range in the literature of 80e-6 to 706e-6 moles/L for the CO_2 half-saturation for macrophytes(this range includes a mix of species that are restricted to CO_2 and species than can use HCO3$^-$).
- Maberly and Madsen (1998) report a range of 22e-6 to 170e-6 moles per liter for the half-saturation for species that are restricted to CO_2, and 175e-6 to 550e-6 moles per liter for species that can use CO_2 and HCO3$^-$. This paper suggests that species that can use HCO3$^-$ have significantly higher half-saturation constants compared with species that are restricted to CO_2. The authors suggest that "... macrophytes that are restricted to CO_2 have a higher affinity for uptake of CO_2 than species that have an additional ability to use HCO3$^-$", although the mechanism for the difference is not clear.

If HCO3$^-$ use is indicated in cell B69, then the half-saturation constant is applied to the sum of HCO3 and CO_2 instead of only CO_2.

Bottom algae use HCO3$^-$ as substrate. Two options are available from the pull down list:

- 'Yes' if bottom algae can use both HCO3- and CO2 as a substrate.
- 'No' if bottom algae are restricted to CO2 as a substrate.

Light model. A pull-down menu is used to select among three light models: Half saturation, Smith and Steele. The Half saturation model is the default.

Light Constant

Ammonia preference

Subsistence quota for nitrogen

Subsistence quota for phosphorus

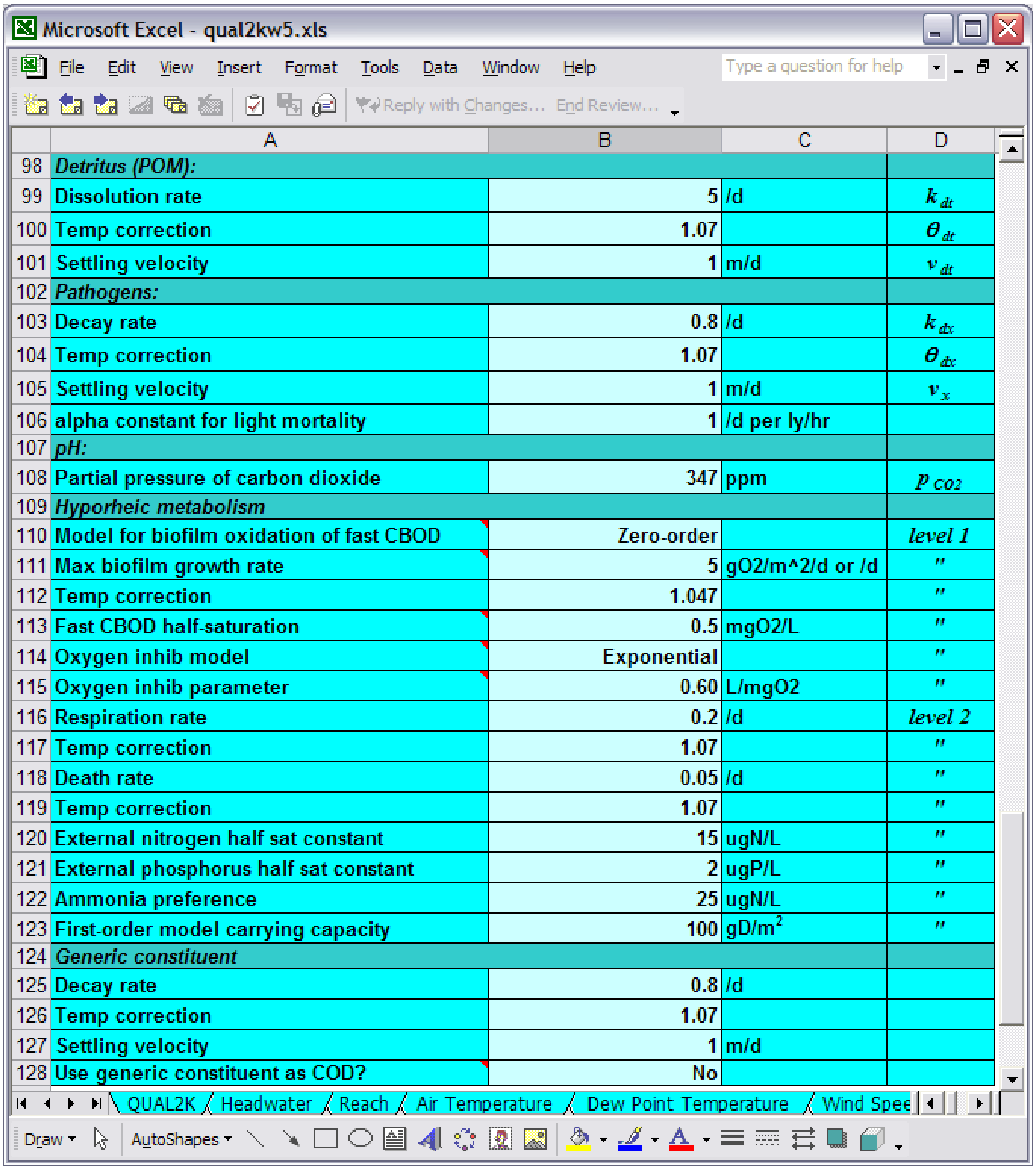
Maximum uptake rate for nitrogen

Maximum uptake rate for phosphorus

Internal nitrogen half sat constant

Internal phosphorus half sat constant

Figure 17 shows the part of the Rates Worksheet used to input rate parameters for bottom algae.



	A	B	C	D
98	*Detritus (POM):*			
99	Dissolution rate	5	/d	k_{dt}
100	Temp correction	1.07		θ_{dt}
101	Settling velocity	1	m/d	v_{dt}
102	*Pathogens:*			
103	Decay rate	0.8	/d	k_{dx}
104	Temp correction	1.07		θ_{dx}
105	Settling velocity	1	m/d	v_x
106	alpha constant for light mortality	1	/d per ly/hr	
107	*pH:*			
108	Partial pressure of carbon dioxide	347	ppm	p_{CO2}
109	*Hyporheic metabolism*			
110	Model for biofilm oxidation of fast CBOD	Zero-order		*level 1*
111	Max biofilm growth rate	5	gO2/m^2/d or /d	"
112	Temp correction	1.047		"
113	Fast CBOD half-saturation	0.5	mgO2/L	"
114	Oxygen inhib model	Exponential		"
115	Oxygen inhib parameter	0.60	L/mgO2	"
116	Respiration rate	0.2	/d	*level 2*
117	Temp correction	1.07		"
118	Death rate	0.05	/d	"
119	Temp correction	1.07		"
120	External nitrogen half sat constant	15	ugN/L	"
121	External phosphorus half sat constant	2	ugP/L	"
122	Ammonia preference	25	ugN/L	"
123	First-order model carrying capacity	100	gD/m^2	"
124	*Generic constituent*			
125	Decay rate	0.8	/d	
126	Temp correction	1.07		
127	Settling velocity	1	m/d	
128	Use generic constituent as COD?	No		

Figure 18. The part of the Rates Worksheet used to input rate parameters for detritus, pathogens, pH, hyporheic metabolism, and the generic constituent.

Detritus (POM):

Dissolution

Temperature correction
Settling Velocity

Pathogens:

Decay
Temperature correction
Settling Velocity
Alpha constant for light mortality

pH:

pCO2. The partial pressure of CO_2 in the atmosphere.

Hyporheic metabolism:

Model for biofilm oxidation of fast CBOD. The biofilm oxidation of fast CBOD can be simulated with either a zero-order ($gO_2/m^2/d$) or a first-order (day^{-1}) model. The default is zero order.
Max biofilm growth rate. Depending on the order model chosen, this is the maximum oxidation or growth rate at 20 ºC in units of $gO_2/m^2/d$ (zero order) or d^{-1} (first order).
Temp correction.
Fast CBOD half-saturation.
Oxygen inhib model.
Oxygen inhib parameter.
Respiration rate. This and the following parameters are only used if level 2 was selected in cell B21 of the QUAL2K sheet, and they are similar to the parameters for bottom algae above.
Temp correction.
Death rate.
Temp correction.
External nitrogen half sat constant.
External phosphorus half sat constant.
Ammonia preference.
First-order model carrying capacity. In the event that a first-order model is chosen, a carrying capacity is required in order to bound growth. This is the maximum possible biofilm biomass in gD/m^2.

Generic constituent:

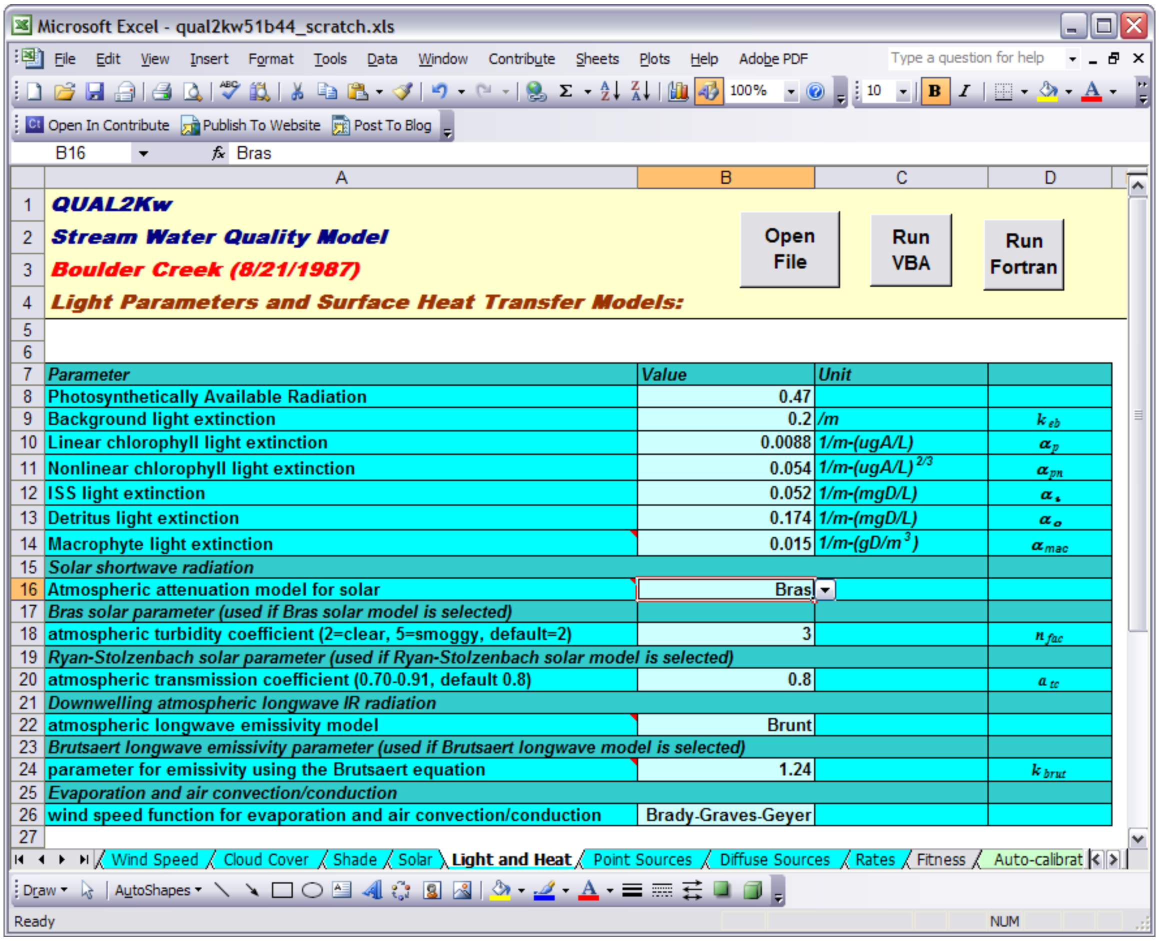
Decay
Temperature correction
Settling Velocity
Use generic constituent as COD? The user has the option of using the generic constituent in one of two ways:

- Select 'Yes' to use the generic constituent variable as a non-carbonaceous non-nitrogenous form of chemical oxygen demand (COD) in units of mgO2/L.If 'Yes' is selected then the amount of COD that decays is subtracted from the dissolved oxygen state variable in the mass balance derivatives. The user should enter the COD concentrations in units of mgO_2/L for headwater, downstream boundary (if used), point sources, and diffuse sources.

- Select 'No' to assume that the generic constituent does not interact with any other state variables. The user should may enter the concentrations of the generic constituent in any consistent concentration units for headwater, downstream boundary (if used), point sources, and diffuse sources (use same concentration units for all).

1.2.8 Light and Heat Worksheet

This worksheet is used to enter information related to the system’s light and heat parameters.



QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

Light Parameters and Surface Heat Transfer Models:

Parameter	Value	Unit	
Photosynthetically Available Radiation	0.47		
Background light extinction	0.2	/m	k_{eb}
Linear chlorophyll light extinction	0.0088	1/m-(ugA/L)	α_p
Nonlinear chlorophyll light extinction	0.054	1/m-(ugA/L)$^{2/3}$	α_{pn}
ISS light extinction	0.052	1/m-(mgD/L)	α_i
Detritus light extinction	0.174	1/m-(mgD/L)	α_o
Macrophyte light extinction	0.015	1/m-(gD/m^3)	α_{mac}
Solar shortwave radiation			
Atmospheric attenuation model for solar	Bras		
Bras solar parameter (used if Bras solar model is selected)			
atmospheric turbidity coefficient (2=clear, 5=smoggy, default=2)	3		n_{fac}
Ryan-Stolzenbach solar parameter (used if Ryan-Stolzenbach solar model is selected)			
atmospheric transmission coefficient (0.70-0.91, default 0.8)	0.8		a_{tc}
Downwelling atmospheric longwave IR radiation			
atmospheric longwave emissivity model	Brunt		
Brutsaert longwave emissivity parameter (used if Brutsaert longwave model is selected)			
parameter for emissivity using the Brutsaert equation	1.24		k_{brut}
Evaporation and air convection/conduction			
wind speed function for evaporation and air convection/conduction	Brady-Graves-Geyer		

Figure 19. The Light Worksheet used to input light-related parameters.

Photosynthetically Available Radiation. This is the fraction of incoming solar radiation that is available for photosynthesis. It is recommended that this value be set to 0.47.

Background light extinction. This parameter accounts for light extinction due to water and color.

Linear chlorophyll light extinction. This parameter accounts for the linear dependence of light extinction due to phytoplankton chlorophyll *a*. According to Riley (1956), this parameter should be set to 0.0088/(m μgA/L).

Nonlinear chlorophyll light extinction. This parameter accounts for the nonlinear dependence of light extinction due to phytoplankton chlorophyll *a*. According to Riley (1956), this parameter should be set to 0.054/(m (μgA/L)$^{2/3}$). Note that if the relationship is believed to be linear, this parameter can be set to zero and the linear coefficient modified accordingly.

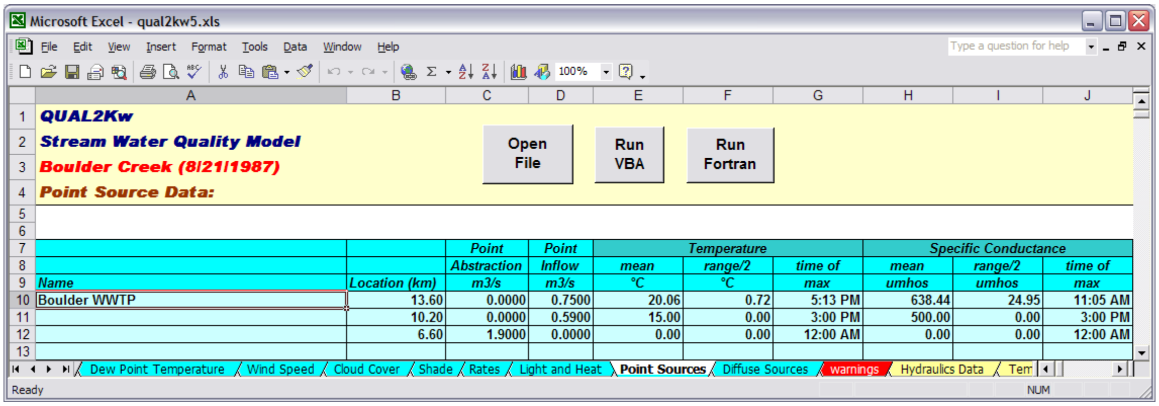
Inorganic suspended solids light extinction. This parameter accounts for the nonlinear dependence of light extinction on inorganic suspended solids.

Detritus light extinction. This parameter accounts for the nonlinear dependence of light extinction on detritus.

Atmospheric attenuation model for solar (default: Bras). A pull down menu allows you to choose among 2 options: the Bras or the Ryan-Stolzenbach models. To use observed data from the 'Solar' Worksheet select 'Observed'.
Atmospheric turbidity coefficient (2=clear, 5=smoggy, default=2). This is used if the Bras solar model is selected
Atmospheric transmission coefficient (0.70-0.91, default 0.8). This is used if the Ryan-Stolzenbach solar model is selected.
Atmospheric longwave emissivity model (recommended default: Brutsaert). A pull down menu allows you to choose among 6 options: the Brutsaert, Brunt Idso-Jackson, Koberg, Satterlund, or Swinbank models.
Parameter for emissivity using the Brutsaert equation. Brutsaert (1982) recommended a default value of 1.24 based on typical values for various physical constants. Several articles have since been published with various recommended values considering the uncertainty and calibration to observations of downwelling longwave radiation. Crawford and Duchon (1999) suggested a range for kbrut from 1.28 in January to 1.16 in July with sinusoidal seasonal variaton. Sridhar and Elliot (2002) recommended an average value of 1.31 based on calibration to observed longwave radiation data in Oklahoma, with values ranging from 1.30 to 1.32 between four sites. Culf and Gash (1993) also recommended a value of 1.31 instead of 1.24 during dry seasons in Niger, and a reduced value during wet seasons. A default value of 1.24 is suggested.
Wind speed function for evaporation and air convection/conduction (default: Brady-Graves-Geyer). A pull down menu allows you to choose among 3 options: the Brady-Graves-Geyer, the Adams 1, or the Adams 2 models.

1.2.9 Point Sources Worksheet

This worksheet is used to enter information related the system's point sources.



QUAL2Kw
Stream Water Quality Model
Boulder Creek (8/21/1987)
Point Source Data:

		Point	Point	Temperature			Specific Conductance		
		Abstraction	Inflow	mean	range/2	time of	mean	range/2	time of
Name	Location (km)	m3/s	m3/s	°C	°C	max	umhos	umhos	max
Boulder WWTP	13.60	0.0000	0.7500	20.06	0.72	5:13 PM	638.44	24.95	11:05 AM
	10.20	0.0000	0.5900	15.00	0.00	3:00 PM	500.00	0.00	3:00 PM
	6.60	1.9000	0.0000	0.00	0.00	12:00 AM	0.00	0.00	12:00 AM

Figure 20. The Point Sources Worksheet.

Name. User-specified label to identify the particular point source inflow or abstraction.
Location. The kilometer where the point source or abstraction enters or leaves the river.
Source Inflows and Outflows. A source can either be an inflow (loading or tributary) or an outflow (abstraction). Note that it can not be both. If there is an abstraction flow (i.e., a positive value in column C), the remaining information in columns D through AZ will be ignored.

Point abstraction. For an abstraction, a positive[3] value for flow (m^3/s) must be entered. If this is done, the values in columns D through AZ should be left blank.

Point inflow. For an input, a value for flow (m^3/s) must be entered in column D. Column C should be a zero or a blank.

Constituents. The temperature and the water quality concentrations of the inflow are entered in columns E through AZ.

QUAL2K allows the temperature and concentrations of each point source to be entered as a sinusoid that varies over the diel cycle. Figure 20 shows an example for the temperature of the Boulder CO WWTP.

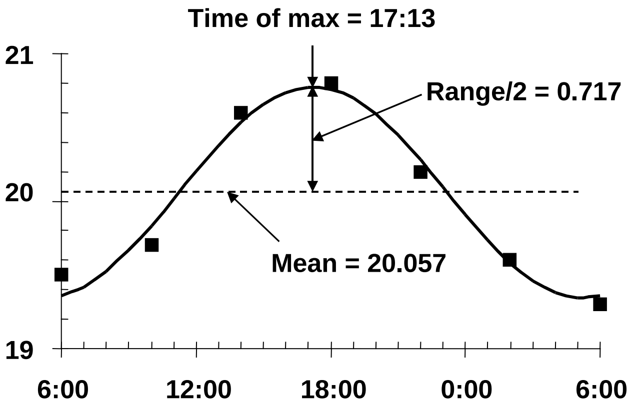
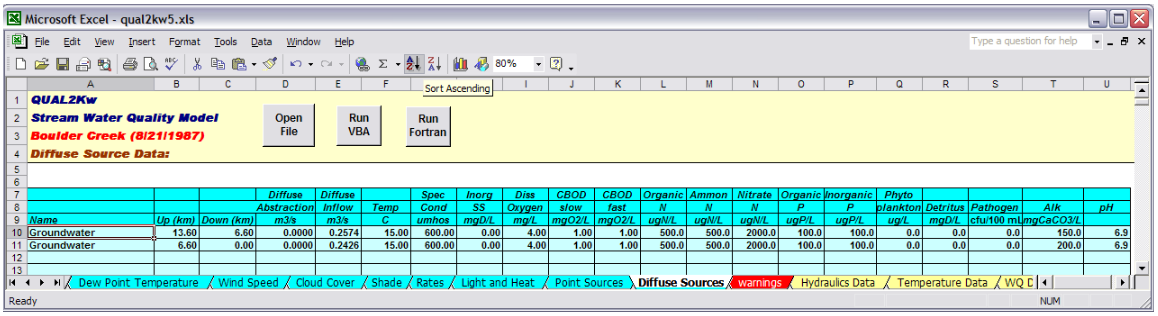


Figure 21. Temperature for the Boulder, CO wastewater treatment plant effluent on Sept. 21-22, 1987 along with a sinusoidal fit to the data.

1.2.10 Diffuse Sources Worksheet

This worksheet is used to enter information related the system's diffuse (i.e., non-point) sources and abstractions.



QUAL2Kw
Stream Water Quality Model
Boulder Creek (8/21/1987)
Diffuse Source Data:

Name	Up (km)	Down (km)	Diffuse Abstraction m3/s	Diffuse Inflow m3/s	Temp C	Spec Cond umhos	Inorg SS mgD/L	Diss Oxygen mg/L	CBOD slow mgO2/L	CBOD fast mgO2/L	Organic N ugN/L	Ammon N ugN/L	Nitrate N ugN/L	Organic P ugP/L	Inorganic P ugP/L	Phyto plankton ug/L	Detritus mgD/L	Pathogen cfu/100 mL	Alk mgCaCO3/L	pH
Groundwater	13.60	6.60	0.0000	0.2574	15.00	600.00	0.00	4.00	1.00	1.00	500.0	500.0	2000.0	100.0	100.0	0.0	0.0	0.0	150.0	6.9
Groundwater	6.60	0.00	0.0000	0.2426	15.00	600.00	0.00	4.00	1.00	1.00	500.0	500.0	2000.0	100.0	100.0	0.0	0.0	0.0	200.0	6.9

Figure 22. The Diffuse Sources Worksheet.

Name. User-specified label to identify the particular diffuse inflow or abstraction.

Location. The upstream and downstream kilometers over which the diffuse source or abstraction enters or leaves the river.

---

[3] Some software treats an abstraction as a negative inflow. In Q2K, the flow is entered as a positive number and the software internally calculates it as a loss from the reach.

Source inflows and outflows. A distributed source can either be an inflow (loading or tributary) or an outflow (abstraction). Note that it can not be both. If there is an abstraction flow (i.e., a positive value in column D), the remaining information in columns E through U will be ignored. If a particular segment location actually has diffuse inflow and outflow, then these can both be entered on separate rows.

Diffuse abstraction. For an abstraction, a positive[4] value for flow (m^3/s) must be entered in column D. If this is done, the values in columns E through U should be left blank.

Diffuse inflow. For an input, a value for flow (m^3/s) must be entered in column E. Column D should be a zero or a blank.

Constituents. The temperature and the water quality concentrations of the diffuse inflow are entered in columns F through U.

---

[4] Some software treats an abstraction as a negative inflow. In Q2K, the flow is entered as a positive number and the software internally calculates it as a loss from the reach.

1.3 WARNINGS WORKSHEET

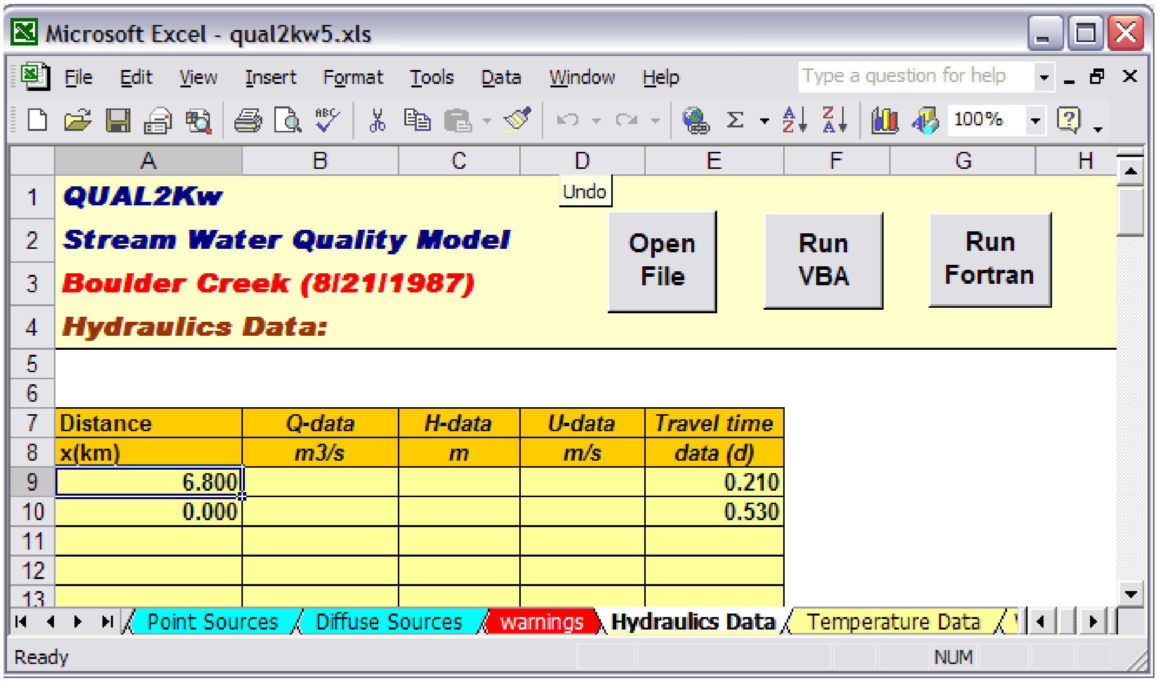
The Warnings Worksheet will display any warnings that occur when the model is run. It is a good idea to inspect the Warnings Worksheet after the model is run. If bad inputs are detected in some of the input Worksheets then Warnings may be provided. For example, if the user specifies in cell B21 of the QUAL2K Worksheet that hyporheic metabolism should not be calculated, but the user also includes a positive value for hyporheic exchange flow in column AL of the Reach Worksheet, then a warning will provided to explain that hyporheic simulation will not occur unless it is specified on the QUAL2K Worksheet.

1.4 DATA WORKSHEETS (OPTIONAL)

A series of worksheets are used to enter measured data for display on plots. This information is optional; that is, the model will run regardless of whether these sheets hold data. These are identified by pale yellow tabs.

1.4.1 Hydraulics Data Worksheet (Optional)

This worksheet is used to enter data related to the system's hydraulics (Figure 22).



QUAL2Kw
Stream Water Quality Model
Boulder Creek (8/21/1987)
Hydraulics Data:

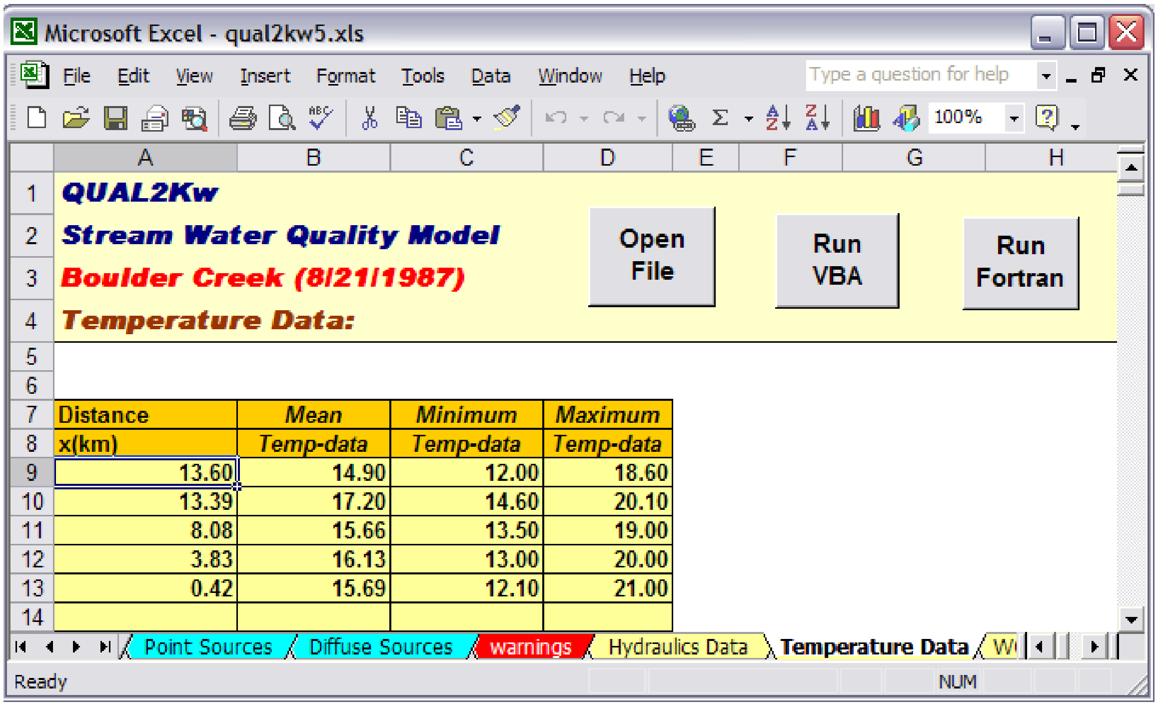
Distance x(km)	Q-data m3/s	H-data m	U-data m/s	Travel time data (d)
6.800				0.210
0.000				0.530

Figure 23. The Hydraulics Data Worksheet.

Distance. This is the distance (km) at which the hydraulics data are plotted.
***Q*-data.** Flow data in m^3/s.
***H*-data.** Depth data in m.
***U*-data.** Velocity data in m/s.
Travel time-data. Travel time in days.

1.4.2 Temperature Data Worksheet

This worksheet is used to enter temperature data (Figure 23).



QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

Temperature Data:

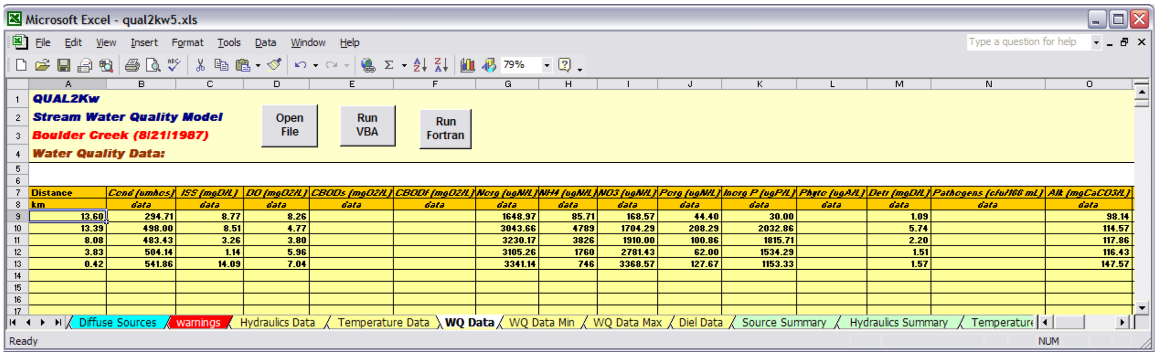
Distance x(km)	Mean Temp-data	Minimum Temp-data	Maximum Temp-data
13.60	14.90	12.00	18.60
13.39	17.20	14.60	20.10
8.08	15.66	13.50	19.00
3.83	16.13	13.00	20.00
0.42	15.69	12.10	21.00

Figure 24. The Temperature Data Worksheet.

Distance. This is the distance (km) at which the temperature data are plotted.
Mean Temperature-data. The mean temperature in °C.
Minimum Temperature-data. The minimum temperature in °C.
Maximum Temperature-data. The maximum temperature in °C.

1.4.3 WQ Data Worksheet

This worksheet is used to enter mean daily values for water quality data. The first part of the worksheet is shown in Figure 24.



QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

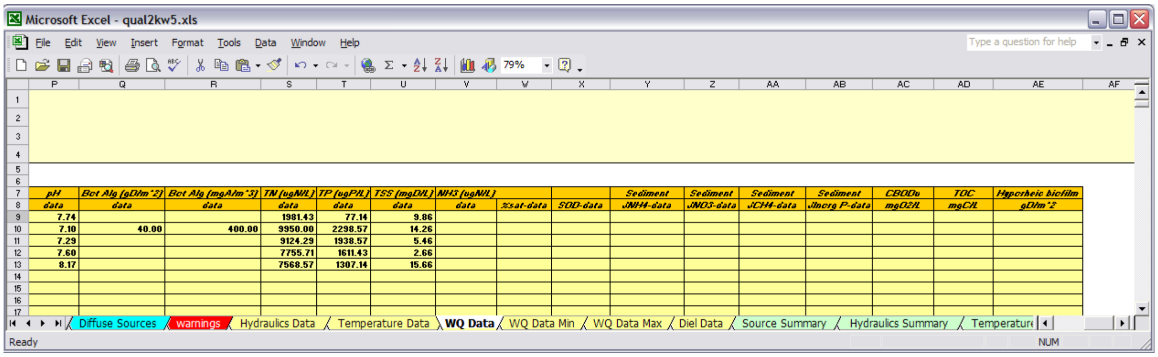
Water Quality Data:

Distance km	Cond (umhos) data	ISS (mgD/L) data	DO (mgO2/L) data	CBODs (mgO2/L) data	CBODf (mgO2/L) data	Norg (ugN/L) data	NH4 (ugN/L) data	NO3 (ugN/L) data	Porg (ugN/L) data	Inorg P (ugP/L) data	Phytc (ugA/L) data	Detr (mgD/L) data	Pathogens (cfu/100 mL) data	Alk (mgCaCO3/L) data
13.60	294.71	8.77	8.26			1648.97	85.71	168.57	44.40	30.00		1.09		98.14
13.39	498.00	8.51	4.77			3043.66	4789	1704.29	208.29	2032.86		5.74		114.57
8.08	483.43	3.26	3.80			3230.17	3826	1910.00	100.86	1815.71		2.20		117.86
3.83	504.14	1.14	5.96			3105.26	1760	2781.43	62.00	1534.29		1.51		116.43
0.42	541.86	14.09	7.04			3341.14	746	3368.57	127.67	1153.33		1.57		147.57

Figure 25. The first part of the Water Quality Data Worksheet.

Distance. This is the distance (km) at which the water quality data are plotted.
Constituents. The mean measured water quality concentrations are entered in columns B through Q.
Other Concentrations and Fluxes. A variety of other concentrations and fluxes are entered in Columns Q through AC as shown in Figure 25. These are

- **Bottom Algae in units of mgA/m^2.**
- **Total nitrogen-data.**
- **Total phosphorus-data.**
- **Total suspended solids-data.**
- **NH_3 (unionized ammonia)-data**
- **% saturation-data.**
- **SOD-data**
- **Sediment ammonium flux.**
- **Sediment methane flux.**
- **Sediment inorganic phosphorus flux.**
- **Ultimate carbonaceous BOD.** This is the total of detritus, slow CBOD, fast CBOD, and phytoplankton biomass expressed as oxygen equivalents.
- **Total Organic Carbon.** This is the total of inorganic suspended solids, phytoplankton biomass and detritus expressed as carbon.
- **Hyporheic biofilm.** This is the observed biomass of heterotrophic bacteria biofilm expressed as gD/m^2.



	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
7	pH	Bot Alg (gD/m^2)	Bot Alg (mgA/m^3)	TN (ugN/L)	TP (ugP/L)	TSS (mgD/L)	NH3 (ugN/L)			Sediment	Sediment	Sediment	Sediment	CBODu	TOC	Hyporheic biofilm
8	data	data	data	data	data	data	data	%sat-data	SOD-data	JNH4-data	JNO3-data	JCH4-data	JInorg P-data	mgO2/L	mgC/L	gD/m^2
9	7.74			1981.43	77.14	9.86										
10	7.10	40.00	400.00	9950.00	2298.57	14.26										
11	7.29			9124.29	1938.57	5.46										
12	7.60			7755.71	1611.43	2.66										
13	8.17			7568.57	1307.14	15.66										

Figure 26. The last part of the Water Quality Data Worksheet.

1.4.4 WQ Data Min Worksheet

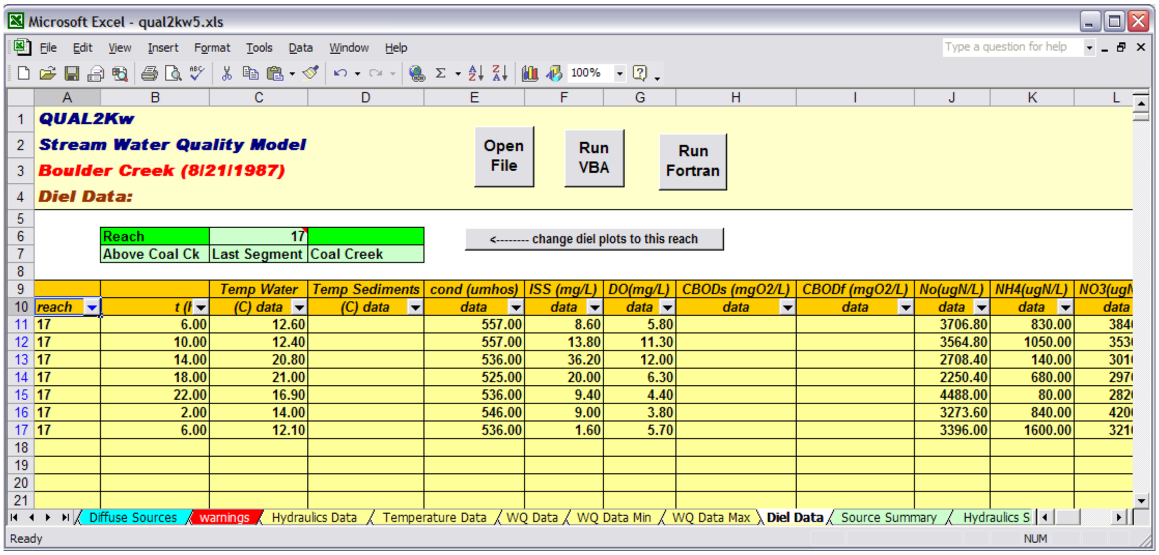
This worksheet is used to enter minimum daily values for water quality data. The layout is the same as for the WQ Data Worksheet.

1.4.5 WQ Data Max Worksheet

This worksheet is used to enter maximum daily values for water quality data. The layout is the same as for the WQ Data Worksheet.

1.4.6 Diel Data Worksheet

This worksheet is used to enter diel data for a selected reach. This data is then plotted as points on the graphs of diel model output. The user may also switch the dynamic diel plots to any reach by first entering a new reach number in cell C6 (press the enter key after entering the new value), and then using the button labeled “change diel plots to this reach”. To show all diel data for all reaches in the Diel Data Worksheet (for example to clear the data or enter data for more reaches) you can turn off Excel’s Autofilter feature by using the Excel menu selection “Data/Filter/Autofilter”.



QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

Diel Data:

Reach	17	
Above Coal Ck	Last Segment	Coal Creek

		Temp Water	Temp Sediments	cond (umhos)	ISS (mg/L)	DO(mg/L)	CBODs (mgO2/L)	CBODf (mgO2/L)	No(ugN/L)	NH4(ugN/L)	NO3(ugN
reach	t (h	(C) data	(C) data	data	data	data	data	data	data	data	data
17	6.00	12.60		557.00	8.60	5.80			3706.80	830.00	384
17	10.00	12.40		557.00	13.80	11.30			3564.80	1050.00	353
17	14.00	20.80		536.00	36.20	12.00			2708.40	140.00	301
17	18.00	21.00		525.00	20.00	6.30			2250.40	680.00	297
17	22.00	16.90		536.00	9.40	4.40			4488.00	80.00	282
17	2.00	14.00		546.00	9.00	3.80			3273.60	840.00	420
17	6.00	12.10		536.00	1.60	5.70			3396.00	1600.00	321

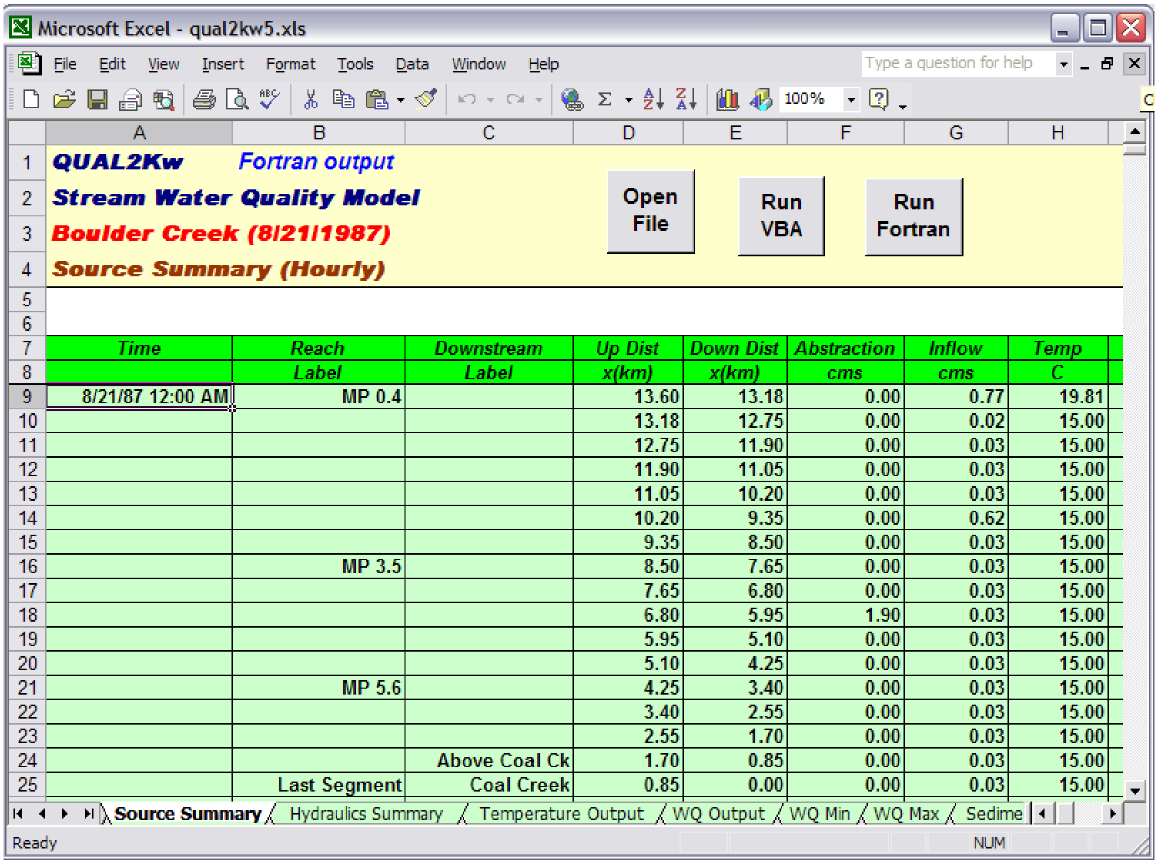
Figure 27. The Diel Data Worksheet.

1.5 OUTPUT WORKSHEETS

These are a series of worksheets that present tables of numerical output generated by Q2K. This information is displayed on plots along with measured data. These are identified by pale green tabs.

1.5.1 Source Summary Worksheet

This worksheet summarizes the total loading for each model reach by time of day. Note that cell B1 indicates whether the output for the last model run was performed by the VBA or Fortran versions of Q2K.



QUAL2Kw *Fortran output*

Stream Water Quality Model

Boulder Creek (8/21/1987)

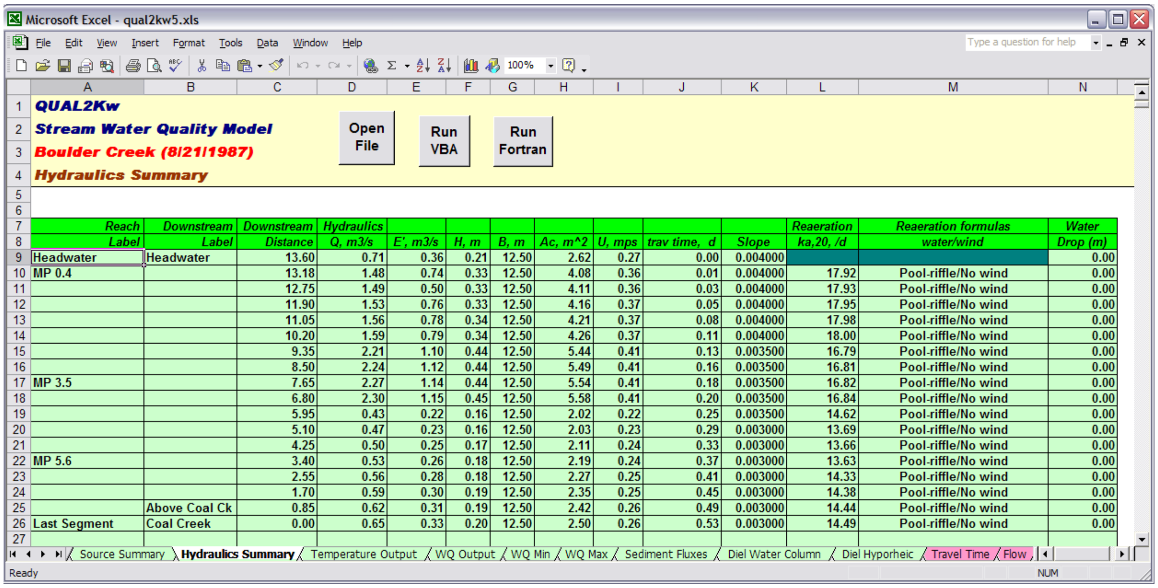
Source Summary (Hourly)

Time	Reach Label	Downstream Label	Up Dist x(km)	Down Dist x(km)	Abstraction cms	Inflow cms	Temp C
8/21/87 12:00 AM	MP 0.4		13.60	13.18	0.00	0.77	19.81
			13.18	12.75	0.00	0.02	15.00
			12.75	11.90	0.00	0.03	15.00
			11.90	11.05	0.00	0.03	15.00
			11.05	10.20	0.00	0.03	15.00
			10.20	9.35	0.00	0.62	15.00
			9.35	8.50	0.00	0.03	15.00
	MP 3.5		8.50	7.65	0.00	0.03	15.00
			7.65	6.80	0.00	0.03	15.00
			6.80	5.95	1.90	0.03	15.00
			5.95	5.10	0.00	0.03	15.00
			5.10	4.25	0.00	0.03	15.00
	MP 5.6		4.25	3.40	0.00	0.03	15.00
			3.40	2.55	0.00	0.03	15.00
			2.55	1.70	0.00	0.03	15.00
		Above Coal Ck	1.70	0.85	0.00	0.03	15.00
	Last Segment	Coal Creek	0.85	0.00	0.00	0.03	15.00

Figure 28. The Source Summary Worksheet.

1.5.2 Hydraulics Summary Worksheet

This worksheet summarizes the hydraulic parameters for each model reach.



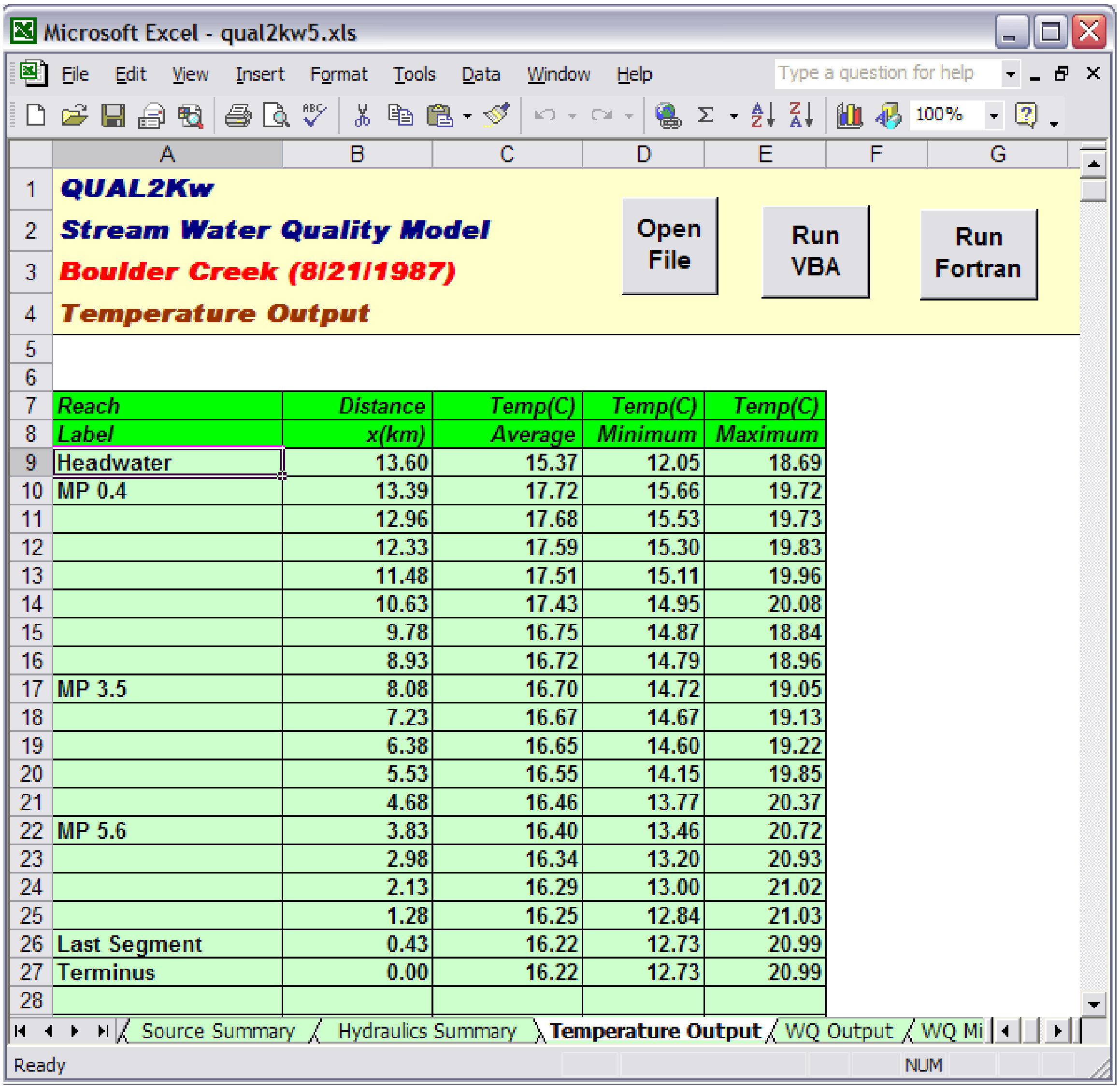
QUAL2Kw
Stream Water Quality Model
Boulder Creek (8/21/1987)
Hydraulics Summary

Reach Label	Downstream Label	Downstream Distance	Hydraulics Q, m3/s	E', m3/s	H, m	B, m	Ac, m^2	U, mps	trav time, d	Slope	Reaeration ka,20, /d	Reaeration formulas water/wind	Water Drop (m)
Headwater	Headwater	13.60	0.71	0.36	0.21	12.50	2.62	0.27	0.00	0.004000			0.00
MP 0.4		13.18	1.48	0.74	0.33	12.50	4.08	0.36	0.01	0.004000	17.92	Pool-riffle/No wind	0.00
		12.75	1.49	0.50	0.33	12.50	4.11	0.36	0.03	0.004000	17.93	Pool-riffle/No wind	0.00
		11.90	1.53	0.76	0.33	12.50	4.16	0.37	0.05	0.004000	17.95	Pool-riffle/No wind	0.00
		11.05	1.56	0.78	0.34	12.50	4.21	0.37	0.08	0.004000	17.98	Pool-riffle/No wind	0.00
		10.20	1.59	0.79	0.34	12.50	4.26	0.37	0.11	0.004000	18.00	Pool-riffle/No wind	0.00
		9.35	2.21	1.10	0.44	12.50	5.44	0.41	0.13	0.003500	16.79	Pool-riffle/No wind	0.00
		8.50	2.24	1.12	0.44	12.50	5.49	0.41	0.16	0.003500	16.81	Pool-riffle/No wind	0.00
MP 3.5		7.65	2.27	1.14	0.44	12.50	5.54	0.41	0.18	0.003500	16.82	Pool-riffle/No wind	0.00
		6.80	2.30	1.15	0.45	12.50	5.58	0.41	0.20	0.003500	16.84	Pool-riffle/No wind	0.00
		5.95	0.43	0.22	0.16	12.50	2.02	0.22	0.25	0.003500	14.62	Pool-riffle/No wind	0.00
		5.10	0.47	0.23	0.16	12.50	2.03	0.23	0.29	0.003000	13.69	Pool-riffle/No wind	0.00
		4.25	0.50	0.25	0.17	12.50	2.11	0.24	0.33	0.003000	13.66	Pool-riffle/No wind	0.00
MP 5.6		3.40	0.53	0.26	0.18	12.50	2.19	0.24	0.37	0.003000	13.63	Pool-riffle/No wind	0.00
		2.55	0.56	0.28	0.18	12.50	2.27	0.25	0.41	0.003000	14.33	Pool-riffle/No wind	0.00
		1.70	0.59	0.30	0.19	12.50	2.35	0.25	0.45	0.003000	14.38	Pool-riffle/No wind	0.00
	Above Coal Ck	0.85	0.62	0.31	0.19	12.50	2.42	0.26	0.49	0.003000	14.44	Pool-riffle/No wind	0.00
Last Segment	Coal Creek	0.00	0.65	0.33	0.20	12.50	2.50	0.26	0.53	0.003000	14.49	Pool-riffle/No wind	0.00

Figure 29. The Hydraulics Summary Worksheet.

1.5.3 Temperature Output Worksheet

This worksheet summarizes the temperature output for each model reach.



QUAL2Kw

Stream Water Quality Model

Boulder Creek (8/21/1987)

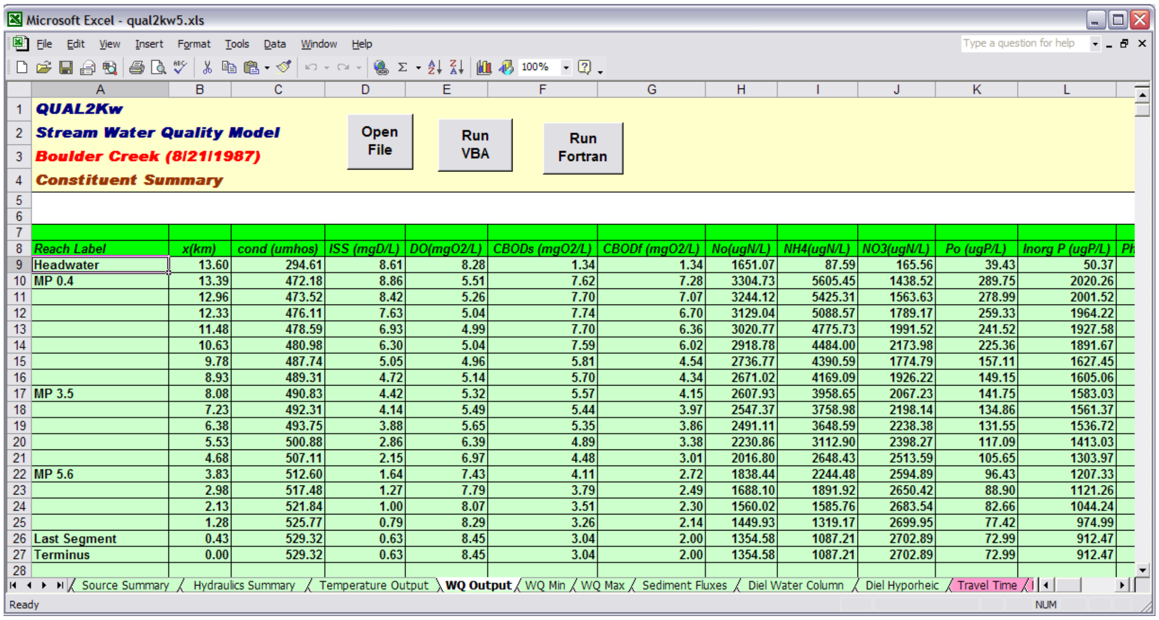
Temperature Output

Reach Label	Distance x(km)	Temp(C) Average	Temp(C) Minimum	Temp(C) Maximum
Headwater	13.60	15.37	12.05	18.69
MP 0.4	13.39	17.72	15.66	19.72
	12.96	17.68	15.53	19.73
	12.33	17.59	15.30	19.83
	11.48	17.51	15.11	19.96
	10.63	17.43	14.95	20.08
	9.78	16.75	14.87	18.84
	8.93	16.72	14.79	18.96
MP 3.5	8.08	16.70	14.72	19.05
	7.23	16.67	14.67	19.13
	6.38	16.65	14.60	19.22
	5.53	16.55	14.15	19.85
	4.68	16.46	13.77	20.37
MP 5.6	3.83	16.40	13.46	20.72
	2.98	16.34	13.20	20.93
	2.13	16.29	13.00	21.02
	1.28	16.25	12.84	21.03
Last Segment	0.43	16.22	12.73	20.99
Terminus	0.00	16.22	12.73	20.99

Figure 30. The Temperature Output Worksheet.

1.5.4 Water Quality Output Worksheet

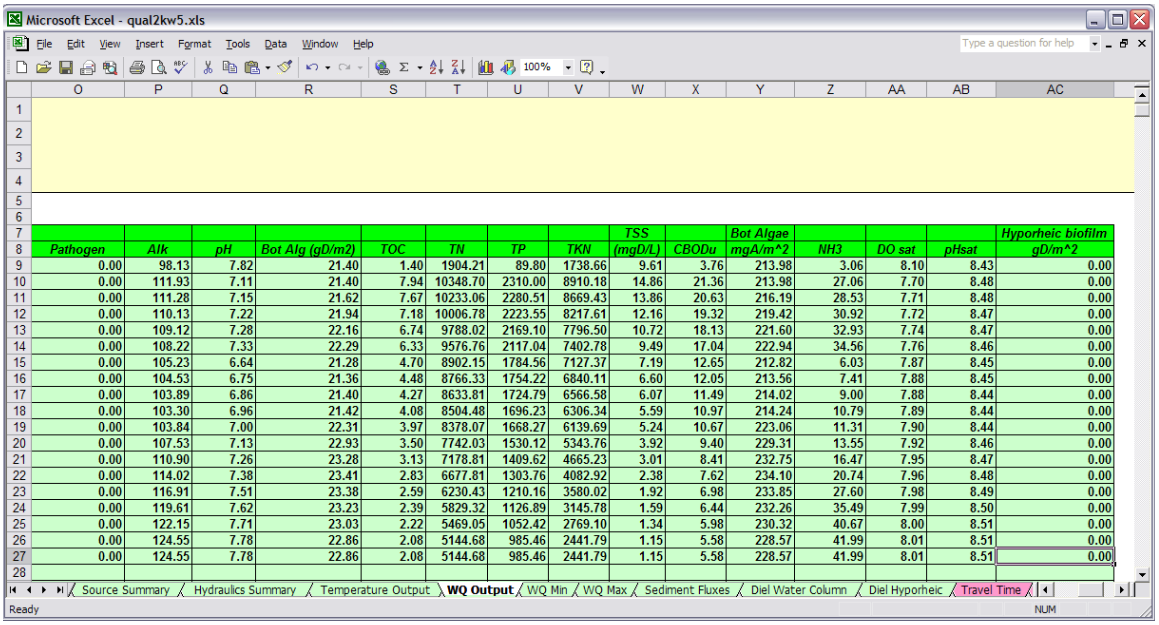
This worksheet summarizes the mean concentration output for each model reach.



QUAL2Kw
Stream Water Quality Model
Boulder Creek (8/21/1987)
Constituent Summary

Reach Label	x(km)	cond (umhos)	ISS (mgD/L)	DO(mgO2/L)	CBODs (mgO2/L)	CBODf (mgO2/L)	No(ugN/L)	NH4(ugN/L)	NO3(ugN/L)	Po (ugP/L)	Inorg P (ugP/L)
Headwater	13.60	294.61	8.61	8.28	1.34	1.34	1651.07	87.59	165.56	39.43	50.37
MP 0.4	13.39	472.18	8.86	5.51	7.62	7.28	3304.73	5605.45	1438.52	289.75	2020.26
	12.96	473.52	8.42	5.26	7.70	7.07	3244.12	5425.31	1563.63	278.99	2001.52
	12.33	476.11	7.63	5.04	7.74	6.70	3129.04	5088.57	1789.17	259.33	1964.22
	11.48	478.59	6.93	4.99	7.70	6.36	3020.77	4775.73	1991.52	241.52	1927.58
	10.63	480.98	6.30	5.04	7.59	6.02	2918.78	4484.00	2173.98	225.36	1891.67
	9.78	487.74	5.05	4.96	5.81	4.54	2736.77	4390.59	1774.79	157.11	1627.45
	8.93	489.31	4.72	5.14	5.70	4.34	2671.02	4169.09	1926.22	149.15	1605.06
MP 3.5	8.08	490.83	4.42	5.32	5.57	4.15	2607.93	3958.65	2067.23	141.75	1583.03
	7.23	492.31	4.14	5.49	5.44	3.97	2547.37	3758.98	2198.14	134.86	1561.37
	6.38	493.75	3.88	5.65	5.35	3.86	2491.11	3648.59	2238.38	131.55	1536.72
	5.53	500.88	2.86	6.39	4.89	3.38	2230.86	3112.90	2398.27	117.09	1413.03
	4.68	507.11	2.15	6.97	4.48	3.01	2016.80	2648.43	2513.59	105.65	1303.97
MP 5.6	3.83	512.60	1.64	7.43	4.11	2.72	1838.44	2244.48	2594.89	96.43	1207.33
	2.98	517.48	1.27	7.79	3.79	2.49	1688.10	1891.92	2650.42	88.90	1121.26
	2.13	521.84	1.00	8.07	3.51	2.30	1560.02	1585.76	2683.54	82.66	1044.24
	1.28	525.77	0.79	8.29	3.26	2.14	1449.93	1319.17	2699.95	77.42	974.99
Last Segment	0.43	529.32	0.63	8.45	3.04	2.00	1354.58	1087.21	2702.89	72.99	912.47
Terminus	0.00	529.32	0.63	8.45	3.04	2.00	1354.58	1087.21	2702.89	72.99	912.47

Figure 31. The first part of the Water Quality Output Worksheet.



								TSS		Bot Algae				Hyporheic biofilm
Pathogen	Alk	pH	Bot Alg (gD/m2)	TOC	TN	TP	TKN	(mgD/L)	CBODu	mgA/m^2	NH3	DO sat	pHsat	gD/m^2
0.00	98.13	7.82	21.40	1.40	1904.21	89.80	1738.66	9.61	3.76	213.98	3.06	8.10	8.43	0.00
0.00	111.93	7.11	21.40	7.94	10348.70	2310.00	8910.18	14.86	21.36	213.98	27.06	7.70	8.48	0.00
0.00	111.28	7.15	21.62	7.67	10233.06	2280.51	8669.43	13.86	20.63	216.19	28.53	7.71	8.48	0.00
0.00	110.13	7.22	21.94	7.18	10006.78	2223.55	8217.61	12.16	19.32	219.42	30.92	7.72	8.47	0.00
0.00	109.12	7.28	22.16	6.74	9788.02	2169.10	7796.50	10.72	18.13	221.60	32.93	7.74	8.47	0.00
0.00	108.22	7.33	22.29	6.33	9576.76	2117.04	7402.78	9.49	17.04	222.94	34.56	7.76	8.46	0.00
0.00	105.23	6.64	21.28	4.70	8902.15	1784.56	7127.37	7.19	12.65	212.82	6.03	7.87	8.45	0.00
0.00	104.53	6.75	21.36	4.48	8766.33	1754.22	6840.11	6.60	12.05	213.56	7.41	7.88	8.45	0.00
0.00	103.89	6.86	21.40	4.27	8633.81	1724.79	6566.58	6.07	11.49	214.02	9.00	7.88	8.44	0.00
0.00	103.30	6.96	21.42	4.08	8504.48	1696.23	6306.34	5.59	10.97	214.24	10.79	7.89	8.44	0.00
0.00	103.84	7.00	22.31	3.97	8378.07	1668.27	6139.69	5.24	10.67	223.06	11.31	7.90	8.44	0.00
0.00	107.53	7.13	22.93	3.50	7742.03	1530.12	5343.76	3.92	9.40	229.31	13.55	7.92	8.46	0.00
0.00	110.90	7.26	23.28	3.13	7178.81	1409.62	4665.23	3.01	8.41	232.75	16.47	7.95	8.47	0.00
0.00	114.02	7.38	23.41	2.83	6677.81	1303.76	4082.92	2.38	7.62	234.10	20.74	7.96	8.48	0.00
0.00	116.91	7.51	23.38	2.59	6230.43	1210.16	3580.02	1.92	6.98	233.85	27.60	7.98	8.49	0.00
0.00	119.61	7.62	23.23	2.39	5829.32	1126.89	3145.78	1.59	6.44	232.26	35.49	7.99	8.50	0.00
0.00	122.15	7.71	23.03	2.22	5469.05	1052.42	2769.10	1.34	5.98	230.32	40.67	8.00	8.51	0.00
0.00	124.55	7.78	22.86	2.08	5144.68	985.46	2441.79	1.15	5.58	228.57	41.99	8.01	8.51	0.00
0.00	124.55	7.78	22.86	2.08	5144.68	985.46	2441.79	1.15	5.58	228.57	41.99	8.01	8.51	0.00

Figure 32. The last part of the Water Quality Output Worksheet.

1.5.5 Water Quality Minimum WQ Output Worksheet

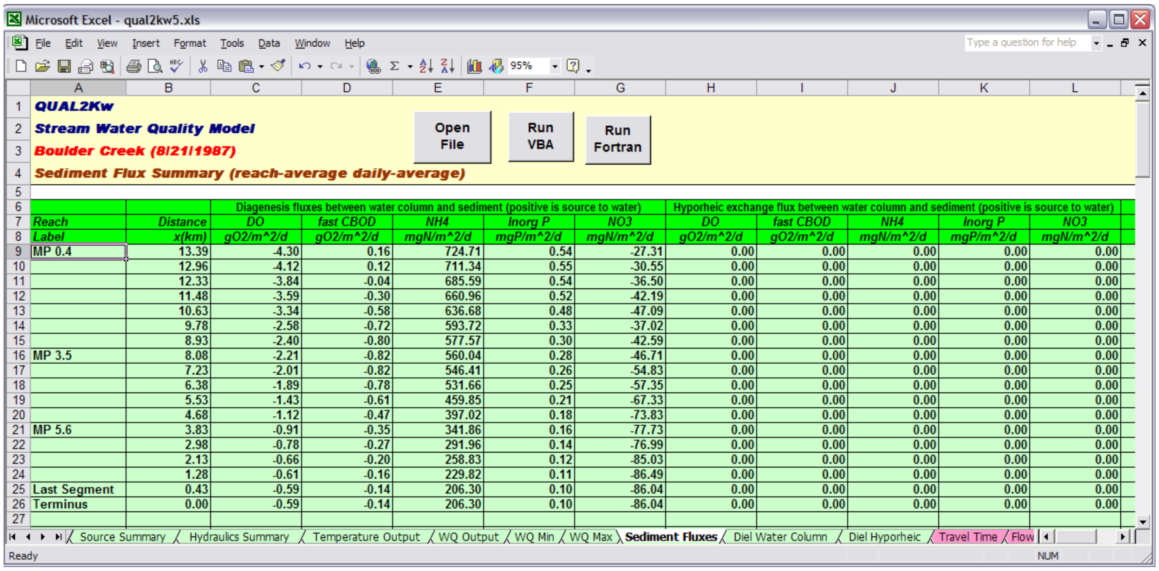
This worksheet summarizes the minimum concentration for the model's water-quality variables for each model reach. It has the same layout as the Water Quality Output Worksheet (Figure 30 and Figure 31).

1.5.6 Water Quality Maximum WQ Output Worksheet

This worksheet summarizes the maximum concentration for the model's water-quality variables for each model reach. It has the same layout as the Water Quality Output Worksheet (Figure 30 and Figure 31).

1.5.7 Sediment Flux Output Worksheet

This worksheet summarizes the reach-averaged and daily-averaged fluxes of oxygen and nutrients between the water and the underlying sediment compartment for each model reach. The fluxes due to diagenesis and hyporheic exchange are reported separately. Positive values of flux indicate a source to the water from the sediment or hyporheic zone. Negative values indicate a loss from the water column to the sediment or hyporheic zone.



QUAL2Kw
Stream Water Quality Model
Boulder Creek (8/21/1987)
Sediment Flux Summary (reach-average daily-average)

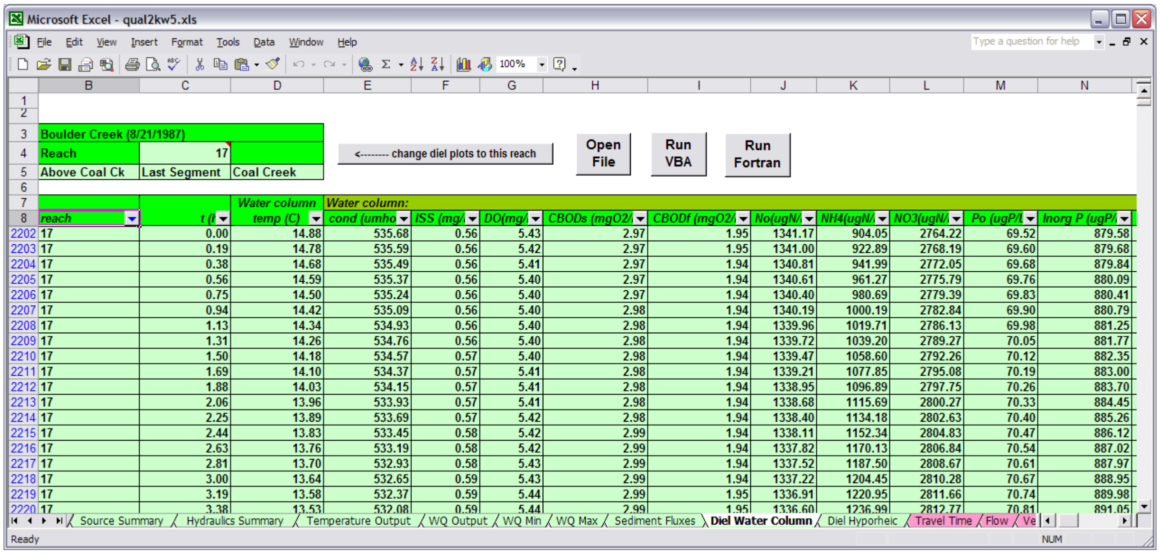
		Diagenesis fluxes between water column and sediment (positive is source to water)					Hyporheic exchange flux between water column and sediment (positive is source to water)				
Reach	Distance	DO	fast CBOD	NH4	Inorg P	NO3	DO	fast CBOD	NH4	Inorg P	NO3
Label	x(km)	gO2/m^2/d	gO2/m^2/d	mgN/m^2/d	mgP/m^2/d	mgN/m^2/d	gO2/m^2/d	gO2/m^2/d	mgN/m^2/d	mgP/m^2/d	mgN/m^2/d
MP 0.4	13.39	-4.30	0.16	724.71	0.54	-27.31	0.00	0.00	0.00	0.00	0.00
	12.96	-4.12	0.12	711.34	0.55	-30.55	0.00	0.00	0.00	0.00	0.00
	12.33	-3.84	-0.04	685.59	0.54	-36.50	0.00	0.00	0.00	0.00	0.00
	11.48	-3.59	-0.30	660.96	0.52	-42.19	0.00	0.00	0.00	0.00	0.00
	10.63	-3.34	-0.58	636.68	0.48	-47.09	0.00	0.00	0.00	0.00	0.00
	9.78	-2.58	-0.72	593.72	0.33	-37.02	0.00	0.00	0.00	0.00	0.00
	8.93	-2.40	-0.80	577.57	0.30	-42.59	0.00	0.00	0.00	0.00	0.00
MP 3.5	8.08	-2.21	-0.82	560.04	0.28	-46.71	0.00	0.00	0.00	0.00	0.00
	7.23	-2.01	-0.82	546.41	0.26	-54.83	0.00	0.00	0.00	0.00	0.00
	6.38	-1.89	-0.78	531.66	0.25	-57.35	0.00	0.00	0.00	0.00	0.00
	5.53	-1.43	-0.61	459.85	0.21	-67.33	0.00	0.00	0.00	0.00	0.00
	4.68	-1.12	-0.47	397.02	0.18	-73.83	0.00	0.00	0.00	0.00	0.00
MP 5.6	3.83	-0.91	-0.35	341.86	0.16	-77.73	0.00	0.00	0.00	0.00	0.00
	2.98	-0.78	-0.27	291.96	0.14	-76.99	0.00	0.00	0.00	0.00	0.00
	2.13	-0.66	-0.20	258.83	0.12	-85.03	0.00	0.00	0.00	0.00	0.00
	1.28	-0.61	-0.16	229.82	0.11	-86.49	0.00	0.00	0.00	0.00	0.00
Last Segment	0.43	-0.59	-0.14	206.30	0.10	-86.04	0.00	0.00	0.00	0.00	0.00
Terminus	0.00	-0.59	-0.14	206.30	0.10	-86.04	0.00	0.00	0.00	0.00	0.00

Figure 33. The Sediment Flux Worksheet.

1.5.8 Diel Water Column, Hyporheic, and Fluxes Worksheets

These worksheets displays diel output for temperature and water quality constituent data for the water column and sediment/hyporheic zone, and water column fluxes of a selected reach. The user may also switch the dynamic diel plots to any other reach by first entering a new reach number in cell C4 (press the enter key after entering the new value), and then using the button labeled "change diel plots to this reach". The diel variation in pH, total suspended solids, total phosphorus, total nitrogen, and oxygen saturation are also displayed.

The Diel Water Column Worksheet also displays the growth limitation factors for bottom algae due to temperature, light, nitrogen, phosphorus, carbon, and the combined limitation from all factors. The Diel Hyporheic Worksheet also displays the diel sediment fluxes from diagenesis and hyporheic metabolism and mass transfer. The Diel Fluxes Worksheet displays water column fluxes for heat, dissolved oxygen, and inorganic carbon.



Boulder Creek (8/21/1987)		
Reach	17	
Above Coal Ck	Last Segment	Coal Creek

			Water column	Water column:									
	reach	t (h	temp (C)	cond (umho	ISS (mg/	DO(mg/	CBODs (mgO2/	CBODf (mgO2/	No(ugN/	NH4(ugN/	NO3(ugN/	Po (ugP/L	Inorg P (ugP/
2202	17	0.00	14.88	535.68	0.56	5.43	2.97	1.95	1341.17	904.05	2764.22	69.52	879.58
2203	17	0.19	14.78	535.59	0.56	5.42	2.97	1.95	1341.00	922.89	2768.19	69.60	879.68
2204	17	0.38	14.68	535.49	0.56	5.41	2.97	1.94	1340.81	941.99	2772.05	69.68	879.84
2205	17	0.56	14.59	535.37	0.56	5.40	2.97	1.94	1340.61	961.27	2775.79	69.76	880.09
2206	17	0.75	14.50	535.24	0.56	5.40	2.97	1.94	1340.40	980.69	2779.39	69.83	880.41
2207	17	0.94	14.42	535.09	0.56	5.40	2.98	1.94	1340.19	1000.19	2782.84	69.90	880.79
2208	17	1.13	14.34	534.93	0.56	5.40	2.98	1.94	1339.96	1019.71	2786.13	69.98	881.25
2209	17	1.31	14.26	534.76	0.56	5.40	2.98	1.94	1339.72	1039.20	2789.27	70.05	881.77
2210	17	1.50	14.18	534.57	0.57	5.40	2.98	1.94	1339.47	1058.60	2792.26	70.12	882.35
2211	17	1.69	14.10	534.37	0.57	5.41	2.98	1.94	1339.21	1077.85	2795.08	70.19	883.00
2212	17	1.88	14.03	534.15	0.57	5.41	2.98	1.94	1338.95	1096.89	2797.75	70.26	883.70
2213	17	2.06	13.96	533.93	0.57	5.41	2.98	1.94	1338.68	1115.69	2800.27	70.33	884.45
2214	17	2.25	13.89	533.69	0.57	5.42	2.98	1.94	1338.40	1134.18	2802.63	70.40	885.26
2215	17	2.44	13.83	533.45	0.58	5.42	2.99	1.94	1338.11	1152.34	2804.83	70.47	886.12
2216	17	2.63	13.76	533.19	0.58	5.42	2.99	1.94	1337.82	1170.13	2806.84	70.54	887.02
2217	17	2.81	13.70	532.93	0.58	5.43	2.99	1.94	1337.52	1187.50	2808.67	70.61	887.97
2218	17	3.00	13.64	532.65	0.59	5.43	2.99	1.94	1337.22	1204.45	2810.28	70.67	888.95
2219	17	3.19	13.58	532.37	0.59	5.44	2.99	1.95	1336.91	1220.95	2811.66	70.74	889.98
2220	17	3.38	13.53	532.08	0.59	5.44	2.99	1.95	1336.60	1236.99	2812.77	70.81	891.05

Figure 34. The Diel Output Worksheet.

1.6 PLOTS

These are a series of Excel charts that present model output in graphical form. These are identified by rose (spatial) and blue (diel) tabs.

1.6.1 Spatial Charts

QUAL2K displays a series of charts that plot the model output and data versus distance (km) along the river.

Figure 34 shows an example of the plot for dissolved oxygen. The black line is the simulated mean DO (as displayed on the WQ Worksheet), whereas the dashed red lines are the minimum (WQ Min Worksheet) and maximum (WQ Max Worksheet) values, respectively. The black squares are the measured mean data points that were entered on the WQ Data Worksheet. The white squares are the minimum (WQ Min Worksheet) and maximum (WQ Max Worksheet) data points, respectively. The plot is labeled with the river name and the simulation date. Notice that this plot also displays the oxygen saturation as a dashed blue line.

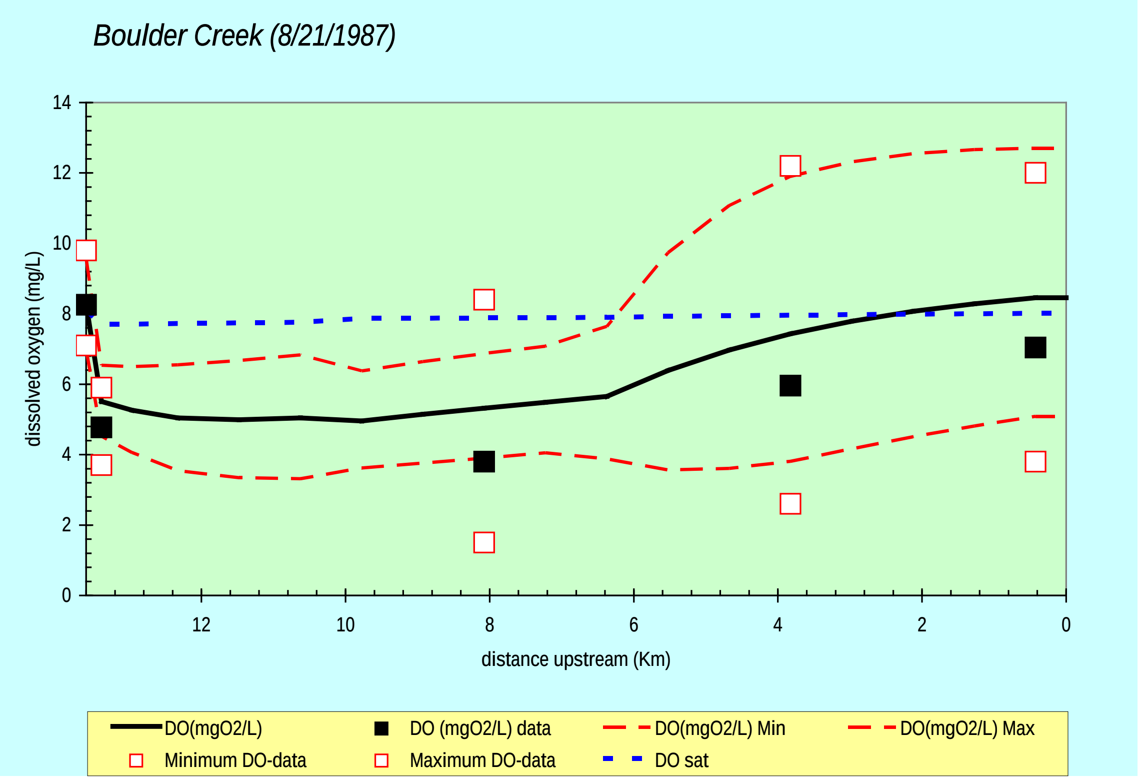


Figure 35. The plot of dissolved oxygen versus distance downstream in km.

The following series of variables are plotted:

Hydraulics Plots:

- **Travel Time**
- **Flow**
- **Velocity**
- **Depth**
- **Reaeration**

Temperature and state-variable plots:

- **Temperature**
- **Conductivity**
- **ISS (Inorganic suspended solids)**
- **Dissolved oxygen**
- **Detritus**
- **Slow CBOD**
- **Fast CBOD**
- **DON (Dissolved organic nitrogen)**
- **NH4 (Ammonia nitrogen)**
- **NO3 (Nitrate nitrogen)**
- **DOP (Dissolved organic phosphorus)**
- **Inorganic phosphorus**
- **Phytoplankton**
- **Bot Pl gD per m2 (Bottom algae in units of gD/m^2)**
- **Pathogen**
- **Alkalinity**
- **pH**

Additional State-variable plots:

- **Bot Pl mgA per m2 (Bottom algae in units of mgA/m^2)**
- **CBODu**
- **NH3**
- **TN and TP**
- **TSS**

Sediment-water plots:

- **SOD**
- **CH4 Sed Flux**
- **NH4 Sed Flux**
- **Inorg P Sed Flux**

1.6.2 Diel Charts

QUAL2K displays a series of charts that plot the model output and data versus time of day (in hours) for temperature and the model state variables.

Figure 35 shows an example of the diel plot for dissolved oxygen. The black line is the simulated pH (as displayed on the Diel Output Worksheet). The black squares are the measured data points that were entered on the Diel Data Worksheet. The plot is labeled with the river name, the date and the name of the reach that is plotted. Notice that this plot also displays the oxygen saturation as a dashed blue line.

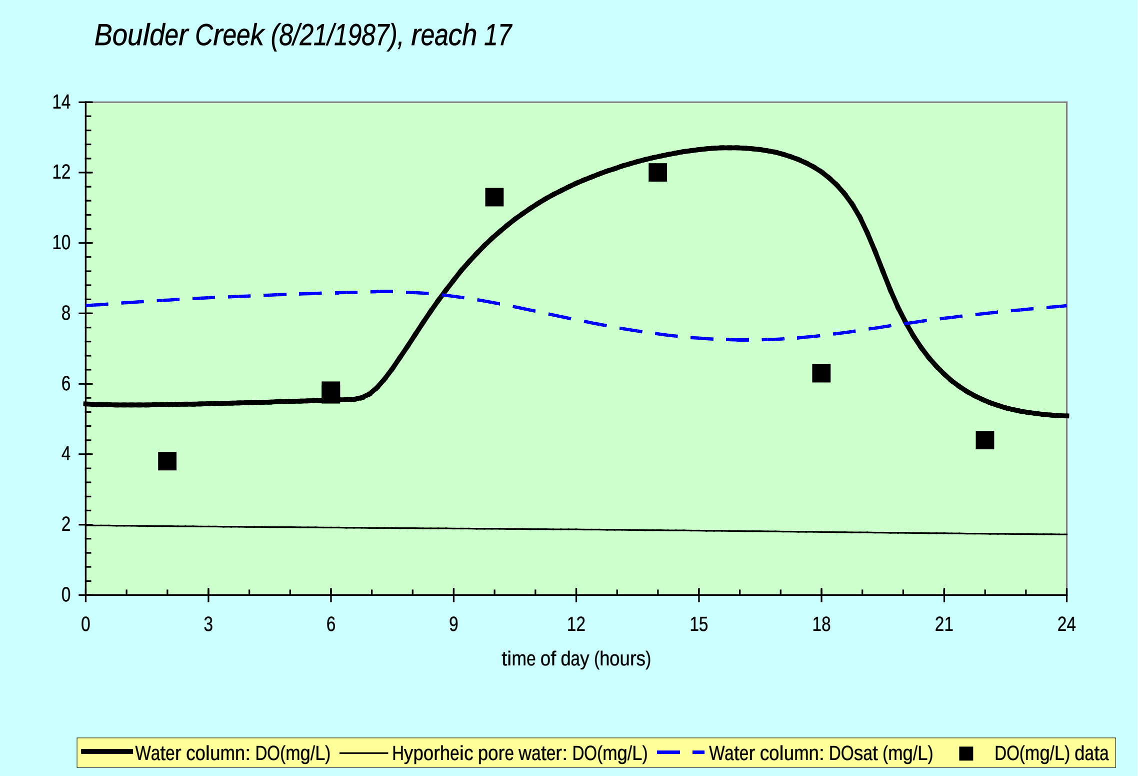
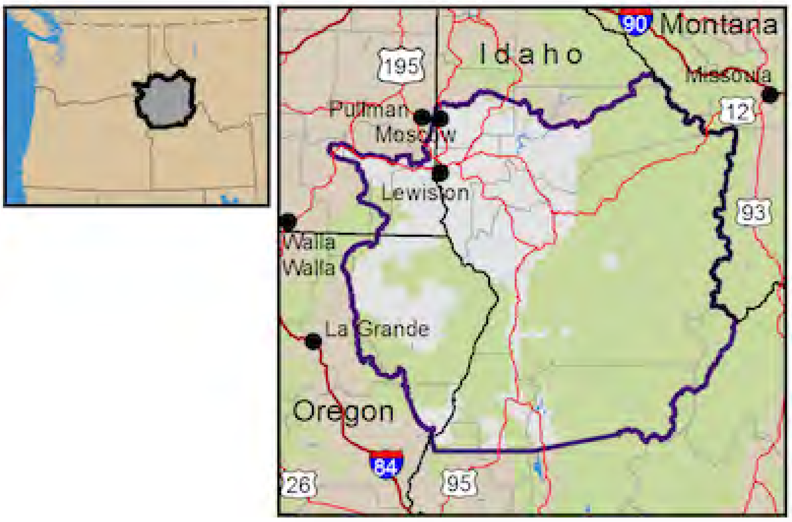


Figure 36. The diel plot of dissolved oxygen versus time of day.

Climate Summary Report

Tribe:
Nez Perce Tribe

Area of Interest:
Indian Claims Commission
Territory



Annual Average Temperature

Average daily temperature from January to December.

Emissions	Time	Value	Change
Historical	1990	42.6 °F	
Low	2010-2039	45.2+/-0.7 °F	+2.5 °F
Low	2040-2069	47.2+/-1.2 °F	+4.5 °F
Low	2070-2099	48.2+/-1.4 °F	+5.6 °F
High	2010-2039	45.5+/-0.7 °F	+2.9 °F
High	2040-2069	48.7+/-1.4 °F	+6.1 °F
High	2070-2099	52.3+/-2.0 °F	+9.7 °F

Data Source: MACAv2-METDATA

Jun.-Aug. Maximum Temperature

Average daily maximum temperature from June to August.

Emissions	Time	Value	Change
Historical	1990	75.1 °F	
Low	2010-2039	78.3+/-0.9 °F	+3.1 °F
Low	2040-2069	80.7+/-1.5 °F	+5.5 °F
Low	2070-2099	81.9+/-1.7 °F	+6.8 °F
High	2010-2039	78.7+/-0.9 °F	+3.6 °F
High	2040-2069	82.7+/-1.8 °F	+7.6 °F
High	2070-2099	87.2+/-2.6 °F	+12.1 °F

Data Source: MACAv2-METDATA

Warm Days (above 86°F (30°C))

Average number of days each year in which the daily maximum temperature is above 86°F (30°C).

Emissions	Time	Value	Change
Historical	1990	16.6 days	
Low	2010-2039	26.9+/-2.8 days	+10.2 days
Low	2040-2069	36.3+/-5.5 days	+19.7 days
Low	2070-2099	42.4+/-6.7 days	+25.7 days
High	2010-2039	28.6+/-2.8 days	+11.9 days
High	2040-2069	45.0+/-6.8 days	+28.3 days
High	2070-2099	66.1+/-10.8 days	+49.5 days

Data Source: MACAv2-METDATA

Freeze Free Days

Average number of days each year when the minimum daily temperature remains above freezing at 32°F (0°C).

Emissions	Time	Value	Change
Historical	1990	175.2 days	
Low	2010-2039	198.7+/-7.6 days	+23.5 days
Low	2040-2069	216.6+/-13.0 days	+41.4 days
Low	2070-2099	227.6+/-16.0 days	+52.4 days
High	2010-2039	201.6+/-8.4 days	+26.4 days
High	2040-2069	230.5+/-15.5 days	+55.3 days
High	2070-2099	262.8+/-18.6 days	+87.6 days

Data Source: MACAv2-METDATA

Annual Precipitation

Total precipitation from January to December.

Emissions	Time	Value	Change
Historical	1990	34.1 in	
Low	2010-2039	35.4+/-1.3 in	+1.3 in
Low	2040-2069	35.5+/-1.1 in	+1.4 in
Low	2070-2099	36.0+/-1.6 in	+1.9 in
High	2010-2039	34.9+/-1.1 in	+0.7 in
High	2040-2069	35.9+/-1.6 in	+1.8 in
High	2070-2099	37.1+/-1.9 in	+3.0 in

Data Source: MACAv2-METDATA

Oct.-Mar. Precipitation

Total precipitation from October to March.

Emissions	Time	Value	Change
Historical	1990	20.9 in	
Low	2010-2039	21.8+/-0.7 in	+0.9 in
Low	2040-2069	22.1+/-0.8 in	+1.2 in
Low	2070-2099	22.4+/-1.0 in	+1.5 in
High	2010-2039	21.5+/-0.9 in	+0.5 in
High	2040-2069	22.3+/-1.0 in	+1.4 in
High	2070-2099	23.6+/-1.0 in	+2.7 in

Data Source: MACAv2-METDATA

Apr.-Sept. Precipitation

Total precipitation from April to September.

Emissions	Time	Value	Change
Historical	1990	13.2 in	
Low	2010-2039	13.5+/-0.8 in	+0.3 in
Low	2040-2069	13.4+/-0.9 in	+0.2 in
Low	2070-2099	13.6+/-1.1 in	+0.4 in
High	2010-2039	13.4+/-0.6 in	+0.2 in
High	2040-2069	13.6+/-1.1 in	+0.4 in
High	2070-2099	13.5+/-1.4 in	+0.3 in

Data Source: MACAv2-METDATA

Apr. 1st Snow

Amount of water contained in the snowpack on April 1st.

Emissions	Time	Value	Change
Historical	1990	13.6 in	
Low	2010-2039	12.0+/-0.8 in	-1.6 in
Low	2040-2069	10.6+/-0.7 in	-3.0 in
Low	2070-2099	9.4+/-1.1 in	-4.2 in
High	2010-2039	12.0+/-0.8 in	-1.7 in
High	2040-2069	9.6+/-1.4 in	-4.0 in
High	2070-2099	6.1+/-1.6 in	-7.5 in

Data Source: VIC-MACAv2-LIVNEH

May 1st Snow

Amount of water contained in the snowpack on May 1st.

Emissions	Time	Value	Change
Historical	1990	11.5 in	
Low	2010-2039	9.1+/-1.0 in	-2.4 in
Low	2040-2069	7.5+/-0.7 in	-4.0 in
Low	2070-2099	5.8+/-1.1 in	-5.7 in
High	2010-2039	9.0+/-0.9 in	-2.5 in
High	2040-2069	6.2+/-1.2 in	-5.3 in
High	2070-2099	3.0+/-1.0 in	-8.5 in

Data Source: VIC-MACAv2-LIVNEH

Jul.-Sept. Soil Moisture

Average amount of water contained in the upper meters of soil from July to September.

Emissions	Time	Value	Change
Historical	1990	20.7 in	
Low	2010-2039	19.4+/-0.4 in	-1.3 in
Low	2040-2069	18.7+/-0.5 in	-2.0 in
Low	2070-2099	18.4+/-0.7 in	-2.3 in
High	2010-2039	19.5+/-0.5 in	-1.2 in
High	2040-2069	18.2+/-0.7 in	-2.6 in
High	2070-2099	17.1+/-1.1 in	-3.6 in

Data Source: VIC-MACAv2-LIVNEH

Heat Accumulation (above 32°F (0°C))

Measure of the heat accumulation in plants, calculated as the annual daily sum of degrees in which the average daily temperature exceeds 32°F (0°C), an important temperature threshold for species in achieving different phases in their life cycles. This metric is also called the cumulative degree days.

Emissions	Time	Value	Change
Historical	1990	4750.4 GDD (°F)	
Low	2010-2039	5450.9+/-190.0 GDD (°F)	+700.5 GDD (°F)
Low	2040-2069	6017.4+/-361.4 GDD (°F)	+1267.0 GDD (°F)
Low	2070-2099	6354.4+/-442.5 GDD (°F)	+1604.0 GDD (°F)
High	2010-2039	5544.3+/-196.3 GDD (°F)	+793.9 GDD (°F)
High	2040-2069	6492.4+/-436.4 GDD (°F)	+1741.9 GDD (°F)
High	2070-2099	7649.1+/-667.4 GDD (°F)	+2898.7 GDD (°F)

Data Source: MACAv2-METDATA

Heat Accumulation (above 40°F (3°C))

Measure of the heat accumulation in plants, calculated as the annual daily sum of degrees in which the average daily temperature exceeds 40°F (3°C), an important temperature threshold for species in achieving different phases in their life cycles. This metric is also called the cumulative degree days.

Emissions	Time	Value	Change
Historical	1990	3456.2 GDD (°F)	
Low	2010-2039	4052.2+/-164.1 GDD (°F)	+596.0 GDD(°F)
Low	2040-2069	4538.0+/-315.2 GDD (°F)	+1081.7 GDD(°F)
Low	2070-2099	4829.0+/-382.5 GDD (°F)	+1372.8 GDD(°F)
High	2010-2039	4132.4+/-167.7 GDD (°F)	+676.1 GDD(°F)
High	2040-2069	4956.6+/-382.4 GDD (°F)	+1500.4 GDD(°F)
High	2070-2099	5978.7+/-604.1 GDD (°F)	+2522.5 GDD(°F)

Data Source: MACAv2-METDATA

Heat Accumulation (above 45°F (5°C))

Measure of the heat accumulation in plants, calculated as the annual daily sum of degrees in which the average daily temperature exceeds 45°F (5°C), an important temperature threshold for species in achieving different phases in their life cycles. This metric is also called the cumulative degree days.

Emissions	Time	Value	Change
Historical	1990	2726.8 GDD (°F)	
Low	2010-2039	3255.2+/-146.8 GDD (°F)	+528.4 GDD(°F)
Low	2040-2069	3689.1+/-282.8 GDD (°F)	+962.3 GDD(°F)
Low	2070-2099	3947.7+/-340.7 GDD (°F)	+1220.9 GDD(°F)
High	2010-2039	3327.6+/-149.4 GDD (°F)	+600.8 GDD(°F)
High	2040-2069	4068.5+/-343.6 GDD (°F)	+1341.7 GDD(°F)
High	2070-2099	4993.4+/-553.0 GDD (°F)	+2266.6 GDD(°F)

Data Source: MACAv2-METDATA

Heat Accumulation (above 50°F (10°C))

Measure of the heat accumulation in plants, calculated as the annual daily sum of degrees in which the average daily temperature exceeds 50°F (10°C), an important temperature threshold for species in achieving different phases in their life cycles. This metric is also called the cumulative degree days.

Emissions	**Time**	**Value**	**Change**
Historical	1990	1321.4 GDD (°F)	
Low	2010-2039	1694.6+/-109.0 GDD (°F)	+373.1 GDD(°F)
Low	2040-2069	2010.3+/-209.9 GDD (°F)	+688.9 GDD(°F)
Low	2070-2099	2196.3+/-250.2 GDD (°F)	+874.9 GDD(°F)
High	2010-2039	1749.1+/-109.2 GDD (°F)	+427.6 GDD(°F)
High	2040-2069	2298.9+/-256.0 GDD (°F)	+977.4 GDD(°F)
High	2070-2099	3003.7+/-430.5 GDD (°F)	+1682.2 GDD(°F)

Data Source: MACAv2-METDATA

Growing Season Length

Average number of consecutive days each year when the minimum daily temperature remains above freezing at 32°F (0°C).

Emissions	**Time**	**Value**	**Change**
Historical	1990	95.2 days	
Low	2010-2039	120.4+/-9.6 days	+25.2 days
Low	2040-2069	138.8+/-16.1 days	+43.6 days
Low	2070-2099	140.6+/-18.2 days	+45.4 days
High	2010-2039	124.0+/-10.8 days	+28.8 days
High	2040-2069	152.2+/-18.3 days	+57.0 days
High	2070-2099	175.3+/-22.5 days	+80.1 days

Data Source: MACAv2-METDATA

Data Sources:

MACAv2-METDATA: MACAv2-METDATA: downscaled climate data from CMIP5 bias corrected to climate observations from METDATA dataset.
VIC-MACAv2-LIVNEH: VIC-MACAv2-LIVNEH: modeled hydrology data using the VIC hydrology model forced with climate data from MACAv2-LIVNEH bias corrected to climate observations from LIVNEH dataset.

Climate Toolbox Summaries

THE CLIMATE TOOLBOX

EXPLORE CLIMATE DATA OVER THE CONTIGUOUS UNITED STATES

ClimateToolbox.org

- ✔ Web browser based
- ✔ No login required
- ✔ Easy and intuitive to use
- ✔ Official and experimental data
- ✔ Interactive maps
- ✔ Downloadable data

The **Climate Toolbox** is a collection of tools that provide maps and graphs of climate and hydrology data so there is no need to download or process the data yourself to obtain the important information the data contain.

Past Climate Observations
(1979-yesterday)

Climate Forecasts
(Next 1-7 months)

Climate Projections
(2030-2099)

Regional Climate

Maps of climate metrics provide a regional view of past and real-time conditions, forecasts and projections.

Local Climate

Graphs and dashboards of location-specific climate information illustrate past and real-time conditions, forecasts and projections.

Downloads

Downloads of the visualizations or data can be integrated into your own analysis or presentations, or used in the decision-making process.

Produced by
UC MERCED UNIVERSITY OF CALIFORNIA
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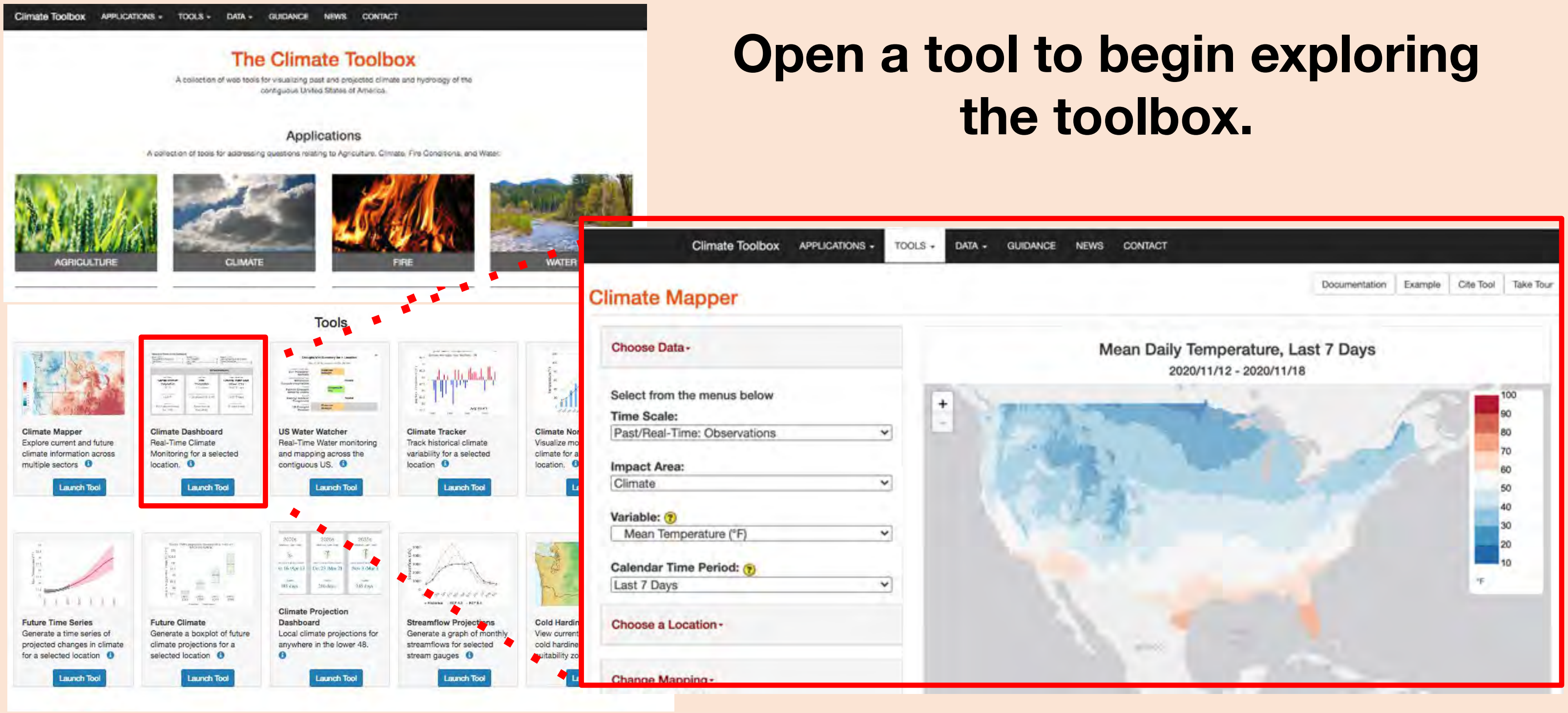
Funded by
CIRC Climate Impacts Research Consortium
NIDIS
NOAA RISA Regional Integrated Sciences and Assessments

The Toolbox



Time Scale: Past/Real-Time: Observations

Impact Area: Climate

Variable: Mean Temperature (°F)

Calendar Time Period: Last 7 Days

Open a tool to begin exploring the toolbox.

Data

Experimental Data: The tools primarily use the experimental, gridded gridMET data from the University of California, Merced and variable infiltration capacity (VIC) hydrology dataset from the University of Washington. These high resolution (4-km), real-time data yield models of hydrology, fire danger, and soil moisture (Palmer Drought Severity Index).

Official Data: Some tools use official station observations and gridded model data from NRCS, USGS, NASA and NOAA, including streamflow, groundwater levels, reservoir levels, snow water equivalent, and soil moisture metrics.

Application-Specific Metrics: Several metrics in the tools can be used for decision making related to agriculture, drought, fire danger, and water availability.

Climate

Temperature
Precipitation
Humidity
Solar radiation
Wind speed

Water

Snow water equivalent
Soil moisture
Runoff
Streamflow
Reservoir levels
Groundwater levels
Drought indices

Agriculture

Growing degrees days
Palmer Drought Severity Index

Fire danger

Days since rain
Burning index
Energy release component
Vapor pressure deficit

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Appendix C: Interior Columbia Basin Stream Type Chinook Salmon and Steelhead Populations: Habitat Intrinsic Potential Analysis

Thomas Cooney & Damon Holzer (NWFSC)
March 16, 2006

Introduction

Interior Columbia River Basin (ICB) salmon and steelhead have evolved to take advantage of a wide diversity of habitats. Climatic, geological, topographic, and landcover patterns have produced a robust evolutionary trajectory in streams flowing through vastly disparate terrestrial environments. This opportunity for uniquely adapted populations has created a challenge for identifying, both qualitatively and quantitatively, intrinsic habitats within large watersheds such as the ICB. Though salmon and steelhead occupy streams flowing through a wide spectrum of upland environments, their freshwater habitat preferences are limited to a comparatively narrow set of hydrological and streambed conditions (Reiser and Bjornn, 1979). However, it is the interaction between apposite flow path structure and adjacent terrestrial geomorphologies that determines intrinsic suitability. Ultimately, site specific stream reach characteristics and salmonid habitat preferences are influenced negatively and positively by both adjacent and out of view landscapes.

The analysis described below is intended to provide a simple and objective overview of the distribution of historical production potential across the tributary habitats used by Interior Columbia basin yearling type Chinook and steelhead populations. The initial iterations of our approach were patterned after an analysis of Puget Sound Chinook habitat potential developed by the Puget Sound Technical Recovery Team. That approach relied on empirically derived relationships between salmon spawner densities and channel characteristics (Montgomery et al., 1999). In the Puget Sound Chinook application, production potential was expressed in terms of spawners per unit reach length and related to a set of physical reach level measures: stream width, stream gradient, valley width and vegetative cover. In combination these factors were related to the relative amount of pool habitat, an important determinant of relative spawning and juvenile density. Similar sets of reach level habitat measures have been used to map relative production potential for coho and steelhead in Oregon coastal watersheds (Nickelson, et al., 1992, Burnett, 2001) and for steelhead in the Willamette River drainage (Steel, 2004).

Methods

We developed a reach level intrinsic potential (IP) analysis for application to stream type Chinook and steelhead spawning reaches assess habitat quality within currently and historically occupied portions of the ICB. This approach has enabled us to formulate a baseline perspective from which we can assess contemporary changes to productivity. Utilizing established relationships between habitat type, stream structure, landscape processes, and spawning use, we built a locally adapted Geographic Information System (GIS) based model incorporating regional spatial data, fisheries surveys, and professional knowledge. The GIS was used for the development, presentation, management and modeling of spatially referenced data. Modeled geomorphological characteristics were assigned to unique categories comprised of gradient, width, and valley confinement, from which additional stream and landform modifiers were incorporated to adjust intrinsic potential. We then evaluated these classes against known distributional densities in order to test modeled habitat quality. Results from these comparisons were used to weight and summarize reach areas for the entire stream network within the ICB based on relative Chinook salmon and steelhead habitat preferences.

We used the following process to develop the historical intrinsic potential analysis for Interior Columbia basin tributary habitats:

1. Fish density vs. habitat characteristics: Reviewed literature and available data sets relating simple measures of habitat characteristics to production potential for salmon and steelhead.

2. GIS data acquisition: Acquired and developed GIS data describing key habitat measures related to salmon and steelhead production potential for ICB ESU populations as determined in step 1.

3. Determining boundaries: Identified and applied criteria for defining the upper and lower boundaries to Chinook salmon and steelhead production within ICB watersheds using natural barrier locations and other habitat factors.

4. Initial classification: Classified stream reaches based on habitat characteristics (stream width, gradient, valley confinement) into categories representing varying levels of relative productivity. These habitat classes where then used to attribute spawning reaches, with respect to modeled salmon and steelhead production potentials, as high, moderate, low, negligible or none.

5. Preliminary validation and updating: Compared results from step 4 against specific measures of relative abundance of spawning adults and provided output to regional fisheries biologists for review. Additional habitat factors (reflected in GIS layers) were incorporated into the IP analysis to improve the correspondence of modeled distributions with empirical data and field observations.

6. Finalizing and applying reach level ratings: Finalized relative spawning potential rating categories as a function of physical habitat characteristics, and generated weighted totals by population and associated sub areas.

Fish Density Data Analysis

Our preliminary efforts focused on identifying published data and reports that related simple measures of habitat characteristics to stream type Chinook salmon and steelhead production. We found that direct measures of life stage specific productivity within particular reach characteristics are rarely available at fine scales or distributed across multiple watersheds. In fact, there is no single dataset with a consistent measure of relative abundance across the full range of environmental conditions found within ICB streams. As a result, we based our investigation on a set of discrete regional data sets. In general, we utilized spawning surveys, habitat studies, and stream transect juvenile sampling data to describe relative densities of stream type Chinook and steelhead in geospatially specific stream reaches.

Juvenile Abundance Transects

Initially, analyses relating densities of juveniles measured at a consistent life stage to habitat characteristics were used to assign relative intrinsic potential ratings and identify important structural elements within stream reaches. Studies generally show that for both yearling and stream type Chinook, juvenile densities are typically highest in relatively low gradient, unconfined stream reaches with well defined pool structure (e.g., Hillman& Miller, 2002, Petrosky & Holubetz, 1988), while steeper gradient relatively confined tributary reaches typically support the highest relative densities of juvenile steelhead (e.g., Slaney et al., 1980, Petrosky & Holubetz, 1988, Burnett, 2001). Steelhead have also been reported to use braided mainstem reaches for spawning and rearing, given appropriate flow, temperature and substrate conditions (e.g., ODFW, 1972).

Idaho Parr Data. Using juvenile transect survey data collected by the Idaho Department of Fish and Game (IDFG), we completed additional analyses comparing juvenile abundance to stream habitat. In the early to mid 1980's, IDFG biologists compiled a baseline data set for evaluating the effectiveness of habitat improvement projects. The data set included both measures of parr densities (Chinook and steelhead/rainbow trout) and habitat measures. The IDFG studies (as concluded (as discussed above) that Chinook parr densities were the highest in low gradient stream sections in relatively wide valleys and that steelhead/rainbow juvenile densities were the highest in steeper gradient, more confined reaches (e.g., Petrosky & Holubetz, 1988). The original analyses focused on data collected in years with relatively high parental escapements to minimize the confounding effect of relatively low seeding (Petrosky and Holubetz, 1988). We used data from naturally seeded areas from that parsed data set for the current analyses. For stream type Chinook (figure 1) and steelhead (figure 2), parr densities were plotted against gradient and stream width within two valley width categories corresponding to B channel and C channel designations (Rosgen, 1985) used in the original study. We found that wider stream reaches known to be used for spawning and rearing by steelhead were not well represented in the Idaho baseline study. A second data set, compiled by the Washington Department of Game for larger rivers in western Washington and Puget Sound, was also analyzed to provide some insight into production relationships in larger systems.

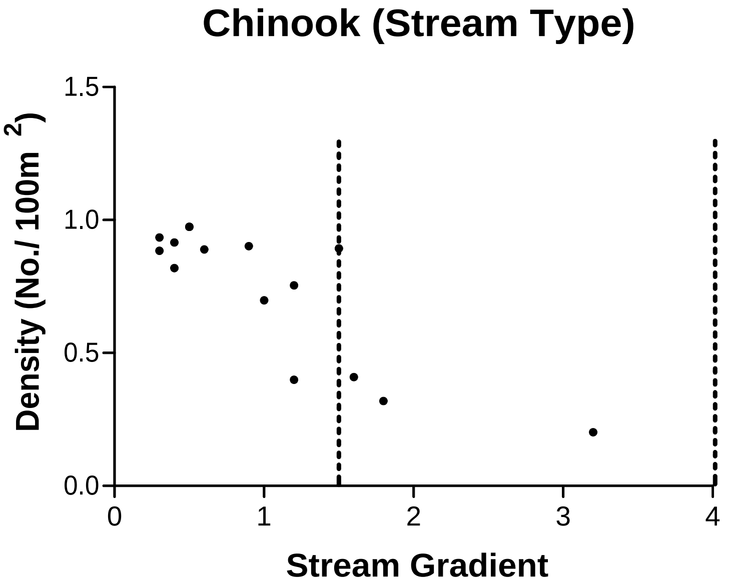

Figure 1. Idaho Spring/Summer Chinook. Juvenile densities vs. stream gradient for naturally seeded baseline monitoring areas in the Salmon and Clearwater River systems. Parsed data set—low seeding years not included (Petrosky and Holubetz, 1988). Dotted lines indicate assigned category boundaries.

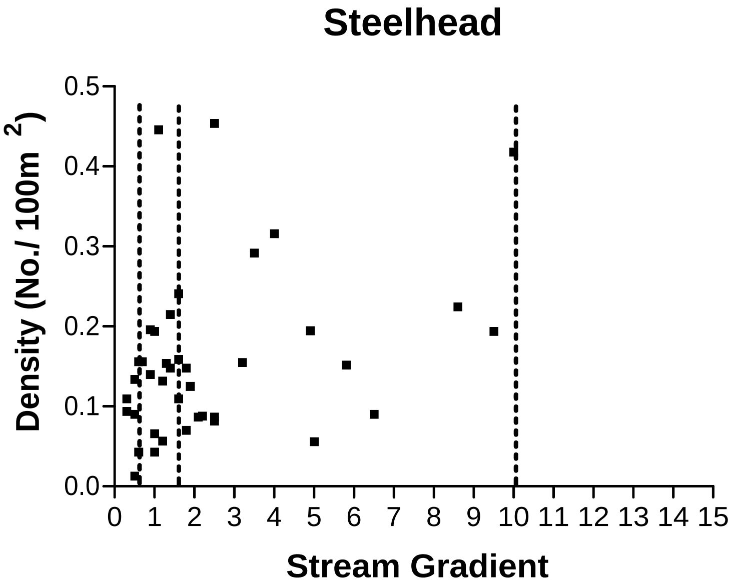

Figure 2. Idaho Steelhead. Juvenile densities vs. stream gradient for naturally seeded baseline monitoring areas in the Salmon and Clearwater River systems. Parsed data set- low seeding years not included (Petrosky and Holubetz, 1988). Dotted lines indicate assigned category boundaries.

The results from these investigations became the foundation for our habitat modeling scheme and helped identify the structural elements that would be required for additional analyses. Specifically, it became quite apparent that accurate measures of stream width, gradient, and valley confinement would be crucial for assessing intrinsic potential within the GIS. Developing models and acquiring data that describe these variables at a reasonable scale became our next task.

GIS Data Acquisition and Modeling

The National Hydrography Dataset (NHD) 1:100,000-scale networked reach model was used as the base stream layer for our intrinsic potential analysis. The NHD's layer contains all hydrographic features, including naturally flowing reaches and anthropogenic constructs such as irrigation canals, ditches, and laterals. Using only natural flow paths from the networked data, we built a linearly referenced stream layer comprised of contiguous 200-meter stream reaches. Segments were *addressed* using a "from", "to", and "id" field by dividing each unique stream into a continuous set of 200-meter tabular entries (stream length / 200 = number of events per stream), from which linear referencing processes were used to geocode address attributes within the hydrography network. This segment length was chosen to facilitate our classification of salmonid barriers, as a 200-meter reach with a 20% gradient has been found to be impassable for upstream migrants (Cramer, 2001; WDNR, 2002). These 200-meter hydrosections have become the basic unit of measurement for all ICTRT intrinsic potential summaries and analyses.

Stream Gradient

Stream gradient has been found to be an important habitat qualifier for salmonid spawning preference, and is determined by the change in vertical distance over reach length. As a flow path characteristic, gradient functions both as an indicator of upstream limit on migration (Cramer, 2001; WDNR, 2002) and as a predictor of habitat quality within accessible reaches (Cramer, 2001; Lunetta *et al*., 1997). Within the GIS, we used linear referencing techniques and zonal statistics to generate elevation values for all 200-meter stream segments. The minimum (downstream-most point) and maximum (upstream-most point) stream elevations were calculated using the USGS's National Elevation Dataset (NED) 10-meter horizontal resolution digital elevation models (DEMs).

Although spatial agreement is relatively high between the NHD's 100k hydrography and the NED, we had to augment standard neighborhood analysis techniques recognizing that even small misalignments can introduce large errors into the gradient calculations. We developed a procedure using Euclidean geometry to assign elevations for each segment in order to resolve the relatively small geographic differences between the DEM flow paths and our NHD derived 200-meter reach segments. Within each stream length, 10 equally spaced positions were linearly referenced to the reach and were given a unique code. We then calculated a contiguous zone for each point and computed a zonal statistical summary comparing the Euclidean output to the DEM. From these data, the minimum value determined for each zone was assumed to be the elevation of the DEM flow path, and therefore assignable to the vector stream layer for computational accuracy. An additional summary was generated for each unique 200-meter stream segment in order to obtain the minimum and maximum value from the previous calculation that used intervening points. Using the measures from this output as the upstream and downstream elevations, we attributed all linear features with their computed gradient.

Channel Bankfull and Wetted Width

Stream widths are an important metric for determining the amount of available habitat and the upstream extent of migrants. In our analysis, we have utilized both bankfull and wetted widths as a means of recognizing spawning time differences between stream type Chinook and steelhead. Because steelhead spawn near the peak of the hydrograph, and conversely, stream type Chinook salmon spawn near its lowest point, it was more accurate to assign different stream dimensions for both species. Therefore, we have applied bankfull width to steelhead and wetted width to stream type Chinook salmon, and all measurements relating to specie specific habitat totals include these adjustments in the calculations.

Stream width is predominantly a function of stream discharge, which can be estimated from a combination of drainage area and precipitation (Leopold *et al.*, 1964; Sumioka *et al*. 1998). Therefore, utilizing discharge as a proxy for stream width, we estimated stream dimensions from watershed size and mean annual precipitation. We used measured widths from field based stream measurements within the Columbia River basin to develop equations for estimating bankfull and wetted width (ODFW, 1999; WDOE, 2004). Upstream drainage area and accumulated average annual precipitation for each width measurement were derived from 60-meter DEMs (resampled from the 10-meter NED) and a 4-km grid of mean annual precipitation (1971-2000) (NCDC, 2004).

We conducted an analysis using linear regression between measured stream width and the accumulated precipitation and basin size metrics. For bankfull width, we applied the appropriate channel measurement within the field data; for wetted width, only measurements taken during August and September were included to accurately represent stream type Chinook salmon spawning times. Both analyses yielded statistically significant relationships between the basin size, precipitation, and stream width values and the resulting regression model was applied to the 200-meter reach data.

Valley Confinement

We estimated mean valley width for each reach by projecting 20 transects across the DEM-defined valley floor in each 200-m segment, and then calculating the mean valley width of the segment. The horizontal extent of the transect (valley width) was determined using flood height calculations from previous studies (Hall, 2007). As with our gradient calculations, we accounted for spatial discrepancies between the NHD 100k streams and the DEM flow path by calculating floodplain width based on the DEM flow path, and then assigning the calculated floodplain width to the 200-meter stream segments for subsequent data analyses.

Specifically, the valley width was calculated by creating a Euclidean based layer whose value was inherited from and spatially centered to the flow path elevation for each transect. Additionally, the flood height value was added to this grid layer, and the resulting calculation was subtracted from the NED. The results in this output grid showed the extent of the floodplain (based on the assigned flood height) where the values were less than or equal to zero. These valley areas were then summarized for all 20 transects independently, from which a mean value was generated and attributed to each 200-meter segment.

Determining Upstream and Downstream Extents

Upstream limits on the potential use of tributary habitat for spawning and rearing by salmon and steelhead were defined in terms of physical barriers, stream gradient, width, and water temperature. Reaches above documented natural obstructions and DEM calculated gradient barriers were excluded as production areas. Stream reaches with gradients above 5% were also excluded as spawning/rearing areas for yearling Chinook salmon populations based on expert opinion and on a review of index reach data sets for ICB streams. Minimum stream widths capable of supporting spawning were estimated based on available width measurements for index reaches with documented redd counts and mapped distributions. Additionally, a water temperature model was used to mark the downstream extent of spring Chinook salmon in Upper Columbia and Lower Snake River populations.

Natural Barriers

Barrier identification was our first data development scheme describing habitat quality, and employed both GIS calculated gradient barriers (representing the 20% limit described previously), and documented features such as falls, cascades, and reaches disconnected by sub-surface flows. We have utilized multiple digital, hardcopy, and field personnel sources to determine where natural obstructions mark the upstream extent of salmon and steelhead habitat. When possible, GIS datasets describing barriers were identified and incorporated into the base layer. In many cases archived report material and expert opinions had to be transferred to digital media and spatially referenced using recorded locations (such as river distance or an identifiable landmark). We have converted all sources of information into a GIS point feature theme and have preserved narratives and source information.

Within our IP analysis, natural barrier identification has been an ongoing process. Some features previously identified as complete barriers have been removed due to inconsistent information (such as salmon or steelhead observations above these locations) and others have been labeled as variably accessible due to significant year to year changes in stream flow, and hence passability. Local review of ICTRT data has provided many new additional barriers, which have been used to update stream accessibility metrics. In all cases, we have identified the 200-meter segments adjacent to complete migration blockages and have attributed all corresponding upstream features as inaccessible habitat.

Stream Width

Stream channel size generally decreases as you move upstream. At some point, stream dimensions constrict to such a point that habitat becomes unusable for salmon and steelhead. For spring Chinook, we used two data sets in order to determine stream size limitations; results from recent USFWS redd mapping efforts in the Middle Fork Salmon River, and Grande Ronde redd count index reaches. For steelhead, we utilized John Day redd count index reaches, O. *mykiss* presence/absence data from ODFW, IDFG parr count transects from the Salmon and Clearwater basins, and suitability maps developed by IDFG (Thurow, 1988). Channel widths calculated for the 200-meter segments used in the IP analysis were spatially joined to each dataset, and mean values were summarized for each unit. In both the spring Chinook and steelhead analyses, we used the 95th percentile low value for bankfull and wetted width to delineate our upstream extent. Use of smaller tributaries for juvenile rearing has been documented (e.g., Nez Perce tribal comment letter), and spawning in smaller tributaries may occur in particular situations. Further discussion of our stream width metrics will follow in the next section.

Water Temperature

The lower reaches of many interior basin tributaries are subject to summer temperatures that are well above levels injurious to salmon and steelhead. Persistent high temperature levels can have a significant impact on the ability of a given reach to sustain both juvenile rearing and adult spawning. Although current thermal regimes within ICB drainages are significantly influenced by human activities, it is likely that some lower reach habitat has always been temperature limited. Unfortunately, there are no temporally or spatially broad datasets describing historical temperature profiles, so any model using contemporary data reflects current habitat degradations. This is important to note, because any modeling exercise which uses current data will have output shaped by modern externalities.

A Streamnet (1999) temperature dataset was used for modeling water temperatures as they relate to environmental characteristics. We adopted the temperature criteria used by Chapman & Chandler (2001) which determined that a weekly mean average temperature (WMAT) exceeding 22 degree C could potentially limit or exclude salmon and steelhead production. Using NCDC mean July temperatures (1971-2000), percent forest cover (calculated from USGS NLCD), and elevation (USGS DEM), we developed a reach specific model that predicts the likelihood of exceeding a WMAT of 22 degree C. In the Streamnet dataset we chose data points that were the least likely to be anthropogenically altered. These included locations directly above or below dams, within irrigation infrastructures, or adjacent to urbanized areas. The final analysis revealed significant relationships between a WMAT of 22 degree C and air temperature, percent forest cover, and elevation. These variables were used to develop a simple screen that either included or excluded 200-meter segments within the 22 degree C zone. This delineation was then used to define the lower extent of spring Chinook salmon spawning potential in Upper Columbia River and Lower Snake River Populations. It should be noted that the initial set of variables used in this analysis do not reflect the effects of groundwater on ameliorating temperatures in mainstem reaches with broad, alluvial flood plains such as those found in the Lower Yakima River.

Reach Level Habitat Potential Ratings

Four different habitat measures were used to define our criteria for estimating reach specific production potential for stream type Chinook and steelhead within ICB habitats. The characteristics selected were; (1) stream width (modeled as bankfull and wetted width), (2) stream gradient (change in elevation over reach length), (3) valley width (relative width of valley compared to bankfull width) and (4) riparian vegetation (as a percent of landcover). We previously discussed how these variables were calculated using a GIS, and will now describe the methods employed for categorizing data.

Stream Width.

We established three stream width categories after considering the range of widths associated with the empirical density data for Interior Columbia streams, the relative distribution of channel widths in areas identified as supporting steelhead spawning in the basin and the categories employed in the Puget Sound analysis. The three categories were 3.6 m(wetted) or 3.8 m(bankfull) to 25 m, 25 - 50 m and >50 m. The rationale for our upstream extent (minimum stream width) was described earlier, and agrees with other observations. For example, streams less than 3 m in bankfull width were at the lower margins sampled in the Idaho baseline study. Also, presence/absence data provided by the Nez Perce Tribal staff indicates that few streams less than 3 m support production for steelhead. WDFW has recommended using a 2 m wetted width as the lower limit for steelhead in western Washington streams. Although most transects within the Idaho parr data were between 3.8 m and 25 m bankfull width, the WDG study included mainstems up to 50 m wide, and this value defines the upper limit of our moderately sized width class. Very little abundance data existed for the largest mainstem rivers (>50 m).

Based on previous analyses, we set lower limits relative to spawning/rearing potential of 3.6 m (wetted width) for Chinook and 3.8 m (bankfull width) for steelhead. Spring Chinook spawn in the late summer and early fall, and summer wetted width is an appropriate measure of stream size relative to this time period. Steelhead spawn in the late spring on the end of the spring freshet, and bankfull width is a more appropriate measure of stream size relative to this period.

Valley Confinement

The Idaho baseline study classified streams as B or C type channels using criteria defined by Rosgen (1985). Using the valley confinement estimates calculated earlier, we defined 200-meter reaches within our IP analysis as C type if valley width exceeded 20 times bankfull width. Values less than 20 times bankfull width were either attributed as confined or unconfined (defined below).

Confined streams with moderate to high gradients are unlikely to exhibit the stream structures necessary to support salmon and steelhead spawning. We incorporated a measure of confinement (as a function of valley to bankfull width) into our IP criteria, and assigned categories to all 200-meter segments. Streams that have a valley to bankfull width ratio less than 4 are defined as confined, and have virtually no opportunity for lateral channel migration and floodplain development (Beechie *et al*., 2006, Hall *et al*., 2007). This means that confined channels lack instream processes which promote the development of suitable spawning substrates. If valley width was less than 4 times bankfull width, a stream segment was attributed as confined and the intrinsic production potential was downgraded by one level.

Gradient

A set of gradient categories was developed based upon the Puget Sound TRT Chinook matrix (e.g., Table 2 in WRIA 18 Draft Summary Report - Puget Sound Chinook Recovery Analysis Team) and the categories used in the Idaho and Washington Game Department studies. For Chinook, most of the observed parr density/stream gradient data pairs fell within the 3 to 25 m stream width category. In general, densities were relatively high at gradients below 1.0 to 1.5 %. Although observations were relatively sparse, densities were low at gradients exceeding 1.5 to 2.0 percent. The frequency of samples exhibiting low pool cover (less than 50%) increased rapidly as gradients exceeded 1.5%.

Steelhead exhibited the reverse pattern with relatively low densities at gradients below 0.5, increasing as gradients rise to approximately 4%. Steelhead parr densities remained relatively high as gradients increased above 4%. We assigned the highest potential rating to gradients between 4% and 7% (an upper limit consistent with expert opinion cited in the draft Lower Columbia/Willamette TRT Viability report). Stream reaches in the 3.8-25 m bankfull width category that had gradients between 7 and 15% were designated with low potential. No spawning potential was assumed if gradients exceeded 15%. Steelhead parr densities at gradients exceeding 1.0 remained at relatively high levels in the widest streams in the sampled areas, but transects located in streams greater than 20 m bankfull width were not well represented.

We used adult steelhead spawning surveys to supplement the parr data analyses in determining relative ratings for streams exceeding 25 m bankfull width. Klickitat River index redd counts (YKFP 2002) and radio tracking results for Yakima Basin steelhead (Hockersmith et al., 1995) were geo-referenced and used to describe width and gradient classes in spawning locations within larger streams. We modified our ratings for the 25-50 meter wide category using the relative ratios generated from these analyses.

Riparian Vegetation

An additional modifier was originally incorporated into the framework based on forest cover as a source of large woody debris (LWD). Using the USGS (2000) National Land Cover Dataset (NLCD), we calculated the percent of forest within buffered 200-meter stream segments, and classified reaches with greater than 90% forest cover as mesic forest. In Puget Sound stream systems (PSTRT 200?), pool structure is affected by the availability of large woody debris (LWD), which can mitigate for the limitations of moderate gradient reaches. Initially, we included the assumption that LWD sources within adjacent riparian areas (classified as mesic forest) would result in increased pool structure in moderate gradient reaches (and would therefore increase suitability). However, analysis of the USFWS Middle Fork adult redd data set did not support increased production potential (redd densities) in forest versus non-forested reaches in moderate gradient or confined reaches. As a result, we dropped this rating category from our analysis.

Initial Rating Assignments

Classes assigned to stream gradient, width (bankfull and wetted), and valley confinement were grouped into habitat categories and given a rating of “high”, “moderate”, “low”, or “none.” These relative ratings were determined from observed life stage specific abundance values within specific habitat classes and applied to the 200-meter stream segments within our IP dataset. Maps from this exercise were distributed to regional biologists for review.

Review and Modification Including Additional Habitat Screens

The results from our habitat suitability classification were analyzed using two methods: solicited reviews from field biologists and comparisons with current spawning survey summaries. Firstly, maps were developed for individual watersheds and distributed to local agencies for review and comment. Feedback from this process then became the basis for developing sediment and stream velocity habitat screens as they relate to intrinsic quality. Secondly, statistical comparisons were made between IP habitat classes and productivity as measured by redd counts. The spring/summer Chinook survey from the Middle Fork Salmon River (USFWS) was used for our IP analysis of stream type Chinook, and WDFW steelhead surveys in the Upper Columbia (2004-06) were used to compare with O. mykiss IP values. Both datasets were important because they included redd surveys of entire streams, making non-occupied reaches significant and comparable to IP modeled categories. Based on these comparisons, some class specific adjustments were made to IP ratings, most notably for adding confinement as a significant feature in steelhead ratings, modification of gradient and width classes, and removal of the mesic forest modifier.

Habitat Screens-Sedimentation

The ability of a particular reach to support salmonid spawning can be significantly affected by sediment conditions within that reach (e.g., Bjornn and Reiser, 1991). Relatively low gradient stream reaches meandering through wide valleys can be deposition areas for fine sediments, especially if the surrounding soil types are highly erosive and fine grained. We used available GIS layers summarizing soil characteristics to assign relative indices of erosion potential and particle size to each tributary reach. The indices were calculated as an average across the HUC-6 corresponding to each particular stream reach.

Stream sedimentation is often a critical factor limiting the spatial distribution of salmonid spawning. In riverine systems, certain environmental traits promote the accumulation of stream sediments that can obscure suitable substrates. Specifically, the deposition of fine particles within streams is effected by factors such as soil type and hydrological conditions. In our analysis, these attributes were employed in order to determine where sedimentation might influence salmon and steelhead production. Most crucial to our investigation were the identification of highly erodible soils and low gradient streams which maximize particle detachment and limit transport.

Two primary data sources were utilized in our effort to locate probable sedimentation: the USDA-NRCS STATSGO soil survey, and reach level gradients obtained from USGS DEMs. The STATSGO dataset contains a measure of potential erodibility, or K factor, which is a predictive measure (0.0 – 1.0) of particle detachment resulting from rainfall. Soil texture and permeability are the key factors in determining the K factor, with clays having the lowest value (least erodible) and silts having the highest (most erodible). The USDA-NRCS considers soils with a K factor greater than 0.40 to be the most highly erodible and prone to runoff. Soils in this category are predominately composed of silts and silty loams. It should be noted that K factor is a measurement for bare soil conditions, and our analysis is for intrinsic habitats. However, natural disturbances would likely aid in the process of sedimentation more readily in soil units with the greatest erosion potential.

In addition to soil erodibility, we utilized stream gradients as a measure of depositional potential. Gradients were calculated for all 200-meter reaches within our study area using the minimum and maximum elevation per reach as obtained from the USGS DEMs. Low gradient streams result in lower flows and reduced stream power, which in turn promotes depositional rather than transport processes.

In order to determine stream reaches most at risk for sedimentation, we developed a habitat screening mechanism based on K factor and gradient. We first selected low gradient streams (<= 0.5%) and then intersected these results with soil units having a K factor greater than 0.4. Also, we identified sub watersheds having at least 50% of their area within highly erodible soils (K > 0.4). Low gradient reaches within these watersheds and those intersecting highly erodible soil units were attributed with high sediment potential. Additionally, the accumulated mean K factor was calculated for upstream reaches above all 200-meter segments, and where the accumulated mean was greater than or equal to 0.4 we applied the sediment screen. In reaches that were previously classified with moderate or high IP ratings, values within the sediment screen dropped to low.

Stream Velocity

For steelhead, an additional screen was developed in order to address highly rated IP areas identified as low potential by regional biologists. These reaches were primarily at the upper ends of drainages or emanated from relatively arid headwater areas. Generally, it appeared that persistent low flow conditions would preclude steelhead occupation. Using the NHD Plus database, we spatially joined mean annual stream velocity attributes to the 200-segments within the IP analysis. We then compared existing measure of productivity at specific locations (John Day steelhead index reaches, IDFG suitability maps, and Upper Columbia redd counts) to NHD calculated mean annual velocities and determined upper and lower limits. As with the sediment screen, all moderate and high potential rated reaches were changed to low if they were located outside the acceptable value range.

John Day Gravel Assessment-- stream confinement and gradient

Additional reviews from local biologists identified highly rated IP steelhead habitat within confined reaches and higher gradients that unlikely could support suitable substrate development. Stream gravel assessments within the Joseph Creek subwatershed were used to evaluate the significance of gradient and confinement to the distribution of suitable spawning substrates. The original dataset was developed by ODFW and was based upon stream surveys conducted in 1965 and 1966.

Spawning gravel summaries were classified by ODFW using “good” and “marginal” qualifiers, but the total of both categories were used for our analyses. We summarized mean bankfull width, confinement (valley width / bankfull width), and gradient for all 200 meter reach segments within the surveyed streams and joined it to the stream gravel dataset. The confinement parameter was expressed as the percent of stream confined (confinement was defined for reaches where valley width was less than or equal to 4 times bankfull width). To facilitate the standardization of gravel quantity among streams, the gravel area was divided by the bankfull stream area to compute the amount of gravel per unit stream area. These values were then multiplied by 10,000 to convert the values to integers.

We utilized an ANOVA to determine if there were differences between the amount of available spawning gravels within different gradient and confinement groups. Percent of stream confined was classified into two categories (<10% confined [uc], >10% confined [c]), and gradient was classified into 3 groups (0 – 1.5%, 1.5 – 4.0%, and > 4.0%). From the ANOVA, the streams with a greater percentage of confinement and higher gradients were shown to contain fewer spawning gravels as a percentage of stream area. These results were applied to our IP assessment by introducing confinement parameters to the steelhead habitat criteria.

Middle Fork Salmon and Upper Columbia Redd Surveys

The Middle Fork Salmon survey included GPS located redds within all accessible streams (1995-2003 return years, R. Thurow USFS pers. comm.). In the Upper Columbia (Okanogan, Methow, and Wenatchee subbasins), GPS data was collected (2004-2006) for redds observed in specific streams (C. Baldwin, WDFW pers. comm.) By identifying the nearest IP stream reach for each redd, we successfully quantified the total number observed per 200-meter segment in the intrinsic potential dataset. These results enabled us to evaluate our classification of IP habitat using observed redd densities by spatially joining predicted values to field measurements. Categories were summed by total Chinook or steelhead redds located within each habitat class, and an ANOVA was used to compare the total redd counts to unique categories. The results showed general agreement between our IP analysis (predicted quality) and redd density (observed productivity), but some differences were noted. These results were used to adjust model parameters to reflect spawning patterns observed for stream type Chinook in the Middle

Fork Salmon River and steelhead in the Upper Columbia, and formulated our final rating scheme.

Using the results from our ANOVA analyses, the greatest mean redd count for a habitat category was assigned a “high” intrinsic spawning potential. This group represented the most preferred habitat by observed Chinook and steelhead spawners in the dataset. Any grouping whose mean redd count was at least fifty percent of this highest value was also attributed with a “high” intrinsic potential. Continuing, those categories receiving between 25% and 50% of the highest value were given a “moderate” rating, between 12.5% and 25% a “low” rating, and less than 12.5% a “negligible” rating. The “negligible” rating was only applied to the stream type Chinook IP classification. These values were then used to weight potential habitat (for both area and length) so that a “high” rated reach was multiplied by 1.0, “moderate” by 0.5, “low” by 0.25, and “negligible” by 0.0. Functionally, the “negligible” category had the same effect on total habitat as inaccessible areas or those failing to meet our minimum width criteria (which were assigned a “none” rating). Neither the “none” or “negligible” classification contributed habitat, in terms of weighted length or area, to the total intrinsic spawning potential per population.

Species Specific Ratings

The final rating assignments are provided in Tables C-1 and C-2 for yearling type Chinook salmon and steelhead reaches, respectively.

Yearling Chinook

Table C-1. Relative potential for Interior Columbia basin Spring and Spring/Summer Chinook salmon spawning and initial rearing as a function of stream reach physical characteristics. BF: Bankfull stream width; Gradient: percent change over 200 m reach; and relative ronfinement: valley width expressed as ratio to BF stream width.

Stream Width/ Gradient Categories		**Valley Width Ratio (Ratio of valley width to bankfull stream width)**		
Bankfull Width (BF)	**Gradient**	**Confined (<= 4 X BF width)**	**Moderate (4 to 20 X BF width)**	**Wide > 20 X BF width**
BF < 3.7 m	≥ 0	None	None	None
BF 3.7 to 25 m	0 - 0.5	***Medium***	***High***	***High***
	0.5 - 1.5	***Low***	***Medium***	***High***
	1.5 - 4.0	***Low***	***Low***	***Medium***
	4.0 - 7.0	Negligible	***Low***	***Low***
	> 7.0	None	None	None
BF 25 m to 50 m	0 - 0.5	None	***Medium***	***Medium***
	0.5 - 10.0	None	None	None
	≥ 10	None	None	None
BF > 50 m	≥ 0	None	None	None

Steelhead

Table C-2. Relative potential for Interior Columbia basin steelhead spawning and initial rearing as a function of stream reach physical characteristics. BF: Bankfull stream width; Gradient: percent change over 200 m reach; and relative confinement: valley width expressed as ration to BF stream width.

Stream Width/ Gradient Categories		**Valley Width Ratio (Ratio of valley width to bankfull stream width)**		
Bankfull Width (BF)	**Gradient**	**Confined (<= 4 X BF width)**	**Moderate (4 to 20 X BF width)**	**Wide > 20 X BF width**
BF < 3.8 m	≥ 0	None	None	None
BF 3.8 to 25 m	0 - 0.5	None	***Medium***	***Medium***
	0.5 - 4.0	***Low***	***High***	***High***
	4.0 - 7.0	None	***Low***	***Low***
	> 7.0	None	None	None
BF 25 m to 50 m	0 - 4.0	***Low***	***Medium***	***Medium***
	> 4.0	None	None	None
BF > 50 m	≥ 0	None	***Low***	***Low***

Population Totals: Historical Potential Spawning Habitat

An estimate of potential spawning habitat area is a particularly relevant measure for use in expressing the size of specific populations relative to abundance and productivity criteria. A strong tendency for returning spawners to home back to natal spawning areas is a general characteristic of Chinook and steelhead. The predominant life history patterns for both of these species involve a year or more freshwater rearing, generally in the natal tributary. Returns to particular spawning reaches are therefore largely dependent upon the production from the previous generation of spawning in that same reach. As a result, the availability of suitable quantities of high quality rearing habitat also affects production and therefore average abundance associated with a particular spawning area.

Once final habitat adjustments were completed for the IP analysis, we weighted stream metrics using our new screening elements. In some cases, new criteria changed the rating by one or two categories, and in others the screen factor completely eliminated habitat potential (Table C-3). We used these updated results to generate population specific estimates of total spawning potential. We expressed the total amount of historical spawning habitat for each population as an equivalent amount of good spawning habitat. We weighted the amount of habitat (length and area) in each 200 meter reach within a population by a simple proportion corresponding to the assigned reach rating – high, medium, or low (we included a fourth category – negligible, for yearling type Chinook populations). Units of habitat rated with high production potential for a species were given a weight of 1. Units of medium production potential were given a relative rating of 0.5 and habitat units classified as low production potential were assigned a relative rating of 0.25. For Chinook populations, some reaches were rated as negligible. For the purposes of this analysis those reaches were assigned a weight of 0. A relative index of productivity for aggregate areas was calculated by summing the weighted total amounts of habitat within each category within the appropriate geographic units. The ratios of 1 to .5 to .25 for high, medium and low intrinsic potential categories reflect the patterns observed in the WDG steelhead parr density study (Gibbons et al., 1985, table 6) and are generally consistent with relative densities reported for spring Chinook late fall parr in the Idaho studies.

<u>Tributaries Supporting Two Chinook ESUs</u>

The intrinsic potential analysis described above is based on general physical requirements for Chinook spawning and early rearing. Some population areas in the Interior Basin support more than one Chinook ESU. We adjusted the total area assigned to the listed spring Chinook population in accordance with the following observations.

Upper Columbia Spring Chinook

Each of the extant populations of upper Columbia spring Chinook is associated with a population of summer Chinook. With the possible exception of the Entiat, summer Chinook runs are believed to have been endemic to each system. Upper Columbia River summer Chinook salmon are classified in a separate ESU. There are significant differences in life history patterns between the two ESUs - summer Chinook return to the Columbia River primarily in July and August, spawn approximately 1 month later than spring Chinook, and leave their natal tributary for the mainstem during the summer of their first year of life. Summer Chinook spawn later and lower down in the mainstems of the major Upper Columbia tributaries. Gradient and substrate characteristics of stream habitat within the stream sections used for spawning are similar for both runs. There is some overlap in each system between the lower end of the spring run spawning and the upper end of summer Chinook spawning.

Summer Chinook salmon utilize the Wenatchee River mainstem up through Tumwater Canyon for spawning. Spring Chinook salmon spawning is generally confined to the major tributaries to the Wenatchee and the mainstem reach downstream of Lake Wenatchee to Tumwater Canyon.

In the Methow basin, summer Chinook spawning is confined to the mainstem Methow River below the Chewuch River confluence (Anon., 1998). Chapman et al. (1994) states that summer/fall Chinook utilize the lower 50 miles of the Methow River mainstem. In the Okanogan, summer Chinook salmon currently spawn between Zosel Dam and the town of Mallott and from Enloe Dam to Driscoll Island.

Spring Chinook spawning in the Entiat drainage occurs above river mile 16 of the mainstem and in the lower five miles of a major tributary, the Mad River. Summer Chinook spawning extends downstream from approximately river mile 20 to the mouth.

Snake River Spring/Summer Chinook

There is limited potential for overlap in spawning/rearing areas among ESUs of Chinook in the Snake Basin.

Tucannon River: Currently, fall Chinook use the lower 10 km of the Tucannon mainstem for spawning (redd survey data summarized in Milk et al, 2005). Spring Chinook spawning currently occurs in the mainstem from the mouth of Sheep Cr. (river mile 52) downstream to King Grade (RM 21) - draft Lower Snake Recovery Plan p 82). The Tucannon system has been heavily impacted by human activities, resulting in increased stream temperatures and high sedimentation rates. Projections of historical temperatures indicate almost all of the mainstem Tucannon would have had average July temperatures below 22 deg. C.

Table C-3. Population total historical intrinsic potential spawning habitat. Units are 10,000 m^2 (equivalent to 1 km of 10 wide stream of reach habitat rated in High category). Core area habitat is the portion of the total within the major tributary drainage for the corresponding population.

Steelhead				Chinook			
ESU	Population	Total	Core	ESU	Population	Total	Core
Upper Columbia Steelhead	UCENT-s	141	136	Upper Columbia Spring Chinook	UCENT	30	30
	UCMET-s	533	526		UCMET	146	146
	UCWEN-s	550	488		UCWEN	153	153
	UCOKA-s (US)	352	336		UCOKA (US)	40	41
	UCCRC-s	360	---	Snake River Spring/Summer Chinook	SNASO	20	20
Middle Columbia Steelhead	MCWSA-s	48	46		SNTUC	44	44
	MCKLI-s	436	435		GRWEN	38	38
	MCFIF-s	191	164		GRLOS	106	106
	DREST-s	408	408		GRLOO	8	8
	DRWST-s	825	457		GRMIN	42	42
	MCROC-s	67	67		GRCAT	66	34
	MCWIL-s	298	255		GRUMA	91	91
	DRCRO-s	1156	---		IRMAI	48	48
	JDLMT-s	1175	1170		IRBSH	28	28
	JDNFJ-s	687	687		SRLSR	44	28
	JDMFJ-s	296	296		SFMAI	75	55
	JDSFJ-s	103	103		SFSEC	47	47
	JDUMA-s	335	335		SFEFS	60	60
	MCUMA-s	907	783		SRCHA	34	21
	WWMAI-s	371	360		MFBIG	60	60
	WWTOU-s	229	229		MFLMA	18	8
	YRTOP-s	191	157		MFCAM	26	26
	YRSAT-s	411	180		MFLOO	27	27
	YRNAC-s	734	535		MFUMA	53	53
	YRUMA-s	921	921		MFSUL	12	12
Snake River Steelhead	SNTUC-s	272	188		MFBEA	50	50
	SNASO-s	157	94		MFMAR	23	23
	CRLMA-s	743	743		SRPAN	41	40
	CRNFC-s	841	---		SRNFS	19	17
	CRLOL-s	78	78		SRLEM	135	133
	CRLOC-s	340	340		SRLMA	144	144
	CRSEL-s	500	500		SRPAH	111	111
	CRSFC-s	262	262		SREFS	57	57
	GRLMT-s	306	306		SRYFS	21	21
	GRJOS-s	194	194		SRVAL	27	27
	GRWAL-s	399	399		SRUMA	69	69
	GRUMA-s	714	714				
	IRMAI-s	304	304				
	SRLSR-s	276	85				
	SRCHA-s	169	60				
	SFSEC-s	92	92				
	SFMAI-s	299	299				
	SRPAN-s	163	125				
	MFBIG-s	428	428				
	MFUMA-s	448	448				
	SRNFS-s	98	62				
	SRLEM-s	426	368				
	SRPAH-s	385	257				
	SREFS-s	379	165				
	SRUMA-s	464	464				

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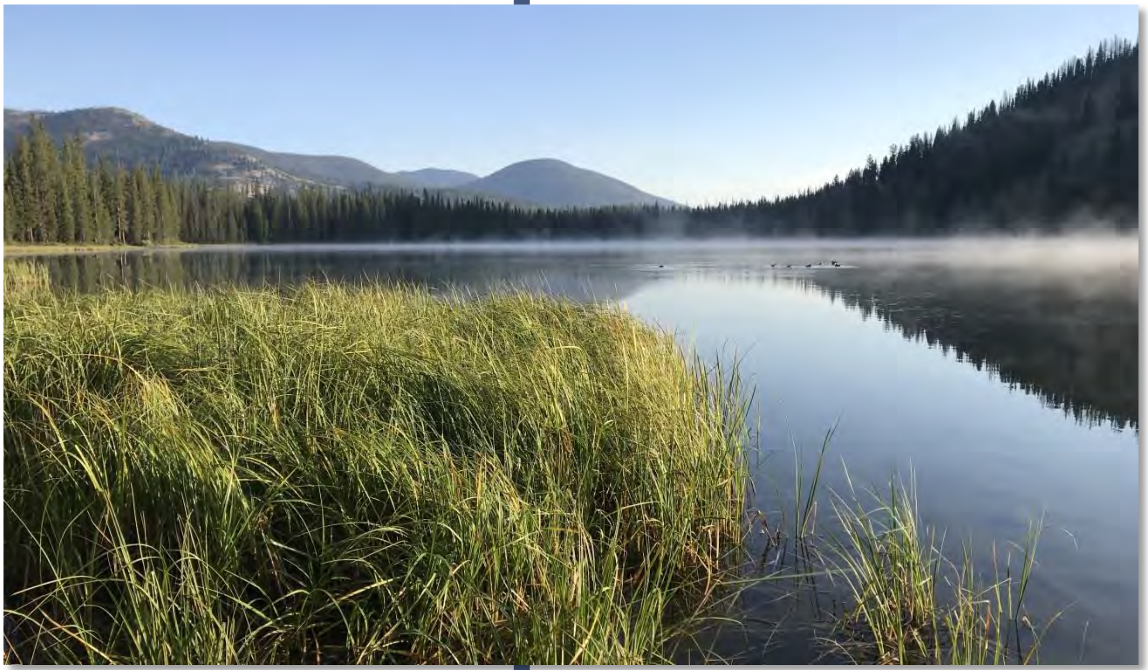
Idaho's
2018/2020 Integrated Report

Appendix A: Clean Water Act Section 305 (b) List and Section 303(d) List



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Executive Summary

Appendix A provides the Clean Water Act § 305(b) list and § 303(d) list for the 2018/2020 Integrated Report. The § 305(b) list documents the current condition of all state surface waters, including publicly owned lakes, and the § 303(d) list identifies those waters that are impaired and need a total maximum daily load (TMDL). Impaired waters on the § 303(d) list are a subset of waters on the § 305(b) list.

Category 1: Waters are wholly within a designated wilderness or 2008 Idaho Roadless Rule “Wild Land Recreation” area and are presumed to be fully supporting all beneficial uses.

2018/2020 Integrated Report - Category 1

Clearwater

17060301 Upper Selway

ID17060301CL001 02	Selway River - Bear Creek to Moose Creek	19.88	Miles
ID17060301CL001 05	Selway River - Bear Creek to Moose Creek	10.55	Miles
ID17060301CL002 02	Magpie Creek - source to mouth	4.53	Miles
ID17060301CL003 02	Bitch Creek - source to mouth	10.31	Miles
ID17060301CL004 02	Selway River - White Cap Creek to Bear Creek	22.98	Miles
ID17060301CL004 05	Selway River - White Cap Creek to Bear Creek	16.19	Miles
ID17060301CL005_02	Ditch Creek - source to mouth	19.7	Miles
ID17060301CL005_03	Ditch Creek - source to mouth	2.01	Miles
ID17060301CL006 02	Elk Creek - source to mouth	10.14	Miles
ID17060301CL007_02	Goat Creek - source to mouth	36.22	Miles
ID17060301CL007_03	Goat Creek - source to mouth	8.57	Miles
ID17060301CL012 02	Eagle Creek - source to mouth	26.98	Miles
ID17060301CL013 02	Crooked Creek - source to mouth	16.34	Miles
ID17060301CL013 03	Crooked Creek - source to mouth	3.49	Miles
ID17060301CL014_05	Selway River - Deep Creek to White Cap Creek	9.24	Miles
ID17060301CL015 02	Little Clearwater River- Flat Creek to mouth	8.59	Miles
ID17060301CL015 04	Little Clearwater River- Flat Creek to mouth	6.02	Miles
ID17060301CL016_02	Short Creek - source to mouth	13.09	Miles
ID17060301CL017_02	Little Clearwater River - source to Flat Creek	13.98	Miles
ID17060301CL017_03	Little Clearwater River - source to Flat Creek	1.32	Miles
ID17060301CL017 04	Little Clearwater River - source to Flat Creek	3.12	Miles
ID17060301CL018_02	Burnt Knob Creek - source to mouth	17.06	Miles
ID17060301CL018_02L	Burnt Knob Lakes	6.08	Acres
ID17060301CL018 03	Burnt Knob Creek - source to mouth	1.56	Miles
ID17060301CL019 03	Salamander Creek - source to mouth	4.22	Miles
ID17060301CL022_01L	Gold Pan Lake	11.01	Acres

Clearwater

ID17060301CL022 02L	Thirteen Lakes	12.84	Acres
ID17060301CL022 03	Selway River - confluence of Hidden and Surprise Creeks	7.38	Miles
ID17060301CL023_02	Three Lakes Creek - source to mouth	18.67	Miles
ID17060301CL023_02L	Elk Track Lakes - Three Lakes Creek	11.65	Acres
ID17060301CL023 03	Three Lakes Creek - source to mouth	1.66	Miles
ID17060301CL024_02	Swet Creek - source to mouth	12.72	Miles
ID17060301CL024_02L	Swet Lake	11.23	Acres
ID17060301CL025_02	Stripe Creek - source to mouth	4.4	Miles
ID17060301CL026 02	Hidden Creek - source to mouth	6.73	Miles
ID17060301CL027_02	Surprise Creek - source to mouth	13.65	Miles
ID17060301CL028_02	Wilkerson Creek - Storm Creek to mouth	15.06	Miles
ID17060301CL028_03	Wilkerson Creek - Storm Creek to mouth	4.56	Miles
ID17060301CL029 02	Wilkerson Creek - source to Storm Creek	8.84	Miles
ID17060301CL030 02	Storm Creek - source to mouth	18.19	Miles
ID17060301CL030_03	Storm Creek - source to mouth	3.27	Miles
ID17060301CL033 02	Lazy Creek - source to mouth	11.59	Miles
ID17060301CL036 02	Indian Creek - source to mouth	36.16	Miles
ID17060301CL037_02	Schofield Creek - source to mouth	12.99	Miles
ID17060301CL039_03	White Cap Creek - Canyon Creek to mouth	3.09	Miles
ID17060301CL040_02	Canyon Creek - source to mouth	37.52	Miles
ID17060301CL040 02L	Unamed Lake - Canyon Creek	9.36	Acres
ID17060301CL040_03	Canyon Creek - source to mouth	1.37	Miles
ID17060301CL041_02	Cooper Creek - source to mouth	10.78	Miles
ID17060301CL041 03	Cooper Creek - source to mouth	0.72	Miles
ID17060301CL042 01L	Triple Lakes	15.66	Acres
ID17060301CL042 02	White Cap Creek - source to Canyon Creek	48.5	Miles
ID17060301CL042_02L	White Cap Lakes	36.16	Acres
ID17060301CL042 03	White Cap Creek - source to Canyon Creek	12.71	Miles
ID17060301CL042_0L	Unnamed Lakes in 17060301CL4202	15.67	Acres
ID17060301CL043_02	Paloma Creek - source to mouth	6.74	Miles
ID17060301CL044_02	Bad Luck Creek - source to mouth	21.83	Miles
ID17060301CL045 02	Gardner Creek - source to mouth	9.83	Miles

ID17060301CL046 02	North Star Creek - source to mouth	7.25	Miles
ID17060301CL047 02	Bear Creek - Cub Creek to mouth	13.01	Miles
ID17060301CL048_02	Cub Creek - Brushy Fork Creek to mouth	5.81	Miles
ID17060301CL048_03	Cub Creek - Brushy Fork Creek to mouth	4.29	Miles
ID17060301CL049 02	Brushy Fork Creek - source to mouth	20.51	Miles
ID17060301CL049_02L	Brushy Fork Lake	19.5	Acres
ID17060301CL049_03	Brushy Fork Creek - source to mouth	2.81	Miles
ID17060301CL050_02	Cub Creek - source to Brushy Fork Creek	23.94	Miles
ID17060301CL050 02L	Cub Lake	40.42	Acres
ID17060301CL051_02	Paradise Creek - source to mouth	30.88	Miles
ID17060301CL051_02L	Spruce Lake	10.41	Acres
ID17060301CL052_02	Bear Creek - Wahoo Creek to Cub Creek	21.72	Miles
ID17060301CL052 03	Bear Creek - Wahoo Creek to Cub Creek	8.65	Miles
ID17060301CL053 02L	Diamond Lake	10.26	Acres
ID17060301CL054_02	Granite Creek - source to mouth	6.92	Miles
ID17060301CL055 02	Wahoo Creek - source to mouth	14.2	Miles
ID17060301CL055 02L	Park Lakes	22.86	Acres
ID17060301CL055_03	Wahoo Creek - source to mouth	5.51	Miles
ID17060301CL056_02	Pettibone Creek - source to mouth	30.83	Miles
ID17060301CL056_02L	Sid and Papoose Lakes	7.59	Acres
ID17060301CL056 03	Pettibone Creek - source to mouth	9.82	Miles
ID17060301CL057_02	Cow Creek - source to mouth	3.16	Miles
ID17060301CL058_02	Dog Creek - source to mouth	9.26	Miles

17060302 Lower Selway

ID17060302CL021 02L	Buck Lake	4.14	Acres
ID17060302CL023_02	Otter Creek - source to mouth	18.19	Miles
ID17060302CL024_02	Mink Creek - source to mouth	14.71	Miles
ID17060302CL024 03	Mink Creek - source to mouth	4.52	Miles
ID17060302CL025 02	Marten Creek - source to mouth	33.6	Miles
ID17060302CL025_03	Marten Creek - source to mouth	5.22	Miles
ID17060302CL026 02	Trout Creek - source to mouth	12.28	Miles
ID17060302CL027 02	Moose Creek - East Fork Moose Creek to mouth	5.52	Miles

ID17060302CL027 05	Moose Creek - East Fork Moose Creek to mouth	3.73	Miles
ID17060302CL028 02	East Fork Moose Creek - Cedar Creek to Moose Creek	27.93	Miles
ID17060302CL028_04	East Fork Moose Creek - Cedar Creek to Moose Creek	14.06	Miles
ID17060302CL029_02	Freeman Creek - source to mouth	3.34	Miles
ID17060302CL030 02	Monument Creek - source to mouth	7.17	Miles
ID17060302CL031_02	Elbow Creek - source to mouth	10.86	Miles
ID17060302CL032_02	Battle Creek - source to mouth	13.57	Miles
ID17060302CL032_02L	Battle Lake	35.45	Acres
ID17060302CL033 01L	Dead Elk Creek Lake	10.69	Acres
ID17060302CL033_02	East Fork Moose Creek - source to Cedar Creek	45.87	Miles
ID17060302CL033_02L	Goat Lakes	41.15	Acres
ID17060302CL033_03	East Fork Moose Creek - source to Cedar Creek	11.67	Miles
ID17060302CL033 03L	Moose Lake	9.51	Acres
ID17060302CL033 0L	Jeanette Lake	6.58	Acres
ID17060302CL034_02	Chute Creek - source to mouth	2.87	Miles
ID17060302CL035 02	Dead Elk Creek - source to mouth	3.92	Miles
ID17060302CL036 02	Cedar Creek - source to mouth	27.05	Miles
ID17060302CL036_03	Cedar Creek - source to mouth	5.14	Miles
ID17060302CL037_02	Maple Creek - source to mouth	12.54	Miles
ID17060302CL037_02L	Maple Lake	4.05	Acres
ID17060302CL038 02	Double Creek - source to mouth	15.46	Miles
ID17060302CL038_02L	May Lake	11.78	Acres
ID17060302CL039_02	Fitting Creek - source to mouth	4.88	Miles
ID17060302CL040 02	North Fork Moose Creek - Rhoda Creek to mouth	29.66	Miles
ID17060302CL040 03	North Fork Moose Creek - Rhoda Creek to mouth	0.57	Miles
ID17060302CL040 05	North Fork Moose Creek - Rhoda Creek to mouth	7.26	Miles
ID17060302CL041_02	North Fork Moose Creek - West Moose Creek to Rhoda Creek	10.88	Miles
ID17060302CL041 04	North Fork Moose Creek - West Moose Creek to Rhoda Creek	11.37	Miles
ID17060302CL042_02	North Fork Moose Creek - source to West Fork Moose Creek	24.64	Miles
ID17060302CL042_03	North Fork Moose Creek - source to West Fork Moose Creek	2.88	Miles
ID17060302CL043_02	West Fork Moose Creek - source to mouth	35.64	Miles
ID17060302CL043 03	West Fork Moose Creek - source to mouth	4.76	Miles

ID17060302CL044 02	Rhoda Creek - Wounded Doe Creek to mouth	2.86	Miles
ID17060302CL044 04	Rhoda Creek - Wounded Doe Creek to mouth	3.18	Miles
ID17060302CL045_01L	Wounded Doe Creek Lake	7	Acres
ID17060302CL045_02	Wounded Doe Creek - source to mouth	22.87	Miles
ID17060302CL045 03	Wounded Doe Creek - source to mouth	4.99	Miles
ID17060302CL046_01L	North and South Lone Lakes	26.36	Acres
ID17060302CL046_02	Rhoda Creek - source to Wounded Doe Creek	31.9	Miles
ID17060302CL046_02L	Two Lakes	22.73	Acres
ID17060302CL046 03	Rhoda Creek - source to Wounded Doe Creek	4.88	Miles
ID17060302CL046_0L	Shasta Lake	5.25	Acres
ID17060302CL047_02	Lizard Creek - Lizard Lakes to mouth	7.35	Miles
ID17060302CL047_02L	Lizard Lakes	51.51	Acres
ID17060302CL048 02	Meeker Creek - source to mouth	9.46	Miles
ID17060302CL049 02	Three Links Creek - source to mouth	40.31	Miles
ID17060302CL049_02L	North and South Three Links Lakes	31.39	Acres
ID17060302CL049 03	Three Links Creek - source to mouth	10.18	Miles
ID17060302CL049 04	Three Links Creek - source to mouth	4.19	Miles
ID17060302CL052_01L	Cove-Rainbow Lakes	9.75	Acres

17060303 Lochsa

ID17060303CL007 02	Old Man Creek - source to mouth	41.94	Miles
ID17060303CL007 02L	Old Man Lakes	77.18	Acres
ID17060303CL007 0L	Chimney Lake	4.93	Acres
ID17060303CL010_02L	Rock Creek Lakes	19.58	Acres
ID17060303CL010 03	Boulder Creek - source to mouth	4.48	Miles
ID17060303CL011 02L	Long Lake	28.25	Acres
ID17060303CL015_02	Sponge Creek - source to Fish Lake Creek	22.37	Miles
ID17060303CL016_02	Fish Lake Creek - source to mouth	23.73	Miles
ID17060303CL016 02L	Fish Lake	53.12	Acres
ID17060303CL018 02	Warm Springs Creek - source to Wind Lakes Creek	23.45	Miles
ID17060303CL018_02L	Hungry Lake	23.66	Acres
ID17060303CL019 02L	Wind Lakes	37.46	Acres
ID17060303CL019 03	Wind Lakes Creek - source to mouth	4.83	Miles

ID17060303CL023 02L	Walton Lakes	22.21	Acres
ID17060303CL025 02	White Sand Creek - source to Storm Creek	33.27	Miles
ID17060303CL025_02L	Garnet Lake, Parachute Lake	29.99	Acres
ID17060303CL025_03	White Sand Creek - source to Storm Creek	2.1	Miles
ID17060303CL025 0L	Garnet Lake	7.73	Acres
ID17060303CL026_02L	Colt Creek Lakes	26.93	Acres
ID17060303CL027_02L	Hoodoo Lake	8.22	Acres
ID17060303CL029_02	Big Sand Creek - source to Hidden Creek	22.61	Miles
ID17060303CL029 02L	Big Sand Lake	69.72	Acres
ID17060303CL030_01L	Tadpole Lake	12.27	Acres
ID17060303CL030_02	Hidden Creek - source to mouth	12.79	Miles
ID17060303CL030_02L	Hidden Lake (Hidden Creek to source)	117.8	Acres
ID17060303CL030 03	Hidden Creek - source to mouth	3.47	Miles
ID17060303CL031 02	Big Flat Creek - source to mouth	10.59	Miles
ID17060303CL032_01L	Storm Lake	13.38	Acres
ID17060303CL032 02L	Maud Lake	24.11	Acres
ID17060303CL032 03L	Dan, Dodge, Maud Lakes	17.57	Acres
ID17060303CL039_02	Hopeful Creek - source to mouth	12.35	Miles

17060305 South Fork Clearwater

ID17060305CL015 02	Gospel Creek - source to mouth	18.84	Miles
ID17060305CL015 02L	Moores and Middle Knob Lakes	63.11	Acres
ID17060305CL016 02	West Fork Gospel Creek - source to mouth	5.94	Miles
ID17060305CL016_02L	Gospel Lakes	10.47	Acres
ID17060305CL018 02	Johns Creek - source to Moores Creek	17.65	Miles
ID17060305CL018 03	Johns Creek - source to Moores Creek	3.6	Miles
ID17060305CL019_02	Moores Creek - source to mouth	8.76	Miles
ID17060305CL020_02	Square Mountain Creek - source to mouth	5.04	Miles
ID17060305CL021 02	Hagen Creek - source to mouth	11.26	Miles

17060307 Upper North Fork Clearwater

ID17060307CL024_02	Kelly Creek - confluence of North and Middle Fork Kelly Cree	42.22	Miles
ID17060307CL024 03	Kelly Creek - confluence of North and Middle Fork Kelly Cree	8.36	Miles

ID17060307CL024 04	Kelly Creek - confluence of North and Middle Fork Kelly Cree	3.16	Miles
ID17060307CL025 02	South Fork Kelly Creek - source to mouth	12.99	Miles
ID17060307CL026_02	Middle Fork Kelly Creek - source to mouth	15.36	Miles
ID17060307CL027_02	North Fork Kelly Creek - source to mouth	9.27	Miles
ID17060307CL048 02	Collins Creek - source to mouth	33.62	Miles

17060308 Lower North Fork Clearwater

ID17060308CL010_02	Isabella Creek - headwaters to Elmer/Jug Creek	3.14	Miles
ID17060308CL012_02L	Larkins Lakes	7.74	Acres
ID17060308CL013 02	Sawtooth Creek - source to mouth	25.89	Miles
ID17060308CL013 02L	Sawtooth Creek Lakes	33.51	Acres

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Panhandle

17010104 Lower Kootenai

ID17010104PN008 02L	Smith Lake	4.33	Acres
ID17010104PN011_02L	Myrtle Lake	19.74	Acres

17010214 Pend Oreille Lake

ID17010214PN041_01L	Beehive Lakes	16.28	Acres

17010304 St. Joe

ID17010304PN041_02g	Bean Creek 1st and 2nd order	13.72	Miles

Salmon

17060101 Hells Canyon

ID17060101SL004 02L	Unnamed lakes in Six Lake Basin	22.84	Acres
ID17060101SL006_02	Granite and Devils Farm Creeks - 1st and 2nd order	18.45	Miles
ID17060101SL006_02L	Emerald Lake	30.47	Acres
ID17060101SL007 02L	Little Granite Creek Lakes	77.85	Acres
ID17060101SL009_02	Sheep Creek - confluence of West and East Fork Sheep Creeks	11.77	Miles
ID17060101SL010_02	West Fork Sheep Creek - source to mouth	6.15	Miles
ID17060101SL010_02L	Sheep Creek Lakes	80.03	Acres
ID17060101SL011 02	East Fork Sheep Creek - source to mouth	5.24	Miles
ID17060101SL012 02	Clarks Fork - source to mouth	13.39	Miles

17060201 Upper Salmon

ID17060201SL031 02L	Elk Lake	4.1	Acres
ID17060201SL046 02L	Crimson Lake (Cabin Creek)	17.49	Acres
ID17060201SL058 01L	Hanson Lakes	27.12	Acres
ID17060201SL058_0L	McGown Lakes	9.11	Acres
ID17060201SL060_01L	Alpine Lake	21.48	Acres
ID17060201SL060_02L	Sawtooth Lake	169.91	Acres
ID17060201SL061_02L	Goat Lakes	50.17	Acres
ID17060201SL062_02L	Marshall Lake	4.15	Acres
ID17060201SL065 01L	Stephens Lakes	14.94	Acres
ID17060201SL065 02L	Unamed Lake to Fish Hook Creek Tributary	18.03	Acres
ID17060201SL066 02L	Bench Lakes	61.01	Acres
ID17060201SL067_01L	Saddleback Lakes (Upper and Lower)	24.1	Acres
ID17060201SL067 02	Redfish Lake Creek - source to Redfish Lake	14.41	Miles
ID17060201SL067 02L	Kathryn - Cramer-Alpine Lakes	101.75	Acres
ID17060201SL070_02L	Decker Creek Lakes	6.06	Acres
ID17060201SL074_02L	Hell Roaring Creek Lakes	188.32	Acres
ID17060201SL075 01L	Cabin Creek Lakes	17.14	Acres
ID17060201SL076 02L	Toxaway Lakes	142.63	Acres
ID17060201SL076_0L	Farley Lake	48.9	Acres
ID17060201SL077 03L	Twin Lakes	49.35	Acres

ID17060201SL077 0L	Alice Lakes	79.13	Acres
ID17060201SL080 02	Alpine Creek - source to mouth	9.73	Miles
ID17060201SL080_02L	Unnamed Lakes - Alpine Creek	106.67	Acres
ID17060201SL094_02L	Unnamed Lake - Trib to Warm Springs Creek	3.85	Acres
ID17060201SL097 02	Warm Springs Creek - source to Pigtail Creek	16.56	Miles
ID17060201SL098_02	Swimm Creek - source to mouth	3.54	Miles
ID17060201SL098_02L	Swimm Lake	17.6	Acres
ID17060201SL099_01L	Crater Lake	17.31	Acres
ID17060201SL099 02L	Ocalkens Lakes	15.84	Acres
ID17060201SL099_0L	Hoodoo Lake	4.94	Acres
ID17060201SL105_02L	Big Boulder Lakes	142.24	Acres
ID17060201SL105_0L	Island Lake and Upper Goat Lake	22.64	Acres
ID17060201SL106 02L	Quiet Lakes	58.14	Acres
ID17060201SL106 0L	Frog Lakes-Spring Basin	12.98	Acres
ID17060201SL108_02L	Chamberlain Basin Lakes	30.46	Acres
ID17060201SL109 02L	Deer Lakes	12.29	Acres
ID17060201SL112 02	South Fork East Fork Salmon River - source to mouth	24.85	Miles
ID17060201SL112_03	South Fork East Fork Salmon River - source to mouth	2.04	Miles
ID17060201SL113_02	Ibex Creek - source to mouth	3.79	Miles
ID17060201SL115_02	Bowery Creek - source to mouth	24.41	Miles
ID17060201SL119 02	East Pass Creek - source to mouth	38.64	Miles
ID17060201SL119_03	East Pass Creek - source to mouth	3.43	Miles
ID17060201SL120_02	Taylor Creek - source to mouth	7.95	Miles
ID17060201SL121 02	West Fork Herd Creek - source to mouth	20.42	Miles
ID17060201SL121 03	West Fork Herd Creek - source to mouth	3.93	Miles
ID17060201SL121 04	West Fork Herd Creek-East Fork Herd Creek to East Pass Creek	1.42	Miles
ID17060201SL122_02	East Fork Herd Creek - source to mouth	17.59	Miles
ID17060201SL122 03	East Fork Herd Creek - source to mouth	2.29	Miles

17060202 Pahsimeroi

ID17060202SL022_02L	East Fork Pahsimeroi River Lakes	11.49	Acres

Salmon

17060203 Middle Salmon-Panther

ID17060203SL001_02L	Dome Lake	17.29	Acres
ID17060203SL004_02L	Big Clear Creek Lakes	29.72	Acres
ID17060203SL006_02L	Cathedral and Golden Trout Lakes	25.84	Acres

17060205 Upper Middle Fork Salmon

ID17060205SL001_01L	Iris Lakes	6.27	Acres
ID17060205SL001_02L	Finger Lakes	7.51	Acres
ID17060205SL001_03	Cougar and Fall Creeks - 3rd order sections	5.5	Miles
ID17060205SL002_03	Marble and Little Cottonwood Creeks - 3rd order	4.16	Miles
ID17060205SL003_02	Trail Creek - 1st and 2nd order	28.29	Miles
ID17060205SL003_03	Trail and Poee Creeks - 3rd order	6.6	Miles
ID17060205SL004_02	Big Cottonwood Creek - entire drainage	9.08	Miles
ID17060205SL005_02	Dynamite Creek - 1st and 2nd order	19.43	Miles
ID17060205SL005_03	Dynamite Creek - 3rd order	2.26	Miles
ID17060205SL006_02	Indian Creek - 1st and 2nd order	91.66	Miles
ID17060205SL006_02L	Cultens Creek - unnamed headwater lake	7.1	Acres
ID17060205SL006_03	Indian Creek - 3rd order (Big Chief Creek to mouth)	14.41	Miles
ID17060205SL007_03	Pistol, Forty-five, and Little Pistol Creeks - 3rd order	21.35	Miles
ID17060205SL007_04	Pistol Creek - 4th order (Forty-five Creek to mouth)	4.87	Miles
ID17060205SL008_03	Elkhorn Creek - 3rd order (NF Elkhorn Creek to mouth)	1.48	Miles
ID17060205SL009_03	Sulphur and Honeymoon Creeks - 3rd order	1.81	Miles
ID17060205SL013_04a	Elk Creek - Wilderness Area	3.93	Miles
ID17060205SL016_02L	Upper Lost Lakes	4.49	Acres
ID17060205SL025_02L	Knapp Lakes	16.56	Acres
ID17060205SL028_01L	Mabie Lakes	12.8	Acres
ID17060205SL032_02L	Ruffneck Lakes	19.87	Acres
ID17060205SL033_01L	Soldier Lakes	5.1	Acres
ID17060205SL033_02	Soldier Creek - source to mouth	20.27	Miles
ID17060205SL033_02L	Cutthroat Lake	6.77	Acres
ID17060205SL033_03	Soldier Creek - source to mouth	5.42	Miles
ID17060205SL034_03	Greyhound Creek - source to mouth	1.97	Miles

ID17060205SL035 02	Rapid River - Bell Creek to mouth	14.04	Miles
ID17060205SL035 04	Rapid River - Bell Creek to mouth	5.71	Miles
ID17060205SL036_02	Bell Creek - source to mouth	5.07	Miles
ID17060205SL037_04	Rapid River - Lucinda Creek to Bell Creek	2.22	Miles
ID17060205SL039 01L	Josephus Lake	10.89	Acres
ID17060205SL041_02L	Vanity Lakes	11.73	Acres
ID17060205SL044_02	Sheep Creek-confluence of North and South Fork Sheep Creek	1.01	Miles
ID17060205SL044_03	Sheep Creek-confluence of North and South Fork Sheep Creek	2.02	Miles
ID17060205SL045 02	South Fork Sheep Creek - source to mouth	6.56	Miles
ID17060205SL046_02	North Fork Sheep Creek - source to mouth	4.36	Miles
ID17060205SL047_02	Little Loon Creek - source to mouth	53.55	Miles
ID17060205SL047_03	Little Loon Creek - source to mouth	7.03	Miles
ID17060205SL048 05	Loon Creek - Cabin Creek to mouth	11.19	Miles
ID17060205SL049 02	Loon Creek - Warm Springs Creek to Cabin Creek	18.07	Miles
ID17060205SL049_05	Loon Creek - Warm Springs Creek to Cabin Creek	3.42	Miles
ID17060205SL050 02	Loon Creek - Cottonwood Creek to Warm Springs Creek	4.51	Miles
ID17060205SL050 04	Loon Creek - Cottonwood Creek to Warm Springs Creek	2.61	Miles
ID17060205SL051_02	Loon Creek - Shell Creek to Cottonwood Creek	1.07	Miles
ID17060205SL051_04	Loon Creek - Shell Creek to Cottonwood Creek	1.68	Miles
ID17060205SL052_02	Shell Creek - source to mouth	4.43	Miles
ID17060205SL058 02	Trail Creek - source to mouth	15.27	Miles
ID17060205SL059_02	Loon Creek - source to Pioneer Creek	18.41	Miles
ID17060205SL059_02L	Horseshoe Lake (Loon Creek)	22.43	Acres
ID17060205SL059 03	Loon Creek - source to Pioneer Creek	2.63	Miles
ID17060205SL060 02L	Unnamed Lakes - Tango Creek	5.56	Acres
ID17060205SL060 03	Pioneer Creek - source to mouth	2.32	Miles
ID17060205SL063_02L	Mystery Lakes	26.04	Acres
ID17060205SL064 02	East Fork Mayfield Creek - source to mouth	31.49	Miles
ID17060205SL065_02	Cottonwood Creek - source to mouth	18.4	Miles
ID17060205SL065_03	Cottonwood Creek - source to mouth	1.82	Miles
ID17060205SL066_02	South Fork Cottonwood Creek - source to mouth	7.29	Miles
ID17060205SL068 02	Trapper Creek - source to mouth	28.45	Miles

Salmon

ID17060205SL068 03	Trapper Creek - source to mouth	1.49	Miles
ID17060205SL069 03	Warm Springs Creek - source to Trapper Creek	3.2	Miles
ID17060205SL070_02	Cabin Creek - source to mouth	18.01	Miles

17060206 Lower Middle Fork Salmon

ID17060206SL001 03	Norton and Stoddard Creeks - 3rd order	6.81	Miles
ID17060206SL002_02	Papoose Creek - 1st and 2nd order	28.94	Miles
ID17060206SL002_03	Papoose Creek - 3rd order	2.99	Miles
ID17060206SL003_02L	Jacobs Ladder and Belvidere Creeks - unnamed headwater lakes	10.32	Acres
ID17060206SL004 02	Cabin Creek - 1st and 2nd order	26.54	Miles
ID17060206SL004 03	Cabin Creek - 3rd order (Cow Creek to mouth)	1.28	Miles
ID17060206SL005_02	Cave Creek - 1st and 2nd order	14.99	Miles
ID17060206SL005 03	Cave Creek - 3rd order (West Fork Cave Creek to mouth)	2.9	Miles
ID17060206SL006 02	Crooked Creek - 1st and 2nd order	31.24	Miles
ID17060206SL006_03	Crooked Creek - 3rd order (West Fork Crooked Creek to mouth)	6.88	Miles
ID17060206SL007_02	Big Ramey Creek - 1st and 2nd order	33.95	Miles
ID17060206SL007_03	Big Ramey Creek - 3rd order (West Fork to mouth)	3.36	Miles
ID17060206SL008 02	Beaver Creek - 1st and 2nd order	35.54	Miles
ID17060206SL008_03	Beaver Creek - 3rd order (West Fork to Big Creek)	8.25	Miles
ID17060206SL011_02	Little Marble Creek - entire watershed	13.92	Miles
ID17060206SL012 03L	Roosevelt Lake	7.01	Acres
ID17060206SL012 04	Monumental Creek - 4th order (West Fork to mouth)	14.87	Miles
ID17060206SL013 02	Snowslide Creek - 1st and 2nd order	19.67	Miles
ID17060206SL013_02L	Beehive Creek - unnamed headwater lake	7.68	Acres
ID17060206SL013 03	Snowslide Creek - 3rd order (Beehive Creek to mouth)	3.01	Miles
ID17060206SL014 02	West Fork Monumental Creek - 1st and 2nd order	20.28	Miles
ID17060206SL014_03	West Fork Monumental Creek - 3rd order	6.49	Miles
ID17060206SL015_02	Rush Creek - 1st and 2nd order except Two Point Creek	81.22	Miles
ID17060206SL015 03	Rush and Corner Creeks - 3rd order	3.02	Miles
ID17060206SL016 02	Two Point Creek - entire drainage	4.91	Miles
ID17060206SL017_02	Soldier Creek - entire drainage	19.73	Miles
ID17060206SL019 02	Sheep Creek - 1st and 2nd order	25	Miles
ID17060206SL019 03	Sheep Creek - 3rd order	7.96	Miles

ID17060206SL020 02	Camas Creek - Yellowjacket Creek to mouth	16.56	Miles
ID17060206SL021 02	Camas Creek - Forge Creek to Yellowjacket Creek	25.12	Miles
ID17060206SL021_02L	Woodtick Lake	4.56	Acres
ID17060206SL024_01L	West Fork Lakes	14.33	Acres
ID17060206SL024 02L	Liberty Lakes	6.44	Acres
ID17060206SL029_02	South Fork Camas Creek - source to mouth	21.61	Miles
ID17060206SL029_03	South Fork Camas Creek - source to mouth	2.18	Miles
ID17060206SL030_03	Camas Creek - source to South Fork Camas Creek	3.77	Miles
ID17060206SL037 02	Yellowjacket Creek - Jenny Creek to mouth	6.56	Miles
ID17060206SL037_03	Yellowjacket Creek - Jenny Creek to mouth	4.32	Miles
ID17060206SL038_02L	Lake Creek	5.44	Acres
ID17060206SL045_02	Jenny Creek - source to mouth	2.01	Miles
ID17060206SL046 01L	Paragon Lakes	12.5	Acres
ID17060206SL046 02	Wilson Creek - source to mouth	29.62	Miles
ID17060206SL046_02L	Sky High Lakes	28.99	Acres
ID17060206SL046 03	Wilson Creek - source to mouth	11.23	Miles
ID17060206SL046 0L	Wilson Creek Lakes	22.04	Acres
ID17060206SL047_02	Waterfall Creek - source to mouth	22.85	Miles
ID17060206SL047_02L	Terrace Lakes	7.95	Acres
ID17060206SL047_03	Waterfall Creek - source to mouth	1.3	Miles
ID17060206SL048 01L	Airplane, Shoban and Sheepeater Lakes	23.72	Acres
ID17060206SL048_02	Ship Island Creek - source to mouth	8.82	Miles
ID17060206SL048_02L	Ship Island Lake	85.63	Acres
ID17060206SL049 02	Roaring Creek - source to mouth	8.75	Miles
ID17060206SL049 02L	Roaring Creek Lakes	11.22	Acres
ID17060206SL049 03	Roaring Creek - source to mouth	4.35	Miles
ID17060206SL050_02	Goat Creek - source to mouth	9.23	Miles

17060207 Middle Salmon-Chamberlain

ID17060207SL009 02	Fivemile Creek - source to mouth	27.61	Miles
ID17060207SL011_02	Lemhi Creek - source to mouth	16.04	Miles
ID17060207SL012 02	Fall Creek - source to mouth	2.62	Miles
ID17060207SL013 02	Trout Creek - source to mouth	13.03	Miles

Salmon

ID17060207SL014 02	Richardson Creek - source to mouth	14.5	Miles
ID17060207SL014 03	Richardson Creek - source to mouth	3.93	Miles
ID17060207SL015_02	Dillinger Creek - source to mouth	14.69	Miles
ID17060207SL016_02	Hot Springs Creek - source to mouth	9.62	Miles
ID17060207SL017 02	Big Bear Creek - source to mouth	12.54	Miles
ID17060207SL018_02	Salmon River - Horse Creek to Chamberlain Creek	43.65	Miles
ID17060207SL018_07	Salmon River - Horse Creek to Chamberlain Creek	11.89	Miles
ID17060207SL019_02	Chamberlain Creek - McCalla Creek to mouth	4.27	Miles
ID17060207SL019 05	Chamberlain Creek - McCalla Creek to mouth	4.18	Miles
ID17060207SL020_02	Chamberlain Creek - Game Creek to McCalla Creek	35.22	Miles
ID17060207SL020_04	Chamberlain Creek - Game Creek to McCalla Creek	11.94	Miles
ID17060207SL021_02	Queen Creek - source to mouth	8.93	Miles
ID17060207SL022 02	Game Creek - source to mouth	11.06	Miles
ID17060207SL023 02	West Fork Game Creek - source to mouth	11.84	Miles
ID17060207SL024_03	Chamberlain Creek - confluence of Rim and South Fork Chamber	5.55	Miles
ID17060207SL025 02	Flossie Creek - source to mouth	7.75	Miles
ID17060207SL026 02	Rim Creek - source to mouth	5.25	Miles
ID17060207SL027_02	South Fork Chamberlain Creek - source to mouth	5.75	Miles
ID17060207SL028_02	Moose Creek - source to mouth	12.68	Miles
ID17060207SL028_03	Moose Creek - source to mouth	1.86	Miles
ID17060207SL029 02	Lodgepole Creek - source to mouth	19.39	Miles
ID17060207SL029_03	Lodgepole Creek - source to mouth	3.56	Miles
ID17060207SL030_02	McCalla Creek - source to mouth	35.91	Miles
ID17060207SL030 03	McCalla Creek - source to mouth	8.79	Miles
ID17060207SL030 04	McCalla Creek - source to mouth	2.79	Miles
ID17060207SL032 02	Disappointment Creek - source to mouth	11.47	Miles
ID17060207SL032_03	Disappointment Creek - source to mouth	4.17	Miles
ID17060207SL033 02	Starvation Creek - source to mouth	7.25	Miles
ID17060207SL034_02	Hungry Creek - source to mouth	3.83	Miles
ID17060207SL035_02	Cottonwood Creek - source to mouth	44.1	Miles
ID17060207SL035_03	Cottonwood Creek - source to mouth	11.91	Miles
ID17060207SL036 02	Peak Creek - source to mouth	9.17	Miles

ID17060207SL038 02	Butts Creek - source to mouth	8.88	Miles
ID17060207SL039 02	Kitchen Creek - source to mouth	21.29	Miles
ID17060207SL041_02	Horse Creek - Little Horse Creek to mouth	19.97	Miles
ID17060207SL041_04	Horse Creek - Little Horse Creek to mouth	9.3	Miles
ID17060207SL045 03	East Fork Reynolds Creek - source to mouth	1.48	Miles
ID17060207SL046_02	Reynolds Creek - source to mouth	4.49	Miles
ID17060207SL047_02	West Horse Creek - source to mouth	19.1	Miles
ID17060207SL048_02	Little Squaw Creek - source to mouth	6.92	Miles
ID17060207SL049 02	Harrington Creek - source to mouth	16.86	Miles
ID17060207SL049_03	Harrington Creek - source to mouth	2.21	Miles
ID17060207SL050_02	Sabe Creek - Hamilton Creek to mouth	18.3	Miles
ID17060207SL050_04	Sabe Creek - Hamilton Creek to mouth	6.05	Miles
ID17060207SL051 03	Hamilton Creek - source to mouth	7.18	Miles
ID17060207SL052 03	Sabe Creek - source to Hamilton Creek	5.17	Miles
ID17060207SL053_02	Center Creek - source to mouth	3.8	Miles
ID17060207SL054 02	Rattlesnake Creek - source to mouth	13.5	Miles
ID17060207SL057 02	Prospector Creek - source to mouth	3.78	Miles
ID17060207SL058_02	Cache Creek - source to mouth	9.73	Miles
ID17060207SL059_02	Salt Creek - source to mouth	8.18	Miles
ID17060207SL060_02	Rainey Creek - source to mouth	6.85	Miles
ID17060207SL067 02	Crooked Creek - Lake Creek to mouth	22.11	Miles
ID17060207SL068_04	Crooked Creek - Big Creek to Lake Creek	1.55	Miles
ID17060207SL070_03	Lake Creek - source to mouth	3.43	Miles
ID17060207SL070 04	Lake Creek - source to mouth	5.9	Miles
ID17060207SL071 02	Arlington Creek - source to mouth	3.69	Miles
ID17060207SL072 02	Bull Creek - 1st and 2nd order tribs	12.69	Miles
ID17060207SL074_03	Sheep Creek - source to mouth	8.43	Miles
ID17060207SL075 02	Long Meadow Creek - source to mouth	8.76	Miles
ID17060207SL076_03	Wind River - source to mouth	6.69	Miles

17060208 South Fork Salmon

ID17060208SL035 02	Porphyry Creek - 1st and 2nd order	34.17	Miles
ID17060208SL035 03	Porphyry and Wolf Fang Creeks - 3rd order	4.09	Miles

Salmon

17060209 Lower Salmon

ID17060209SL041 02a	Slate Creek	9.41	Miles
ID17060209SL041_02L	Slate Lakes	9.73	Acres

17060210 Little Salmon

ID17060210SL002_01L	Satan Lake	4.96	Acres
ID17060210SL002 02L	Twin Lakes	6.37	Acres
ID17060210SL003_02L	Hanson, Lower Cannon, Dog, Slide Rock and Horse Heaven Lakes	41.84	Acres
ID17060210SL003_0L	Mirror Lake	8.11	Acres

Southwest

17050102 Bruneau

ID17050102SW027 03	Sheepshead Draw - 3rd order	2.63	Miles

17050105 South Fork Owyhee

ID17050105SW001_03	Unnamed 3rd order tributary to SF Owyhee River	1.25	Miles

17050106 East Little Owyhee

ID17050106SW001 03	Unnamed third order tributary to Little Owyhee River	2.21	Miles

17050107 Middle Owyhee

ID17050107SW001_03	Dukes Creek - 3rd order	1.21	Miles
ID17050107SW001 07	Owyhee River - South Fork Owyhee River to ID/OR border	9.03	Miles

17050111 North and Middle Forks Boise

ID17050111SW001_01L	Spangle Lakes	56.9	Acres
ID17050111SW001_02L	Leggit Lake	18.91	Acres
ID17050111SW001_03L	Lynx Creek Lakes	8.94	Acres
ID17050111SW001 0L	Little Spangle Lake and Flytrip Creek headwater lakes	43.74	Acres
ID17050111SW001_LL	Suprise Lakes	6.71	Acres
ID17050111SW006_01L	Queens River - unnamed headwater lake	7.4	Acres
ID17050111SW007 01L	Scenic Lake	15.06	Acres
ID17050111SW007 02L	Browns Lake	22.73	Acres
ID17050111SW010 02L	McKay Creek Lake	2.03	Acres
ID17050111SW011_01L	Alidade Lake	6.05	Acres
ID17050111SW011 02L	Johnson, Pats, Azure, Rock Island and Arrowhead Lakes	45.56	Acres
ID17050111SW012 02L	Jennie Lake	4.77	Acres

17050120 South Fork Payette

ID17050120SW005_00L	Benedict, Everly and Three Island Lakes	39.92	Acres
ID17050120SW005 02L	Edna, Vernon, and Virginia Lakes	124.58	Acres
ID17050120SW005 03	SF Payette River - 3rd order (Benedict Creek to Baron Creek)	13.23	Miles
ID17050120SW005 03L	Elk Lake	21.21	Acres
ID17050120SW005 04L	Trail Creek Lakes	14.39	Acres
ID17050120SW005 0L	Ardeth Lake	79.6	Acres
ID17050120SW005 LL	Pinchot Creek unnamed headwater lakes	24.36	Acres

Southwest

ID17050120SW006 02	Goat Creek - entire drainage	12.96	Miles
ID17050120SW006 02L	Blue Rock, Packrat, and Oreamnos Lakes	36.45	Acres
ID17050120SW007_01L	North Fork Baron Creek - unnamed headwater lakes	26.62	Acres
ID17050120SW007_02	Baron and NF Baron Creeks - 1st and 2nd order	19.12	Miles
ID17050120SW007 02L	Baron Lakes	50.96	Acres
ID17050120SW007_03	Baron Creek - 3rd order (North Fork Baron Creek to mouth)	2.64	Miles
ID17050120SW010_01L	Cat Lakes	7.08	Acres
ID17050120SW011_02L	Red Mountain Lakes	6.12	Acres
ID17050120SW013 02L	Unnamed lakes on south side of Red Mountain	13.15	Acres

17050123 North Fork Payette

ID17050123SW020_02L	Twentymile Lakes	16.22	Acres

Upper Snake

17040104 Palisades

ID17040104SK021 02	Fish Creek - source to mouth	16.84	Miles

17040217 Little Lost

ID17040217SK021_02L	Shadow Lakes	9.24	Acres
ID17040217SK024_02L	Unnamed Lake - Big Creek	3.34	Acres

17040218 Big Lost

ID17040218SK027_02L	North Fork Lakes	9.89	Acres
ID17040218SK032_02L	Moose Lake	12.43	Acres
ID17040218SK036 02L	Broad Canyon Lakes	41.18	Acres

17040221 Little Wood

ID17040221SK020 02L	Windy Lakes	28.74	Acres

Category 2: Waters are fully supporting those beneficial uses that have been assessed. The use attainment of the remaining beneficial uses has not been determined due to insufficient (or no) data and information.

2018/2020 Integrated Report - Category 2

Bear River

16010102 Central Bear

ID16010102BR007 02	Salt Creek - source to Idaho/Wyoming border	3.56	Miles

16010201 Bear Lake

ID16010201BR004_03	Eightmile Creek - 1 mile below FS boundary to mouth	4.82	Miles
ID16010201BR005_02b	Pearl Creek - upper	6.34	Miles
ID16010201BR006 02a	Beaver Creek	3.75	Miles
ID16010201BR006 02b	Fern Creek	2.14	Miles
ID16010201BR006_02c	N and S Stauffer Cr and Stauffer Cr to Beaver Cr	7.33	Miles
ID16010201BR007_02a	Skinner Creek - above USFS boundary includes N and S Forks	6.59	Miles
ID16010201BR008 02a	upper Co-Op Creek	5.47	Miles
ID16010201BR010 02c	Meadow Creek	3.14	Miles
ID16010201BR010_02d	upper North Creek - HW to Snyder Cr confluence	17.08	Miles
ID16010201BR010 03	North Creek - Emigration Creek to Liberty Creek	6.1	Miles
ID16010201BR011 02a	Mill Creek - HW to Liberty Creek	6.03	Miles
ID16010201BR014 02a	Bloomington Creek - North, South and Middle Forks	17.22	Miles
ID16010201BR019_02a	Fish Haven Creek	13.31	Miles
ID16010201BR020_02c	Telephone Draw	2.76	Miles
ID16010201BR022 02a	Right Hand Fork Georgetown Creek	5.43	Miles
ID16010201BR022_03	Georgetown Creek - source to mouth	3.62	Miles

16010202 Middle Bear

ID16010202BR003 02a	Maple Creek - Left Fk Maple Creek to Cub River	8.33	Miles
ID16010202BR003 02c	Sugar Creek	6.75	Miles
ID16010202BR004 02	Cub River - source to Sugar Creek	38.68	Miles
ID16010202BR004_02a	Foster Creek	5.54	Miles
ID16010202BR004 03	Cub River - 2 order source to Sugar Creek	7.36	Miles
ID16010202BR005 02a	Worm Creek (upper)	11.26	Miles

Bear River

ID16010202BR007 02	Mink and Strawberry Creek - 2nd order tributaries	41.36	Miles
ID16010202BR007 02b	Mink Creek	1.76	Miles
ID16010202BR014_02a	Divide Creek	4.33	Miles
ID16010202BR014_02b	Cottonwood Creek Tributaries - source to Shingle Creek	27	Miles
ID16010202BR014 02d	Jacobson Creek	7.61	Miles
ID16010202BR014_03	Cottonwood Creek - source to Oneida Narrows Reservoir	5.84	Miles
ID16010202BR017_02a	Oxford Creek	3.51	Miles
ID16010202BR018_02a	Gooseberry Creek	14.45	Miles
ID16010202BR018 03a	Stockton Creek	6.07	Miles
ID16010202BR020_02b	Dry Canyon	14.17	Miles

16010203 Little Bear-Logan

ID16010203BR001 02	Beaver Creek - source to Idaho/Utah border	13.91	Miles
ID16010203BR002 02b	Hodge Nibley Creek	2.92	Miles
ID16010203BR002_02c	Boss Canyon	3.16	Miles
ID16010203BR002_03	Logan River - source to Idaho/Utah border	1.2	Miles

16010204 Lower Bear-Malad

ID16010204BR001_02a	Two Mile Canyon	7.31	Miles
ID16010204BR002_02b	New Canyon Creek	12.94	Miles
ID16010204BR002_02d	Devil Creek	26.42	Miles
ID16010204BR006 02b	Second Creek	5.2	Miles
ID16010204BR010 02a	Indian Mill Creek	4.58	Miles

Clearwater

17060108 Palouse

ID17060108CL004a 02	Gnat Creek - source to T40N, R05W, Sec. 26	5.82	Miles
ID17060108CL004b_02	Gnat Creek - T40N, R05W, Sec. 26 to mouth	1.87	Miles
ID17060108CL006a_02	Missouri Flat Creek - source to T40N, R5W, Sec. 17	1.26	Miles
ID17060108CL006b 02	Missouri Flat Creek - T40N, R5W, Sec. 17 to ID/WA border	7.42	Miles
ID17060108CL007a_02	Fourmile Creek - source to T40N, R5W, Sec. 5	2.64	Miles
ID17060108CL007b_02	Fourmile Creek - T40N, R5W, Sec. 5 to ID/WA border	11.45	Miles
ID17060108CL008a_02	Silver Creek - source to T43, R5W, Sec. 29	0.81	Miles
ID17060108CL009 02	Palouse River - Deep Creek to ID/WA border; tribs	29.58	Miles
ID17060108CL009 04	Palouse River - Deep Creek to Idaho/Washington border	9.14	Miles
ID17060108CL016_02	Palouse River - Strychnine Creek to Hatter Creek	43.79	Miles
ID17060108CL016 04	Palouse River - Strychnine Creek to Hatter Creek	16.52	Miles
ID17060108CL017 02	Flat Creek - source to mouth	21.54	Miles
ID17060108CL018_02	Palouse River - source to Strychnine Creek	26.24	Miles
ID17060108CL018_03	Palouse River - source to Strychnine Creek	4.52	Miles
ID17060108CL019_02	Little Sand Creek - source to mouth	10.52	Miles
ID17060108CL019 03	Little Sand Creek - source to mouth	2.21	Miles
ID17060108CL022_02	Strychnine Creek - source to mouth	12.56	Miles
ID17060108CL022_03	Strychnine Creek - source to mouth	2.04	Miles
ID17060108CL023 03	Meadow Creek - East Fork Meadow Creek to mouth	2.76	Miles
ID17060108CL024 02	East Fork Meadow Creek - source to mouth	19.84	Miles
ID17060108CL025 02	Meadow Creek - source to East Fork Meadow Creek	16.21	Miles
ID17060108CL026_02	White Pine Creek - source to mouth	3.86	Miles
ID17060108CL028 02	Jerome Creek - source to mouth	6.55	Miles
ID17060108CL033a 02	Cedar Creek - source to T43N, R05W, Sec. 28	0.22	Miles

17060301 Upper Selway

ID17060301CL008_03	Running Creek - Lynx Creek to mouth	10.49	Miles

17060302 Lower Selway

ID17060302CL001 02	Selway River - O'Hara Creek to mouth	21.84	Miles
ID17060302CL002 02	Goddard Creek - source to mouth	16.53	Miles
ID17060302CL003_02	O'Hara Creek - confluence of West and East Fork O'Hara Creek	43.52	Miles

ID17060302CL003 03	O'Hara Creek - confluence of West and East Fork O'Hara Creek	6.36	Miles
ID17060302CL003 04	O'Hara Creek - confluence of Hamby Fork to mouth	4.42	Miles
ID17060302CL004_02	West Fork O'Hara Creek - source to mouth	11.14	Miles
ID17060302CL006_02	Twentythree, Nineteen Mile Creeks and tribs.	27.14	Miles
ID17060302CL006 02a	Island Creek - source to mouth	6.5	Miles
ID17060302CL006_02b	Slide Creek - source to mouth	4.16	Miles
ID17060302CL007_03	Falls Creek - source to mouth	4.35	Miles
ID17060302CL008_02	Meadow Creek - Buck Lake Creek to mouth	29.66	Miles
ID17060302CL008 04	Meadow Creek - Buck Lake Creek to mouth	10.31	Miles
ID17060302CL012_04	Meadow Creek - East Fork Meadow Creek to Buck Lake Creek	11.62	Miles
ID17060302CL013_02	Butte Creek - source to mouth	9.98	Miles
ID17060302CL014_03	Sable Creek - source to mouth	3.55	Miles
ID17060302CL015 02	Simmons Creek - source to mouth	10.91	Miles
ID17060302CL016 02	Meadow Creek - source to East Fork Meadow Creek	41.23	Miles
ID17060302CL022_02	Selway River - Moose Creek to Meadow Creek	98.23	Miles
ID17060302CL050 04	Gedney Creek - West Fork Gedney Creek to mouth	3.48	Miles
ID17060302CL053 02	Glover Creek - source to mouth	11.69	Miles
ID17060302CL054_02	Boyd Creek - source to mouth	8.83	Miles
ID17060302CL055_02	Rackliff Creek - source to mouth	9.4	Miles

17060303 Lochsa

ID17060303CL003 02	Lochsa River - Old Man Creek to Deadman Creek	10.84	Miles
ID17060303CL004 03	Coolwater Creek - source to mouth	2.4	Miles
ID17060303CL005_02	Fire Creek - source to mouth	21.85	Miles
ID17060303CL006 03	Split Creek - source to mouth	1.08	Miles
ID17060303CL008 02	Lochsa River - Fish Creek to Old Man Creek	23.59	Miles
ID17060303CL009_02	Holly Creek - and tributaries	65.99	Miles
ID17060303CL010_02	Boulder Creek - source to mouth	41.18	Miles
ID17060303CL010 04	Boulder Creek - source to mouth	4	Miles
ID17060303CL011 02	Stanley Creek - source to mouth	14.69	Miles
ID17060303CL012_02	Eagle Mountain Creek - source to mouth	7.11	Miles
ID17060303CL017 03	Warm Springs Creek - Wind Lakes Creek to mouth	6.15	Miles
ID17060303CL020 02	Robin Creek - and tributaries	13.56	Miles

Clearwater

ID17060303CL020 02a	Un-named Tributaries	4.45	Miles
ID17060303CL023 02	Walton Creek - source to mouth	12.57	Miles
ID17060303CL026_02	Colt Creek - source to mouth	23.61	Miles
ID17060303CL027_02	Hoodoo, Muleshoe, Bridge Creeks	20.59	Miles
ID17060303CL027 03	Big Sand Creek - Hidden Creek to mouth	7.77	Miles
ID17060303CL028_02	Swamp Creek - source to mouth	13.9	Miles
ID17060303CL032_03	Storm Creek - source to mouth	4.81	Miles
ID17060303CL033_02	Beaver Creek - source to mouth	13.07	Miles
ID17060303CL035 02	Pack Creek and tributaries	30.68	Miles
ID17060303CL035_03	Brushy Fork - Spruce Creek to mouth	5.75	Miles
ID17060303CL036_02	Spruce Creek - source to mouth	19.11	Miles
ID17060303CL037_02	Brushy Fork - source to Spruce Creek	12.5	Miles
ID17060303CL038 02	Haskell Creek - and tributaries	29.96	Miles
ID17060303CL038 03	Crooked Fork - source to Brushy Fork	4.97	Miles
ID17060303CL039_03	Hopeful Creek - source to mouth	2.18	Miles
ID17060303CL040 02	Fox Creek - source to mouth, and tributaries	22.64	Miles
ID17060303CL040 03	Boulder Creek - source to mouth	3.31	Miles
ID17060303CL041_02	Papoose Creek - source to mouth	17.73	Miles
ID17060303CL041_03	Papoose Creek - source to mouth	1.89	Miles
ID17060303CL042_02	Parachute Creek - source to mouth	5.46	Miles
ID17060303CL043 02	Wendover Creek - source to mouth	5.67	Miles
ID17060303CL044_02	Badger Creek - source to mouth	5.18	Miles
ID17060303CL045_02	Waw'aalamnime Creek	6.95	Miles
ID17060303CL045 03	Waw’aalamnime Creek - source to mouth	3.66	Miles
ID17060303CL047 02	Doe Creek - source to mouth	8.99	Miles
ID17060303CL048 02	Post Office Creek - source to mouth	20.07	Miles
ID17060303CL048_03	Post Office Creek - 3rd order segment	0.69	Miles
ID17060303CL049 03	Weir Creek - 3rd order segment	1.86	Miles
ID17060303CL050_02	Indian Grave Creek - source to mouth	15.42	Miles
ID17060303CL051_03	Bald Mountain Creek - source to mouth	3.14	Miles
ID17060303CL052_02	Fish Creek - Hungery Creek to mouth	7.89	Miles
ID17060303CL052 04	Fish Creek - Hungery Creek to mouth	4.67	Miles

ID17060303CL053 03	Willow Creek - source to mouth	1.07	Miles
ID17060303CL056 02	Hungery Creek - source to Obia Creek	8.66	Miles
ID17060303CL057_02	Fish Creek - headwaters and tributaries	48.4	Miles
ID17060303CL057_03	Fish Creek - source to Hungery Creek	8.41	Miles
ID17060303CL058 02	Bimerick Creek - source to mouth	15.42	Miles
ID17060303CL059_03	Deadman Creek - East Fork Deadman Creek to mouth	2.18	Miles
ID17060303CL060_03	East Fork Deadman Creek - source to mouth	0.64	Miles
ID17060303CL062_02	Canyon Creek - source to mouth	26.45	Miles
ID17060303CL065 02	Pete King Creek - source to Walde Creek	11.91	Miles

17060304 Middle Fork Clearwater

ID17060304CL001_02	Middle Fork Clearwater River - confluence of Lochsa	81.97	Miles
ID17060304CL001 03	Middle Fork Clearwater River - confluence of Lochsa	0.96	Miles
ID17060304CL002 02	Clear Creek - South Fork Clear Creek to mouth	33.69	Miles
ID17060304CL002_04	Clear Creek - South Fork Clear Creek to mouth	7.75	Miles
ID17060304CL003_02	West Fork Clear Creek - source to mouth	13.56	Miles
ID17060304CL004_02	South Fork Clear Creek - source to mouth	25.73	Miles
ID17060304CL006 02	Clear Creek - source to South Fork Clear Creek	8.79	Miles
ID17060304CL006_04	Clear Creek - source to South Fork Clear Creek	2.11	Miles
ID17060304CL007_02	Middle Fork Clear Creek - source to mouth	11.41	Miles
ID17060304CL008 02	Browns Spring Creek - source to mouth	7.55	Miles
ID17060304CL009 02	Pine Knob Creek - source to mouth	5.33	Miles
ID17060304CL010 02	Lodge Creek - source to mouth	5.4	Miles
ID17060304CL011_02	Maggie Creek - source to mouth	25.13	Miles

17060305 South Fork Clearwater

ID17060305CL052L 00	Lucas Lake	0.92	Acres

17060306 Clearwater

ID17060306CL001_07	Lower Granite Dam pool	5.16	Miles
ID17060306CL002_07	Clearwater River - Potlatch River to Lower Granite Dam Pool	3.75	Miles
ID17060306CL022 02	Clearwater River - confluence of South and Middle Fork Clear	23.1	Miles
ID17060306CL026 02	Lolo Creek - Yakus Creek to mouth	62.97	Miles
ID17060306CL026_04	Lolo Creek - Yakus Creek to mouth	19.28	Miles

Clearwater

ID17060306CL027 02	Yakus Creek - source to mouth	20.65	Miles
ID17060306CL028 02	Lolo Creek - source to Yakus Creek	37.71	Miles
ID17060306CL028_03	Lolo Creek - source to Yakus Creek	5.08	Miles
ID17060306CL028_04	Lolo Creek - source to Yakus Creek	14.04	Miles
ID17060306CL030 02	Yoosa Creek - source to mouth	26.68	Miles
ID17060306CL030_03	Yoosa Creek - source to mouth	2.78	Miles
ID17060306CL034_02	Jim Ford Creek	12.08	Miles
ID17060306CL039_02	Shanghai Creek and tributaries	153.56	Miles
ID17060306CL040 02	Whiskey Creek - source to mouth	16.83	Miles
ID17060306CL040_03	Whiskey Creek - source to mouth	9.55	Miles
ID17060306CL045_02	Potlatch River - Corral Creek to Big Bear Creek	30.51	Miles
ID17060306CL046_02	Cedar Creek - headwaters	48.61	Miles
ID17060306CL047 02	Boulder Creek - headwaters	18.65	Miles
ID17060306CL050 02	Little Boulder Creek - source to mouth	6.63	Miles
ID17060306CL051_02	East Fork Potlatch River - source to mouth	51.56	Miles
ID17060306CL051 03	East Fork Potlatch River - Mallory Creek to Ruby Creek	11.06	Miles
ID17060306CL052 02	Ruby Creek - headwaters	17.2	Miles
ID17060306CL057_02	East Fork Big Bear Creek - source to mouth	46.69	Miles
ID17060306CL058_02	West Fork Big Bear Creek - source to mouth	15.44	Miles
ID17060306CL059_03	Dry Creek - source to mouth	2.75	Miles
ID17060306CL060 02	Little Bear Creek - source to mouth	37.44	Miles
ID17060306CL060_03	Little Bear Creek - 3rd order main stem	9.79	Miles
ID17060306CL060_04	Little Bear Creek - 4th order main stem	4.67	Miles
ID17060306CL064 03	Little Potlatch Creek - source to mouth	8.92	Miles

17060307 Upper North Fork Clearwater

ID17060307CL001_02	North Fork Clearwater River-Skull Ck. to Aquarius Campground	13.74	Miles
ID17060307CL001_02b	Sheep Creek	6.89	Miles
ID17060307CL002 02	Deadhorse, Dead Mule Creeks and tribs	29.24	Miles
ID17060307CL002 02a	Flat Creek	9.72	Miles
ID17060307CL003_02	Moose, Lodge, Rettig, Tepee Creeks	42.62	Miles
ID17060307CL003 02a	Tumble Creek - source to mouth	4.6	Miles
ID17060307CL003 03	Washington Creek - source to mouth	8.87	Miles

Clearwater

ID17060307CL004 02	Siwash, Cave Creeks and tribs	21.59	Miles
ID17060307CL007 02	French Creek - source to Sylvan Creek	12.71	Miles
ID17060307CL007_02b	Hem Creek - source to mouth	9.98	Miles
ID17060307CL007_03	French Creek - Sylvan Creek to mouth	2.12	Miles
ID17060307CL008 02	North Fork Clearwater River - Weitas Creek to Orogrande Cr.	17.13	Miles
ID17060307CL009_02	Weitas Creek - Hemlock Creek to mouth	29.85	Miles
ID17060307CL009_03	Weitas Creek - Hemlock Creek to mouth	2.04	Miles
ID17060307CL010_02	Hemlock Creek - source to mouth	39.51	Miles
ID17060307CL011 02	Weitas Creek - Windy Creek to Hemlock Creek	38.31	Miles
ID17060307CL011_04	Weitas Creek - Windy Creek to Hemlock Creek	10.31	Miles
ID17060307CL016_02	North Fork Clearwater River - Kelly Creek to Weitas Creek	28.55	Miles
ID17060307CL017_03	Fourth of July Creek - source to mouth	9.96	Miles
ID17060307CL018 02	Kelly Creek - Cayuse Creek to mouth	36.14	Miles
ID17060307CL018 03	Kelly Creek - Cayuse Creek to mouth	1.05	Miles
ID17060307CL020_02	Lookout, Monroe Creek - source to mouth	22.47	Miles
ID17060307CL022 03	Cayuse Creek - source to Gravey Creek	15.31	Miles
ID17060307CL023 02	Toboggan Creek - source to mouth	26.96	Miles
ID17060307CL028_02	Moose Creek - Osier Creek to mouth	3.05	Miles
ID17060307CL029_02	Little Moose Creek - source to mouth	21.22	Miles
ID17060307CL031_02	Moose Creek - source to Osier Creek	21.72	Miles
ID17060307CL032 02	North Fork Clearwater River - Lake Creek to Kelly Creek	8.2	Miles
ID17060307CL032_02b	Pete Ott, Hidden, Fix, Stolen Creeks	22.4	Miles
ID17060307CL033_02	Lake Creek - source to mouth	31.36	Miles
ID17060307CL034 02	North Fork Clearwater River - Vanderbilt Gulch to Lake Creek	8.44	Miles
ID17060307CL035 02	Long Creek - source to mouth	24.5	Miles
ID17060307CL039 02	Elizabeth Creek - source to mouth	8.85	Miles
ID17060307CL041_02	Sprague Creek - source to mouth	1.92	Miles
ID17060307CL042 02	Larson Creek - source to mouth	9.01	Miles
ID17060307CL043_02	Rock Creek - source to mouth	15.88	Miles
ID17060307CL044_02	Quartz Creek - source to mouth	5.7	Miles
ID17060307CL044_02b	Upper Quartz Creek and Tributaries	26.85	Miles
ID17060307CL044 03	Quartz Creek - Wolf Creek to mouth	6.22	Miles

Clearwater

ID17060307CL046 02	Skull Creek - Collins Creek to mouth	5.66	Miles
ID17060307CL046 04	Skull Creek - Collins Creek to mouth	3.91	Miles
ID17060307CL047_02	Snow Creek and tribs	41.59	Miles
ID17060307CL047_04	Skull Creek - source to Collins Creek	5.06	Miles
ID17060307CL048 03	Collins Creek - 3rd order	5.83	Miles

17060308 Lower North Fork Clearwater

ID17060308CL006_02	Silver Creek - source to Dworshak Reservoir	31.53	Miles
ID17060308CL006_03	Silver Creek - source to Dworshak Reservoir	3.65	Miles
ID17060308CL007 02	Benton Creek - source to Dworshak Reservoir	16.61	Miles
ID17060308CL008 02	Marquette Creek - source to mouth	1.91	Miles
ID17060308CL009_02a	South Fork Beaver Creek - source to mouth	8.23	Miles
ID17060308CL009 02b	Bertha Creek - source to mouth	2.72	Miles
ID17060308CL009 02d	Sourdough Creek	5.68	Miles
ID17060308CL010_02a	Dog Creek - source to mouth	3.87	Miles
ID17060308CL010_02b	Goat Creek - and tributaries	15.13	Miles
ID17060308CL010_02c	Fern Creek - and tributaries	8.44	Miles
ID17060308CL017 02	Little North Fork Clearwater River -source to Rutledge Creek	11.42	Miles
ID17060308CL018_03	Little North Fork Clearwater River - source to Rutledge Cr.	5.17	Miles
ID17060308CL022_03	Glover Creek -source to mouth	2.59	Miles
ID17060308CL024 02	Isabella Creek - source to mouth	14.2	Miles
ID17060308CL026 02	Gold Creek - source to Dworshak Reservoir	22.5	Miles
ID17060308CL026 03	Gold Creek - source to Dworshak Reservoir	5.05	Miles
ID17060308CL027_02	Weitas Creek - source to Dworshak Reservoir	9.77	Miles
ID17060308CL030 02	Elk Creek tributaries inc. Morris, Deer, Pete Cr	20.16	Miles
ID17060308CL030 02a	West Fork Elk Creek - source to Elk Creek	3.5	Miles
ID17060308CL030_02b	Elk Creek - headwaters	16.5	Miles
ID17060308CL030_02c	Johnson Creek - source to mouth	3.27	Miles
ID17060308CL030 03	Elk Creek - source to Elk Creek Reservoir	7.58	Miles
ID17060308CL030 03L	Elk Creek Reservoir	75.67	Acres
ID17060308CL035_02	Dicks Creek - source to Dworshak Reservoir	16.85	Miles

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Panhandle

17010101 Middle Kootenai

ID17010101PN001 02	Star Creek - source to Idaho/Montana border	13.99	Miles
ID17010101PN002_02	North Callahan Creek - source to Idaho/Montana border	28.36	Miles
ID17010101PN002_03	North Callahan Creek - source to Idaho/Montana border	6	Miles
ID17010101PN003 03	South Callahan Creek - Glad Creek to Idaho/Montana border	2.09	Miles
ID17010101PN004_02	South Callahan Creek - source to Glad Creek	6.44	Miles
ID17010101PN005_02	Glad Creek - source to mouth	7.61	Miles
ID17010101PN005_03	Glad Creek - source to mouth	0.54	Miles
ID17010101PN006 02	Keeler Creek - source to Idaho/Montana border	2.18	Miles

17010104 Lower Kootenai

ID17010104PN005 02	Tribs to Smith Creek - Cow Creek to Kootenai R.	4.61	Miles
ID17010104PN006 02a	Beaver Creek - headwaters to Cow Creek	7.07	Miles
ID17010104PN007 02	Smith Creek - source to Cow Creek	26.39	Miles
ID17010104PN009 02	Parker Creek - upper portion, forested	22.02	Miles
ID17010104PN010_02	Trout Creek - tribs to Trout Creek	15.25	Miles
ID17010104PN012_02	Lost Creek and unnamed stream segments	5.31	Miles
ID17010104PN013_02	Tributaries to Myrtle Creek	30.97	Miles
ID17010104PN016_02	Upper Snow Creek	12.27	Miles
ID17010104PN020_02	Ruby Creek - Upper, headwaters to Gold Creek	11.98	Miles
ID17010104PN021 02	Fall Creek - upper, headwaters and tribs to Fall Creek	28.89	Miles
ID17010104PN024 02	Dodge Creek	4.65	Miles
ID17010104PN026 02	1st & 2nd order tribs to Trail Creek - including Cone Creek	19.64	Miles
ID17010104PN028_02	Twentymile Creek - source to mouth	11.91	Miles
ID17010104PN030 02	Cow Creek - Headwaters including Cabin Creek and Brush Creek	29.13	Miles
ID17010104PN032 02	Gable Creek - source to mouth	10.77	Miles
ID17010104PN033_02	Boulder Creek - source to East Fork Boulder Creek	37.32	Miles
ID17010104PN034_02	East Fork Boulder Creek - source to mouth	18.22	Miles
ID17010104PN040 02	Mission Creek - tributaries to Mission Creek	9.95	Miles

17010105 Moyie

ID17010105PN005 02	Moyie River-Tributaries btw Round Prairie Creek to Meadow Cr	34.66	Miles
ID17010105PN010_02	Round Prairie Creek - source to Gillon Creek	18.61	Miles

17010214 Pend Oreille Lake

ID17010214PN009L 0L	Spirit Lake	1542.31	Acres
ID17010214PN010_02	Brickel Creek - Idaho/Washington border to mouth	27.78	Miles
ID17010214PN018_02a	Falls Creek	13.14	Miles
ID17010214PN029 02	Strong Creek - source to mouth	4.25	Miles
ID17010214PN053_02	Little Sand Creek - Headwaters to Sand Creek	13.39	Miles
ID17010214PN054_02	Syringa Creek - Upper, 1st and 2nd order tribs	14.68	Miles
ID17010214PN055_03	Carr Creek - Lower	2.57	Miles
ID17010214PN057 02	Smith Creek - Headwaters to Pend Oreille River	8.64	Miles
ID17010214PN059 02	Riley Creek Tributaries	11.65	Miles
ID17010214PN060_02	Manley Creek -Headwaters to Riley Creek	5.85	Miles

17010215 Priest

ID17010215PN002 02	Big Creek - source to mouth	16.65	Miles
ID17010215PN006 02	Priest Lake	35.35	Miles
ID17010215PN008_02	Soldier Creek - source to mouth	24.59	Miles
ID17010215PN009_02	Hunt Creek - source to mouth	18.52	Miles
ID17010215PN011_02	Bear Creek - source to mouth	11.34	Miles
ID17010215PN015_02	Caribou Creek - source to mouth	27.42	Miles
ID17010215PN015_03	Caribou Creek - source to mouth	7.66	Miles
ID17010215PN016 02	01 & 02 Tribs to Upper Priest Lake	6.41	Miles
ID17010215PN018 03	Upper Priest River - Idaho/Canadian border to mouth	18.69	Miles
ID17010215PN019 03	Hughes Fork - source to mouth	6.6	Miles
ID17010215PN019_04	Hughes Fork - source to mouth	3.33	Miles
ID17010215PN020 02	Beaver Creek - source to mouth	12.68	Miles
ID17010215PN021 02	Tango Creek - source to mouth	3.25	Miles
ID17010215PN022_02	Granite Creek - Idaho/Washington border to mouth	103.69	Miles
ID17010215PN022_03	Granite Creek - Idaho/Washington border to mouth	10.44	Miles

17010301 Upper Coeur d Alene

ID17010301PN001 02a	NF Coeur d'Alene R tributaries btw Yellowdog and Prichard Cr	17.88	Miles
ID17010301PN002 02	Graham Creek, headwaters and tributaries	13.11	Miles
ID17010301PN002_03	Graham Creek, below Deceitful Gulch	1.06	Miles

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ID17010301PN009 02	Lost Creek, headwaters and tributaries	19.16	Miles
ID17010301PN010 02	Shoshone Creek tributaries, below Falls Creek	7.5	Miles
ID17010301PN014_02	Jordan Creek - headwaters and tributaries	15.31	Miles
ID17010301PN014_02a	Cub Creek	1.48	Miles
ID17010301PN014 02b	Calamity Creek	3.8	Miles
ID17010301PN017_02	Tepee Creek tributaries below Trail Creek	20.71	Miles
ID17010301PN023_02	Flat Creek headwaters and tributaries	12.52	Miles
ID17010301PN025_02	Downey Creek - Headwaters to mainstem Downey Creek	10.21	Miles
ID17010301PN025 03	Downey Creek - lower	2.33	Miles
ID17010301PN027_03	Grizzly Creek between Dewey Creek and NFCDA River	1.12	Miles
ID17010301PN029_02	Cougar Gulch headwaters and tributaries	18.57	Miles
ID17010301PN030_02b	Hudlow Creek and tributaries	8.68	Miles
ID17010301PN038 02	Skookum Creek headwaters and tributaries	7.63	Miles

17010302 South Fork Coeur d Alene

ID17010302PN002_02	Upper Little Pine Cr and Hauck Gulch	4.25	Miles
ID17010302PN003_02	Pine Cr headwaters and tributaries above East Fork Pine Cr	31.48	Miles
ID17010302PN005 02	Hunter Creek and tributaries	6.84	Miles
ID17010302PN008b_02	Shields Gulch from mining impact area to South Fork CdA R	0.73	Miles
ID17010302PN011_02	South Fork CDA R tribs btw Little North Fork and Canyon Cr	33.28	Miles
ID17010302PN012 02	Willow Creek and tributaries	4.36	Miles
ID17010302PN013 03	South Fork Coeur d'Alene R - Little North Fork to Daisy Gul	1.12	Miles
ID17010302PN019 02	West Fork Moon Creek and tributaries	4.28	Miles

17010303 Coeur d Alene Lake

ID17010303PN006 03	Lake Creek - Idaho/Washington border to mouth	3.48	Miles
ID17010303PN006 04	Lake Creek - Idaho/Washington border to mouth	0.07	Miles
ID17010303PN025_02	Thompson Creek	6.13	Miles
ID17010303PN027_02	Turner Creek - source to mouth	5.12	Miles

17010304 St. Joe

ID17010304PN005 06	St. Joe River - St. Maries River to mouth	0.82	Miles
ID17010304PN007 03	St. Maries River - Santa Creek to mouth	0.2	Miles
ID17010304PN020_02	Merry Creek - source to mouth	26.45	Miles

Panhandle

ID17010304PN021 02	Childs Creek - source to mouth	8.52	Miles
ID17010304PN025 02	Beaver Creek - source to mouth	11.98	Miles
ID17010304PN027_02c	1st and 2nd order to St Joe River between Slate Cr and NF	40.5	Miles
ID17010304PN028_02	Bond Creek - source to mouth	27.08	Miles
ID17010304PN028 03	Bond Creek - source to mouth	5.2	Miles
ID17010304PN029_02	Hugus Creek- source to mouth	15.19	Miles
ID17010304PN031_03	Marble Creek - Hobo Creek to mouth	2.66	Miles
ID17010304PN032_02	Eagle Creek - source to mouth	11.83	Miles
ID17010304PN033 02a	Bussel Creek, Lines Creek, Norton Creek and Toles Creek	20.25	Miles
ID17010304PN033_03	Bussel Creek - source to mouth	3.8	Miles
ID17010304PN034_02	Hobo Creek - source to mouth	9.46	Miles
ID17010304PN035_03	Marble Creek - source to Hobo Creek	7.86	Miles
ID17010304PN036 02	Homestead Creek - source to mouth	12.39	Miles
ID17010304PN037 02	Daveggio Creek - source to mouth	10.3	Miles
ID17010304PN037_03	Daveggio Creek - source to mouth	1.84	Miles
ID17010304PN038 03	Boulder Creek - source to mouth	2.69	Miles
ID17010304PN039 02	Fishhook Creek - source to mouth	51.3	Miles
ID17010304PN040_02	Siwash Creek - source to mouth	9.31	Miles
ID17010304PN041_02b	2nd order tributaries to St Joe River from NF to Gold Creek	11.95	Miles
ID17010304PN041_02c	1st order tributaries to St Joe River from Gold to Copper Cr	15.88	Miles
ID17010304PN041 02h	Heller and Sherlock Creek 1st and 2nd order	9.1	Miles
ID17010304PN041_03	St Joe River from Heller Creek to Yankee Bar	1.87	Miles
ID17010304PN041_04	St. Joe River - source to North Fork St. Joe River	59.51	Miles
ID17010304PN042 02	Sisters Creek - source to mouth	48.95	Miles
ID17010304PN042 03	Sisters Creek - source to mouth	4.59	Miles
ID17010304PN043 02	Prospector Creek - source to mouth	6.76	Miles
ID17010304PN044_02	Nugget Creek - source to mouth	8.6	Miles
ID17010304PN046 02	Mosquito Creek - source to mouth	10.48	Miles
ID17010304PN047_02	Fly Creek - source to mouth	7.42	Miles
ID17010304PN049_02	Copper Creek - source to mouth	7.23	Miles
ID17010304PN050_02	Timber Creek - source to mouth	6.55	Miles
ID17010304PN051 02	Red Ives Creek - source to mouth	12.69	Miles

ID17010304PN054 02	Bruin Creek - source to mouth	4.06	Miles
ID17010304PN055 02	Quartz Creek - source to mouth	18.25	Miles
ID17010304PN055_03	Quartz Creek - source to mouth	2.5	Miles
ID17010304PN056_02	Eagle Creek - source to mouth	12.91	Miles
ID17010304PN057 02	Bird Creek - source to mouth	15.63	Miles
ID17010304PN058_02	Skookum Creek - source to mouth	12.54	Miles
ID17010304PN059_02	North Fork St. Joe River - Loop Creek to mouth	27.8	Miles
ID17010304PN061_02	North Fork St. Joe River - source to Loop Creek	31.99	Miles
ID17010304PN061 03	North Fork St. Joe River - source to Loop Creek	7.23	Miles
ID17010304PN062_02	Slate Creek - headwaters and tributaries	57.63	Miles
ID17010304PN064_03	Trout Creek - source to mouth	5.81	Miles
ID17010304PN066_02	Reeds Gulch Creek - source to mouth	4.72	Miles
ID17010304PN067 02	Rochat Creek - source to St. Joe River	8.54	Miles

17010305 Upper Spokane

ID17010305PN012_02	Rathdrum Creek - Twin Lakes to mouth	7.36	Miles

Salmon

17060101 Hells Canyon

ID17060101SL004 02	Deep Creek - 1st and 2nd order	20.86	Miles
ID17060101SL009_03	Sheep Creek - confluence of West and East Fork Sheep Creeks	5.96	Miles
ID17060101SL014_03	Kirkwood Creek - source to mouth	1.98	Miles
ID17060101SL023 02	Getta Creek - source to mouth	26.97	Miles

17060103 Lower Snake-Asotin

ID17060103SL005_03	Cottonwood Creek - source to mouth	1.66	Miles
ID17060103SL007_02	Corral Creek - source to mouth	12.11	Miles
ID17060103SL010 02	Billy Creek - source to mouth	6.61	Miles
ID17060103SL012 02	Redbird Creek - source to mouth	10.89	Miles

17060201 Upper Salmon

ID17060201SL002_03	Morgan Creek - West Creek to mouth	7.21	Miles
ID17060201SL003 02	Morgan Creek - source to West Creek	74.94	Miles
ID17060201SL003 03	Morgan Creek - source to West Creek	7.68	Miles
ID17060201SL004_02	West Creek - Blowfly Creek to mouth	8.31	Miles
ID17060201SL005_02	Blowfly Creek - source to mouth	3.11	Miles
ID17060201SL006 02	West Fork Morgan Creek - source to Blowfly Creek	7.46	Miles
ID17060201SL008 03	Darling Creek - source to mouth	4.45	Miles
ID17060201SL009_02	Challis Creek - Bear Creek to Darling Creek	19.71	Miles
ID17060201SL010_02	Eddy Creek - source to mouth	20.61	Miles
ID17060201SL011 02	Bear Creek - source to mouth	18.14	Miles
ID17060201SL012 02	Challis Creek - source to Bear Creek	27.53	Miles
ID17060201SL012_03	Challis Creek - source to Bear Creek	3.29	Miles
ID17060201SL013_02	Mill Creek - source to mouth	24.96	Miles
ID17060201SL013 03	Mill Creek - 3rd order	9.66	Miles
ID17060201SL015_02	Garden Creek - source to mouth	43.65	Miles
ID17060201SL016_02	Salmon River - East Fork Salmon River to Garden Creek	91.42	Miles
ID17060201SL017_02	Bayhorse Creek - source to mouth	24.86	Miles
ID17060201SL017 03	Bayhorse Creek - source to mouth	5.02	Miles
ID17060201SL019 02	Salmon River - Squaw Creek to East Fork Salmon River	28.04	Miles
ID17060201SL020_02	Kinnikinic Creek - source to mouth	18.46	Miles

Salmon

ID17060201SL021 02	Squaw Creek - Cash Creek to mouth	18.87	Miles
ID17060201SL022 02	Cash Creek - source to mouth	11.55	Miles
ID17060201SL025_02	Cinnabar Creek - source to mouth	12.66	Miles
ID17060201SL028_02	Thompson Creek - source to mouth	24.63	Miles
ID17060201SL028 03	Thompson Creek - source to mouth	8.97	Miles
ID17060201SL030_02	Buckskin Creek - source to mouth	2.85	Miles
ID17060201SL031_02	Salmon River - Yankee Fork Creek to Thompson Creek	50.23	Miles
ID17060201SL031_03	Salmon River - Yankee Fork Creek to Thompson Creek	4.02	Miles
ID17060201SL032 02	Yankee Fork Creek - Jordan Creek to mouth	20.31	Miles
ID17060201SL032_04	Yankee Fork Creek - Jordan Creek to mouth	9	Miles
ID17060201SL033_03	Ramey Creek - source to mouth	1.48	Miles
ID17060201SL034_02	Yankee Fork Creek - source to Jordan Creek	50.54	Miles
ID17060201SL034 03	Yankee Fork Creek - source to Jordan Creek	6.22	Miles
ID17060201SL034 04	Yankee Fork Creek - source to Jordan Creek	7.05	Miles
ID17060201SL035_02	Fivemile Creek - source to mouth	11.38	Miles
ID17060201SL036 02	Elevenmile Creek - source to mouth	4.19	Miles
ID17060201SL037 02	McKay Creek - source to mouth	9.02	Miles
ID17060201SL038_02	Twentymile Creek - source to mouth	3.59	Miles
ID17060201SL039_02	Tenmile Creek - source to mouth	5.15	Miles
ID17060201SL040_02	Eightmile Creek - source to mouth	19.12	Miles
ID17060201SL040 03	Eightmile Creek - source to mouth	3.52	Miles
ID17060201SL041_03	Jordan Creek - from and including Unnamed Tributary	1.36	Miles
ID17060201SL042_03	Jordan Creek - source to Unnamed Tributary	2.64	Miles
ID17060201SL047 02	Salmon River - Valley Creek to Yankee Fork Creek	39.95	Miles
ID17060201SL049 02	East Basin Creek - source to mouth	11.4	Miles
ID17060201SL050 02	Basin Creek - source to East Basin Creek	54.01	Miles
ID17060201SL050_03	Basin Creek - source to East Basin Creek	6.86	Miles
ID17060201SL051 02	Valley Creek - Trap Creek to mouth	30	Miles
ID17060201SL051_04	Valley Creek - Trap Creek to mouth	6.85	Miles
ID17060201SL053_03	Valley Creek - source to Trap Creek	10.29	Miles
ID17060201SL055_02	Trap Creek - source to Meadow Creek	8.58	Miles
ID17060201SL056 02	Meadow Creek - source to mouth	4.4	Miles

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Salmon

ID17060201SL057 02	Elk Creek - source to mouth	24.92	Miles
ID17060201SL058 02	Stanley Creek - source to mouth	23.26	Miles
ID17060201SL060_02	Iron Creek - source to mouth	10.06	Miles
ID17060201SL065_02	Fishhook Creek - source to mouth	15.77	Miles
ID17060201SL068 02	Salmon River	23.44	Miles
ID17060201SL068_05	Salmon River	9.24	Miles
ID17060201SL069_02	Decker Creek - Huckleberry Creek to mouth	14.26	Miles
ID17060201SL069_03	Decker Creek - Huckleberry Creek to mouth	0.35	Miles
ID17060201SL069 04	Decker Creek - Huckleberry Creek to mouth	0.3	Miles
ID17060201SL070_02	Decker Creek - source to Huckleberry Creek	6.22	Miles
ID17060201SL071_02	Huckleberry Creek - source to mouth	6	Miles
ID17060201SL073_05	Salmon River - Alturas Lake Creek to Fisher Creek	5.11	Miles
ID17060201SL074 02	Hell Roaring Creek - source to mouth	12.19	Miles
ID17060201SL075 02	Alturas Lake Creek - Alturas Lake to mouth	14.13	Miles
ID17060201SL075_03	Alturas Lake Creek - Alturas Lake to mouth	3.94	Miles
ID17060201SL080 03	Alpine Creek - source to mouth	3.28	Miles
ID17060201SL081 02	Salmon River - source to Alturas Lake Creek	51.05	Miles
ID17060201SL081_03	Salmon River - source to Alturas Lake Creek	11.93	Miles
ID17060201SL081_04	Salmon River - source to Alturas Lake Creek	10.96	Miles
ID17060201SL082_02	Beaver Creek - source to mouth	20.39	Miles
ID17060201SL083 02	Smiley Creek - source to mouth	15.52	Miles
ID17060201SL083_03	Smiley Creek - source to mouth	7.61	Miles
ID17060201SL084_02	Frenchman Creek - source to mouth	9.42	Miles
ID17060201SL085 02	Pole Creek - source to mouth	26.17	Miles
ID17060201SL086 03	Champion Creek - source to mouth	5.63	Miles
ID17060201SL087 02	Fourth of July Creek - source to mouth	16.73	Miles
ID17060201SL087_03	Fourth of July Creek - source to mouth	8.78	Miles
ID17060201SL088 02	Fisher Creek - source to mouth	19.39	Miles
ID17060201SL090_02	Gold Creek - source to mouth	10.06	Miles
ID17060201SL091_02	Little Casino Creek - source to mouth	10.25	Miles
ID17060201SL092_02	Big Casino Creek - source to mouth	13.7	Miles
ID17060201SL093 02	Rough Creek - source to mouth	8.8	Miles

ID17060201SL094 03	Warm Springs Creek - Swimm Creek to mouth	7.19	Miles
ID17060201SL099 03	Slate Creek - source to mouth	4.72	Miles
ID17060201SL100_02	Holman Creek - source to mouth	9.32	Miles
ID17060201SL104_03	Big Lake Creek - source to mouth	1.76	Miles
ID17060201SL105 02	Big Boulder Creek - source to mouth	22.46	Miles
ID17060201SL105_03	Big Boulder Creek - source to mouth	9.32	Miles
ID17060201SL106_02	Little Boulder Creek - source to mouth	18.43	Miles
ID17060201SL107_03	Germania Creek - Chamberlain Creek to mouth	4.68	Miles
ID17060201SL109 02	Germania Creek - source to Chamberlain Creek	42.93	Miles
ID17060201SL110_04	East Fork Salmon River - confluence of South and West Fork	4.46	Miles
ID17060201SL114_02	West Pass Creek - source to mouth	25.24	Miles
ID17060201SL114_03	West Pass Creek - source to mouth	3.91	Miles
ID17060201SL118 04	Herd Creek-confluence of West Fork Herd Creek and East Pass	7.47	Miles
ID17060201SL123 02	Lake Creek - source to mouth	21.37	Miles
ID17060201SL125_03	Road Creek - source to Corral Basin Creek	2.9	Miles
ID17060201SL126 02	Mosquito Creek - source to mouth	12.41	Miles

17060202 Pahsimeroi

ID17060202SL019_03	Mahogany Creek - source to mouth	2.96	Miles
ID17060202SL020_03	Pahsimeroi River	2.96	Miles
ID17060202SL022 02	East Fork Pahsimeroi River - source to mouth	39.77	Miles
ID17060202SL028 03	Goldburg Creek - Donkey Creek to mouth	9.39	Miles
ID17060202SL030 02	Goldburg Creek - source to Donkey Creek	32.09	Miles
ID17060202SL031_02	Big Creek	24.32	Miles
ID17060202SL032 02	South Fork Big Creek - source to mouth	27.89	Miles
ID17060202SL033 02	North Fork Big Creek - source to mouth	30.01	Miles
ID17060202SL035_03	Patterson Creek - source to and including Inyo Creek	1.26	Miles
ID17060202SL036_02	Falls Creek - source to mouth	39.29	Miles
ID17060202SL038 02	Morse Creek - source to Irrigation junction (T15S, R23E)	18.94	Miles
ID17060202SL038 03	Morse Creek - source to Irrigation junction (T15S, R23E)	3.8	Miles

17060203 Middle Salmon-Panther

ID17060203SL001 02	Salmon River - Panther Creek to Middle Fork Salmon River	29.71	Miles

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Salmon

ID17060203SL003 02	Garden Creek - source to mouth	13.93	Miles
ID17060203SL004 02	Clear Creek - source to mouth	40.75	Miles
ID17060203SL006_03	Big Deer Creek - source to South Fork Big Deer Creek	8.24	Miles
ID17060203SL009_02	Bucktail Creek - source to mouth	1.82	Miles
ID17060203SL010 02	Panther Creek - Napias Creek to Big Deer Creek	21.16	Miles
ID17060203SL011_02	Panther Creek - Tributaries btw Blackbird Cr. to Napias Cr.	6.97	Miles
ID17060203SL012a_02	Blackbird Creek - source to Blackbird Reservoir Dam	2.93	Miles
ID17060203SL012b_02	Blackbird Creek - Blackbird Reservoir Dam to mouth	7.83	Miles
ID17060203SL014 02	Panther Creek - Porphyry Creek to Blackbird Creek	8.66	Miles
ID17060203SL015_02	Musgrove Creek - source to mouth	17.7	Miles
ID17060203SL016_02	Porphyry Creek - source to mouth	9.5	Miles
ID17060203SL017_02	Panther Creek - source to Porphyry Creek	43.87	Miles
ID17060203SL018 02	Moyer Creek - source to mouth	39.97	Miles
ID17060203SL018 03	Moyer Creek - source to mouth	7.3	Miles
ID17060203SL019_03	Woodtick Creek - source to mouth	5.14	Miles
ID17060203SL020 03	Deep Creek - Little Deep Creek to mouth	2.31	Miles
ID17060203SL022 02	Deep Creek - source to Little Deep Creek	17.35	Miles
ID17060203SL023_04	Napias Creek - Moccasin Creek to mouth	2.68	Miles
ID17060203SL024_02	Napias Creek - Arnett Creek to and including Moccasin Creek	28.69	Miles
ID17060203SL024_04	Napias Creek - Arnett Creek to and including Moccasin Creek	1.37	Miles
ID17060203SL025 02	Napias Creek - source to Arnett Creek	20.64	Miles
ID17060203SL026_02	Arnett Creek - source to mouth	18.31	Miles
ID17060203SL027_02	Trail Creek - source to mouth	9.49	Miles
ID17060203SL028 02	Beaver Creek - source to mouth	17.52	Miles
ID17060203SL030 02	Pine Creek - source to mouth	24.39	Miles
ID17060203SL031 02	East Boulder Creek - source to mouth	14.38	Miles
ID17060203SL032_02	Salmon River - North Fork Sheep Creek to Indian Creek	21.47	Miles
ID17060203SL035 03	Moose Creek - Dolly Creek to Little Moose Creek	1.43	Miles
ID17060203SL036_02	Moose Creek - source to Dolly Creek	16.43	Miles
ID17060203SL037_02	Dolly Creek - source to mouth	9.36	Miles
ID17060203SL039_02	Salmon River - Carmen Creek to North Fork Salmon River	57.75	Miles
ID17060203SL043 03	Williams Creek - confluence of North and South Fork Williams	4.9	Miles

Salmon

ID17060203SL044 02	North Fork Williams Creek - source to mouth	6.42	Miles
ID17060203SL045 02	South Fork Williams Creek - source to mouth	7.05	Miles
ID17060203SL047_02	Salmon River - Iron Creek to Twelvemile Creek	67.53	Miles
ID17060203SL048_02	Iron Creek - North Fork Iron Creek to mouth	29.15	Miles
ID17060203SL048 03	Iron Creek - North Fork Iron Creek to mouth	11.15	Miles
ID17060203SL049_02	North Fork Iron Creek - source to mouth	20.07	Miles
ID17060203SL050_02	Iron Creek - source to North Fork Iron Creek	4.4	Miles
ID17060203SL051_02	West Fork Iron Creek - source to mouth	5.69	Miles
ID17060203SL052 02	South Fork Iron Creek - source to mouth	6.96	Miles
ID17060203SL053_02	Salmon River - Pahsimeroi River to Iron Creek	52.67	Miles
ID17060203SL054_03	Hot Creek - source to mouth	12.61	Miles
ID17060203SL055_02	Cow Creek - source to mouth	27.14	Miles
ID17060203SL056 02	Allison Creek - source to mouth	10.21	Miles
ID17060203SL057 03	McKim Creek - source to mouth	2.49	Miles
ID17060203SL060_03	Twelvemile Creek - source to mouth	3.33	Miles
ID17060203SL061 03	Carmen Creek - Freeman Creek to mouth	5.25	Miles
ID17060203SL062 02	Freeman Creek - source to mouth	20.68	Miles
ID17060203SL063_02	Carmen Creek - source to Freeman Creek	24.01	Miles
ID17060203SL064_02	Tower Creek - source to mouth	19.78	Miles
ID17060203SL064_03	Tower Creek - source to mouth	1.94	Miles
ID17060203SL066 02	Fourth of July Creek - source to Little Fourth of July Creek	17.05	Miles
ID17060203SL071_03	Sheep Creek - source to mouth	8.64	Miles
ID17060203SL073_02	Dahlonega Creek - Nez Perce Creek to mouth	11.82	Miles
ID17060203SL074 02	Dahlonega Creek - source to Nez Perce Creek	4.87	Miles
ID17060203SL076 02	Anderson Creek - source to mouth	7.66	Miles
ID17060203SL077 02	North Fork Salmon River - Twin Creek to Dahlonega Creek	15.71	Miles
ID17060203SL077_03	North Fork Salmon River - Twin Creek to Dahlonega Creek	5.71	Miles
ID17060203SL078 02	North Fork Salmon River - source to Twin Creek	17.47	Miles
ID17060203SL078_03	North Fork Salmon River - source to Twin Creek	3.41	Miles
ID17060203SL080_02	Twin Creek - source to mouth	14.29	Miles
ID17060203SL081_02	Hughes Creek - source to mouth	48.23	Miles
ID17060203SL081 03	Hughes Creek - source to mouth	6.14	Miles

ID17060203SL083 03	Indian Creek - source to mouth	11.37	Miles
ID17060203SL084 02	Squaw Creek - source to mouth	15.89	Miles
ID17060203SL085_02	Spring Creek - source to mouth	17.41	Miles
ID17060203SL085_03	Spring Creek - source to mouth	2.28	Miles
ID17060203SL086 02	Boulder Creek - source to mouth	13.38	Miles
ID17060203SL087_03	Owl Creek - East Fork Owl Creek to mouth	1.99	Miles
ID17060203SL090_02	Colson Creek - source to mouth	11.32	Miles

17060204 Lemhi

ID17060204SL001 02	Lemhi River - Kenney Creek to mouth	44.45	Miles
ID17060204SL002 02	Mulkey Creek - source to mouth	6.1	Miles
ID17060204SL003a_03	Withington Creek - diversion (T20N, R23E, Sec. 09) to mouth	2.25	Miles
ID17060204SL003b 02	Withington Creek - source to diversion (T20N, R23E, Sec. 09)	21.25	Miles
ID17060204SL003b 03	Withington Creek - source to diversion (T20N, R23E, Sec. 09)	3.19	Miles
ID17060204SL004_02	Haynes Creek - source to mouth	19.82	Miles
ID17060204SL009_05	Hayden Creek - Basin Creek to mouth	3.5	Miles
ID17060204SL010_04	Basin Creek - Lake Creek to mouth	2.66	Miles
ID17060204SL013 02	McNutt Creek - source to mouth	16.77	Miles
ID17060204SL015_04	Hayden Creek - Bear Valley Creek to Basin Creek	4.96	Miles
ID17060204SL016_04	Bear Valley Creek -Wright Creek to mouth	2.78	Miles
ID17060204SL017 02	Bear Valley Creek - source to Wright Creek	13.83	Miles
ID17060204SL017 03	Bear Valley Creek - source to Wright Creek	3.64	Miles
ID17060204SL018 03	Wright Creek - source to mouth	3.7	Miles
ID17060204SL019_02	Kadletz Creek - source to mouth	4.95	Miles
ID17060204SL020 02	Hayden Creek -West Fork Hayden Creek to Bear Valley Creek	20.95	Miles
ID17060204SL020 03	Hayden Creek -West Fork Hayden Creek to Bear Valley Creek	6.52	Miles
ID17060204SL023_02	East Fork Hayden Creek - source to mouth	11.34	Miles
ID17060204SL026b_02	Mill Creek - source to diversion (T16N, R24E, Sec. 22)	10.53	Miles
ID17060204SL028 02	Lee Creek - source to mouth	19.55	Miles
ID17060204SL029a 03	Big Eightmile Creek-diversion (T16N, R25E, Sec. 21) to mouth	3.5	Miles
ID17060204SL029b_03	Big Eightmile Creek - source to diversion	8.15	Miles
ID17060204SL031 04	Big Timber Creek - Little Timber Creek to mouth	4.85	Miles
ID17060204SL032b 02	Little Timber Creek - source to diversion	13.38	Miles

ID17060204SL032b 03	Little Timber Creek - source to diversion	1.64	Miles
ID17060204SL033 02	Big Timber Creek - Rocky Creek to Little Timber Creek	15.1	Miles
ID17060204SL033_03	Big Timber Creek - Rocky Creek to Little Timber Creek	9.6	Miles
ID17060204SL039_02	Meadow Lake Creek - source to mouth	4.94	Miles
ID17060204SL046 02	Clear Creek - source to mouth	19.25	Miles
ID17060204SL047_02	Tenmile Creek - Powderhorn Gulch to mouth	2.81	Miles
ID17060204SL050b_02	Hawley Creek - source to diversion (T15N, R27E, Sec. 03)	51.51	Miles
ID17060204SL050b_03	Hawley Creek - source to diversion (T15N, R27E, Sec. 03)	11.48	Miles
ID17060204SL055b 03	Yearian Creek - source to diversion (T17N, R24E, Sec. 03)	2.23	Miles
ID17060204SL057_03	Cow Creek - source to mouth	1.89	Miles
ID17060204SL058_02	Agency Creek - source to Cow Creek	29.98	Miles
ID17060204SL058_03	Agency Creek - source to Cow Creek	2.05	Miles
ID17060204SL059b 02	Pattee Creek - source to diversion (T19N, R24E, Sec. 16)	7.38	Miles
ID17060204SL059b 03	Pattee Creek - source to diversion (T19N, R24E, Sec. 16)	22.42	Miles
ID17060204SL061_02	Kenney Creek - source to mouth	20.7	Miles

17060205 Upper Middle Fork Salmon

ID17060205SL001 02	MF Salmon River - 1st and 2nd order above Loon Creek	194.31	Miles
ID17060205SL002_02	Marble Creek and tributaries - 1st and 2nd order	88.87	Miles
ID17060205SL007_02	Pistol and Little Pistol Creeks - 1st and 2nd order	128.43	Miles
ID17060205SL008 02	Elkhorn Creek - 1st and 2nd order	29.01	Miles
ID17060205SL009 02	Sulphur Creek - 1st and 2nd order	59.31	Miles
ID17060205SL009 04	Sulphur Creek - 4th order (Honeymoon Creek to mouth)	11.1	Miles
ID17060205SL010_02	Boundary Creek - entire drainage	9.32	Miles
ID17060205SL011 02	Dagger Creek - entire drainage	16.34	Miles
ID17060205SL012 02	Lower Bear Valley Creek - 1st and 2nd order tributaries	53.27	Miles
ID17060205SL012_03	Bear Valley Creek - 3rd order	2.08	Miles
ID17060205SL012_04	Bear Valley Creek - 4th order (Cache Creek to Elk Creek)	7.36	Miles
ID17060205SL013 02	Elk and Bearskin Creeks - 1st & 2nd order (non-wilderness)	40.87	Miles
ID17060205SL013 02a	Elk and Porter Creeks - 1st & 2nd order (wilderness)	46.42	Miles
ID17060205SL013_03a	Elk & Porter Creeks - 3rd order	3.29	Miles
ID17060205SL014 02	Sheep Trail Creek - entire drainage	8.18	Miles
ID17060205SL015 02	Cub Creek - entire drainage	2.62	Miles

ID17060205SL016 01L	Lower Lost Lake	6.49	Acres
ID17060205SL016 02	Cache Creek and tributaries - 1st and 2nd order	15.85	Miles
ID17060205SL016_03	Cache Creek - 3rd order	4.37	Miles
ID17060205SL017_02	Fir Creek - 1st and 2nd order	11.5	Miles
ID17060205SL018 02	Marsh Creek - Beaver Creek to mouth	11.52	Miles
ID17060205SL019_02	Marsh Creek - Knapp Creek to Beaver Creek	6.03	Miles
ID17060205SL020_03	Cape Horn Creek - Banner Creek to mouth	4.11	Miles
ID17060205SL021_02	Cape Horn Creek - source to Banner Creek	6.29	Miles
ID17060205SL022 02	Banner Creek - source to mouth	16.41	Miles
ID17060205SL023_02	Swamp Creek - source to mouth	7.38	Miles
ID17060205SL028_02	Beaver Creek - Bear Creek to mouth	13.84	Miles
ID17060205SL029_02	Beaver Creek - Winnemucca Creek to Bear Creek	7.48	Miles
ID17060205SL031 02	Beaver Creek - source to Winnemucca Creek	18.42	Miles
ID17060205SL032 02	Bear Creek - source to mouth	10.6	Miles
ID17060205SL038_02	Lime, Bruin, Garnet and Sulphur Creeks - 1st and 2nd order	20.13	Miles
ID17060205SL038 03	Sulphur Creek - 3rd order	2.1	Miles
ID17060205SL039 02	Float Creek - 1st and 2nd order	11.21	Miles
ID17060205SL039_03	Float Creek - 3rd order (Harlan Creek to Rapid River)	2.61	Miles
ID17060205SL041_02	Vanity Creek - 1st and 2nd order	22.04	Miles
ID17060205SL041_03	Vanity Creek - 3rd order (Seafoam Creek to Rapid River)	0.84	Miles
ID17060205SL042 02	Rapid River above Vanity Creek - 1st and 2nd order tribs	39.07	Miles
ID17060205SL042_03	Rapid River and Pinyon Creeks - 3rd order sections	4.09	Miles
ID17060205SL062_02	Mayfield Creek-confluence of East and West Fork Mayfield Cr.	7.39	Miles
ID17060205SL063 02	West Fork Mayfield Creek - source to mouth	21.38	Miles
ID17060205SL064 03	East Fork Mayfield Creek - source to mouth	8.66	Miles
ID17060205SL067 02	Warm Springs Creek - Trapper Creek to mouth	56.85	Miles

17060206 Lower Middle Fork Salmon

ID17060206SL001 02	MF Salmon River - 1st and 2nd order below Loon Creek	172.92	Miles
ID17060206SL003 02	Big Creek - 1st and 2nd order tributaries	131.58	Miles
ID17060206SL003_03	Big Creek - 3rd order (Belvidere Creek to Logan Creek)	4.97	Miles
ID17060206SL003 04	Big Creek - 4th order (Monumental Creek to Logan Creek)	12.73	Miles
ID17060206SL009 02	Smith Creek - 1st and 2nd order	14.38	Miles

ID17060206SL009 03	Smith Creek - 3rd order, between NF Smith and Big Creeks	3.95	Miles
ID17060206SL010 02	Logan and Government Creeks - 1st and 2nd order	22.7	Miles
ID17060206SL010_03	Logan Creek - 3rd order	0.41	Miles
ID17060206SL012_02	Monumental Creek - 1st & 2nd order mainstem tributaries	82.58	Miles
ID17060206SL012 03	Monumental Creek - 3rd order (Annie Creek to West Fork)	8.05	Miles
ID17060206SL034_02a	Arrastra Creek	4.82	Miles
ID17060206SL038_02	Yellowjacket Creek - Hoodoo Creek to Jenny Creek	10.11	Miles
ID17060206SL040_02	Little Jacket Creek - source to mouth	8.3	Miles
ID17060206SL042 02	Trail Creek - source to mouth	11.1	Miles
ID17060206SL044_02	Hoodoo Creek - source to mouth	18.7	Miles

17060207 Middle Salmon-Chamberlain

ID17060207SL001 07	Salmon River - South Fork Salmon River to river mile 106	27.4	Miles
ID17060207SL002 02	Fall Creek - source to mouth	21.72	Miles
ID17060207SL002_03	Fall Creek - 3rd Order	1.33	Miles
ID17060207SL003_02	Carey Creek - source to mouth	7.89	Miles
ID17060207SL004_03	California Creek - source to mouth	2.03	Miles
ID17060207SL006 02	Rabbit Creek - source to mouth	8.28	Miles
ID17060207SL007_02	Warren Creek - 1st and 2nd order tributaries	76.98	Miles
ID17060207SL007_03	Warren Creek - 3rd order seg. within roadless and wilderness	9.3	Miles
ID17060207SL008 07	Salmon River - Chamberlain Creek to South Fork Salmon River	41	Miles
ID17060207SL037 02	Salmon River - Middle Fork Salmon River to Horse Creek	27.53	Miles
ID17060207SL037 07	Salmon River - Middle Fork Salmon River to Horse Creek	11.56	Miles
ID17060207SL040_02	Corn Creek - source to mouth	8.53	Miles
ID17060207SL044 03	Horse Creek - source to Reynolds Creek	5.28	Miles
ID17060207SL055 02	Bargamin Creek - source to mouth	100.57	Miles
ID17060207SL055_04	Bargamin Creek - source to mouth	15.97	Miles
ID17060207SL056_02	Porcupine Creek - source to mouth	8.55	Miles
ID17060207SL061 02	Noble Creek - source to mouth	46.86	Miles
ID17060207SL061 02a	Big Mallard Creek - headwater to SF Big Mallard Creek	8.44	Miles
ID17060207SL061_03	Big Mallard Creek - SF Big Mallard Creek to mouth	13.4	Miles
ID17060207SL062 02	Little Mallard Creek - source to Fish Barrier	10.78	Miles
ID17060207SL063 02	Rhett Creek - source to Rabbit Creek	22.08	Miles

ID17060207SL063 03	Rhett Creek - Rabbit Creek to mouth	1.99	Miles
ID17060207SL065 02	Jersey Creek - source to mouth	16.14	Miles
ID17060207SL066_02	Indian Creek - source to mouth	8.81	Miles
ID17060207SL069_02	Big Creek - source to mouth	10.49	Miles
ID17060207SL069 02a	Eutopia Creek - and tributaries	19.31	Miles
ID17060207SL069_03	Big Creek - source to mouth	8.92	Miles
ID17060207SL070_02	Lake Creek - source to mouth	51.27	Miles
ID17060207SL072_03	Bull Creek - source to mouth	4.53	Miles
ID17060207SL073 02	Elk Creek - source to mouth	9.43	Miles
ID17060207SL076_04	Wind River - Meadow Creek to Salmon River	2.56	Miles
ID17060207SL077_02	Meadow Creek - source to mouth	31.76	Miles
ID17060207SL077_03	Meadow Creek - source to mouth	6.34	Miles

17060208 South Fork Salmon

ID17060208SL001_02	SF Salmon R. below Secesh R: most 1st and 2nd order streams	118.94	Miles
ID17060208SL001_03	Smith Creek - 3rd order (Big Buck Creek to SF Salmon River)	1.08	Miles
ID17060208SL003_02	Pony Creek - entire drainage	18.79	Miles
ID17060208SL004 02	Bear Creek - 1st and 2nd order	13.86	Miles
ID17060208SL005_04	Secesh River - 4th order (Grouse Creek to mouth)	24.33	Miles
ID17060208SL006_02	Lake Creek - 1st and 2nd order	43.64	Miles
ID17060208SL006 03	Lake Creek - 3rd order (Threemile Creek to Summit Creek)	4.05	Miles
ID17060208SL007 02	Summit Creek - entire watershed	15.76	Miles
ID17060208SL008 02	Loon Creek - entire drainage	17.84	Miles
ID17060208SL011_02	Fitsum Creek - 1st and 2nd order	40.29	Miles
ID17060208SL011 03	Fitsum Creek - 3rd order	2.3	Miles
ID17060208SL013 02	Cougar Creek - 1st and 2nd order	16	Miles
ID17060208SL013_03	Cougar Creek - 3rd order (South Fork Cougar Creek to mouth)	2.79	Miles
ID17060208SL014_02	Blackmare Creek - 1st and 2nd order	19.23	Miles
ID17060208SL014 03	Blackmare and SF Blackmare Creeks - 3rd order sections	4.82	Miles
ID17060208SL016 02	Six-bit Creek - entire watershed	10.7	Miles
ID17060208SL017_02	Trail Creek & Curtis Creek - 1st and 2nd order	29.55	Miles
ID17060208SL017 03	Curtis Creek - 3rd order (Trail Creek to SF Salmon River)	1.42	Miles
ID17060208SL020L 0L	Warm Lake	411.96	Acres

Salmon

ID17060208SL021 02	Fourmile Creek - 1st and 2nd order	20.22	Miles
ID17060208SL021 03	Fourmile Creek - 3rd order (SF Fourmile Creek to mouth)	1.23	Miles
ID17060208SL022_02	Camp Creek - 1st and 2nd order	34.21	Miles
ID17060208SL022_03	Camp and Phoebe Creeks - 3rd order sections	5.33	Miles
ID17060208SL023 02a	East Fork of the South Fork Salmon River - 1st and 2nd order	79.24	Miles
ID17060208SL023_04	East Fork South Fork Salmon River - 4th order section	10.95	Miles
ID17060208SL024_02	Caton Creek and tributaries - 1st and 2nd order	37.38	Miles
ID17060208SL024_03	Reegan and Caton Creeks - 3rd order sections	7.42	Miles
ID17060208SL025 02a	Lower Johnson Creek - 1st and 2nd order tributaries	60.38	Miles
ID17060208SL026_02	Burntlog Creek and tributaries - 1st and 2nd order	48.54	Miles
ID17060208SL026_03	Burntlog Creek - 3rd order	10.35	Miles
ID17060208SL027_02	Trapper Creek & tributaries - 1st and 2nd order	13.88	Miles
ID17060208SL027 03	Trapper Creek - 3rd order	4.33	Miles
ID17060208SL028 02	Riordan and NF Riordan Creeks - 1st and 2nd order	21.9	Miles
ID17060208SL028_03	Riordan Creek - 3rd order (North Fork to mouth)	3.67	Miles
ID17060208SL029 02	Sugar Creek & tributaries - 1st and 2nd order	20.4	Miles
ID17060208SL030 03	Tamarack Creek - 3rd order (Bum Cr. to SF Salmon River)	4.62	Miles
ID17060208SL032_02	Quartz and Vein Creeks - 1st and 2nd order	16.63	Miles
ID17060208SL032_03	Quartz Creek - 3rd order	3.33	Miles
ID17060208SL033_02	Sheep Creek - 1st and 2nd order	25.72	Miles
ID17060208SL033 03	Sheep and South Fork Sheep Creeks - 3rd order	4.08	Miles

17060209 Lower Salmon

ID17060209SL003_03	Cottonwood Creek - unnamed trib to mouth	5.91	Miles
ID17060209SL008 02	Salmon River - Slate Creek to Rice Creek	96.91	Miles
ID17060209SL009 02	Sotin Creek - source to mouth	4.33	Miles
ID17060209SL010_02	Deer Creek - source to EF Deer Creek	21.41	Miles
ID17060209SL010_03	Deer Creek - EF Deer Creek to mouth	3.17	Miles
ID17060209SL012 02	China Creek- source to Little China Creek	7.45	Miles
ID17060209SL012 03	China Creek- Little China Creek to mouth	1.36	Miles
ID17060209SL013_02	Cow Creek - source to mouth	15.16	Miles
ID17060209SL014 03	Race Creek - confluence West and SF Race Creek to mouth	1.67	Miles
ID17060209SL015 02	West Fork Race Creek - source to mouth	10.3	Miles

ID17060209SL015_03	West Fork Race Creek - source to mouth	1.37	Miles
ID17060209SL017_02	Kessler Creek - source to South Fork Race Creek	4.43	Miles
ID17060209SL020_03	Lake Creek - source to mouth	6.2	Miles
ID17060209SL023_03	French Creek - Little French Creek to mouth	12.43	Miles
ID17060209SL026_02	Kelly Creek - source to mouth	14.71	Miles
ID17060209SL029_02	Allison Creek - roadless boundary to West Fork Allison Creek	4.25	Miles
ID17060209SL029_02a	Allison Creek - headwaters to roadless boundary	5.14	Miles
ID17060209SL030_02	West Fork Allison Creek - source to mouth	10.72	Miles
ID17060209SL032_02	Fiddle Creek - source to mouth	12.33	Miles
ID17060209SL033_02	John Day Creek - source to mouth	25.08	Miles
ID17060209SL033_03	John Day Creek - source to mouth	4.01	Miles
ID17060209SL034_02	Slate Creek - from and including Hurley Creek to mouth	12.54	Miles
ID17060209SL034_04	Slate Creek - from and including Hurley Creek to mouth	5.29	Miles
ID17060209SL035_02	Little Van Buren Creek - source to mouth	5.95	Miles
ID17060209SL036_02	Slate Creek - Little Slate Creek to Hurley Creek	22.51	Miles
ID17060209SL036_04	Slate Creek - Little Slate Creek to Hurley Creek	7.35	Miles
ID17060209SL037_02	Little Slate Creek - headwaters and tributaries	40.25	Miles
ID17060209SL037_02a	Little Boulder Creek - source to mouth	7.6	Miles
ID17060209SL037_02b	Big Boulder Creek - source to mouth	7.34	Miles
ID17060209SL037_03	Little Slate Creek - unnamed trib to Van Buren Creek	9.5	Miles
ID17060209SL037_04	Little Slate Creek - Van Buren Cr to mouth	8.07	Miles
ID17060209SL038_02	Deadhorse Creek - source to mouth	8.36	Miles
ID17060209SL039_02	Van Buren Creek - source to NF Van Buren	10.16	Miles
ID17060209SL039_03	Van Buren Creek - NF Van Buren Cr to mouth	2	Miles
ID17060209SL040_02	Turnbull Creek - source to mouth	4.97	Miles
ID17060209SL041_02	Slate Creek - Wilderness boundary to Little Slate Creek	7.72	Miles
ID17060209SL042_02	North Fork Slate Creek - source to mouth	15.12	Miles
ID17060209SL043_02	McKinzie Creek - source to mouth	16.07	Miles
ID17060209SL044_03	Skookumchuck Creek	3.36	Miles
ID17060209SL045_02	South Fork Skookumchuck Creek - source to mouth	13.37	Miles
ID17060209SL047_04	Whitebird Creek - 4th Order Segment	5.75	Miles
ID17060209SL048_03	South Fork Whitebird Creek - Little Whitebird Creek to mouth	4.38	Miles

ID17060209SL049 02	Little Whitebird Creek - source to mouth	6.88	Miles
ID17060209SL050 02	South Fork Whitebird Creek -source to Little Whitebird Creek	9.28	Miles
ID17060209SL050_03	South Fork Whitebird Creek -source to Little Whitebird Creek	6.63	Miles
ID17060209SL051_02	Jungle Creek - source to mouth	2.16	Miles
ID17060209SL052 02	Asbestos Creek - source to mouth	2.86	Miles
ID17060209SL053_02	Teepee Creek - source to mouth	4.75	Miles
ID17060209SL054_02	Pinnacle Creek - source to mouth	5.86	Miles
ID17060209SL055_02	North Fork Whitebird Creek - source to mouth	33.12	Miles
ID17060209SL055 03	North Fork Whitebird Creek - 3rd order segment	6.05	Miles
ID17060209SL060_03	Deep Creek - source to mouth	1.42	Miles
ID17060209SL061_02	Maloney Creek - source to WF Maloney and tributaries	30.04	Miles
ID17060209SL061_03	Maloney Creek - source to mouth	1.44	Miles
ID17060209SL062 02	Deer Creek - tributaries	20.87	Miles
ID17060209SL062 02a	Deer Creek - source to WF Deer Creek	26.9	Miles
ID17060209SL062_03	Deer Creek - downstream of waterfall to mouth	6.79	Miles
ID17060209SL063 03	Eagle Creek - source to mouth	6.15	Miles
ID17060209SL064 02	China Creek - source to Banks Creek	21.87	Miles
ID17060209SL064_03	China Creek - source to mouth	1.83	Miles

17060210 Little Salmon

ID17060210SL001 02	Little Salmon River - 1st and 2nd order below Round Valley	98.53	Miles
ID17060210SL001 02a	Indian Creek - entire drainage	2.45	Miles
ID17060210SL001 03	Squaw Creek - 3rd order	5.61	Miles
ID17060210SL002_02	Rapid River and tributaries - 1st and 2nd order	77.03	Miles
ID17060210SL002 02a	Shingle Creek - mainstem 1st order headwaters	6.09	Miles
ID17060210SL002 03	Rapid River and Lake Fork - 3rd order	12.52	Miles
ID17060210SL002_03a	Shingle Creek - 3rd order (South Fork to mouth)	0.91	Miles
ID17060210SL002_04	Rapid River - 4th order	6.55	Miles
ID17060210SL002 0L	Black Lake	25.82	Acres
ID17060210SL003 02	WF Rapid River and tributaries - 1st and 2nd order	32.79	Miles
ID17060210SL003_03	West Fork Rapid River - 3rd order (Bridge Creek to mouth)	2.47	Miles
ID17060210SL004 02	Paradise Creek - entire drainage	6.86	Miles
ID17060210SL005 02	Boulder Creek - 1st and 2nd order	45.28	Miles

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Salmon

ID17060210SL005 03	Boulder Creek - 3rd order	7.3	Miles
ID17060210SL006 02	Round Valley Creek - 1st and 2nd order	18.85	Miles
ID17060210SL006_03	Round Valley Creek - 3rd order (Brush Creek to mouth)	1.87	Miles
ID17060210SL007_02	Little Salmon River - Meadow Valley tributaries	53.62	Miles
ID17060210SL007 02a	Little Salmon River, Vick and Mill Creeks- 1st and 2nd order	18.86	Miles
ID17060210SL007_03	Little Salmon River - 3rd order	1.18	Miles
ID17060210SL008_02	Mud and Little Mud Creeks - 1st and 2nd order	35.43	Miles
ID17060210SL009_02	Big Creek - upper 1st and 2nd order (forested)	30.66	Miles
ID17060210SL010 02	Goose Creek - 1st and 2nd order	54.95	Miles
ID17060210SL010_02L	Fish Lake	12.32	Acres
ID17060210SL010_03	Goose and Little Goose Creeks - 3rd order sections	8.34	Miles
ID17060210SL011_02	Brundage Reservoir tributaries - 1st and 2nd order	3.79	Miles
ID17060210SL011L 0L	Brundage Reservoir	216	Acres
ID17060210SL012 02	Goose Creek - 1st and 2nd order above Goose Lake	6.16	Miles
ID17060210SL012L_0L	Goose Lake	366.11	Acres
ID17060210SL013 02	Sixmile Creek - entire drainage	10.48	Miles
ID17060210SL014 02	Hazard Creek and tributaries - 1st and 2nd order	42.89	Miles
ID17060210SL014_02L	Hazard Lakes	244.4	Acres
ID17060210SL014_03	Hazard Creek - 3rd order	7.21	Miles
ID17060210SL014_04	Hazard Creek - Hard Creek to mouth	0.88	Miles
ID17060210SL015 02	Hard Creek and tributaries - 1st and 2nd order	33.69	Miles
ID17060210SL015_03	Hard Creek - 3rd order	10.01	Miles
ID17060210SL016_02	Elk and Little Elk Creeks - 1st and 2nd Order	13.29	Miles
ID17060210SL016 02a	Elk Creek - roadless boundary to Little Elk Creek	3.18	Miles
ID17060210SL016 03	Elk Creek - Little Elk Creek to mouth	0.98	Miles

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Southwest

17050101 C. J. Strike Reservoir

ID17050101SW002 02	Bruneau Sand Dunes Lake	0.06	Miles
ID17050101SW002_0L	Bruneau Sand Dunes Lake	37.47	Acres
ID17050101SW003_02	Browns Creek - lower 1st and 2nd order	31.64	Miles
ID17050101SW010 02	King Hill Creek - 1st and 2nd order	46.88	Miles
ID17050101SW013_02	Alkali Creek - 1st & 2nd order	28.54	Miles
ID17050101SW013_03	Alkali Creek - 3rd order section	4.96	Miles
ID17050101SW014_02	Cold Springs Creek - 1st and 2nd order	24.96	Miles
ID17050101SW015 02	Ryegrass Creek - entire watershed	28.28	Miles
ID17050101SW016 02	Bennett Creek - 1st and 2nd order	53.05	Miles
ID17050101SW016_03	Bennett Creek - 3rd order	29.35	Miles
ID17050101SW017 02	Hot Springs Creek - 1st and 2nd order above reservoir	18.69	Miles
ID17050101SW018 02	Dive Creek - 1st and 2nd order	4.3	Miles
ID17050101SW019_02	Rattlesnake Creek below Mountain Home Reservoir	38.36	Miles
ID17050101SW020L_0L	Mountain Home Reservoir	405	Acres
ID17050101SW021_02	Canyon Creek-1st and 2nd order tribs below Fraiser Reservoir	10.55	Miles
ID17050101SW023 04	Canyon Creek - 4th order (Syrup Creek to Fraiser Reservoir)	21.43	Miles
ID17050101SW024_02	Long Tom Creek - 1st and 2nd order	37.88	Miles
ID17050101SW025_02	Syrup Creek and tributaries - 1st and 2nd order	32.35	Miles
ID17050101SW025 03	Syrup Creek - 3rd order (Cottonwood Creek to Long Tom Creek)	5.77	Miles
ID17050101SW026 03	Squaw and Mud Springs Creeks - 3rd order	10.26	Miles

17050102 Bruneau

ID17050102SW003_04	Little Jacks Creek - 4th order section	22.37	Miles
ID17050102SW004 03	Big Jacks Creek -3rd order	21.13	Miles
ID17050102SW004 04	Big Jacks Creek - 4th order (Dry Canyon to Duncan Creek)	7.36	Miles
ID17050102SW005_02	Cottonwood Creek - entire drainage	20.07	Miles
ID17050102SW006_02	Duncan Creek - 1st and 2nd order	38.06	Miles
ID17050102SW006 03	Duncan Creek - 3rd order (Zeno Canyon to Big Jacks Creek)	5.42	Miles
ID17050102SW007 02	Wickahoney Creek - 1st and 2nd order	87.93	Miles
ID17050102SW007_03	Wickahoney Creek - 3rd order	3.54	Miles
ID17050102SW007 04	Wickahoney Creek - 4th order	3.63	Miles

Southwest

ID17050102SW010 02	Hot Creek - 1st and 2nd order	37.19	Miles
ID17050102SW010 03	Hot Creek - 3rd order	12.82	Miles
ID17050102SW011_06	Bruneau River - Clover Creek to Hot Creek	18.22	Miles
ID17050102SW013_05	Bruneau River - Jarbidge River to Sheep Creek	13.57	Miles
ID17050102SW013 06	Bruneau River - Sheep Creek to Clover Creek	8.71	Miles
ID17050102SW014_03	Sheep Creek - 3rd order	14.2	Miles
ID17050102SW014_05	Sheep Creek - 5th order	22.23	Miles
ID17050102SW015_03	Louse and Crab Creeks - 3rd order sections	24.08	Miles
ID17050102SW016 02	Marys Creek and Tributaries - 1st and 2nd order	105.84	Miles
ID17050102SW017_03	Bull Creek - 3rd order (West Fork Bull Creek to mouth)	11.43	Miles
ID17050102SW020_05	Bruneau River - Idaho/Nevada border to Jarbidge River	28.37	Miles
ID17050102SW021_02	Columbet and Rattlesnake Creeks - entire drainages	67.99	Miles
ID17050102SW021 03	Jarbidge River and Buck Creek - 3rd order	2.03	Miles
ID17050102SW021 04	Jarbidge River - 4th order downstream of Buck Creek	32.79	Miles
ID17050102SW024_03	East Fork Jarbidge River - Idaho/Nevada border to mouth	4.93	Miles
ID17050102SW030 03	Big Flat Creek - 3rd order	11.48	Miles
ID17050102SW032 02	Cherry Creek - Idaho/Nevada border to mouth	13.84	Miles
ID17050102SW033_03	Deer Creek - 3rd order	5.23	Miles
ID17050102SW034_02	Deadwood Creek - 1st and 2nd order	28.59	Miles

17050103 Middle Snake-Succor

ID17050103SW006 02	Snake River - 1st & 2nd order between Corder Cr. & Marsing	187.66	Miles
ID17050103SW007 02	Squaw Creek - 1st & 2nd order	67.65	Miles
ID17050103SW007_03	Squaw Creek - 3rd order	12.08	Miles
ID17050103SW009 02	Reynolds Creek - 1st and 2nd order	172.97	Miles
ID17050103SW011 02	Rabbit Creek (south side of Snake River)- 1st and 2nd order	117.54	Miles
ID17050103SW012_03	Sinker Creek - 3rd order	9.19	Miles
ID17050103SW024_02	Shoofly & Poison Creeks - 1st and 2nd order	130.13	Miles
ID17050103SW024 04	Shoofly Creek - 4th order (West Fork to Snake River)	19.99	Miles
ID17050103SW025 03	Corder Creek - 3rd order	9.07	Miles

17050104 Upper Owyhee

ID17050104SW001 06	Owyhee River - 6th order (Juniper Creek to SF Owyhee River)	51.21	Miles

ID17050104SW006 06	Owyhee River - Blue Creek to Juniper Creek	7.86	Miles
ID17050104SW014 02	Shoofly Creek & Tributaries - 1st & 2nd order	53.43	Miles
ID17050104SW014_03	Shoofly Creek - 3rd order	12.14	Miles
ID17050104SW014_04	Shoofly Creek - 4th order	13.9	Miles
ID17050104SW025 02	Big Springs Creek - 1st and 2nd	36.91	Miles
ID17050104SW026_02	Deep Creek - 1st and 2nd order rangeland tributaries	158.22	Miles
ID17050104SW026_03a	Deep Creek - 3rd order forested tributaries	8.59	Miles
ID17050104SW027_02	Dickshooter Creek - 1st and 2nd order	107.86	Miles
ID17050104SW027 04	Dickshooter Creek - 4th order	14.46	Miles

17050107 Middle Owyhee

ID17050107SW005_03	Pole Creek - 3rd order	1.46	Miles
ID17050107SW006 02	Squaw Creek and tributaries - 1st and 2nd order	52.37	Miles
ID17050107SW006 03	Squaw Creek - 3rd order	8.58	Miles

17050108 Jordan

ID17050108SW003_02	Williams Creek - 1st and 2nd order	20.33	Miles
ID17050108SW003_03	Williams Creek - 3rd order (Pole Bridge Creek to mouth)	2.23	Miles
ID17050108SW005_02	Old Man, Coyote, Howl and parts of South Mountain Creeks	44.56	Miles
ID17050108SW005_03	South Mountain Creek - 3rd order	4.57	Miles
ID17050108SW005_05	Big Boulder Creek - South Boulder Creek to Jordan Creek	7.63	Miles
ID17050108SW006 03	South Boulder and Indian Creeks - 3rd order sections	8.42	Miles
ID17050108SW006 04	South Boulder Creek - 4th order (Indian Creek to mouth)	3.11	Miles
ID17050108SW007 03	North Boulder Creek - 3rd order (Mammoth Creek to mouth)	2.31	Miles
ID17050108SW007_05	Big Boulder Creek (North Boulder to South Boulder Creeks)	3.86	Miles
ID17050108SW009 02	Combination Creek - entire drainage	12.33	Miles
ID17050108SW010 03	Rock Creek - 3rd order below Triangle Reservoir	5.06	Miles
ID17050108SW011_02	Rose Creek - entire drainage	13.61	Miles
ID17050108SW012_04	Josephine Creek - 4th order (Wickiup Creek to mouth)	8.35	Miles
ID17050108SW017 02	Flint and East Creeks - 1st and 2nd order	18.63	Miles
ID17050108SW017 03	Flint Creek - 3rd order (East Creek to mouth)	4.35	Miles
ID17050108SW018_02	Louse Creek - 1st and 2nd order	20.55	Miles
ID17050108SW018 03	Louse Creek - 3rd order (Sullivan Gulch to mouth)	5.49	Miles

ID17050108SW019 03	Trout Creek - 3rd order	7.77	Miles
ID17050108SW021 04	Cow Creek - 4th order	4.32	Miles

17050111 North and Middle Forks Boise

ID17050111SW001_02	MF Boise River - 1st and 2nd order forested tributaries	198.97	Miles
ID17050111SW001 02a	MF Boise River: 1st and 2nd order rangeland tributaries	11.19	Miles
ID17050111SW001_03	MF Boise River, Swanholm and Lost Man Creeks: 3rd order	18.52	Miles
ID17050111SW001_04	Middle Fork Boise River - 4th order	34.12	Miles
ID17050111SW002_02	East Fork Roaring River - 1st and 2nd order	30.79	Miles
ID17050111SW002 02L	Roaring River Lakes	16.98	Acres
ID17050111SW002 03	Roaring River and EF Roaring River - 3rd order sections	8.29	Miles
ID17050111SW003_02	Hot Creek - entire drainage	8.08	Miles
ID17050111SW004 02	Yuba River - 1st and 2nd order	32.89	Miles
ID17050111SW004 03	Yuba River and Corbus Creek - 3rd order sections	3.45	Miles
ID17050111SW004_04	Yuba River - 4th order section	2.86	Miles
ID17050111SW005_02	Decker Creek - 1st and 2nd order	24.34	Miles
ID17050111SW005_03	Decker Creek - 3rd order	1.15	Miles
ID17050111SW006 02	Queens River and China Fork - 1st and 2nd order	33.67	Miles
ID17050111SW006_03	Queens River - 3rd order section	2.18	Miles
ID17050111SW007_02	Little Queens River & tributaries - 1st and 2nd order	23.21	Miles
ID17050111SW007 03	Little Queens River - 3rd order (Right Creek to mouth)	1.01	Miles
ID17050111SW008 02	Black Warrior Creek & tributaries - 1st and 2nd order	20.33	Miles
ID17050111SW008 03	Black Warrior Creek - 3rd order	2.38	Miles
ID17050111SW009_02	Browns Creek - 1st and 2nd order	11.48	Miles
ID17050111SW009 03	Browns Creek - 3rd order	1.57	Miles
ID17050111SW010 02	NF Boise River and Trail Creek - 1st and 2nd order	149.02	Miles
ID17050111SW010_03	NF Boise River and Trail Creek - 3rd order sections	8.77	Miles
ID17050111SW010_04	North Fork Boise River - 4th order	17.59	Miles
ID17050111SW010 05	North Fork Boise River - 5th order	18.44	Miles
ID17050111SW011 02	Johnson Creek & tributaries - 1st and 2nd order	27.25	Miles
ID17050111SW011_03	Johnson Creek - 3rd order (Grouse Creek to mouth)	4.01	Miles
ID17050111SW012 02	Bear River and tributaries: 1st and 2nd order sections	39.19	Miles
ID17050111SW012 03	Bear River - 3rd order section	8.18	Miles

ID17050111SW013 02	Big and Little Owl Creeks - entire drainage	12.07	Miles
ID17050111SW014 02	Crooked River, Pikes Fk, and Beaver Creek- 1st and 2nd order	125.45	Miles
ID17050111SW014_03	Crooked River, Pikes Fork and Beaver Creek - 3rd order	3.86	Miles
ID17050111SW014_04	Crooked River - 4th order	12.91	Miles
ID17050111SW015 02	Rabbit Creek & tributaries - 1st and 2nd order	34.35	Miles
ID17050111SW015_03	Rabbit Creek - 3rd order	6.4	Miles
ID17050111SW016_02	Meadow Creek - 1st and 2nd order	7.28	Miles
ID17050111SW017_02	French Creek - entire watershed	10.84	Miles

17050112 Boise-Mores

ID17050112SW001L 0L	Lucky Peak Reservoir	2765.19	Acres
ID17050112SW002L_0L	Arrowrock Reservoir (not including SF Boise River arm)	2177.76	Acres
ID17050112SW003 02	Grouse Creek - 1st and 2nd order	13.05	Miles
ID17050112SW004 02	Birch, Badger, Haga, and Alder Creeks	38.09	Miles
ID17050112SW005_02	Sheep Creek - 1st and 2nd order	41.58	Miles
ID17050112SW005_03	Sheep and SF Sheep Creeks - 3rd order	6.95	Miles
ID17050112SW005_04	Sheep Creek - 4th order (South Fork Sheep Creek to mouth)	1.32	Miles
ID17050112SW006 02	Brown Creek - 1st and 2nd order	4.21	Miles
ID17050112SW007_02	Cottonwood Creek and tributaries - 1st and 2nd order	27.7	Miles
ID17050112SW007_03	Cottonwood Creek - 3rd order (North Fork to mouth)	2.74	Miles
ID17050112SW011 02	Thorn Creek - 1st and 2nd order	29.63	Miles
ID17050112SW012 02	Elk Creek and tributaries - 1st and 2nd order	44.55	Miles
ID17050112SW012 03	Elk Creek - 3rd order (Ross Fork to mouth)	11.18	Miles
ID17050112SW014_02	Granite Creek - 1st and 2nd order	65.8	Miles
ID17050112SW014 03	Granite, Woof, and Clear Creeks - 3rd order sections	3.23	Miles
ID17050112SW016 02	Daggett Creek and tributaries - 1st & 2nd order	13.8	Miles
ID17050112SW017_02	Robie Creek and tributaries - 1st and 2nd order	17.79	Miles
ID17050112SW017_03	Robie Creek - 3rd order (Karney Creek to mouth)	4.55	Miles

17050113 South Fork Boise

ID17050113SW001 03	Rattlesnake Creek - 3rd order	0.87	Miles
ID17050113SW001_06	SF Boise River (tiny segment above Arrowrock)	0.55	Miles
ID17050113SW001L 0L	Arrowrock Reservoir (South Fork Boise River arm)	821.09	Acres

ID17050113SW002a 03	Willow Creek - 3rd order below Cottonwood Creek	7.43	Miles
ID17050113SW002a 04	Willow Creek - 4th order	0.93	Miles
ID17050113SW002b_02	Willow Creek and tributaries - 1st and 2nd order	31.94	Miles
ID17050113SW002b_03	Willow Creek - 3rd order above Cottonwood Creek	5.28	Miles
ID17050113SW003 02	Wood Creek - 1st and 2nd order	29.12	Miles
ID17050113SW003_03	Wood Creek - 3rd order (Deadman Creek to Willow Creek)	2.02	Miles
ID17050113SW004_02	SF Boise River (Anderson Dam to Arrowrock) - 1st & 2nd order	153.36	Miles
ID17050113SW004_06	South Fork Boise River - Anderson Dam to Arrowrock Reservoir	31.53	Miles
ID17050113SW005 02	Tributaries to Anderson Ranch Reservoir - 1st and 2nd order	81.32	Miles
ID17050113SW005_03	Castle Creek - 3rd order	1.39	Miles
ID17050113SW007_02	Cat Creek - 1st and 2nd order	23.79	Miles
ID17050113SW007_03	Cat Creek - 3rd order (Buck Creek to mouth)	3.1	Miles
ID17050113SW008 02	Little Camas Creek - 1st and 2nd order above Reservoir	25.78	Miles
ID17050113SW008 03	Little Camas Creek - 3rd order above Little Camas Reservoir	4.31	Miles
ID17050113SW010_02	Lime and North Fork Lime Creeks - 1st and 2nd order	99.17	Miles
ID17050113SW010 02a	Moores Creek - 1st and 2nd order	45.18	Miles
ID17050113SW010 03	North and Middle Fork Lime Creeks - 3rd order sections	9.62	Miles
ID17050113SW010_04	Lime Creek - 4th order (NF Lime Creek to Moores Creek)	7.13	Miles
ID17050113SW010_04a	Moores Creek - 4th order (Big Springs Creek to mouth)	2.69	Miles
ID17050113SW011_02	South Fork Lime Creek - 1st and 2nd order	70.94	Miles
ID17050113SW011 03	South Fork Lime Creek - 3rd order	9.38	Miles
ID17050113SW012_02	Deer Creek - 1st and 2nd order	24.83	Miles
ID17050113SW012_03	Deer Creek - 3rd order	1.28	Miles
ID17050113SW013 02	South Fork Boise River - 1st and 2nd order	69.4	Miles
ID17050113SW013 05	SF Boise River - Willow Creek to Anderson Ranch Reservoir	22.03	Miles
ID17050113SW014 02	Grouse Creek - 1st and 2nd order	17.63	Miles
ID17050113SW015_02	SF Boise River - 1st and 2nd order tribs,Willow to Big Smoky	60.99	Miles
ID17050113SW015 03	Kelley Creek - 3rd order (EF Kelley Creek to SF Boise River)	0.64	Miles
ID17050113SW016_02	Beaver Creek - entire drainage	9.55	Miles
ID17050113SW017_02	Boardman Creek - 1st and 2nd order	19.75	Miles
ID17050113SW017_03	Boardman Creek - 3rd order (Smoky Dome Canyon to mouth)	5	Miles
ID17050113SW018 02	Little Smoky Creek - 1st and 2nd order	136.5	Miles

ID17050113SW018 04	Little Smoky Creek - 4th order (Grindstone to Big Smoky Cr.)	9.56	Miles
ID17050113SW018 05	Big Smoky Creek - 5th order (Little Smoky to SF Boise River)	2.84	Miles
ID17050113SW019_02	Big Smoky Creek - 1st and 2nd order except Paradise Creek	117.57	Miles
ID17050113SW019_04	Big Smoky Creek - 4th order	15.79	Miles
ID17050113SW020 02	Paradise Creek - entire drainage	14.39	Miles
ID17050113SW021_02	South Fork Boise River - 1st and 2nd order	72.4	Miles
ID17050113SW021_03	South Fork Boise River - 3rd order	2.95	Miles
ID17050113SW021_04	South Fork Boise River - 4th order	15	Miles
ID17050113SW022 03	Johnson Creek - 3rd order	5.54	Miles
ID17050113SW023_02	Ross Fork - 1st and 2nd order	31.3	Miles
ID17050113SW023_03	Ross Fork - 3rd order (SF Ross Creek to SF Boise River)	3.7	Miles
ID17050113SW024_02	Skeleton Creek - 1st and 2nd order	27.18	Miles
ID17050113SW024 03	Skeleton Creek - 3rd order (East Fork to mouth)	6.01	Miles
ID17050113SW025 02	Willow Creek and tributaries - 1st and 2nd order	22.8	Miles
ID17050113SW025_03	Willow Creek - 3rd order (Haypress Creek to mouth)	5.62	Miles
ID17050113SW026 02	Shake Creek - entire drainage	12.18	Miles
ID17050113SW027 02	Feather River - 1st and 2nd order	80.45	Miles
ID17050113SW027_03	Elk Creek and Feather River - 3rd order sections	4.28	Miles
ID17050113SW027_04	Feather River - 4th order (Elk Creek to mouth)	6.01	Miles
ID17050113SW028_02	Trinity Creek and tributaries - 1st and 2nd order	50.02	Miles
ID17050113SW028 02L	Big Trinity Lake	25.5	Acres
ID17050113SW028_03	Parks and Trinity Creeks - 3rd order	0.8	Miles
ID17050113SW028_04	Trinity Creek - 4th order (Parks Creek to mouth)	4.76	Miles
ID17050113SW029 02	Green Creek - entire drainage	7.27	Miles
ID17050113SW030 02	Dog Creek - entire drainage	11.13	Miles
ID17050113SW031 02	Fall Creek - 1st and 2nd order tributaries	84.26	Miles
ID17050113SW031_03	Fall and Tally Creeks - 3rd order sections	4.81	Miles
ID17050113SW031 04	Fall Creek - 4th order (Tally Creek to mouth)	4.99	Miles
ID17050113SW033_02	Rattlesnake Creek and tributaries - 1st and 2nd order	42.05	Miles
ID17050113SW033_03	Rattlesnake Creek - 3rd order	10.88	Miles

17050114 Lower Boise

ID17050114SW003b 02	Indian Creek Tribs - Indian Creek Res. to New York Canal	202.09	Miles

ID17050114SW003b 04	Indian Creek- Indian Creek Reservoir to New York Canal	20.64	Miles
ID17050114SW013 02	Dry Creek - 1st and 2nd order	69.15	Miles
ID17050114SW013_03	Dry, Currant and Spring Valley Creeks - 3rd order sections	10.09	Miles

17050115 Middle Snake-Payette

ID17050115SW003 02	Ashlock Gulch - 1st and 2nd order	13.19	Miles

17050120 South Fork Payette

ID17050120SW001_02a	SF Payette River - 1st and 2nd order - Lowman to Grandjean	110.14	Miles
ID17050120SW001_03	South Fork Payette River - 3rd order	5.19	Miles
ID17050120SW001 04	South Fork Payette River - 4th order	36.9	Miles
ID17050120SW002 02	Rock Creek - 1st and 2nd order	25.67	Miles
ID17050120SW002 03	Rock Creek - 3rd order	0.91	Miles
ID17050120SW003 02	Tenmile Creek - entire drainage	35.76	Miles
ID17050120SW004 02	Wapiti Creek - entire drainage	14.63	Miles
ID17050120SW005 02	SF Payette R - 1st and 2nd order above and inc. Trail Cr.	58.25	Miles
ID17050120SW005_04	South Fork Payette River - Baron Creek to Trail Creek	0.73	Miles
ID17050120SW008_02	Bear Creek - entire watershed	5.47	Miles
ID17050120SW009_02	Canyon Creek - 1st and 2nd order	28.79	Miles
ID17050120SW009_03	Canyon Creek - 3rd order	6.51	Miles
ID17050120SW010_02	Warm Spring Creek - 1st and 2nd order	53.44	Miles
ID17050120SW010 02L	Bull Trout Lakes	72.99	Acres
ID17050120SW010 03	Warm Spring and Gates Creeks - 3rd order	12.95	Miles
ID17050120SW011 02	Eightmile and EF Eightmile Creeks - 1st and 2nd order	30.3	Miles
ID17050120SW011_03	Eightmile Creek - 3rd order (East Fork to mouth)	1.25	Miles
ID17050120SW012 02	Fivemile Creek - entire watershed	13.61	Miles
ID17050120SW013 02	Clear Creek and tributaries - 1st and 2nd order	64.23	Miles
ID17050120SW013_03	Clear Creek - 3rd order (South Fork Clear Creek to mouth)	17.03	Miles
ID17050120SW014_02	Deadwood River - 1st and 2nd order below Deadwood Dam	76.14	Miles
ID17050120SW014 04	Deadwood River - Deadwood Reservoir Dam to mouth	23.02	Miles
ID17050120SW015 02	Whitehawk and NF Whitehawk Creeks - 1st and 2nd order	19.49	Miles
ID17050120SW015_03	Whitehawk Creek - 3rd order	3.18	Miles
ID17050120SW016 02	Warm Springs Cr. and tributaries - 1st and 2nd order	20.46	Miles

ID17050120SW016 03	Warm Springs Creek - 3rd order	1.23	Miles
ID17050120SW017 02	Wilson Creek - entire watershed	11.85	Miles
ID17050120SW018_02	Deadwood Reservoir - 1st & 2nd order tributaries	51.07	Miles
ID17050120SW018L_0L	Deadwood Reservoir	3014.93	Acres
ID17050120SW019 02	Deadwood River - 1st and 2nd order above the Reservoir	54.67	Miles
ID17050120SW019_03	Deadwood River above Deadwood Dam - 3rd order	16.75	Miles
ID17050120SW020_02	Scott Creek - entire drainage	19.35	Miles
ID17050120SW021_02	Big Pine Creek - 1st and 2nd order tributaries	20.74	Miles
ID17050120SW021 03	Big Pine Creek - 3rd order (East Fork to mouth)	2.09	Miles

17050121 Middle Fork Payette

ID17050121SW001_02	Middle Fork Payette River - 1st and 2nd order	48.64	Miles
ID17050121SW002 02	Anderson Creek and tributaries - 1st and 2nd order	38.36	Miles
ID17050121SW002 03	Anderson Creek - 3rd order section	10	Miles
ID17050121SW003_02	Lightning Creek - 1st and 2nd order	23.17	Miles
ID17050121SW003_03	Lightning Creek - 3rd order	8.29	Miles
ID17050121SW004_02	Big Bulldog Creek - entire watershed	19.64	Miles
ID17050121SW005 02	Upper MF Payette River - 1st and 2nd order	122.02	Miles
ID17050121SW006_02	Rattlesnake Creek - entire drainage	9.81	Miles
ID17050121SW007_03	Silver Creek - 3rd order (Peace Creek to mouth)	6.25	Miles
ID17050121SW008 02	Peace and Valley Creek - 1st and 2nd order sections	13.61	Miles
ID17050121SW008 03	Peace Creek - 3rd order (Valley Creek to mouth)	1.13	Miles
ID17050121SW009 02	Bull and Sixteen-to-One Creeks - 1st and 2nd order	41.6	Miles
ID17050121SW010_02	Scriver Creek and tributaries - 1st and 2nd order	35.36	Miles
ID17050121SW010 03	Scriver Creek - 3rd order (West Fork to mouth)	6.08	Miles

17050122 Payette

ID17050122SW002_06	Black Canyon Reservoir	1028.87	Acres
ID17050122SW003_02	Payette River - 1st and 2nd order rangeland tributaries	89.78	Miles
ID17050122SW003 06	Payette River - NF/SF Confluence to Black Canyon Reservoir	38.11	Miles
ID17050122SW004 03	Shafer Creek - 3rd order (Bogus Creek to Harris Creek)	9.49	Miles
ID17050122SW004_04	Shafer Creek - 4th order (Harris Creek to mouth)	3.71	Miles
ID17050122SW005 02	Harris Creek - 1st and 2nd order	33.95	Miles

ID17050122SW005 03	Harris Creek - 3rd order (Shoemaker Creek to Shafer Creek)	6.32	Miles
ID17050122SW008 05	Payette River - Middle Fork to North Fork	7.59	Miles
ID17050122SW009_02	Deer Creek - entire drainage	20.42	Miles
ID17050122SW010_02	Squaw Creek - 1st and 2nd order forested	47.62	Miles
ID17050122SW010 02a	Squaw Creek -1st and 2nd order rangeland	137.58	Miles
ID17050122SW010_03	Squaw, Third Fork Squaw and Coon Creeks - 3rd order	19.09	Miles
ID17050122SW010_04	Squaw Creek - 4th order	24.61	Miles
ID17050122SW010_05	Squaw Creek - 5th order	24.24	Miles
ID17050122SW011 02	Little Squaw Creek - 1st and 2nd order, except Soldier Creek	53.78	Miles
ID17050122SW011_04	Little Squaw Creek - 4th order (Soldier Creek to mouth)	1.71	Miles
ID17050122SW012_02	Soldier Creek - 1st and 2nd order	20.5	Miles
ID17050122SW013_02	Pine Creek - 1st and 2nd order	34.25	Miles
ID17050122SW013 03	Pine Creek - 3rd order (between Cottonwood and Squaw Creeks)	2.65	Miles
ID17050122SW014 02	Second Fork Squaw Creek - 1st and 2nd order	42.46	Miles
ID17050122SW014_02L	Sage Hen Reservoir	176.79	Acres
ID17050122SW014 03	Second Fork Squaw Creek - 3rd order section	8.43	Miles
ID17050122SW015 03	Bissel Creek - upper 3rd order	5.7	Miles
ID17050122SW020L_0L	Paddock Valley Reservoir	1190.37	Acres

17050123 North Fork Payette

ID17050123SW001 02	North Fork Payette River - 1st and 2nd order	141.06	Miles
ID17050123SW001 02L	Blue Lake	12.98	Acres
ID17050123SW003 01L	East Mountain Reservoir	18.33	Acres
ID17050123SW003_02L	Herrick Reservoir	39.7	Acres
ID17050123SW004 02	Big Creek - 1st and 2nd order	61.14	Miles
ID17050123SW004 03	Big Creek - upper 3rd order (Snag Creek to Horsethief Creek)	8.72	Miles
ID17050123SW005_02	Horsethief Creek- entire drainage above Horsethief Reservoir	3.47	Miles
ID17050123SW005_02L	Horsethief Reservoir	248.8	Acres
ID17050123SW006 0L	Smalley Reservoir	14.73	Acres
ID17050123SW008 02	Gold Fork - 1st and 2nd order	64.32	Miles
ID17050123SW008_03	NF and SF Gold Fork - 3rd order sections	3.3	Miles
ID17050123SW008 04	Gold Fork - North Fork to Kenally Creek	5.52	Miles
ID17050123SW009 02	Flat Creek - entire drainage	10.19	Miles

ID17050123SW010 02L	Rapid Creek Lakes	21.79	Acres
ID17050123SW010 03	Kennally and Rapid Creeks - 3rd order	9.25	Miles
ID17050123SW011_01L	Boulder Meadows Reservoir	30.7	Acres
ID17050123SW011_02a	Boulder/Willow Creeks - 1st and 2nd order forested sections	42.52	Miles
ID17050123SW011 0L	Louie Lake and Upper Jug Creek Reservoir	51.3	Acres
ID17050123SW013_02	Little Payette Lake - 1st and 2nd order tributaries	3.58	Miles
ID17050123SW013L_0L	Little Payette Lake	1439.35	Acres
ID17050123SW014_02	Lake Fork above Little Payette Lake - 1st & 2nd tributaries	63.55	Miles
ID17050123SW014 03	Lake Fork - Browns Pond to Little Payette Lake	2.16	Miles
ID17050123SW014_03a	Lake Fork - 3rd order (South Fork to Browns Pond)	2.31	Miles
ID17050123SW016_02	Mill, Duffner, and Williams Creeks - 1st and 2nd order	38.48	Miles
ID17050123SW017_02	Payette Lake - Westside tributaries inc. Deadhorse & Landing	15.22	Miles
ID17050123SW018 01L	Pearl Lake	8.83	Acres
ID17050123SW018 03	North Fork Payette River - 3rd order	11.37	Miles
ID17050123SW019_02	Upper Payette Lake tributaries - Cougar and Camp Creeks	6.62	Miles
ID17050123SW019L 0L	Upper Payette Lake	301.62	Acres
ID17050123SW020 02	Twentymile Creek - 1st and 2nd order	10.74	Miles
ID17050123SW020_03	Twentymile Creek - 3rd order	3.14	Miles
ID17050123SW021_02	NF Payette River above Upper Payette Lake - entire drainage	18.35	Miles
ID17050123SW022_01L	Granite Lake	187.73	Acres
ID17050123SW022 02	Fisher Creek - 1st and 2nd order	22.43	Miles

17050124 Weiser

ID17050124SW004L_0L	Crane Creek Reservoir	2315.68	Acres
ID17050124SW007 02	Weiser River - 1st and 2nd order (upstream of Keithly Creek)	210.22	Miles
ID17050124SW007 03	Weiser River - 3rd order (Price Valley to East Fork)	16.9	Miles
ID17050124SW007_04	Weiser River - East Fork to West Fork	8.43	Miles
ID17050124SW007_04a	Weiser River - West Fork to Hornet Creek	7.87	Miles
ID17050124SW008 02	Little Weiser River tributaries - 1st and 2nd order	79.8	Miles
ID17050124SW008 03a	Little Weiser River - upper 3rd order (forested)	6.53	Miles
ID17050124SW009_02L	Ben Ross Reservoir	291.57	Acres
ID17050124SW011 02	Anderson Creek - entire drainage	16.22	Miles
ID17050124SW014 02	Middle Fork Weiser River - 1st and 2nd order	79.94	Miles

ID17050124SW014 03a	Middle Fork Weiser River - upper 3rd order (forested)	11.98	Miles
ID17050124SW015 02	Cottonwood Creek - 1st and 2nd order	18.18	Miles
ID17050124SW015_03	Cottonwood Creek - 3rd order (North Fork to mouth)	7.36	Miles
ID17050124SW016_02	East Fork Weiser River - 1st and 2nd order	32.08	Miles
ID17050124SW016 03	East Fork Weiser River - Fourth Gulch to Weiser River	2.29	Miles
ID17050124SW017_02	West Fork Weiser River - 1st and 2nd order except Lost Creek	37.36	Miles
ID17050124SW017_03	West Fork Weiser River - 3rd order (Corral Creek to mouth)	12.76	Miles
ID17050124SW018_02	Lost Creek - Lost Valley Reservoir Dam to mouth	14.94	Miles
ID17050124SW019 02L	Lost Valley Reservoir	522.48	Acres
ID17050124SW020_02	Lost Creek - entire drainage above Lost Valley Reservoir	26.18	Miles
ID17050124SW021_02	Hornet Creek - 1st and 2nd order	96.44	Miles
ID17050124SW021_03	Hornet and North Fork Hornet Creeks - 3rd order	10.94	Miles
ID17050124SW021 04	Hornet Creek - 4th order (North Fork to Weiser River)	7.88	Miles
ID17050124SW022 02	Johnson Creek - 1st & 2nd order	16.53	Miles
ID17050124SW022_03	Johnson Creek - 3rd order (Orchid Canyon to mouth)	6.21	Miles
ID17050124SW023 02	Goodrich Creek - entire drainage	20.26	Miles
ID17050124SW024 02	Cow Creek - entire drainage	14.46	Miles
ID17050124SW025_02	Rush Creek and Beaver Creeks - 1st and 2nd order	36.07	Miles
ID17050124SW027_02	Pine Creek - 1st and 2nd order	81.99	Miles
ID17050124SW027_03	Pine Creek - 3rd order	14.67	Miles
ID17050124SW027 04	Pine Creek - 4th order (West Pine Creek to Weiser River)	3.77	Miles
ID17050124SW028_02	Keithly Creek & tributaries - 1st and 2nd order	61.87	Miles
ID17050124SW031_03	Mann Creek - lower 3rd order	0.62	Miles
ID17050124SW031L 0L	Mann Creek Reservoir	269.34	Acres
ID17050124SW032 02	Mann Creek - 1st and 2nd order above Mann Creek Reservoir	57.21	Miles
ID17050124SW032 03	Mann Creek - 3rd order above Mann Creek Reservoir	10.13	Miles
ID17050124SW033_02	Monroe Creek - 1st and 2nd order	58.37	Miles

17050201 Brownlee Reservoir

ID17050201SW001 02	Tributaries to Snake River - 1st and 2nd order	33.62	Miles
ID17050201SW009_02	Grouse Creek - 1st and 2nd order	14.5	Miles
ID17050201SW010 04	Rock Creek - 4th order	4.83	Miles
ID17050201SW011 03	Wolf Creek - 3rd order	3.9	Miles

Southwest

ID17050201SW013 02	Sturgill Creek - entire watershed	27.53	Miles
ID17050201SW014 02	Brownlee Creek & tributaries - 1st & 2nd order	64.05	Miles
ID17050201SW014_03	West & Middle Brownlee Creeks - 3rd order sections	4.33	Miles
ID17050201SW014_04	Brownlee Creek - 4th order	2.06	Miles
ID17050201SW017 02	Indian Creek - 1st and 2nd order	45.05	Miles
ID17050201SW017_03	Indian Creek - 3rd order (Huntley Gulch to mouth)	9.31	Miles

Upper Snake

17040104 Palisades

ID17040104SK003 02	Snake River - Fall Creek to Black Canyon Creek	76.05	Miles
ID17040104SK004_02	Pritchard Creek - source to mouth	16.36	Miles
ID17040104SK005_04	Fall Creek - South Fork Fall Creek to mouth	5.81	Miles
ID17040104SK007 02	South Fork Fall Creek - source to mouth	17.48	Miles
ID17040104SK007_03	South Fork Fall Creek - source to mouth	5.07	Miles
ID17040104SK011_02	1st and 2nd order tributaries to Elk Creek and Bear Creek	35.58	Miles
ID17040104SK011_03	Elk Creek - 3rd order	2.26	Miles
ID17040104SK014 03	McCoy Creek - Fish Creek to Palisades Reservoir	1.54	Miles
ID17040104SK014 04	McCoy Creek - Fish Creek to Palisades Reservoir	4.91	Miles
ID17040104SK015_04	McCoy Creek - Iowa Creek to Fish Creek	4.75	Miles
ID17040104SK016 02	McCoy Creek - Clear Creek to Iowa Creek	20.69	Miles
ID17040104SK017 03	Wolverine Creek - source to mouth	1.49	Miles
ID17040104SK018_03	Clear Creek - source to mouth	3.94	Miles
ID17040104SK019_02	McCoy Creek - source to Clear Creek	16.42	Miles
ID17040104SK019_03	McCoy Creek - source to Clear Creek	3.66	Miles
ID17040104SK020 03	Iowa Creek - source to mouth	2.32	Miles
ID17040104SK021_03	Fish Creek - source to mouth	2.57	Miles
ID17040104SK024_03	Indian Creek - Idaho/Wyoming border to Palisades Reservoir	3.6	Miles
ID17040104SK025 04	Big Elk Creek - Idaho/Wyoming border to Palisades Reservoir	4.74	Miles
ID17040104SK027 03	Palisades Creek - source to mouth	16.47	Miles
ID17040104SK028 02	Rainey Creek - source to mouth	89.55	Miles
ID17040104SK029_02	Pine Creek - source to mouth	82.84	Miles
ID17040104SK029 03	Pine Creek - source to mouth	16.17	Miles
ID17040104SK030 02	Black Canyon Creek - source to mouth	7.08	Miles
ID17040104SK031_02	Burnt Canyon Creek - source to mouth	21.13	Miles
ID17040104SK031_03	Burnt Canyon Creek - source to mouth	2.96	Miles

17040105 Salt

ID17040105SK001 02a	King Creek	5.68	Miles
ID17040105SK001_02c	Trout Creek - source to mouth	8.34	Miles
ID17040105SK002 02	Jackknife Creek - source to Idaho/Wyoming border	28.21	Miles

ID17040105SK002 02a	Deep Creek	9.57	Miles
ID17040105SK002 02b	Trail Creek	12.07	Miles
ID17040105SK002_03	Jackknife Creek - source to Idaho/Wyoming border	6.64	Miles
ID17040105SK002_03a	Squaw Creek	3.1	Miles
ID17040105SK002 04	Jackknife Creek - source to Idaho/Wyoming border	4.73	Miles
ID17040105SK003_02b	Whiskey Creek	1.55	Miles
ID17040105SK003_02f	Corral Creek	3.7	Miles
ID17040105SK003_02g	Chicken Creek	1.59	Miles
ID17040105SK003 02h	Marshall Canyon	2.11	Miles
ID17040105SK004_02	South Fork Tincup Creek - source to mouth	12.92	Miles
ID17040105SK004_02a	Brush Creek	3.59	Miles
ID17040105SK004_02b	Crooked Creek	3.37	Miles
ID17040105SK005 02a	Limekiln Creek	4.3	Miles
ID17040105SK005 02b	Toms Canyon	7.19	Miles
ID17040105SK006_02	Stump Creek - 2nd order tribs and North Fork Stump	56.04	Miles
ID17040105SK006 02a	Flat Valley Creek	2.83	Miles
ID17040105SK006 02b	Bechler Creek	5.4	Miles
ID17040105SK006_02d	west fork Boulder Creek	3.18	Miles
ID17040105SK006_02h	Mill Canyon	3.81	Miles
ID17040105SK006_03	Stump Creek - above Diamond Boulder Creek	3.01	Miles
ID17040105SK006 03a	lower Boulder Creek	2.89	Miles
ID17040105SK007_02d	Tygee Creek	18.63	Miles
ID17040105SK007_02e	upper Webster Creek	9.16	Miles
ID17040105SK008 02	Crow Creek - source to Idaho/Wyoming border	64.98	Miles
ID17040105SK008 02b	Clear Creek	4.52	Miles
ID17040105SK008 02d	Crow Creek	6.79	Miles
ID17040105SK008_03a	Wells Canyon	1.16	Miles
ID17040105SK008 03b	Crow Creek	7.47	Miles
ID17040105SK009_02a	upper Sage Creek	5.18	Miles
ID17040105SK010_02a	South Fork Deer Creek	11.7	Miles
ID17040105SK010_02b	North Fork Deer Creek	3.19	Miles
ID17040105SK010 03	Deer Creek - source to mouth	3.17	Miles

Upper Snake

17040202 Upper Henrys

ID17040202SK003 02	Moose Creek - source to confluence with Warm River	10.89	Miles
ID17040202SK004_03	Partridge Creek - source to mouth	6.24	Miles
ID17040202SK006_04	Robinson Creek - Rock Creek to mouth	4.41	Miles
ID17040202SK007 02	Porcupine Creek - source to mouth	16.34	Miles
ID17040202SK008_03	Rock Creek - Wyoming Creek to mouth	7.72	Miles
ID17040202SK010_02	Rock Creek - source to Wyoming Creek	12.15	Miles
ID17040202SK011_03	Robinson Creek - Idaho/Wyoming border and sources west of bo	13.65	Miles
ID17040202SK012 02	Snow Creek - source to mouth	16.54	Miles
ID17040202SK013 02	Fish Creek - source to mouth	24.39	Miles
ID17040202SK014_05	Henrys Fork - Thurman Creek to Warm River	26.57	Miles
ID17040202SK018 02a	Chick Creek	15.94	Miles
ID17040202SK021 02	Henrys Fork-Confluence of Big Springs and Henrys Lake Outlet	18.4	Miles
ID17040202SK022_02	Moose Creek - source to confluence with Henrys Fork	18.98	Miles
ID17040202SK024_02	Thirsty Creek - Idaho/ Wyoming border to mouth	37.73	Miles
ID17040202SK025_04	Henrys Lake Outlet - Henrys Lake Dam to mouth	19.74	Miles
ID17040202SK027 03	Reas Pass Creek - source to sink	1.99	Miles
ID17040202SK028_02	Jones Creek - source to mouth	7.16	Miles
ID17040202SK029_02	Jesse Creek - source to mouth	5.85	Miles
ID17040202SK031 02	Tygee Creek - source to sink	10.57	Miles
ID17040202SK036 02	Duck Creek - source to mouth	14.52	Miles
ID17040202SK040 02	Hotel Creek - source to mouth	21.76	Miles
ID17040202SK040_03	Hotel Creek - source to mouth	3.52	Miles
ID17040202SK041 02	Yale Creek - source to mouth	11.24	Miles
ID17040202SK042 02	Blue Creek - source to mouth	10.67	Miles
ID17040202SK044_02	Icehouse Creek - source to Island Park Reservoir	17.69	Miles
ID17040202SK046_04	Willow Creek - source to mouth	9.98	Miles
ID17040202SK047 02	Myers Creek - source to mouth	20.79	Miles
ID17040202SK048 03	Sheridan Creek -source to Kilgore Road (T13N, R41E, Sec. 07)	3.88	Miles

17040203 Lower Henrys

ID17040203SK005 05	Falls River - Stream order 5 segments	4.89	Miles

ID17040203SK006 04	Conant Creek - Idaho/Wyoming border to Squirrel Creek	6.21	Miles
ID17040203SK008 03	Squirrel Creek - Idaho/Wyoming border to mouth	17.09	Miles
ID17040203SK010_03	Boone Creek - Idaho/Wyoming border to mouth	4.87	Miles
ID17040203SK012_06	Henrys Fork - Ashton Reservoir Dam to Falls River	6.51	Miles

17040204 Teton

ID17040204SK001_05	South Fork Teton River - Teton River Forks to Henrys Fork	32.15	Miles
ID17040204SK008_02	Canyon Creek - Warm Creek to mouth	120.72	Miles
ID17040204SK008_04	Canyon Creek - Warm Creek to mouth	11.25	Miles
ID17040204SK013 02	Milk Creek - source to mouth	42.93	Miles
ID17040204SK022 02	Horseshoe Creek - source to pipeline diversion	15.3	Miles
ID17040204SK022_03	Horseshoe Creek - source to pipeline diversion	2.23	Miles
ID17040204SK023 02	Twin Creek - source to mouth	9.93	Miles
ID17040204SK024 03	Mahogany Creek -pipeline diversion (NE ¼, Sec. 27, T4N, R44)	7	Miles
ID17040204SK027_02	Henderson Creek - source to sink	3.06	Miles
ID17040204SK030_02	Patterson Creek - source to pump diversion	5.21	Miles
ID17040204SK033_02	Little Pine Creek - source to mouth	11.6	Miles
ID17040204SK035 02	Trail Creek - Trail Creek pipeline diversion	7.87	Miles
ID17040204SK037_02	Game Creek - source to diversion	0.71	Miles
ID17040204SK038_02	Trail Creek - Idaho/Wyoming border to Trail Creek pipeline	7.44	Miles
ID17040204SK038 03	Trail Creek - Idaho/Wyoming border to Trail Creek pipeline	3	Miles
ID17040204SK039 02	Moose Creek - Idaho/Wyoming border to mouth	1.28	Miles
ID17040204SK047 02	Teton Creek - Highway 33 bridge to mouth	9.21	Miles
ID17040204SK059_03	Badger Creek - source to diversion	2.18	Miles
ID17040204SK063 04	Bitch Creek - Swanner Creek to mouth	7.41	Miles
ID17040204SK065 03	Bitch Creek - Idaho/Wyoming border to Swanner Creek	11.42	Miles

17040205 Willow

ID17040205SK001_05	Willow Creek - Ririe Reservoir Dam to Eagle Rock Canal	5.49	Miles
ID17040205SK002 05L	Ririe Reservoir (Willow Creek)	1414.58	Acres
ID17040205SK009 03	Mud Creek - source to mouth	1.09	Miles
ID17040205SK023_02	Gravel Creek - source to mouth	21.54	Miles

Upper Snake

17040206 American Falls

ID17040206SK010 02a	Crystal Creek	6.41	Miles
ID17040206SK012_02	Midnight Creek - source to mouth	11.46	Miles
ID17040206SK013_02	Michaud Creek - source to mouth	7.94	Miles

17040207 Blackfoot

ID17040207SK002 02a	Beaver Creek	1.04	Miles
ID17040207SK002_02c	Trail Creek	5.15	Miles
ID17040207SK008_03	Thompson Creek - source to mouth	2.32	Miles
ID17040207SK010 02	Mill Canyon Creek and other Blackfoot River 2nd order tribs	30.06	Miles
ID17040207SK016 02c	Bear Canyon - headwaters to Diamond Creek	2.44	Miles
ID17040207SK017 02a	upper Timothy Creek	4.94	Miles
ID17040207SK018 02a	Lanes Creek - headwaters to FS boundary	3.6	Miles
ID17040207SK020 02	Browns Canyon	10.04	Miles
ID17040207SK022 02	Upper Sheep Creek - headwaters and unnamed tributaries	11.64	Miles
ID17040207SK022_03a	Sheep Creek - above confluence of South Fork Sheep Creek	2.31	Miles
ID17040207SK027_02a	Horse Creek	11.08	Miles
ID17040207SK027_02b	Poison Creek - source to Rawlins Creek	12.08	Miles
ID17040207SK028_02	Miner Creek - source to mouth	15.7	Miles
ID17040207SK028_02a	Menassa Creek	2.4	Miles

17040208 Portneuf

ID17040208SK001 02a	Cusick Creek	4.92	Miles
ID17040208SK003 02a	Gibson Jack Creek - upper and middle	14.66	Miles
ID17040208SK004_02	Mink Creek 2nd ord tribs - source to mouth	29.04	Miles
ID17040208SK004_02b	Mink Creek - West Fork (Portneuf tributary)	8.71	Miles
ID17040208SK006 02b	upper Yago Creek	4.51	Miles
ID17040208SK006_02c	Yago Creek - lower	3.61	Miles
ID17040208SK006_02d	upper Aspen Creek	5.06	Miles
ID17040208SK006_02e	Marsh Creek - left hand fork	6.87	Miles
ID17040208SK006 02f	Potter Creek	5.2	Miles
ID17040208SK007 02	Walker Creek - lower	2.88	Miles
ID17040208SK007_02a	Upper Walker Creek - headwaters to S. FK. Walker Creek	10.74	Miles

ID17040208SK008 02a	Bell Marsh Creek (upper) - headwaters to USFS boundary	6.73	Miles
ID17040208SK009 02a	upper Goodenough Creek - headwaters to Mormon Canyon	7.68	Miles
ID17040208SK015_02a	Mill Creek	13.07	Miles
ID17040208SK016_02a	King Creek	21.95	Miles
ID17040208SK016 02d	Harkness Creek	5.69	Miles
ID17040208SK016_02e	Robbers Roost Creek - headwaters to Portneuf River	7.18	Miles
ID17040208SK016_02f	Upper Rock Creek	4.61	Miles
ID17040208SK016_02g	Lower Rock Creek	6.67	Miles
ID17040208SK016 03a	Fish Creek	4.81	Miles
ID17040208SK017_02a	East Creek	11.07	Miles
ID17040208SK017_02b	Deer Creek - Dempsey/Portneuf River tributary	3.28	Miles
ID17040208SK021_02b	North Fork Toponce Creek	1.58	Miles
ID17040208SK021 02c	Middle Fork Toponce Creek	8.31	Miles
ID17040208SK021 02d	Toponce Creek - South Fork	18.24	Miles
ID17040208SK021_03a	Toponce Creek - middle	4.22	Miles
ID17040208SK022 02a	Pebble Creek - Big Canyon to North Fork Pebble Creek	9.23	Miles
ID17040208SK022 02b	Clear Creek	2.85	Miles
ID17040208SK022_02c	Pebble Creek - South Fork (Portneuf tributary)	6.48	Miles
ID17040208SK022_02d	Pebble Creek - North Fork	12.87	Miles
ID17040208SK022_03	Pebble Creek - lower	6.31	Miles
ID17040208SK023 02c	Webb Creek	10.18	Miles
ID17040208SK023_02h	Inman Creek - North and South Fork	4.69	Miles
ID17040208SK023_03	Lower Rapid Creek	5.62	Miles
ID17040208SK023 03b	Inman Creek-Confluence of Forks to USFS boundary	2.32	Miles
ID17040208SK026 02	North Fork Pocatello Creek - source to mouth	6.35	Miles

17040209 Lake Walcott

ID17040209SK003_02	Marsh Creek - source to mouth	170.67	Miles
ID17040209SK005 07	Snake River - Raft River to Lake Walcott	4.57	Miles
ID17040209SK006 07	Snake River - Rock Creek to Raft River	13.14	Miles

17040210 Raft

ID17040210SK004 02	Conner Creek - source to mouth	23.69	Miles

Upper Snake

ID17040210SK011 02	Grape Creek - source to mouth	62.16	Miles
ID17040210SK012 02	Edwards Creek - source to mouth	68.19	Miles
ID17040210SK016_02	Clear Creek - Idaho/Utah border to mouth	327.75	Miles

17040211 Goose

ID17040211SK005 02	Goose Creek - Beaverdam Cr. to Lower Goose Cr. Reservoir	88.68	Miles
ID17040211SK008_03	Goose Creek - source to Idaho/Utah border	3.13	Miles
ID17040211SK008_04	Goose Creek - source to Idaho/Utah border	6.33	Miles
ID17040211SK013_02	Mill Creek - source to mouth	53.52	Miles
ID17040211SK013 03	Mill Creek - source to mouth	5.49	Miles

17040212 Upper Snake-Rock

ID17040211SK001 02	Big Cottonwood Creek - source to mouth	66.2	Miles
ID17040211SK001 03	Big Cottonwood Creek - source to mouth	17.24	Miles
ID17040212SK004 03	Tuana Gulch - source to mouth	14.1	Miles
ID17040212SK017 02	Fifth Fork Rock Creek - source to mouth	26.23	Miles
ID17040212SK018_02	Rock Creek - source to Fifth Fork Rock Creek	54.36	Miles
ID17040212SK018_03	Rock Creek - source to Fifth Fork Rock Creek	6.64	Miles
ID17040212SK018_04	Rock Creek - source to Fifth Fork Rock Creek	8.12	Miles
ID17040212SK022_02	Dry Creek - source to mouth	45.88	Miles
ID17040212SK024_02	East Fork Dry Creek - source to mouth	14.75	Miles
ID17040212SK039 03	Deer Creek - source to mouth trib to Clover Creek	0.87	Miles

17040214 Beaver-Camas

ID17040214SK001 06	Camas Creek - Beaver Creek to Mud Lake	16.12	Miles
ID17040214SK006_02	Ching Creek - source to mouth	87.8	Miles
ID17040214SK012_02	West Camas Creek - Targhee National Forest Boundary	12.85	Miles
ID17040214SK022 02	Idaho Creek - source to mouth	8.67	Miles

17040215 Medicine Lodge

ID17040215SK020_02	Warm Springs Creek - source to mouth	85.31	Miles

17040216 Birch

ID17040216SK009 02	Willow Creek - source to mouth	25.34	Miles
ID17040216SK015 03	Pass Creek - source to mouth	5.99	Miles

17040217 Little Lost

ID17040217SK001 02	Little Lost River - canal (T06N, R28E) to playas	160.27	Miles
ID17040217SK004_02	North Creek - source to mouth	23.76	Miles
ID17040217SK005_02	Uncle Ike Creek - source to mouth	30.6	Miles
ID17040217SK008 02	Badger Creek - source to mouth	14.51	Miles
ID17040217SK008_03	Badger Creek - source to mouth	6.55	Miles
ID17040217SK012_02	Sawmill Creek - Warm Creek to mouth	34.76	Miles
ID17040217SK013_02	Warm Creek - source to mouth	4.97	Miles
ID17040217SK016 02	Bear Creek - source to mouth	4.67	Miles
ID17040217SK018 02	Timber Creek - source to mouth	10.8	Miles
ID17040217SK019_02	Summit Creek - source to mouth	50.45	Miles

17040218 Big Lost

ID17040218SK019 02	Rock Creek - source to mouth	16.78	Miles
ID17040218SK023 05	Parsons Creek	11.25	Miles
ID17040218SK025_04	Big Lost River - Summit Creek to and including Burnt Creek	4.96	Miles
ID17040218SK027_02	North Fork Big Lost River - source to mouth	67.67	Miles
ID17040218SK028_03	Summit Creek - source to mouth	0.55	Miles
ID17040218SK029_02	Kane Creek - source to mouth	18.06	Miles
ID17040218SK030_02	Wildhorse Creek - Fall Creek to mouth	7.56	Miles
ID17040218SK031 02	Wildhorse Creek - source to Fall Creek	26.81	Miles
ID17040218SK038 02	Lake Creek - source to mouth	13.69	Miles
ID17040218SK040 02	Cabin Creek - source to mouth	13.82	Miles
ID17040218SK044_02	Navarre Creek - source to mouth	20.86	Miles
ID17040218SK044 03	Navarre Creek - source to mouth	3.19	Miles
ID17040218SK045 02	Alder Creek - source to mouth	64.48	Miles
ID17040218SK045_03	Alder Creek - source to mouth	9.37	Miles
ID17040218SK050_04	Lupine Creek - source to mouth	4.72	Miles
ID17040218SK051 02	Left Fork Cherry Creek - source to mouth	16.19	Miles
ID17040218SK052 02	Antelope Creek - Iron Bog Creek to Dry Fork Creek	24.2	Miles
ID17040218SK053_02	Bear Creek - source to mouth	23.56	Miles
ID17040218SK054 03	Iron Bog Creek - confluence of Left and Right Fork Iron Bog	2.15	Miles

ID17040218SK056 02	Left Fork Iron Bog Creek - source to mouth	6.78	Miles

17040219 Big Wood

ID17040219SK007_02	Big Wood River - North Fork Big Wood River to Seamans Creek	82.7	Miles
ID17040219SK007_04	Big Wood River - North Fork Big Wood River to Seamans Creek	8.75	Miles
ID17040219SK010 04	East Fork Wood River - Hyndman Creek to mouth	6.22	Miles
ID17040219SK011_03	East Fork Wood River - source to Hyndman Creek	9.66	Miles
ID17040219SK012_02	Hyndman Creek - source Creek to mouth	35.52	Miles
ID17040219SK012_03	Hyndman Creek - source Creek to mouth	8.1	Miles
ID17040219SK013 04	Trail Creek - Corral Creek to mouth	9.95	Miles
ID17040219SK014 02	Trail Creek - source to and including Corral Creek	60.07	Miles
ID17040219SK014_03	Trail Creek - source to and including Corral Creek	6.26	Miles
ID17040219SK017 02	North Fork Big Wood River - source to mouth	38.7	Miles
ID17040219SK017 03	North Fork Big Wood River - source to mouth	5.67	Miles
ID17040219SK018_02	Big Wood River - source to North Fork Big Wood River	115.28	Miles
ID17040219SK018_03	Big Wood River - source to North Fork Big Wood River	6.84	Miles
ID17040219SK018_04	Big Wood River - source to North Fork Big Wood River	13.06	Miles
ID17040219SK019 02	Boulder Creek - source to mouth	11.12	Miles
ID17040219SK020_02	Prairie Creek - source to mouth	17.95	Miles
ID17040219SK020_03	Prairie Creek - source to mouth	2.64	Miles
ID17040219SK021 02	Baker Creek - source to mouth	50.55	Miles
ID17040219SK021 03	Baker Creek - source to mouth	7.75	Miles
ID17040219SK022 02	Fox Creek - source to mouth	9.67	Miles
ID17040219SK023_02	Warm Springs Creek - Thompson Creek to mouth	40.43	Miles
ID17040219SK023 04	Warm Springs Creek - Thompson Creek to mouth	13.5	Miles
ID17040219SK024 04	Warm Springs Creek - source to and including Thompson Creek	5.12	Miles
ID17040219SK026_02	North Fork Deer Creek - source to mouth	61.66	Miles
ID17040219SK026_03	Deer Creek - source to mouth	12.85	Miles

17040220 Camas

ID17040220SK011 02	Sampson Creek - Source to Wardrop Creek	4.95	Miles
ID17040220SK012_02	Soldier Creek - source to and including Wardrop Creek	55.93	Miles
ID17040220SK016 02	East Fork Corral Creek - source to mouth	14.59	Miles

ID17040220SK017 02	West Fork Corral Creek - source to mouth	10.3	Miles
ID17040220SK019 02	Chimney Creek - source to mouth	31.99	Miles
ID17040220SK020_02	Negro Creek - 1st and 2nd order	21.25	Miles
ID17040220SK021_02	Wildhorse Creek - 1st and 2nd order	35.56	Miles
ID17040220SK022 02	Malad River - 1st and 2nd order	36.34	Miles
ID17040220SK022_03	Malad River - 3rd order	8.75	Miles

17040221 Little Wood

ID17040221SK013_05	Little Wood River-Muldoon Cr. to Little Wood River Reservoir	2.47	Miles
ID17040221SK017 03	Friedman Creek - Trail Creek to mouth	5.93	Miles
ID17040221SK018 02	Trail Creek - source to mouth	16.21	Miles
ID17040221SK019_02	Friedman Creek - source to Trail Creek	11.13	Miles
ID17040221SK020 02	Little Wood River - source to Muldoon Creek	96.37	Miles
ID17040221SK020 03	Little Wood River - source to Muldoon Creek	7.36	Miles
ID17040221SK020_04	Little Wood River - source to Muldoon Creek	12.79	Miles
ID17040221SK020_05	Little Wood River - source to Muldoon Creek	1.1	Miles
ID17040221SK021_02	Baugh Creek - source to mouth	49.02	Miles
ID17040221SK021 04	Baugh Creek - source to mouth	3.79	Miles

Category 3: Waters have insufficient (or no) data and information to determine if beneficial uses are being attained or impaired.

2018/2020 Integrated Report - Category 3

Bear River

16010102 Central Bear

ID16010102BR001 02	Intermittent tributaries of Central Bear Subbasin	45.06	Miles
ID16010102BR002 02	Pegram Creek - source to mouth	53.77	Miles
ID16010102BR003_02	Thomas Fork - Idaho/Wyoming border to mouth	31.84	Miles
ID16010102BR003_02L	Upper Gardiner Reservoir (dam)	4.39	Acres
ID16010102BR004_03	Raymond Creek - Idaho/Wyoming border to mouth	0.21	Miles
ID16010102BR008 02L	Sheep Creek Reservoir	23.55	Acres

16010201 Bear Lake

ID16010201BR001_02	Unnamed tributary to Alexander Reservoir	1.23	Miles
ID16010201BR002 02L	Per Reservoir	40.57	Acres
ID16010201BR002_03	Bear River	2.55	Miles
ID16010201BR002_0L	Welling Number Two Dam	11.98	Acres
ID16010201BR006 02	Stauffer Creek - source to mouth	6.33	Miles
ID16010201BR006 03a	Spring Creek	1.12	Miles
ID16010201BR009_02	Ovid Creek - confluence of North and Mill Creek to mouth	35.39	Miles
ID16010201BR009 02L	Little Valley Reservoir	33.6	Acres
ID16010201BR010_02	North Creek - source to mouth	19.33	Miles
ID16010201BR011 02	Mill Creek - source to mouth	17.73	Miles
ID16010201BR011_03	Lower Mill Creek	3.87	Miles
ID16010201BR012 02	Upper Bear Lake Outlet intermittent streams	9.06	Miles
ID16010201BR012 05	Bear Lake Outlet - Lifton Station to Bear River	11.21	Miles
ID16010201BR012_05L	Mud Lake	3.12	Acres
ID16010201BR012 0L	Lifton Station to Bear River	3265.23	Acres
ID16010201BR013 02	Lower Paris Creek	27.6	Miles
ID16010201BR013 02L	Unnamed Waterbody to Paris Creek	10.44	Acres
ID16010201BR014_02	Bloomington Creek - source to mouth	32.41	Miles
ID16010201BR014 02aL	Bloomington Lake	10.03	Acres

Bear River

ID16010201BR014 02L	Bloomington Creek - Source to Mouth	157.18	Acres
ID16010201BR015 02	Spring Creek - source to mouth	2.54	Miles
ID16010201BR015_03	Spring Creek - St. Charles Cr to Mud Lake	2.69	Miles
ID16010201BR016_02	Little and St. Charles Creeks - source to Bear Lake	7.44	Miles
ID16010201BR017 02	Dry Canyon Creek - source to mouth	16.76	Miles
ID16010201BR018 02	Bear Lake	62.89	Miles
ID16010201BR018_02a	Mud Lake - Dingle Swamp system	42.06	Miles
ID16010201BR018 0L	Bear Lake	34453.92	Acres
ID16010201BR019_02	Fish Haven Creek - source to Bear Lake	3.1	Miles
ID16010201BR019 02b	Fish Haven Creek	2.02	Miles
ID16010201BR022_02	Georgetown Creek - source to mouth	35.77	Miles
ID16010201BR023 02	Soda Creek - Soda Creek Reservoir Dam to Alexander Reservoir	13.05	Miles

16010202 Middle Bear

ID16010202BR001_02	Spring Creek - source to Idaho/Utah border	15.41	Miles
ID16010202BR001 03	Spring Creek - source to Idaho/Utah border	4.51	Miles
ID16010202BR002_02	Cub River	3.81	Miles
ID16010202BR005 03L	Johnson Reservoir (Lamont Reservoir)	43.2	Acres
ID16010202BR005_0L	Lamont Reservoir	84.54	Acres
ID16010202BR005 0La	Hinkley Reservoir	26.84	Acres
ID16010202BR006_00L	Nielson Reservoir (dam)	15.91	Acres
ID16010202BR006_01L	Nash Reservoir (Dam)	16.04	Acres
ID16010202BR006 02L	Tingey Dam (Reservoir)	20.48	Acres
ID16010202BR007_02c	Mink Creek	3.58	Miles
ID16010202BR008 02	Oneida Narrows Reservoir	12.11	Miles
ID16010202BR014_02	Cottonwood Creek - source to Oneida Narrows Reservoir	21.23	Miles
ID16010202BR014 02L	Stock Valley Reservoir (dam)	18.67	Acres
ID16010202BR015_02L	Condie Reservoir	86	Acres
ID16010202BR015 03L	Casperson Reservoir (dam)	19.33	Acres
ID16010202BR015_04L	Strongarm Reservoir #1	151.94	Acres
ID16010202BR015 0L	Winder Reservoir	75.86	Acres
ID16010202BR016_01L	Twin Lakes Reservoir	437.28	Acres
ID16010202BR017 02	Oxford Slough	24.49	Miles
ID16010202BR018 02	Swan Lake Creek Complex	18.98	Miles

ID16010202BR018 02c	Stockton Creek	19.7	Miles
ID16010202BR018 02L	Stockton Creek Reservoir	31.72	Acres
ID16010202BR018_03	Swan Lake Creek Complex	2.52	Miles
ID16010202BR018_03L	Swan Lake	61.7	Acres
ID16010202BR020 02e	Weston Creek	5.3	Miles

16010203 Little Bear-Logan

ID16010203BR002_02	Logan River - source to Idaho/Utah border	3.98	Miles
ID16010203BR002 02a	Logan River	8.11	Miles

16010204 Lower Bear-Malad

ID16010204BR001_02	Malad River - Little Malad River to Idaho/Utah border	59.36	Miles
ID16010204BR002 03L	Saint Johns Reservoir	10.01	Acres
ID16010204BR003_02L	Devil Creek Reservoir	85.1	Acres
ID16010204BR005 02	Deep Creek - Deep Creek Reservoir Dam to mouth	16.06	Miles
ID16010204BR006L_0L	Deep Creek Reservoir	63.37	Acres
ID16010204BR007_02L	Upper Deep Creek Reservoir	25.69	Acres
ID16010204BR008 04L	Billy Snipe Reservoir	4.3	Acres
ID16010204BR009L_0L	Daniels Reservoir	361.49	Acres
ID16010204BR010_02	Wright Creek - source to Daniels Reservoir	32.21	Miles
ID16010204BR011_02	Dairy Creek - source to mouth	42.13	Miles
ID16010204BR013 02	Samaria Creek - source to mouth	30.31	Miles
ID16010204BR013_03	Samaria Creek - source to mouth	4.58	Miles

16020309 Curlew Valley

ID16020309BR001 02	Deep Creek - Rock Creek to Idaho/Utah border	381.75	Miles
ID16020309BR001_02L	Sweeten Reservoir	18.32	Acres
ID16020309BR001_03b	Deep Creek - Rock Creek to Idaho/Utah border	38.83	Miles
ID16020309BR001_03L	Stone Reservoir	123.92	Acres
ID16020309BR002 02	Deep Creek - source to Rock Creek	87.16	Miles
ID16020309BR002_03	Deep Creek - source to Rock Creek	18.9	Miles
ID16020309BR003 03	Rock Creek - source to mouth	6.96	Miles

Clearwater

17060108 Palouse

ID17060108CL002 02	South Fork Palouse River - Gnat Creek to ID/WA border	21.97	Miles
ID17060108CL008b_02	Silver Creek - T43, R5W, Sec. 29 to Idaho/Washington border	5.86	Miles
ID17060108CL010 04	Palouse River - Hatter Creek to Deep Creek	6.17	Miles
ID17060108CL017_03	Flat Creek - source to mouth	0.2	Miles
ID17060108CL023 02	Meadow Creek - East Fork Meadow Creek to mouth	1.08	Miles
ID17060108CL033b_02	Cedar Creek - T43N, R05W, Sec. 28 to Idaho/Washington border	11.8	Miles

17060109 Rock

ID17060109CL001 02	South Fork Pine Creek - source to Idaho/Washington border	8.4	Miles
ID17060109CL002_02	North Fork Pine Creek - source to Idaho/Washington border	7.88	Miles
ID17060109CL003 02	Unnamed Trib.-source to ID/WA border (T44N, R05W,Sec18)	2.78	Miles

17060301 Upper Selway

ID17060301CL008 02	Running Creek - Lynx Creek to mouth	33.07	Miles
ID17060301CL009 02	Running Creek - source to Lynx Creek	22.07	Miles
ID17060301CL009_03	Running Creek - source to Lynx Creek	3.68	Miles
ID17060301CL010 02	South Fork Running Creek - source to mouth	9.6	Miles
ID17060301CL011_02	Lynx Creek - source to mouth	13.9	Miles
ID17060301CL014 02	Selway River - Deep Creek to White Cap Creek	44.32	Miles
ID17060301CL014_04	Selway River - Deep Creek to White Cap Creek	5.55	Miles
ID17060301CL019 02	Salamander Creek - source to mouth	18.73	Miles
ID17060301CL020_02	Flat Creek - source to mouth	14.62	Miles
ID17060301CL021_02	Magruder Creek - source to mouth	12.17	Miles
ID17060301CL022 02	Selway River - confluence of Hidden and Surprise Creeks	67.38	Miles
ID17060301CL022_04	Selway River - confluence of Hidden and Surprise Creeks	7.74	Miles
ID17060301CL031_02	Deep Creek - source to mouth	24	Miles
ID17060301CL031_03	Deep Creek - source to mouth	9.68	Miles
ID17060301CL032 02	Vance Creek - source to mouth	6.16	Miles
ID17060301CL033_03	Lazy Creek - source to mouth	1.37	Miles
ID17060301CL034 02	Pete Creek - source to mouth	5.13	Miles
ID17060301CL035 02	Cayuse Creek - source to mouth	14.81	Miles
ID17060301CL036 03	Indian Creek - source to mouth	7.49	Miles
ID17060301CL038_02	Snake Creek - source to mouth	10.55	Miles

Clearwater

ID17060301CL039_02	White Cap Creek - Canyon Creek to mouth	36.57	Miles
ID17060301CL039_04	White Cap Creek - Canyon Creek to mouth	7.69	Miles
ID17060301CL047_04	Bear Creek - Cub Creek to mouth	4.92	Miles
ID17060301CL053_02	Bear Creek - source to Wahoo Creek	18.37	Miles

17060302 Lower Selway

ID17060302CL001_06	Selway River - O'Hara Creek to mouth	6.89	Miles
ID17060302CL005_02	East Fork O'Hara Creek - source to mouth	6.54	Miles
ID17060302CL006_06	Selway River - Meadow Creek to O'Hara Creek	12.26	Miles
ID17060302CL007_02	Falls Creek - source to mouth	9.6	Miles
ID17060302CL008_03	Meadow Creek - Buck Lake Creek to mouth	0.37	Miles
ID17060302CL009_02	Horse Creek - source to mouth	17.47	Miles
ID17060302CL010_02	Fivemile Creek - source to mouth	17.44	Miles
ID17060302CL011_02	Little Boulder Creek - source to mouth	9.83	Miles
ID17060302CL012_02	Meadow Creek - East Fork Meadow Creek to Buck Lake Creek	31.7	Miles
ID17060302CL014_02	Sable Creek - source to mouth	15.2	Miles
ID17060302CL016_03	Meadow Creek - source to East Fork Meadow Creek	12.18	Miles
ID17060302CL016_04	Meadow Creek - source to East Fork Meadow Creek	5.15	Miles
ID17060302CL017_02	Butter Creek - source to mouth	5.86	Miles
ID17060302CL018_02	Three Prong Creek - source to mouth	14.51	Miles
ID17060302CL018_03	Three Prong Creek - source to mouth	2.89	Miles
ID17060302CL019_02	East Fork Meadow Creek - source to mouth	17.25	Miles
ID17060302CL019_03	East Fork Meadow Creek - source to mouth	1.63	Miles
ID17060302CL020_02	Schwar Creek - source to mouth	22.67	Miles
ID17060302CL021_02	Buck Lake Creek - source to mouth	27.66	Miles
ID17060302CL021_03	Buck Lake Creek - source to mouth	10.73	Miles
ID17060302CL022_06	Selway River - Moose Creek to Meadow Creek	20.97	Miles
ID17060302CL050_02	Gedney Creek - West Fork Gedney Creek to mouth	4.27	Miles
ID17060302CL051_02	Gedney Creek - source to West Fork Gedney Creek	18.93	Miles
ID17060302CL051_03	Gedney Creek - source to West Fork Gedney Creek	1.5	Miles
ID17060302CL052_02	West Fork Gedney Creek - source to mouth	28.66	Miles
ID17060302CL052_03	West Fork Gedney Creek - source to mouth	4.13	Miles

17060303 Lochsa

ID17060303CL002 02	Kerr Creek - source to mouth	7.33	Miles
ID17060303CL004_02	Coolwater Creek - source to mouth	11.08	Miles
ID17060303CL006 02	Split Creek - source to mouth	16.34	Miles
ID17060303CL007_03	Old Man Creek - source to mouth	9.55	Miles
ID17060303CL013 02	Lochsa River- Warm Springs Creek to Indian Grave Creek	30.21	Miles
ID17060303CL014_02	Sponge Creek - Fish Lake Creek to mouth	3.4	Miles
ID17060303CL014 03	Sponge Creek - Fish Lake Creek to mouth	5.37	Miles
ID17060303CL017 02	Warm Springs Creek - Wind Lakes Creek to mouth	28.93	Miles
ID17060303CL019_02	Wind Lakes Creek - source to mouth	17.01	Miles
ID17060303CL021_02	Jay Creek - source to mouth	5.89	Miles
ID17060303CL022_02	Cliff Creek - source to mouth	6.22	Miles
ID17060303CL024 02	White Sand Creek - Storm Creek to mouth	13.93	Miles
ID17060303CL024_04	White Sand Creek - Storm Creek to mouth	9.91	Miles
ID17060303CL025 04	White Sand Creek - source to Storm Creek	4.26	Miles
ID17060303CL026_03	Colt Creek - source to mouth	4.47	Miles
ID17060303CL032 02	Storm Creek - source to mouth	42.03	Miles
ID17060303CL033_03	Beaver Creek - source to mouth	0.62	Miles
ID17060303CL034 02	Crooked Fork - Brushy Fork to mouth	13.98	Miles
ID17060303CL034_05	Crooked Fork - Brushy Fork to mouth	6.89	Miles
ID17060303CL035_04	Brushy Fork - Spruce Creek to mouth	4.67	Miles
ID17060303CL038 04	Crooked Fork - source to Brushy Fork	6.59	Miles
ID17060303CL046_02	West Fork Waw’aalamnime Creek - source to mouth	6.41	Miles
ID17060303CL048 02L	Indian Postoffice Lake	4.6	Acres
ID17060303CL049_02	Weir Creek - source to mouth	15.11	Miles
ID17060303CL051 02	Bald Mountain Creek - source to mouth	2.34	Miles
ID17060303CL053_02	Willow Creek - source to mouth	14.56	Miles
ID17060303CL054 02	Hungery Creek - Obia Creek to mouth	17.78	Miles
ID17060303CL054_03	Hungery Creek - Obia Creek to mouth	7.78	Miles
ID17060303CL055 02	Obia Creek - source to mouth	12.13	Miles
ID17060303CL059_02	Deadman Creek - East Fork Deadman Creek to mouth	0.98	Miles
ID17060303CL060 02	East Fork Deadman Creek - source to mouth	17.02	Miles

Clearwater

17060304 Middle Fork Clearwater

ID17060304CL001 05	Middle Fork Clearwater River - confluence of Lochsa	16.9	Miles
ID17060304CL004_03	South Fork Clear Creek - source to mouth	6.86	Miles
ID17060304CL006 03	Clear Creek - source to South Fork Clear Creek	3.37	Miles
ID17060304CL007_03	Middle Fork Clear Creek - source to mouth	1.84	Miles
ID17060304CL011 03	Maggie Creek - source to mouth	3.01	Miles

17060306 Clearwater

ID17060306CL001_02	Lower Granite Dam pool	20.79	Miles
ID17060306CL001 03	Lower Granite Dam pool	0.08	Miles
ID17060306CL002_02	Clearwater River - Potlatch River to Lower Granite Dam pool	9.21	Miles
ID17060306CL006 02L	Lake Waha	94.12	Acres
ID17060306CL013_02	Clearwater River - North Fork Clearwater River to mouth	0.37	Miles
ID17060306CL021 02	Clearwater River - Lolo Creek to North Fork Clearwater River	0.13	Miles
ID17060306CL026_03	Lolo Creek - Yakus Creek to mouth	2.6	Miles
ID17060306CL033_02	Big Creek - source to mouth	6.79	Miles
ID17060306CL042 02	Louse Creek - source to mouth	5.89	Miles
ID17060306CL044_02	Potlatch River - Big Bear Creek to mouth	12.58	Miles
ID17060306CL046_03	Cedar Creek - source to mouth	2.67	Miles
ID17060306CL048_02	Potlatch River - Moose Creek to Corral Creek	15.64	Miles
ID17060306CL056 02	Big Bear Creek	25.39	Miles
ID17060306CL057_04	East Fork Big Bear Creek - source to mouth	0.34	Miles
ID17060306CL059 02	Dry Creek - source to mouth	16.51	Miles
ID17060306CL063_02	Bethel Canyon - source to mouth	16.32	Miles
ID17060306CL064 02	Little Potlatch Creek - source to mouth	62.33	Miles
ID17060306CL065_02	Howard Gulch - source to mouth	3.35	Miles

17060307 Upper North Fork Clearwater

ID17060307CL001 05	North Fork Clearwater River-Skull Ck. to Aquarius Campground	7.11	Miles
ID17060307CL002_05	North Fork Clearwater River- Washington Creek to Skull Creek	12.82	Miles
ID17060307CL004 05	North Fork Clearwater River - Orogrande Creek to Washington	6.74	Miles
ID17060307CL008 05	North Fork Clearwater River -Weitas Creek to Orogrande Creek	4.24	Miles
ID17060307CL009 04	Weitas Creek - Hemlock Creek to mouth	6.59	Miles
ID17060307CL013_02	Little Weitas Creek - source to mouth	32.35	Miles

ID17060307CL013 03	Little Weitas Creek - source to mouth	5.44	Miles
ID17060307CL014 02	Weitas Creek - source to Windy Creek	46.14	Miles
ID17060307CL014_03	Weitas Creek - source to Windy Creek	3.01	Miles
ID17060307CL014_04	Weitas Creek - source to Windy Creek	5.16	Miles
ID17060307CL015 02	Windy Creek - source to mouth	17.63	Miles
ID17060307CL016 05	North Fork Clearwater River - Kelly Creek to Weitas Creek	14.1	Miles
ID17060307CL017_02	Fourth of July Creek - source to mouth	42.06	Miles
ID17060307CL018 05	Kelly Creek - Cayuse Creek to mouth	16.5	Miles
ID17060307CL019_02	Cayuse Creek - Gravey Creek to mouth	22.66	Miles
ID17060307CL019 04	Cayuse Creek - Gravey Creek to mouth	16.44	Miles
ID17060307CL022_02	Cayuse Creek - source to Gravey Creek	57.81	Miles
ID17060307CL032 04	North Fork Clearwater River - Lake Creek to Kelly Creek	18.63	Miles
ID17060307CL034_03	North Fork Clearwater River - Vanderbilt Gulch to Lake Creek	5.04	Miles
ID17060307CL036_02	North Fork Clearwater River - source to Vanderbilt Gulch	28.59	Miles
ID17060307CL037 02	Vanderbilt Gulch - source to mouth	14.45	Miles
ID17060307CL038 02	Meadow Creek - source to mouth	30.28	Miles
ID17060307CL047_03	Skull Creek - source to Collins Creek	4.16	Miles

17060308 Lower North Fork Clearwater

ID17060308CL002 02	Dworshak Reservoir tributaries	251.34	Miles
ID17060308CL002_03	Dworshak Reservoir 3rd Order Tribs.	10.99	Miles
ID17060308CL002_05	Dworshak Reservoir	24.69	Miles
ID17060308CL002 06L	Dworshak Reservoir	13972.85	Acres
ID17060308CL004_02L	Deer Creek Reservoir	55.2	Acres
ID17060308CL008 05	North Fork Clearwater River - Aquaruis Cmpgrd to Dworshak R.	2.87	Miles
ID17060308CL011_02	Little North Fork Clearwater River	47.22	Miles
ID17060308CL011 03	Little North Fork Clearwater River	1.53	Miles
ID17060308CL011_05	Little North Fork Clearwater River	13.63	Miles
ID17060308CL012 02	Little North Fork Clearwater R.-Spotted Louis to Foehl Creek	10.15	Miles
ID17060308CL012_04	Little North Fork Clearwater R.-Spotted Louis to Foehl Creek	4.33	Miles
ID17060308CL012 05	Little North Fork Clearwater R.-Spotted Louis C. to Foehl C.	2.9	Miles
ID17060308CL013_03	Sawtooth Creek - source to mouth	5.43	Miles
ID17060308CL014 02	Canyon Creek - source to mouth	42.39	Miles
ID17060308CL014 03	Canyon Creek - source to mouth	3.31	Miles

Clearwater

ID17060308CL014 04	Canyon Creek - source to mouth	6.65	Miles
ID17060308CL015 02	Spotted Louis Creek - source to mouth	11.7	Miles
ID17060308CL016_02	Little North Fork Clearwater R.-Rutledge Cr.to Spotted Louis	25.42	Miles
ID17060308CL016_02L	Steamboat Lake	7.91	Acres
ID17060308CL016 04	Little North Fork Clearwater -Rutledge Cr. to Spotted Louis	5.74	Miles
ID17060308CL018 01L	Fish Lake	5.89	Acres
ID17060308CL018_02	Little North Fork Clearwater R.- source to Rutledge Creek	50.18	Miles
ID17060308CL018 02L	Lost Lake	27.02	Acres
ID17060308CL018_04	Little North Fork Clearwater River - source to Rutledge Cr.	2.78	Miles
ID17060308CL019 02	Foehl Creek - source to mouth	28.42	Miles
ID17060308CL019_03	Foehl Creek - source to mouth	4.03	Miles
ID17060308CL022 02	Glover Creek - source to mouth	27.94	Miles
ID17060308CL035_03	Dicks Creek - source to Dworshak Reservoir	0.65	Miles

17010101 Middle Kootenai

ID17010101PN003 02	South Callahan Creek - Glad Creek to Idaho/Montana border	3.13	Miles

17010104 Lower Kootenai

ID17010104PN001_01L	Unnamed Waterbody near Watson Spur	59.48	Acres
ID17010104PN001 02	1st & 2nd order tribs Kootenai R- Shorty Isl. - ID/BC border	63.65	Miles
ID17010104PN002 02L	Saddle Lake	1.68	Acres
ID17010104PN003_02L	Marsh Lake	4.07	Acres
ID17010104PN006_02L	Joe and Hidden Lakes	44.29	Acres
ID17010104PN011 01L	Ball Lakes- Spanish Creek	8.43	Acres
ID17010104PN013_02L	Myrtle Creek Lakes	8.52	Acres
ID17010104PN015 02	Deep Creek - Snow Creek to mouth	1.57	Miles
ID17010104PN016_01L	Snow and Corner Lakes	10.55	Acres
ID17010104PN016 02L	Bottleneck Lake	10.61	Acres
ID17010104PN017_02L	Roman Nose Lakes	33.56	Acres
ID17010104PN018_02	Deep Creek - Brown Creek to Snow Creek	6.1	Miles
ID17010104PN020 02a	Gold Creek	2.51	Miles
ID17010104PN022_02	Tributaries to Deep Creek - below McArthur Lake	5.05	Miles
ID17010104PN023_02	White Creek	1	Miles
ID17010104PN024_04	Dodge Creek - headwaters to Dodge Cr	8.25	Miles
ID17010104PN026 03a	Trail Creek - Highway to mouth	0.88	Miles
ID17010104PN027_02	Brown Creek - upper, headwaters to Brown Creek	14.18	Miles
ID17010104PN029 02	Kootenai River Tributaries - Moyie River to Deep Creek	17.45	Miles
ID17010104PN029_02a	Dobson Creek	15.64	Miles
ID17010104PN029 02L	Dawson Lake	29.75	Acres
ID17010104PN031_01L	Bonner Lake	21.49	Acres
ID17010104PN031 02	Kootenai River - tributaries, Idaho/Montana to Moyie River	42.76	Miles
ID17010104PN031_02L	Herman Lake	30.63	Acres
ID17010104PN035_02	Curley Creek - upper from Perkins Lake and unnamed tribs	9.61	Miles
ID17010104PN035 02L	Perkins Lake (Curley Creek)	53.11	Acres
ID17010104PN036 02	Fleming Creek - upper	27.66	Miles
ID17010104PN037 02	Rock Creek - upper	20.89	Miles
ID17010104PN038_02	Mission Creek - Brush Creek to mouth	3.76	Miles

Panhandle

17010105 Moyie

ID17010105PN002 05	Moyie River - Meadow Creek to Moyie Falls Dam	7.88	Miles
ID17010105PN005_05	Moyie River - Round Prairie Creek to Meadow Creek	10.07	Miles
ID17010105PN006 02L	Spruce Lake	6.09	Acres
ID17010105PN006_05	Moyie River - Idaho/Canadian border to Round Prairie Creek	7.55	Miles
ID17010105PN008 02	Round Prairie Creek - Gillon Creek to mouth	3.23	Miles
ID17010105PN008_03	Round Prairie Creek - Gillon Creek to mouth	3.67	Miles
ID17010105PN009 02L	Robinson Lake (Gillon Creek)	53.75	Acres

17010213 Lower Clark Fork

ID17010213PN001_02	Clark Fork River Delta - Mosquito Creek to Pend Oreille Lake	8.27	Miles
ID17010213PN001 03	Clark Fork River Delta - Mosquito Creek to Pend Oreille Lake	1.19	Miles
ID17010213PN001_04	Clark Fork River Delta - Mosquito Creek to Pend Oreille Lake	1.45	Miles
ID17010213PN003 02	Tributary to Clark Fork River	6.53	Miles
ID17010213PN006_02	West Fork Elk Creek - source to Idaho/Montana border	5.19	Miles
ID17010213PN007_02	West Fork Blue Creek - source to Idaho/Montana border	6.02	Miles
ID17010213PN008 02	Gold Creek - source to Idaho/Montana border	7.49	Miles
ID17010213PN016_02L	Porcupine Lake	10.48	Acres
ID17010213PN019_02L	Darling-Gem Lakes	16.35	Acres

17010214 Pend Oreille Lake

ID17010214PN001 02	Pend Oreille River - tribs, Priest River to Albeni Falls Dam	10.28	Miles
ID17010214PN002_02	Tribs to PDO River between Long Bridge and Priest River	17.7	Miles
ID17010214PN002_02b	Unnamed Tributaries	5.81	Miles
ID17010214PN002 02L	Morton Slough	124.22	Acres
ID17010214PN002_03a	Syringa Creek and Tributaries	1.7	Miles
ID17010214PN003_02L	Hoodoo Lake	92.62	Acres
ID17010214PN003_03	Hoodoo Creek - source to mouth	3.53	Miles
ID17010214PN004 02	Kelso Lake outlet Creek	7.07	Miles
ID17010214PN004_02L	Kelso - Round Lakes	60.76	Acres
ID17010214PN005 02	Granite Lake Tributaries	3.51	Miles
ID17010214PN005L 0L	Granite Lake	18.42	Acres
ID17010214PN006 01L	Beaver Lake	17.26	Acres
ID17010214PN006_02	Beaver Lake - Stream Order 1 & 2 Tribs	9.67	Miles

ID17010214PN006 02L	Lambertson Lake	21.47	Acres
ID17010214PN007 02	Spirit Creek - source to mouth	6.59	Miles
ID17010214PN007_03	Spirit Creek - source to mouth	4.76	Miles
ID17010214PN008_02	Blanchard Lake Stream Order 01 & 02 Tribs	20.17	Miles
ID17010214PN008 02L	Blanchard Lake	134.69	Acres
ID17010214PN009 02	01 & 02 Tribs to Spirit Lake	3.88	Miles
ID17010214PN011_02	Jewell Lake	8.04	Miles
ID17010214PN011 02L	Jewel Lake	32.38	Acres
ID17010214PN012_04L	Round Lake	43.04	Acres
ID17010214PN013 02	Cocolalla Lake Tributaries	9.36	Miles
ID17010214PN013_02a	Westmond Creek and Tributaries	8.84	Miles
ID17010214PN013 02L	Unnamed Lake Westmond Creek	7.78	Acres
ID17010214PN016_02	Fry Creek - source to mouth	11.24	Miles
ID17010214PN018_02	West side first and second order tribs. to Pend Oreille Lake	28.91	Miles
ID17010214PN019 02L	Gamble Lake	102.62	Acres
ID17010214PN020 0L	Mirror Lake	84.87	Acres
ID17010214PN028_02	Riser Creek - source to mouth	3.23	Miles
ID17010214PN028_02a	Cougar Creek - source to mouth	3.2	Miles
ID17010214PN037 02L	Beaver Lake	4.16	Acres
ID17010214PN040_0L	Walsh Lake	36.47	Acres
ID17010214PN041 02L	Harrison Lake	28.85	Acres
ID17010214PN045_02L	Caribou Lake	5.88	Acres
ID17010214PN055 02	Carr Creek - tributaries	2.38	Miles
ID17010214PN056_02	Unnamed Tributary to Carr Creek	9.39	Miles
ID17010214PN061 02	Unnamed tributary to Pend Oreille River	8.56	Miles
ID17010215PN001 02	Lower Priest River - Upper West Branch Priest River to mouth	77.64	Miles

17010215 Priest

ID17010215PN001 02	Lower Priest River - Upper West Branch Priest River to mouth	77.64	Miles
ID17010215PN001_02L	Mirror Lake	6.45	Acres
ID17010215PN001 03	Lower Priest River - Upper West Branch Priest River to mouth	3.39	Miles
ID17010215PN001_03L	Blue Lake	66.84	Acres
ID17010215PN004 02L	Unnamed Lake - Lost Creek	4.06	Acres
ID17010215PN005 02	Lower Priest River - Priest Lake to Upper West Branch Priest	2.78	Miles

ID17010215PN006L 0L	Priest Lake	23341.56	Acres
ID17010215PN007 02	Chase Lake	1.58	Miles
ID17010215PN007L_0L	Chase Lake	174.25	Acres
ID17010215PN009_02L	Hunt Lake	13.89	Acres
ID17010215PN012 01L	Two Mouth Lakes	11.74	Acres
ID17010215PN012 02L	Standard Lakes	12.88	Acres
ID17010215PN013_02L	Kent Lake	13.95	Acres
ID17010215PN014 04	Priest Lake Thorofare - Upper Priest Lake to Priest Lake	2.75	Miles
ID17010215PN015_02L	Caribou Lakes	12.88	Acres
ID17010215PN016L 0L	Upper Priest Lake	1340.77	Acres
ID17010215PN018_04	Upper Priest River - Idaho/Canadian border to mouth	1.37	Miles
ID17010215PN024 02	Kalispell Creek - Idaho/Washington border to mouth	32.73	Miles
ID17010215PN027_02	Upper West Branch Priest River	44.82	Miles
ID17010215PN028_02	Goose Creek - Idaho/Washington border to mouth	32.41	Miles
ID17010215PN029 02	Quartz Creek - source to mouth	14.64	Miles
ID17010215PN030 02	Lower West Branch Priest River	95.09	Miles
ID17010215PN031_02	Moores Creek - source to mouth	25	Miles

17010216 Pend Oreille

ID17010216PN001 02	South Salmo River - headwaters to Idaho/Washington border	4.44	Miles
ID17010216PN002_02	Pend Oreille River tributaries, below Albeni Falls Dam	11.19	Miles
ID17010216PN002_02L	Freeman Lake - Freeman Creek	52.87	Acres

17010301 Upper Coeur d Alene

ID17010301PN005_02L	Revett Lake	16.25	Acres
ID17010301PN013 02a	NF Coeur d'Alene R tributaries btw Jordan Cr and Tepee Cr	7.46	Miles
ID17010301PN018_03	Independence Creek, btw Ellis Cr. and Declaration Creek	0.78	Miles

17010302 South Fork Coeur d Alene

ID17010302PN002 02a	Lower Little Pine Creek	1.46	Miles
ID17010302PN007a_01L	Elsie Lake	14.3	Acres
ID17010302PN008a 02	Shields Gulch from headwaters to mining impact area	1.2	Miles
ID17010302PN009a 02L	Lost Lake	4.45	Acres
ID17010302PN011 02L	Unnamed Lake Gold Creek	3.69	Acres
ID17010302PN012_02L	Upper Stevens/Lone Lakes	39.09	Acres

ID17010302PN015 02L	Upper and Lower Glidden Lakes	34.87	Acres

17010303 Coeur d Alene Lake

ID17010303PN001_02a	French Gulch	1.64	Miles
ID17010303PN001 02b	Unnamed Tributary to Bennett Bay	2.01	Miles
ID17010303PN001_02c	Blue Creek	8.49	Miles
ID17010303PN001 02d	Neachen Creek, Unnamed Creek into Echo & Gotham Bay	6.67	Miles
ID17010303PN001_02e	Unnamed Tribs to Powderhorn & Bell Bay	4.78	Miles
ID17010303PN001 02f	Delcaro Ck, Lyle Ck, Scott Ck, & Stinson Ck.	10.44	Miles
ID17010303PN006 02	Lake Creek - Idaho/Washington border to mouth	14.29	Miles
ID17010303PN007_02	Unnamed Tributary to Black Lake	4.51	Miles
ID17010303PN008_02	01 & 02 tribs to Anderson Lake	4.38	Miles
ID17010303PN009_02	Black Lake - Stream order 1 & 2	2.12	Miles
ID17010303PN010 02	Medicine Lake - Stream order 1 & 2	8.17	Miles
ID17010303PN010_03	Evans Creek	0.52	Miles
ID17010303PN011 02	Willow Creek - source to mouth	0.98	Miles
ID17010303PN012_02	Evans Creek - source to mouth	0.1	Miles
ID17010303PN012 03	Evans Creek - source to mouth	1.17	Miles
ID17010303PN013_02	Robinson Creek - source to mouth	12.15	Miles
ID17010303PN014 02	Bull Run Creek Stream Order 1 & 2	4.54	Miles
ID17010303PN014_02L	Bull Run Lake	78.89	Acres
ID17010303PN015_02L	Crystal Lake	8.93	Acres
ID17010303PN016 02	Unnamed Tribs to CDA River between NF CDA River and Cataldo	3.92	Miles
ID17010303PN017_02	Skeel and Cataldo Creeks - source to mouth	11.75	Miles
ID17010303PN018 02	French Gulch - source to mouth	10	Miles
ID17010303PN019_02	Hardy and Hayden Gulch and Whitman Draw Creeks Complex	11.16	Miles
ID17010303PN021L 0L	Rose Lake	317.13	Acres
ID17010303PN022_03	Tributary to Killarney Lake	1.58	Miles
ID17010303PN023 02	Tributaries to Swan Lake	6.49	Miles
ID17010303PN024L_0L	Blue Lake	227.25	Acres

17010304 St. Joe

ID17010304PN005 02	St. Joe River - St. Maries River to mouth	0.38	Miles
ID17010304PN007_02	St. Maries River - Santa Creek to mouth	14.37	Miles

ID17010304PN007 02a	Soldier Creek	5.74	Miles
ID17010304PN007 02b	1st and 2nd order tributaries to St. Maries River from Santa	36.76	Miles
ID17010304PN012_02	St. Maries River - Carpenter Creek to Santa Creek	25.03	Miles
ID17010304PN015_02	St. Maries River - confluence of West Fork and Middle Fork	30.48	Miles
ID17010304PN031 02	Marble Creek - Hobo Creek to mouth	21.88	Miles
ID17010304PN035 02	Marble Creek - source to Hobo Creek	32.91	Miles
ID17010304PN035_02L	Crater Lake	3.84	Acres
ID17010304PN038 02	Boulder Creek - source to mouth	20.67	Miles
ID17010304PN039_02L	Crow Lake - Red Raven Creek	1.81	Acres
ID17010304PN041 01L	Halo, Bacon and Forage Lakes	18.99	Acres
ID17010304PN041_02	1st order tribs to St Joe River from NF to Gold Creek	27.4	Miles
ID17010304PN041 02d	1st order tributaries to St Joe River from Copper to Heller	15.86	Miles
ID17010304PN041_02e	Ruby Creek and tributaries	10.69	Miles
ID17010304PN041_02f	Bacon Creek 1st and 2nd order	9.99	Miles
ID17010304PN041 02L	Saint Joe and Frog Lakes	20.52	Acres
ID17010304PN041 03b	Bean Creek 3rd order	1.95	Miles
ID17010304PN041_03c	Bacon Creek 3rd order	1.7	Miles
ID17010304PN045_02L	Dismal Lake	5.96	Acres
ID17010304PN059 04	North Fork St. Joe River - Loop Creek to mouth	10.15	Miles
ID17010304PN064_02	Trout Creek - source to mouth	15.4	Miles
ID17010304PN065 02	Falls Creek - source to mouth	9.59	Miles
ID17010304PN068_02	Street Creek - source to mouth	10.42	Miles

17010305 Upper Spokane

ID17010305PN001 02	Liberty Creek - source to Idaho/Washington border	6.41	Miles
ID17010305PN002_03	Cable Creek - source to Idaho/Washington border	0.44	Miles
ID17010305PN003 02	Skalan Creek	4.59	Miles
ID17010305PN004_02	Tributaries to Spokane River - CDA Lake to Post Falls Dam	6.15	Miles
ID17010305PN004 02a	Blackwell Island Canal	0.95	Miles
ID17010305PN005_01L	Avondale Lake	57.32	Acres
ID17010305PN005 02	Hayden Lake Tributaries to Lake and Rathdrum aquifer	22.34	Miles
ID17010305PN005_02L	Alpine and Avondale Lakes	73.32	Acres
ID17010305PN005 0L	Chilco Lake	33.5	Acres
ID17010305PN006 02	Yellowbanks Creek - source to mouth	6.96	Miles

ID17010305PN007 02	Jim Creek - source to mouth	2.49	Miles
ID17010305PN013 02	Twin Lakes	4.84	Miles
ID17010305PN015_03	Hauser Lake outlet - Hauser Lake to aquifer	2.94	Miles
ID17010305PN016_02	01 & 02 tribs to Hauser Lake	9.25	Miles

17010306 Hangman

ID17010306PN002 02	Little Hangman Creek - source to Idaho/Washington border	0.63	Miles
ID17010306PN004_02	Rose Creek	1.06	Miles

17010308 Little Spokane

ID17010308PN001 02	McDonald Creek - source to mouth	19.84	Miles

17060101 Hells Canyon

ID17060101SL001_02	Snake River - Wolf Creek to Salmon River	44.1	Miles
ID17060101SL002_02	Snake River - Sheep Creek to Wolf Creek	21.24	Miles
ID17060101SL003_02	Snake River - Hells Canyon Dam to Sheep Creek	6.11	Miles
ID17060101SL005_02	Brush Creek - source to mouth	1.68	Miles
ID17060101SL006_03	Granite Creek - 3rd order (Devils Farm Creek to mouth)	3.11	Miles
ID17060101SL007_02	Little Granite Creek - source to mouth	6.76	Miles
ID17060101SL008_02	Bernard Creek - source to mouth	4.51	Miles
ID17060101SL013_02	Caribou Creek - source to mouth	3.47	Miles
ID17060101SL014_02	Kirkwood Creek - source to mouth	20.49	Miles
ID17060101SL015_02	Kirby Creek - source to mouth	4.27	Miles
ID17060101SL016_02	Corral Creek - source to mouth	12.22	Miles
ID17060101SL017_02	Klopton Creek - source to mouth	10.64	Miles
ID17060101SL019_02	West Creek - source to mouth	6.05	Miles
ID17060101SL020_02	Big Canyon Creek - source to mouth	12.3	Miles
ID17060101SL021_02	Jones Creek - source to mouth	2.69	Miles
ID17060101SL022_02	Highrange Creek - source to mouth	5.69	Miles
ID17060101SL024_02	Wolf Creek - Basin Creek to mouth	11.63	Miles
ID17060101SL026_02	Basin Creek - source to mouth	12.75	Miles
ID17060101SL027_02	Dry Creek - source to mouth	1.72	Miles
ID17060101SL027_03	Dry Creek - source to mouth	1.79	Miles

17060103 Lower Snake-Asotin

ID17060103SL001_02	Snake River	3.76	Miles
ID17060103SL002_02	Snake River-Captain John Creek to Asotin Creek	16.57	Miles
ID17060103SL002_08	Snake River - Captain John Creek to Asotin Creek	17.02	Miles
ID17060103SL003_02	Snake River - Cottonwood Creek to Captain John Creek	34.8	Miles
ID17060103SL003_08	Snake River - Cottonwood Creek to Captain John Creek	19.83	Miles
ID17060103SL004_02	Snake River - Salmon River to Cottonwood Creek	17.37	Miles
ID17060103SL005_02	Cottonwood Creek - source to mouth	15.04	Miles
ID17060103SL006_02	Cave Gulch - source to mouth	7.16	Miles
ID17060103SL008_02	Middle Creek - source to mouth	3.54	Miles
ID17060103SL009_02	Dough Creek - source to mouth	4.16	Miles

ID17060103SL011 02	Captain John Creek - source to mouth	32.5	Miles
ID17060103SL011 03	Captain John Creek - source to mouth	4.15	Miles
ID17060103SL013_02	Tenmile Canyon - source to mouth	16.57	Miles
ID17060103SL013_03	Tenmile Canyon - source to mouth	1.45	Miles
ID17060103SL015 02	Unnamed Tributary - source to mouth (T34N, R05W, Sec. 24)	6.22	Miles

17060201 Upper Salmon

ID17060201SL001_03	Salmon River - Pennal Gulch to Pahsimeroi River	15.1	Miles
ID17060201SL002 02	Morgan Creek - West Creek to mouth	22.44	Miles
ID17060201SL007 02	Challis Creek - Darling Creek to mouth	2.72	Miles
ID17060201SL008_02	Darling Creek - source to mouth	20.08	Miles
ID17060201SL011_02L	Spruce Gulch Lake	10.93	Acres
ID17060201SL012_02L	Mosquito Flat Reservoir	40.1	Acres
ID17060201SL014 02	Salmon River - Garden Creek to Pennal Gulch	48.82	Miles
ID17060201SL014_03	Salmon River - Garden Creek to Pennal Gulch	6.3	Miles
ID17060201SL014 04	Salmon River - Garden Creek to Pennal Gulch	2.72	Miles
ID17060201SL015_02L	Buster Lake	11.44	Acres
ID17060201SL015 04	Garden Creek - source to mouth	8.82	Miles
ID17060201SL016_02L	Unnamed Diversion - Tributary to Salmon River (Bradbury Flat	7.17	Acres
ID17060201SL016 03	Salmon River - East Fork Salmon River to Garden Creek	2.33	Miles
ID17060201SL016_04	Salmon River - East Fork Salmon River to Garden Creek	2.25	Miles
ID17060201SL017_01L	Little Bayhorse Lake	15.03	Acres
ID17060201SL017 02L	Bayhorse Lake	25.15	Acres
ID17060201SL018_02	Lyon Creek - source to mouth	8.83	Miles
ID17060201SL024 02L	Unnamed Lake - Trail Creek	3.68	Acres
ID17060201SL027_02	Salmon River - Thompson Creek to Squaw Creek	21.15	Miles
ID17060201SL027 03	Salmon River - Thompson Creek to Squaw Creek	3.11	Miles
ID17060201SL029_02	Pat Hughes Creek -source to mouth	2.96	Miles
ID17060201SL033 02	Ramey Creek - source to mouth	12.22	Miles
ID17060201SL034_02L	Unnamed Lakes - Trib to Yankee Fork	5.05	Acres
ID17060201SL041 02	Jordan Creek	3.93	Miles
ID17060201SL042_02	Jordan Creek - source to Unnamed Tributary	17.29	Miles
ID17060201SL043 02	West Fork Yankee Fork Creek - Lightning Creek to mouth	18.38	Miles
ID17060201SL043 03	West Fork Yankee Fork Creek - Lightning Creek to mouth	5.23	Miles

Salmon

ID17060201SL044 02	Lightning Creek - source to mouth	18.17	Miles
ID17060201SL045 02	West Fork Yankee Fork Creek - source to Lightning Creek	21.26	Miles
ID17060201SL045_02L	West Fork Yankee Fork Lakes	16.67	Acres
ID17060201SL045_03	West Fork Yankee Fork Creek - source to Lightning Creek	2.19	Miles
ID17060201SL046 02	Cabin Creek - source to mouth	9.52	Miles
ID17060201SL048 02	Basin Creek - East Basin Creek to mouth	3.15	Miles
ID17060201SL049_02L	East Basin Lakes	13.39	Acres
ID17060201SL051 03	Valley Creek - Trap Creek to mouth	6.37	Miles
ID17060201SL052_02	Stanley Creek - source to mouth	16.99	Miles
ID17060201SL052 03	Stanley Creek - source to mouth	1.86	Miles
ID17060201SL053_02	Valley Creek - source to Trap Creek	29.65	Miles
ID17060201SL053 02L	Valley Creek Lakes	25.32	Acres
ID17060201SL054_02	Trap Creek - Meadow Creek to mouth	4.65	Miles
ID17060201SL055_02L	Kelly and Martin Lakes	9.08	Acres
ID17060201SL058 02L	Stanley Lake	176.13	Acres
ID17060201SL059 02	Crooked Creek - source to mouth	6.65	Miles
ID17060201SL061_02	Goat Creek - source to mouth	9.92	Miles
ID17060201SL061_03	Goat Creek - source to mouth	0.03	Miles
ID17060201SL062 02	Meadow Creek - source to mouth	8.18	Miles
ID17060201SL062_03	Meadow Creek - source to mouth	2.49	Miles
ID17060201SL063 02	Salmon River - Redfish Lake Creek to Valley Creek	6.12	Miles
ID17060201SL064_03	Redfish Lake Creek - Redfish Lake to mouth	2.58	Miles
ID17060201SL064 03L	Little Redfish Lake	64.08	Acres
ID17060201SL066_02	Fishhook Creek	8.88	Miles
ID17060201SL066L 0L	Redfish Lake	1511.25	Acres
ID17060201SL067 03	Redfish Lake Creek - source to Redfish Lake	3.93	Miles
ID17060201SL072_02	Salmon River - Fisher Creek to Decker Creek	2.51	Miles
ID17060201SL072_05	Salmon River - Fisher Creek to Decker Creek	8.26	Miles
ID17060201SL073 02	Salmon River - Alturas Lake Creek to Fisher Creek	5.15	Miles
ID17060201SL075 02L	Yellow Belly Lake	195.27	Acres
ID17060201SL075_04	Alturas Lake Creek - Alturas Lake to mouth	7.03	Miles
ID17060201SL075 04L	Perkins Lake	48.1	Acres
ID17060201SL076_01L	McDonald Lake	13.91	Acres

Salmon

ID17060201SL076 02	Toxaway/Farley Lake - source to mouth	10.74	Miles
ID17060201SL077 02	Unnamed Tributaries to Petit Lake	9.72	Miles
ID17060201SL077_02L	Pettit Lake	390.8	Acres
ID17060201SL078_02	Unnamed Tributaries to Alturas Lake	1.28	Miles
ID17060201SL078L 0L	Alturas Lake	824.51	Acres
ID17060201SL079 02	Alturas Lake Creek - source to Alturas Lake	13.42	Miles
ID17060201SL079_03	Alturas Lake Creek - source to Alturas Lake	2.61	Miles
ID17060201SL086 02	Champion Creek - source to mouth	19.67	Miles
ID17060201SL086_02L	Champion Lakes	40.07	Acres
ID17060201SL087 01L	Fourth of July Lake	7.15	Acres
ID17060201SL087_02L	Heart and Six Lakes	10.04	Acres
ID17060201SL088 03	Fisher Creek - source to mouth	0.71	Miles
ID17060201SL089_03	Williams Creek - source to mouth	1.46	Miles
ID17060201SL093_02L	Rough Lake	10.46	Acres
ID17060201SL094 02	Warm Springs Creek - Swimm Creek to mouth	25.83	Miles
ID17060201SL095 02	Warm Springs Creek - Pigtail Creek to Swimm Creek	36.41	Miles
ID17060201SL095_02L	Garland Lakes	4.56	Acres
ID17060201SL095_03	Warm Springs Creek - Pigtail Creek to Swimm Creek	4.83	Miles
ID17060201SL096 02	Pigtail Creek - source to mouth	16.12	Miles
ID17060201SL097_03	Warm Springs Creek - source to Pigtail Creek	3.75	Miles
ID17060201SL101 02	Sullivan Creek - source to mouth	14.54	Miles
ID17060201SL101_03	Sullivan Creek - source to mouth	3.48	Miles
ID17060201SL101 03L	Sulivan Lake	42	Acres
ID17060201SL102_02	East Fork Salmon River - Herd Creek to mouth	28.24	Miles
ID17060201SL102 05	East Fork Salmon River - Herd Creek to mouth	10.38	Miles
ID17060201SL103 04	East Fork Salmon River - Germania Creek to Herd Creek	15.65	Miles
ID17060201SL104_02	Big Lake Creek - source to mouth	33.48	Miles
ID17060201SL104_03L	Jimmy Smith Lake	64.26	Acres
ID17060201SL105 01L	Unnamed Lake - Trib to Big Boulder Creek	3.08	Acres
ID17060201SL106 01L	Boulder Chain Lakes	102.5	Acres
ID17060201SL107_02	Germania Creek - Chamberlain Creek to mouth	7.17	Miles
ID17060201SL108 02	Chamberlain Creek - source to mouth	8.12	Miles
ID17060201SL109_03	Germania Creek - source to Chamberlain Creek	5.6	Miles

ID17060201SL110 02	East Fork Salmon River - confluence of South and West Fork	20.41	Miles
ID17060201SL110 03	East Fork Salmon River - confluence of South and West Fork	5.88	Miles
ID17060201SL111_02	West Fork East Fork Salmon River - source to mouth	9.95	Miles
ID17060201SL115_03	Bowery Creek - source to mouth	1.7	Miles
ID17060201SL116 02	Pine Creek - source to mouth	13.15	Miles
ID17060201SL117 02	McDonald Creek - source to mouth	10.13	Miles
ID17060201SL118_02	Herd Creek -confluence of West Fork Herd Creek and East Pass	23.74	Miles
ID17060201SL124 02	Road Creek - Corral Basin Creek to mouth	17.02	Miles
ID17060201SL127_02	Corral Basin Creek - source to mouth	14.93	Miles
ID17060201SL127 03	Corral Basin Creek - source to mouth	1.57	Miles
ID17060201SL128_02	Horse Basin Creek - source to mouth	21.18	Miles
ID17060201SL128 03	Horse Basin Creek - source to mouth	4.47	Miles
ID17060201SL129_02	Spar Canyon Creek - source to mouth	44.32	Miles
ID17060201SL129_03	Spar Canyon Creek - source to mouth	7.22	Miles
ID17060201SL130 02	Bradshaw Gulch - source to mouth	14.75	Miles
ID17060201SL131 02	Warm Spring Creek - Hole-in-Rock Creek to mouth	39.29	Miles
ID17060201SL131_03	Warm Spring Creek - Hole-in-Rock Creek to mouth	3.3	Miles
ID17060201SL131_04L	Warm Springs Creek Pond	35.39	Acres
ID17060201SL134 02	Hole-in-Rock Creek - source to mouth	18.83	Miles
ID17060201SL135_02	Pennal Gulch - source to mouth	10.11	Miles

17060202 Pahsimeroi

ID17060202SL001 02	Pahsimeroi River - Patterson Creek to mouth	52.33	Miles
ID17060202SL001_03	Pahsimeroi River - Patterson Creek to mouth	4.06	Miles
ID17060202SL002 03	Pahsimeroi River - Meadow Creek to Patterson Creek	1.11	Miles
ID17060202SL004_03	North Fork Lawson Creek - source to mouth	1.9	Miles
ID17060202SL008 02	Pahsimeroi River - Big Creek to Furey Lane (T15S, R22E)	3.94	Miles
ID17060202SL009_02L	Grouse Creek Lakes	10.9	Acres
ID17060202SL010 02	Pahsimeroi River - Goldburg Creek to Big Creek	55.52	Miles
ID17060202SL012_02	Unnamed Tributary - source to mouth (T12N, R23E, Sec. 22)	13.52	Miles
ID17060202SL012 03	Unnamed Tributary - source to mouth (T12N, R23E, Sec. 22)	17.44	Miles
ID17060202SL013_02	Doublespring Creek - Christian Gulch to mouth	3.32	Miles
ID17060202SL013 03	Doublespring Creek - Christian Gulch to mouth	5.45	Miles
ID17060202SL014 02	Christian Gulch - source to mouth	17.87	Miles

ID17060202SL015 02	Doublespring Creek - source to Christian Gulch	27.91	Miles
ID17060202SL015 03	Doublespring Creek - source to Christian Gulch	4.65	Miles
ID17060202SL016_02	Mud Spring Canyon Complex	25.28	Miles
ID17060202SL017_02	Pahsimeroi River - Burnt Creek to Unnamed Tributary	4.83	Miles
ID17060202SL019 02	Mahogany Creek - source to mouth	17.84	Miles
ID17060202SL020 02	Pahsimeroi River-confluence of Rock Creek and East Fork Pass	5.27	Miles
ID17060202SL021_02	Rock Creek - source to mouth	5.51	Miles
ID17060202SL022 01L	Merriam Lakes	10.13	Acres
ID17060202SL023_02	Burnt Creek - Long Creek to mouth	10.89	Miles
ID17060202SL025 02	Long Creek - Short Creek to mouth	4.91	Miles
ID17060202SL025_03	Long Creek - Short Creek to mouth	1.69	Miles
ID17060202SL027 02	Long Creek - source to Short Creek	26.75	Miles
ID17060202SL027_03	Long Creek - source to Short Creek	1.11	Miles
ID17060202SL028_02	Goldburg Creek - Donkey Creek to mouth	23.56	Miles
ID17060202SL030 03	Goldburg Creek - source to Donkey Creek	2.36	Miles
ID17060202SL034 02	Patterson Creek - Inyo Creek to mouth	7.68	Miles
ID17060202SL034_03L	Patterson Creek Tailings Ponds	33	Acres
ID17060202SL035_02L	Unnamed Lake - Patterson Creek	3.16	Acres
ID17060202SL037 02	Morse Creek - Irrigation junction to mouth	3.02	Miles
ID17060202SL037_03	Morse Creek - Irrigation junction to mouth	9.15	Miles
ID17060202SL039 02	Morgan Creek - source to mouth	47.03	Miles
ID17060202SL039_04	Morgan Creek - source to mouth	0.8	Miles

17060203 Middle Salmon-Panther

ID17060203SL002 02	Panther Creek - Big Deer Creek to mouth	27.11	Miles
ID17060203SL005_02	Big Deer Creek - South Fork Big Deer Creek to mouth	3.45	Miles
ID17060203SL006 02	Big Deer Creek - source to South Fork Big Deer Creek	21.06	Miles
ID17060203SL008_02	South Fork Big Deer Creek -source to Bucktail Creek	2.93	Miles
ID17060203SL013a 02	West Fork Blackbird Creek - source to concrete channel	7.87	Miles
ID17060203SL013b_02	West Fork Blackbird Creek - concrete channel to mouth only	0.61	Miles
ID17060203SL017 02L	Opal Lake	13.81	Acres
ID17060203SL018_02L	Unnamed Lake - SF Moyer Creek	5.73	Acres
ID17060203SL019 02	Woodtick Creek - source to mouth	12.52	Miles
ID17060203SL021 02	Little Deep Creek - source to mouth	13.5	Miles

Salmon

ID17060203SL023 02	Napias Creek - Moccasin Creek to mouth	1.86	Miles
ID17060203SL028 03	Beaver Creek - source to mouth	1.97	Miles
ID17060203SL029_02	Salmon River - Indian Creek to Panther Creek	26.1	Miles
ID17060203SL032_03	Salmon River - North Fork Sheep Creek to Indian Creek	2.65	Miles
ID17060203SL033 02	Moose Creek - Little Moose Creek to mouth	5.15	Miles
ID17060203SL033 03	Moose Creek - Little Moose Creek to mouth	2.09	Miles
ID17060203SL034_02	Little Moose Creek - source to mouth	5.49	Miles
ID17060203SL035 02	Moose Creek - Dolly Creek to Little Moose Creek	7.95	Miles
ID17060203SL038_02	Dump Creek - Moose Creek to mouth	3.2	Miles
ID17060203SL040 02	Wallace Creek - source to mouth	7.93	Miles
ID17060203SL041_02	Salmon River - Pollard Creek to Carmen Creek	30.67	Miles
ID17060203SL041 02L	Up Lake	3.88	Acres
ID17060203SL041_06	Salmon River - Pollard Creek to Carmen Creek	3.28	Miles
ID17060203SL042_02a	Chipps & Jesse Creek	23.84	Miles
ID17060203SL042 03	Salmon River - Williams Creek to Pollard Creek	1.24	Miles
ID17060203SL046 02	Salmon River - Twelvemile Creek to Williams Creek	21.02	Miles
ID17060203SL050_02L	Iron Lake(s)	23.14	Acres
ID17060203SL050_03	Iron Creek - source to North Fork Iron Creek	0.22	Miles
ID17060203SL051 03	West Fork Iron Creek - source to mouth	2.23	Miles
ID17060203SL054_02	Hot Creek - source to mouth	89.89	Miles
ID17060203SL054 04	Hot Creek - source to mouth	2.47	Miles
ID17060203SL055_02L	Goat Lake	4.7	Acres
ID17060203SL055 03	Cow Creek - source to mouth	4.19	Miles
ID17060203SL057_02	McKim Creek - source to mouth	22.23	Miles
ID17060203SL057 02L	Unnamed Lakes- Trib to McKim Creek	3.42	Acres
ID17060203SL058 02	Poison Creek - source to mouth	22.57	Miles
ID17060203SL058_03	Poison Creek - source to mouth	2	Miles
ID17060203SL059_02	Warm Springs Creek - source to mouth	20.25	Miles
ID17060203SL060 02	Twelvemile Creek - source to mouth	17.02	Miles
ID17060203SL061 02	Carmen Creek - Freeman Creek to mouth	14.34	Miles
ID17060203SL065_03	Fourth of July Creek - Little Fourth of July Creek to mouth	1.77	Miles
ID17060203SL066 03	Fourth of July Creek - source to Little Fourth of July Creek	1.53	Miles
ID17060203SL067_02	Little Fourth of July Creek - source to mouth	4.95	Miles

Salmon

ID17060203SL068 02	North Fork Salmon River - Hughes Creek to mouth	6.47	Miles
ID17060203SL068 04	North Fork Salmon River - Hughes Creek to mouth	5.71	Miles
ID17060203SL069_02	Big Silverlead Creek - source to mouth	10.25	Miles
ID17060203SL070_02	North Fork Salmon River - Sheep Creek to Hughes Creek	4.76	Miles
ID17060203SL070 04	North Fork Salmon River - Sheep Creek to Hughes Creek	2.97	Miles
ID17060203SL071 02	Sheep Creek - source to mouth	34.54	Miles
ID17060203SL072_02	North Fork Salmon River - Dahlonega Creek to Sheep Creek	6.94	Miles
ID17060203SL072 04	North Fork Salmon River - Dahlonega Creek to Sheep Creek	3.3	Miles
ID17060203SL073_03	Dahlonega Creek - Nez Perce Creek to mouth	4.67	Miles
ID17060203SL075 02	Nez Perce Creek - source to mouth	7.29	Miles
ID17060203SL079_02	Pierce Creek - source to mouth	10.35	Miles
ID17060203SL082 02	Hull Creek - source to mouth	10.24	Miles
ID17060203SL082_02L	Cummings Lake	6.28	Acres
ID17060203SL082_03	Hull Creek - source to mouth	0.65	Miles
ID17060203SL083 02	Indian Creek - source to mouth	40.91	Miles
ID17060203SL087 02	Owl Creek - East Fork Owl Creek to mouth	1.92	Miles
ID17060203SL088_02	East Fork Owl Creek - source to mouth	13.22	Miles
ID17060203SL089_02	Owl Creek - source to East Fork Owl Creek	25.64	Miles
ID17060203SL089 03	Owl Creek - source to East Fork Owl Creek	7.38	Miles

17060204 Lemhi

ID17060204SL003a_06	Lemhi River (West Branch) - Haynes Creek to Withington Creek	3.59	Miles
ID17060204SL004 06	Lemhi River (West Branch) - Kenney Creek to Haynes Creek	2.63	Miles
ID17060204SL005_02	Lemhi River - Hayden Creek to Kenney Creek	27.25	Miles
ID17060204SL006 02	Baldy Creek - source to mouth	9.71	Miles
ID17060204SL007a_02	McDevitt Creek - diversion (T19N, R23E, Sec. 36) to mouth	2.12	Miles
ID17060204SL008 02	Muddy Creek - source to mouth	10.86	Miles
ID17060204SL009_02	Hayden Creek - Basin Creek to mouth	3.45	Miles
ID17060204SL010 02	Basin Creek - Lake Creek to mouth	3.55	Miles
ID17060204SL011_02	Basin Creek	9.12	Miles
ID17060204SL012 02	Trail Creek - source mouth	19.39	Miles
ID17060204SL012_03	Trail Creek - source mouth	1.38	Miles
ID17060204SL013 03	McNutt Creek - source to mouth	1.4	Miles
ID17060204SL013 0L	Unnamed Lakes -McNutt Creek	7.95	Acres

ID17060204SL014 01L	Lake Creek Reservoir	7.32	Acres
ID17060204SL014 02	Lake Creek - source to mouth	6.94	Miles
ID17060204SL015_02	Hayden Creek - Bear Valley Creek to Basin Creek	8.67	Miles
ID17060204SL016_02	Bear Valley Creek -Wright Creek to mouth	6.02	Miles
ID17060204SL017 01L	Bear Valley Lakes - Bear Valley Creek	42.53	Acres
ID17060204SL017 02L	Buck Lakes	11.98	Acres
ID17060204SL018_02	Wright Creek - source to mouth	4.18	Miles
ID17060204SL018 02L	Wright Creek Lakes	9.26	Acres
ID17060204SL021_02	Hayden Creek - source to West Fork Hayden Creek	6.05	Miles
ID17060204SL022 02	West Fork Hayden Creek - source to mouth	8.4	Miles
ID17060204SL022_02L	Unnamed Lakes - West Fork Hayden Creek and Bray Creek	10.23	Acres
ID17060204SL022 03	West Fork Hayden Creek - source to mouth	0.62	Miles
ID17060204SL023_02L	Buffalo Skull Lake	4.11	Acres
ID17060204SL024_02	Lemhi River - Peterson Creek to Hayden Creek	41.18	Miles
ID17060204SL024 02L	Bates Gulch Lake	4.01	Acres
ID17060204SL024 03	Lemhi River - Peterson Creek to Hayden Creek	1.21	Miles
ID17060204SL025_02	Lemhi River - confluence of Big and Little Eightmile Creeks	10.16	Miles
ID17060204SL026b_02L	Mill Creek Lakes	32.57	Acres
ID17060204SL028 02L	Unnamed Lake - Stroud Creek	3.33	Acres
ID17060204SL028_03	Lee Creek - source to mouth	4.29	Miles
ID17060204SL029b 02	Big Eightmile Creek - source to diversion	18.1	Miles
ID17060204SL030_02	Lemhi River-confluence of Eighteenmile Creek and Texas Creek	38.28	Miles
ID17060204SL030 03	Lemhi River-confluence of Eighteenmile Creek and Texas Creek	6.88	Miles
ID17060204SL031_02	Big Timber Creek - Little Timber Creek to mouth	3.94	Miles
ID17060204SL032a 03	Little Timber Creek - diversion (T15N, R25E, Sec. 13)	2.54	Miles
ID17060204SL032b 01L	Little Timber Creek Lakes	17.31	Acres
ID17060204SL032b_02L	Stone Reservoir	20.25	Acres
ID17060204SL034_02	Rocky Creek - source to mouth	3.95	Miles
ID17060204SL035 02	Big Timber Creek - source to Rocky Creek	25.06	Miles
ID17060204SL035 03	Big Timber Creek - source to Rocky Creek	2.73	Miles
ID17060204SL036_02	Texas Creek - Deer Creek to mouth	35.07	Miles
ID17060204SL037 02	Deer Creek - source to mouth	6.94	Miles
ID17060204SL037_02L	Deer Creek Lake	6.27	Acres

Salmon

ID17060204SL038 02	Texas Creek - Meadow Creek to Deer Creek	14.3	Miles
ID17060204SL038 03	Texas Creek - Meadow Creek to Deer Creek	1.9	Miles
ID17060204SL040_02	Texas Creek - source to Meadow Lake Creek	14.07	Miles
ID17060204SL042_02	Eighteenmile Creek - Clear Creek to Hawley Creek	5.53	Miles
ID17060204SL044 02	Divide Creek - source to mouth	29.56	Miles
ID17060204SL044 03	Divide Creek - source to mouth	2.73	Miles
ID17060204SL048_02	Tenmile Creek - source to Powderhorn Gulch	6.36	Miles
ID17060204SL049 02	Powderhorn Gulch - source to mouth	7.63	Miles
ID17060204SL051a_03	Canyon Creek - diversion (T16N, R26E, Sec.22) to mouth	1.45	Miles
ID17060204SL052b 02L	Little Eightmile Diversion	10.19	Acres
ID17060204SL053_02	Peterson Creek - source to mouth	14.16	Miles
ID17060204SL054 02	Reese Creek - source to mouth	10.15	Miles
ID17060204SL055a_03	Yearian Creek - diversion (T17N, R24E, Sec. 03) to mouth	1.77	Miles
ID17060204SL055b_02	Yearian Creek - source to diversion (T17N, R24E, Sec. 03)	16.72	Miles
ID17060204SL056a 04	Agency Creek - diversion (T19N, R24E, Sec. 28) to mouth	1.98	Miles
ID17060204SL056b 04	Agency Creek - Cow Creek to diversion (T19N, R24E, Sec. 28)	2.56	Miles
ID17060204SL057_02	Cow Creek - source to mouth	10.01	Miles
ID17060204SL059a_03	Pattee Creek - diversion (T19N, R24E, Sec. 16) to mouth	0.88	Miles
ID17060204SL060a 02	Pratt Creek - diversion (T20N, R23E, Sec. 11) to mouth	0.44	Miles
ID17060204SL060b_02	Pratt Creek - source to diversion (T20N, R23E, Sec. 11)	3.57	Miles
ID17060204SL065a 03	Geertson Creek - diversion (T21N, R23E, Sec. 20) to mouth	1.42	Miles
ID17060204SL066a_02	Kirtley Creek - diversion (T21N, R22E, Sec. 02) to mouth	3.73	Miles

17060205 Upper Middle Fork Salmon

ID17060205SL001 06	Middle Fork Salmon River - Marsh Creek to Loon Creek	59.35	Miles
ID17060205SL002_04	Marble Creek - 4th order (Little Cottonwood Creek to mouth)	15.86	Miles
ID17060205SL020 02	Cape Horn Creek - Banner Creek to mouth	8.32	Miles
ID17060205SL022_02L	Unnamed Wetlands near Bull Trout Lake	80.49	Acres
ID17060205SL028 02L	Cape Horn Lakes	33.35	Acres
ID17060205SL029_03	Beaver Creek - Winnemucca Creek to Bear Creek	2.93	Miles
ID17060205SL032 03	Bear Creek - source to mouth	1.18	Miles
ID17060205SL034_02	Greyhound Creek - source to mouth	9.43	Miles
ID17060205SL038 04	Rapid River - Float Creek to Lucinda Creek	4.65	Miles
ID17060205SL039 02L	Josephus Lake	4.02	Acres

ID17060205SL040_02	Rapid River - Vanity Creek to Float Creek	1.37	Miles
ID17060205SL040_04	Rapid River - Vanity Creek to Float Creek	1.42	Miles
ID17060205SL043_02	Lucinda Creek - source to mouth	4.18	Miles
ID17060205SL048_02	Loon Creek - Cabin Creek to mouth	69.83	Miles
ID17060205SL053_02	Loon Creek - Grouse Creek to Shell Creek	12.14	Miles
ID17060205SL053_04	Loon Creek - Grouse Creek to Shell Creek	2.98	Miles
ID17060205SL054_02	Grouse Creek - source to mouth	5.47	Miles
ID17060205SL055_04	Loon Creek - Canyon Creek to Grouse Creek	1.48	Miles
ID17060205SL056_02	Canyon Creek - source to mouth	7.93	Miles
ID17060205SL057_02	Loon Creek - Pioneer Creek to Canyon Creek	9.38	Miles
ID17060205SL057_04	Loon Creek - Pioneer Creek to Canyon Creek	3.57	Miles
ID17060205SL058_03	Trail Creek - source to mouth	1.22	Miles
ID17060205SL060_02	Pioneer Creek - source to mouth	14.75	Miles
ID17060205SL061_02	No Name Creek - source to mouth	1.38	Miles
ID17060205SL062_03	Mayfield Creek-confluence of East and West Fork Mayfield Cr.	3.17	Miles
ID17060205SL067_04	Warm Springs Creek - Trapper Creek to mouth	11.02	Miles
ID17060205SL069_02	Warm Springs Creek - source to Trapper Creek	18.26	Miles

17060206 Lower Middle Fork Salmon

ID17060206SL001_06	Middle Fork Salmon River - Loon Creek to mouth	45.25	Miles
ID17060206SL003_05	Big Creek - 5th order (Monumental Creek to mouth)	23.58	Miles
ID17060206SL015_04	Rush Creek - 4th order (Corner Creek to mouth)	12.65	Miles
ID17060206SL018_02	Brush Creek - 1st and 2nd order	31.72	Miles
ID17060206SL018_03	Brush Creek - 3rd order (North Fork to mouth)	6.64	Miles
ID17060206SL022_02	Camas Creek - Duck Creek to Forge Creek	10.85	Miles
ID17060206SL023_02	Camas Creek - Silver Creek to Duck Creek	5.06	Miles
ID17060206SL024_02	West Fork Camas Creek - source to mouth	44.49	Miles
ID17060206SL025_02	Camas Creek - Castle Creek to Silver Creek	1.98	Miles
ID17060206SL026_02	Camas Creek - Furnance Creek to Castle Creek	8.8	Miles
ID17060206SL027_02	Camas Creek - White Goat Creek to Furnance Creek	4.79	Miles
ID17060206SL031_02	White Goat Creek - source to mouth	5.48	Miles
ID17060206SL032_02	Furnace Creek - source to mouth	19.12	Miles
ID17060206SL034_02L	Arrastra Creek Lakes	6.84	Acres
ID17060206SL034_03L	Boggerman Dam Reservoir	3.73	Acres

ID17060206SL036 02	Forge Creek - source to mouth	6.15	Miles
ID17060206SL041 02	Yellowjacket Creek - Trail Creek to Little Jacket Creek	2.88	Miles

17060207 Middle Salmon-Chamberlain

ID17060207SL001 02	Salmon River - South Fork Salmon River to river mile 106	63.69	Miles
ID17060207SL004_02	California Creek - source to mouth	28.33	Miles
ID17060207SL005 02	Cottontail Creek - source to mouth	5.64	Miles
ID17060207SL008_02	Salmon River - Chamberlain Creek to South Fork Salmon River	124.63	Miles
ID17060207SL009 03	Fivemile Creek - source to mouth	7.47	Miles
ID17060207SL010 02	Little Fivemile Creek - source to mouth	10.42	Miles
ID17060207SL022_03	West Fork Chamberlain Creek - 3rd Order	2.19	Miles
ID17060207SL024_02	Chamberlain Creek - 1st and 2nd order tributaries	26.59	Miles
ID17060207SL024_04	Chamberlain Creek - 4th Order	5.49	Miles
ID17060207SL031 02	Whimstick Creek - 1st and 2nd order tribs	43.58	Miles
ID17060207SL031_03	Whimstick Creek - 3rd Order	7.46	Miles
ID17060207SL042 02	Little Horse Creek - source to mouth	16.81	Miles
ID17060207SL043_02	Horse Creek - Reynolds Creek to Little Horse Creek	15.5	Miles
ID17060207SL043 04	Horse Creek - Reynolds Creek to Little Horse Creek	4.69	Miles
ID17060207SL044_02	Horse Creek - source to Reynolds Creek	35.64	Miles
ID17060207SL045 02	East Fork Reynolds Creek - source to mouth	14.07	Miles
ID17060207SL046_03	Reynolds Creek - source to mouth	1.53	Miles
ID17060207SL051_02	Hamilton Creek - source to mouth	36.33	Miles
ID17060207SL052 02	Sabe Creek - source to Hamilton Creek	34.62	Miles
ID17060207SL055_03	Bargamin Creek - source to mouth	5.25	Miles
ID17060207SL064 02	Big Blowout Creek - source to mouth	7.55	Miles
ID17060207SL074_02	Sheep Creek - source to mouth	56.11	Miles
ID17060207SL076 02	Wind River - source to mouth	37.53	Miles

17060208 South Fork Salmon

ID17060208SL002_02	Raines Creek - entire drainage	12.13	Miles
ID17060208SL030 02	Tamarack Creek - 1st and 2nd order	15.53	Miles

17060209 Lower Salmon

ID17060209SL001 02	Salmon River - Rice Creek to mouth	131.7	Miles
ID17060209SL001_03	Salmon River - Rice Creek to mouth	1.37	Miles

Salmon

ID17060209SL001 07	Salmon River - Rice Creek to mouth	37.45	Miles
ID17060209SL002 02	Flynn Creek - source to mouth	11.51	Miles
ID17060209SL005_02	Burnt Creek - source to mouth	4.18	Miles
ID17060209SL006_02	Round Spring Creek - source to mouth	9.17	Miles
ID17060209SL011 02	Salmon River - tributaries; Little Salmon R. to Slate Creek	60.43	Miles
ID17060209SL011 07	Salmon River - Little Salmon River to Slate Creek	19.81	Miles
ID17060209SL014_02	Race Creek - 1st order tributary	1.06	Miles
ID17060209SL016 02	South Fork Race Creek - source to mouth	8.31	Miles
ID17060209SL018_02	Grave Creek - source to mouth	4.88	Miles
ID17060209SL019 02	Salmon River	43.69	Miles
ID17060209SL019_07	Salmon River	19.12	Miles
ID17060209SL020 02	Lake Creek - source to mouth	17.08	Miles
ID17060209SL020_02L	Piper Lakes, Mary Lake, John Lake	10.04	Acres
ID17060209SL021_01L	Upper Twin Lake, Partridge Creek Lake	9.8	Acres
ID17060209SL021 02	Partridge Creek - source to mouth	27.71	Miles
ID17060209SL021 03	Partridge Creek - source to mouth	8.19	Miles
ID17060209SL021_0L	Paradise Lake	6.26	Acres
ID17060209SL022_02	Elkhorn Creek - source to mouth	26.63	Miles
ID17060209SL022 02L	Lava Butte Lakes	11.94	Acres
ID17060209SL023_02	French Creek - Little French Creek to mouth	26	Miles
ID17060209SL024 01L	French Creek Lakes, Mac Han Lakes	13.52	Acres
ID17060209SL024_02	Little French Creek - source to mouth	27.69	Miles
ID17060209SL024 02L	Scribner Lake	11.54	Acres
ID17060209SL025_02	French Creek - source to Little French Creek	26.22	Miles
ID17060209SL025 03	French Creek - source to Little French Creek	2.79	Miles
ID17060209SL027 02	Van Creek - source to mouth	4.66	Miles
ID17060209SL028_02	Allison Creek - West Fork Allison Creek to mouth	2.83	Miles
ID17060209SL031_02	Berg Creek - source to mouth	7.21	Miles
ID17060209SL045 03	South Fork Skookumchuck Creek - source to mouth	3.19	Miles
ID17060209SL046 02	North Fork Skookumchuck Creek - source to mouth	21.3	Miles
ID17060209SL047_02	Whitebird Creek - confluence of N&SF Whitebird Cr to mouth	46.21	Miles
ID17060209SL047 03	Whitebird Creek-confluence of North and South Fork Whitebird	1.93	Miles
ID17060209SL048_02	South Fork Whitebird Creek - Little Whitebird Creek to mouth	3.92	Miles

ID17060209SL056 02	Rock Creek - tributaries	8.39	Miles
ID17060209SL059 02	Telcher Creek - source to mouth	17.3	Miles
ID17060209SL063_02	Eagle Creek - source to mouth	29.92	Miles
ID17060209SL065_02	Wapshilla Creek - source to mouth	11.85	Miles
ID17060209SL065 03	Wapshilla Creek - source to mouth	1.06	Miles

17060210 Little Salmon

ID17060210SL012_02L	Twin Lakes	40.53	Acres
ID17060210SL015 02L	Corral Creek Lakes	44.63	Acres
ID17060210SL016 02L	Buck and Elk Lakes	23.33	Acres

Southwest

17050101 C. J. Strike Reservoir

ID17050101SW001 01L	Bruneau Duck Ponds	15.26	Acres
ID17050101SW001_02L	Flying H Canal Diversion Pond	88.07	Acres
ID17050101SW001 03	Dry Creek - 3rd order	6.2	Miles
ID17050101SW005_02	Snake River - 1st and 2nd order tribs near Glenns Ferry	16.67	Miles
ID17050101SW007 02	Pot Hole Creek - 1st and 2nd order	102.23	Miles
ID17050101SW007_03	Pot Hole Creek - 3rd order	21.24	Miles
ID17050101SW009 02	Rosevear Gulch - 1st and 2nd order	63.1	Miles
ID17050101SW009 03	Rosevear Gulch - 3rd order	11.08	Miles
ID17050101SW012_01L	Morrow Reservoir	47.76	Acres
ID17050101SW012_03L	Trail Diversion Dam	10.19	Acres
ID17050101SW013_02L	Blair Trail Reservoir	146.53	Acres
ID17050101SW017L 0L	Hot Springs Creek Reservoirs	275.2	Acres
ID17050101SW019_02L	Rattlesnake Springs Ponds	43.58	Acres
ID17050101SW019 0L	John Hoffman Reservoir	7.19	Acres
ID17050101SW021_04	Canyon Creek - 4th order (Fraiser Reservoir to Squaw Creek)	6.5	Miles
ID17050101SW021 05	Canyon Creek - 5th order (Squaw Creek to CJ Strike)	10.69	Miles
ID17050101SW022_04	Fraiser Reservoir	2.93	Miles
ID17050101SW023 02	Canyon Creek - 1st and 2nd order above Fraiser Reservoir	44.34	Miles
ID17050101SW023_05	West Side Canal (half mile segment)	0.55	Miles
ID17050101SW024_03L	Long Tom Reservoir	156.44	Acres
ID17050101SW026 02	Squaw Creek - 1st and 2nd order	101.71	Miles
ID17050101SW026_04	Squaw Creek - 4th order (Mud Springs to Canyon Creek)	17.21	Miles

17050102 Bruneau

ID17050102SW001_02	Wilkins Gulch and unnamed tributaries to CJ Strike Reservoir	6.36	Miles
ID17050102SW002 02	Deadman Gulch and Black Rocks - 1st and 2nd order	173.05	Miles
ID17050102SW002_02L	Unnamed Pond near Black Rocks	5.13	Acres
ID17050102SW002_03	Deadman Gulch and Black Rocks - 3rd order	11.92	Miles
ID17050102SW002 04	Deadman Gulch and Black Rocks - 4th order	8.39	Miles
ID17050102SW003 01L	Unnamed Intermittent Lake in Little Jacks Creek Basin	5.23	Acres
ID17050102SW003 02	Little Jacks Creek - 1st and 2nd order	142.67	Miles
ID17050102SW003_03	Little Jacks Creek and O X Prong - 3rd order	13.7	Miles

ID17050102SW004 02	Big Jacks Creek - 1st and 2nd order	214.04	Miles
ID17050102SW004 03L	Jacks Creek Reservoir	19.84	Acres
ID17050102SW008_02	Sugar Creek - 1st and 2nd order tributaries	122.12	Miles
ID17050102SW008_03	Sugar Creek - 3rd order	21.35	Miles
ID17050102SW008 04a	Sugar Creek - 4th order	7.55	Miles
ID17050102SW009 02	Loveridge and Seventyone Gulches - 1st and 2nd order	58.92	Miles
ID17050102SW009_03	Seventyone Gulch - 3rd order	0.54	Miles
ID17050102SW010 03L	Broken Wagon Flat Reservoir	8.65	Acres
ID17050102SW011_02	Bruneau River (Hot Cr. to Clover Cr.) - 1st and 2nd order	103.26	Miles
ID17050102SW011 02L	White Lake	9.81	Acres
ID17050102SW011_03	Big Draw	13.59	Miles
ID17050102SW012 02	Miller Water - 1st and 2nd order	81.39	Miles
ID17050102SW012_03	Miller Water - 3rd order	2.44	Miles
ID17050102SW012_04	Miller Water - 4th order	11.4	Miles
ID17050102SW013 02	Bruneau River - 1st and 2nd order	35.4	Miles
ID17050102SW014 02	Sheep Creek - 1st and 2nd order	112.97	Miles
ID17050102SW015_02	Louse and Crab Creeks - 1st and 2nd order	100.78	Miles
ID17050102SW015_03L	Blackstone Reservoir	34.27	Acres
ID17050102SW016 01L	Otter Reservoir	1.72	Acres
ID17050102SW016_02aL	Buckhorn Reservoir	113.23	Acres
ID17050102SW016 02L	Rattlesnake Reservoir	6.65	Acres
ID17050102SW016_03	Marys Creek - 3rd order	5.56	Miles
ID17050102SW018 03	Pole Creek - 3rd order	4.17	Miles
ID17050102SW019_03	Cat Creek - 3rd order	7.07	Miles
ID17050102SW020 02	Bruneau River - 1st and 2nd order above Jarbidge River	94.47	Miles
ID17050102SW020 03	Deep Creek and Triplet Canyon - 3rd order	5.23	Miles
ID17050102SW023_03	Dorsey Creek - 3rd order	4.87	Miles
ID17050102SW024_02	East Fork Jarbidge River - 1st and 2nd order tributaries	3.18	Miles
ID17050102SW026 02	Unnamed draw in Inside Desert - 1st and 2nd order	101.41	Miles
ID17050102SW026 03	Unnamed draw in Inside Desert - 3rd order	14.73	Miles
ID17050102SW027_02	Sheepshead Draw - 2nd order	43.56	Miles
ID17050102SW028 02	Clover Creek (East Fork Bruneau River) - 1st and 2nd order	88.59	Miles
ID17050102SW028_03	Clover Creek (East Fork Bruneau River) - 3rd order	2.47	Miles

ID17050102SW029_02	Juniper Draw - 1st and 2nd order	78.21	Miles
ID17050102SW029_03	Juniper Draw - 3rd order	3.9	Miles
ID17050102SW035_02	Buck Flat Draw - 1st and 2nd order	89.37	Miles
ID17050102SW035_03	Buck Flat Draw - 3rd order	14.93	Miles
ID17050102SW035_04	Buck Flat Draw - 4th order	10.21	Miles

17050103 Middle Snake-Succor

ID17050103SW001_02	Snake River - 1st and 2nd order	8.48	Miles
ID17050103SW002_02	Sage Creek and tributaries - 1st and 2nd order	22.61	Miles
ID17050103SW002_02L	Unnamed Lake in Strode Basin	2.4	Acres
ID17050103SW003_02L	Johnston Lakes	4.27	Acres
ID17050103SW003_03L	Succor Creek Reservoir	180.43	Acres
ID17050103SW005_02L	Unnamed Lake on Pole Creek Top	5.37	Acres
ID17050103SW006_03	Snake River - 3rd order unnamed tributaries near Sinker Cr.	7.11	Miles
ID17050103SW006_03L	Pacific Land Company Dam	15.99	Acres
ID17050103SW010_02	West Rabbit Creek - 1st and 2nd order	30.6	Miles
ID17050103SW010_03	West Rabbit Creek - 3rd order	5.84	Miles
ID17050103SW011_03	Rabbit Creek (south side of Snake River)- 3rd order	7.65	Miles
ID17050103SW011_04	Rabbit Creek (south side of Snake River)- 4th order	7.9	Miles
ID17050103SW012_02	Sinker Creek - 1st and 2nd order rangeland tributaries	63.08	Miles
ID17050103SW012_02a	Sinker Creek - 1st and 2nd order forested tributaries	36.63	Miles
ID17050103SW012_04L	Hulet-Sinker Creek Reservoir	54.13	Acres
ID17050103SW013_02	Fossil Creek - 1st and 2nd order	65.22	Miles
ID17050103SW013_03	Fossil Creek - 3rd order	10.13	Miles
ID17050103SW014_02L	Foremans Reservoir	29.7	Acres
ID17050103SW015_02	Unnamed stream near Oreana	6.57	Miles
ID17050103SW015_05	Catherine Creek - 5th order (Browns Creek to Castle Creek)	5.73	Miles
ID17050103SW017_02	Bates Creek - 1st and 2nd order	19.08	Miles
ID17050103SW017_03	Bates Creek - 3rd order	1.74	Miles
ID17050103SW018_02	Hart and Little Hart Creeks - 1st and 2nd order	46.19	Miles
ID17050103SW018_03	Hart Creek - 3rd order	5.15	Miles
ID17050103SW022_02	McKeeth Wash - 1st and 2nd order	44.08	Miles
ID17050103SW022_03	McKeeth Wash - 3rd order	10.08	Miles
ID17050103SW023_02	Vinson Wash - 1st and 2nd order	60.74	Miles

Southwest

17050104 Upper Owyhee

ID17050104SW001_02	Owyhee River - 1st and 2nd order	115.67	Miles
ID17050104SW001_03	Owyhee River - 3rd order tributaries	8.85	Miles
ID17050104SW002_02	Unnamed streams in YP Desert	13.79	Miles
ID17050104SW003_02	Piute Creek - 1st and 2nd order	102.48	Miles
ID17050104SW003_03	Piute Creek - 3rd order	8.65	Miles
ID17050104SW003_04	Piute Creek - 4th order	6.06	Miles
ID17050104SW003_04L	Piute Basin Reservoir	8.4	Acres
ID17050104SW004_02	Juniper Creek - 1st and 2nd order	58.86	Miles
ID17050104SW004_02L	Little Juniper Basin Reservoir	3.91	Acres
ID17050104SW004_03	Juniper Creek - 3rd order	4.53	Miles
ID17050104SW004_04	Juniper Creek - 4th order	9.37	Miles
ID17050104SW005_02	Juniper Creek - 1st and 2nd order	28.62	Miles
ID17050104SW005_03	Juniper Creek - 3rd order	5.25	Miles
ID17050104SW006_02	Thacker and Ross Sloughs - 1st and 2nd order	19.25	Miles
ID17050104SW006_02L	Mud Flat	121.03	Acres
ID17050104SW007_02	Blue Creek: 1st and 2nd order tribs above Blue Cr. Reservoir	40.58	Miles
ID17050104SW007_03	Blue Creek - Blue Creek Reservoir to Little Blue Creek	4.72	Miles
ID17050104SW007_04	Blue Creek - Little Blue Creek to Shoofly Creek	10.63	Miles
ID17050104SW007_05	Blue Creek - Shoofly Creek to Owyhee River	1.45	Miles
ID17050104SW010_02	Payne Creek - 1st and 2nd order	42.77	Miles
ID17050104SW010_02L	Payne Creek Reservoir	74.27	Acres
ID17050104SW010_03	Payne Creek - 3rd order	5.96	Miles
ID17050104SW010_04	Payne Creek - 4th order	0.71	Miles
ID17050104SW011_02	Squaw Creek - 1st and 2nd order	35.8	Miles
ID17050104SW011_02L	Squaw Creek Reservoir	41.63	Acres
ID17050104SW011_03	Squaw Creek - 3rd order	1.11	Miles
ID17050104SW011_0L	Indian Creek Reservoir	18.49	Acres
ID17050104SW012_02	Little Blue Creek - 1st and 2nd order	49.85	Miles
ID17050104SW012_02L	Sewell Reservoir	5.6	Acres
ID17050104SW012_03L	Little Blue Creek Reservoir	139.9	Acres
ID17050104SW013_02	Blue Creek - 1st and 2nd order above Blue Creek Reservoir	80.05	Miles
ID17050104SW013_02L	Unnamed lake on Turner Table	101.97	Acres

ID17050104SW014_03L	Bybee Reservoir	68.16	Acres
ID17050104SW014_05	Shoofly Creek ditch - half mile section	0.21	Miles
ID17050104SW015_02	Harris Creek - 1st and 2nd order	46.13	Miles
ID17050104SW015_03	Harris Creek - 3rd order	8.48	Miles
ID17050104SW015_03L	Unnamed Reservoir on Harris Creek	36.3	Acres
ID17050104SW017_02L	Rough Lake	160.74	Acres
ID17050104SW018_02L	Ross Lake	308.84	Acres
ID17050104SW019_02L	Juniper Lake	388.99	Acres
ID17050104SW020_02L	Henry Lake	171.8	Acres
ID17050104SW021_02	Unnamed tributary to Owyhee River near Ross Lake	5.98	Miles
ID17050104SW022_02	Yatahoney Creek - 1st and 2nd order	44.23	Miles
ID17050104SW022_03	Yatahoney Creek - 3rd order	7.22	Miles
ID17050104SW023_01L	Unnamed Pond near Hutch Springs	7.23	Acres
ID17050104SW023_02L	Battle Creek Spring Pond	12.38	Acres
ID17050104SW023_03L	Battle Creek Reservoir	8.47	Acres
ID17050104SW024_02L	Dry Creek Reservoir	72.57	Acres
ID17050104SW026_01L	Bennett Reservoir	4.62	Acres
ID17050104SW026_02L	Hackberry Reservoir	15.48	Acres
ID17050104SW026_03	Deep Creek - 3rd order rangeland tributaries	12.93	Miles
ID17050104SW027_03	Dickshooter Creek - 3rd order	6.07	Miles
ID17050104SW028_02L	Johnson Reservoir	5.63	Acres
ID17050104SW029_02	Camas Creek - 1st and 2nd order	40.16	Miles
ID17050104SW031_02L	Unnamed Reservoir on Wilson Creek	2.18	Acres
ID17050104SW032_02L	Star Reservoir	38.73	Acres
ID17050104SW032_03L	Unnamed Reservoir near Castro Ranch	4.97	Acres

17050105 South Fork Owyhee

ID17050105SW001_02	Unnamed 1st and 2nd order tributaries to SF Owyhee River	129.09	Miles
ID17050105SW002_02	Spring Creek - 1st and 2nd order	46.56	Miles
ID17050105SW002_03	Spring Creek - 3rd order	6.12	Miles
ID17050105SW003_02	Bull Camp Reservoir - 1st and 2nd order	16.33	Miles
ID17050105SW003_03	Bull Camp Reservoir - 3rd order	1.62	Miles
ID17050105SW003_04	Bull Camp Reservoir - 4th order	4.61	Miles
ID17050105SW004_02	Homer Wells Reservoir - 1st and 2nd order	85.99	Miles

Southwest

ID17050105SW004 03	Homer Wells Reservoir - 3rd order	12.06	Miles
ID17050105SW004 03L	Horse Basin Reservoirs and Homer Wells Reservoir	12.84	Acres
ID17050105SW004_04	Homer Wells Reservoir - 4th order	5.77	Miles
ID17050105SW004_04L	Homer Wells Reservoir	35.85	Acres
ID17050105SW005 02	Coyote Flat - 1st and 2nd order	30.33	Miles
ID17050105SW005 03	Coyote Flat - 3rd order	4.72	Miles

17050106 East Little Owyhee

ID17050106SW001 02	Little Owyhee River - 1st and 2nd order tributaries	76.16	Miles
ID17050106SW001 06	Little Owyhee River - State Line to South Fork Owyhee	15.76	Miles
ID17050106SW002_02	Tent Creek- 1st and 2nd order	32.81	Miles
ID17050106SW002_03	Tent Creek- 3rd order	12.94	Miles
ID17050106SW002_04	Tent Creek- 4th order	4.01	Miles
ID17050106SW002 04L	Tent Creek Reservoir	21.05	Acres

17050107 Middle Owyhee

ID17050107SW001_02	Dukes Creek and Bald Mountain Canyon - 1st and 2nd order	34.93	Miles
ID17050107SW002 02	Oregon Lake Creek - 1st and 2nd order	7.41	Miles
ID17050107SW003_02	Field Creek - 1st and 2nd order	11.28	Miles
ID17050107SW005_02	Pole Creek - 1st and 2nd order	17.93	Miles
ID17050107SW007_02	Cottonwood Creek - 1st and 2nd order	22.34	Miles
ID17050107SW013 02	Cherry Creek - 1st and 2nd order	52.07	Miles
ID17050107SW013_03	Cherry Creek - 3rd order	3.83	Miles
ID17050107SW014 02	Soldier, Stove and Sheep Creeks - 1st and 2nd order	31.9	Miles

17050108 Jordan

ID17050108SW001_02	Jordan Creek, Lower - 1st and 2nd order tributaries	34.36	Miles
ID17050108SW002_02L	Unnamed Reservoir on Lone Tree Creek	6.74	Acres
ID17050108SW002_03	Lone Tree Creek - 3rd order	6.08	Miles
ID17050108SW004 02L	Pershall Reservoir	9.8	Acres
ID17050108SW006_02	South Boulder, Indian and Bogus Creeks - 1st and 2nd order	53.63	Miles
ID17050108SW007 02	North Boulder Creek - 1st and 2nd order	30.96	Miles
ID17050108SW008 02	Mammoth Creek - entire drainage	12.8	Miles
ID17050108SW010 02	Triangle Creek and unnamed tributaries to Rock Creek	28.67	Miles
ID17050108SW010_05	Rock Creek -Triangle Reservoir Dam to mouth	5.16	Miles

ID17050108SW012 02	Josephine and Wickiup Creeks - 1st and 2nd order	45.45	Miles
ID17050108SW012 03	Josephine and Wickiup Creeks - 3rd order	4.79	Miles
ID17050108SW013_03L	Triangle Reservoir	82.94	Acres
ID17050108SW015_02L	Unnamed Reservoir near Meadow Creek	125.72	Acres
ID17050108SW015 03L	Spencer Reservoir	28.8	Acres
ID17050108SW016 02	Deer Creek - entire drainage	13.66	Miles
ID17050108SW019_02	Trout Creek - 1st and 2nd order	33.78	Miles
ID17050108SW020 02	Hooker Creek - entire drainage	7.56	Miles
ID17050108SW023_02	Baxter Creek - 1st and 2nd order	6.94	Miles

17050111 North and Middle Forks Boise

ID17050111SW001_00L	Lake Creek - unnamed headwater lake	8.26	Acres

17050112 Boise-Mores

ID17050112SW001 02	Sheep, Charcoal, Birch, Macks and Deer Creeks	39.93	Miles
ID17050112SW002_02	1st and 2nd order tributaries to Arrowrock Reservoir	35.23	Miles
ID17050112SW008_02	Deer Creek - entire drainage	5.52	Miles
ID17050112SW010 02	Smith Creek - entire drainage	8.53	Miles

17050113 South Fork Boise

ID17050113SW001 02	Arrowrock Reservoir (1st and 2nd order tributaries)	16.7	Miles
ID17050113SW002a_02	Willow Creek - 1st and 2nd order	29.29	Miles
ID17050113SW006 02	Little Camas Creek - unnamed tributary near aqueduct	3.77	Miles
ID17050113SW006_04	Little Camas Creek - Little Camas Reservoir to mouth	1.96	Miles
ID17050113SW009_02	Wood and Little Wood Creeks - 1st and 2nd order	17.06	Miles
ID17050113SW009 03	Wood Creek - 3rd order	0.41	Miles
ID17050113SW015_05	South Fork Boise River - 5th order	16.31	Miles
ID17050113SW019_03	Big Smoky Creek - 3rd order	9.44	Miles
ID17050113SW022_02	Johnson Creek - 1st and 2nd order	18.09	Miles
ID17050113SW023 02L	Perkins Lake	10.11	Acres
ID17050113SW028_01L	Rainbow Lakes, Heart Lake, Big Lookout Lake	33.14	Acres

17050114 Lower Boise

ID17050114SW003c 03L	Indian Creek Reservoir	126.28	Acres
ID17050114SW003d_02L	Caldwell Draw Reservoir	4.96	Acres

Southwest

ID17050114SW005_03	West Hartley Gulch	8.22	Miles
ID17050114SW007_02	Unnamed 1st order tributary to Fifteenmile Creek	1.25	Miles
ID17050114SW008_02	Tenmile Creek - 1st and 2nd order	36.24	Miles
ID17050114SW009_03L	Blacks Creek Reservoir	82.5	Acres
ID17050114SW010_03L	Unnamed Ponds on Fivemile Creek	10.94	Acres
ID17050114SW011a_02	Warm Springs and Squaw Creeks, and Maynard Gulch	19.48	Miles
ID17050114SW011a_02L	Warm Springs Golf Course Lake	4.33	Acres
ID17050114SW011b_02	Lydle Gulch and two nearby unnamed intermittent streams	7.29	Miles
ID17050114SW013_04	Dry Creek - 4th order (Spring Valley Creek to mouth)	4.9	Miles
ID17050114SW014_02	Big Gulch and Little Gulch Creeks, and Woods Gulch	36.2	Miles
ID17050114SW015_02	Willow Creek - 1st and 2nd order	77.74	Miles
ID17050114SW016_02	Tributaries to West Hartley Gulch and Sand Hollow Creek	45.64	Miles
ID17050114SW017_02	Sand Hollow Creek - 1st and 2nd order tributaries	33.35	Miles

17050115 Middle Snake-Payette

ID17050115SW001_02	Cherry Gulch and Buttermilk Slough	34.69	Miles
ID17050115SW002_08	Snake River side channels near Homestead Gulch	0.42	Miles
ID17050115SW005_02	Sand Hollow	24.18	Miles

17050121 Middle Fork Payette

ID17050121SW009_03	Bull Creek - 3rd order (Sixteen-to-One Creek to mouth)	0.74	Miles

17050122 Payette

ID17050122SW001_02	Graveyard and Langley Gulches, and Haw Creek	192.68	Miles
ID17050122SW001_02L	Unnamed Pond between Langley and Graveyard Gulches	4.06	Acres
ID17050122SW003_03	Fleming Creek - 3rd order	2.09	Miles
ID17050122SW004_02	Shafer Creek - 1st and 2nd order	76.5	Miles
ID17050122SW006_02	Porter Creek - 1st and 2nd order	19.67	Miles
ID17050122SW006_03	Porter Creek - 3rd order (Shanks Creek to mouth)	4.72	Miles
ID17050122SW007_02	Hill Creek - 1st and 2nd order	25.33	Miles
ID17050122SW007_03	Hill Creek - 3rd order	3.1	Miles
ID17050122SW008_02	Eddy Creek and unnamed tributaries to SF Payette River	12.23	Miles
ID17050122SW011_01L	Beal Reservoir Number 3	13.82	Acres
ID17050122SW011_02L	Unnamed reservoir on Padget Creek	25.24	Acres
ID17050122SW015_02L	Little Lake	58.36	Acres

Southwest

ID17050122SW016 02	Sand Hollow - 1st and 2nd order	23.3	Miles
ID17050122SW017 02L	Unnamed Pond in Stone Quarry Gulch	4.69	Acres
ID17050122SW018_02	Little Willow Creek below Paddock Valley - 1st and 2nd order	87.08	Miles
ID17050122SW019_02	Indian, Hog Cove and Rattlesnake Creeks - 1st and 2nd order	19.37	Miles
ID17050122SW019 03	Indian Creek - 3rd order (Rattlesnake to Little Willow)	3.32	Miles
ID17050122SW020 02	Two unnamed tributaries to Paddock Valley Reservoir	7.7	Miles
ID17050122SW021_02	Little Willow Creek above Paddock - 1st and 2nd order	28.25	Miles
ID17050122SW021 03	Little Willow Creek above Paddock Valley Res. - 3rd order	4.12	Miles

17050123 North Fork Payette

ID17050123SW004_02L	Corral Creek Reservoir	40.29	Acres
ID17050123SW004_03L	Warner Pond	17.66	Acres
ID17050123SW006_01L	Calendar Reservoir	15.79	Acres
ID17050123SW006 02L	Davis Reservoir	30.39	Acres
ID17050123SW010_01L	Fogg Lake	3.05	Acres
ID17050123SW011 00L	Boulder Lake	78.2	Acres
ID17050123SW011_02aL	Melton Reservoir	8.26	Acres
ID17050123SW011 02L	Jussila-Bow Lake and unnamed reservoir on Cold Creek	37.86	Acres
ID17050123SW014_03L	Browns Pond	83.24	Acres
ID17050123SW016 02L	Hait Reservoir (Blackhawk Lake)	63.32	Acres
ID17050123SW017_01L	Unamed Lake between Lemah and Fall Creeks	15.61	Acres
ID17050123SW017_02L	Blackwell Lake	33.54	Acres
ID17050123SW018 02L	Brush Lake	165.14	Acres
ID17050123SW021_01L	Deep and Trail Lakes	40.38	Acres
ID17050123SW022 02L	Horton Lake	5.71	Acres

17050124 Weiser

ID17050124SW001 02	Weiser River - Keithly Creek to mouth	116.53	Miles
ID17050124SW003_02	Camp and Star Butte Creeks - 1st and 2nd order	31.12	Miles
ID17050124SW003_02L	Star Butte Pond	23.18	Acres
ID17050124SW003 03	Camp Creek - 3rd order	2.38	Miles
ID17050124SW004 02	Milk Creek - entire drainage	24.23	Miles
ID17050124SW005 02L	Soulen Reservoir	117.61	Acres
ID17050124SW006_01L	Groner Reservoir	12.48	Acres

ID17050124SW006 02L	Crane Springs Pond	15.97	Acres
ID17050124SW009 02	Ben Ross Reservoir - all inlet and outlet streams	9.29	Miles
ID17050124SW010_02	Mill Creek - entire drainage	13.97	Miles
ID17050124SW013_02	Bacon Creek - entire drainage	7.97	Miles
ID17050124SW026 02	Spring and Camp Creeks - 1st and 2nd order	26.52	Miles
ID17050124SW026 03	Spring Creek - 3rd order (Camp Creek to mouth)	1.5	Miles
ID17050124SW029_02	Sage Creek - 1st and 2nd order	40.35	Miles
ID17050124SW029 03	Sage Creek - 3rd order (Fairchild Reservoir outlet to mouth)	6.04	Miles
ID17050124SW030_02	Mann Creek - 1st and 2nd order	25.74	Miles
ID17050124SW031 02	Unnamed tributary to Mann Creek near Fairchild Reservoir	2.9	Miles
ID17050124SW033_02L	Barton Reservoir	17.48	Acres

17050201 Brownlee Reservoir

ID17050201SW002 02	Tributaries to Snake River - 1st and 2nd order	16.36	Miles
ID17050201SW002_02a	Salt Creek - entire drainage	4.37	Miles
ID17050201SW004 02	Snake River - Weiser River to Scott Creek	1.88	Miles
ID17050201SW011_02	Wolf Creek - 1st and 2nd order	10.58	Miles
ID17050201SW015 02L	Barber Flat Reservoir	4.95	Acres

Upper Snake

17040104 Palisades

ID17040104SK005_02	Fall Creek - South Fork Fall Creek to mouth	20.53	Miles
ID17040104SK009_02	Indian Creek - source to mouth	9.82	Miles
ID17040104SK010_02	1st & 2nd Order Streams flowing into Palisades Reservoir	52.95	Miles
ID17040104SK010L_0L	Palisades Reservoir	15432.53	Acres
ID17040104SK012_02	North Fork Bear Creek - source to mouth	17.27	Miles
ID17040104SK012_03	North Fork Bear Creek - source to mouth	2.66	Miles
ID17040104SK014_02	McCoy Creek - Fish Creek to Palisades Reservoir	30.37	Miles
ID17040104SK015_02	McCoy Creek - Iowa Creek to Fish Creek	20.64	Miles
ID17040104SK016_04	McCoy Creek - Clear Creek to Iowa Creek	2.8	Miles
ID17040104SK017_02	Wolverine Creek - source to mouth	15.51	Miles
ID17040104SK018_02	Clear Creek - source to mouth	28.93	Miles
ID17040104SK020_02	Iowa Creek - source to mouth	18.73	Miles
ID17040104SK024_02	Indian Creek - Idaho/Wyoming border to Palisades Reservoir	6.58	Miles
ID17040104SK025_02	Big Elk Creek - Idaho/Wyoming border to Palisades Reservoir	28.66	Miles
ID17040104SK027_02	Palisades Creek - source to mouth	110.26	Miles
ID17040104SK028_03	Rainey Creek - source to mouth	4.46	Miles

17040105 Salt

ID17040104SK010L_0L	Palisades Reservoir	15432.53	Acres
ID17040105SK001_02	Tributaries of Salt River - source to Idaho/Wyoming border	18.27	Miles
ID17040105SK002_02c	Cabin Creek	3.02	Miles
ID17040105SK002_02d	Squaw Creek	16.23	Miles
ID17040105SK003_02a	Rich Creek	1.5	Miles
ID17040105SK003_02c	Lau Creek	2.03	Miles
ID17040105SK005_02	Tributaries of Salt River - source to Idaho/Wyoming border	24.97	Miles
ID17040105SK005_05	Tributaries of Salt River - source to Idaho/Wyoming border	0.29	Miles
ID17040105SK006_02f	White Canyon	3.2	Miles
ID17040105SK006_02L	Unnamed Lake - Trib to Stump Creek	4.06	Acres
ID17040105SK007_02	Tygee Creek - source to mouth	16.54	Miles
ID17040105SK007_02a	Webster Creek	2.48	Miles
ID17040105SK007_02b	Draney Creek	3.42	Miles
ID17040105SK007_02g	Roberts Creek	5.6	Miles

ID17040105SK010 02	Deer Creek - source to mouth	2.47	Miles
ID17040105SK011 02	Rock Creek - source to mouth	17.49	Miles
ID17040105SK011_02a	Rock Creek	2.95	Miles
ID17040105SK012_01L	Elk Valley Springs	11.89	Acres
ID17040105SK012 02	Spring Creek - source to mouth	4.23	Miles
ID17040105SK012 02b	Spring Creek	2.99	Miles

17040201 Idaho Falls

ID17040201SK001 02	Snake River - Dry Bed Creek to river mile 791	23.73	Miles
ID17040201SK001 04	Snake River - Dry Bed Creek to river mile 791	21.33	Miles
ID17040201SK002_02	South Fork Willow Creek - source to mouth	4.56	Miles
ID17040201SK003_05	North Fork Willow Creek - source to mouth	10.22	Miles
ID17040201SK004_02	Dry Bed Creek - source to mouth	14.31	Miles
ID17040201SK004 06	Dry Bed Creek - source to mouth	41.47	Miles
ID17040201SK009_02	Snake River - Annis Slough to Dry Bed Creek	21.38	Miles
ID17040201SK009 06	Snake River - Annis Slough to Dry Bed Creek	5.22	Miles
ID17040201SK009_07	Snake River - Annis Slough to Dry Bed Creek	24.95	Miles
ID17040201SK010 02	Spring Creek - canal (T05N, R38E) to mouth	5.49	Miles
ID17040201SK011_02	Spring Creek - source to canal (T05N, R38E)	4.26	Miles
ID17040201SK012 02	Snake River - Dry Bed to Annis Slough	53.63	Miles
ID17040201SK012_06	Snake River - Dry Bed to Annis Slough	63.59	Miles
ID17040201SK012_07	Snake River - Dry Bed to Annis Slough	1.5	Miles
ID17040201SK014 02	Lyons Creek - source to mouth	57.97	Miles
ID17040201SK014_03	Lyons Creek - source to mouth	5.23	Miles
ID17040201SK016 02	Market Lake - 1st and 2nd Order Tribs	0.46	Miles
ID17040201SK016_02L	Market Lake	56.15	Acres
ID17040201SK017 02	Kettle Butte complex	30.03	Miles

17040202 Upper Henrys

ID17040202SK001_01L	Blue Creek Reservoir - Cherry Dam	4.35	Acres
ID17040202SK001 02	Henrys Fork - Warm River to Ashton Reservoir Dam	105.78	Miles
ID17040202SK001 02L	Coleman Canyon Lake	4.81	Acres
ID17040202SK001 03	Henrys Fork - Warm River to Ashton Reservoir Dam	1.15	Miles
ID17040202SK001_06	Henrys Fork - Warm River to Ashton Reservoir Dam	6.39	Miles

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Upper Snake

ID17040202SK001 06L	Ashton Reservoir (Henrys Fork)	358.33	Acres
ID17040202SK002 02	Warm River - Warm River Spring to mouth	15.57	Miles
ID17040202SK004_02	Partridge Creek - source to mouth	45.85	Miles
ID17040202SK006_02	Robinson Creek - Rock Creek to mouth	3.54	Miles
ID17040202SK007 02L	Long Meadows Lakes	27.41	Acres
ID17040202SK008 02	Rock Creek - Wyoming Creek to mouth	10.11	Miles
ID17040202SK009_02	Wyoming Creek - Idaho/Wyoming border to mouth	5.16	Miles
ID17040202SK010 02L	Robinson Lake (Rock Creek)	33.86	Acres
ID17040202SK011_02	Robinson Creek - Idaho/Wyoming border	43.64	Miles
ID17040202SK013 03	Fish Creek - source to mouth	4.02	Miles
ID17040202SK014_02	Henrys Fork - Thurman Creek to Warm River	35.87	Miles
ID17040202SK014 02L	Fish Pond (Henry's Fork)	64.75	Acres
ID17040202SK015_02	Henrys Fork - Island Park Reservoir Dam to Thurman Creek	16.38	Miles
ID17040202SK015_05	Henrys Fork - Island Park Reservoir Dam to Thurman Creek	9.65	Miles
ID17040202SK016 03	Buffalo River - Elk Creek to mouth	2.33	Miles
ID17040202SK017 02	Toms Creek - source to mouth	11.73	Miles
ID17040202SK018_02	Buffalo River - source to Elk Creek	17.81	Miles
ID17040202SK019_02	Elk Creek - source to mouth	7.11	Miles
ID17040202SK019 02L	Elk Creek Reservoir	20.44	Acres
ID17040202SK020_01L	Unnamed Lake - Island Park Reservoir	7.24	Acres
ID17040202SK020 02	Island Park Reservoir	83.21	Miles
ID17040202SK020_02L	Bishop Lake	17.19	Acres
ID17040202SK020L 0L	Island Park Reservoir	7647.44	Acres
ID17040202SK021_05	Henrys Fork-Confluence of Big Springs and Henrys Lake Outlet	7.92	Miles
ID17040202SK023 02	Big Springs - source to mouth	1.32	Miles
ID17040202SK025 03	Henrys Lake Outlet - Henrys Lake Dam to mouth	2.09	Miles
ID17040202SK026_02	Meadows Creek - source to mouth	5.28	Miles
ID17040202SK027_02	Reas Pass Creek - source to sink	17.25	Miles
ID17040202SK032 02	Henrys Lake 1st and 2nd order Tribs	25.52	Miles
ID17040202SK032L 0L	Henrys Lake	6078.47	Acres
ID17040202SK034_02L	Edwards and Clark Lakes	24.98	Acres
ID17040202SK037 02	Rock Creek - source to mouth	10.29	Miles
ID17040202SK037_02L	Lake Marie	3.15	Acres

Upper Snake

ID17040202SK038 02	Hope Creek - source to mouth	4.72	Miles
ID17040202SK039 02	Crooked Creek - source to mouth	17.74	Miles
ID17040202SK039_04	Crooked Creek - source to mouth	12.93	Miles
ID17040202SK043_02	Sheep Creek - source to mouth	24.72	Miles
ID17040202SK043 03	Sheep Creek - source to mouth	1.16	Miles
ID17040202SK043 03L	Sheep Creek Reservoir	20.13	Acres
ID17040202SK044_02L	Icehouse Creek Reservoirs	83.28	Acres
ID17040202SK045 02	Sheridan Creek - Kilgore Road (T13N, R41E, Sec. 07) to mouth	35.73	Miles
ID17040202SK046_02	Willow Creek - source to mouth	18.92	Miles
ID17040202SK046 03	Willow Creek - source to mouth	2.64	Miles
ID17040202SK047_03	Myers Creek - source to mouth	3.76	Miles
ID17040202SK048 02	Sheridan Creek -source to Kilgore Road (T13N, R41E, Sec. 07)	17.71	Miles
ID17040202SK048_02L	Unnamed Lake - West Fork Sheridan Creek	3.88	Acres
ID17040202SK049_02	Sheridan Reservoir - Tribs order 1 & 2	8.17	Miles
ID17040202SK049L 0L	Sheridan Reservoir	324.25	Acres
ID17040202SK050 02	Dry Creek - source to Sheridan Reservoir	3.31	Miles
ID17040202SK051_02	Thurman Creek - source to mouth	18.11	Miles
ID17040202SK051_02L	Silver Lake	164.77	Acres
ID17040202SK051 0L	Golden Lake	39.7	Acres
ID17040202SK052_02	Rattlesnake Creek - source to mouth	14.34	Miles

17040203 Lower Henrys

ID17040201SK012 02	Snake River - Dry Bed to Annis Slough	53.63	Miles
ID17040201SK012_06	Snake River - Dry Bed to Annis Slough	63.59	Miles
ID17040201SK014 02	Lyons Creek - source to mouth	57.97	Miles
ID17040203SK001_02	Henrys Fork	6.88	Miles
ID17040203SK001 06	Henrys Fork	26.48	Miles
ID17040203SK002_01L	Unnamed Lake	18.69	Acres
ID17040203SK002 02	Henry's Fork-North Fork Teton R. to South Fork Teton River	20.8	Miles
ID17040203SK002_02L	Egin Lakes	32.05	Acres
ID17040203SK002 06	Henry's Fork - North Fork Teton River to South Fork Teton R.	44.91	Miles
ID17040203SK002_0L	Mackerts Pond	5.51	Acres
ID17040203SK003 02	Henrys Fork - Falls River to North Fork Teton River	12.61	Miles
ID17040203SK003 02L	Unnamed Lake - Henrys Fork	2.07	Acres

ID17040203SK003 05	Henrys Fork - Falls River to North Fork Teton River	8.73	Miles
ID17040203SK004 02	Unnamed Tribs to Falls River	38.57	Miles
ID17040203SK004_03	Unnamed Tribs to Falls River	10.99	Miles
ID17040203SK005_02	Falls River - 02 Stream Order and tribs	6.13	Miles
ID17040203SK006 02	Conant Creek - Idaho/Wyoming border to Squirrel Creek	8.63	Miles
ID17040203SK007 02L	Ernest Lake	12.02	Acres
ID17040203SK008_02	Squirrel Creek - Idaho/Wyoming border to mouth	19.91	Miles
ID17040203SK009 02	Falls River - Idaho/Wyoming border to Boone Creek	17.69	Miles
ID17040203SK009_04	Falls River - Idaho/Wyoming border to Boone Creek	17.23	Miles
ID17040203SK011 02	Boundary Creek - Idaho/Wyoming border (T12N, R46E, Sec. 06)	17.31	Miles
ID17040203SK011_03	Boundary Creek - Idaho/Wyoming border (T12N, R46E, Sec. 06)	3.47	Miles
ID17040203SK011 04	Boundary Creek - Idaho/Wyoming border (T12N, R46E, Sec. 06)	6.08	Miles
ID17040203SK012_02	Henrys Fork - Ashton Reservoir Dam to Falls River	60.79	Miles
ID17040203SK012_02L	Mikesell Reservoirs #1 and #2	31.37	Acres
ID17040203SK013 04L	Lemon Lake - (Sand Creek)	42.56	Acres
ID17040203SK014 02	Pine Creek - source to mouth	21.29	Miles
ID17040203SK014_03	Pine Creek - source to mouth	1.9	Miles
ID17040203SK014_03L	Lower Arcadia Reservoir (Pine Creek Source to Mouth)	71.59	Acres
ID17040203SK015 02	Sand Creek - source to Pine Creek	79.19	Miles
ID17040203SK015_02L	Sand Creek Reservoir	70.28	Acres
ID17040203SK015 03	Sand Creek - source to Pine Creek	4.83	Miles
ID17040203SK015_03L	Upper Arcadia Reservoir	53.62	Acres
ID17040203SK015 04L	Blue Creek Reservoir(s) #'S 1, 2, 3	81.12	Acres
ID17040203SK016_06	Warm Slough - source to mouth	8.6	Miles

17040204 Teton

ID17040204SK001 02	South Fork Teton River - Teton River Forks to Henrys Fork	42.04	Miles
ID17040204SK001_03	South Fork Teton River - Teton River Forks to Henrys Fork	4.77	Miles
ID17040204SK002 02	North Fork Teton River - Teton River Forks to Henrys Fork	4.56	Miles
ID17040204SK003_02	Teton River - Teton Dam to Teton River Forks	26	Miles
ID17040204SK004 02	Teton River - Canyon Creek to Teton Dam	10.26	Miles
ID17040204SK004_05	Teton River - Canyon Creek to Teton Dam	5.52	Miles
ID17040204SK005 02	Moody Creek - confluence of North and South Fork Moody Creek	106.44	Miles
ID17040204SK006 03	South Fork Moody Creek - source to mouth	0.74	Miles

ID17040204SK007 03	North Fork Moody Creek - source to mouth	1.25	Miles
ID17040204SK009 02	Canyon Creek - source to Warm Creek	57.42	Miles
ID17040204SK009_04	Canyon Creek - source to Warm Creek	0.36	Miles
ID17040204SK010_02	Calamity Creek - source to mouth	19.63	Miles
ID17040204SK012 02	Teton River - Milk Creek to Canyon Creek	17.48	Miles
ID17040204SK012 05	Teton River - Milk Creek to Canyon Creek	5.03	Miles
ID17040204SK013_03	Milk Creek - source to mouth	7.1	Miles
ID17040204SK014 02	Teton River - Felt Dam outlet to Milk Creek	22.42	Miles
ID17040204SK014_05	Teton River - Felt Dam outlet to Milk Creek	7.64	Miles
ID17040204SK015 02	Teton River - Felt Dam pool	7.22	Miles
ID17040204SK016_02	Teton River - Highway 33 bridge to Felt Dam pool	12.11	Miles
ID17040204SK017 02	Teton River	31.91	Miles
ID17040204SK017_03	Teton River	5.37	Miles
ID17040204SK019_02L	Packsaddle Lake	5	Acres
ID17040204SK020 02	Teton River	35.07	Miles
ID17040204SK020 03	Teton River	2.75	Miles
ID17040204SK021_02	Horseshoe Creek	2.48	Miles
ID17040204SK024_02	Mahogany Creek -pipeline diversion (NE ¼, Sec. 27, T4N, R44)	8.61	Miles
ID17040204SK028 02	Teton River	5.57	Miles
ID17040204SK029_02	Patterson Creek - pump diversion (SE ¼, Sec. 31, T4N, R44E)	1.55	Miles
ID17040204SK031 02	Grove Creek - source to sink	2.56	Miles
ID17040204SK034_03	Warm Creek - source to mouth	1.95	Miles
ID17040204SK047 03	Teton Creek	4.37	Miles
ID17040204SK051_02	Dry Creek - Idaho/Wyoming border to sinks	2.95	Miles
ID17040204SK051 03	Dry Creek - Idaho/Wyoming border to sinks	7.85	Miles
ID17040204SK053 02	South Leigh Creek	3.42	Miles
ID17040204SK054_02	Spring Creek - North Leigh Creek to mouth	4.06	Miles
ID17040204SK055_02	North Leigh Creek - Idaho/Wyoming border to mouth	4.99	Miles
ID17040204SK057 02	Badger Creek	5.85	Miles
ID17040204SK058 02	Badger Creek	29.1	Miles
ID17040204SK059_02	Badger Creek	0.88	Miles
ID17040204SK060 02	South Fork Badger Creek	2.08	Miles
ID17040204SK061_02	South Fork Badger Creek - Idaho/Wyoming border to diversion	6.07	Miles

Upper Snake

ID17040204SK062 02	North Fork Badger Creek - Idaho/Wyoming border to mouth	13.51	Miles
ID17040204SK062 03	North Fork Badger Creek - Idaho/Wyoming border to mouth	2.09	Miles
ID17040204SK063_02	Bitch Creek - Swanner Creek to mouth	15.25	Miles
ID17040204SK064_02	Swanner Creek - Idaho/Wyoming border to mouth	35.4	Miles
ID17040204SK064 03	Swanner Creek - Idaho/Wyoming border to mouth	3.8	Miles
ID17040204SK065 02	Bitch Creek - Idaho/Wyoming border to Swanner Creek	30.01	Miles
ID17040204SK065_02L	McRenolds Reservoir	4.15	Acres

17040205 Willow

ID17040201SK001 04	Snake River - Dry Bed Creek to river mile 791	21.33	Miles
ID17040201SK001_05	Snake River - Dry Bed Creek to river mile 791	2.9	Miles
ID17040201SK002_05	South Fork Willow Creek - source to mouth	6.87	Miles
ID17040201SK003_05	North Fork Willow Creek - source to mouth	10.22	Miles
ID17040201SK007 02	Crow Creek - source to Willow Creek	37.71	Miles
ID17040205SK001_02	Willow Creek - Ririe Reservoir Dam to Eagle Rock Canal	15.3	Miles
ID17040205SK002 02	01 & 02 Tribs to Ririe Reservoir	21.76	Miles
ID17040205SK003_02	Blacktail Creek - source to Ririe Reservoir	23.55	Miles
ID17040205SK003 03	Blacktail Creek - source to Ririe Reservoir	2.96	Miles
ID17040205SK004_02	Willow Creek - Bulls Fork to Ririe Reservoir	5.67	Miles
ID17040205SK005 03	Willow Creek - Birch Creek to Bulls Fork	2.9	Miles
ID17040205SK007_02	Squaw Creek - source to mouth	10.76	Miles
ID17040205SK014_02L	Rat Lake	12.85	Acres
ID17040205SK015 02L	Robinson Reservoir	17.81	Acres
ID17040205SK016_02	Grays Lake outlet - Hell Creek to mouth	11.3	Miles
ID17040205SK017 02	Grays Lake outlet - Homer Creek to Hell Creek	11.6	Miles
ID17040205SK018_02L	Unnamed Lake Trib to Homer Creek	2.81	Acres
ID17040205SK019 02	Grays Lake outlet - Brockman Creek to Homer Creek	22.22	Miles
ID17040205SK021_02L	Grays Lake	23678.06	Acres
ID17040205SK022 02	Little Valley Creek - source to mouth	9.25	Miles
ID17040205SK022_02L	Little Valley Reservoir	263.99	Acres
ID17040205SK023 03	Gravel Creek - source to mouth	6.9	Miles
ID17040205SK030_03	Bulls Fork - source to mouth	0.78	Miles

Upper Snake

17040206 American Falls

ID17040201SK001 04	Snake River - Dry Bed Creek to river mile 791	21.33	Miles
ID17040206SK004_02	Blind Spring - source to mouth	8.12	Miles
ID17040206SK007 02	Sawmill Creek - source to mouth	8.39	Miles
ID17040206SK011_02	Clifton Creek - source to mouth	14.92	Miles
ID17040206SK022 02a	Snake River-ephemeral streams btw RM 750 and RM 773	339.43	Miles
ID17040206SK022_02L	Jensens Lake	65.07	Acres
ID17040206SK022 03	Snake River	30.2	Miles
ID17040206SK023 02	Jeff Cabin Creek - source to mouth	0.06	Miles
ID17040206SK025_02	Little Hole Draw - source to American Falls Reservoir	298.4	Miles
ID17040206SK025_02L	Little Hole Draw-unnamed lakes west of American Falls Res	24.91	Acres
ID17040206SK025_03	Little Hole Draw-source to American Falls Reservoir	5.5	Miles
ID17040207SK001 05	Blackfoot River - Fort Hall Main Canal diversion to mouth	15.45	Miles

17040207 Blackfoot

ID17040201SK005_02	Sand Creek complex	118.01	Miles
ID17040201SK005 03	Sand Creek complex	12.28	Miles
ID17040201SK005_04	Sand Creek complex	3.8	Miles
ID17040201SK006_05	Crow Creek - Willow Creek to mouth	25.28	Miles
ID17040206SK022_03	Snake River	30.2	Miles
ID17040207SK001 02	Blackfoot River - Fort Hall Main Canal diversion to mouth	2.15	Miles
ID17040207SK001_05	Blackfoot River - Fort Hall Main Canal diversion to mouth	15.45	Miles
ID17040207SK002 02	Blackfoot River - Blackfoot Reservoir Dam to Fort Hall Main	96.47	Miles
ID17040207SK002_02L	Equalizing Reservoir	225.22	Acres
ID17040207SK002 03	Blackfoot River - Blackfoot Reservoir Dam to Fort Hall Main	0.06	Miles
ID17040207SK006_02aL	Chicken Creek Reservoir	8.49	Acres
ID17040207SK009 02	Blackfoot Reservoir 1st and 2nd order tributaries	112.09	Miles
ID17040207SK009_02L	Enders Pond	48.12	Acres
ID17040207SK009L_0L	Blackfoot Reservoir	17457.29	Acres
ID17040207SK017 02	Timothy Creek - source to mouth	5.34	Miles
ID17040207SK017 02b	lower Timothy Creek	1.49	Miles
ID17040207SK021 02	Chippy Creek - source to mouth	17.27	Miles
ID17040207SK021_02b	lower Olsen Creek	0.94	Miles

ID17040207SK024 02	Wooley Valley - source to mouth	21.17	Miles
ID17040207SK025 02b	Sheep Creek and unnamed tributary to Clarks Cut	5.29	Miles
ID17040207SK025_03a	lower Clark's Cut - Meadow Creek to Sheep Creek	1.22	Miles

17040208 Portneuf

ID17040206SK015_02	Ross Fork - Indian Creek to Gibson Canal	11.38	Miles
ID17040206SK016 02	Indian Creek - source to mouth	1.6	Miles
ID17040206SK017_02	South Fork Ross Fork - source to mouth	3.97	Miles
ID17040208SK001 02b	Trail Creek	5.6	Miles
ID17040208SK001 03	Blackrock Canyon - lower	1.5	Miles
ID17040208SK006_02L	Wiregrass Reservoir	4.13	Acres
ID17040208SK012_02	Hawkins Reservoir	1.1	Miles
ID17040208SK018_02L	Twentyfour Mile Reservoir	34.01	Acres
ID17040208SK019 02	01 & 02 Tribs to Chesterfield Reservoir	13.42	Miles
ID17040208SK019L_0L	Chesterfield Reservoir	959.04	Acres
ID17040208SK021 02L	Blue Lake	2.5	Acres

17040209 Lake Walcott

ID17040209SK000_02	Unclassified Waters	521.65	Miles
ID17040209SK000_02A	Dayley Creek	46.09	Miles
ID17040209SK000_02L	Unclassified Farm Pond in 17040209	9.39	Acres
ID17040209SK000 03	Unclassified Waters in CU 17040209	19.55	Miles
ID17040209SK001_03	Unnamed 3rd order tributaries to the Snake River	0.3	Miles
ID17040209SK003 02A	Intermittent streams of Marsh Creek - source to mouth	15.51	Miles
ID17040209SK003_04A	Howell Creek	3.04	Miles
ID17040209SK003 04L	Dewy Pond (Marsh Creek Source to Mouth)	79.07	Acres
ID17040209SK004_02	Lake Walcott (Snake River)	6.27	Miles
ID17040209SK006 02	Snake River - Rock Creek to Raft River	73.93	Miles
ID17040209SK006_03	Snake River - Rock Creek to Raft River	7.94	Miles
ID17040209SK007_02	Fall Creek - source to mouth	17.46	Miles
ID17040209SK008 02	Rock Creek	76	Miles
ID17040210SK001 02	Raft River - Heglar Canyon Creek to mouth	68.37	Miles
ID17040221SK000 02	Unclassified Waters	186.74	Miles

Upper Snake

17040210 Raft

ID17040210SK001 02	Raft River - Heglar Canyon Creek to mouth	68.37	Miles
ID17040210SK001_03	Raft River - Heglar Canyon Creek to mouth	5.77	Miles
ID17040210SK002 02A	Coe Creek	53.94	Miles
ID17040210SK002_03	Raft River - Cassia Creek to Heglar Canyon Creek	14.95	Miles
ID17040210SK003 02	Cassia Creek - Conner Creek to mouth	74.39	Miles
ID17040210SK004_03	Conner Creek - source to mouth	2.45	Miles
ID17040210SK005 02	Cassia Creek - Clyde Creek to Conner Creek	72.11	Miles
ID17040210SK005 03	Cassia Creek - Clyde Creek to Conner Creek	3.38	Miles
ID17040210SK007_02L	Independence Lakes	24.11	Acres
ID17040210SK008_02	Raft River - Cottonwood Creek to Cassia Creek	135.41	Miles
ID17040210SK008_03	Raft River - Cottonwood Creek to Cassia Creek	0.33	Miles
ID17040210SK009 02	Cottonwood Creek - source to mouth	23.54	Miles
ID17040210SK009_03	Cottonwood Creek - source to mouth	0.17	Miles
ID17040210SK010 02	Raft River	167.88	Miles
ID17040210SK010_03	Raft River	10.3	Miles
ID17040210SK010 03L	Unnamed Ponds- One Mile Creek	4.46	Acres
ID17040210SK012_03	Edwards Creek - source to mouth	7.36	Miles
ID17040210SK013 02	Raft River - Idaho/Utah border to Edwards Creek	61.22	Miles
ID17040210SK013_03	Raft River - Idaho/Utah border to Edwards Creek	17.19	Miles
ID17040210SK014_02	Junction Creek - source to Idaho/Utah border	26.42	Miles
ID17040210SK015 02	Cottonwood Creek - source to Idaho/Utah border	31.35	Miles
ID17040210SK015_03	Cottonwood Creek - source to Idaho/Utah border	1.06	Miles
ID17040210SK016 03	Clear Creek - Idaho/Utah border to mouth	25.33	Miles
ID17040210SK016_04	Clear Creek - Idaho/Utah border to mouth	12.37	Miles
ID17040210SK017 02	Kelsaw Canyon Creek - source to mouth	15.76	Miles
ID17040210SK018_02	Meadow Creek - source to mouth	112.22	Miles
ID17040210SK018 03	Meadow Creek - source to mouth	22.62	Miles
ID17040210SK023_02	Heglar Canyon Creek - source to mouth	74.32	Miles
ID17040210SK023 03	Heglar Canyon Creek - source to mouth	10.36	Miles
ID17040210SK023_04	Heglar Canyon Creek - source to mouth	8.44	Miles

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Upper Snake

17040211 Goose

ID17040209SK000 02	Unclassified Waters	521.65	Miles
ID17040211SK000_02	Unclassified Waters	126.31	Miles
ID17040211SK000 03	Unclassified Waters	11.04	Miles
ID17040211SK002_02	Lower Goose Creek	33.3	Miles
ID17040211SK002 03	Lower Goose Creek	1.62	Miles
ID17040211SK010_02	Blue Hill Creek and tribs. to Goose Creek	17.94	Miles
ID17040211SK010 03	Blue Hill Creek - source to mouth	2.96	Miles
ID17040211SK014 02	Land-Willow-Smith Creek complex	108.59	Miles
ID17040211SK014_03	Land/Willow/Smith Creek complex	14.04	Miles

17040212 Upper Snake-Rock

ID17040209SK000_02	Unclassified Waters	521.65	Miles
ID17040212SK000 03	Unclassified Waters	16.43	Miles
ID17040212SK002_02	Big Pilgrim Gulch - source to mouth	30.72	Miles
ID17040212SK003_02	Cassia Gulch - source to mouth	22.06	Miles
ID17040212SK003 03	Cassia Gulch - source to mouth	0.48	Miles
ID17040212SK004_02	Tuana Gulch - source to mouth	72.87	Miles
ID17040212SK009_02	Deep Creek - source to High Line Canal	13.29	Miles
ID17040212SK014_03	North Cottonwood Creek - source to mouth (3rd order)	4.23	Miles
ID17040212SK014 04L	McMullen Creek Reservoir	79	Acres
ID17040212SK016_02	Rock Creek	23.63	Miles
ID17040212SK016 03	Rock Creek	0.36	Miles
ID17040212SK021_0L	Murtaugh Lake	835.69	Acres
ID17040212SK025 02	Big Cottonwood Creek - source to mouth	11.74	Miles
ID17040212SK026_03L	Wilson Lake Reservoir	514.56	Acres
ID17040212SK029 02	Banbury Springs	0.56	Miles
ID17040212SK030_02	Box Canyon Creek - source to mouth	2.1	Miles
ID17040212SK032_02	Bickel Springs	1.77	Miles
ID17040212SK034 02	Clover Creek - Pioneer Reservoir Dam to mouth	42.61	Miles
ID17040212SK036 03	Clover Creek - source to Pioneer Reservoir	0.58	Miles
ID17040212SK037 02	Cottonwood Creek - source to mouth	20.76	Miles
ID17040212SK037_03	Cottonwood Creek - source to mouth	0.71	Miles

ID17040212SK038 03	Catchall Creek - source to mouth	1.3	Miles
ID17040212SK039 02	Deer Creek - source to mouth	19.07	Miles
ID17040212SK041_02	Dry Creek - source to mouth	48.64	Miles
ID17040212SK041_03	Dry Creek - source to mouth	12.02	Miles
ID17040219SK030 03L	Bray Lake	140.75	Acres

17040213 Salmon Falls

ID17040212SK000_03	Unclassified Waters	16.43	Miles
ID17040213SK000 02	Unclassified Waters	47.76	Miles
ID17040213SK000 03	Unclassified Waters	2.92	Miles
ID17040213SK001_02	Salmon Falls Creek - Devil Creek to mouth	27.28	Miles
ID17040213SK001_02L	Unnamed Pond - Salmon Falls Creek	4.53	Acres
ID17040213SK002_02	Devil Creek-1st and 2nd order tribs.	164.57	Miles
ID17040213SK002 02L	Heil Reservoir (Heil Dam)	47.69	Acres
ID17040213SK003_01L	Unnamed Farm Ponds	7.84	Acres
ID17040213SK003 02	Salmon Falls Creek - Salmon Falls Creek Dam to Devil Creek	150.21	Miles
ID17040213SK003_02L	Cedar Mesa Reservoir	23.34	Acres
ID17040213SK003 03	Salmon Falls Creek - Salmon Falls Creek Dam to Devil Creek	0.25	Miles
ID17040213SK004_03	Trib to Cedar Creek Reservoir	1.07	Miles
ID17040213SK007 02	Whiskey Slough, Salmon Falls Creek Reservoir tributaries	37.02	Miles
ID17040213SK007_02L	Whiskey Slough	3.43	Acres
ID17040213SK009_02	Salmon Falls Creek-Idaho/Nevada border to Salmon Falls Creek	42.23	Miles
ID17040213SK009 03	Salmon Falls Creek-Idaho/Nevada border to Salmon Falls Creek	1.7	Miles
ID17040213SK011_02	Shoshone Creek - Hot Creek to Idaho/Nevada border	87.99	Miles
ID17040213SK011 03	Shoshone Creek - Hot Creek to Idaho/Nevada border	2.45	Miles
ID17040213SK013_02	Shoshone Creek - Cottonwood Creek to Hot Creek	24.84	Miles
ID17040213SK016 02L	Unnamed diversion trib to Shoshone Creek	7.17	Acres

17040214 Beaver-Camas

ID17040214SK001_02	Camas Creek - Beaver Creek to Mud Lake	6.82	Miles
ID17040214SK001 05	Camas Creek - Beaver Creek to Mud Lake	5.54	Miles
ID17040214SK001 05L	Sandhole Lake	142.06	Acres
ID17040214SK001 06L	Rays Lake	192.79	Acres
ID17040214SK002_02	Camas Creek - Spring Creek to Beaver Creek	49.6	Miles

ID17040214SK004 02	Spring Creek - Dry Creek to mouth	1.32	Miles
ID17040214SK004 04	Spring Creek - Dry Creek to mouth	8.73	Miles
ID17040214SK005_02	Dry Creek Tributaries	12.87	Miles
ID17040214SK005_03	Dry Creek - source to mouth	12.9	Miles
ID17040214SK006 02L	Spring Creek Reservoir	8.13	Acres
ID17040214SK007 04	Camas Creek	17.96	Miles
ID17040214SK008_03L	Unnamed Lake - Crab Creek	4.24	Acres
ID17040214SK009 03	Warm Creek - Cottonwood Creek to mouth and East Camas Creek	21.11	Miles
ID17040214SK009_04	Warm Creek - Cottonwood Creek to mouth and East Camas Creek	6.54	Miles
ID17040214SK014 02	Beaver Creek - Dry Creek to canal	91.01	Miles
ID17040214SK014_02L	Unnamed Ponds - Beaver Creek to Dry Creek	16.47	Acres
ID17040214SK014 03	Beaver Creek - Dry Creek to canal (T09N, R36E)	3.15	Miles
ID17040214SK015_02	Beaver Creek - Rattlesnake Creek to Dry Creek	1.39	Miles
ID17040214SK016_04	Rattlesnake Creek - source to mouth	1.06	Miles
ID17040214SK019 02	Miners Creek - source to mouth	21.08	Miles
ID17040214SK025 02	Dry Creek - source to mouth	23.61	Miles
ID17040214SK025_03	Dry Creek - source to mouth	7.08	Miles
ID17040214SK026_02	Cottonwood Creek Tributaries	79.57	Miles
ID17040214SK026 03	Cottonwood Creek	10.25	Miles
ID17040215SK001_06L	Mud Lake	3094.08	Acres
ID17040215SK001 0L	North Lake	764.17	Acres
ID17040215SK002_02	Medicine Lodge Creek - Indian Creek to playas	153.58	Miles

17040215 Medicine Lodge

ID17040215SK002 01L	Unnamed Intermittent Lake	11.87	Acres
ID17040215SK002_02	Medicine Lodge Creek - Indian Creek to playas	153.58	Miles
ID17040215SK004 02	East Fork Indian Creek	14.11	Miles
ID17040215SK006_02	Medicine Lodge Creek - Edie Creek to Indian Creek	8.42	Miles
ID17040215SK019 02	Blue Creek - source to mouth	29.17	Miles
ID17040215SK020_03	Warm Springs Creek - source to mouth	27.56	Miles
ID17040215SK022 02	Chandler Canyon complex	153.93	Miles
ID17040215SK022_03	Chandler Canyon complex	11.36	Miles
ID17040216SK001 02	Birch Creek - Reno Ditch to playas	137.35	Miles

Upper Snake

17040216 Birch

ID17040216SK001 02	Birch Creek - Reno Ditch to playas	137.35	Miles
ID17040216SK001_03	Birch Creek - Reno Ditch to playas	2.28	Miles
ID17040216SK002 02	Birch Creek - Pass Creek to Reno Ditch	18.7	Miles
ID17040216SK003_02	Birch Creek	43.74	Miles
ID17040216SK003 04	Birch Creek	6.74	Miles
ID17040216SK004_02	Unnamed Tributary - source to mouth; includes Timber Canyon	32.92	Miles
ID17040216SK004 03	Unnamed Tributary - source to mouth; includes Timber Canyon	2.53	Miles
ID17040216SK005 02	Birch Creek	19.61	Miles
ID17040216SK005_03	Birch Creek	2.44	Miles
ID17040216SK005_04	Birch Creek	1.76	Miles
ID17040216SK006_02	Scott Canyon Creek - source to mouth	16.84	Miles
ID17040216SK007 02	Mud Creek - Willow Creek to Scott Canyon Creek	2.63	Miles
ID17040216SK007_03	Mud Creek - Willow Creek to Scott Canyon Creek	4.68	Miles
ID17040216SK008 02	Cedar Gulch and Irish Canyon - source to mouth	29.72	Miles
ID17040216SK010_02	Mud Creek	39.09	Miles
ID17040216SK010 03	Mud Creek	2.51	Miles
ID17040216SK011_02	Mud Creek-source to Unnamed Tributary (T12N, R11W, Sec. 29)	42.25	Miles
ID17040216SK011 03	Mud Creek -source to Unnamed Tributary (T12N, R11W, Sec. 29)	5.7	Miles
ID17040216SK012_02	Unnamed Tributary - source to mouth (T12N, R11W, Sec. 29)	50.06	Miles
ID17040216SK012_03	Unnamed Tributary - source to mouth (T12N, R11W, Sec. 29)	0.1	Miles
ID17040216SK013 02	Meadow Canyon Creek - source to mouth	23.86	Miles
ID17040216SK013_03	Meadow Canyon Creek - source to mouth	7.15	Miles
ID17040216SK014 02	Rocky Canyon Creek - source to mouth	15.7	Miles
ID17040216SK015_02	Pass Creek - source to mouth	43.44	Miles
ID17040216SK016 02	Eightmile Canyon Creek - source to mouth	50.76	Miles
ID17040216SK016_03	Eightmile Canyon Creek - source to mouth	4.68	Miles

17040217 Little Lost

ID17040217SK001 03	Little Lost River - canal (T06N, R28E) to playas	0.14	Miles
ID17040217SK002 02	Little Lost River - Big Spring Creek to canal (T06N, R28E)	10.25	Miles
ID17040217SK004 03	North Creek - source to mouth	5.78	Miles
ID17040217SK005_03	Uncle Ike Creek - source to mouth	4.47	Miles

ID17040217SK006 02	Unnamed Tributaries - source to mouth (T08N, R28E)	80	Miles
ID17040217SK007 03	Little Lost River - Badger Creek to Big Spring Creek	4.13	Miles
ID17040217SK010_02	Little Lost River - confluence of Summit and Sawmill Creeks	15.02	Miles
ID17040217SK010_03	Little Lost River - confluence of Summit and Sawmill Creeks	1.04	Miles
ID17040217SK011 02	Deep Creek - source to mouth	27.24	Miles
ID17040217SK012 03	Sawmill Creek - Warm Creek to mouth	2.53	Miles
ID17040217SK014_02L	Mill Creek Lake	15.72	Acres
ID17040217SK020 02	Dry Creek - Dry Creek Canal to mouth	24.76	Miles
ID17040217SK022_02	Wet Creek - Squaw Creek to mouth	19.65	Miles
ID17040217SK026 02	Taylor Canyon Creek - source to mouth	36.22	Miles
ID17040217SK026_04	Taylor Canyon Creek - source to mouth	1.72	Miles
ID17040217SK027 02	Cabin Fork Creek - source to mouth	30.57	Miles
ID17040217SK027_03	Cabin Fork Creek - source to mouth	4.98	Miles
ID17040217SK028_02	Hurst Creek - source to mouth	48.43	Miles
ID17040217SK028 03	Hurst Creek - source to mouth	9.65	Miles
ID17040217SK029 02	Unnamed Tributary	8.88	Miles
ID17040218SK011_02	Big Lost River - McKay Reservoir Dam to Beck and Evan Ditch	76.99	Miles

17040218 Big Lost

ID17040209SK000 02	Unclassified Waters	521.65	Miles
ID17040209SK000_03	Unclassified Waters in CU 17040209	19.55	Miles
ID17040216SK001_02	Birch Creek - Reno Ditch to playas	137.35	Miles
ID17040218SK001 02	Big Lost River Sinks (playas) and Dry Channel	2.08	Miles
ID17040218SK001_06	Big Lost River Sinks (playas) and Dry Channel	32.35	Miles
ID17040218SK002 02	Big Lost River-Spring Creek to Big Lost River Sinks (playas)	659.06	Miles
ID17040218SK002_02L	Arco Canal	17.95	Acres
ID17040218SK002 03	Big Lost River- Spring Creek to Big Lost River Sinks (playa)	12.48	Miles
ID17040218SK002_04	Big Lost River-Spring Creek to Big Lost River Sinks (playas)	6.05	Miles
ID17040218SK003 02	Spring Creek - Lower Pass Creek to Big Lost River	31.37	Miles
ID17040218SK004_02	Big Lost River - Antelope Creek to Spring Creek	40.66	Miles
ID17040218SK004 06	Big Lost River - Antelope Creek to Spring Creek	38	Miles
ID17040218SK005_02	King, Lime Kiln, Ramshorn, and Anderson Canyon Creek	37.98	Miles
ID17040218SK005 06	King, Lime Kiln, Ramshorn, and Anderson Canyon Creek	0.21	Miles
ID17040218SK006 02	Lower Pass Creek - source to mouth	15.04	Miles

Upper Snake

ID17040218SK006 05	Lower Pass Creek - source to mouth	3.87	Miles
ID17040218SK007 02	Big Lost River - Alder Creek to Antelope Creek	7.71	Miles
ID17040218SK008_02	Elbow, Jepson, Clark, Maddock, and Jaggles Canyon Creek	35.46	Miles
ID17040218SK008_03	Elbow, Jepson, Clark, Maddock, and Jaggles Canyon Creek	3.95	Miles
ID17040218SK009 02L	Mud Lake	6.25	Acres
ID17040218SK010 02	Big Lost River - Beck and Evan Ditch to Alder Creek	2.79	Miles
ID17040218SK011_02	Big Lost River - McKay Reservoir Dam to Beck and Evan Ditch	76.99	Miles
ID17040218SK012 02	Unnamed Tributaries to McKay Reservoir	30.74	Miles
ID17040218SK012L_0L	McKay Reservoir	1172.23	Acres
ID17040218SK013 02	Big Lost River - Jones Creek to McKay Reservoir	11.86	Miles
ID17040218SK014_02	Jones Creek - source to mouth	10.17	Miles
ID17040218SK015 02	Big Lost River - Thousand Springs Creek to Jones Creek	19.66	Miles
ID17040218SK016_05	Thousand Springs Creek - source to mouth	8.86	Miles
ID17040218SK017_02	Lone Cedar Creek - source to mouth	5.7	Miles
ID17040218SK018 02	Cedar Creek - source to mouth	6.85	Miles
ID17040218SK020 02	Willow Creek - source to mouth	19.29	Miles
ID17040218SK021_02	Arentson Gulch and Unnamed Tributaries - source to mouth	35.86	Miles
ID17040218SK022_03	Sage Creek - source to mouth	7.64	Miles
ID17040218SK032 02	Fall Creek - source to mouth	22.23	Miles
ID17040218SK034_02	Fox Creek - source to mouth	9.04	Miles
ID17040218SK038 02L	Long and Rough Lakes	22	Acres
ID17040218SK041_03	Corral Creek - source to mouth	2.19	Miles
ID17040218SK042 02	Boone Creek - source to mouth	11.96	Miles
ID17040218SK043_02L	Lehman Creek Lake	1.98	Acres
ID17040218SK045 05	Alder Creek - source to mouth	4.65	Miles
ID17040218SK047 02	Antelope Creek - Dry Fork Creek to Spring Creek	9.64	Miles
ID17040218SK048_02	Spring Creek - source to mouth	9.99	Miles
ID17040218SK049_02	Cherry Creek-confluence of Left Fork Cherry and Lupine Creek	37.13	Miles
ID17040218SK050 02	Lupine Creek - source to mouth	24.23	Miles
ID17040218SK054 02	Iron Bog Creek - confluence of Left and Right Fork Iron Bog	1.52	Miles
ID17040218SK059_02	Dry Fork Creek - source to mouth	37.02	Miles
ID17040218SK059 03	Dry Fork Creek - source to mouth	15.09	Miles
ID17040218SK059_05	Dry Fork Creek - source to mouth	8.72	Miles

ID17040218SK060 02	South Fork Antelope Creek - Antelope Creek to mouth	4.48	Miles
ID17040218SK061 02	Hammond Spring Creek complex	69.58	Miles
ID17040218SK061_03	Hammond Spring Creek complex	5.8	Miles

17040219 Big Wood

ID17040219SK000_01L	Turkey Lake	4.9	Acres
ID17040219SK000 02	Unclassified Waters	250.56	Miles
ID17040219SK000_02L	Unnamed Reservoir	5.29	Acres
ID17040219SK000 03	Unclassified Waters	2.13	Miles
ID17040219SK000 05	Unclassified Waters	9	Miles
ID17040219SK001_02	Malad River - confluence of Black Canyon Creek and Big Wood	18.15	Miles
ID17040219SK002_02	Big Wood River - Magic Reservoir Dam to mouth	48.02	Miles
ID17040219SK002_03	Big Wood River - Magic Reservoir Dam to mouth	3.1	Miles
ID17040219SK003 02	01 & 02 Tribs to Magic Reservoir	12.08	Miles
ID17040219SK003L_0L	Magic Reservoir	3563.54	Acres
ID17040219SK004 02	Big Wood River - Seamans Creek to Magic Reservoir	69.25	Miles
ID17040219SK005_02	Seamans Creek - Slaughterhouse Creek to mouth	5.26	Miles
ID17040219SK006 03L	Seaman Creek Diversion Pond	15.54	Acres
ID17040219SK008_02L	Quigley Pond	5.65	Acres
ID17040219SK009 02	Indian Creek - source to mouth	12.96	Miles
ID17040219SK010_02	East Fork Wood River - Hyndman Creek to mouth	14.2	Miles
ID17040219SK011_04	East Fork Wood River - source to Hyndman Creek	2.04	Miles
ID17040219SK013 02	Trail Creek - Corral Creek to mouth	7.76	Miles
ID17040219SK015_02	Lake Creek - source to mouth	10.64	Miles
ID17040219SK025 02a	Greenhorn Creek - USFS boundary to mouth	4.49	Miles
ID17040219SK027_02L	Unnamed Lake Democrat Gulch	4.62	Acres
ID17040219SK029 02L	Thorn Creek Reservoir	110.19	Acres
ID17040219SK029_03	Thorn Creek - source to mouth	7.09	Miles
ID17040219SK029 04	Thorn Creek - source to mouth	5.35	Miles
ID17040219SK030_04	Black Canyon Creek - source to mouth	9.08	Miles

17040220 Camas

ID17040220SK001 02	Camas Creek - Elk Creek to Magic Reservoir	48.75	Miles
ID17040220SK001_05L	Magic Reservoir - Camas Creek	290.08	Acres

ID17040220SK003 02	Willow Creek - Beaver Creek to mouth	8.98	Miles
ID17040220SK007 02	Camas Creek - Solider Creek to Elk Creek	12.17	Miles
ID17040220SK008_02	Deer Creek - Big Deer Creek to mouth	13.5	Miles
ID17040220SK008_03	Deer Creek - Big Deer Creek to mouth	11.75	Miles
ID17040220SK008 04	Deer Creek - Big Deer Creek to mouth	0.38	Miles
ID17040220SK009 02	Deer Creek - source to and including Big Deer Creek	13.8	Miles
ID17040220SK010_02	Powell Creek - source to mouth	16.71	Miles
ID17040220SK013 02	Camas Creek - Corral Creek to Soldier Creek	37.39	Miles
ID17040220SK013_03	Camas Creek - Corral Creek to Soldier Creek	11.43	Miles
ID17040220SK014 02	Threemile Creek - source to mouth	21.75	Miles
ID17040220SK016_03	East Fork Corral Creek - source to mouth	1.9	Miles
ID17040220SK018 02L	Unnamed Diversion to Camas Creek	7.79	Acres
ID17040220SK019_03	Chimney Creek - source to mouth	2.54	Miles
ID17040220SK019_04	Chimney Creek - source to mouth	7.61	Miles
ID17040220SK020 03	Negro Creek - 3rd order	0.43	Miles
ID17040220SK023 02	Unnamed Tributaries near Mormon Reservoir	7.74	Miles
ID17040220SK023_03	Unnamed Tributaries to Mormon Reservoir	0.43	Miles
ID17040220SK026_02	Spring Creek Complex	17.82	Miles
ID17040220SK026 02L	Spring Creek Reservoir	110.74	Acres
ID17040220SK026_03	Spring Creek Complex	6.4	Miles
ID17040220SK027 02	Kelly Reservoir - 1st and 2nd order tribs.	3.12	Miles
ID17040220SK027L_0L	Kelly Reservoir	95.92	Acres

17040221 Little Wood

ID17040219SK001 02	Malad River - confluence of Black Canyon Creek and Big Wood	18.15	Miles
ID17040219SK002_02	Big Wood River - Magic Reservoir Dam to mouth	48.02	Miles
ID17040219SK002 03	Big Wood River - Magic Reservoir Dam to mouth	3.1	Miles
ID17040221SK000_02	Unclassified Waters	186.74	Miles
ID17040221SK000 03	Unclassified Waters	38.43	Miles
ID17040221SK000_03L	Mud Lake	19.75	Acres
ID17040221SK001 02	Little Wood River - Richfield (T04S, R19E, Sec. 25) to mouth	26.55	Miles
ID17040221SK002_02	Little Wood River	1.28	Miles
ID17040221SK004 04	Carey Lake outlet	1.07	Miles
ID17040221SK005 02	Unnamed Tribuatary to Carey Lake	1.35	Miles

Upper Snake

ID17040221SK005L 0L	Carey Lake	200.6	Acres
ID17040221SK006 02	Fish Creek - Fish Creek Reservoir Dam to mouth	46.81	Miles
ID17040221SK006_02L	Huff Lake	35.15	Acres
ID17040221SK007_02	Unnamed Tributaries to Fish Creek Reservoir	2.84	Miles
ID17040221SK009 02	West Fork Fish Creek - source to Fish Creek Reservoir	27.04	Miles
ID17040221SK010 02	Little Wood River - Little Wood River Reservoir Dam to Carey	39.46	Miles
ID17040221SK010_05a	Little Wood River	9.78	Miles
ID17040221SK011 02	Little Fish Creek - source to mouth	26.08	Miles
ID17040221SK011_02L	Howard Reservoir	24.88	Acres
ID17040221SK011 03	Little Fish Creek - source to mouth	5.39	Miles
ID17040221SK011_03L	Cameron Reservoir (Little Fisher Creek)	28.73	Acres
ID17040221SK012 02	01 & 02 tribs to Little Wood River Reservoir	16.61	Miles
ID17040221SK013_02	Little Wood River-Muldoon Cr. to Little Wood River Reservoir	24.12	Miles
ID17040221SK013_02L	Campbell Reservoir	108.91	Acres
ID17040221SK014 02L	Muldon Creek Lake	2.17	Acres
ID17040221SK015 02	South Fork Muldoon Creek - Friedman Creek to mouth	9.83	Miles
ID17040221SK015_03	South Fork Muldoon Creek - Friedman Creek to mouth	8.02	Miles
ID17040221SK016_03	South Fork Muldoon Creek - source to Friedman Creek	2.7	Miles
ID17040221SK017 02	Friedman Creek - Trail Creek to mouth	4.65	Miles
ID17040221SK021_03	Baugh Creek - source to mouth	3.81	Miles

Category 4a: Waters have a TMDL completed and approved by EPA.

2018/2020 Integrated Report - Category 4a

Bear River

16010102 Central Bear

		EPA TMDL ID	Approval Date		
ID16010102BR001_05	Bear River - Idaho/Wyoming border to railroad bridge			25.46	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010102BR003_04	Thomas Fork - Idaho/Wyoming border to mouth			30.09	Miles
NITROGEN, TOTAL		30351	Jun 29, 2006		
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010102BR005_02	Dry Creek - Dip Creek to Thomas Fork			6.67	Miles
PHOSPHORUS, TOTAL		53480	Sep 13, 2013		
SEDIMENTATION/SILTATION		53480	Sep 13, 2013		
ID16010102BR005_02a	Dry Creek (including Dip Creek) to USFS boundary			10.19	Miles
PHOSPHORUS, TOTAL		53480	Sep 13, 2013		
SEDIMENTATION/SILTATION		53480	Sep 13, 2013		
ID16010102BR006_02	Preuss Creek - USFS boundary to Geneva Ditch			6.04	Miles
SEDIMENTATION/SILTATION		53480	Sep 13, 2013		
ID16010102BR006_02a	Beaver Creek - headwaters to Preuss Creek			7.51	Miles
SEDIMENTATION/SILTATION		53480	Sep 13, 2013		
ID16010102BR006_02b	Preuss Creek (includes Fish Cr) headwaters to USFS boundary			12.03	Miles
SEDIMENTATION/SILTATION		53480	Sep 13, 2013		
ID16010102BR008_02	Sheep Creek - source to mouth			22.42	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010102BR008_03	Sheep Creek - source to mouth			2.64	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
SEDIMENTATION/SILTATION		30351	Jun 29, 2006		

Bear River

16010201 Bear Lake

		EPA TMDL ID	Approval Date		
ID16010201BR001_0L	Alexander Reservoir (Bear River)			1031.87	Acres
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010201BR002_02a	Sulpher Canyon - Headwaters (middle and S.Sulpher) to mouth			12.24	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010201BR002_02c	lower Skinner Creek - above Nounan Rd Crossing to Bear River			4.41	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
SEDIMENTATION/SILTATION		30351	Jun 29, 2006		
ID16010201BR002_05	Bear River-railroad bridge (T14N, R45E, Sec. 21) to Ovid Cr.			57.47	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010201BR002_06	Bear River - Ovid Creek confluence to Alexander Reservoir			44.09	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
		53480	Sep 13, 2013		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
		53480	Sep 13, 2013		
ID16010201BR003_02	lower Bailey Creek - FS boundary to mouth			3.05	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010201BR003_02a	Upper Bailey Creek - HW to FS boundary			4.71	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010201BR004_02	Eightmile Creek - headwaters to N. Wilson Creek			28.53	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010201BR004_02a	South Wilson Creek			4.68	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010201BR004_03a	Eightmile Creek - N Wilson Cr to 1 mi below FS boundary			1.75	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
SEDIMENTATION/SILTATION		30351	Jun 29, 2006		

Bear River

ID16010201BR005_02	lower Pearl Creek		0.52	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010201BR005_02a	middle Pearl Creek		3.41	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010201BR006_03	Lower Stauffer Creek - Spring Creek to Bear River		4.14	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010201BR007_02	Skinner Creek - unnamed tribs of Skinner Creek		8.84	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010201BR009_04	Ovid Creek - confluence of North and Mill Creek to mouth		15.02	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010201BR020_02f	Snowslide Creek (lower) - tributary to Crow Creek		0.87	Miles
SEDIMENTATION/SILTATION	53480	Sep 13, 2013		
ID16010201BR021_02	Snowslide Creek - Crow Creek tributary, source to mouth		5.48	Miles
SEDIMENTATION/SILTATION	53480	Sep 13, 2013		
ID16010201BR022_03a	Lower Georgetown Creek - left hand fork to mouth		3.91	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010201BR023_02a	Soda Creek - Soda Cr Reservoir to Soda Springs		3.87	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010201BR023_02b	Soda Creek (lower) - Soda Springs to Alexander Reservoir		1.01	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010201BR024_02	Soda Creek Reservoir		203.44	Acres
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010201BR025_02	Soda Creek - source to Soda Creek Reservoir		16.13	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		

Bear River

16010202 Middle Bear

		EPA TMDL ID	Approval Date		
ID16010202BR002_04	Cub River - Maple Creek to Border			5.57	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
		53480	Sep 13, 2013		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR003_02	Cub River - Sugar Creek to US Hwy 91 Bridge			12.7	Miles
ESCHERICHIA COLI (E. COLI)		30351	Jun 29, 2006		
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR003_03	Cub River - Sugar Creek to Maple Creek			5.28	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR003_03a	Maple Creek			3.81	Miles
ESCHERICHIA COLI (E. COLI)		30351	Jun 29, 2006		
ID16010202BR005_02	Worm Creek - unnamed tributaries			21.49	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR005_02b	Worm Creek (lower) - Glendale Reservoir to Border			13.67	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
		53480	Sep 13, 2013		
SEDIMENTATION/SILTATION		30351	Jun 29, 2006		
ID16010202BR006_02	Bear River-Oneida Narrows Reservoir Dam to Idaho/Utah border			49.37	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR006_02a	Deep Creek			10.37	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
SEDIMENTATION/SILTATION		30351	Jun 29, 2006		
ID16010202BR006_06	Bear River-Oneida Narrows Reservoir Dam to Idaho/Utah border			36.09	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR007_02a	Strawberry Creek			10.36	Miles
PHOSPHORUS, TOTAL		53480	Sep 13, 2013		
SEDIMENTATION/SILTATION		53480	Sep 13, 2013		

Bear River

ID16010202BR007_03	Mink Creek - source to mouth			8.01	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR008_0L	Oneida Narrows Reservoir			420.78	Acres
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR009_02	Unnamed Tributaries			112.96	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR009_02a	Smith Creek - HW to mouth			9.07	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR009_02b	Alder Creek - headwaters to mouth			17.72	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR009_02c	Burton Creek - headwaters to mouth			13.83	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR009_06	Bear River - Alexander Reservoir Dam to Densmore Creek			15.62	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
		53480	Sep 13, 2013		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR009_06a	Bear River - Denismore Cr to above Oneida Reservoir			21.37	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR010_02	Williams Creek - source to mouth			20.49	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR010_02a	Williams Creek - FS boundary to Bear River			4.04	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR011_02	Trout Creek - source to mouth			47.03	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		

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ID16010202BR011_03	Trout Creek - source to mouth		3.94	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR012_02	Whiskey Creek - source to mouth		4.91	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR013_02	Densmore Creek - source to mouth		22.88	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR014_04	Cottonwood Creek - lower Cottonwood Creek (4th order)		14.02	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR015_02	Battle Creek - upper Battle Creek and unnamed tributaries		68.66	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR015_03	Battle Creek - source to mouth		3.03	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR015_04	Battle Creek - source to mouth		16.27	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR019_02	Fivemile Creek - source to Dayton		9.51	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR019_02a	Fivemile Creek - Dayton to mouth		5.71	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR020_02	Weston Creek - unnamed tributaries		32.2	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR020_02a	Black Canyon		15.15	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		
ID16010202BR020_02c	upper Weston Creek - FS boundary to reservoir		12.19	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006		

ID16010202BR020_02d	Weston Cr - HW to FS boundary and Trail Hollow			10.76	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR020_03	Weston Creek - Dry Canyon to above Weston City			8.29	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010202BR020_04	Weston Creek - above Weston City to Bear River			4.7	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		

16010204 Lower Bear-Malad

		EPA TMDL ID	Approval Date		
ID16010204BR001_04	Malad River - Little Malad River to Idaho/Utah border			25.56	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010204BR002_02	Devil Creek - Devil Creek Reservoir Dam to mouth			10.24	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010204BR002_02a	Campbell Creek			2.87	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010204BR002_02c	Evans Creek			2.64	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010204BR002_03	Devil Creek - Devil Creek Reservoir Dam to mouth			25.63	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010204BR005_03	Deep Creek - Deep Creek Reservoir Dam to mouth			10.53	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010204BR006_02	Susan Hollow			4.04	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		
ID16010204BR006_03	Deep Creek Reservoir			0.34	Miles
PHOSPHORUS, TOTAL		30351	Jun 29, 2006		
TOTAL SUSPENDED SOLIDS (TSS)		30351	Jun 29, 2006		

Bear River

ID16010204BR007_02	Deep Creek - source to upper Deep Creek Reservoir	4.45	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR007_03	Deep Creek - upper Deep Creek Reservoir to Deep Cr Reservoir	1.01	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR008_02	Malad River - mouth and unnamed tributaries to N Fk Canyon	117.09	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR008_02a	Elkhorn Creek - source to mouth	4.55	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR008_03	Little Malad River - Daniels Reservoir Dam to mouth	4.06	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR008_04	Little Malad River - Daniels Reservoir Dam to mouth	24.55	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR009_02	Little Malad River - headwaters to Daniels Reservoir	36.04	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR010_02b	Upper Wright Creek - headwaters to Indian Mill Canyon	8.86	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR010_03	middle Wright Creek - Indian Mill Canyon to Dairy Creek	2.72	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR010_04	Wright Creek - Dairy Creek to Daniels Reservoir	4.16	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	
ID16010204BR011_03	Dairy Creek - source to mouth	5.41	Miles
PHOSPHORUS, TOTAL	53480	Sep 13, 2013	
ID16010204BR012_02	Malad River - source to Little Malad River	47.4	Miles
PHOSPHORUS, TOTAL	30351	Jun 29, 2006	
TOTAL SUSPENDED SOLIDS (TSS)	30351	Jun 29, 2006	

Bear River

16020309 Curlew Valley

		EPA TMDL ID	Approval Date		
ID16020309BR001_03	North Canyon			6.01	Miles
TOTAL SUSPENDED SOLIDS (TSS)		ID_Curle_Jul-02-19	Jul 02, 2019		
ID16020309BR002_02a	Sheep Creek			13.38	Miles
ESCHERICHIA COLI (E. COLI)		ID_Curle_Jul-02-19	Jul 02, 2019		
TOTAL SUSPENDED SOLIDS (TSS)		ID_Curle_Jul-02-19	Jul 02, 2019		
ID16020309BR003_02a	Meadow Brook Creek			28.99	Miles
ESCHERICHIA COLI (E. COLI)		ID_Curle_Jul-02-19	Jul 02, 2019		
TOTAL SUSPENDED SOLIDS (TSS)		ID_Curle_Jul-02-19	Jul 02, 2019		
ID16020309BR003_03a	Rock Creek (Curlew Valley)			3.71	Miles
ESCHERICHIA COLI (E. COLI)		ID_Curle_Jul-02-19	Jul 02, 2019		
TOTAL SUSPENDED SOLIDS (TSS)		ID_Curle_Jul-02-19	Jul 02, 2019		

17060108 Palouse

		EPA TMDL ID	Approval Date		
ID17060108CL001_02	Cow Creek - source to Idaho/Washington border			85.95	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		22724	Feb 13, 2006		
ID17060108CL001_03	Cow Creek - source to Idaho/Washington border			10.69	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		22724	Feb 13, 2006		
TEMPERATURE		56186	Apr 30, 2014		
ID17060108CL002_03	South Fork Palouse River-Gnat Cr. to Idaho/Washington border			8.25	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		33470	Oct 01, 2007		
SEDIMENTATION/SILTATION		33470	Oct 01, 2007		
TEMPERATURE		33470	Oct 01, 2007		
		68181	Aug 23, 2017		
ID17060108CL003_02	South Fork Palouse River - source to Gnat Creek; tribs			14.51	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		33470	Oct 01, 2007		
SEDIMENTATION/SILTATION		33470	Oct 01, 2007		
TEMPERATURE		33470	Oct 01, 2007		
		68181	Aug 23, 2017		
ID17060108CL003_03	South Fork Palouse River - source to Gnat Creek			1.91	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		33470	Oct 01, 2007		
SEDIMENTATION/SILTATION		33470	Oct 01, 2007		
TEMPERATURE		33470	Oct 01, 2007		
		68181	Aug 23, 2017		
ID17060108CL005_02	Paradise Creek - Urban boundary to Idaho/Washington border			11.41	Miles
ESCHERICHIA COLI (E. COLI)		67000	Nov 01, 2016		
		907	Feb 12, 1998		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		907	Feb 12, 1998		
SEDIMENTATION/SILTATION		907	Feb 12, 1998		
TEMPERATURE		907	Feb 12, 1998		
ID17060108CL005_02a	Paradise Creek - forest habitat boundary to Urban boundary			16.91	Miles
ESCHERICHIA COLI (E. COLI)		67000	Nov 01, 2016		
		907	Feb 12, 1998		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		907	Feb 12, 1998		
SEDIMENTATION/SILTATION		907	Feb 12, 1998		
TEMPERATURE		907	Feb 12, 1998		

ID17060108CL005_02b	Idlers Rest Creek - source to forest habitat boundary	5.49	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	907	Feb 12, 1998	
SEDIMENTATION/SILTATION	907	Feb 12, 1998	
TEMPERATURE	907	Feb 12, 1998	

ID17060108CL011a_02	Flannigan Creek - source to T41N, R05W, Sec. 23	18.03	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	

ID17060108CL011a_03	Flannigan Creek - source to T41N, R05W, Sec. 23	3.06	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	

ID17060108CL011b_02	Flannigan Creek - T41N, R05W, Sec. 23 to mouth	2.92	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	

ID17060108CL011b_03	Flannigan Creek - T41N, R05W, Sec. 23 to mouth	3.71	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	

ID17060108CL012_03	Rock Creek-confluence of WF and EF Rock Cr to mouth	1.73	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	

ID17060108CL013a_02	West Fork Rock Creek - source to T41N, R04W, Sec. 30	5.68	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	

ID17060108CL013b_03	West Fork Rock Creek - T41N, R04W, Sec. 30 to mouth	1.4	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	

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ID17060108CL014a_02	**East Fork Rock Creek - source to T41N, R 04W, Sec. 29**	**2.23**	**Miles**
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
ID17060108CL014b_02	**East Fork Rock Creek - T41N, R 04W, Sec. 29 to mouth**	**1.66**	**Miles**
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
ID17060108CL015a_02	**Hatter Creek - source to T40N, R04W, Sec. 3**	**17.3**	**Miles**
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	
ID17060108CL015b_02	**Hatter Creek - T40N, R04W, Sec. 3 to mouth**	**20.47**	**Miles**
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	
ID17060108CL015b_03	**Hatter Creek - T40N, R04W, Sec. 3 to mouth**	**5.23**	**Miles**
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	
ID17060108CL027a_02	**Big Creek - source to T42N, R03W, Sec. 08**	**5.23**	**Miles**
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	
ID17060108CL027b_02	**Big Creek - T42N, R03W, Sec. 08 to mouth**	**15.49**	**Miles**
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	
ID17060108CL029_02	**Gold Creek - T42N, R04W, Sec. 28 to mouth**	**1.45**	**Miles**
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005	
SEDIMENTATION/SILTATION	11288	Mar 14, 2005	
TEMPERATURE	11288	Mar 14, 2005	
	68181	Aug 23, 2017	

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ID17060108CL029_03	Gold Creek - T42N, R04W, Sec. 28 to mouth		1.78	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005		
SEDIMENTATION/SILTATION	11288	Mar 14, 2005		
TEMPERATURE	11288	Mar 14, 2005		
	68181	Aug 23, 2017		
ID17060108CL030_02	Gold Creek - source to T42N, R04W, Sec. 28		19.96	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005		
TEMPERATURE	11288	Mar 14, 2005		
	68181	Aug 23, 2017		
ID17060108CL031a_02	Crane Creek - source to T42N, 04W, Sec. 28		3.7	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005		
SEDIMENTATION/SILTATION	11288	Mar 14, 2005		
TEMPERATURE	11288	Mar 14, 2005		
	68181	Aug 23, 2017		
ID17060108CL031b_02	Crane Creek - T42N, 04W, Sec. 08 to mouth		6.56	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005		
SEDIMENTATION/SILTATION	11288	Mar 14, 2005		
TEMPERATURE	11288	Mar 14, 2005		
	68181	Aug 23, 2017		
ID17060108CL032a_02	Deep Creek - source to T42, R05, Sec. 02		23.75	Miles
SEDIMENTATION/SILTATION	11288	Mar 14, 2005		
TEMPERATURE	11288	Mar 14, 2005		
	68181	Aug 23, 2017		
ID17060108CL032a_03	Deep Creek - source to T42, R05, Sec. 02		0.63	Miles
SEDIMENTATION/SILTATION	11288	Mar 14, 2005		
TEMPERATURE	11288	Mar 14, 2005		
	68181	Aug 23, 2017		
ID17060108CL032b_02	Deep Creek - T42, R05, Sec. 02 to mouth		15.29	Miles
ESCHERICHIA COLI (E. COLI)	11288	Mar 14, 2005		
SEDIMENTATION/SILTATION	11288	Mar 14, 2005		
TEMPERATURE	11288	Mar 14, 2005		
	68181	Aug 23, 2017		
ID17060108CL032b_03	Deep Creek - T42, R05, Sec. 02 to mouth		6.18	Miles
SEDIMENTATION/SILTATION	11288	Mar 14, 2005		
TEMPERATURE	11288	Mar 14, 2005		
	68181	Aug 23, 2017		

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17060303 Lochsa

		EPA TMDL ID	Approval Date		
ID17060303CL001_02	Lochsa River - Deadman Creek to mouth			27.91	Miles
TEMPERATURE		ID99922	Aug 27, 2018		
ID17060303CL061_02	Deadman Creek - source to East Fork Deadman Creek			8.67	Miles
TEMPERATURE		ID99922	Aug 27, 2018		
ID17060303CL062_03	Canyon Creek - source to mouth			0.63	Miles
TEMPERATURE		ID99922	Aug 27, 2018		
ID17060303CL063_02	Pete King Creek - Walde Creek to mouth			12.71	Miles
TEMPERATURE		ID99922	Aug 27, 2018		
ID17060303CL063_03	Pete King Creek - Walde Creek to mouth			5.5	Miles
TEMPERATURE		ID99922	Aug 27, 2018		
ID17060303CL064_02	Walde Creek - source to mouth			12.46	Miles
TEMPERATURE		ID99922	Aug 27, 2018		

17060305 South Fork Clearwater

		EPA TMDL ID	Approval Date		
ID17060305CL001_02	South Fork Clearwater River - Butcher Creek to mouth			2.8	Miles
SEDIMENTATION/SILTATION		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL003_02	Cottonwood Creek - source to Cottonwood Creek waterfall			30.32	Miles
AMMONIA, UN-IONIZED		334	Jun 06, 2000		
DISSOLVED OXYGEN		334	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		334	Jun 06, 2000		
SEDIMENTATION/SILTATION		334	Jun 06, 2000		
TEMPERATURE		334	Jun 06, 2000		
ID17060305CL003_03	Cottonwood Creek - source to Cottonwood Creek waterfall			0.39	Miles
AMMONIA, UN-IONIZED		334	Jun 06, 2000		
DISSOLVED OXYGEN		334	Jun 06, 2000		
FECAL COLIFORM		334	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		334	Jun 06, 2000		
SEDIMENTATION/SILTATION		334	Jun 06, 2000		
TEMPERATURE		334	Jun 06, 2000		

Clearwater

ID17060305CL003_04	Cottonwood Creek - source to Cottonwood Creek waterfall		5.4	Miles
AMMONIA, UN-IONIZED	334	Jun 06, 2000		
DISSOLVED OXYGEN	334	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	334	Jun 06, 2000		
SEDIMENTATION/SILTATION	334	Jun 06, 2000		
TEMPERATURE	334	Jun 06, 2000		
ID17060305CL006_02	Stockney Creek - source to mouth		21.98	Miles
DISSOLVED OXYGEN	334	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	334	Jun 06, 2000		
SEDIMENTATION/SILTATION	334	Jun 06, 2000		
TEMPERATURE	334	Jun 06, 2000		
ID17060305CL006_03	Stockney Creek - source to mouth		6.44	Miles
DISSOLVED OXYGEN	334	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	334	Jun 06, 2000		
SEDIMENTATION/SILTATION	334	Jun 06, 2000		
TEMPERATURE	334	Jun 06, 2000		
ID17060305CL007_02	Shebang Creek - source to mouth		34.31	Miles
DISSOLVED OXYGEN	334	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	334	Jun 06, 2000		
SEDIMENTATION/SILTATION	334	Jun 06, 2000		
TEMPERATURE	334	Jun 06, 2000		
ID17060305CL007_03	Shebang Creek - source to mouth		7.72	Miles
DISSOLVED OXYGEN	334	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	334	Jun 06, 2000		
SEDIMENTATION/SILTATION	334	Jun 06, 2000		
TEMPERATURE	334	Jun 06, 2000		
ID17060305CL008_02	South Fork Cottonwood Creek - source to mouth		24.97	Miles
DISSOLVED OXYGEN	334	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	334	Jun 06, 2000		
SEDIMENTATION/SILTATION	334	Jun 06, 2000		
TEMPERATURE	334	Jun 06, 2000		
ID17060305CL008_03	South Fork Cottonwood Creek - 3rd order segment		5.02	Miles
DISSOLVED OXYGEN	334	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	334	Jun 06, 2000		
SEDIMENTATION/SILTATION	334	Jun 06, 2000		
TEMPERATURE	334	Jun 06, 2000		

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ID17060305CL009_02	Long Haul Creek - source to mouth	14.98	Miles
DISSOLVED OXYGEN	334	Jun 06, 2000	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	334	Jun 06, 2000	
SEDIMENTATION/SILTATION	334	Jun 06, 2000	
TEMPERATURE	334	Jun 06, 2000	

ID17060305CL010_02	Threemile Creek - source to unnamed tributary	36.08	Miles
DISSOLVED OXYGEN	10730	Jul 22, 2004	
	11089	Jul 22, 2004	
ESCHERICHIA COLI (E. COLI)	10730	Jul 22, 2004	
	11089	Jul 22, 2004	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	10730	Jul 22, 2004	
	11089	Jul 22, 2004	
SEDIMENTATION/SILTATION	10730	Jul 22, 2004	
	11089	Jul 22, 2004	
TEMPERATURE	10730	Jul 22, 2004	
	11089	Jul 22, 2004	

ID17060305CL011a_02	Butcher Creek-unnamed tributary (mouth fish barrier)	5.94	Miles
SEDIMENTATION/SILTATION	10730	Jul 22, 2004	
	11089	Jul 22, 2004	
TEMPERATURE	10730	Jul 22, 2004	
	11089	Jul 22, 2004	

ID17060305CL011b_02	Butcher Creek - fish barrier to source	11.17	Miles
SEDIMENTATION/SILTATION	10730	Jul 22, 2004	
	11089	Jul 22, 2004	
TEMPERATURE	10730	Jul 22, 2004	
	11089	Jul 22, 2004	

ID17060305CL012_02	South Fork Clearwater River - sidewall tributaries	46.75	Miles
SEDIMENTATION/SILTATION	10730	Jul 22, 2004	
TEMPERATURE	10730	Jul 22, 2004	

ID17060305CL012_02a	Schwartz Creek	44.46	Miles
SEDIMENTATION/SILTATION	10730	Jul 22, 2004	
TEMPERATURE	10730	Jul 22, 2004	

ID17060305CL012_05	South Fork Clearwater River - Johns Creek to Butcher Creek	22.27	Miles
SEDIMENTATION/SILTATION	10730	Jul 22, 2004	
	11089	Jul 22, 2004	
TEMPERATURE	10730	Jul 22, 2004	
	11089	Jul 22, 2004	

Clearwater

ID17060305CL013_02	Mill Creek - source to mouth			36.24	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL013_03	Mill Creek - 3rd order, from Merton Creek to mouth			8.45	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL014_02	Johns Creek - tributaries			42.61	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL014_04	Johns Creek - Gospel Creek to mouth			9.48	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL015_03	Gospel Creek - source to mouth			1.96	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL017_02	Johns Creek - Moores Creek to Gospel Creek			15.01	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL017_03	Johns Creek - Moores Creek to Gospel Creek			3.84	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL022_02	Huddleson Creek and tributaries			33.91	Miles
SEDIMENTATION/SILTATION		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL022_02a	Granite Creek			4.08	Miles
SEDIMENTATION/SILTATION		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL022_05	South Fork Clearwater River - Tenmile Creek to Johns Creek			11.78	Miles
SEDIMENTATION/SILTATION		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		

ID17060305CL023_02	Wing Creek - source to Little Wing Creek		9.58	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL023_03	Wing Creek - Little Wing Creek to mouth		1.42	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL024_02	Twentymile Creek - 1st and 2nd order mainstem & tributaries		24.75	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL024_03	Twentymile Creek - unnamed tributary to mouth		3.17	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL025_02	Tenmile Creek - Sixmile Creek to mouth		2.75	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL025_04	Tenmile Creek - Sixmile Creek to mouth		3.67	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL026_02	Tenmile Creek - Williams Creek to Sixmile Creek		12.5	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL026_03	Tenmile Creek - 3rd order segment		2.45	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL027_02	Tenmile Creek - source to Williams Creek		21.73	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL028_02	Williams Creek - source to mouth		11.67	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL029_02	Sixmile Creek - source to mouth		12.8	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL029_03	Sixmile Creek - 3rd Order from Fourmile Cr to mouth		1.03	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		

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ID17060305CL030_02	South Fork Clearwater River - Crooked River to Tenmile Creek			28.39	Miles
SEDIMENTATION/SILTATION		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL030_05	South Fork Clearwater River - Crooked River to Tenmile Creek			11.76	Miles
SEDIMENTATION/SILTATION		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL031_02	Crooked River - Relief Creek to mouth			12.45	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL031_03	Crooked River - 3rd order from Relief Creek to mouth			7.44	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL032_02	Crooked River - confluence of West and East Fork Crooked R.			29.48	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL032_03	Crooked River - WF and EF Crooked R. to Relief Creek			4.21	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL033_02	West Fork Crooked River - source to mouth			13.51	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL034_02	East Fork Crooked River - source to mouth			12	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL035_02	Relief Creek - source to mouth			13.47	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL036_02	South Fork Clearwater River - tributaries			2.49	Miles
SEDIMENTATION/SILTATION		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		

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ID17060305CL036_05	South Fork Clearwater River - 5th order mainstem segment			3.96	Miles
SEDIMENTATION/SILTATION		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL037_02	Red River- Siegel Creek to mouth			17.13	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL037_04	Red River- Siegel Creek to mouth			7.82	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL038_02	Red River - South Fork Red River to Siegel Creek			27.13	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL038_02a	Little Moose Creek - source to mouth			8.86	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL038_04	Red River - South Fork Red River to Siegel Creek			7.62	Miles
TEMPERATURE		10730	Jul 22, 2004		
ID17060305CL039_02	Moose Butte Creek - source to, and including Hays Cr.			12.51	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL039_03	Moose Butte Creek - 3rd order segment			2.64	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL040_02	South Fork Red River - Trapper Creek to mouth			3.38	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL040_03	South Fork Red River - Trapper Creek to mouth			3.02	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL041_02	South Fork Red River - West Fork Red River to Trapper Creek			4.1	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL041_03	South Fork Red River - West Fork Red River to Trapper Creek			3.74	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		

ID17060305CL042_02	West Fork Red River - source to mouth		14.14	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL042_03	West Fork Red River - source to mouth		0.74	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL043_02	South Fork Red River - source to West Fork Red River		7.91	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL044_02	Trapper Creek - source to mouth		13.82	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL045_02	Red River - source to South Fork Red River		32.47	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL045_03	Red River - Unnamed tributary to South Fork Red River		10.89	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL046_02	Soda Creek - source to mouth		7.95	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL047_02	Bridge Creek - source to mouth		7.18	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL048_02	Otterson Creek - source to mouth		6.18	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL049_02	Trail Creek - source to mouth		9.37	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL050_02	Siegel Creek - source to mouth		13.6	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		
ID17060305CL051_02	Red Horse Creek - source to mouth		14.04	Miles
TEMPERATURE	10730	Jul 22, 2004		
	11089	Jul 22, 2004		

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ID17060305CL052_02	American River - East Fork American River to mouth			10.6	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL052_04	American River - 4th order,East Fork American River to mouth			9.47	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL053_02	Kirks Fork - source to mouth			15.76	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL053_03	Kirks Fork - 3rd order segment			1.3	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL054_02	East Fork American River - source to mouth			30.96	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL054_03	East Fork American River - source to mouth			2.13	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL055_02	American River - source to East Fork American River			33.69	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL055_03	American River - source to East Fork American River			5.62	Miles
TEMPERATURE		10730	Jul 22, 2004		
ID17060305CL056_02	Elk Creek			2.04	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL056_03	Elk Creek-confluence of Big Elk & Little Elk Creeks to mouth			2.35	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL057_02	Little Elk Creek - source to mouth			12.69	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL058_02	Big Elk Creek - source to WF Big Elk Creek			15.34	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		

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ID17060305CL058_03	Big Elk Creek - 3rd Order			4.36	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL059_02	Buffalo Gulch - source to mouth			6.49	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL060_02	Whiskey Creek - source to mouth			4.19	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL061_02	Maurice Creek - source to mouth			2.64	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL062_02	Newsome Creek - Beaver Creek to mouth			5.48	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL062_04	Newsome Creek - Beaver Creek to mouth			6.92	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL063_02	Bear Creek - source to mouth			8.01	Miles
TEMPERATURE		10730	Jul 22, 2004		
ID17060305CL064_02	Nugget Creek - source to mouth			4.55	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL065_02	Beaver Creek - source to mouth			6.67	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL066_04	Newsome Creek - 4th order			2.26	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL067_02	Mule Creek - source to mouth			13.2	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL067_03	Mule Creek - 3rd Order			0.57	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		

ID17060305CL068_02	Newsome Creek - source to Mule Creek			15.2	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL068_03	Newsome Creek - source to Mule Creek			0.48	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL069_02	Haysfork Creek - source to mouth			9.5	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL070_02	Baldy Creek - source to mouth			8.01	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL071_02	Pilot Creek - source to mouth			7.61	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL071_03	Pilot Creek - 3rd Order			2.84	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL072_02	Sawmill Creek - source to mouth			6.03	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL073_02	Sing Lee Creek - source to mouth			4.51	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL074_02	West Fork Newsome Creek - source to mouth			4.25	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL074_02a	West Fork Newsome Creek			2.95	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL075_02	Leggett Creek - source to mouth			11.86	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL076_02	Fall Creek - source to mouth			7.77	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		

ID17060305CL077_02	Silver Creek - 1st and 2nd order			9.63	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL077_02a	Silver Creek - headwaters and tributaries			29.47	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL077_03	Silver Creek - unnamed tributary to mouth			1.87	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL078_02	Peasley Creek - source to mouth			22.28	Miles
TEMPERATURE		10730	Jul 22, 2004		
ID17060305CL079_02	Cougar Creek - source to mouth			17.05	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL080_02	Meadow Creek - source to and inc. NF Meadow Cr.			41.01	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL080_03	Meadow Creek - NF Meadow Cr to mouth			6.76	Miles
TEMPERATURE		10730	Jul 22, 2004		
ID17060305CL081_02	Sally Ann Creek - source to and inc. Wall Creek			17.73	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL081_03	Sally Ann Creek - Wall Creek to mouth			0.26	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		
ID17060305CL082_02	Rabbit Creek - source to mouth			8.81	Miles
TEMPERATURE		10730	Jul 22, 2004		
		11089	Jul 22, 2004		

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		EPA TMDL ID	Approval Date		
ID17060306CL003_02	Lindsay Creek - 1st and 2nd order tributaries			21.1	Miles
ESCHERICHIA COLI (E. COLI)		32412	Jun 26, 2007		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		32412	Jun 26, 2007		
SEDIMENTATION/SILTATION		32412	Jun 26, 2007		

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ID17060306CL003_03	Lindsay Creek - 3rd order		3.64	Miles
ESCHERICHIA COLI (E. COLI)	32412	Jun 26, 2007		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	32412	Jun 26, 2007		
SEDIMENTATION/SILTATION	32412	Jun 26, 2007		
ID17060306CL029_02	Eldorado Creek - 1st and 2nd Order Tributaries		52.08	Miles
TEMPERATURE	41453	Dec 12, 2011		
ID17060306CL031_02	Jim Brown Creek - 1st and 2nd Order Tributaries		44.61	Miles
TEMPERATURE	41453	Dec 12, 2011		
ID17060306CL031_03	Jim Brown Creek - 3rd Order		5.51	Miles
TEMPERATURE	41453	Dec 12, 2011		
ID17060306CL032_02	Musselshell Creek - 1st and 2nd order tributaries		30.83	Miles
TEMPERATURE	41453	Dec 12, 2011		
ID17060306CL032_03	Musselshell Creek - 3rd Order		4.33	Miles
TEMPERATURE	41453	Dec 12, 2011		
ID17060306CL034_04	Jim Ford Creek - waterfall (12.5 miles upstream) to mouth		8.97	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	580	Jun 06, 2000		
TEMPERATURE	580	Jun 06, 2000		
	ID99955	Sep 26, 2018		
ID17060306CL035_02	Heywood, Wilson Creeks and tributaries		48.65	Miles
FECAL COLIFORM	580	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	580	Jun 06, 2000		
TEMPERATURE	580	Jun 06, 2000		
	ID99955	Sep 26, 2018		
ID17060306CL035_03	Jim Ford Creek - source to Jim Ford Cr waterfall (12.5 mi)		6.39	Miles
FECAL COLIFORM	580	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	580	Jun 06, 2000		
TEMPERATURE	580	Jun 06, 2000		
	ID99955	Sep 26, 2018		
ID17060306CL035_04	Jim Ford Creek - source to Jim Ford Creek waterfall		3.87	Miles
FECAL COLIFORM	580	Jun 06, 2000		
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	580	Jun 06, 2000		
TEMPERATURE	580	Jun 06, 2000		
	ID99955	Sep 26, 2018		

ID17060306CL036_02	Grasshopper Creek - source to mouth	19.58	Miles
FECAL COLIFORM	580	Jun 06, 2000	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	580	Jun 06, 2000	
TEMPERATURE	580	Jun 06, 2000	
	ID99955	Sep 26, 2018	

ID17060306CL036_03	Grasshopper Creek - source to mouth	4.3	Miles
FECAL COLIFORM	580	Jun 06, 2000	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	580	Jun 06, 2000	
TEMPERATURE	580	Jun 06, 2000	
	ID99955	Sep 26, 2018	

ID17060306CL037_02	Winter Creek - Winter Creek waterfall (3.4 miles upstream)	6.63	Miles
FECAL COLIFORM	580	Jun 06, 2000	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	580	Jun 06, 2000	
TEMPERATURE	580	Jun 06, 2000	
	ID99955	Sep 26, 2018	

ID17060306CL037_03	Winter Creek - waterfall (3.4 miles upstream) to mouth	2.41	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	580	Jun 06, 2000	
TEMPERATURE	580	Jun 06, 2000	
	ID99955	Sep 26, 2018	

ID17060306CL038_02	Winter Creek - source to Winter Creek waterfall	6.77	Miles
FECAL COLIFORM	580	Jun 06, 2000	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	580	Jun 06, 2000	
TEMPERATURE	580	Jun 06, 2000	
	ID99955	Sep 26, 2018	

ID17060306CL044_06	Potlatch River - 6th Order	7.35	Miles
SEDIMENTATION/SILTATION	35864	Feb 13, 2009	
TEMPERATURE	35864	Feb 13, 2009	
	99944	Jul 12, 2018	

ID17060306CL045_05	Potlatch River - 5th Order	18.48	Miles
TEMPERATURE	35864	Feb 13, 2009	
	99944	Jul 12, 2018	

ID17060306CL046_04	Cedar Creek - 4th Order	5.18	Miles
SEDIMENTATION/SILTATION	35864	Feb 13, 2009	
TEMPERATURE	35864	Feb 13, 2009	
	99944	Jul 12, 2018	

Clearwater

ID17060306CL047_03	Boulder Creek - 3rd Order		4.14	Miles
ESCHERICHIA COLI (E. COLI)	35864	Feb 13, 2009		
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		
ID17060306CL048_04	Potlatch River - 4th Order		6.67	Miles
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		
ID17060306CL048_05	Potlatch River - 5th Order		7.7	Miles
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		
ID17060306CL049_02	Potlatch River - headwaters		61.69	Miles
ESCHERICHIA COLI (E. COLI)	35864	Feb 13, 2009		
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		
ID17060306CL049_03	Potlatch River - 3rd Order		5.3	Miles
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		
ID17060306CL049_04	Potlatch River - 4th Order		3.71	Miles
ESCHERICHIA COLI (E. COLI)	35864	Feb 13, 2009		
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		
ID17060306CL051_04	East Fork Potlatch River - 4th Order		4.73	Miles
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		
ID17060306CL052_03	Ruby Creek - 3rd Order		2.14	Miles
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		
ID17060306CL053_02	Moose Creek - headwaters		15.7	Miles
ESCHERICHIA COLI (E. COLI)	35864	Feb 13, 2009		
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		
ID17060306CL053_03	Moose Creek - 3rd Order		3.7	Miles
ESCHERICHIA COLI (E. COLI)	35864	Feb 13, 2009		
TEMPERATURE	35864	Feb 13, 2009		
	99944	Jul 12, 2018		

ID17060306CL054_02	Corral Creek - headwaters			22.29	Miles
TEMPERATURE		35864	Feb 13, 2009		
		99944	Jul 12, 2018		
ID17060306CL054_03	Corral Creek - 3rd Order			7.57	Miles
TEMPERATURE		35864	Feb 13, 2009		
		99944	Jul 12, 2018		
ID17060306CL055_02	Pine Creek - headwaters			35.94	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		35864	Feb 13, 2009		
SEDIMENTATION/SILTATION		35864	Feb 13, 2009		
TEMPERATURE		35864	Feb 13, 2009		
		99944	Jul 12, 2018		
ID17060306CL055_03	Pine Creek - 3rd Order			3.87	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		35864	Feb 13, 2009		
SEDIMENTATION/SILTATION		35864	Feb 13, 2009		
TEMPERATURE		35864	Feb 13, 2009		
		99944	Jul 12, 2018		
ID17060306CL056_04	Big Bear Creek - 4th Order			17.05	Miles
TEMPERATURE		35864	Feb 13, 2009		
		99944	Jul 12, 2018		
ID17060306CL056_05	Big Bear Creek - 5th Order			1.01	Miles
TEMPERATURE		35864	Feb 13, 2009		
		99944	Jul 12, 2018		
ID17060306CL061_02	West Fork Little Bear Creek - 1st and 2nd Order			38.52	Miles
NITROGEN, TOTAL		35864	Feb 13, 2009		
SEDIMENTATION/SILTATION		35864	Feb 13, 2009		
ID17060306CL061_03	West Fork Little Bear Creek - 3rd Order			9.22	Miles
ESCHERICHIA COLI (E. COLI)		35864	Feb 13, 2009		
NITROGEN, TOTAL		35864	Feb 13, 2009		
SEDIMENTATION/SILTATION		35864	Feb 13, 2009		
ID17060306CL062_02	Middle Potlatch Creek - headwaters			45.85	Miles
SEDIMENTATION/SILTATION		35864	Feb 13, 2009		
TEMPERATURE		35864	Feb 13, 2009		
		99944	Jul 12, 2018		
ID17060306CL062_03	Middle Potlatch Creek - 3rd Order			14.47	Miles
SEDIMENTATION/SILTATION		35864	Feb 13, 2009		
TEMPERATURE		35864	Feb 13, 2009		
		99944	Jul 12, 2018		

ID17060306CL067_02	Hatwai Creek - 1st and 2nd Order tributaries			37.53	Miles
ESCHERICHIA COLI (E. COLI)		39642	Dec 28, 2010		
NITROGEN, NITRATE		39642	Dec 28, 2010		
PHOSPHORUS, TOTAL		39642	Dec 28, 2010		
ID17060306CL067_03	Hatwai Creek - 3rd Order			4.1	Miles
ESCHERICHIA COLI (E. COLI)		39642	Dec 28, 2010		
NITROGEN, NITRATE		39642	Dec 28, 2010		
PHOSPHORUS, TOTAL		39642	Dec 28, 2010		
TEMPERATURE		39642	Dec 28, 2010		
		ID_Hatwa_Aug-23-19	Aug 23, 2019		

17060307 Upper North Fork Clearwater

		EPA TMDL ID	Approval Date		
ID17060307CL001_02a	Sneak Creek - source to mouth			5.38	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL005_02	Orogrande Creek - 1st and 2nd order tributaries			28.97	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL005_02a	Tamarack Creek - source to mouth			5.66	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL005_04	Orogrande Creek - 4th Order			12.59	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL006_02	Orogrande Creek - headwaters			36.83	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL006_03	Orogrande Creek - 3rd Order			4.04	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL007_02a	Sylvan Creek - source to mouth			5.72	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL012_02	Middle Creek - tributaries			18.23	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL012_02a	Middle Creek - headwaters			8.46	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL012_03	Middle Creek - 3rd Order			2.05	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL012_03a	Middle Creek			5.54	Miles
TEMPERATURE		9705	Dec 09, 2003		
ID17060307CL021_02	Gravey Creek - source to mouth			19.13	Miles
TEMPERATURE		9705	Dec 09, 2003		

ID17060307CL021_02a	Marten Creek - source to mouth		7.55	Miles
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL021_02b	Grass Creek - source to mouth		1.65	Miles
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL021_03	Gravey Creek - 3rd Order		1.44	Miles
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL021_03a	Gravey Creek - 3rd Order		4.4	Miles
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL030_02	Osier Creek - source to mouth		18.94	Miles
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL030_02a	Osier Creek Tributaries: Sugar, Swamp, Pollock Creeks		13.74	Miles
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL030_03	Osier Creek - 3rd Order		3.88	Miles
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL032_02a	Deception Gulch Creek - source to mouth		6.38	Miles
SEDIMENTATION/SILTATION	9705	Dec 09, 2003		
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL033_03	Lake Creek - 3rd order segment		4.85	Miles
TEMPERATURE	ID99933	Sep 04, 2018		
ID17060307CL040_02	Cold Springs Creek - source to mouth		11.26	Miles
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL044_02a	Grizzly Creek - source to mouth		4.49	Miles
TEMPERATURE	9705	Dec 09, 2003		
ID17060307CL045_02	Cougar Creek - source to mouth		5.9	Miles
TEMPERATURE	9705	Dec 09, 2003		

17060308 Lower North Fork Clearwater

	EPA TMDL ID	Approval Date		
ID17060308CL002_02a	Swamp Creek - 1st and 2nd Order Tributaries		12.77	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL002_02b	Elkberry Creek		32.2	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL002_02c	Middle Fork Robinson Creek		25.54	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL002_02d	Cedar Creek - source to mouth		6.22	Miles
TEMPERATURE	3828	Jan 15, 2003		

Clearwater

ID17060308CL002_03a	Swamp Creek - 3rd order, Follet Creek to Dworshak Reservoir	0.72	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003	
TEMPERATURE	3828	Jan 15, 2003	
ID17060308CL002_04	Elk Creek - Cedar Creek to Dworshak Reservoir	7.47	Miles
TEMPERATURE	3828	Jan 15, 2003	
ID17060308CL002_04a	Long Meadow Creek - unnamed trib to Dworshak Reservoir	2.31	Miles
ESCHERICHIA COLI (E. COLI)	3828	Jan 15, 2003	
SEDIMENTATION/SILTATION	3828	Jan 15, 2003	
TEMPERATURE	3828	Jan 15, 2003	
ID17060308CL003_02	Gold Creek, Meadow Creek, unnamed tributary	29.71	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003	
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL003_03	Reeds Creek - Alder Creek to Gold Creek	3.35	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003	
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL003_04	Reeds Creek - Gold Creek to unnamed tributary	1.85	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003	
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL004_02	Reeds Creek - source to Deer Creek, inc. tribs	28.18	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003	
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL004_03	Reeds Creek - Deer Creek to Alder Creek	8.05	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003	
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL005_02	Alder Creek - source to mouth	30.86	Miles
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL009_02	Beaver Creek - tributaries	38.38	Miles
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL009_02c	Bingo Creek - source to mouth	2.77	Miles
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL009_02e	Beaver Creek - headwater	4.73	Miles
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL009_03	Beaver Creek - source to mouth	5.65	Miles
TEMPERATURE	54540	Nov 06, 2013	
ID17060308CL009_04	Beaver Creek - source to mouth	7.7	Miles
TEMPERATURE	54540	Nov 06, 2013	

Clearwater

ID17060308CL010_03	Isabella Creek - Elmer/Jug Creek to mouth		5.39	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL020_02	Unnamed tributary to Stony Creek		2.09	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL020_04	Stony Creek - Glover Creek to Breakfast Creek		3.68	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL020_04a	Breakfast Creek - 4th Order, Stony Cr to Dworshak Reservoir		1.91	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL021_02	Floodwood Creek - tributaries		43.66	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL021_02a	Floodwood Creek - headwaters to Pinchot Creek		8.23	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL021_03	Floodwood Creek - 3rd order		9.93	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL021_03a	Floodwood Creek - Pinchot Creek to Goat Creek		1.67	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL023_02	Stony Creek - source to Glover; tributaries		21.44	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL023_02a	Stony Creek - 2nd Order		2.76	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL023_03	Stony Creek - unnamed trib to Glover Creek		5.79	Miles
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL025_02	Breakfast Creek - source to Stony Creek		10.04	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	54540	Nov 06, 2013		
ID17060308CL028_02	Swamp Creek - source to Dworshak Reservoir		1.79	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL028_03	Swamp Creek - source to Dworshak Reservoir		3	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL029_02	Cranberry Creek - source to Dworshak Reservoir		14.26	Miles
ESCHERICHIA COLI (E. COLI)	3828	Jan 15, 2003		
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	3828	Jan 15, 2003		

ID17060308CL030_02d	Partridge Creek - source to mouth		6.87	Miles
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
ID17060308CL030_02e	Deep Creek, Fisher Creek, and tributaries		33.31	Miles
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL030_03a	Elk Creek - 3rd Order, Reservoir to Elk Creek Falls		3.83	Miles
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL030_03b	Elk Creek - Elk Creek Falls to conflence of Deep Creek		2.13	Miles
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL030_04	Elk Creek - confluence of Deep Creek to Cedar Creek		3.66	Miles
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL034_02	Three Bear, Round Meadow, Oviatt Creeks and tributaries		58.46	Miles
ESCHERICHIA COLI (E. COLI)	3828	Jan 15, 2003		
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL034_02a	Long Meadow Creek		1.2	Miles
ESCHERICHIA COLI (E. COLI)	3828	Jan 15, 2003		
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL034_03	Long Meadow Creek - 3rd Order		7.7	Miles
ESCHERICHIA COLI (E. COLI)	3828	Jan 15, 2003		
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	3828	Jan 15, 2003		
ID17060308CL034_04	Long Meadow Creek - 4th Order		4.4	Miles
ESCHERICHIA COLI (E. COLI)	3828	Jan 15, 2003		
SEDIMENTATION/SILTATION	3828	Jan 15, 2003		
TEMPERATURE	3828	Jan 15, 2003		

17010104 Lower Kootenai

		EPA TMDL ID	Approval Date		
ID17010104PN002_02	Boundary Cr & tribs - ID/Canada border to ID/Canada border			16.99	Miles
TEMPERATURE		32002	Feb 06, 2007		
		ID_Koote_Jun-28-19	Jun 28, 2019		
ID17010104PN002_03	Boundary Creek - Idaho/Canadian border to Id/Canadian border			7.58	Miles
TEMPERATURE		32002	Feb 06, 2007		
		ID_Koote_Jun-28-19	Jun 28, 2019		
ID17010104PN003_02	1st & 2nd order tribs to Grass Creek			27.34	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN003_03	Grass Creek - third order portion to Idaho/Canadian border			7.73	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN004_02	Blue Joe Creek - source to Idaho/Canadian border			15.43	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN005_04	Smith Creek - Cow Creek to Kootenai River			7.87	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN006_02	Cow Creek - headwaters to Smith Creek			9.47	Miles
SEDIMENTATION/SILTATION		32002	Feb 06, 2007		
ID17010104PN006_03	Cow Creek - source to mouth			2.16	Miles
SEDIMENTATION/SILTATION		32002	Feb 06, 2007		
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN007_03	Smith Creek - source to Cow Creek			4.99	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN008_02	Long Canyon Creek - source to mouth			29.8	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN010_03	Trout Creek - 3rd order to branch			4.55	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN011_02	Upper Ball Creek - source to forest edge			34.24	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN011_02a	Ball Creek- lower portion, forest to Kootenai River			0.78	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN013_03	Myrtle Creek - Jim Creek to mouth			11	Miles
TEMPERATURE		61640	Oct 22, 2014		
ID17010104PN014_02	Cascade Creek - source to mouth			3.57	Miles
TEMPERATURE		61640	Oct 22, 2014		

ID17010104PN015_04	Lower Deep Creek - Snow Creek to Kootenai River		4.32	Miles
SEDIMENTATION/SILTATION	32002	Feb 06, 2007		
TEMPERATURE	32002	Feb 06, 2007		
	ID_Koote_Jun-28-19	Jun 28, 2019		
ID17010104PN016_03	Lower Snow Creek		7.57	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN017_02	Caribou Creek - source to mouth		10.74	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN018_04	Deep Creek - Ruby Creek to Snow Creek		4.91	Miles
SEDIMENTATION/SILTATION	32002	Feb 06, 2007		
TEMPERATURE	32002	Feb 06, 2007		
	ID_Koote_Jun-28-19	Jun 28, 2019		
ID17010104PN019_04	Deep Creek - Trail Creek to Brown Creek		4.63	Miles
SEDIMENTATION/SILTATION	32002	Feb 06, 2007		
TEMPERATURE	32002	Feb 06, 2007		
	ID_Koote_Jun-28-19	Jun 28, 2019		
ID17010104PN020_03	Ruby Creek - lower, Gold Creek to Deep Creek		1.6	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN021_03	Fall Creek - lower, 3rd order portion to Deep Creek		8.07	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN022_03	Deep Creek - McArthur Lake to Trail Creek		6.58	Miles
SEDIMENTATION/SILTATION	32002	Feb 06, 2007		
TEMPERATURE	32002	Feb 06, 2007		
	ID_Koote_Jun-28-19	Jun 28, 2019		
ID17010104PN025_02	Deep Creek - source to McArthur Lake		11.51	Miles
TEMPERATURE	32002	Feb 06, 2007		
	ID_Koote_Jun-28-19	Jun 28, 2019		
ID17010104PN026_03	Trail Creek - source to Highway		2.61	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN030_03	Cow Creek - lower, Brush Creek to earthen levy		1.32	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN032_03	Boulder Creek - East Fork Boulder Creek to mouth		4.22	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN033_03	Boulder Creek - Pinochle Creek to East Fork Boulder Creek		9.74	Miles
TEMPERATURE	61640	Oct 22, 2014		

ID17010104PN035_03	Curley Creek - lower, unnamed trib to Kootenai River		8.65	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN036_03	Fleming Creek - lower		3.49	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN037_03	Rock Creek - lower		1.33	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN038_03	Mission Creek - Brush Creek to mouth		2.91	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN039_02	Brush Creek - source to mouth		9.73	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010104PN040_03	Mission Creek - Idaho/Canadian border to Brush Creek		9.06	Miles
TEMPERATURE	61640	Oct 22, 2014		

17010105 Moyie

	EPA TMDL ID	Approval Date		
ID17010105PN002_02	Moyie River - Meadow Creek to Moyie Falls Dam		9.19	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN003_02	Skin Creek - Idaho/Montana border to mouth		8.81	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN004_02	Deer Creek - source to mouth		30.94	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN004_03	Deer Creek - source to mouth		6.25	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN006_02	Tribs to Moyie River btwn CA border and Round Prairie Creek		22.87	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN007_02	Canuck Creek - Idaho/Montana border to Idaho/Canadian border		13.71	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN009_02	Gillon Creek - Idaho/Canadian border to mouth		6.95	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN010_03	Round Prairie Creek - source to Gillon Creek		2.96	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN011_02	Miller Creek - source to mouth		3.69	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN012_02	Meadow Creek - source to Wall Creek		22.63	Miles
TEMPERATURE	61640	Oct 22, 2014		
ID17010105PN012_03	Meadow Creek - Wall Creek to Moyie River		2.63	Miles
TEMPERATURE	61640	Oct 22, 2014		

Panhandle

17010213 Lower Clark Fork

		EPA TMDL ID	Approval Date		
ID17010213PN001_08	Clark Fork River Delta - Mosquito Creek to Pend Oreille Lake			11	Miles
CADMIUM		33766	Oct 22, 2007		
COPPER		33766	Oct 22, 2007		
DISSOLVED GAS SUPERSATURATION		33766	Oct 22, 2007		
ZINC		33766	Oct 22, 2007		
ID17010213PN002_02	Johnson Creek - source to mouth			15.31	Miles
SEDIMENTATION/SILTATION		33766	Oct 22, 2007		
TEMPERATURE		33766	Oct 22, 2007		
ID17010213PN002_03	Johnson Creek - source to mouth			2.12	Miles
SEDIMENTATION/SILTATION		33766	Oct 22, 2007		
TEMPERATURE		33766	Oct 22, 2007		
ID17010213PN003_08	Clark Fork River - Cabinet Gorge Dam to Mosquito Creek			7.45	Miles
CADMIUM		33766	Oct 22, 2007		
COPPER		33766	Oct 22, 2007		
DISSOLVED GAS SUPERSATURATION		33766	Oct 22, 2007		
ZINC		33766	Oct 22, 2007		
ID17010213PN004_02	Twin Creek - 1st & 2nd order Twin & Delyle Creek			13.89	Miles
SEDIMENTATION/SILTATION		33766	Oct 22, 2007		
TEMPERATURE		33766	Oct 22, 2007		
ID17010213PN004_02a	Dry Creek			9.65	Miles
TEMPERATURE		33766	Oct 22, 2007		
ID17010213PN004_03	Twin Creek - Delyle Creek to Clark Fork River			3.46	Miles
SEDIMENTATION/SILTATION		33766	Oct 22, 2007		
TEMPERATURE		33766	Oct 22, 2007		
ID17010213PN005_08	Clark Fork River - Idaho/Montana border to Cabinet Gorge Dam			0.55	Miles
CADMIUM		33766	Oct 22, 2007		
COPPER		33766	Oct 22, 2007		
DISSOLVED GAS SUPERSATURATION		33766	Oct 22, 2007		
ZINC		33766	Oct 22, 2007		
ID17010213PN009_02	Mosquito Creek - source to mouth			8.78	Miles
TEMPERATURE		33766	Oct 22, 2007		
ID17010213PN010_04	Lightning Creek - Spring Creek to mouth			1.51	Miles
SEDIMENTATION/SILTATION		33766	Oct 22, 2007		
TEMPERATURE		33766	Oct 22, 2007		

ID17010213PN011_02	Lightning Creek - Cascade Creek to Spring Creek		0.22	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN011_04	Lightning Creek - Cascade Creek to Spring Creek		2.66	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN012_02	Cascade Creek - source to mouth		7.38	Miles
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN013_02	Lightning Creek - East Fork Creek to Cascade Creek		10.38	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN013_04	Lightning Creek - East Fork Creek to Cascade Creek		6.77	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN014_02	East Fork Creek - Idaho/Montana border to mouth		5.24	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN014_03	East Fork Creek - Idaho/Montana border to mouth		0.92	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN015_02	Savage Creek - Idaho/Montana border to mouth		4.84	Miles
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN016_02	Tribs. to Lightning Cr between Wellington & E. Fork Creek		15.18	Miles
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN016_03	Lightning Creek - Wellington Creek to East Fork Creek		4.78	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN017_02	Lightning Creek - tribs between Wellington & Rattle Creek		2.78	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN017_03	Lightning Creek - Rattle Creek to Wellington Creek		2.72	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		
ID17010213PN018_02	Rattle Creek - source to mouth		10.41	Miles
SEDIMENTATION/SILTATION	33766	Oct 22, 2007		
TEMPERATURE	33766	Oct 22, 2007		

ID17010213PN019_02	Lightning Creek - source to Rattle Creek			18.37	Miles
SEDIMENTATION/SILTATION		33766	Oct 22, 2007		
TEMPERATURE		33766	Oct 22, 2007		
ID17010213PN019_03	Lightning Creek - source to Rattle Creek			2.13	Miles
SEDIMENTATION/SILTATION		33766	Oct 22, 2007		
TEMPERATURE		33766	Oct 22, 2007		
ID17010213PN020_02	Wellington Creek - source to mouth			7.91	Miles
SEDIMENTATION/SILTATION		33766	Oct 22, 2007		
TEMPERATURE		33766	Oct 22, 2007		

17010214 Pend Oreille Lake

		EPA TMDL ID	Approval Date		
ID17010214PN003_02	Hoodoo Creek - source to mouth			51.82	Miles
SEDIMENTATION/SILTATION		2003	Sep 14, 2000		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN003_02a	Hoodoo Creek			14.86	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN012_02	Cocolalla Creek - Cocolalla Lake to mouth			13.28	Miles
SEDIMENTATION/SILTATION		2003	Sep 14, 2000		
ID17010214PN012_04	Cocolalla Creek - Cocolalla Lake to mouth			7.42	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN013L_0L	Cocolalla Lake			803.74	Acres
DISSOLVED OXYGEN		2002	Apr 02, 2001		
PHOSPHORUS, TOTAL		2002	Apr 02, 2001		
ID17010214PN014_02	Cocolalla Creek - source to Cocolalla Lake			40.66	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN014_03	Cocolalla Creek - source to Cocolalla Lake			9.17	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN014_04	Cocolalla Creek - source to Cocolalla Lake			0.2	Miles
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN015_02	Fish Creek - source to mouth			15.27	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		

ID17010214PN015_03	Fish Creek - source to mouth			2.37	Miles
TEMPERATURE		33918	Jan 31, 2008		
ID17010214PN018L_0L	Pend Oreille Lake			80828.61	Acres
PHOSPHORUS, TOTAL		3498	Oct 08, 2002		
ID17010214PN021_02	Cheer Creek			4.64	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN021_03	Gold Crk.- WGold to lake PDO			1.67	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN022_02	West Gold Creek			9.62	Miles
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN023_02	Gold Creek, headwaters to chloride gulch			6.92	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN023_03	Gold Creek			1.15	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN024_02	Chloride Creek			7.13	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN025_02	North Gold Creek - source to mouth			17.13	Miles
SEDIMENTATION/SILTATION		33918	Jan 31, 2008		
ID17010214PN025_03	North Gold Creek			2.29	Miles
SEDIMENTATION/SILTATION		33918	Jan 31, 2008		
ID17010214PN026_02	Cedar Creek			9.47	Miles
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN027_02	Granite Creek			26.56	Miles
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN027_03	Granite Creek, Lower			4.68	Miles
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN030_02	Trestle Creek - source to mouth			21	Miles
TEMPERATURE		34333	Apr 24, 2008		

ID17010214PN031_04	Lower Pack River - Sand Creek to mouth			19.22	Miles
PHOSPHORUS, TOTAL		35767	Dec 31, 2008		
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN032_02	Trout Creek			10.13	Miles
PHOSPHORUS, TOTAL		35767	Dec 31, 2008		
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN033_02	Rapid Lightning Creek, Upper			47.03	Miles
SEDIMENTATION/SILTATION		2003	Sep 14, 2000		
ID17010214PN033_03	Rapid Lightning Creek, Trapper Cr to Pack R			7.8	Miles
SEDIMENTATION/SILTATION		2003	Sep 14, 2000		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN034_02	Gold Creek - headwaters to Pack River			17.79	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
		33918	Jan 31, 2008		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN035_02	Grouse Creek - tributaries to Grouse Creek			3.34	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
ID17010214PN035_03	Grouse Creek - North Fork Grouse Creek to Pack R.			9.14	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN036_02	Grouse Creek - 1st and 2nd order tribs above NF Grouse Cr			28.55	Miles
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN036_03	Grouse Creek - Flume Cr to North Fork Grouse Cr			7.07	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN037_02	North Fork Grouse Creek - headwaters to Grouse Cr			16.69	Miles
SEDIMENTATION/SILTATION		2003	Sep 14, 2000		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN038_02	Sand Creek - headwaters to Pack River			13.54	Miles
PHOSPHORUS, TOTAL		35767	Dec 31, 2008		
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		
ID17010214PN039_02	Upper Pack River - tribs between Lindsey Cr and Sand Cr			12.87	Miles
SEDIMENTATION/SILTATION		2002	Apr 02, 2001		

ID17010214PN039_03	Upper Pack River - Hellroaring Cr to Colburn Cr		8.33	Miles
PHOSPHORUS, TOTAL	35767	Dec 31, 2008		
SEDIMENTATION/SILTATION	2002	Apr 02, 2001		
TEMPERATURE	34333	Apr 24, 2008		
ID17010214PN039_04	Upper Pack River - Colburn Cr to Sand Creek		3.8	Miles
PHOSPHORUS, TOTAL	35767	Dec 31, 2008		
SEDIMENTATION/SILTATION	2002	Apr 02, 2001		
TEMPERATURE	34333	Apr 24, 2008		
ID17010214PN041_02	Upper Pack River - tributaries above Hellroaring Cr.		55.79	Miles
PHOSPHORUS, TOTAL	35767	Dec 31, 2008		
SEDIMENTATION/SILTATION	33918	Jan 31, 2008		
TEMPERATURE	34333	Apr 24, 2008		
ID17010214PN041_03	Upper Pack River - Mainstem, Zuni Cr. to Hellroaring Cr.		10.11	Miles
PHOSPHORUS, TOTAL	35767	Dec 31, 2008		
SEDIMENTATION/SILTATION	33918	Jan 31, 2008		
TEMPERATURE	34333	Apr 24, 2008		
ID17010214PN042_02	McCormick Creek - headwaters to Pack R.		10.78	Miles
SEDIMENTATION/SILTATION	2002	Apr 02, 2001		
TEMPERATURE	34333	Apr 24, 2008		
ID17010214PN043_02	Jeru Creek - source to mouth		6.33	Miles
SEDIMENTATION/SILTATION	2002	Apr 02, 2001		
TEMPERATURE	34333	Apr 24, 2008		
ID17010214PN044_02	Hellroaring Creek - Headwaters to Pack R.		10.92	Miles
SEDIMENTATION/SILTATION	33918	Jan 31, 2008		
TEMPERATURE	34333	Apr 24, 2008		
ID17010214PN046_02	Berry Creek - headwaters to Colburn Cr.		13.58	Miles
SEDIMENTATION/SILTATION	2002	Apr 02, 2001		
ID17010214PN046_03	Colburn Cr, Berry Cr to Pack River		0.36	Miles
PHOSPHORUS, TOTAL	35767	Dec 31, 2008		
SEDIMENTATION/SILTATION	2002	Apr 02, 2001		
ID17010214PN047_02	Colburn Creek - Headwaters to Berry Cr.		8.6	Miles
PHOSPHORUS, TOTAL	35767	Dec 31, 2008		
SEDIMENTATION/SILTATION	2002	Apr 02, 2001		
ID17010214PN048_03	Sand Creek - Schweitzer Cr to Pend Oreille L. at City Beach		4.04	Miles
SEDIMENTATION/SILTATION	33918	Jan 31, 2008		
TEMPERATURE	34333	Apr 24, 2008		

ID17010214PN048_03a	Sand Creek			1.6	Miles
SEDIMENTATION/SILTATION		33918	Jan 31, 2008		
ID17010214PN049_02	Sand Creek - tributaries above Schweitzer Creek			15.92	Miles
SEDIMENTATION/SILTATION		33918	Jan 31, 2008		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN049_03	Sand Creek - 3rd order portion above Schweitzer Creek			3.54	Miles
SEDIMENTATION/SILTATION		33918	Jan 31, 2008		
TEMPERATURE		34333	Apr 24, 2008		
ID17010214PN050_02	Spring Jack Creek - headwaters to Sand Cr.			2.62	Miles
SEDIMENTATION/SILTATION		33918	Jan 31, 2008		
ID17010214PN051_02	Swede Creek - headwaters to Sand Cr.			3.06	Miles
SEDIMENTATION/SILTATION		33918	Jan 31, 2008		
ID17010214PN052_02	Schweitzer Creek - headwaters to Sand Cr.			6.74	Miles
SEDIMENTATION/SILTATION		33918	Jan 31, 2008		

17010215 Priest

		EPA TMDL ID	Approval Date		
ID17010215PN001_05	Lower Priest River-Upper West Branch Priest River to mouth			35.97	Miles
SEDIMENTATION/SILTATION		6509	Jun 23, 2003		
TEMPERATURE		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN003_02	Middle Fork East River - source to mouth			26.32	Miles
TEMPERATURE		6509	Jun 23, 2003		
		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN003_03	Middle Fork East River - source to mouth			6.58	Miles
TEMPERATURE		6509	Jun 23, 2003		
		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN003_04	East River main stem - source to mouth			2.51	Miles
SEDIMENTATION/SILTATION		6509	Jun 23, 2003		
TEMPERATURE		6509	Jun 23, 2003		
		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN004_02	North Fork East River - source to mouth			27.51	Miles
TEMPERATURE		6509	Jun 23, 2003		
		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN004_03	North Fork East River - source to mouth			2.22	Miles
TEMPERATURE		6509	Jun 23, 2003		
		ID_PRIES_5-15-2019	May 15, 2019		

ID17010215PN008_03	Soldier Creek - source to mouth		1.78	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN009_03	Hunt Creek - source to mouth		1.18	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN010_02	Indian Creek - source to mouth		21.63	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN010_03	Indian Creek - source to mouth		3.24	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN012_02	Two Mouth Creek - source to mouth		27.77	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN013_02	Lion Creek - source to mouth		32.42	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN017_02	Trapper Creek - source to mouth		22.48	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN017_03	Trapper Creek - source to mouth		1.71	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN018_02	Upper Priest River - Idaho/Canadian border to mouth		47.33	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN019_02	Hughes Fork - source to mouth		57.1	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN020_03	Beaver Creek - source to mouth		1.66	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN022_04	Granite Creek - Idaho/Washington border to mouth		14	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN023_02	Reeder Creek - source to mouth		22.63	Miles
SEDIMENTATION/SILTATION	6509	Jun 23, 2003		
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN023_03	Reeder Creek - source to mouth		0.64	Miles
SEDIMENTATION/SILTATION	6509	Jun 23, 2003		
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN024_03	Kalispell Creek - Idaho/Washington border to mouth		12.18	Miles
SEDIMENTATION/SILTATION	2077	Mar 27, 2002		
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN025_02	Lamb Creek - Idaho/Washington border to mouth		27.95	Miles
TEMPERATURE	ID_PRIES_5-15-2019	May 15, 2019		

ID17010215PN026_02	Binarch Creek - Idaho/Washington border to mouth			13.24	Miles
SEDIMENTATION/SILTATION		6509	Jun 23, 2003		
TEMPERATURE		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN027_04	Upper West Branch Priest River - Idaho/Washington border			6.72	Miles
TEMPERATURE		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN028_03	Goose Creek - Idaho/Washington border to mouth			5.23	Miles
TEMPERATURE		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN030_03	Lower West Branch Priest River - Idaho/Washington border			11.91	Miles
SEDIMENTATION/SILTATION		2077	Mar 27, 2002		
TEMPERATURE		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN030_04	Lower West Branch Priest River -ID/WA border to Priest River			10.81	Miles
SEDIMENTATION/SILTATION		2077	Mar 27, 2002		
TEMPERATURE		ID_PRIES_5-15-2019	May 15, 2019		
ID17010215PN031_03	Moores Creek - source to mouth			3.86	Miles
TEMPERATURE		ID_PRIES_5-15-2019	May 15, 2019		

17010301 Upper Coeur d Alene

		EPA TMDL ID	Approval Date		
ID17010301PN001_02	North Fork Coeur d'Alene River tributaries below Prichard Cr			77.85	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN001_05	North Fork Coeur d'Alene River, below Prichard Creek			26.28	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN001_05a	North Fork Coeur d'Alene R. btw Yellowdog and Prichard Cr			14.75	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN003_02	Beaver Creek - Headwaters and tributaries			44.89	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN003_03	Beaver Creek- below White Creek			3.7	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN004_02	Prichard Cr., tributaries between Butte Gulch and Eagle Cr.			4.17	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
ID17010301PN004_03	Prichard Creek - between Butte Gulch and Eagle Creek			5.45	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		

ID17010301PN004_04	Prichard Creek below Eagle Creek		2.94	Miles
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN005_02	Prichard Creek -headwaters and tributaries above Butte Gulch		24.34	Miles
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN005_03	Prichard Creek - between Barton Gulch to Butte Gulch		1.98	Miles
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
ID17010301PN006_02	Butte Gulch - headwaters to Prichard Cr.		5.33	Miles
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
ID17010301PN007_02	East Fork Eagle Creek and tributaries		16.3	Miles
CADMIUM	2047	Feb 19, 2002		
LEAD	2047	Feb 19, 2002		
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
ZINC	2047	Feb 19, 2002		
ID17010301PN007_03	Eagle Creek		1.02	Miles
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
ID17010301PN008_02	West Fork Eagle Creek and tributaries		14.68	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN009_03	Lost Creek, below East Fork Lost Creek		1.28	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN010_03	Shoshone Creek, below Falls Creek		6.76	Miles
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN011_02	Falls Creek and tributaries		8.06	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN012_02	Shoshone Creek, headwaters and tribs above Falls Creek		46.83	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN012_03	Shoshone Creek, between Little Lost Fork and Falls Creek		7.07	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN013_02	NF Coeur d'Alene R tributaries btw Tepee Cr and Yellowdog Cr		33.83	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN013_04	North Fork Coeur d'Alene River btw Jordan Cr and Tepee Cr		7.05	Miles
TEMPERATURE	56000	Apr 17, 2014		

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ID17010301PN013_05	North Fork Coeur d'Alene River btw Tepee Cr and Yellowdog Cr		11.87	Miles
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN014_03	Jordan Creek and lower Lost Fork below Plant Creek		3.39	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN015_02	NF Coeur d'Alene River, upper, headwaters and tributaries		70.4	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN015_03	NF Coeur d'Alene River, upper, and lower Buckskin Creek		6.03	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN015_04	NF Coeur d'Alene R. between Buckskin Cr. and Jordan Cr.		9.52	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN016_02	West Elk Creek and Cataract Creek		7.33	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN017_04	Tepee Creek, between Trail and Independence Creek		4.13	Miles
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN017_05	Tepee Creek, below Independence Creek		4.7	Miles
SEDIMENTATION/SILTATION	2047	Feb 19, 2002		
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN018_02	Independence Creek headwaters and tributaries		68.83	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN018_03a	Declaration Creek, lower		1.53	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN018_03b	Snow Creek, lower		2.76	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN018_04	Independence Creek, below Declaration Creek		9.99	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN019_02	Trail Creek - headwaters and tributaries		35.65	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN019_03	Trail Creek, below Stewart Creek		6.29	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN020_02	Tepee Creek - headwaters and tributaries		48.56	Miles
TEMPERATURE	56000	Apr 17, 2014		
ID17010301PN020_03	Tepee Creek-between Short Creek and Trail Creek		4.6	Miles
TEMPERATURE	56000	Apr 17, 2014		

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ID17010301PN021_02	Brett Creek and tributaries			6.56	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN022_02	Miners Creek and tributaries			4.95	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN023_03	Flat Creek, lower			4.68	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN024_02	Yellowdog Creek - Headwaters to NF CDA River			12.19	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN026_02	Brown Creek and tributaries			7.79	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN028_02	Steamboat Creek - headwaters to tributaries			47.21	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN028_03	Steamboat Creek and West Fork Steamboat Cr. below Comfy Cr.			6.86	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN029_03	Cougar Gulch, btw EF Cougar Gulch and NF CDA River			6.7	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN030_02	Little North Fork Coeur d'Alene R - headwaters to Solitaire			4.52	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
ID17010301PN030_02a	Little North Fork Coeur d'Alene R tributaries above Iron Cr.			16.32	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN030_02c	Little NF Coeur d'Alene R tribs btw Hudlow and Deception Cr			25.99	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN030_02d	Little North Fork Coeur d'Alene R tributaries below Skookum			30.81	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN030_03	Little NF CDA River - btw Solitaire and Deception Creek			11.26	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN030_04	Little North Fork CDA River below Skookum Creek			23.97	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN031_02	Bumblebee Creek and tributaries			7.93	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN032_02	Laverne Creek and tributaries			8.91	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN033_02	Leiberg Creek and tributaries			12.96	Miles
TEMPERATURE		56000	Apr 17, 2014		

ID17010301PN034_02	Bootjack Creek and tributaries			5.14	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN035_02	Iron Creek and tributaries			13.44	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN036_02	Burnt Cabin Creek and tributaries			12.99	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN037_02	Deception Creek and tributaries			8.34	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN038_03	Skookum Creek, lower			0.91	Miles
TEMPERATURE		56000	Apr 17, 2014		
ID17010301PN039_02	Copper Creek headwaters and tributaries			18.88	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
ID17010301PN039_03	Copper Creek - below Homer Creek			2.55	Miles
SEDIMENTATION/SILTATION		2047	Feb 19, 2002		
TEMPERATURE		56000	Apr 17, 2014		

17010302 South Fork Coeur d Alene

		EPA TMDL ID	Approval Date		
ID17010302PN001_02	South Fork Coeur d'Alene River - Tributaries below Placer Cr			62.8	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN001_03	South Fork Coeur d' Alene River-btw Placer Cr. and Big Cr.			7.6	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN001_03a	South Fork Coeur d'Alene River-Canyon Creek to Placer Creek			0.85	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN001_04	South Fork Coeur d'Alene River - btw Big Cr and Pine Cr			9.96	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN001_05	South Fork Coeur d'Alene River - btw Pine Cr and CdA River			2.23	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN002_04	Pine Creek - East Fork Pine Creek to South Fork CdA River			5.31	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN004_02	East Fork Pine Creek headwaters and tributaries			22.54	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN004_03	East Fork Pine Creek below Douglas Creek			4	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN006_02	Government Gulch			3.54	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		

ID17010302PN014_02	Canyon Creek - from Gorge Gulch to South Fork CdA R.			8.64	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN015_02	Canyon Creek from headwaters to Gorge Gulch			4.08	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN016_02	Ninemile Creek and tribs except Ninemile Cr above East Fork			9.32	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		
ID17010302PN017_02	Ninemile Creek above East Fork Ninemile Creek			1.79	Miles
SEDIMENTATION/SILTATION		9448	Aug 21, 2003		

17010303 Coeur d Alene Lake

		EPA TMDL ID	Approval Date		
ID17010303PN002_02	Cougar Creek - source to mouth			15.72	Miles
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN003_02	Kid Creek - source to mouth			4.08	Miles
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
ID17010303PN004_02	Mica Creek - source to mouth			24.18	Miles
FECAL COLIFORM		2001	Jul 14, 2000		
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN004_03	Mica Creek - source to mouth			1.29	Miles
FECAL COLIFORM		2001	Jul 14, 2000		
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
ID17010303PN009L_0L	Black Lake			201.72	Acres
PHOSPHORUS, TOTAL		40619	Aug 31, 2011		
ID17010303PN015_02	Latour Creek - source to mouth			48.84	Miles
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN020_02	Fourth of July Creek - source to mouth			31.87	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN020_03	Fourth of July Creek - source to mouth			5.66	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN021_02	Rose Creek			8.17	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN022_02	Tributaries to Killarney Lake			17.67	Miles
TEMPERATURE		50345	Nov 30, 2012		

ID17010303PN024_02	Cottonwood Creek			9.96	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN026_02	Carlin Creek - source to mouth			17.23	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN028_02	Beauty Creek - source to mouth			11.59	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN028_03	Beauty Creek - source to mouth			2.62	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN029_02	Wolf Lodge Creek - source to mouth			23.79	Miles
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN029_03	Wolf Lodge Creek - source to mouth			5.74	Miles
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN030_02	Cedar Creek - source to mouth			24.92	Miles
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN030_03	Cedar Creek - source to mouth			1.46	Miles
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN031_02	Marie Creek - source to mouth			19.67	Miles
SEDIMENTATION/SILTATION		2001	Jul 14, 2000		
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN032_03	Fernan Creek - Fernan Lake to mouth			0.74	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN033_03L	Fernan Lake			340.36	Acres
PHOSPHORUS, TOTAL		54580	Nov 06, 2013		
ID17010303PN034_02	Fernan Creek - source to Fernan Lake			19.38	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN034_02a	Fernan Creek			0.69	Miles
TEMPERATURE		50345	Nov 30, 2012		
ID17010303PN034_03	Fernan Creek - source to Fernan Lake			3.14	Miles
TEMPERATURE		50345	Nov 30, 2012		

17010304 St. Joe

		EPA TMDL ID	Approval Date		
ID17010304PN007_05	St. Maries River - Santa Creek to mouth			24.06	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN008_02	Alder Creek - source to mouth			7.38	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
ID17010304PN009_02	John Creek - source to mouth			27.76	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN010_02	Santa Creek - source to mouth			34.22	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN010_03	Santa Creek - source to mouth			4.18	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN010_04	Santa Creek - source to mouth			8.95	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN011_02	Charlie Creek - source to mouth			32.72	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
ID17010304PN011_03	Charlie Creek - source to mouth			5.81	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN012_05	St. Maries River - Carpenter Creek to Santa Creek			9.42	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN013_02	Tyson Creek - headwaters to mouth			14.16	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
ID17010304PN013_03	Tyson Creek - source to mouth			2.14	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN014_02	Carpenter Creek - source to mouth			27.55	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		

Panhandle

ID17010304PN014_03	Carpenter Creek - source to mouth			1.02	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
ID17010304PN015_05	St. Maries River			10.43	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN016_02	Emerald Creek - source to mouth			40.14	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN016_03	Emerald Creek - E Fork Emerald to St. Maries River			8.68	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN017_02	West Fork St. Maries River - source to mouth			52.34	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN017_03	West Fork St. Maries River - source to mouth			5.53	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN017_04	West Fork St. Maries River - source to mouth			3.66	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN018_02	Middle Fork St. Maries River - source to mouth			34.25	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN018_03	Middle Fork St. Maries River - source to mouth			1.54	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN018_04	Middle Fork St. Maries River - source to mouth			4.7	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN018_05	Middle Fork St. Maries River - source to mouth			1.39	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN019_02	Gold Center Creek - source to mouth			19.68	Miles
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN019_03	Gold Center Creek - source to mouth			2.16	Miles
TEMPERATURE		41462	Dec 05, 2011		

ID17010304PN020_03	Merry Creek - source to mouth			5.13	Miles
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN023_02	Crystal Creek - source to mouth			8.89	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
ID17010304PN024_02	Renfro Creek - source to mouth			21.97	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
ID17010304PN024_03	Renfro Creek - locally known as Davis Creek			1.22	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
ID17010304PN026_02	Thorn Creek - upper			35.2	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN026_03	Thorn Creek - lower			1.91	Miles
SEDIMENTATION/SILTATION		9449	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN027_02b	1st and 2nd order to St Joe River between Big and Slate Cr			42.63	Miles
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN027_05	St. Joe River - St. Joe City to St. Maries River			14.76	Miles
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN027_05a	St. Joe River - North Fork St. Joe River to St. Joe City			36.35	Miles
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN030_02	Mica Creek - source to mouth			40.01	Miles
SEDIMENTATION/SILTATION		9450	Aug 21, 2003		
ID17010304PN030_03	Mica Creek - source to mouth			10.68	Miles
SEDIMENTATION/SILTATION		9450	Aug 21, 2003		
ID17010304PN031_04	Marble Creek - Hobo Creek to mouth			11.81	Miles
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN033_02	Bear and Little Bear Creeks			4.52	Miles
SEDIMENTATION/SILTATION		9450	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN039_03	Fishhook Creek - source to mouth			4.5	Miles
SEDIMENTATION/SILTATION		41462	Dec 05, 2011		
		9450	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		
ID17010304PN039_04	Fishhook Creek - source to mouth			5.35	Miles
SEDIMENTATION/SILTATION		9450	Aug 21, 2003		
TEMPERATURE		41462	Dec 05, 2011		

ID17010304PN041_02a	Sherlock Creek	2.23	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN041_03a	Heller Creek 3rd order	0.23	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN045_02	EF and WF Bluff Creek, upstream from their convergence	37.13	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN045_03	Bluff Creek - downstream from convergence of EF and WF	1.83	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN048_02	Beaver Creek - source to mouth	10.79	Miles
TEMPERATURE	9450	Aug 21, 2003	
ID17010304PN052_02	Simmons Creek - source to mouth	31.46	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN052_03	Simmons Creek - source to mouth	10.05	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN053_02	Gold Creek - source to mouth	25.85	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN060_02	Loop Creek - source to mouth	39.84	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN060_03	Loop Creek - source to mouth	6.59	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN062_03	Slate Creek - source to mouth	14.49	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN063_02	Big Creek - source to mouth	46.31	Miles
TEMPERATURE	41462	Dec 05, 2011	
ID17010304PN063_03	Big Creek - source to mouth	11.62	Miles
TEMPERATURE	41462	Dec 05, 2011	

17010305 Upper Spokane

	EPA TMDL ID	Approval Date	
ID17010305PN005L_0L	Hayden Lake	3800.26	Acres
PHOSPHORUS, TOTAL	2019	Jan 31, 2001	
ID17010305PN013L_0L	Twin Lakes	915.25	Acres
PHOSPHORUS, TOTAL	2019	Jan 31, 2001	
ID17010305PN014_02	Fish Creek -upper and tributaries, ID/WA border to Twin Lake	26.69	Miles
SEDIMENTATION/SILTATION	34434	Jun 05, 2008	
TEMPERATURE	34434	Jun 05, 2008	

ID17010305PN014_03	Fish Creek - mainstem, Idaho/Washington border to Twin Lakes		4.53	Miles
ESCHERICHIA COLI (E. COLI)	34434	Jun 05, 2008		
SEDIMENTATION/SILTATION	34434	Jun 05, 2008		
TEMPERATURE	34434	Jun 05, 2008		
ID17010305PN016L_0L	Hauser Lake		539.18	Acres
PHOSPHORUS, TOTAL	2019	Jan 31, 2001		

17010306 Hangman

	EPA TMDL ID	Approval Date		
ID17010306PN001_02	Hangman Creek - Tribs to Hangman Cr from Headwaters to WA		16.53	Miles
ESCHERICHIA COLI (E. COLI)	32994	Aug 29, 2007		
SEDIMENTATION/SILTATION	32994	Aug 29, 2007		
TEMPERATURE	32994	Aug 29, 2007		
ID17010306PN001_03	Hangman Creek confluence with SF to Tribal Boundary		0.1	Miles
ESCHERICHIA COLI (E. COLI)	32994	Aug 29, 2007		
SEDIMENTATION/SILTATION	32994	Aug 29, 2007		
TEMPERATURE	32994	Aug 29, 2007		

17060101 Hells Canyon

		EPA TMDL ID	Approval Date		
ID17060101SL001_08	Snake River - Wolf Creek to Salmon River			14.77	Miles
DISSOLVED GAS SUPERSATURATION		9781	Mar 01, 2004		
TEMPERATURE		10745	Sep 09, 2004		
ID17060101SL002_08	Snake River - Sheep Creek to Wolf Creek			26.28	Miles
DISSOLVED GAS SUPERSATURATION		9781	Mar 01, 2004		
TEMPERATURE		10745	Sep 09, 2004		
ID17060101SL003_08	Snake River - Hells Canyon Dam to Sheep Creek			17.93	Miles
DISSOLVED GAS SUPERSATURATION		9781	Mar 01, 2004		
TEMPERATURE		10745	Sep 09, 2004		
ID17060101SL024_04	Wolf Creek - 4th Order			5.75	Miles
TEMPERATURE		38235	Feb 09, 2010		
ID17060101SL025_02	Wolf Creek - 1st and 2nd Order Tributaries			22.37	Miles
TEMPERATURE		38235	Feb 09, 2010		
ID17060101SL025_03	Wolf Creek - 3rd Order			2.83	Miles
TEMPERATURE		38235	Feb 09, 2010		
ID17060101SL025_04	Wolf Creek - 4th Order			0.87	Miles
TEMPERATURE		38235	Feb 09, 2010		
ID17060101SL028_02	Divide Creek - 1st and 2nd order Tributaries			34.98	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010		
TEMPERATURE		38235	Feb 09, 2010		
ID17060101SL028_03	Divide Creek - 3rd Order			11.04	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010		
TEMPERATURE		38235	Feb 09, 2010		

17060103 Lower Snake-Asotin

		EPA TMDL ID	Approval Date		
ID17060103SL014_02	Tammany Creek - WBID 015 to unnamed tributary			14.57	Miles
ESCHERICHIA COLI (E. COLI)		39572	Dec 17, 2010		
NITROGEN, NITRATE		39572	Dec 17, 2010		
PHOSPHORUS, TOTAL		39572	Dec 17, 2010		
SEDIMENTATION/SILTATION		39572	Dec 17, 2010		

ID17060103SL014_03	Tammany Creek - Unnamed Tributary to mouth			4.26	Miles
ESCHERICHIA COLI (E. COLI)		39572	Dec 17, 2010		
NITROGEN, NITRATE		39572	Dec 17, 2010		
PHOSPHORUS, TOTAL		39572	Dec 17, 2010		
SEDIMENTATION/SILTATION		39572	Dec 17, 2010		
ID17060103SL016_02	Tammany Creek-source to Unnamed Tributary(T34N, R04W, Sec19)			18.48	Miles
ESCHERICHIA COLI (E. COLI)		39572	Dec 17, 2010		
NITROGEN, NITRATE		39572	Dec 17, 2010		
PHOSPHORUS, TOTAL		39572	Dec 17, 2010		
SEDIMENTATION/SILTATION		39572	Dec 17, 2010		

17060201 Upper Salmon

		EPA TMDL ID	Approval Date		
ID17060201SL001_06	Salmon River - Pennal Gulch to Pahsimeroi River			25.79	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL007_04	Challis Creek - Darling Creek to mouth			3.42	Miles
SEDIMENTATION/SILTATION		4107	Mar 19, 2003		
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL009_03	Challis Creek - Bear Creek to Darling Creek			4.94	Miles
SEDIMENTATION/SILTATION		4107	Mar 19, 2003		
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL009_04	Challis Creek - Bear Creek to Darling Creek			1.5	Miles
SEDIMENTATION/SILTATION		4107	Mar 19, 2003		
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL014_06	Salmon River - Garden Creek to Pennal Gulch			10.82	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL016_06	Salmon River - East Fork Salmon River to Garden Creek			15.93	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL019_05	Salmon River - Squaw Creek to East Fork Salmon River			8.16	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL021_04	Squaw Creek - Cash Creek to mouth			7.79	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL023_02	Squaw Creek Tributaries			46.1	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL023_03	Squaw Creek- Willow Creek to Martin Creek			6.01	Miles
TEMPERATURE		67081	Dec 07, 2016		

ID17060201SL023_04	Squaw Creek - Martin Creek to Cash Creek			2.95	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL024_02	Aspen Creek - source to mouth			5.58	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL027_05	Salmon River - Thompson Creek to Squaw Creek			4.42	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL031_05	Salmon River - Yankee Fork Creek to Thompson Creek			13.85	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL047_05	Salmon River - Valley Creek to Yankee Fork Creek			12.64	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL063_05	Salmon River - Redfish Lake Creek to Valley Creek			5.39	Miles
TEMPERATURE		67081	Dec 07, 2016		
ID17060201SL131_04	Warm Spring Creek - Hole-in-Rock Creek to mouth			4.29	Miles
SEDIMENTATION/SILTATION		67081	Dec 07, 2016		
ID17060201SL132_02	Warm Spring Creek - source to Hole-in-Rock Creek			104.66	Miles
SEDIMENTATION/SILTATION		67081	Dec 07, 2016		
ID17060201SL132_03	Warm Spring Creek - source to Hole-in-Rock Creek			5.07	Miles
SEDIMENTATION/SILTATION		67081	Dec 07, 2016		
ID17060201SL132_04	Warm Spring Creek - source to Hole-in-Rock Creek			6.72	Miles
SEDIMENTATION/SILTATION		67081	Dec 07, 2016		

17060202 Pahsimeroi

		EPA TMDL ID	Approval Date		
ID17060202SL001_05	Pahsimeroi River - Patterson Creek to mouth			10.27	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
TEMPERATURE		2000	Dec 06, 2001		
		55921	Apr 10, 2014		
ID17060202SL002_02	Pahsimeroi River - Meadow Creek to Patterson Creek			50.68	Miles
ESCHERICHIA COLI (E. COLI)		55921	Apr 10, 2014		
SEDIMENTATION/SILTATION		55921	Apr 10, 2014		
TEMPERATURE		55921	Apr 10, 2014		
ID17060202SL002_04	Pahsimeroi River - Meadow Creek to Patterson Creek			2.47	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
ID17060202SL002_05	Pahsimeroi River - Meadow Creek to Patterson Creek			10.21	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
TEMPERATURE		55921	Apr 10, 2014		

ID17060202SL004_02	North Fork Lawson Creek - source to mouth			11.83	Miles
SEDIMENTATION/SILTATION		55921	Apr 10, 2014		
ID17060202SL007_04	Pahsimeroi River - Furey Lane (T15S, R22E) to Meadow Creek			1.56	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
ID17060202SL008_04	Pahsimeroi River - Big Creek to Furey Lane (T15S, R22E)			3.18	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
ID17060202SL010_03	Pahsimeroi River - Goldburg Creek to Big Creek			5.32	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
ID17060202SL010_04	Pahsimeroi River - Goldburg Creek to Big Creek			6.74	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
ID17060202SL011_04	Pahsimeroi R-Unnamed Trib (T12N,R23E,Sec. 22) to Goldburg Ck			2.54	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
ID17060202SL017_04	Pahsimeroi R-Burnt Ck to Unnamed Trib (T12N, R23E, Sec. 22)			10.34	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
ID17060202SL018_04	Pahsimeroi River - Mahogany Creek to Burnt Creek			6.17	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
TEMPERATURE		2000	Dec 06, 2001		
		55921	Apr 10, 2014		
ID17060202SL022_03	East Fork Pahsimeroi River - source to mouth			1.42	Miles
SEDIMENTATION/SILTATION		2000	Dec 06, 2001		
TEMPERATURE		2000	Dec 06, 2001		
		55921	Apr 10, 2014		
ID17060202SL026_02	Short Creek - source to mouth			5.83	Miles
SEDIMENTATION/SILTATION		55921	Apr 10, 2014		

17060203 Middle Salmon-Panther

		EPA TMDL ID	Approval Date		
ID17060203SL047_02L	Williams Lake			179.98	Acres
PHOSPHORUS, TOTAL		1379	Jul 02, 2001		

17060204 Lemhi

		EPA TMDL ID	Approval Date		
ID17060204SL001_06	Lemhi River - Kenney Creek to mouth			24.65	Miles
ESCHERICHIA COLI (E. COLI)		673	Mar 14, 2000		
TEMPERATURE		50329	Feb 27, 2013		
ID17060204SL005_06	Lemhi River - Hayden Creek to Kenney Creek			12.77	Miles
ESCHERICHIA COLI (E. COLI)		673	Mar 14, 2000		

Salmon

ID17060204SL007a_03	McDevitt Creek - diversion (T19N, R23E, Sec. 36) to mouth		2.36	Miles
SEDIMENTATION/SILTATION	673	Mar 14, 2000		
ID17060204SL007b_02	McDevitt Creek - source to diversion (T19N, R23E, Sec. 36)		19.09	Miles
SEDIMENTATION/SILTATION	673	Mar 14, 2000		
ID17060204SL007b_03	McDevitt Creek - source to diversion (T19N, R23E, Sec. 36)		4.44	Miles
SEDIMENTATION/SILTATION	673	Mar 14, 2000		
ID17060204SL024_05	Lemhi River - Peterson Creek to Hayden Creek		11.7	Miles
ESCHERICHIA COLI (E. COLI)	673	Mar 14, 2000		
ID17060204SL025_05	Lemhi River - confluence of Big and Little Eightmile Creeks		5.87	Miles
ESCHERICHIA COLI (E. COLI)	673	Mar 14, 2000		
ID17060204SL030_04	Lemhi River (West Branch) - Big Spring Creek		6.57	Miles
TEMPERATURE	50329	Feb 27, 2013		
ID17060204SL030_05	Lemhi River (East Branch)-Eighteenmile & Texas Ck Confluence		10.39	Miles
TEMPERATURE	50329	Feb 27, 2013		
ID17060204SL041_04	Eighteenmile Creek - Hawley Creek to mouth		2.21	Miles
SEDIMENTATION/SILTATION	673	Mar 14, 2000		
TEMPERATURE	50329	Feb 27, 2013		
ID17060204SL042_03	Eighteenmile Creek - Clear Creek to Hawley Creek		12.62	Miles
SEDIMENTATION/SILTATION	673	Mar 14, 2000		
TEMPERATURE	50329	Feb 27, 2013		
ID17060204SL043_03	Eighteenmile Creek - Divide Creek to Clear Creek		5.96	Miles
SEDIMENTATION/SILTATION	673	Mar 14, 2000		
TEMPERATURE	50329	Feb 27, 2013		
ID17060204SL045_02	Eighteenmile Creek - source to Divide Creek		29.68	Miles
SEDIMENTATION/SILTATION	673	Mar 14, 2000		
TEMPERATURE	50329	Feb 27, 2013		
ID17060204SL051b_02	Canyon Creek - source to diversion (T16N, R26E, Sec.22)		70.12	Miles
ESCHERICHIA COLI (E. COLI)	50329	Feb 27, 2013		
ID17060204SL052a_02	Little Eightmile Creek		0.43	Miles
TEMPERATURE	50329	Feb 27, 2013		
ID17060204SL052b_02	Little Eightmile Creek-source to diversion		25	Miles
TEMPERATURE	50329	Feb 27, 2013		
ID17060204SL062a_02	Sandy Creek - diversion (T20N, R24E, Sec. 17) to mouth		2.1	Miles
SEDIMENTATION/SILTATION	673	Mar 14, 2000		

ID17060204SL062b_02	Sandy Creek - source to diversion (T20N, R24E, Sec. 17)			12.33	Miles
SEDIMENTATION/SILTATION		673	Mar 14, 2000		
TEMPERATURE		50329	Feb 27, 2013		
ID17060204SL063_02	Wimpey Creek - source to mouth			19.67	Miles
SEDIMENTATION/SILTATION		673	Mar 14, 2000		
ID17060204SL064a_02	Bohannon Creek - diversion (T21N, R23E, Sec. 22) to mouth			1.36	Miles
SEDIMENTATION/SILTATION		673	Mar 14, 2000		
TEMPERATURE		50329	Feb 27, 2013		
ID17060204SL064b_02	Bohannon Creek - source to diversion (T21N, R23E, Sec. 22)			13.58	Miles
SEDIMENTATION/SILTATION		673	Mar 14, 2000		
TEMPERATURE		50329	Feb 27, 2013		
ID17060204SL065a_02	Geertson Creek - diversion (T21N, R23E, Sec. 20) to mouth			11.44	Miles
SEDIMENTATION/SILTATION		673	Mar 14, 2000		
ID17060204SL065b_02	Geertson Creek - source to diversion (T21N, R23E, Sec. 20)			14.71	Miles
SEDIMENTATION/SILTATION		673	Mar 14, 2000		
ID17060204SL066a_03	Kirtley Creek - diversion (T21N, R22E, Sec. 02) to mouth			2.28	Miles
SEDIMENTATION/SILTATION		673	Mar 14, 2000		
TEMPERATURE		50329	Feb 27, 2013		
ID17060204SL066b_02	Kirtley Creek			20.95	Miles
SEDIMENTATION/SILTATION		673	Mar 14, 2000		

17060205 Upper Middle Fork Salmon

		EPA TMDL ID	Approval Date		
ID17060205SL018_05	Marsh Creek - Beaver Creek to mouth			5.47	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060205SL019_03	Marsh Creek - Knapp Creek to Beaver Creek			4.5	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060205SL019_04	Marsh Creek - Knapp Creek to Beaver Creek			0.83	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060205SL024_02	Marsh Creek - source to Knapp Creek			20.72	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060205SL024_03	Marsh Creek - source to Knapp Creek			1.11	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060205SL025_02	Knapp Creek - source to mouth			28.1	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060205SL028_04	Beaver Creek - Bear Creek to mouth			5.26	Miles
TEMPERATURE		35882	Feb 13, 2009		

ID17060205SL030_02	Winnemucca Creek - source to mouth			12.92	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060205SL030_03	Winnemucca Creek - source to mouth			3.69	Miles
TEMPERATURE		35882	Feb 13, 2009		

17060206 Lower Middle Fork Salmon

		EPA TMDL ID	Approval Date		
ID17060206SL020_04	Camas Creek - Yellowjacket Creek to mouth			4.37	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL021_04	Camas Creek - Forge Creek to Yellowjacket Creek			3.61	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL022_04	Camas Creek - Duck Creek to Forge Creek			3.8	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL023_04	Camas Creek - Silver Creek to Duck Creek			2.2	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL025_04	Camas Creek - Castle Creek to Silver Creek			2.83	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL026_04	Camas Creek - Furnance Creek to Castle Creek			2.65	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL027_04	Camas Creek - White Goat Creek to Furnance Creek			1.87	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL028_04	Camas Creek - South Fork Camas Creek to White Goat Creek			1.64	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL030_02	Camas Creek - source to South Fork Camas Creek			47.1	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL033_02	Castle Creek - source to mouth			25.47	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL034_02	Silver Creek - source to mouth			48.08	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL034_03	Silver Creek - source to mouth			14.6	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL035_02	Duck Creek - source to mouth			11.03	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL038_03	Yellowjacket Creek - Hoodoo Creek to Jenny Creek			1.56	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL039_03	Yellowjacket Creek - Little Jacket Creek to Hoodoo Creek			0.82	Miles
TEMPERATURE		35882	Feb 13, 2009		

ID17060206SL041_03	Yellowjacket Creek - Trail Creek to Little Jacket Creek			2.98	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL043_02	Yellowjacket Creek - source to Trail Creek			48.55	Miles
TEMPERATURE		35882	Feb 13, 2009		
ID17060206SL043_03	Yellowjacket Creek - source to Trail Creek			5.39	Miles
TEMPERATURE		35882	Feb 13, 2009		

17060207 Middle Salmon-Chamberlain

		EPA TMDL ID	Approval Date		
ID17060207SL067_05	Crooked Creek - Lake Creek to mouth			8.27	Miles
TEMPERATURE		3822	Jan 09, 2003		
		68180	Aug 21, 2017		
ID17060207SL068_02	Crooked Creek - source to unnamed tributary			41.74	Miles
TEMPERATURE		3822	Jan 09, 2003		
		68180	Aug 21, 2017		
ID17060207SL068_03	Crooked Creek - unnamed tributary to Big Creek			2.5	Miles
TEMPERATURE		3822	Jan 09, 2003		
		68180	Aug 21, 2017		

17060208 South Fork Salmon

		EPA TMDL ID	Approval Date		
ID17060208SL001_06	South Fork Salmon River - East Fork Salmon River to mouth			36.73	Miles
SEDIMENTATION/SILTATION		2617	Jan 31, 1992		
		41957	Jul 03, 2012		
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL005_02	Secesh River - 1st and 2nd order tributaries			146.83	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL005_03	Secesh River, Grouse, and Willow Basket Creeks - 3rd order			7.1	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL009_02	Lick Creek - 1st and 2nd order			25.4	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL009_03	Lick Creek - 3rd order (Prince Creek to Secesh River)			6.24	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL010_02	SF Salmon River and tribs above EFSF - 1st and 2nd order			135.11	Miles
TEMPERATURE		41957	Jul 03, 2012		

Salmon

ID17060208SL010_03	SF Salmon River - 3rd order (Curtis Creek to Mormon Creek)			13.7	Miles
SEDIMENTATION/SILTATION		2617	Jan 31, 1992		
		41957	Jul 03, 2012		
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL010_04	SF Salmon River - 4th order (Curtis Cr. to Buckhorn Cr.)			26.77	Miles
SEDIMENTATION/SILTATION		2617	Jan 31, 1992		
		41957	Jul 03, 2012		
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL010_05	South Fork Salmon River - 5th order			8.22	Miles
SEDIMENTATION/SILTATION		2617	Jan 31, 1992		
		41957	Jul 03, 2012		
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL012_02	Buckhorn Creek and tributaries - 1st and 2nd order			56.32	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL012_03	Buckhorn Creek - 3rd order			9.02	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL012_04	Buckhorn and WF Buckhorn Creeks - 4th order			2.58	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL012_05	Buckhorn Creek - 5th order (WF Buckhorn Creek to mouth)			0.49	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL015_02	Dollar and NF Dollar Creeks - 1st and 2nd order			22.37	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL015_03	Dollar Creek - 3rd order (NF Dollar Creek to mouth)			0.94	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL018_02	Rice Creek - entire watershed			9.4	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL019_02	All 1st and 2nd order streams in Warm Lake Creek drainage			16.21	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL019_03	Warm Lake and Cabin Creeks - 3rd order			1.93	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL020_02	Warm Lake Creek above Warm Lake - entire watershed			6.2	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL025_02	Upper Johnson Creek and tributaries - 1st and 2nd order			70.57	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL025_03	Johnson Creek - 3rd order			18.12	Miles
TEMPERATURE		41957	Jul 03, 2012		

ID17060208SL025_04	Johnson Creek - 4th order			13.09	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL031_02	Profile Creek and tributaries - 1st and 2nd order			21.38	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL031_03	Profile Creek - 3rd order (Missouri Cr. to SF Salmon River)			4.13	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL034_02	Elk Creek and tributaries - 1st and 2nd order			37.03	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL034_03	Elk Creek and West Fork Elk Creek - 3rd order sections			1.16	Miles
TEMPERATURE		41957	Jul 03, 2012		
ID17060208SL034_04	Elk Creek - 4th order (West Fork Elk Creek to mouth)			4.12	Miles
TEMPERATURE		41957	Jul 03, 2012		

17060209 Lower Salmon

		EPA TMDL ID	Approval Date		
ID17060209SL003_02	Cottonwood Creek - source to unnamed tributary			22.64	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010		
ID17060209SL004_02	Billy Creek - source to mouth			5.17	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010		
SEDIMENTATION/SILTATION		38235	Feb 09, 2010		
ID17060209SL007_02	Rice Creek - tributaries			55.28	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010		
TEMPERATURE		38235	Feb 09, 2010		
ID17060209SL007_03	Rice Creek - 3rd Order			8.88	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010		
TEMPERATURE		38235	Feb 09, 2010		
ID17060209SL028_03	Allison Creek - 3rd Order			2.72	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010		
ID17060209SL056_04	Rock Creek - 4th Order			3.74	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010		
SEDIMENTATION/SILTATION		38235	Feb 09, 2010		
TEMPERATURE		38235	Feb 09, 2010		
ID17060209SL057_02	John's Creek - 1st and 2nd order tributaries			44.3	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010		
SEDIMENTATION/SILTATION		38235	Feb 09, 2010		
TEMPERATURE		38235	Feb 09, 2010		

ID17060209SL057_02a	Telcher Creek - 1st & 2nd order stream segments		34.63	Miles
TEMPERATURE		38235	Feb 09, 2010	
ID17060209SL057_03	Rock Creek - 3rd order		6.56	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010	
SEDIMENTATION/SILTATION		38235	Feb 09, 2010	
TEMPERATURE		38235	Feb 09, 2010	
ID17060209SL058_02	Grave Creek - headwaters to unnamed tributary		27.43	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010	
ID17060209SL058_03	Grave Creek - unnamed trib to Rock Creek		3.38	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010	
ID17060209SL060_02	Deep Creek - source to unnamed tributary		28.3	Miles
ESCHERICHIA COLI (E. COLI)		38235	Feb 09, 2010	
SEDIMENTATION/SILTATION		38235	Feb 09, 2010	

17060210 Little Salmon

		EPA TMDL ID	Approval Date		
ID17060210SL007_04	Little Salmon River - 4th order			4.27	Miles
TEMPERATURE		22907	Mar 29, 2006		
ID17060210SL007_05	Little Salmon River - 5th order			16.91	Miles
ESCHERICHIA COLI (E. COLI)		22907	Mar 29, 2006		
PHOSPHORUS, TOTAL		22907	Mar 29, 2006		
TEMPERATURE		22907	Mar 29, 2006		
ID17060210SL008_03	Mud and Little Mud Creeks - 3rd order			8.13	Miles
SEDIMENTATION/SILTATION		50340	Apr 10, 2013		
ID17060210SL009_02a	Big Creek - lower 2nd order (rangeland)			4.38	Miles
ESCHERICHIA COLI (E. COLI)		22907	Mar 29, 2006		
PHOSPHORUS, TOTAL		22907	Mar 29, 2006		
ID17060210SL010_04	East Branch Goose Creek and 4th order section of Goose Creek			5.45	Miles
ESCHERICHIA COLI (E. COLI)		50340	Apr 10, 2013		

17050101 C. J. Strike Reservoir

		EPA TMDL ID	Approval Date		
ID17050101SW001_02	CJ Strike Reservoir & Dry Creek - 1st and 2nd order			126.73	Miles
DISSOLVED OXYGEN		30361	Jun 21, 2006		
PHOSPHORUS, TOTAL		30361	Jun 21, 2006		
ID17050101SW001_07	Snake River - Browns Creek to CJ Strike Reservoir			11.15	Miles
DISSOLVED OXYGEN		30361	Jun 21, 2006		
PHOSPHORUS, TOTAL		30361	Jun 21, 2006		
ID17050101SW001_07L	CJ Strike Reservoir (excluding Bruneau arm)			4764.97	Acres
DISSOLVED OXYGEN		30361	Jun 21, 2006		
PHOSPHORUS, TOTAL		30361	Jun 21, 2006		
ID17050101SW005_07	Snake River - Clover Creek to Browns Creek			25	Miles
PHOSPHORUS, TOTAL		30361	Jun 21, 2006		
SEDIMENTATION/SILTATION		30361	Jun 21, 2006		
ID17050101SW012_02	Little Canyon Creek - 1st and 2nd order			31.02	Miles
SEDIMENTATION/SILTATION		30361	Jun 21, 2006		
ID17050101SW012_03	Little Canyon Creek - upper 3rd order			10.2	Miles
SEDIMENTATION/SILTATION		30361	Jun 21, 2006		
ID17050101SW012_03a	Little Canyon Creek - lower 3rd order			10.9	Miles
SEDIMENTATION/SILTATION		30361	Jun 21, 2006		
ID17050101SW014_03	Cold Springs Creek - 3rd order			17.28	Miles
SEDIMENTATION/SILTATION		30361	Jun 21, 2006		

17050102 Bruneau

		EPA TMDL ID	Approval Date		
ID17050101SW001_07L	CJ Strike Reservoir (excluding Bruneau arm)			4764.97	Acres
DISSOLVED OXYGEN		30361	Jun 21, 2006		
PHOSPHORUS, TOTAL		30361	Jun 21, 2006		
ID17050102SW001L_0L	CJ Strike Reservoir - Bruneau Arm			2052.27	Acres
DISSOLVED OXYGEN		30361	Jun 21, 2006		
PHOSPHORUS, TOTAL		30361	Jun 21, 2006		

ID17050102SW002_05 Jacks Creek-Little Jacks Ck to CJ Strike Reservoir			12.29 Miles
ESCHERICHIA COLI (E. COLI)	1998	Mar 13, 2001	
PHOSPHORUS, TOTAL	1998	Mar 13, 2001	
	33833	Nov 13, 2007	
SEDIMENTATION/SILTATION	1998	Mar 13, 2001	
TOTAL SUSPENDED SOLIDS (TSS)	1998	Mar 13, 2001	
	33833	Nov 13, 2007	
ID17050102SW008_04 Sugar Valley Wash - 4th order			5.45 Miles
DISSOLVED OXYGEN	1998	Mar 13, 2001	
ESCHERICHIA COLI (E. COLI)	1998	Mar 13, 2001	
PHOSPHORUS, TOTAL	1998	Mar 13, 2001	
SEDIMENTATION/SILTATION	1998	Mar 13, 2001	
ID17050102SW009_06 Bruneau River - 6th order (Hot Creek to mouth)			16.9 Miles
PHOSPHORUS, TOTAL	1998	Mar 13, 2001	
ID17050102SW028_04 Clover Creek - 4th order (Deadwood Creek to Buck Flat Draw)			29.63 Miles
ESCHERICHIA COLI (E. COLI)	1998	Mar 13, 2001	
ID17050102SW028_05 Clover Creek (East Fork Bruneau River) - 5th order			24.75 Miles
ESCHERICHIA COLI (E. COLI)	1998	Mar 13, 2001	
ID17050102SW031_02 Three Creek - 1st and 2nd order			34.9 Miles
SEDIMENTATION/SILTATION	1998	Mar 13, 2001	
ID17050102SW031_03 Three Creek - 3rd order			6.99 Miles
SEDIMENTATION/SILTATION	1998	Mar 13, 2001	

17050103 Middle Snake-Succor

	EPA TMDL ID	Approval Date	
ID17050103SW001_07 Snake River - Marsing (RM425) to State Line			16.09 Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	9711	Jan 05, 2004	
ID17050103SW001_07a Snake River - State line to Boise River			4.19 Miles
DDD (DICHLORODIPHENYLDICHLOROETHANE)	9781	Mar 01, 2004	
DDE (DICHLORODIPHENYLDICHLOROETHYLENE)	9781	Mar 01, 2004	
DDT (DICHLORODIPHENYLTRICHLOROETHANE)	9781	Mar 01, 2004	
DIELDRIN	9781	Mar 01, 2004	
PHOSPHORUS, TOTAL	9711	Jan 05, 2004	
ID17050103SW002_03 Sage Creek - 3rd order			7.76 Miles
ESCHERICHIA COLI (E. COLI)	9711	Jan 05, 2004	
SEDIMENTATION/SILTATION	9711	Jan 05, 2004	

Southwest

ID17050103SW002_04	Lower Succor Creek - 4th order (state line to mouth)			5.51	Miles
FECAL COLIFORM		9711	Jan 05, 2004		
SEDIMENTATION/SILTATION		9711	Jan 05, 2004		
ID17050103SW003_02	Upper Succor Creek - 1st and 2nd order tributaries			68.4	Miles
SEDIMENTATION/SILTATION		9711	Jan 05, 2004		
TEMPERATURE		33844	Dec 11, 2007		
ID17050103SW003_03	Upper Succor Creek - 3rd order (Granite Creek to State Line)			15.7	Miles
SEDIMENTATION/SILTATION		9711	Jan 05, 2004		
TEMPERATURE		33844	Dec 11, 2007		
ID17050103SW004_02	McBride Creek - 1st and 2nd order			73.1	Miles
SEDIMENTATION/SILTATION		53940	Oct 22, 2013		
ID17050103SW004_03	McBride Creek - 3rd order			6.89	Miles
SEDIMENTATION/SILTATION		53940	Oct 22, 2013		
ID17050103SW005_02	Jump Creek - 1st and 2nd order			85.11	Miles
SEDIMENTATION/SILTATION		9711	Jan 05, 2004		
ID17050103SW005_03	Jump Creek - 3rd order			19.51	Miles
SEDIMENTATION/SILTATION		9711	Jan 05, 2004		
ID17050103SW006_07b	Snake River - Swan Falls to Marsing (RM425)			36.13	Miles
PHOSPHORUS, TOTAL		9711	Jan 05, 2004		
ID17050103SW008_02	Hardtrigger Creek - entire drainage			23.01	Miles
SEDIMENTATION/SILTATION		53940	Oct 22, 2013		
ID17050103SW012_04	Sinker Creek - 4th order			15.74	Miles
SEDIMENTATION/SILTATION		9711	Jan 05, 2004		
TEMPERATURE		38234	Feb 18, 2010		
ID17050103SW014_02	Castle Creek - 1st & 2nd order rangeland tributaries			163.39	Miles
TEMPERATURE		33844	Dec 11, 2007		
ID17050103SW014_02a	Castle Creek - 1st & 2nd order forested tributaries			56.15	Miles
TEMPERATURE		33844	Dec 11, 2007		
ID17050103SW014_03	Castle Creek - 3rd order tributaries			10.41	Miles
SEDIMENTATION/SILTATION		9711	Jan 05, 2004		
TEMPERATURE		33844	Dec 11, 2007		
ID17050103SW014_04	Castle Creek - lower 4th order (irrigated section)			9.21	Miles
SEDIMENTATION/SILTATION		9711	Jan 05, 2004		
TEMPERATURE		33844	Dec 11, 2007		
ID17050103SW014_04a	Castle Creek - upper 4th order (canyon section)			16.4	Miles
TEMPERATURE		33844	Dec 11, 2007		

ID17050103SW014_05	Castle Creek - 5th order (Catherine Cr. to Snake River)			3.81	Miles
SEDIMENTATION/SILTATION		9711	Jan 05, 2004		
TEMPERATURE		33844	Dec 11, 2007		
ID17050103SW016_03	Pickett Creek - 3rd order			6.43	Miles
SEDIMENTATION/SILTATION		53940	Oct 22, 2013		
ID17050103SW020_02	South Fork Castle Creek & tributaries - 1st & 2nd order			41.8	Miles
TEMPERATURE		33844	Dec 11, 2007		
ID17050103SW020_03	SF Castle Creek - 3rd order (Clover Cr. to NF Castle Cr.)			5.55	Miles
TEMPERATURE		33844	Dec 11, 2007		
ID17050103SW021_03	Birch Creek - 3rd order			15.11	Miles
TOTAL SUSPENDED SOLIDS (TSS)		53940	Oct 22, 2013		
ID17050103SW021_04	Birch Creek - 4th order			2.69	Miles
TOTAL SUSPENDED SOLIDS (TSS)		53940	Oct 22, 2013		
ID17050103SW023_03	Vinson Wash - 3rd order			7.95	Miles
TOTAL SUSPENDED SOLIDS (TSS)		53940	Oct 22, 2013		

17050104 Upper Owyhee

		EPA TMDL ID	Approval Date		
ID17050104SW005L_0L	Juniper Basin Reservoir			241.79	Acres
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
ID17050104SW013_03	Blue Creek - 3rd order upstream of Blue Creek Reservoir			13.72	Miles
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
ID17050104SW013_0L	Blue Creek Reservoir			183.88	Acres
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
ID17050104SW023_02	Battle Creek - 1st & 2nd order			252.96	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW023_03	Battle Creek - 3rd order			36.39	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW023_04	Battle Creek - 4th order			29.46	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW026_04	Deep Creek - 4th order section			15.54	Miles
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW026_05	Deep Creek - 5th order (Nickel Creek to mouth)			24.9	Miles
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
TEMPERATURE		42251	Jul 20, 2012		

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ID17050104SW028_02	Pole Creek - 1st and 2nd order			71.16	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW028_03	Pole Creek - 3rd order			6.4	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW028_04	Pole Creek - 4th order			12.13	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW029_03	Camas Creek - 3rd order			7.31	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW030_02	Camel Creek - 1st and 2nd order			28.58	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW031_02	Nickel Creek & tributaries - 1st and 2nd order			76.89	Miles
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW031_03	Nickel, Thomas & Smith Creeks - 3rd order sections			9.7	Miles
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW031_04	Nickel Creek - 4th order			8.21	Miles
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW032_02	Castle Creek - 1st and 2nd order			44.45	Miles
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW032_03	Castle Creek - 3rd order			6.02	Miles
SEDIMENTATION/SILTATION		4106	Mar 12, 2003		
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW033_03	Beaver Creek - 3rd order			3.7	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW033_04	Beaver Creek - 4th order			2.58	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW034_02	Red Canyon Creek - 1st and 2nd order			77.65	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW034_03	Red Canyon Creek - 3rd order			10.09	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050104SW034_04	Red Canyon Creek - 4th order			2.96	Miles
TEMPERATURE		42251	Jul 20, 2012		

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17050105 South Fork Owyhee

		EPA TMDL ID	Approval Date		
ID17050105SW001_06	SF Owyhee River - Nevada border to Little Owyhee River			19.62	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050105SW001_07	South Fork Owyhee River - Little Owyhee River to mouth			12.8	Miles
TEMPERATURE		42251	Jul 20, 2012		

17050107 Middle Owyhee

		EPA TMDL ID	Approval Date		
ID17050107SW004_02	MF Owyhee River & tributaries - 1st and 2nd order			48.02	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW004_03	Middle Fork Owyhee River - 3rd order section			4.59	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW008_02	North Fork Owyhee River - 1st and 2nd order			39.82	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW008_03	North Fork Owyhee River - 3rd order section			6.52	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW008_04	NF Owyhee River & Juniper Creek - 4th order			2.32	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW008_05	NF Owyhee River - 5th order (Juniper Creek to State Line)			6.38	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW009_02	Pleasant Valley Cr. & Tribs - 1st & 2nd order			37.74	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW009_03	Pleasant Valley Creek - 3rd order section			5.68	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW010_02	Noon Creek - entire watershed			23.95	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW011_02	Cabin & Corral Creeks & tributaries - 1st & 2nd order			36.08	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW011_03	Cabin & Corral Creeks - 3rd order sections			2.59	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW012_02	Juniper Creek & tributaries - 1st & 2nd order			24.49	Miles
TEMPERATURE		42251	Jul 20, 2012		
ID17050107SW012_03	Juniper Creek - 3rd order section			6.87	Miles
TEMPERATURE		42251	Jul 20, 2012		

17050108 Jordan

		EPA TMDL ID	Approval Date		
ID17050108SW001_05	Jordan Creek - Williams Creek to State Line			13.35	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW004_02	Jordan Creek, Upper - 1st and 2nd order tributaries			102.35	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW004_03	Jordan Creek - Jacobs Gulch to Louse Creek			13.41	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW004_04	Jordan Creek - Louse Creek to Big Boulder Creek			5.64	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW004_05	Jordan Creek - Big Boulder Creek to Williams Creek			3.37	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW013_02	Rock Creek above Triangle Reservoir - 1st and 2nd order			63.9	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW014_02	Louisa Creek - entire drainage			13.81	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW015_02	Spring and Meadow Creeks - 1st and 2nd order			48.83	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW015_03	Spring and Meadow Creeks - 3rd order sections			8.09	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW021_02	Cow Creek - 1st and 2nd order			55.14	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW021_03	Cow Creek - 3rd order (Wildcat Canyon to Soda Creek)			3.42	Miles
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW022_02	Soda, Swisher and Chimney Creeks - 1st and 2nd order			36.92	Miles
SEDIMENTATION/SILTATION		40189	Apr 13, 2011		
TEMPERATURE		40189	Apr 13, 2011		
ID17050108SW022_03	Soda Creek - 3rd order section			3.08	Miles
SEDIMENTATION/SILTATION		40189	Apr 13, 2011		
TEMPERATURE		40189	Apr 13, 2011		

17050112 Boise-Mores

		EPA TMDL ID	Approval Date		
ID17050112SW001L_0La	Lucky Peak Lake - Robie Creek Swim Beach area			13	Acres
ESCHERICHIA COLI (E. COLI)		38234	Feb 18, 2010		

ID17050112SW009_02	Mores Creek - 1st and 2nd order			133.16	Miles
SEDIMENTATION/SILTATION		38234	Feb 18, 2010		
TEMPERATURE		38234	Feb 18, 2010		
ID17050112SW009_03	Mores Creek - 3rd order (Hayfork Creek to Elk Creek)			12.3	Miles
SEDIMENTATION/SILTATION		38234	Feb 18, 2010		
TEMPERATURE		38234	Feb 18, 2010		
ID17050112SW009_04	Mores Creek - 4th order (Elk Creek to Grimes Creek)			8.84	Miles
SEDIMENTATION/SILTATION		38234	Feb 18, 2010		
TEMPERATURE		38234	Feb 18, 2010		
ID17050112SW009_06	Mores Creek - 6th order (Grimes Creek to mouth)			10.54	Miles
SEDIMENTATION/SILTATION		38234	Feb 18, 2010		
TEMPERATURE		38234	Feb 18, 2010		
ID17050112SW011_03	Thorn Creek - 3rd order (NF Thorn Creek to mouth)			4.99	Miles
TEMPERATURE		38234	Feb 18, 2010		
ID17050112SW013_02	Grimes Creek - 1st and 2nd order			154.27	Miles
TEMPERATURE		38234	Feb 18, 2010		
ID17050112SW013_03	Grimes, Clear and Smith Creeks - 3rd order sections			8.57	Miles
TEMPERATURE		38234	Feb 18, 2010		
ID17050112SW013_04	Grimes Creek - 4th order (Clear Creek to Granite Creek)			9.64	Miles
SEDIMENTATION/SILTATION		38234	Feb 18, 2010		
TEMPERATURE		38234	Feb 18, 2010		
ID17050112SW013_05	Grimes Creek - 5th order (Granite Creek to mouth)			14.65	Miles
SEDIMENTATION/SILTATION		38234	Feb 18, 2010		
TEMPERATURE		38234	Feb 18, 2010		
ID17050112SW015_02	Macks Creek - 1st and 2nd order			17.79	Miles
TEMPERATURE		38234	Feb 18, 2010		

17050113 South Fork Boise

		EPA TMDL ID	Approval Date		
ID17050113SW010_05	Lime Creek - 5th order			4.07	Miles
TEMPERATURE		35910	Mar 25, 2009		
ID17050113SW032_02	Smith Creek and tributaries - 1st and 2nd order			47.41	Miles
TEMPERATURE		35910	Mar 25, 2009		
ID17050113SW032_03	Smith Creek - 3rd order (Mule Gulch to SF Boise River)			16.45	Miles
TEMPERATURE		35910	Mar 25, 2009		

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17050114 Lower Boise

		EPA TMDL ID	Approval Date		
ID17050114SW001_02	Dixie Slough			20.16	Miles
ESCHERICHIA COLI (E. COLI)		64560	Sep 18, 2015		
ID17050114SW001_06	Boise River - Indian Creek to mouth			44.91	Miles
FECAL COLIFORM		34394	Jun 03, 2008		
		735	Jan 25, 2000		
PHOSPHORUS, TOTAL		65220	Dec 22, 2015		
SEDIMENTATION/SILTATION		34394	Jun 03, 2008		
		735	Jan 25, 2000		
ID17050114SW002_04	Indian Creek - Sugar Avenue to Boise River			11.91	Miles
ESCHERICHIA COLI (E. COLI)		64560	Sep 18, 2015		
SEDIMENTATION/SILTATION		64560	Sep 18, 2015		
ID17050114SW003b_03	Indian Creek - Indian Creek Reservoir to New York Canal			41.2	Miles
SEDIMENTATION/SILTATION		64560	Sep 18, 2015		
ID17050114SW003d_02	Indian Creek above Reservoir - 1st and 2nd order			62.17	Miles
ESCHERICHIA COLI (E. COLI)		64560	Sep 18, 2015		
SEDIMENTATION/SILTATION		64560	Sep 18, 2015		
ID17050114SW003d_03	Indian Creek above Reservoir - 3rd order			11.54	Miles
SEDIMENTATION/SILTATION		64560	Sep 18, 2015		
ID17050114SW004_06	Lake Lowell			6059.2	Acres
PHOSPHORUS, TOTAL		39781	Dec 06, 2010		
ID17050114SW005_06	Boise River - Veterans Memorial Parkway to Star Bridge			36.89	Miles
FECAL COLIFORM		34394	Jun 03, 2008		
		735	Jan 25, 2000		
SEDIMENTATION/SILTATION		34394	Jun 03, 2008		
		735	Jan 25, 2000		
ID17050114SW005_06a	Boise River-Star to Middleton			11.34	Miles
FECAL COLIFORM		735	Jan 25, 2000		
SEDIMENTATION/SILTATION		735	Jan 25, 2000		
ID17050114SW005_06b	Boise River-Middleton to Indian Creek			7.84	Miles
FECAL COLIFORM		735	Jan 25, 2000		
PHOSPHORUS, TOTAL		65220	Dec 22, 2015		
SEDIMENTATION/SILTATION		735	Jan 25, 2000		

ID17050114SW006_02	Mason Creek - entire watershed		29.83	Miles
ESCHERICHIA COLI (E. COLI)	64560	Sep 18, 2015		
SEDIMENTATION/SILTATION	64560	Sep 18, 2015		
ID17050114SW007_04	Fifteenmile Creek - 4th order (Fivemile Creek to mouth)		3.73	Miles
ESCHERICHIA COLI (E. COLI)	64560	Sep 18, 2015		
SEDIMENTATION/SILTATION	64560	Sep 18, 2015		
ID17050114SW008_03	Tenmile Creek - 3rd order below Blacks Creek Reservoir		29.49	Miles
ESCHERICHIA COLI (E. COLI)	64560	Sep 18, 2015		
SEDIMENTATION/SILTATION	64560	Sep 18, 2015		
ID17050114SW010_02	Fivemile, Eightmile, and Ninemile Creeks - 1st and 2nd order		66.16	Miles
ESCHERICHIA COLI (E. COLI)	64560	Sep 18, 2015		
ID17050114SW010_03	Fivemile Creek - 3rd order		22.63	Miles
ESCHERICHIA COLI (E. COLI)	64560	Sep 18, 2015		
SEDIMENTATION/SILTATION	64560	Sep 18, 2015		
ID17050114SW012_02	Stewart Gulch, Cottonwood and Crane Creeks - 1st & 2nd order		63.71	Miles
ESCHERICHIA COLI (E. COLI)	64560	Sep 18, 2015		
ID17050114SW015_03	Willow Creek - 3rd order		18.36	Miles
SEDIMENTATION/SILTATION	64560	Sep 18, 2015		
ID17050114SW016_03	Sand Hollow Creek (C-Line Canal to I-84)		5.55	Miles
SEDIMENTATION/SILTATION	64560	Sep 18, 2015		
ID17050114SW017_03	Sand Hollow Creek - I-84 to Sharp Road		18.25	Miles
ESCHERICHIA COLI (E. COLI)	64560	Sep 18, 2015		
SEDIMENTATION/SILTATION	64560	Sep 18, 2015		
ID17050114SW017_06	Sand Hollow Creek - Sharp Road to Snake River		3.68	Miles
ESCHERICHIA COLI (E. COLI)	64560	Sep 18, 2015		
SEDIMENTATION/SILTATION	64560	Sep 18, 2015		

17050115 Middle Snake-Payette

		EPA TMDL ID	Approval Date		
ID17050115SW001_08	Snake River - Boise River to Weiser River			75.57	Miles
DDD (DICHLORODIPHENYLDICHLOROETHANE)		9781	Mar 01, 2004		
DDE (DICHLORODIPHENYLDICHLOROETHYLENE)		9781	Mar 01, 2004		
DDT (DICHLORODIPHENYLTRICHLOROETHANE)		9781	Mar 01, 2004		
DIELDRIN		9781	Mar 01, 2004		
DISSOLVED OXYGEN		9781	Mar 01, 2004		
PHOSPHORUS, TOTAL		10745	Sep 09, 2004		
SEDIMENTATION/SILTATION		10745	Sep 09, 2004		
TEMPERATURE		10745	Sep 09, 2004		

17050121 Middle Fork Payette

		EPA TMDL ID	Approval Date		
ID17050121SW001_04	Lower MF Payette River - 4th order			13.2	Miles
SEDIMENTATION/SILTATION		4189	Jul 18, 2000		
TEMPERATURE		33841	Dec 04, 2007		
ID17050121SW005_03	Upper MF Payette River - 3rd order			13.15	Miles
TEMPERATURE		33841	Dec 04, 2007		
ID17050121SW005_04	Upper MF Payette River - 4th order			8.52	Miles
TEMPERATURE		33841	Dec 04, 2007		

17050122 Payette

		EPA TMDL ID	Approval Date		
ID17050122SW001_06	Payette River - Black Canyon Reservoir Dam to mouth			66.8	Miles
ESCHERICHIA COLI (E. COLI)		744	May 31, 2000		
ID17050122SW015_03a	Bissel Creek - lower 3rd order			3.94	Miles
ESCHERICHIA COLI (E. COLI)		9668	Oct 24, 2003		
SEDIMENTATION/SILTATION		9668	Oct 24, 2003		
ID17050122SW017_02	Big Willow Creek - 1st and 2nd order			164.98	Miles
TEMPERATURE		34592	Jul 01, 2008		
ID17050122SW017_03	Big Willow Creek and Dry Creek - 3rd order sections			15.82	Miles
TEMPERATURE		34592	Jul 01, 2008		
ID17050122SW017_04	Big Willow Creek - 4th order (Dry Creek to Payette Ditch)			13.28	Miles
TEMPERATURE		34592	Jul 01, 2008		
ID17050122SW017_06	Big Willow Creek - 6th order (Payette Ditch, Birding Island)			14.89	Miles
TEMPERATURE		34592	Jul 01, 2008		

ID17050122SW018_03	Little Willow Creek - Paddock Valley Dam to Indian Creek			5.85	Miles
TEMPERATURE		55301	Dec 11, 2013		
ID17050122SW018_04	Little Willow Creek - Indian Creek to mouth			19.25	Miles
ESCHERICHIA COLI (E. COLI)		55301	Dec 11, 2013		
SEDIMENTATION/SILTATION		55301	Dec 11, 2013		
TEMPERATURE		55301	Dec 11, 2013		

17050123 North Fork Payette

		EPA TMDL ID	Approval Date		
ID17050123SW001_06	North Fork Payette River - Cascade to Smiths Ferry			23.21	Miles
SEDIMENTATION/SILTATION		11766	Aug 17, 2005		
ID17050123SW002_02	Round Valley Creek - 1st and 2nd order			30.32	Miles
SEDIMENTATION/SILTATION		11766	Aug 17, 2005		
ID17050123SW002_03	Round Valley Creek - 3rd order			2.4	Miles
SEDIMENTATION/SILTATION		11766	Aug 17, 2005		
ID17050123SW003_02	Clear Creek - 1st and 2nd order tributaries			47.54	Miles
SEDIMENTATION/SILTATION		11766	Aug 17, 2005		
ID17050123SW003_03	Clear Creek - upper 3rd order			9.56	Miles
SEDIMENTATION/SILTATION		11766	Aug 17, 2005		
ID17050123SW003_03a	Clear Creek - lower 3rd order			3.69	Miles
SEDIMENTATION/SILTATION		11766	Aug 17, 2005		
ID17050123SW004_03a	Big Creek - lower 3rd order (Horsethief Creek to mouth)			5.63	Miles
SEDIMENTATION/SILTATION		11766	Aug 17, 2005		
ID17050123SW004_06	Big Creek - NF Payette River side channel			3.16	Miles
SEDIMENTATION/SILTATION		11766	Aug 17, 2005		
ID17050123SW007_02	West Mountain tributaries to Cascade Reservoir			60.49	Miles
PHOSPHORUS, TOTAL		221	May 13, 1996		
ID17050123SW007_05	Gold Fork, 5th order, between high and low water lines			1.17	Miles
PH		1999	Apr 19, 1999		
PHOSPHORUS, TOTAL		1999	Apr 19, 1999		
ID17050123SW007L_0L	Cascade Reservoir			25039.52	Acres
PH		1999	Apr 19, 1999		
PHOSPHORUS, TOTAL		1999	Apr 19, 1999		
ID17050123SW008_05	Gold Fork - upper 5th order, above Gold Fork Ditch			2.61	Miles
PHOSPHORUS, TOTAL		221	May 13, 1996		

ID17050123SW008_05a	Gold Fork - lower 5th order, below Gold Fork Ditch			4.01	Miles
PHOSPHORUS, TOTAL		1999	Apr 19, 1999		
SEDIMENTATION/SILTATION		41498	Feb 22, 2012		
ID17050123SW011_02	Boulder/Willow Creek - 1st and 2nd order irrigated sections			19.63	Miles
PHOSPHORUS, TOTAL		221	May 13, 1996		
ID17050123SW011_03	Boulder Creek - 3rd order (Louie Creek to mouth)			11.55	Miles
PHOSPHORUS, TOTAL		221	May 13, 1996		
SEDIMENTATION/SILTATION		41498	Feb 22, 2012		
ID17050123SW015_02	Mud Creek - 1st and 2nd order			26.75	Miles
PHOSPHORUS, TOTAL		221	May 13, 1996		
SEDIMENTATION/SILTATION		41498	Feb 22, 2012		
ID17050123SW015_03	Mud Creek - 3rd order (Norwood to Reservoir)			7.26	Miles
PHOSPHORUS, TOTAL		221	May 13, 1996		
SEDIMENTATION/SILTATION		41498	Feb 22, 2012		
ID17050123SW017_02a	Payette Lake - Eastside tribs, inc.Lemah & parts of Fall Cr.			22.57	Miles
TEMPERATURE		11766	Aug 17, 2005		
ID17050123SW017_03	Fall Creek - 3rd order			2.5	Miles
TEMPERATURE		11766	Aug 17, 2005		
ID17050123SW018_02	North Fork Payette River - 1st and 2nd order			37.22	Miles
TEMPERATURE		11766	Aug 17, 2005		

17050124 Weiser

		EPA TMDL ID	Approval Date		
ID17050124SW001_05	Weiser River - Keithly Creek to Crane Creek			20.72	Miles
SEDIMENTATION/SILTATION		31999	Jan 19, 2007		
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW001_06	Weiser River - Crane Creek to Galloway Dam			4.66	Miles
SEDIMENTATION/SILTATION		31999	Jan 19, 2007		
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW001_06a	Weiser River - Galloway Dam to Snake River			16.98	Miles
SEDIMENTATION/SILTATION		31999	Jan 19, 2007		
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW003_05	Crane Creek - Crane Creek Reservoir Dam to mouth			17.17	Miles
FECAL COLIFORM		31999	Jan 19, 2007		
SEDIMENTATION/SILTATION		31999	Jan 19, 2007		
TEMPERATURE		31999	Jan 19, 2007		

ID17050124SW004_04	North Crane Creek -500m segment above reservoir (very small)			0.26	Miles
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW005_02	South Crane & Tennison Creeks - 1st and 2nd order			50.95	Miles
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW005_03	South Crane Creek - 3rd order			7.2	Miles
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW005_04	South Crane Creek - 4th order			2.44	Miles
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW006_02	North Crane Creek watershed - all 1st and 2nd order streams			185.98	Miles
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW006_03	North Crane Creek - 3rd order			14.49	Miles
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW006_04	North Crane Creek - (Middle Creek to Reservoir)			5.85	Miles
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW007_05	Weiser River - Hornet Creek to Little Weiser River			24.29	Miles
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW007_05a	Weiser River - Little Weiser River to Keithly Creek			7.38	Miles
SEDIMENTATION/SILTATION		31999	Jan 19, 2007		
TEMPERATURE		31999	Jan 19, 2007		
ID17050124SW008_03	Little Weiser River - lower 3rd order (rangeland)			17.2	Miles
ESCHERICHIA COLI (E. COLI)		31999	Jan 19, 2007		
ID17050124SW008_04	Little Weiser River - Grays Creek to mouth			20.3	Miles
ESCHERICHIA COLI (E. COLI)		31999	Jan 19, 2007		
SEDIMENTATION/SILTATION		31999	Jan 19, 2007		
TEMPERATURE		31999	Jan 19, 2007		

17050201 Brownlee Reservoir

		EPA TMDL ID	Approval Date		
ID17050201SW001_08	Hells Canyon Reservoir			2510.21	Acres
DISSOLVED GAS SUPERSATURATION		9781	Mar 01, 2004		
TEMPERATURE		10745	Sep 09, 2004		

ID17050201SW002_08	**Oxbow Reservoir**	**1106.23**	**Acres**
DDD (DICHLORODIPHENYLDICHLOROETHANE)	9781	Mar 01, 2004	
DDE (DICHLORODIPHENYLDICHLOROETHYLENE)	9781	Mar 01, 2004	
DDT (DICHLORODIPHENYLTRICHLOROETHANE)	9781	Mar 01, 2004	
DIELDRIN	9781	Mar 01, 2004	
DISSOLVED GAS SUPERSATURATION	9781	Mar 01, 2004	
PHOSPHORUS, TOTAL	10745	Sep 09, 2004	
SEDIMENTATION/SILTATION	10745	Sep 09, 2004	
TEMPERATURE	10745	Sep 09, 2004	
ID17050201SW003_08	**Brownlee Reservoir, Lower (Porters Flat to Brownlee Dam)**	**13193.87**	**Acres**
DDD (DICHLORODIPHENYLDICHLOROETHANE)	9781	Mar 01, 2004	
DDE (DICHLORODIPHENYLDICHLOROETHYLENE)	9781	Mar 01, 2004	
DDT (DICHLORODIPHENYLTRICHLOROETHANE)	9781	Mar 01, 2004	
DIELDRIN	9781	Mar 01, 2004	
DISSOLVED OXYGEN	9781	Mar 01, 2004	
PHOSPHORUS, TOTAL	9781	Mar 01, 2004	
SEDIMENTATION/SILTATION	10745	Sep 09, 2004	
TEMPERATURE	10745	Sep 09, 2004	
ID17050201SW004_08	**Brownlee Reservoir, Upper (Weiser to Porters Flat)**	**1081.27**	**Acres**
DDD (DICHLORODIPHENYLDICHLOROETHANE)	9781	Mar 01, 2004	
DDE (DICHLORODIPHENYLDICHLOROETHYLENE)	9781	Mar 01, 2004	
DDT (DICHLORODIPHENYLTRICHLOROETHANE)	9781	Mar 01, 2004	
DIELDRIN	10745	Sep 09, 2004	
DISSOLVED OXYGEN	9781	Mar 01, 2004	
PHOSPHORUS, TOTAL	9781	Mar 01, 2004	
SEDIMENTATION/SILTATION	10745	Sep 09, 2004	
TEMPERATURE	10745	Sep 09, 2004	
ID17050201SW005_02	**Jenkins Creek - entire watershed**	**22.95**	**Miles**
PHOSPHORUS, TOTAL	9489	Sep 30, 2003	
SEDIMENTATION/SILTATION	9489	Sep 30, 2003	
ID17050201SW006_02	**Scott Creek - 2nd order**	**15.52**	**Miles**
PHOSPHORUS, TOTAL	9489	Sep 30, 2003	
SEDIMENTATION/SILTATION	9489	Sep 30, 2003	
ID17050201SW006_03	**Scott Creek - 3rd order**	**14.39**	**Miles**
PHOSPHORUS, TOTAL	9489	Sep 30, 2003	
SEDIMENTATION/SILTATION	9489	Sep 30, 2003	

Southwest

ID17050201SW007_02	Warm Springs Creek - 1st and 2nd order		32.62	Miles
PHOSPHORUS, TOTAL	9489	Sep 30, 2003		
SEDIMENTATION/SILTATION	9489	Sep 30, 2003		
ID17050201SW007_03	Warm Springs Creek - 3rd order		5.31	Miles
PHOSPHORUS, TOTAL	9489	Sep 30, 2003		
SEDIMENTATION/SILTATION	9489	Sep 30, 2003		
ID17050201SW008_02	Hog Creek - 1st & 2nd order		34.41	Miles
PHOSPHORUS, TOTAL	9489	Sep 30, 2003		
ID17050201SW008_03	Hog Creek - 3rd order section		2.89	Miles
PHOSPHORUS, TOTAL	9489	Sep 30, 2003		
ID17050201SW012_02	Dennett Creek - 1st & 2nd order		16.38	Miles
SEDIMENTATION/SILTATION	9489	Sep 30, 2003		
ID17050201SW015_02	Wildhorse River - 1st and 2nd order, including Crooked River		73.79	Miles
TEMPERATURE	33476	Oct 01, 2007		
ID17050201SW015_04	Wildhorse River - 4th order (Bear Creek to mouth)		13.74	Miles
TEMPERATURE	33476	Oct 01, 2007		
ID17050201SW016_02	Bear Creek - 1st and 2nd order		88.4	Miles
TEMPERATURE	33476	Oct 01, 2007		
ID17050201SW016_03	Lick and Deer Creeks - 3rd order sections		4.74	Miles
TEMPERATURE	33476	Oct 01, 2007		
ID17050201SW016_04	Lick and Bear Creeks - 4th order sections		7.45	Miles
TEMPERATURE	33476	Oct 01, 2007		

Upper Snake

17040104 Palisades

		EPA TMDL ID	Approval Date		
ID17040104SK001_02	Snake River - Black Canyon Creek to river mile 856			48.36	Miles
SEDIMENTATION/SILTATION		55461	Feb 10, 2014		
ID17040104SK002_02	Antelope Creek - source to mouth			70.51	Miles
SEDIMENTATION/SILTATION		2013	Feb 20, 2001		
ID17040104SK002_03	Antelope Creek - source to mouth			5.95	Miles
SEDIMENTATION/SILTATION		2013	Feb 20, 2001		
ID17040104SK006_02	Fall Creek - source to South Fork Fall Creek			72.67	Miles
SEDIMENTATION/SILTATION		9805	Apr 08, 2004		
TEMPERATURE		9805	Apr 08, 2004		
ID17040104SK006_03	Fall Creek - source to South Fork Fall Creek			5.02	Miles
SEDIMENTATION/SILTATION		9805	Apr 08, 2004		
TEMPERATURE		9805	Apr 08, 2004		
ID17040104SK006_04	Fall Creek - source to South Fork Fall Creek			7.23	Miles
SEDIMENTATION/SILTATION		9805	Apr 08, 2004		
TEMPERATURE		9805	Apr 08, 2004		
ID17040104SK011_04	Bear Creek - North Fork Bear Creek to Palisades Reservoir			5.35	Miles
SEDIMENTATION/SILTATION		2013	Feb 20, 2001		
ID17040104SK013_02	Bear Creek - source to North Fork Bear Creek			54.73	Miles
SEDIMENTATION/SILTATION		2013	Feb 20, 2001		
ID17040104SK013_03	Bear Creek - source to North Fork Bear Creek			6.75	Miles
SEDIMENTATION/SILTATION		2013	Feb 20, 2001		
ID17040104SK024_04	Indian Creek - Idaho/Wyoming border to Palisades Reservoir			2.21	Miles
SEDIMENTATION/SILTATION		55461	Feb 10, 2014		
ID17040104SK028_04	Rainey Creek - source to mouth			12.45	Miles
ESCHERICHIA COLI (E. COLI)		55461	Feb 10, 2014		
TEMPERATURE		ID_Raine_Jul-25-19	Jul 25, 2019		

17040105 Salt

		EPA TMDL ID	Approval Date		
ID17040105SK001_02b	Newswander Canyon			4.96	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK003_02	Tincup Creek - source to Idaho/Wyoming border			59.91	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK003_02e	Bear Canyon			3.1	Miles
ESCHERICHIA COLI (E. COLI)		68601	Jan 24, 2018		

ID17040105SK003_02i	Luthi Canyon			4.29	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK003_02j	Haderlie Creek			8.65	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK006_02c	Upper Boulder Creek			4.68	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK006_02g	Graehl Canyon			1.4	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK006_04	lower Stump Creek			10.43	Miles
ESCHERICHIA COLI (E. COLI)		68601	Jan 24, 2018		
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK007_02c	Smoky Creek			10.78	Miles
ESCHERICHIA COLI (E. COLI)		68601	Jan 24, 2018		
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK007_02f	Draney Creek			6.87	Miles
ESCHERICHIA COLI (E. COLI)		68601	Jan 24, 2018		
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK007_03	Tygee Creek - source to mouth			5.55	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK008_02a	White Dugway Creek			5.31	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK008_02c	Beaver Dam Creek			5.12	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK008_04	Crow Creek - Deer Creek to border			10.44	Miles
ESCHERICHIA COLI (E. COLI)		68601	Jan 24, 2018		
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK011_03	Rock Creek			3.44	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK012_02a	Little Elk Creek			8.38	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		
ID17040105SK012_03	Spring Creek			1.22	Miles
SEDIMENTATION/SILTATION		ID99911	Aug 27, 2018		

17040201 Idaho Falls

		EPA TMDL ID	Approval Date		
ID17040201SK008_02	Birch Creek - source to mouth			29.34	Miles
SEDIMENTATION/SILTATION		11120	Nov 22, 2004		

ID17040201SK008_03	Birch Creek - source to mouth			6.21	Miles
SEDIMENTATION/SILTATION		11120	Nov 22, 2004		

17040202 Upper Henrys

		EPA TMDL ID	Approval Date		
ID17040202SK002_04	Warm River - Warm River Spring to mouth			8.74	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK002_05	Warm River - Warm River Spring to mouth			0.56	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK005_02	Warm River - source to Warm River Spring			70.27	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK005_03	Warm River - source to Warm River Spring			17.47	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK005_04	Warm River - source to Warm River Spring			7.49	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK018_03	Buffalo River - source to Elk Creek			7.27	Miles
SEDIMENTATION/SILTATION		39050	Aug 17, 2010		
ID17040202SK033_02	Howard Creek - source to mouth			15.23	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK034_02	Targhee Creek - source to mouth			29.06	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK034_03	Targhee Creek - source to mouth			9.34	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK035_02	Timber Creek - source to mouth			16.96	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK035_03	Timber Creek - source to mouth			3.37	Miles
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK036_03	Duck Creek - source to mouth			4.79	Miles
SEDIMENTATION/SILTATION		39050	Aug 17, 2010		
TEMPERATURE		39050	Aug 17, 2010		
ID17040202SK045_03	Sheridan Creek - Kilgore Road (T13N, R41E, Sec. 07) to mouth			18.63	Miles
SEDIMENTATION/SILTATION		39050	Aug 17, 2010		

17040203 Lower Henrys

		EPA TMDL ID	Approval Date		
ID17040203SK007_02	Conant Creek - Idaho/Wyoming border to mouth			45.25	Miles
ESCHERICHIA COLI (E. COLI)		39050	Aug 17, 2010		

ID17040203SK007_03	Conant Creek - Idaho/Wyoming border to mouth			19.42	Miles
ESCHERICHIA COLI (E. COLI)		39050	Aug 17, 2010		
ID17040204SK002_05	North Fork Teton River - Teton River Forks to Henrys Fork			18.75	Miles
PHOSPHORUS, TOTAL		4070	Feb 24, 2003		
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		

17040204 Teton

		EPA TMDL ID	Approval Date		
ID17040204SK002_05	North Fork Teton River - Teton River Forks to Henrys Fork			18.75	Miles
PHOSPHORUS, TOTAL		4070	Feb 24, 2003		
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK003_05	Teton River - Teton Dam to Teton River Forks			22.16	Miles
PHOSPHORUS, TOTAL		4070	Feb 24, 2003		
ID17040204SK005_04	Moody Creek - confluence of North and South Fork Moody Creek			19.57	Miles
PHOSPHORUS, TOTAL		9476	Sep 26, 2003		
ID17040204SK006_02	South Fork Moody Creek - source to mouth			19.98	Miles
SEDIMENTATION/SILTATION		67400	Feb 13, 2017		
ID17040204SK007_02	North Fork Moody Creek - source to mouth			26.35	Miles
ESCHERICHIA COLI (E. COLI)		67400	Feb 13, 2017		
ID17040204SK014_04	Teton River - Felt Dam outlet to Milk Creek			1.66	Miles
NITROGEN, NITRATE		4070	Feb 24, 2003		
PHOSPHORUS, TOTAL		4070	Feb 24, 2003		
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK015_04	Teton River - Felt Dam pool			4.12	Miles
NITROGEN, NITRATE		4070	Feb 24, 2003		
PHOSPHORUS, TOTAL		4070	Feb 24, 2003		
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK016_04	Teton River - Highway 33 bridge to Felt Dam pool			3.26	Miles
NITROGEN, NITRATE		4070	Feb 24, 2003		
PHOSPHORUS, TOTAL		4070	Feb 24, 2003		
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK017_04	Teton River			13.67	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
		67400	Feb 13, 2017		
TEMPERATURE		67400	Feb 13, 2017		
ID17040204SK018_03	Packsaddle Creek-diversion (NE ¼ Sec. 8, T5N, R44E) to mouth			4.45	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		

ID17040204SK019_02	Packsaddle Creek			14.59	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK020_04	Teton River			15.72	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
		67400	Feb 13, 2017		
TEMPERATURE		67400	Feb 13, 2017		
ID17040204SK025_02	Mahogany Creek			6.48	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
TEMPERATURE		9476	Sep 26, 2003		
ID17040204SK026_02	Teton River - Tributaries between Trail Creek to Teton Creek			23.5	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
TEMPERATURE		67400	Feb 13, 2017		
		9476	Sep 26, 2003		
ID17040204SK026_04	Teton River - Trail Creek to Teton Creek			5.63	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
		67400	Feb 13, 2017		
TEMPERATURE		67400	Feb 13, 2017		
ID17040204SK028_03	Teton River			2.6	Miles
SEDIMENTATION/SILTATION		67400	Feb 13, 2017		
TEMPERATURE		67400	Feb 13, 2017		
ID17040204SK035_03	Trail Creek			7.88	Miles
SEDIMENTATION/SILTATION		67400	Feb 13, 2017		
ID17040204SK041_02	Fox Creek			7.99	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
TEMPERATURE		67400	Feb 13, 2017		
		9476	Sep 26, 2003		
ID17040204SK042_02	Fox Creek			0.91	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
TEMPERATURE		67400	Feb 13, 2017		
		9476	Sep 26, 2003		
ID17040204SK044_02	Darby Creek - SW ¼, SE ¼, S10, T4N, R45E, to mouth			4.13	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK045_02	Darby Creek			11.05	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK049_02	Driggs Springs spring creek complex - located between Teton			4.94	Miles
ESCHERICHIA COLI (E. COLI)		67400	Feb 13, 2017		

ID17040204SK050_02	Woods Creek			5.41	Miles
ESCHERICHIA COLI (E. COLI)		67400	Feb 13, 2017		
ID17040204SK052_03	South Leigh Creek - SE ¼, NE ¼, Sec. 1 T5N, R44E to mouth			2.03	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK053_03	South Leigh Creek			9.7	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK054_03	Spring Creek - North Leigh Creek to mouth			13.17	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
TEMPERATURE		67400	Feb 13, 2017		
		9476	Sep 26, 2003		
ID17040204SK056_02	Spring Creek - source to North Leigh Creek, including spring			24.21	Miles
TEMPERATURE		67400	Feb 13, 2017		
		9476	Sep 26, 2003		
ID17040204SK056_03	Spring Creek - source to North Leigh Creek, including spring			1.44	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
TEMPERATURE		67400	Feb 13, 2017		
		9476	Sep 26, 2003		
ID17040204SK057_03	Badger Creek-spring (NW ¼, SW ¼, Sec. 26 T7N, R44E) to mouth			4.69	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		
ID17040204SK058_03	Badger Creek			6.06	Miles
SEDIMENTATION/SILTATION		4070	Feb 24, 2003		

17040205 Willow

		EPA TMDL ID	Approval Date		
ID17040205SK004_05	Willow Creek - Bulls Fork to Ririe Reservoir			2.99	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		10489	Jun 30, 2004		
SEDIMENTATION/SILTATION		10489	Jun 30, 2004		
TEMPERATURE		10489	Jun 30, 2004		
ID17040205SK005_02	Willow Creek - Birch Creek to Bulls Fork			57.41	Miles
TEMPERATURE		10489	Jun 30, 2004		
ID17040205SK005_04	Willow Creek - Birch Creek to Bulls Fork			2.3	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		10489	Jun 30, 2004		
ID17040205SK005_05	Willow Creek - Birch Creek to Bulls Fork			13.51	Miles
TEMPERATURE		10489	Jun 30, 2004		
ID17040205SK008_04	Willow Creek - Mud Creek to Birch Creek			8.84	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS		10489	Jun 30, 2004		

ID17040205SK010_02	Sellars Creek - source to mouth		16.77	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
TEMPERATURE	10489	Jun 30, 2004		
ID17040205SK010_03	Sellars Creek - source to mouth		4.23	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
TEMPERATURE	10489	Jun 30, 2004		
ID17040205SK011_02	Willow Creek - Crane Creek to Mud Creek		23.25	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
ID17040205SK011_04	Willow Creek - Crane Creek to Mud Creek		8.4	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	10489	Jun 30, 2004		
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
TEMPERATURE	10489	Jun 30, 2004		
ID17040205SK012_02	Mill Creek - source to mouth		13.64	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
TEMPERATURE	10489	Jun 30, 2004		
ID17040205SK012_03	Mill Creek - source to mouth		3.3	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
TEMPERATURE	10489	Jun 30, 2004		
ID17040205SK013_02	Willow Creek - source to Crane Creek		37.36	Miles
PHOSPHORUS, TOTAL	10489	Jun 30, 2004		
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
TEMPERATURE	10489	Jun 30, 2004		
ID17040205SK013_03	Willow Creek - source to Crane Creek		3.7	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	10489	Jun 30, 2004		
TEMPERATURE	10489	Jun 30, 2004		
ID17040205SK014_02	Crane Creek - source to mouth		44.94	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
ID17040205SK014_03	Crane Creek - source to mouth		10.86	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
ID17040205SK016_04	Grays Lake outlet - Hell Creek to mouth		4.7	Miles
TEMPERATURE	10489	Jun 30, 2004		
ID17040205SK017_04	Grays Lake outlet - Homer Creek to Hell Creek		8.61	Miles
TEMPERATURE	10489	Jun 30, 2004		
ID17040205SK018_02	Homer Creek - source to mouth		60.4	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004		
TEMPERATURE	10489	Jun 30, 2004		

Upper Snake

ID17040205SK018_03	Homer Creek - source to mouth	17.26	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004	
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK019_04	Grays Lake outlet - Brockman Creek to Homer Creek	12.49	Miles
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK020_02	Grays Lake outlet - Grays Lake to Brockman Creek	18.04	Miles
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK020_04	Grays Lake outlet - Grays Lake to Brockman Creek	11.55	Miles
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK024_02	Brockman Creek - Corral Creek to mouth	20.03	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004	
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK024_03	Brockman Creek - Corral Creek to mouth	7.58	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004	
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK025_02	Brockman Creek - source to Corral Creek	17.34	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004	
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK025_03	Brockman Creek - source to Corral Creek	0.24	Miles
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK026_02	Corral Creek - source to mouth	7.22	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004	
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK027_02	Sawmill Creek - source to mouth	8.44	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004	
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK028_02	Lava Creek - source to mouth	14.67	Miles
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK028_03	Lava Creek - source to mouth	3.29	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004	
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK029_02	Hell Creek - source to mouth	38.37	Miles
TEMPERATURE	10489	Jun 30, 2004	
ID17040205SK029_03	Hell Creek - source to mouth	10.82	Miles
SEDIMENTATION/SILTATION	10489	Jun 30, 2004	
TEMPERATURE	10489	Jun 30, 2004	

ID17040205SK031_02	Tex Creek - source to mouth			41.54	Miles
SEDIMENTATION/SILTATION		10489	Jun 30, 2004		
TEMPERATURE		10489	Jun 30, 2004		
ID17040205SK031_03	Tex Creek - source to mouth			8.85	Miles
SEDIMENTATION/SILTATION		10489	Jun 30, 2004		
TEMPERATURE		10489	Jun 30, 2004		
ID17040205SK032_02	Meadow Creek - source to Ririe Reservoir			40.56	Miles
SEDIMENTATION/SILTATION		10489	Jun 30, 2004		
ID17040205SK032_03	Meadow Creek - source to Ririe Reservoir			1.24	Miles
SEDIMENTATION/SILTATION		10489	Jun 30, 2004		

17040206 American Falls

		EPA TMDL ID	Approval Date		
ID17040206SK001_02	American Falls Reservoir 1st and 2nd order tributaries			34.83	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
ID17040206SK001_02a	Danielson Creek			4.4	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK001L_0L	American Falls Reservoir (Snake River)			31724.26	Acres
CHLOROPHYLL-A		42340	Aug 06, 2012		
ID17040206SK002_02	Bannock Creek - source to American Falls Reservoir			132.97	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK002_03	Bannock Creek - source to American Falls Reservoir			14.24	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK002_04	Bannock Creek - source to American Falls Reservoir			0.81	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK005_02	Sunbeam Creek - source to mouth			24.02	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK006_02	Moonshine Creek - source to mouth			7.37	Miles
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK008_02	West Fork Bannock Creek - source to mouth			18.21	Miles
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		

Upper Snake

ID17040206SK009_02	Knox Creek - source to mouth			23.85	Miles
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK009_03	Knox Creek - source to mouth			7.83	Miles
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK010_02	Rattlesnake Creek - source to mouth			50.82	Miles
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK010_02b	Rattlesnake Creek			1.1	Miles
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK010_03	Rattlesnake Creek - source to mouth			9.95	Miles
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK010_04	Rattlesnake Creek - lower			1.27	Miles
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK022_02	Tribs. to Snake R - btw river mile 791 to American Falls Res			147.92	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK024_02	McTucker Creek - source to American Falls Reservoir			1.94	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK024_02a	McTucker Creek			2.13	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK025_02a	Little Hole Draw			4.11	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040206SK026_02	Pleasant Valley - source to American Falls Reservoir			78.95	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
ID17040206SK026_03	Pleasant Valley - source to American Falls Reservoir			12.18	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		

17040207 Blackfoot

		EPA TMDL ID	Approval Date		
ID17040206SK022_02	Tribs. to Snake R - btw river mile 791 to American Falls Res			147.92	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
SEDIMENTATION/SILTATION		42340	Aug 06, 2012		
ID17040207SK002_02b	Deadman Creek - Blackfoot River tributary			1.06	Miles
SEDIMENTATION/SILTATION		52522	Jul 26, 2013		

ID17040207SK002_05	Blackfoot River - Blackfoot Reservoir Dam to Fort Hall Main	65.16	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	2078	Apr 03, 2002	
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK005_02	Grave Creek - Blackfoot River tributary, source to mouth	15.06	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK005_02a	Grave Creek - upper (Blackfoot River tributary)	3.95	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK005_02b	Warbonnet Creek	6.22	Miles
ESCHERICHIA COLI (E. COLI)	52522	Jul 26, 2013	
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK005_02c	Wood Creek (Blackfoot River tributary)	3.19	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK005_02d	Coyote Creek (Blackfoot River tributary)	1.23	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK005_02e	Sunday Creek (Blackfoot River tributary)	6.28	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK005_03	Grave Creek - West Creek to Blackfoot River	5.49	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK006_02	Corral Creek - Headwaters and unnamed tributaries	40.63	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK006_02a	Chicken Creek - headwaters to Corral Creek (Blackfoot River)	6.42	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK006_02b	Bear Creek - headwaters to Corral Creek (Blackfoot River)	3.85	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK006_03	Corral Creek - middle	9.22	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK006_04	Corral Creek - lower (Blackfoot River tributary)	6.59	Miles
ESCHERICHIA COLI (E. COLI)	52522	Jul 26, 2013	
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK007_02	Grizzly Creek - source to mouth	16.72	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK007_02a	Sawmill Creek - headwaters to Grizzly Creek, Blackfoot River	7.46	Miles
ESCHERICHIA COLI (E. COLI)	52522	Jul 26, 2013	
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK007_03	Grizzly Creek - source to mouth	4.54	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	

Upper Snake

ID17040207SK007_04	Grizzly Creek - source to mouth		2.78	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK008_02	Thompson Creek - upper (Blackfoot River tributary)		10.7	Miles
ESCHERICHIA COLI (E. COLI)	52522	Jul 26, 2013		
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		
ID17040207SK009_02a	Collett Creek - headwaters to Blackfoot Reservoir		3.98	Miles
ESCHERICHIA COLI (E. COLI)	52522	Jul 26, 2013		
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		
ID17040207SK009_02b	Poison Creek - source to Blackfoot Reservoir		8.82	Miles
ESCHERICHIA COLI (E. COLI)	52522	Jul 26, 2013		
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		
ID17040207SK009_03	Little Blackfoot River		7.56	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		
ID17040207SK010_02a	State Land Creek - headwaters to Blackfoot River		9.08	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		
ID17040207SK010_04	Blackfoot River - headwaters to Slug Creek		13.82	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
TEMPERATURE	52522	Jul 26, 2013		
ID17040207SK010_05	Blackfoot River		20.72	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
TEMPERATURE	52522	Jul 26, 2013		
ID17040207SK011_02	Trail Creek - Headwaters and unnamed tributaries		24.28	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK011_03	Trail Creek - source to mouth (Below Findlayson Ranch)		7.85	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK011_03a	upper Trail Creek		1.08	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK012_02	Slug Creek - Headwaters and unnamed tributaries		101.22	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK012_02b	Goodheart Creek		7.54	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		
ID17040207SK012_03	Slug Creek - source to mouth		4.8	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK012_03a	lower Johnson Creek		2.9	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		

ID17040207SK012_04	Slug Creek - source to mouth			18.61	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK013_02	Dry Valley Creek - unnamed tributaries			14.89	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK013_02a	Dry Valley Creek			6.43	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK013_02b	Chicken Creek (tributary to Dry Valley Creek)			2.85	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK014_02	Maybe Creek - source to mouth			5.23	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK015_04	Blackfoot River - small section near Diamond Creek			0.36	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_02	Diamond Creek - unnamed tributaries			41.77	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_02b	Coyote Creek			2.88	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_02d	Timber Creek - headwaters to Diamond Creek			5.56	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_02e	Cabin Creek			3.42	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_02f	Stewart Canyon			2.99	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_02g	Campbell Canyon			2.16	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_02h	upper Kendall Creek			1.55	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_02i	lower Kendall Creek			0.77	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_03	Diamond Creek - lower			19.29	Miles
ESCHERICHIA COLI (E. COLI)		52522	Jul 26, 2013		
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK016_03a	Diamond Creek - middle			10.63	Miles
ESCHERICHIA COLI (E. COLI)		52522	Jul 26, 2013		
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		
ID17040207SK018_02	Lanes Creek - unnamed tributaries			22.25	Miles
SEDIMENTATION/SILTATION		2078	Apr 03, 2002		

Upper Snake

ID17040207SK018_02b	Daves Creek - Headwaters to road crossing	3.05	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK018_02c	Daves Creek - road crossing to Lanes Creek	0.67	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK018_02d	Corrailsen Creek	3.91	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK018_02e	Lanes Creek - FS boundary to Lander Creek	3.13	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK018_03	Lanes Creek - Lander Creek to Chippy Creek	3.65	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK018_04	Lanes Creek - Chippy Creek to Blackfoot River	9.41	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK019_02	Bacon Creek - unnamed tributaries	18.9	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK019_02a	upper Bacon Creek	9.1	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK019_02b	Bacon Creek - below FS boundary	3.52	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK019_03	Bacon Creek - below FS boundary	2.03	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK019_04	Bacon Creek - below FS boundary	4.62	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK021_03	Chippy Creek - lower (Blackfoot River tributary)	4.61	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013	
ID17040207SK022_02a	South Fork Sheep Creek	1.84	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK022_03	Sheep Creek - below confluence of South Fork Sheep Creek	2.55	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK023_02	Angus Creek - unnamed tributaries	11.31	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK023_02a	Rasmussen Creek	6.27	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	
ID17040207SK023_02b	Angus Creek - upper, headwaters to Rasumussen Creek	7.81	Miles
ESCHERICHIA COLI (E. COLI)	52522	Jul 26, 2013	
SEDIMENTATION/SILTATION	2078	Apr 03, 2002	

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ID17040207SK023_04	Lower Angus Creek - Rasmussen Creek to Blackfoot River		3.46	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK025_02	Meadow Creek - headwaters and unnamed tributaries		58.17	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK025_02a	Meadow Creek - headwaters to Crooked Creek		13.09	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK025_02d	Meadow Creek - HW to Fk (including Wham Creek)		12.31	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK025_03	Meadow Creek - Crooked Creek to Clarks Cut		7.19	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK025_03b	Crooked Creek (Meadow Cr/Blackfoot River tributary)		2.13	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		
ID17040207SK025_04	Meadow Creek - Blackfoot Reservoir to Clarks Cut		9.71	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK026_02	Brush Creek - source to mouth		54.56	Miles
TEMPERATURE	33837	Nov 30, 2007		
ID17040207SK026_03	Brush Creek - source to mouth		13.35	Miles
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
TEMPERATURE	2078	Apr 03, 2002		
ID17040207SK027_02	Rawlins Creek - headwaters to Horse Creek		6.23	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		
ID17040207SK027_03	Rawlins Creek - source to mouth		1.89	Miles
ESCHERICHIA COLI (E. COLI)	52522	Jul 26, 2013		
ID17040207SK029_02	Cedar Creek - source to mouth (Blackfoot River tributary)		21.56	Miles
ESCHERICHIA COLI (E. COLI)	52522	Jul 26, 2013		
ID17040207SK029_03	Cedar Creek - source to mouth (Blackfoot River tributary)		2.09	Miles
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		
ID17040207SK030_03	Wolverine Creek - Jones Creek to Mouth		2.55	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	2078	Apr 03, 2002		
SEDIMENTATION/SILTATION	2078	Apr 03, 2002		
ID17040207SK031_02	Jones Creek - source to mouth (Blackfoot River tributary)		4.54	Miles
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	2078	Apr 03, 2002		
SEDIMENTATION/SILTATION	52522	Jul 26, 2013		

Upper Snake

17040208 Portneuf

		EPA TMDL ID	Approval Date		
ID17040206SK001L_0L	American Falls Reservoir (Snake River)			31724.26	Acres
CHLOROPHYLL-A		42340	Aug 06, 2012		
ID17040208SK001_02	Unnamed 2nd order tributaries to Portneuf River			56.86	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK001_05	Portneuf River - Marsh Creek to American Falls Reservoir			24.46	Miles
ESCHERICHIA COLI (E. COLI)		39000	Jul 29, 2010		
NITROGEN, TOTAL		2016	Apr 16, 2001		
OIL AND GREASE		39000	Jul 29, 2010		
PHOSPHORUS, TOTAL		39000	Jul 29, 2010		
TOTAL SUSPENDED SOLIDS (TSS)		39000	Jul 29, 2010		
ID17040208SK003_02	lower Gibson Jack Creek			0.7	Miles
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK004_02a	Kinney Creek - headwaters to Mink Creek			2.58	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
TOTAL SUSPENDED SOLIDS (TSS)		39000	Jul 29, 2010		
ID17040208SK004_02c	South Fork Mink Creek - headwaters to Mink Creek			6.75	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK004_02d	East Fork Mink Creek, 2nd order			7.35	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK004_03a	Mink Creek - S. Fk to E. Fk Mink Creek			2.82	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		

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ID17040208SK004_04	Lower Mink Creek	3.81	Miles
ESCHERICHIA COLI (E. COLI)	39000	Jul 29, 2010	
NITROGEN, TOTAL	2016	Apr 16, 2001	
PHOSPHORUS, TOTAL	2016	Apr 16, 2001	
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	

ID17040208SK005_02	Indian Creek - source to mouth	8.13	Miles
ESCHERICHIA COLI (E. COLI)	39000	Jul 29, 2010	

ID17040208SK006_03	upper middle Marsh Creek	11.11	Miles
NITROGEN, TOTAL	2016	Apr 16, 2001	
PHOSPHORUS, TOTAL	2016	Apr 16, 2001	
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	

ID17040208SK006_03a	Marsh Creek - Rt Fk to Red Rock Pass	3.78	Miles
ESCHERICHIA COLI (E. COLI)	39000	Jul 29, 2010	
NITROGEN, TOTAL	39000	Jul 29, 2010	
PHOSPHORUS, TOTAL	39000	Jul 29, 2010	
TOTAL SUSPENDED SOLIDS (TSS)	39000	Jul 29, 2010	

ID17040208SK006_04	Lower Marsh Creek	17.69	Miles
NITROGEN, TOTAL	2016	Apr 16, 2001	
PHOSPHORUS, TOTAL	2016	Apr 16, 2001	
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	

ID17040208SK006_04a	Lower Middle Marsh Creek	19.76	Miles
ESCHERICHIA COLI (E. COLI)	39000	Jul 29, 2010	
NITROGEN, TOTAL	2016	Apr 16, 2001	
PHOSPHORUS, TOTAL	2016	Apr 16, 2001	
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	

ID17040208SK008_02	Bell Marsh Creek - source to mouth	1.86	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	

ID17040208SK008_02b	lower Bell Marsh Creek	2.7	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	

ID17040208SK009_02	Rowe Creek	3.82	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	

ID17040208SK009_02b	Goodenough Creek	3.67	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	

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ID17040208SK010_02	Garden Creek - source to mouth			19.43	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK010_02a	upper Garden Creek - headwaters to Garden Creek Gap			9.5	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK010_02b	Garden Creek - lower			7.65	Miles
ESCHERICHIA COLI (E. COLI)		39000	Jul 29, 2010		
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK011_02	Hawkins Creek - Hawkins Reservoir Dam to mouth			23.58	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK011_03	lower Hawkins Creek			9.11	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK012L_0L	Hawkins Reservoir			67.42	Acres
NITROGEN, TOTAL		39000	Jul 29, 2010		
PHOSPHORUS, TOTAL		39000	Jul 29, 2010		
ID17040208SK013_02	Hawkins Creek - source to Hawkins Reservoir			17.03	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK013_02a	Hawkins Creek			4.95	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK013_02b	Yellow Dog Creek - headwaters to Hawkins Creek			6.01	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		

ID17040208SK013_03	Hawkins Creek - source to Hawkins Reservoir			0.93	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK014_02	Cherry Creek - ephemeral tributaries			17.64	Miles
ESCHERICHIA COLI (E. COLI)		39000	Jul 29, 2010		
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK014_02a	Upper Cherry Creek			10.04	Miles
ESCHERICHIA COLI (E. COLI)		39000	Jul 29, 2010		
ID17040208SK014_02b	Cherry Creek			5.83	Miles
ESCHERICHIA COLI (E. COLI)		39000	Jul 29, 2010		
ID17040208SK014_03	Cherry Creek - lower			1.57	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK014_04	Birch Creek from Cherry Creek to Marsh Creek confluences			2.74	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK015_02	Birch Creek - source to mouth			13.05	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK015_03	Birch Creek - source to mouth			3.96	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK015_03a	Birch Creek - Mill Creek to I-15 road crossing			2.8	Miles
NITROGEN, TOTAL		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK016_02	Portneuf R - 2nd order tribs-Chesterfield Dam to Marsh Creek			162.63	Miles
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		

Upper Snake

ID17040208SK016_03	Portneuf River- Chesterfield Reservoir to Toponce Creek			5.52	Miles
FECAL COLIFORM		2016	Apr 16, 2001		
NITROGEN, TOTAL		2016	Apr 16, 2001		
OIL AND GREASE		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK016_04	Portneuf River- hist. channel, Toponce to Twentyfour Mile Ck			2.82	Miles
FECAL COLIFORM		2016	Apr 16, 2001		
NITROGEN, TOTAL		2016	Apr 16, 2001		
OIL AND GREASE		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK016_05	Portneuf River- Twentyfour Mile Creek to Marsh Creek			52.21	Miles
FECAL COLIFORM		2016	Apr 16, 2001		
NITROGEN, TOTAL		2016	Apr 16, 2001		
OIL AND GREASE		2016	Apr 16, 2001		
PHOSPHORUS, TOTAL		2016	Apr 16, 2001		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK017_02	Dempsey Creek - source to mouth			1.39	Miles
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK017_02c	Beaverdam Creek			3.84	Miles
TOTAL SUSPENDED SOLIDS (TSS)		39000	Jul 29, 2010		
ID17040208SK017_03	Lower Dempsey Creek			3.58	Miles
ESCHERICHIA COLI (E. COLI)		39000	Jul 29, 2010		
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK018_02	Unnamed tribs to Twentyfourmile and Eighteenmile Creeks			59	Miles
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK018_02a	Twentyfour Mile Creek			1.17	Miles
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK018_03	Eighteenmile Creek			5.16	Miles
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK018_03a	Twentyfour Mile Creek			6.07	Miles
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		
ID17040208SK020_02	Portneuf R.-tributaries - source to Chesterfield Reservoir			5.84	Miles
SEDIMENTATION/SILTATION		2016	Apr 16, 2001		

ID17040208SK021_02	Unnamed tributary to Toponce Creek	2.63	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK021_02a	Little Toponce Creek	1.38	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK021_02e	upper Toponce Creek	5.59	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK021_03	lower Toponce Creek	4.24	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK022_02	Pebble Creek - source to mouth	1.8	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK022_03a	North Fork Pebble Creek	0.98	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK023_02	Unnamed 2nd order tributaries to Rapid Creek	28.88	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK023_02a	upper Jackson Creek	2.38	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK023_02b	lower Jackson Creek	2.15	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK023_02e	upper Moonlight Creek	2.76	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK023_02f	lower Moonlight Creek	0.71	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK023_03a	lower Inman Creek	2.38	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK023_03c	North Fork Rapid Creek	1.58	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK024_02	Unnamed forks of Pocatello Creek	3.71	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK024_03	lower Pocatello Creek	2.91	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK024_03a	middle Pocatello Creek - Fks to Outback Driving Range	2.02	Miles
SEDIMENTATION/SILTATION	2016	Apr 16, 2001	
ID17040208SK025_02	South Fork Pocatello Creek - source to mouth	5.02	Miles
TOTAL SUSPENDED SOLIDS (TSS)	39000	Jul 29, 2010	

17040209 Lake Walcott

		EPA TMDL ID	Approval Date		
ID17040206SK026_02	Pleasant Valley - source to American Falls Reservoir			78.95	Miles
PHOSPHORUS, TOTAL		42340	Aug 06, 2012		
ID17040209SK001_02	D16 Drain & 2nd order tributaries to the Snake River			5.46	Miles
PHOSPHORUS, TOTAL		649	Jun 27, 2000		
ID17040209SK001_07	Snake River - Heyburn/Burley Bridge to Milner Dam			15.58	Miles
PHOSPHORUS, TOTAL		649	Jun 27, 2000		
ID17040209SK002_02	Duck Creek, Spring Creek & 2nd order Snake River tributaries			41.44	Miles
PHOSPHORUS, TOTAL		649	Jun 27, 2000		
ID17040209SK002_07	Snake River - Minidoka Dam to Heyburn/Burley Bridge			19.54	Miles
PHOSPHORUS, TOTAL		649	Jun 27, 2000		
ID17040209SK003_03	Marsh Creek - source to mouth			12.17	Miles
ESCHERICHIA COLI (E. COLI)		63781	Jan 23, 2015		
TEMPERATURE		63781	Jan 23, 2015		
ID17040209SK003_04	Marsh Creek - source to mouth			17.14	Miles
ESCHERICHIA COLI (E. COLI)		63781	Jan 23, 2015		
TEMPERATURE		63781	Jan 23, 2015		
ID17040209SK008_04	Rock Creek - lower (Rockland Valley)			12.53	Miles
TOTAL SUSPENDED SOLIDS (TSS)		2007	Oct 11, 2000		
ID17040209SK009_02	South Fork Rock Creek - source to mouth			246.35	Miles
TOTAL SUSPENDED SOLIDS (TSS)		649	Jun 27, 2000		
ID17040209SK009_03	South Fork Rock Creek - source to mouth			8.01	Miles
TOTAL SUSPENDED SOLIDS (TSS)		649	Jun 27, 2000		
ID17040209SK009_04	South Fork Rock Creek - source to mouth			20.14	Miles
TOTAL SUSPENDED SOLIDS (TSS)		649	Jun 27, 2000		
ID17040209SK010_02	East Fork Rock Creek - source to mouth			22.24	Miles
TOTAL SUSPENDED SOLIDS (TSS)		649	Jun 27, 2000		
ID17040209SK010_03	Rock Creek - East Fork (Rockland) source to mouth			9.24	Miles
TOTAL SUSPENDED SOLIDS (TSS)		649	Jun 27, 2000		

17040210 Raft

		EPA TMDL ID	Approval Date		
ID17040210SK002_02	Raft River - Cassia Creek to Heglar Canyon Creek			166.91	Miles
ESCHERICHIA COLI (E. COLI)		10681	Jul 27, 2004		
SEDIMENTATION/SILTATION		10681	Jul 27, 2004		

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ID17040210SK003_04	Cassia Creek - Conner Creek to mouth			12.76	Miles
ESCHERICHIA COLI (E. COLI)		10681	Jul 27, 2004		
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		
SEDIMENTATION/SILTATION		10681	Jul 27, 2004		
ID17040210SK005_04	Cassia Creek - Clyde Creek to Conner Creek			4.49	Miles
ESCHERICHIA COLI (E. COLI)		10681	Jul 27, 2004		
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		
SEDIMENTATION/SILTATION		10681	Jul 27, 2004		
TEMPERATURE		41538	Apr 17, 2012		
ID17040210SK007_02	Cassia Creek - source to Clyde Creek			38.5	Miles
ESCHERICHIA COLI (E. COLI)		10681	Jul 27, 2004		
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		
SEDIMENTATION/SILTATION		10681	Jul 27, 2004		
ID17040210SK007_03	Cassia Creek- source to confluence of Dry Creek			7.11	Miles
ESCHERICHIA COLI (E. COLI)		10681	Jul 27, 2004		
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		
SEDIMENTATION/SILTATION		10681	Jul 27, 2004		
ID17040210SK007_04	Cassia Creek - Cross Creek to Clyde Creek			5.51	Miles
ESCHERICHIA COLI (E. COLI)		10681	Jul 27, 2004		
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		
SEDIMENTATION/SILTATION		10681	Jul 27, 2004		
ID17040210SK008_04	Raft River - Cottonwood Creek to Cassia Creek			19.86	Miles
ESCHERICHIA COLI (E. COLI)		10681	Jul 27, 2004		
SEDIMENTATION/SILTATION		10681	Jul 27, 2004		
TEMPERATURE		10681	Jul 27, 2004		
ID17040210SK010_04	Raft River			19.1	Miles
SEDIMENTATION/SILTATION		10681	Jul 27, 2004		
TEMPERATURE		10681	Jul 27, 2004		
ID17040210SK013_04	Raft River - Idaho/Utah border to Edwards Creek			8.32	Miles
ESCHERICHIA COLI (E. COLI)		10681	Jul 27, 2004		
SEDIMENTATION/SILTATION		10681	Jul 27, 2004		
TEMPERATURE		10681	Jul 27, 2004		
ID17040210SK020_0L	Sublett Reservoir			79.91	Acres
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		
ID17040210SK021_02	Sublett Creek - source to Sublett Reservoir			38.45	Miles
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		

ID17040210SK021_03	Sublett Creek - source to Sublett Reservoir			5.9	Miles
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		
ID17040210SK022_02	Lake Fork - source to Sublett Reservoir			17	Miles
ESCHERICHIA COLI (E. COLI)		10681	Jul 27, 2004		
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		
ID17040210SK022_03	Lake Fork - source to Sublett Reservoir			1.34	Miles
PHOSPHORUS, TOTAL		10681	Jul 27, 2004		

17040211 Goose

		EPA TMDL ID	Approval Date		
ID17040209SK001_02	D16 Drain & 2nd order tributaries to the Snake River			5.46	Miles
PHOSPHORUS, TOTAL		649	Jun 27, 2000		
ID17040211SK000_02A	Little Cottonwood Creek			63.28	Miles
ESCHERICHIA COLI (E. COLI)		10680	Jul 25, 2004		
ID17040211SK003_02	Trapper Creek			28.09	Miles
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		
SEDIMENTATION/SILTATION		10680	Jul 25, 2004		
ID17040211SK003_04	Trapper Creek - from and including Squaw Cr. to reservoir			7.3	Miles
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		
SEDIMENTATION/SILTATION		10680	Jul 25, 2004		
ID17040211SK004_02	Trapper Creek - source to Squaw Creek			32.59	Miles
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		
SEDIMENTATION/SILTATION		10680	Jul 25, 2004		
ID17040211SK004_03	Trapper Creek - source to Squaw Creek			8.95	Miles
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		
SEDIMENTATION/SILTATION		10680	Jul 25, 2004		
ID17040211SK005_03	Goose Creek - Beaverdam Creek to Lower Goose Creek Reservoir			7.18	Miles
TEMPERATURE		10680	Jul 25, 2004		
ID17040211SK005_05	Goose Creek - Beaverdam Creek to Lower Goose Creek Reservoir			18.76	Miles
SEDIMENTATION/SILTATION		10680	Jul 25, 2004		
TEMPERATURE		10680	Jul 25, 2004		
ID17040211SK006_02	Beaverdam Creek - source to mouth			55.89	Miles
DISSOLVED OXYGEN		10680	Jul 25, 2004		
ESCHERICHIA COLI (E. COLI)		10680	Jul 25, 2004		
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		
TEMPERATURE		10680	Jul 25, 2004		
TOTAL SUSPENDED SOLIDS (TSS)		10680	Jul 25, 2004		

ID17040211SK006_03	Beaverdam Creek - source to mouth			6.32	Miles
DISSOLVED OXYGEN		10680	Jul 25, 2004		
ESCHERICHIA COLI (E. COLI)		10680	Jul 25, 2004		
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		
TEMPERATURE		10680	Jul 25, 2004		
TOTAL SUSPENDED SOLIDS (TSS)		10680	Jul 25, 2004		
ID17040211SK007_02	Trout Creek - source to Idaho/Nevada border			19.92	Miles
TEMPERATURE		41539	Apr 25, 2012		
ID17040211SK007_03	Trout Creek - source to Idaho/Nevada border			4.33	Miles
TEMPERATURE		41539	Apr 25, 2012		
ID17040211SK008_02	Goose Creek - source to Idaho/Utah border			65.23	Miles
TEMPERATURE		41539	Apr 25, 2012		
ID17040211SK009_02	Birch Creek - Idaho/Utah border to mouth			11.04	Miles
ESCHERICHIA COLI (E. COLI)		10680	Jul 25, 2004		
ID17040211SK009_03	Birch Creek - Idaho/Utah border to mouth			2.28	Miles
ESCHERICHIA COLI (E. COLI)		10680	Jul 25, 2004		
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		
ID17040211SK011_02	Cold Creek - source to mouth			15.76	Miles
TEMPERATURE		10680	Jul 25, 2004		
ID17040211SK012_02	Unnamed tributary to Birch Creek			66.9	Miles
ESCHERICHIA COLI (E. COLI)		10680	Jul 25, 2004		
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		
ID17040211SK012_03	Birch Creek - source to mouth			6.66	Miles
ESCHERICHIA COLI (E. COLI)		10680	Jul 25, 2004		
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		
ID17040211SK012_04	Birch Creek - source to mouth			11.9	Miles
ESCHERICHIA COLI (E. COLI)		10680	Jul 25, 2004		
PHOSPHORUS, TOTAL		10680	Jul 25, 2004		

17040212 Upper Snake-Rock

		EPA TMDL ID	Approval Date		
ID17040212SK000_02	1st and 2nd order tribs to Yahoo and Deep Creek			391.97	Miles
FECAL COLIFORM		2018	Aug 25, 2000		
PHOSPHORUS, TOTAL		2018	Aug 25, 2000		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
		2018	Aug 25, 2000		

Upper Snake

ID17040212SK001_02	Snake River - Lower Salmon Falls to Clover Creek			22.13	Miles
	PHOSPHORUS, TOTAL	12122	Sep 14, 2005		
	TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005		
ID17040212SK001_07	Snake River - Lower Salmon Falls to Clover Creek			26.68	Miles
	PHOSPHORUS, TOTAL	12122	Sep 14, 2005		
		2018	Aug 25, 2000		
		781	Apr 25, 1997		
	TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005		
ID17040212SK005_02	Snake River tribs containing Riley Creek and Sand Springs			17.38	Miles
	FECAL COLIFORM	2018	Aug 25, 2000		
	PHOSPHORUS, TOTAL	2018	Aug 25, 2000		
	TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005		
		2018	Aug 25, 2000		
ID17040212SK005_07	Snake River - Box Canyon Creek to Lower Salmon Falls			16.51	Miles
	PHOSPHORUS, TOTAL	2018	Aug 25, 2000		
	TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005		
ID17040212SK006_02	Riley Creek - source to mouth			4.16	Miles
	TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005		
ID17040212SK007_02	2nd order segments of Briggs Creeks and Cedar Draw			31.06	Miles
	PHOSPHORUS, TOTAL	2018	Aug 25, 2000		
	TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005		
ID17040212SK007_07	Snake River - Rock Creek to Box Canyon Creek			18.3	Miles
	PHOSPHORUS, TOTAL	2018	Aug 25, 2000		
		781	Apr 25, 1997		
	TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005		
ID17040212SK008_02	Deep Creek - High Line Canal to mouth			15.81	Miles
	FECAL COLIFORM	2018	Aug 25, 2000		
	PHOSPHORUS, TOTAL	12122	Sep 14, 2005		
	TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005		
ID17040212SK008_03	Deep Creek - High Line Canal to Snake River (3rd order)			9.74	Miles
	FECAL COLIFORM	2018	Aug 25, 2000		
	PHOSPHORUS, TOTAL	12122	Sep 14, 2005		
	TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005		

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Upper Snake

ID17040212SK010_02	Mud Creek and Clear Creek	7.39	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
ID17040212SK010_03	Mud Creek - Deep Creek Road (T09S, R14E) to mouth	1.07	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
ID17040212SK011_02	Mud Creek - source to Deep Creek Road (T09S, R14E)	9.54	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
ID17040212SK012_02	Cedar Draw - source to mouth	17.98	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
ID17040212SK012_03	Cedar Draw - source to mouth	2.93	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
ID17040212SK013_04	Rock Creek -river mile 25 (T11S, R18E, Sec. 36) to mouth	4.63	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
ID17040212SK013_05	Rock Creek -river mile 25 (T11S, R18E, Sec. 36) to mouth	20.19	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	12122	Sep 14, 2005	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
ID17040212SK014_02	North/Dry Cottonwood Creek - source to mouth	37.64	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	12122	Sep 14, 2005	
SEDIMENTATION/SILTATION	12122	Sep 14, 2005	
ID17040212SK014_04	Cottonwood Creek - 4th order segment	6.26	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	12122	Sep 14, 2005	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	

Upper Snake

ID17040212SK015_02	McMullen Creek - source to mouth			49.99	Miles
FECAL COLIFORM		2018	Aug 25, 2000		
PHOSPHORUS, TOTAL		2018	Aug 25, 2000		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
ID17040212SK015_03	McMullen Creek - source to mouth			9.41	Miles
FECAL COLIFORM		2018	Aug 25, 2000		
PHOSPHORUS, TOTAL		2018	Aug 25, 2000		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
ID17040212SK016_04	Rock Creek			8.31	Miles
PHOSPHORUS, TOTAL		2018	Aug 25, 2000		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
ID17040212SK019_02	Snake River - Twin Falls to Rock Creek			0.92	Miles
PHOSPHORUS, TOTAL		12122	Sep 14, 2005		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
ID17040212SK019_07	Snake River - Twin Falls to Rock Creek			12.58	Miles
PHOSPHORUS, TOTAL		2018	Aug 25, 2000		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
		2018	Aug 25, 2000		
		40172	Mar 30, 2011		
ID17040212SK020_07	Snake River - Milner Dam to Twin Falls			21.31	Miles
PHOSPHORUS, TOTAL		2018	Aug 25, 2000		
		781	Apr 25, 1997		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
ID17040212SK022_03	Dry Creek - source to mouth			9.85	Miles
FECAL COLIFORM		2018	Aug 25, 2000		
PHOSPHORUS, TOTAL		12122	Sep 14, 2005		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
ID17040212SK023_02	West Fork Dry Creek - source to mouth			10.72	Miles
FECAL COLIFORM		2018	Aug 25, 2000		
PHOSPHORUS, TOTAL		2018	Aug 25, 2000		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
ID17040212SK027_02	Vinyard Creek - Vinyard Lake to mouth			10.8	Miles
PHOSPHORUS, TOTAL		2018	Aug 25, 2000		
ID17040212SK028_02	Clear Lakes			22.52	Acres
PHOSPHORUS, TOTAL		2018	Aug 25, 2000		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		

ID17040212SK031_02	Sand Springs	4.6	Miles
PHOSPHORUS, TOTAL	12122	Sep 14, 2005	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	

ID17040212SK033_02	Billingsley Creek - source to mouth	8.13	Miles
PHOSPHORUS, TOTAL	125	Aug 23, 1993	
	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
	125	Aug 23, 1993	

ID17040212SK034_04	Clover Creek - Pioneer Reservoir Dam outlet to Snake River	10.1	Miles
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	

ID17040212SK035_04	Pioneer Reservoir	228.92	Acres
PHOSPHORUS, TOTAL	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	

ID17040212SK036_02	Clover Creek - source to Pioneer Reservoir	72.84	Miles
PHOSPHORUS, TOTAL	12122	Sep 14, 2005	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
	2018	Aug 25, 2000	

ID17040212SK036_04	Clover Creek - source to Pioneer Reservoir	26.04	Miles
PHOSPHORUS, TOTAL	12122	Sep 14, 2005	
	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
	2018	Aug 25, 2000	

17040213 Salmon Falls

	EPA TMDL ID	Approval Date	
ID17040212SK000_02	**1st and 2nd order tribs to Yahoo and Deep Creek**	**391.97**	**Miles**
FECAL COLIFORM	2018	Aug 25, 2000	
PHOSPHORUS, TOTAL	2018	Aug 25, 2000	
TOTAL SUSPENDED SOLIDS (TSS)	12122	Sep 14, 2005	
	2018	Aug 25, 2000	
ID17040213SK000_04	**Cedar Creek-reservoir to Salmon Falls Creek**	**9.1**	**Miles**
SEDIMENTATION/SILTATION	34001	Feb 27, 2008	
TEMPERATURE	34001	Feb 27, 2008	

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ID17040213SK001_06	**Salmon Falls Creek - Devil Creek to mouth**	**21.94**	**Miles**
NITROGEN, TOTAL	34001	Feb 27, 2008	
PHOSPHORUS, TOTAL	34001	Feb 27, 2008	
TEMPERATURE	34001	Feb 27, 2008	
TOTAL SUSPENDED SOLIDS (TSS)	34001	Feb 27, 2008	
ID17040213SK002_03	**Devil Creek**	**26.45**	**Miles**
TEMPERATURE	34001	Feb 27, 2008	
ID17040213SK002_04	**Devil Creek - 4th order segment to mouth**	**15.8**	**Miles**
TEMPERATURE	34001	Feb 27, 2008	
ID17040213SK003_06	**Salmon Falls Creek - Salmon Falls Creek Dam to Devil Creek**	**27.56**	**Miles**
NITROGEN, TOTAL	34001	Feb 27, 2008	
PHOSPHORUS, TOTAL	34001	Feb 27, 2008	
TEMPERATURE	34001	Feb 27, 2008	
TOTAL SUSPENDED SOLIDS (TSS)	34001	Feb 27, 2008	
ID17040213SK004_02	**01 & 02 tribs Cedar Creek Reservoir**	**29.15**	**Miles**
PHOSPHORUS, TOTAL	34001	Feb 27, 2008	
SEDIMENTATION/SILTATION	34001	Feb 27, 2008	
TEMPERATURE	34001	Feb 27, 2008	
ID17040213SK004_0L	**Cedar Creek Reservoir**	**970.63**	**Acres**
PHOSPHORUS, TOTAL	34001	Feb 27, 2008	
SEDIMENTATION/SILTATION	34001	Feb 27, 2008	
TEMPERATURE	34001	Feb 27, 2008	
ID17040213SK005_02	**House Creek - source to Cedar Creek Reservoir**	**56.59**	**Miles**
PHOSPHORUS, TOTAL	34001	Feb 27, 2008	
SEDIMENTATION/SILTATION	34001	Feb 27, 2008	
TEMPERATURE	34001	Feb 27, 2008	
ID17040213SK005_03	**House Creek - source to Cedar Creek Reservoir**	**12.81**	**Miles**
PHOSPHORUS, TOTAL	34001	Feb 27, 2008	
SEDIMENTATION/SILTATION	34001	Feb 27, 2008	
TEMPERATURE	34001	Feb 27, 2008	
ID17040213SK006_02	**Cedar Creek - source to Cedar Creek Reservoir**	**44.27**	**Miles**
PHOSPHORUS, TOTAL	34001	Feb 27, 2008	
SEDIMENTATION/SILTATION	34001	Feb 27, 2008	
TEMPERATURE	34001	Feb 27, 2008	

Upper Snake

ID17040213SK006_03	Cedar Creek - source to Cedar Creek Reservoir		3.72	Miles
PHOSPHORUS, TOTAL	34001	Feb 27, 2008		
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK007L_0L	Salmon Falls Creek Reservoir		2648.81	Acres
MERCURY	34001	Feb 27, 2008		
PHOSPHORUS, TOTAL	34001	Feb 27, 2008		
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK008_02	China, Browns, Corral, Player Creeks		47.57	Miles
PHOSPHORUS, TOTAL	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK008_03	China Creek		3.22	Miles
PHOSPHORUS, TOTAL	34001	Feb 27, 2008		
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK009_06	Salmon Falls Creek-Idaho/Nevada border to Salmon Falls Creek		8.66	Miles
PHOSPHORUS, TOTAL	34001	Feb 27, 2008		
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
TOTAL SUSPENDED SOLIDS (TSS)	34001	Feb 27, 2008		
ID17040213SK010_02	North Fork Salmon Falls Creek-source to Idaho/Nevada border		26.74	Miles
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK010_03	North Fork Salmon Falls Creek-source to Idaho/Nevada border		0.85	Miles
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK011_04	Shoshone Creek - Hot Creek to Idaho/Nevada border		11.06	Miles
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK012_02	Hot Creek - Idaho/Nevada border to mouth		28.64	Miles
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK012_03	Hot Creek - Idaho/Nevada border to mouth		3.54	Miles
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK012_03A	Hot Creek		2.34	Miles
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK012_04	Hot Creek - Idaho/Nevada border to mouth		0.11	Miles
TEMPERATURE	34001	Feb 27, 2008		

ID17040213SK013_04	Shoshone Creek - Cottonwood Creek to Hot Creek		9.66	Miles
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK014_02	Big Creek - source to mouth		38.26	Miles
PHOSPHORUS, TOTAL	34001	Feb 27, 2008		
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK014_03	Big Creek - source to mouth		7.18	Miles
PHOSPHORUS, TOTAL	34001	Feb 27, 2008		
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK015_02	Cottonwood Creek - source to mouth		36.63	Miles
ESCHERICHIA COLI (E. COLI)	34001	Feb 27, 2008		
PHOSPHORUS, TOTAL	34001	Feb 27, 2008		
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK015_03	Cottonwood Creek - source to mouth		3.57	Miles
ESCHERICHIA COLI (E. COLI)	34001	Feb 27, 2008		
PHOSPHORUS, TOTAL	34001	Feb 27, 2008		
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK016_02	Shoshone Creek - source to Cottonwood Creek		55.89	Miles
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		
ID17040213SK016_03	Shoshone Creek - source to Cottonwood Creek		11.69	Miles
SEDIMENTATION/SILTATION	34001	Feb 27, 2008		
TEMPERATURE	34001	Feb 27, 2008		

17040214 Beaver-Camas

	EPA TMDL ID	Approval Date		
ID17040214SK002_05	Camas Creek - Spring Creek to Beaver Creek		40.87	Miles
SEDIMENTATION/SILTATION	11655	Aug 04, 2005		
TEMPERATURE	11655	Aug 04, 2005		
ID17040214SK010_02	East Camas Creek		2.43	Miles
TEMPERATURE	11655	Aug 04, 2005		
ID17040214SK010_03	East Camas Creek		4.26	Miles
TEMPERATURE	11655	Aug 04, 2005		

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ID17040214SK011_02	East Camas Creek - source to Larkspur Creek		9.63	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK011_03	East Camas Creek - source to Larkspur Creek		3.39	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK012_03	West Camas Creek		21.29	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK013_02	West Camas Creek -source to Targhee National Forest Boundary		52.54	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK013_03	West Camas Creek -source to Targhee National Forest Boundary		6.54	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK014_05	Beaver Creek - Dry Creek to canal (T09N, R36E)		15.7	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK017_02	Threemile Creek - source to mouth		23.1	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK017_03	Threemile Creek - source to mouth		1.82	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK018_02	Beaver Creek - Miners Creek to Rattlesnake Creek		40.25	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK018_04	Beaver Creek - Miners Creek to Rattlesnake Creek		8.93	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK020_03	Beaver Creek - Idaho Creek to Miners Creek		3.63	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK021_02	Beaver Creek - source to Idaho Creek		68.41	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK021_03	Beaver Creek - source to Idaho Creek		5.37	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040214SK024_02	Huntley Canyon Creek - source to mouth		5.77	Miles
TEMPERATURE		11655	Aug 04, 2005	
ID17040215SK002_04	Medicine Lodge Creek		51.98	Miles
SEDIMENTATION/SILTATION		4152	May 06, 2003	
TEMPERATURE		4152	May 06, 2003	
		67360	Jan 26, 2017	

Upper Snake

17040215 Medicine Lodge

		EPA TMDL ID	Approval Date		
ID17040215SK002_04	Medicine Lodge Creek			51.98	Miles
SEDIMENTATION/SILTATION		4152	May 06, 2003		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK003_02	Indian Creek - confluence of West and East Fork Indian Creek			10.48	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK003_03	Indian Creek - confluence of West and East Fork Indian Creek			6.04	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK005_02	West Fork Indian Creek - source to mouth			24.46	Miles
ESCHERICHIA COLI (E. COLI)		67360	Jan 26, 2017		
ID17040215SK006_04	Medicine Lodge Creek - Edie Creek to Indian Creek			14.7	Miles
ESCHERICHIA COLI (E. COLI)		67360	Jan 26, 2017		
SEDIMENTATION/SILTATION		4152	May 06, 2003		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK007_02	Middle Creek - Dry Creek to mouth			27.33	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK007_03	Middle Creek - Dry Creek to mouth			5.61	Miles
ESCHERICHIA COLI (E. COLI)		67360	Jan 26, 2017		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK008_02	Middle Creek - source to Dry Creek			12.12	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK010_02	Edie Creek - source to mouth			10.17	Miles
SEDIMENTATION/SILTATION		4152	May 06, 2003		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		

ID17040215SK011_02	Medicine Lodge Creek			19.17	Miles
SEDIMENTATION/SILTATION		4152	May 06, 2003		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK011_03	Medicine Lodge Creek			1.83	Miles
SEDIMENTATION/SILTATION		4152	May 06, 2003		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK011_04	Medicine Lodge Creek			3.83	Miles
SEDIMENTATION/SILTATION		4152	May 06, 2003		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK012_02	Irving Creek - source to mouth			13.69	Miles
SEDIMENTATION/SILTATION		4152	May 06, 2003		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK012_03	Irving Creek - source to mouth			2.56	Miles
SEDIMENTATION/SILTATION		4152	May 06, 2003		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK013_02	Warm Creek - source to mouth			14.88	Miles
TEMPERATURE		4152	May 06, 2003		
ID17040215SK013_03	Warm Creek - source to mouth			2.44	Miles
ESCHERICHIA COLI (E. COLI)		67360	Jan 26, 2017		
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK015_02	Horse Creek - source to mouth			8.42	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK016_02	Fritz Creek - source to mouth			15.27	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK017_02	Webber Creek - source to mouth			28.27	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		

ID17040215SK018_02	Deep Creek - source to mouth			77.08	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK018_03	Deep Creek - source to mouth			8.98	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK021_02	Crooked Creek - source to mouth			53.1	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		
ID17040215SK021_03	Crooked Creek - source to mouth			3.67	Miles
TEMPERATURE		4152	May 06, 2003		
		67360	Jan 26, 2017		

17040217 Little Lost

		EPA TMDL ID	Approval Date		
ID17040217SK001_05	Little Lost River - canal (T06N, R28E) to playas			18.63	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK002_05	Little Lost River - Big Spring Creek to canal (T06N, R28E)			5.66	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK003_02	Big Spring Creek - source to mouth			8.1	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK003_03	Big Spring Creek - source to mouth			7.1	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK003_04	Big Spring Creek - source to mouth			1.98	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK007_02	Little Lost River - Badger Creek to Big Spring Creek			79.14	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK007_04	Little Lost River - Badger Creek to Big Spring Creek			14.15	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK009_02	Little Lost River - Wet Creek to Badger Creek			54.26	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK009_04	Little Lost River - Wet Creek to Badger Creek			8.89	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		

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ID17040217SK010_04	Little Lost River - confluence of Summit and Sawmill Creeks			8.56	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK012_04	Sawmill Creek - Warm Creek to mouth			8.13	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK014_02	Sawmill Creek			33.46	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK014_04	Sawmill Creek			7.65	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK015_02	Squaw Creek - source to mouth			12.53	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK017_02	Main Fork - source to mouth			15.65	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		
ID17040217SK017_03	Main Fork - source to mouth			2.69	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		
ID17040217SK018_03	Timber Creek - source to mouth			1.48	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK019_02a	Moffett Creek			2.58	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK019_03	Summit Creek - source to mouth			9	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK020_03	Dry Creek - Dry Creek Canal to mouth			14.65	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK021_02	Dry Creek - source to Dry Creek Canal			46.58	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK021_03	Dry Creek - source to Dry Creek Canal			2.69	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK022_03	Wet Creek - Squaw Creek to mouth			8.36	Miles
TEMPERATURE		65300	Jan 14, 2016		
ID17040217SK024_02	Wet Creek - source to Squaw Creek			53.22	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		
ID17040217SK024_03	Wet Creek - source to Squaw Creek			5.8	Miles
SEDIMENTATION/SILTATION		703	Sep 27, 2000		
TEMPERATURE		65300	Jan 14, 2016		

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ID17040217SK025_02	Deer Creek - source to mouth			17.21	Miles
TEMPERATURE		65300	Jan 14, 2016		

17040218 Big Lost

		EPA TMDL ID	Approval Date		
ID17040218SK006_06	Lower Pass Creek - source to mouth			3.95	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK007_05	Big Lost River - Alder Creek to Antelope Creek			16	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK010_05	Big Lost River - Beck and Evan Ditch to Alder Creek			7.82	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK011_05	Big Lost River - McKay Reservoir Dam to Beck and Evan Ditch			14.72	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK013_05	Big Lost River - Jones Creek to McKay Reservoir			4.16	Miles
SEDIMENTATION/SILTATION		41461	Dec 14, 2011		
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK015_05	Big Lost River - Thousand Springs Creek to Jones Creek			4.77	Miles
SEDIMENTATION/SILTATION		41461	Dec 14, 2011		
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK016_02	Thousand Springs Creek - source to mouth			20.15	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK016_03	Thousand Springs Creek - source to mouth			12.03	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
ID17040218SK022_02	Sage Creek - source to mouth			35.64	Miles
ESCHERICHIA COLI (E. COLI)		41461	Dec 14, 2011		
ID17040218SK024_05	Big Lost River - Burnt Creek to Thousand Springs Creek			18.99	Miles
SEDIMENTATION/SILTATION		41461	Dec 14, 2011		
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK025_05	Big Lost River - Summit Creek to and including Burnt Creek			5.43	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK026_02	Bridge Creek - source to mouth			21.48	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK026_03	Bridge Creek - source to mouth			3.94	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		41461	Dec 14, 2011		

Upper Snake

ID17040218SK027_03	North Fork Big Lost River - source to mouth		12.54	Miles
SEDIMENTATION/SILTATION	10685	Aug 03, 2004		
TEMPERATURE	10685	Aug 03, 2004		
	ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK028_02	Summit Creek - source to mouth		33.33	Miles
SEDIMENTATION/SILTATION	10685	Aug 03, 2004		
TEMPERATURE	10685	Aug 03, 2004		
	ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK030_04	Wildhorse Creek - Fall Creek to mouth		4.95	Miles
SEDIMENTATION/SILTATION	4152	May 06, 2003		
TEMPERATURE	10685	Aug 03, 2004		
	ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK033_02	East Fork Big Lost River - Cabin Creek to mouth		58.56	Miles
SEDIMENTATION/SILTATION	10685	Aug 03, 2004		
TEMPERATURE	41461	Dec 14, 2011		
ID17040218SK033_03	East Fork Big Lost River - Cabin Creek to mouth		1.9	Miles
SEDIMENTATION/SILTATION	10685	Aug 03, 2004		
TEMPERATURE	41461	Dec 14, 2011		
ID17040218SK033_04	East Fork Big Lost River - Cabin Creek to mouth		18.35	Miles
SEDIMENTATION/SILTATION	10685	Aug 03, 2004		
TEMPERATURE	41461	Dec 14, 2011		
ID17040218SK035_02	Star Hope Creek - Lake Creek to mouth		17.1	Miles
SEDIMENTATION/SILTATION	10685	Aug 03, 2004		
TEMPERATURE	10685	Aug 03, 2004		
	ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK035_04	Star Hope Creek - Lake Creek to mouth		7.63	Miles
SEDIMENTATION/SILTATION	10685	Aug 03, 2004		
TEMPERATURE	10685	Aug 03, 2004		
	ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK036_04	Star Hope Creek - source to Lake Creek		3.32	Miles
SEDIMENTATION/SILTATION	10685	Aug 03, 2004		
TEMPERATURE	10685	Aug 03, 2004		
	ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK039_02	East Fork Big Lost River - source to Cabin Creek		37.58	Miles
SEDIMENTATION/SILTATION	10685	Aug 03, 2004		
TEMPERATURE	41461	Dec 14, 2011		

Upper Snake

ID17040218SK039_03	East Fork Big Lost River - source to Cabin Creek			5.34	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK041_02	Corral Creek - source to mouth			18.03	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		10685	Aug 03, 2004		
		ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK043_02	Warm Springs Creek - source to mouth			65.08	Miles
TEMPERATURE		10685	Aug 03, 2004		
		ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK043_03	Warm Springs Creek - source to mouth			1.19	Miles
TEMPERATURE		10685	Aug 03, 2004		
		ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK046_02	Antelope Creek - Spring Creek to mouth			49.58	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		10685	Aug 03, 2004		
		ID_BigLo_Jun-10-19	Jun 10, 2019		
ID17040218SK046_05	Antelope Creek - Spring Creek to mouth			26.73	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK047_04	Antelope Creek - Dry Fork Creek to Spring Creek			3.56	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK047_05	Antelope Creek - Dry Fork Creek to Spring Creek			0.25	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK049_04	Cherry Creek-confluence of Left Fork Cherry and Lupine Creek			13.46	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK049_05	Cherry Creek-confluence of Left Fork Cherry and Lupine Creek			0.65	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK052_04	Antelope Creek - Iron Bog Creek to Dry Fork Creek			12.45	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK053_03	Bear Creek - source to mouth			5.09	Miles
SEDIMENTATION/SILTATION		10685	Aug 03, 2004		
TEMPERATURE		10685	Aug 03, 2004		
		ID_BigLo_Jun-10-19	Jun 10, 2019		

ID17040218SK057_02	Antelope Creek - source to Iron Bog Creek			19.14	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK057_03	Antelope Creek - source to Iron Bog Creek			3.49	Miles
TEMPERATURE		41461	Dec 14, 2011		
ID17040218SK058_02	Leadbelt Creek - source to mouth			16.83	Miles
TEMPERATURE		41461	Dec 14, 2011		

17040219 Big Wood

		EPA TMDL ID	Approval Date		
ID17040219SK001_06	Malad River - confluence of Black Canyon Creek and Big Wood			17.81	Miles
ESCHERICHIA COLI (E. COLI)		2239	May 15, 2002		
PHOSPHORUS, TOTAL		2239	May 15, 2002		
SEDIMENTATION/SILTATION		2239	May 15, 2002		
TOTAL SUSPENDED SOLIDS (TSS)		12122	Sep 14, 2005		
ID17040219SK002_06	Big Wood River - Magic Reservoir Dam to mouth			62.38	Miles
ESCHERICHIA COLI (E. COLI)		2239	May 15, 2002		
PHOSPHORUS, TOTAL		2239	May 15, 2002		
SEDIMENTATION/SILTATION		2239	May 15, 2002		
ID17040219SK004_05	Big Wood River - Seamans Creek to Magic Reservoir			39.26	Miles
ESCHERICHIA COLI (E. COLI)		41532	Feb 09, 2012		
PHOSPHORUS, TOTAL		2239	May 15, 2002		
SEDIMENTATION/SILTATION		2239	May 15, 2002		
ID17040219SK005_05	Seamans Creek - Slaughterhouse Creek to mouth			5.62	Miles
ESCHERICHIA COLI (E. COLI)		2239	May 15, 2002		
PHOSPHORUS, TOTAL		2239	May 15, 2002		
SEDIMENTATION/SILTATION		2239	May 15, 2002		
ID17040219SK006_02	Slaughterhouse Gulch Creek			40.23	Miles
PHOSPHORUS, TOTAL		2239	May 15, 2002		
SEDIMENTATION/SILTATION		2239	May 15, 2002		
ID17040219SK006_03	Seamans Creek - source to and including Slaughterhouse Creek			3.23	Miles
PHOSPHORUS, TOTAL		2239	May 15, 2002		
SEDIMENTATION/SILTATION		2239	May 15, 2002		
ID17040219SK006_05	Seamans Creek - source to and including Slaughterhouse Creek			0.21	Miles
PHOSPHORUS, TOTAL		2239	May 15, 2002		
SEDIMENTATION/SILTATION		2239	May 15, 2002		
ID17040219SK008_02	Quigley Creek - source to mouth			15.86	Miles
TEMPERATURE		55340	Dec 23, 2013		

Upper Snake

ID17040219SK011_02	East Fork Wood River - source to Hyndman Creek		40.7	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
SEDIMENTATION/SILTATION	2239	May 15, 2002		
ID17040219SK015_03	Lake Creek - source to mouth		6.99	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
ID17040219SK016_02	Eagle Creek - source to mouth		12.78	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
SEDIMENTATION/SILTATION	2239	May 15, 2002		
ID17040219SK016_03	Eagle Creek - source to mouth		1.56	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
SEDIMENTATION/SILTATION	2239	May 15, 2002		
ID17040219SK024_02	Warm Springs Creek - source to and including Thompson Creek		73.68	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
ID17040219SK024_03	Warm Springs Creek - source to and including Thompson Creek		7.74	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
ID17040219SK025_02	Greenhorn Creek - source USFS boundary		24.65	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
SEDIMENTATION/SILTATION	2239	May 15, 2002		
ID17040219SK025_03	Greenhorn Creek - source to mouth		4.48	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
SEDIMENTATION/SILTATION	2239	May 15, 2002		
ID17040219SK027_02	Croy Creek - source to mouth		37.36	Miles
SEDIMENTATION/SILTATION	2239	May 15, 2002		
ID17040219SK027_03	Croy Creek - source to mouth		8.36	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
SEDIMENTATION/SILTATION	2239	May 15, 2002		
TOTAL SUSPENDED SOLIDS (TSS)	2239	May 15, 2002		
ID17040219SK028_02	Rock Creek - source to mouth		39.4	Miles
TEMPERATURE	55340	Dec 23, 2013		
ID17040219SK028_03	Rock Creek - source to mouth		9.19	Miles
ESCHERICHIA COLI (E. COLI)	2239	May 15, 2002		
PHOSPHORUS, TOTAL	2239	May 15, 2002		
SEDIMENTATION/SILTATION	2239	May 15, 2002		
ID17040219SK029_02	Thorn Creek - source to mouth		57.95	Miles
PHOSPHORUS, TOTAL	2239	May 15, 2002		
SEDIMENTATION/SILTATION	2239	May 15, 2002		

17040220 Camas

		EPA TMDL ID	Approval Date		
ID17040220SK001_05	Camas Creek - Elk Creek to Magic Reservoir			14.83	Miles
PHOSPHORUS, TOTAL		12257	Sep 30, 2005		
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK002_02	Camp Creek - source to mouth			37.28	Miles
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK002_03	Camp Creek - source to mouth			4.79	Miles
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
ID17040220SK003_04	Willow Creek - Beaver Creek to mouth			9.35	Miles
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK004_02	Beaver Creek - source to mouth			14.14	Miles
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK004_03	Beaver Creek - source to mouth			0.73	Miles
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK006_02	Elk Creek - source to mouth			18.45	Miles
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
ID17040220SK007_05	Camas Creek - Soldier Creek to Elk Creek			14.31	Miles
PHOSPHORUS, TOTAL		12257	Sep 30, 2005		
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK011_03	Soldier Creek - Wardrop Creek to mouth			12.72	Miles
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		

Upper Snake

ID17040220SK013_05	Camas Creek - Corral Creek to Soldier Creek			10.47	Miles
PHOSPHORUS, TOTAL		12257	Sep 30, 2005		
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK015_03	Corral Creek - confluence of East Fork and West Fork Corral			10.82	Miles
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
ID17040220SK018_02	Camas Creek - source to Corral Creek			132.19	Miles
PHOSPHORUS, TOTAL		12257	Sep 30, 2005		
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK018_03	Camas Creek - source to Corral Creek			18.61	Miles
PHOSPHORUS, TOTAL		12257	Sep 30, 2005		
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK018_04	Camas Creek - source to Corral Creek			20.53	Miles
PHOSPHORUS, TOTAL		12257	Sep 30, 2005		
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK018_05	Camas Creek - Cow Creek to Corral Creek			5.39	Miles
PHOSPHORUS, TOTAL		12257	Sep 30, 2005		
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK021_03	Wildhorse Creek - 3rd order			6.97	Miles
ESCHERICHIA COLI (E. COLI)		12257	Sep 30, 2005		
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
TEMPERATURE		12257	Sep 30, 2005		
		67160	Dec 20, 2016		
ID17040220SK023L_0L	Mormon Reservoir			1583.81	Acres
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
ID17040220SK024_02	Dairy Creek - source to Mormon Reservoir			29.56	Miles
PHOSPHORUS, TOTAL		12257	Sep 30, 2005		
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		

ID17040220SK025_02	McKinney Creek - source to Mormon Reservoir			17.49	Miles
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		
ID17040220SK025_03	McKinney Creek - source to Mormon Reservoir			2.26	Miles
SEDIMENTATION/SILTATION		12257	Sep 30, 2005		

17040221 Little Wood

		EPA TMDL ID	Approval Date		
ID17040221SK001_05	Little Wood River			26.86	Miles
PHOSPHORUS, TOTAL		12256	Sep 30, 2005		
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK001_05a	Little Wood River			29.69	Miles
PHOSPHORUS, TOTAL		12256	Sep 30, 2005		
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK001_05b	Little Wood River			5.66	Miles
PHOSPHORUS, TOTAL		12256	Sep 30, 2005		
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK002_05	Little Wood River			25.8	Miles
PHOSPHORUS, TOTAL		12256	Sep 30, 2005		
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK006_03	Fish Creek - Fish Creek Reservoir Dam to mouth			2.68	Miles
PHOSPHORUS, TOTAL		12256	Sep 30, 2005		
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK006_04	Fish Creek - Fish Creek Reservoir Dam to mouth			16.6	Miles
PHOSPHORUS, TOTAL		12256	Sep 30, 2005		
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK008_02	Fish Creek - source to Fish Creek Reservoir			52.93	Miles
ESCHERICHIA COLI (E. COLI)		12256	Sep 30, 2005		
PHOSPHORUS, TOTAL		12256	Sep 30, 2005		
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
TEMPERATURE		12256	Sep 30, 2005		

Upper Snake

ID17040221SK008_03	Fish Creek - source to Fish Creek Reservoir			16.47	Miles
ESCHERICHIA COLI (E. COLI)		12256	Sep 30, 2005		
PHOSPHORUS, TOTAL		12256	Sep 30, 2005		
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK008_04	Fish Creek - source to Fish Creek Reservoir			1.36	Miles
ESCHERICHIA COLI (E. COLI)		12256	Sep 30, 2005		
PHOSPHORUS, TOTAL		12256	Sep 30, 2005		
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK014_02	Muldoon Creek -source to mouth			86.73	Miles
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK014_03	Muldoon Creek -source to mouth			24.29	Miles
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK014_04	Muldoon Creek -source to mouth			3.52	Miles
TEMPERATURE		12256	Sep 30, 2005		
ID17040221SK022_02	Dry Creek - source to mouth			39.64	Miles
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
ID17040221SK022_03	Dry Creek - source to mouth			11.61	Miles
SEDIMENTATION/SILTATION		12256	Sep 30, 2005		
ID17040221SK023_02	Silver Creek - source to mouth			90.95	Miles
TEMPERATURE		12256	Sep 30, 2005		

Category 4b: Waters have had pollution control requirements other than a TMDL placed on them, and these waters are reasonably expected to attain the water quality standard within a reasonable period of time.

2018/2020 Integrated Report - Category 4b

Salmon

17060205 Upper Middle Fork Salmon

ID17060205SL012_02a	Upper Bear Valley Creek and tributaries - 1st and 2nd order	28.86	Miles

SEDIMENTATION/SILTATION

8/31/2020 (RE, DM): In 2010, a CWA Section 319 grant supported the restoration of an Upper Bear Valley Creek tributary –Casner Creek. The Casner Creek Stream Restoration Project was completed in 2013 and included the removal of a berm, the installation of 10 biolog structures, and the revegetation of areas disturbed by the berm removal and biolog installations with sedge mats, willows, and native seed mix. From 2009 to 2011, USFS used the Geomorphic Road Analysis and Inventory Package (GRAIP) to identify key locations where road sediment entered Bear Valley streams. Using this information, the USFS completed numerous road remediation projects to address prioritized source areas. This AU was also monitored by BURP in 2015 and was assessed in the 2016 IR cycle using that data. The area was impacted by wildfires in 2016 and 2017 (Pioneer and Bearskin fires) and was not monitored in the 2018 BURP season (as was originally outlined in the 4b plan) –the effects of these fires have confounded measurement of water quality improvement. During a 2018 snorkel survey, Idaho Fish and Game recorded 2 Chinook salmon in this AU.

ID17060205SL012_05	Bear Valley Creek - 5th order	11.22	Miles

SEDIMENTATION/SILTATION

8/31/2020 (RE, DM): In 2010, a CWA Section 319 grant supported the restoration of an Upper Bear Valley Creek tributary –Casner Creek. The Casner Creek Stream Restoration Project was completed in 2013 and included the removal of a berm, the installation of 10 biolog structures, and the revegetation of areas disturbed by the berm removal and biolog installations with sedge mats, willows, and native seed mix. From 2009 to 2011, USFS used the Geomorphic Road Analysis and Inventory Package (GRAIP) to identify key locations where road sediment entered Bear Valley streams. Using this information, the USFS completed numerous road remediation projects to address prioritized source areas. This AU was also monitored by BURP in 2015 and was assessed in the 2016 IR cycle using that data. The area was impacted by wildfires in 2016 and 2017 (Pioneer and Bearskin fires) and was not monitored in the 2018 BURP season (as was originally outlined in the 4b plan) –the effects of these fires have confounded measurement of water quality improvement. Idaho Fish and Game performed two snorkel surveys in 2015 and 2018 and recorded 105 and 31 Chinook salmon on 7/12/2015 and 7/13/2015, respectively, and 23 and 45 Chinook salmon on 7/17/2018 (at two locations).

ID17060205SL013_03	Bearskin Creek - 3rd order (Little Beaver to Elk Creek)	1.84	Miles

SEDIMENTATION/SILTATION

8/31/2020 (RE, DM): In 2010, a CWA Section 319 grant supported the restoration of an Upper Bear Valley Creek tributary –Casner Creek. The Casner Creek Stream Restoration Project was completed in 2013 and included the removal of a berm, the installation of 10 biolog structures, and the revegetation of areas disturbed by the berm removal and biolog installations with sedge mats, willows, and native seed mix. From 2009 to 2011, USFS used the Geomorphic Road Analysis and Inventory Package (GRAIP) to identify key locations where road sediment entered Bear Valley streams. Using this information, the USFS completed numerous road remediation projects to address prioritized source areas. This AU was also monitored by BURP in 2015 and was assessed in the 2016 IR cycle using that data. The area was impacted by wildfires in 2016 and 2017 (Pioneer and Bearskin fires) and was not monitored in the 2018 BURP season (as was originally outlined in the 4b plan) –the effects of these fires have confounded measurement of water quality improvement.

17060205 Upper Middle Fork Salmon

ID17060205SL013_04	Elk Creek - 4th order	8.91	Miles

SEDIMENTATION/SILTATION	8/31/2020 (RE, DM): In 2010, a CWA Section 319 grant supported the restoration of an Upper Bear Valley Creek tributary –Casner Creek. The Casner Creek Stream Restoration Project was completed in 2013 and included the removal of a berm, the installation of 10 biolog structures, and the revegetation of areas disturbed by the berm removal and biolog installations with sedge mats, willows, and native seed mix. From 2009 to 2011, USFS used the Geomorphic Road Analysis and Inventory Package (GRAIP) to identify key locations where road sediment entered Bear Valley streams. Using this information, the USFS completed numerous road remediation projects to address prioritized source areas. This AU was also monitored by BURP in 2015 and was assessed in the 2016 IR cycle using that data. The area was impacted by wildfires in 2016 and 2017 (Pioneer and Bearskin fires) and was not monitored in the 2018 BURP season (as was originally outlined in the 4b plan) –the effects of these fires have confounded measurement of water quality improvement.

Category 4c: Waters failing to meet applicable water quality standards due to other types of pollution (e.g., flow alteration), not a pollutant.

2018/2020 Integrated Report - Category 4c

Bear River

16010102 Central Bear

ID16010102BR001_05	Bear River - Idaho/Wyoming border to railroad bridge	25.46	Miles

FLOW REGIME MODIFICATION

ID16010102BR002_03	Pegram Creek - source to mouth	6.27	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010102BR006_02	Preuss Creek - USFS boundary to Geneva Ditch	6.04	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

16010201 Bear Lake

ID16010201BR002_05	Bear River-railroad bridge (T14N, R45E, Sec. 21) to Ovid Cr.	57.47	Miles

FLOW REGIME MODIFICATION

ID16010201BR006_03	Lower Stauffer Creek - Spring Creek to Bear River	4.14	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010201BR008_02	Co-Op Creek - source to mouth	3.13	Miles

FLOW REGIME MODIFICATION

ID16010201BR013_02b	Upper Paris Creek	5.48	Miles

FLOW REGIME MODIFICATION

ID16010201BR018_02b	Indian Creek	5.77	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010201BR022_03a	Lower Georgetown Creek - left hand fork to mouth	3.91	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

16010202 Middle Bear

ID16010202BR002_04	Cub River - Maple Creek to Border	5.57	Miles

FLOW REGIME MODIFICATION

Bear River

ID16010202BR003_03	Cub River - Sugar Creek to Maple Creek	5.28	Miles

FLOW REGIME MODIFICATION

ID16010202BR006_06	Bear River-Oneida Narrows Reservoir Dam to Idaho/Utah border	36.09	Miles

FLOW REGIME MODIFICATION

ID16010202BR007_02a	Strawberry Creek	10.36	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID16010202BR009_06	Bear River - Alexander Reservoir Dam to Densmore Creek	15.62	Miles

FLOW REGIME MODIFICATION

ID16010202BR009_06a	Bear River - Denismore Cr to above Oneida Reservoir	21.37	Miles

FLOW REGIME MODIFICATION

ID16010202BR011_03	Trout Creek - source to mouth	3.94	Miles

FLOW REGIME MODIFICATION

ID16010202BR013_02	Densmore Creek - source to mouth	22.88	Miles

FLOW REGIME MODIFICATION

ID16010202BR014_04	Cottonwood Creek - lower Cottonwood Creek (4th order)	14.02	Miles

FLOW REGIME MODIFICATION

ID16010202BR015_04	Battle Creek - source to mouth	16.27	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010202BR018_02b	Swan Lake Creek	13.79	Miles

FLOW REGIME MODIFICATION

ID16010202BR020_02	Weston Creek - unnamed tributaries	32.2	Miles

FLOW REGIME MODIFICATION

ID16010202BR020_02c	upper Weston Creek - FS boundary to reservoir	12.19	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID16010202BR020_02d	Weston Cr - HW to FS boundary and Trail Hollow	10.76	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID16010202BR020_03	Weston Creek - Dry Canyon to above Weston City	8.29	Miles

FLOW REGIME MODIFICATION

ID16010202BR020_04	Weston Creek - above Weston City to Bear River	4.7	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010202BR021_02	Jenkins Hollow (Newton Creek)	14.1	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010202BR021_02a	Steel Canyon	1.53	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

16010204 Lower Bear-Malad

ID16010204BR001_02b	Four Mile Canyon	7.6	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010204BR001_02d	Henderson Creek	4.98	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010204BR001_04	Malad River - Little Malad River to Idaho/Utah border	25.56	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010204BR002_02a	Campbell Creek	2.87	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010204BR006_02	Susan Hollow	4.04	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010204BR008_04	Little Malad River - Daniels Reservoir Dam to mouth	24.55	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010204BR010_03	middle Wright Creek - Indian Mill Canyon to Dairy Creek	2.72	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16010204BR011_03	Dairy Creek - source to mouth	5.41	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

16020309 Curlew Valley

ID16020309BR001_03	North Canyon	6.01	Miles

FLOW REGIME MODIFICATION

Bear River

ID16020309BR001_03a	Deep Creek	15.49	Miles

FLOW REGIME MODIFICATION

ID16020309BR002_02a	Sheep Creek	13.38	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16020309BR003_02a	Meadow Brook Creek	28.99	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID16020309BR003_03a	Rock Creek (Curlew Valley)	3.71	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

Clearwater

17060108 Palouse

ID17060108CL001_02	Cow Creek - source to Idaho/Washington border	85.95	Miles	PHYSICAL SUBSTRATE HABITAT ALTERATIONS
ID17060108CL001_03	Cow Creek - source to Idaho/Washington border	10.69	Miles	PHYSICAL SUBSTRATE HABITAT ALTERATIONS
ID17060108CL002_03	South Fork Palouse River-Gnat Cr. to Idaho/Washington border	8.25	Miles	PHYSICAL SUBSTRATE HABITAT ALTERATIONS FLOW REGIME MODIFICATION
ID17060108CL003_02	South Fork Palouse River - source to Gnat Creek; tribs	14.51	Miles	PHYSICAL SUBSTRATE HABITAT ALTERATIONS FLOW REGIME MODIFICATION
ID17060108CL003_03	South Fork Palouse River - source to Gnat Creek	1.91	Miles	PHYSICAL SUBSTRATE HABITAT ALTERATIONS FLOW REGIME MODIFICATION
ID17060108CL005_02	Paradise Creek - Urban boundary to Idaho/Washington border	11.41	Miles	PHYSICAL SUBSTRATE HABITAT ALTERATIONS FLOW REGIME MODIFICATION
ID17060108CL005_02a	Paradise Creek - forest habitat boundary to Urban boundary	16.91	Miles	FLOW REGIME MODIFICATION PHYSICAL SUBSTRATE HABITAT ALTERATIONS
ID17060108CL005_02b	Idlers Rest Creek - source to forest habitat boundary	5.49	Miles	PHYSICAL SUBSTRATE HABITAT ALTERATIONS FLOW REGIME MODIFICATION
ID17060108CL011a_02	Flannigan Creek - source to T41N, R05W, Sec. 23	18.03	Miles	PHYSICAL SUBSTRATE HABITAT ALTERATIONS FLOW REGIME MODIFICATION
ID17060108CL011a_03	Flannigan Creek - source to T41N, R05W, Sec. 23	3.06	Miles	PHYSICAL SUBSTRATE HABITAT ALTERATIONS FLOW REGIME MODIFICATION
ID17060108CL011b_02	Flannigan Creek - T41N, R05W, Sec. 23 to mouth	2.92	Miles	FLOW REGIME MODIFICATION PHYSICAL SUBSTRATE HABITAT ALTERATIONS

Clearwater

ID17060108CL011b_03	Flannigan Creek - T41N, R05W, Sec. 23 to mouth	3.71	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060108CL012_03	Rock Creek-confluence of WF and EF Rock Cr to mouth	1.73	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060108CL013a_02	West Fork Rock Creek - source to T41N, R04W, Sec. 30	5.68	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060108CL013b_03	West Fork Rock Creek - T41N, R04W, Sec. 30 to mouth	1.4	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060108CL014a_02	East Fork Rock Creek - source to T41N, R 04W, Sec. 29	2.23	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060108CL014b_02	East Fork Rock Creek - T41N, R 04W, Sec. 29 to mouth	1.66	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060108CL015a_02	Hatter Creek - source to T40N, R04W, Sec. 3	17.3	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060108CL015b_02	Hatter Creek - T40N, R04W, Sec. 3 to mouth	20.47	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060108CL015b_03	Hatter Creek - T40N, R04W, Sec. 3 to mouth	5.23	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060108CL027a_02	Big Creek - source to T42N, R03W, Sec. 08	5.23	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060108CL027b_02	Big Creek - T42N, R03W, Sec. 08 to mouth	15.49	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060108CL029_02	Gold Creek - T42N, R04W, Sec. 28 to mouth	1.45	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060108CL029_03	Gold Creek - T42N, R04W, Sec. 28 to mouth	1.78	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060108CL030_02	Gold Creek - source to T42N, R04W, Sec. 28	19.96	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060108CL032a_02	Deep Creek - source to T42, R05, Sec. 02	23.75	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060108CL032a_03	Deep Creek - source to T42, R05, Sec. 02	0.63	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060108CL032b_02	Deep Creek - T42, R05, Sec. 02 to mouth	15.29	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060108CL032b_03	Deep Creek - T42, R05, Sec. 02 to mouth	6.18	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17060305 South Fork Clearwater

ID17060305CL001_02	South Fork Clearwater River - Butcher Creek to mouth	2.8	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL003_02	Cottonwood Creek - source to Cottonwood Creek waterfall	30.32	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL003_03	Cottonwood Creek - source to Cottonwood Creek waterfall	0.39	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL003_04	Cottonwood Creek - source to Cottonwood Creek waterfall	5.4	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL008_02	South Fork Cottonwood Creek - source to mouth	24.97	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL008_03	South Fork Cottonwood Creek - 3rd order segment	5.02	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL010_02	Threemile Creek - source to unnamed tributary	36.08	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL011a_02	Butcher Creek-unnamed tributary (mouth fish barrier)	5.94	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060305CL011b_02	Butcher Creek - fish barrier to source	11.17	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060305CL012_02	South Fork Clearwater River - sidewall tributaries	46.75	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL012_02a	Schwartz Creek	44.46	Miles

FLOW REGIME MODIFICATION

ID17060305CL012_05	South Fork Clearwater River - Johns Creek to Butcher Creek	22.27	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL022_02	Huddleson Creek and tributaries	33.91	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL022_02a	Granite Creek	4.08	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL022_05	South Fork Clearwater River - Tenmile Creek to Johns Creek	11.78	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL030_02	South Fork Clearwater River - Crooked River to Tenmile Creek	28.39	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL030_05	South Fork Clearwater River - Crooked River to Tenmile Creek	11.76	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL036_02	South Fork Clearwater River - tributaries	2.49	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060305CL036_05	South Fork Clearwater River - 5th order mainstem segment	3.96	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17060306 Clearwater

ID17060306CL003_02	Lindsay Creek - 1st and 2nd order tributaries	21.1	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL003_03	Lindsay Creek - 3rd order	3.64	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL006_02	Sweetwater Creek - source to Webb Creek	18.24	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL006_03	Sweetwater Creek - source to Webb Creek	0.22	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL006_04	Sweetwater Creek - source to Webb Creek	3.89	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL007_02	Webb Creek - source to mouth	9.15	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL024_02	Lawyer Creek - source to mouth	51.69	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL024_03	Lawyer Creek - source to mouth	9.71	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL031_02	Jim Brown Creek - 1st and 2nd Order Tributaries	44.61	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

Clearwater

ID17060306CL031_03	Jim Brown Creek - 3rd Order	5.51	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL034_04	Jim Ford Creek - waterfall (12.5 miles upstream) to mouth	8.97	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL035_02	Heywood, Wilson Creeks and tributaries	48.65	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL035_03	Jim Ford Creek - source to Jim Ford Cr waterfall (12.5 mi)	6.39	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL035_04	Jim Ford Creek - source to Jim Ford Creek waterfall	3.87	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL036_02	Grasshopper Creek - source to mouth	19.58	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL036_03	Grasshopper Creek - source to mouth	4.3	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL037_02	Winter Creek - Winter Creek waterfall (3.4 miles upstream)	6.63	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL037_03	Winter Creek - waterfall (3.4 miles upstream) to mouth	2.41	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL038_02	Winter Creek - source to Winter Creek waterfall	6.77	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

Clearwater

ID17060306CL041_02	Bedrock Creek - source to mouth	17.44	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL043_02	Pine Creek - source to mouth	20.96	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL044_06	Potlatch River - 6th Order	7.35	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL045_05	Potlatch River - 5th Order	18.48	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL046_04	Cedar Creek - 4th Order	5.18	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL048_04	Potlatch River - 4th Order	6.67	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL048_05	Potlatch River - 5th Order	7.7	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL049_02	Potlatch River - headwaters	61.69	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL049_03	Potlatch River - 3rd Order	5.3	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL049_04	Potlatch River - 4th Order	3.71	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL051_04	East Fork Potlatch River - 4th Order	4.73	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL052_03 Ruby Creek - 3rd Order 2.14 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL053_02 Moose Creek - headwaters 15.7 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL053_03 Moose Creek - 3rd Order 3.7 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL055_02 Pine Creek - headwaters 35.94 Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL055_03 Pine Creek - 3rd Order 3.87 Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL062_02 Middle Potlatch Creek - headwaters 45.85 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060306CL062_03 Middle Potlatch Creek - 3rd Order 14.47 Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060306CL067_02 Hatwai Creek - 1st and 2nd Order tributaries 37.53 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17060307 Upper North Fork Clearwater

ID17060307CL001_02a Sneak Creek - source to mouth 5.38 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17060308 Lower North Fork Clearwater

ID17060308CL002_02a Swamp Creek - 1st and 2nd Order Tributaries 12.77 Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

Clearwater

ID17060308CL002_03a	Swamp Creek - 3rd order, Follet Creek to Dworshak Reservoir	0.72	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060308CL002_04	Elk Creek - Cedar Creek to Dworshak Reservoir	7.47	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060308CL002_04a	Long Meadow Creek - unnamed trib to Dworshak Reservoir	2.31	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060308CL020_04a	Breakfast Creek - 4th Order, Stony Cr to Dworshak Reservoir	1.91	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060308CL025_02	Breakfast Creek - source to Stony Creek	10.04	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060308CL028_02	Swamp Creek - source to Dworshak Reservoir	1.79	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060308CL028_03	Swamp Creek - source to Dworshak Reservoir	3	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060308CL029_02	Cranberry Creek - source to Dworshak Reservoir	14.26	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060308CL030_03a	Elk Creek - 3rd Order, Reservoir to Elk Creek Falls	3.83	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060308CL030_03b	Elk Creek - Elk Creek Falls to conflence of Deep Creek	2.13	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

Clearwater

ID17060308CL030_04	Elk Creek - confluence of Deep Creek to Cedar Creek	3.66	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060308CL034_02	Three Bear, Round Meadow, Oviatt Creeks and tributaries	58.46	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060308CL034_02a	Long Meadow Creek	1.2	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060308CL034_03	Long Meadow Creek - 3rd Order	7.7	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060308CL034_04	Long Meadow Creek - 4th Order	4.4	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

Panhandle

17010104 Lower Kootenai

ID17010104PN001_02a	Fisher Creek	6.79	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010104PN010_03a	Trout Creek - lower portion below branch	2.93	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010104PN030_03a	Cow Creek- lower re-routed portion along road	3.37	Miles

FLOW REGIME MODIFICATION

ID17010104PN036_03	Fleming Creek - lower	3.49	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

17010214 Pend Oreille Lake

ID17010214PN008_02a	Poirier Creek and tributaries	21.95	Miles

FLOW REGIME MODIFICATION

ID17010214PN008_03L	Lake San Souci	30.19	Acres

FLOW REGIME MODIFICATION

ID17010214PN008_04	Blanchard Lake	2.93	Miles

FLOW REGIME MODIFICATION

ID17010214PN008_04L	Blanchard Creek Diversion	27.68	Acres

FLOW REGIME MODIFICATION

ID17010214PN010_03	Brickel Creek - Idaho/Washington border to mouth	5.62	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010214PN018L_0L	Pend Oreille Lake	80828.61	Acres

FLOW REGIME MODIFICATION

17010301 Upper Coeur d Alene

ID17010301PN001_05	North Fork Coeur d'Alene River, below Prichard Creek	26.28	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17010301PN030_03	Little NF CDA River - btw Solitaire and Deception Creek	11.26	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17010301PN030_04	Little North Fork CDA River below Skookum Creek	23.97	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

17010302 South Fork Coeur d Alene

ID17010302PN014_02	Canyon Creek - from Gorge Gulch to South Fork CdA R.	8.64	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17010303 Coeur d Alene Lake

ID17010303PN002_02	Cougar Creek - source to mouth	15.72	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010303PN003_02	Kid Creek - source to mouth	4.08	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010303PN004_02	Mica Creek - source to mouth	24.18	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010303PN004_03	Mica Creek - source to mouth	1.29	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010303PN007_06	Coeur d'Alene River - Latour Creek to mouth	32	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010303PN020_02	Fourth of July Creek - source to mouth	31.87	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010303PN020_03	Fourth of July Creek - source to mouth	5.66	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010303PN029_03	Wolf Lodge Creek - source to mouth	5.74	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010303PN031_02	Marie Creek - source to mouth	19.67	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17010304 St. Joe

ID17010304PN027_02	1st and 2nd order streams to St Joe below Bond Creek	39.43	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17010304PN027_02a	1st and 2nd order to St. Joe River from Bond to Big Creek	35.11	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

Panhandle

ID17010304PN027_02b	1st and 2nd order to St Joe River between Big and Slate Cr	42.63	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

Salmon

17060201 Upper Salmon

ID17060201SL001_02 Salmon River - Pennal Gulch to Pahsimeroi River 93.3 Miles

FLOW REGIME MODIFICATION

ID17060201SL007_04 Challis Creek - Darling Creek to mouth 3.42 Miles

FLOW REGIME MODIFICATION

ID17060201SL009_03 Challis Creek - Bear Creek to Darling Creek 4.94 Miles

FLOW REGIME MODIFICATION

ID17060201SL009_04 Challis Creek - Bear Creek to Darling Creek 1.5 Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060201SL015_03 Garden Creek - source to mouth 3.92 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17060201SL026_02 Bruno Creek - source to mouth 8.78 Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060201SL048_03 Basin Creek - East Basin Creek to mouth 2.36 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060201SL099_02 Slate Creek - source to mouth 36.77 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060201SL124_04 Road Creek - Corral Basin Creek to mouth 4.79 Miles

FLOW REGIME MODIFICATION

ID17060201SL125_02 Road Creek - source to Corral Basin Creek 31.92 Miles

FLOW REGIME MODIFICATION

ID17060201SL131_04 Warm Spring Creek - Hole-in-Rock Creek to mouth 4.29 Miles

FLOW REGIME MODIFICATION

ID17060201SL132_02 Warm Spring Creek - source to Hole-in-Rock Creek 104.66 Miles

FLOW REGIME MODIFICATION

ID17060201SL132_03 Warm Spring Creek - source to Hole-in-Rock Creek 5.07 Miles

FLOW REGIME MODIFICATION

ID17060201SL132_04	Warm Spring Creek - source to Hole-in-Rock Creek	6.72	Miles

FLOW REGIME MODIFICATION

ID17060201SL133_02	Broken Wagon Creek - source to mouth	44.8	Miles

FLOW REGIME MODIFICATION

ID17060201SL133_03	Broken Wagon Creek - source to mouth	3.17	Miles

FLOW REGIME MODIFICATION

17060202 Pahsimeroi

ID17060202SL006_02	Meadow Creek - source to mouth	28.5	Miles

FLOW REGIME MODIFICATION

ID17060202SL007_04	Pahsimeroi River - Furey Lane (T15S, R22E) to Meadow Creek	1.56	Miles

FLOW REGIME MODIFICATION

ID17060202SL009_02	Grouse Creek - source to mouth	35.97	Miles

FLOW REGIME MODIFICATION

ID17060202SL010_04	Pahsimeroi River - Goldburg Creek to Big Creek	6.74	Miles

FLOW REGIME MODIFICATION

ID17060202SL011_04	Pahsimeroi R-Unnamed Trib (T12N,R23E,Sec. 22) to Goldburg Ck	2.54	Miles

FLOW REGIME MODIFICATION

ID17060202SL017_04	Pahsimeroi R-Burnt Ck to Unnamed Trib (T12N, R23E, Sec. 22)	10.34	Miles

FLOW REGIME MODIFICATION

ID17060202SL031_03	Big Creek - confluence of North and South Fork Big Creeks	13.56	Miles

FLOW REGIME MODIFICATION

ID17060202SL034_03	Patterson Creek - Inyo Creek to mouth	13.61	Miles

FLOW REGIME MODIFICATION

ID17060202SL034_04	Patterson Creek - Inyo Creek to mouth	9.65	Miles

FLOW REGIME MODIFICATION

ID17060202SL039_03	Morgan Creek - source to mouth	14.07	Miles

FLOW REGIME MODIFICATION

17060203 Middle Salmon-Panther

ID17060203SL038_03	Dump Creek - Moose Creek to mouth	5.04	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060203SL042_02	Salmon River - Williams Creek to Pollard Creek	48.86	Miles

FLOW REGIME MODIFICATION

17060204 Lemhi

ID17060204SL007a_03	McDevitt Creek - diversion (T19N, R23E, Sec. 36) to mouth	2.36	Miles

FLOW REGIME MODIFICATION

ID17060204SL026a_02	Mill Creek - diversion (T16N, R24E, Sec. 22) to mouth	10.4	Miles

FLOW REGIME MODIFICATION

ID17060204SL027_02	Walter Creek - source to mouth	7.2	Miles

FLOW REGIME MODIFICATION

ID17060204SL030_05	Lemhi River (East Branch)-Eighteenmile & Texas Ck Confluence	10.39	Miles

FLOW REGIME MODIFICATION

ID17060204SL036_03	Texas Creek	14.93	Miles

FLOW REGIME MODIFICATION

ID17060204SL041_04	Eighteenmile Creek - Hawley Creek to mouth	2.21	Miles

FLOW REGIME MODIFICATION

ID17060204SL042_03	Eighteenmile Creek - Clear Creek to Hawley Creek	12.62	Miles

FLOW REGIME MODIFICATION

ID17060204SL043_03	Eighteenmile Creek - Divide Creek to Clear Creek	5.96	Miles

FLOW REGIME MODIFICATION

ID17060204SL045_02	Eighteenmile Creek - source to Divide Creek	29.68	Miles

FLOW REGIME MODIFICATION

ID17060204SL050a_03	Hawley Creek - diversion (T15N, R27E, Sec. 03) to mouth	2.2	Miles

FLOW REGIME MODIFICATION

ID17060204SL051b_02	Canyon Creek - source to diversion (T16N, R26E, Sec.22)	70.12	Miles

FLOW REGIME MODIFICATION

ID17060204SL052a_02	Little Eightmile Creek	0.43	Miles

FLOW REGIME MODIFICATION

ID17060204SL062a_02	Sandy Creek - diversion (T20N, R24E, Sec. 17) to mouth	2.1	Miles

FLOW REGIME MODIFICATION

ID17060204SL062b_02	Sandy Creek - source to diversion (T20N, R24E, Sec. 17)	12.33	Miles

FLOW REGIME MODIFICATION

ID17060204SL064a_02 Bohannon Creek - diversion (T21N, R23E, Sec. 22) to mouth 1.36 Miles

FLOW REGIME MODIFICATION

ID17060204SL064b_02 Bohannon Creek - source to diversion (T21N, R23E, Sec. 22) 13.58 Miles

FLOW REGIME MODIFICATION

ID17060204SL065a_02 Geertson Creek - diversion (T21N, R23E, Sec. 20) to mouth 11.44 Miles

FLOW REGIME MODIFICATION

ID17060204SL065b_02 Geertson Creek - source to diversion (T21N, R23E, Sec. 20) 14.71 Miles

FLOW REGIME MODIFICATION

ID17060204SL066a_03 Kirtley Creek - diversion (T21N, R22E, Sec. 02) to mouth 2.28 Miles

FLOW REGIME MODIFICATION

17060205 Upper Middle Fork Salmon

ID17060205SL026_02 Asher Creek - source to mouth 3.34 Miles

FLOW REGIME MODIFICATION

ID17060205SL027_02 Unnamed Tributary - source to mouth (T12N, R11E, Sec. 11) 1.62 Miles

FLOW REGIME MODIFICATION

17060207 Middle Salmon-Chamberlain

ID17060207SL007_03a Warren Creek - 3rd order segment outside roadless area 8.68 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17060209 Lower Salmon

ID17060209SL060_02 Deep Creek - source to unnamed tributary 28.3 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

17060210 Little Salmon

ID17060210SL001_05 Little Salmon River - 5th order 24.88 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17060210SL007_04a West Branch Goose Creek 4.38 Miles

FLOW REGIME MODIFICATION

ID17060210SL007_05 Little Salmon River - 5th order 16.91 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

Salmon

ID17060210SL010_04	East Branch Goose Creek and 4th order section of Goose Creek	5.45	Miles

FLOW REGIME MODIFICATION

17050101 C. J. Strike Reservoir

ID17050101SW012_02	Little Canyon Creek - 1st and 2nd order	31.02	Miles
FLOW REGIME MODIFICATION			

17050102 Bruneau

ID17050102SW002_05	Jacks Creek-Little Jacks Ck to CJ Strike Reservoir	12.29	Miles
FLOW REGIME MODIFICATION			
ID17050102SW009_06	Bruneau River - 6th order (Hot Creek to mouth)	16.9	Miles
HABITAT ASSESSMENT			

17050103 Middle Snake-Succor

ID17050103SW001_07	Snake River - Marsing (RM425) to State Line	16.09	Miles
FLOW REGIME MODIFICATION			
ID17050103SW002_04	Lower Succor Creek - 4th order (state line to mouth)	5.51	Miles
FLOW REGIME MODIFICATION			
ID17050103SW003_02	Upper Succor Creek - 1st and 2nd order tributaries	68.4	Miles
FLOW REGIME MODIFICATION			
ID17050103SW003_03	Upper Succor Creek - 3rd order (Granite Creek to State Line)	15.7	Miles
FLOW REGIME MODIFICATION			
ID17050103SW005_03	Jump Creek - 3rd order	19.51	Miles
FLOW REGIME MODIFICATION			
ID17050103SW012_04	Sinker Creek - 4th order	15.74	Miles
FLOW REGIME MODIFICATION			
ID17050103SW014_04	Castle Creek - lower 4th order (irrigated section)	9.21	Miles
FLOW REGIME MODIFICATION			
ID17050103SW014_05	Castle Creek - 5th order (Catherine Cr. to Snake River)	3.81	Miles
FLOW REGIME MODIFICATION			

17050104 Upper Owyhee

ID17050104SW028_02	Pole Creek - 1st and 2nd order	71.16	Miles
FLOW REGIME MODIFICATION			
ID17050104SW028_03	Pole Creek - 3rd order	6.4	Miles
FLOW REGIME MODIFICATION			

ID17050104SW034_02	Red Canyon Creek - 1st and 2nd order	77.65	Miles
FLOW REGIME MODIFICATION			
ID17050104SW034_04	Red Canyon Creek - 4th order	2.96	Miles
FLOW REGIME MODIFICATION			

17050105 South Fork Owyhee

ID17050105SW001_06	SF Owyhee River - Nevada border to Little Owyhee River	19.62	Miles
FLOW REGIME MODIFICATION			

17050107 Middle Owyhee

ID17050107SW004_02	MF Owyhee River & tributaries - 1st and 2nd order	48.02	Miles
FLOW REGIME MODIFICATION			
ID17050107SW004_03	Middle Fork Owyhee River - 3rd order section	4.59	Miles
FLOW REGIME MODIFICATION			
ID17050107SW008_04	NF Owyhee River & Juniper Creek - 4th order	2.32	Miles
FLOW REGIME MODIFICATION			
ID17050107SW009_02	Pleasant Valley Cr. & Tribs - 1st & 2nd order	37.74	Miles
FLOW REGIME MODIFICATION			
ID17050107SW009_03	Pleasant Valley Creek - 3rd order section	5.68	Miles
FLOW REGIME MODIFICATION			
ID17050107SW012_02	Juniper Creek & tributaries - 1st & 2nd order	24.49	Miles
FLOW REGIME MODIFICATION			
ID17050107SW012_03	Juniper Creek - 3rd order section	6.87	Miles
FLOW REGIME MODIFICATION			

17050108 Jordan

ID17050108SW001_05	Jordan Creek - Williams Creek to State Line	13.35	Miles
FLOW REGIME MODIFICATION			
ID17050108SW013_02	Rock Creek above Triangle Reservoir - 1st and 2nd order	63.9	Miles
FLOW REGIME MODIFICATION			
ID17050108SW014_02	Louisa Creek - entire drainage	13.81	Miles
FLOW REGIME MODIFICATION			

ID17050108SW015_02	Spring and Meadow Creeks - 1st and 2nd order	48.83	Miles

FLOW REGIME MODIFICATION

ID17050108SW015_03	Spring and Meadow Creeks - 3rd order sections	8.09	Miles

FLOW REGIME MODIFICATION

ID17050108SW021_02	Cow Creek - 1st and 2nd order	55.14	Miles

FLOW REGIME MODIFICATION

ID17050108SW021_03	Cow Creek - 3rd order (Wildcat Canyon to Soda Creek)	3.42	Miles

FLOW REGIME MODIFICATION

17050112 Boise-Mores

ID17050112SW009_02	Mores Creek - 1st and 2nd order	133.16	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17050112SW009_03	Mores Creek - 3rd order (Hayfork Creek to Elk Creek)	12.3	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17050112SW009_04	Mores Creek - 4th order (Elk Creek to Grimes Creek)	8.84	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17050112SW013_03	Grimes, Clear and Smith Creeks - 3rd order sections	8.57	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17050112SW013_04	Grimes Creek - 4th order (Clear Creek to Granite Creek)	9.64	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17050112SW013_05	Grimes Creek - 5th order (Granite Creek to mouth)	14.65	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17050113 South Fork Boise

ID17050113SW007L_0L	Little Camas Reservoir	965.21	Acres

FLOW REGIME MODIFICATION

ID17050113SW032_03	Smith Creek - 3rd order (Mule Gulch to SF Boise River)	16.45	Miles

FLOW REGIME MODIFICATION

17050114 Lower Boise

ID17050114SW001_06	Boise River - Indian Creek to mouth	44.91	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17050114SW005_06	Boise River - Veterans Memorial Parkway to Star Bridge	36.89	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17050114SW005_06a	Boise River-Star to Middleton	11.34	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17050114SW005_06b	Boise River-Middleton to Indian Creek	7.84	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17050114SW010_02	Fivemile, Eightmile, and Ninemile Creeks - 1st and 2nd order	66.16	Miles

FLOW REGIME MODIFICATION

ID17050114SW011a_06	Boise River - Diversion Dam to Veterans Memorial Parkway	22.74	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17050114SW011b_06	Boise River - Lucky Peak Dam to Diversion Dam	2.31	Miles

FLOW REGIME MODIFICATION

17050123 North Fork Payette

ID17050123SW001_06	North Fork Payette River - Cascade to Smiths Ferry	23.21	Miles

FLOW REGIME MODIFICATION

ID17050123SW001_06a	North Fork Payette River - Smiths Ferry to Banks	19.07	Miles

FLOW REGIME MODIFICATION

ID17050123SW011_03	Boulder Creek - 3rd order (Louie Creek to mouth)	11.55	Miles

FLOW REGIME MODIFICATION

ID17050123SW012_03	Lake Fork - Little Payette Lake to Cascade Reservoir	19.53	Miles

FLOW REGIME MODIFICATION

17050201 Brownlee Reservoir

ID17050201SW007_03	Warm Springs Creek - 3rd order	5.31	Miles

FLOW REGIME MODIFICATION

Upper Snake

17040104 Palisades

ID17040104SK001_06	Snake River	21.98	Miles

FLOW REGIME MODIFICATION

ID17040104SK002_03	Antelope Creek - source to mouth	5.95	Miles

FLOW REGIME MODIFICATION

ID17040104SK003_06	Snake River - Fall Creek to Black Canyon Creek	29.06	Miles

FLOW REGIME MODIFICATION

ID17040104SK008_06	Snake River - Palisades Reservoir Dam to Fall Creek	16.82	Miles

FLOW REGIME MODIFICATION

ID17040104SK026_02	Little Elk Creek - source to Palisades Reservoir	9.67	Miles

FLOW REGIME MODIFICATION

17040105 Salt

ID17040105SK001_02b	Newswander Canyon	4.96	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040105SK003_02d	Houtz Creek	1.13	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040105SK003_02j	Haderlie Creek	8.65	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040105SK007_02c	Smoky Creek	10.78	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040105SK007_03	Tygee Creek - source to mouth	5.55	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17040201 Idaho Falls

ID17040201SK013_06	Snake River - river mile 856 to Dry Bed Creek	6.98	Miles

FLOW REGIME MODIFICATION

17040203 Lower Henrys

ID17040204SK002_05	North Fork Teton River - Teton River Forks to Henrys Fork	18.75	Miles

FLOW REGIME MODIFICATION

17040204 Teton

ID17040204SK002_05	North Fork Teton River - Teton River Forks to Henrys Fork	18.75	Miles
FLOW REGIME MODIFICATION			
ID17040204SK014_04	Teton River - Felt Dam outlet to Milk Creek	1.66	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040204SK015_04	Teton River - Felt Dam pool	4.12	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040204SK016_04	Teton River - Highway 33 bridge to Felt Dam pool	3.26	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040204SK017_04	Teton River	13.67	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040204SK019_02	Packsaddle Creek	14.59	Miles
FLOW REGIME MODIFICATION			
ID17040204SK020_04	Teton River	15.72	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040204SK021_03	Horseshoe Creek	4.81	Miles
FLOW REGIME MODIFICATION			
ID17040204SK025_02	Mahogany Creek	6.48	Miles
FLOW REGIME MODIFICATION			
ID17040204SK026_02	Teton River - Tributaries between Trail Creek to Teton Creek	23.5	Miles
FLOW REGIME MODIFICATION			
ID17040204SK026_04	Teton River - Trail Creek to Teton Creek	5.63	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040204SK028_03	Teton River	2.6	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040204SK032_02	Drake Creek - source to mouth	5.43	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040204SK041_02	Fox Creek	7.99	Miles
FLOW REGIME MODIFICATION			
ID17040204SK042_02	Fox Creek	0.91	Miles
FLOW REGIME MODIFICATION			

ID17040204SK056_02	Spring Creek - source to North Leigh Creek, including spring	24.21	Miles

FLOW REGIME MODIFICATION

17040205 Willow

ID17040205SK006_02	Birch Creek - source to mouth	14.12	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17040205SK006_03	Birch Creek - source to mouth	1.01	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17040205SK015_02	Long Valley Creek - source to mouth	22.3	Miles

FLOW REGIME MODIFICATION

17040206 American Falls

ID17040206SK002_03	Bannock Creek - source to American Falls Reservoir	14.24	Miles

FLOW REGIME MODIFICATION

ID17040206SK010_04	Rattlesnake Creek - lower	1.27	Miles

FLOW REGIME MODIFICATION

ID17040206SK024_02a	McTucker Creek	2.13	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17040207 Blackfoot

ID17040207SK002_02b	Deadman Creek - Blackfoot River tributary	1.06	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK002_05	Blackfoot River - Blackfoot Reservoir Dam to Fort Hall Main	65.16	Miles

FLOW REGIME MODIFICATION

ID17040207SK005_02a	Grave Creek - upper (Blackfoot River tributary)	3.95	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK005_02d	Coyote Creek (Blackfoot River tributary)	1.23	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK005_03	Grave Creek - West Creek to Blackfoot River	5.49	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

Upper Snake

ID17040207SK006_02a	Chicken Creek - headwaters to Corral Creek (Blackfoot River)	6.42	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK006_02b	Bear Creek - headwaters to Corral Creek (Blackfoot River)	3.85	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK006_03	Corral Creek - middle	9.22	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK007_02	Grizzly Creek - source to mouth	16.72	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			
ID17040207SK007_02a	Sawmill Creek - headwaters to Grizzly Creek, Blackfoot River	7.46	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK007_03	Grizzly Creek - source to mouth	4.54	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK008_02	Thompson Creek - upper (Blackfoot River tributary)	10.7	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK009_02a	Collett Creek - headwaters to Blackfoot Reservoir	3.98	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK009_03	Little Blackfoot River	7.56	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS FLOW REGIME MODIFICATION			
ID17040207SK010_02a	State Land Creek - headwaters to Blackfoot River	9.08	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK011_03	Trail Creek - source to mouth (Below Findlayson Ranch)	7.85	Miles
FLOW REGIME MODIFICATION			
ID17040207SK012_02b	Goodheart Creek	7.54	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK012_03	Slug Creek - source to mouth	4.8	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			
ID17040207SK012_03a	lower Johnson Creek	2.9	Miles
PHYSICAL SUBSTRATE HABITAT ALTERATIONS			

ID17040207SK012_04 Slug Creek - source to mouth 18.61 Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK013_02a Dry Valley Creek 6.43 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK015_02a East Mill Creek 2.44 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK016_02e Cabin Creek 3.42 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK018_02e Lanes Creek - FS boundary to Lander Creek 3.13 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK018_03 Lanes Creek - Lander Creek to Chippy Creek 3.65 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK018_04 Lanes Creek - Chippy Creek to Blackfoot River 9.41 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK019_02b Bacon Creek - below FS boundary 3.52 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK019_03 Bacon Creek - below FS boundary 2.03 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK019_04 Bacon Creek - below FS boundary 4.62 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK021_03 Chippy Creek - lower (Blackfoot River tributary) 4.61 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK022_03 Sheep Creek - below confluence of South Fork Sheep Creek 2.55 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK023_02a Rasmussen Creek 6.27 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK023_02b Angus Creek - upper, headwaters to Rasumussen Creek 7.81 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK023_04 Lower Angus Creek - Rasmussen Creek to Blackfoot River 3.46 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK025_02c	Clarks Cut - Sheep Creek to Grays Lake	1.92	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK025_03b	Crooked Creek (Meadow Cr/Blackfoot River tributary)	2.13	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040207SK030_03	Wolverine Creek - Jones Creek to Mouth	2.55	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

17040208 Portneuf

ID17040208SK001_05	Portneuf River - Marsh Creek to American Falls Reservoir	24.46	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040208SK006_03a	Marsh Creek - Rt Fk to Red Rock Pass	3.78	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040208SK006_04	Lower Marsh Creek	17.69	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17040208SK006_04a	Lower Middle Marsh Creek	19.76	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040208SK010_02b	Garden Creek - lower	7.65	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040208SK014_02	Cherry Creek - ephemeral tributaries	17.64	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040208SK014_02b	Cherry Creek	5.83	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17040208SK016_02	Portneuf R - 2nd order tribs-Chesterfield Dam to Marsh Creek	162.63	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040208SK016_03	Portneuf River- Chesterfield Reservoir to Toponce Creek	5.52	Miles

FLOW REGIME MODIFICATION

ID17040208SK016_04	Portneuf River- hist. channel, Toponce to Twentyfour Mile Ck	2.82	Miles

FLOW REGIME MODIFICATION

ID17040208SK016_05	Portneuf River- Twentyfour Mile Creek to Marsh Creek	52.21	Miles

FLOW REGIME MODIFICATION

ID17040208SK017_02c	Beaverdam Creek	3.84	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040208SK018_02a	Twentyfour Mile Creek	1.17	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17040208SK024_03	lower Pocatello Creek	2.91	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17040208SK024_03a	middle Pocatello Creek - Fks to Outback Driving Range	2.02	Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17040209 Lake Walcott

ID17040209SK011_07	Snake River - American Falls Reservoir Dam to Rock Creek	13.33	Miles

FLOW REGIME MODIFICATION

17040210 Raft

ID17040210SK001_05	Raft River - Heglar Canyon Creek to mouth	18.44	Miles

FLOW REGIME MODIFICATION

ID17040210SK002_02	Raft River - Cassia Creek to Heglar Canyon Creek	166.91	Miles

FLOW REGIME MODIFICATION

ID17040210SK002_05	Raft River - Cassia Creek to Heglar Canyon Creek	19.5	Miles

FLOW REGIME MODIFICATION

ID17040210SK003_04	Cassia Creek - Conner Creek to mouth	12.76	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040210SK008_04	Raft River - Cottonwood Creek to Cassia Creek	19.86	Miles

FLOW REGIME MODIFICATION

ID17040210SK010_04	Raft River	19.1	Miles

FLOW REGIME MODIFICATION

ID17040210SK013_04	Raft River - Idaho/Utah border to Edwards Creek	8.32	Miles

FLOW REGIME MODIFICATION

ID17040210SK019_02	Sublett Creek - Sublett Reservoir Dam to mouth	51.51	Miles

FLOW REGIME MODIFICATION

ID17040210SK020_0L	Sublett Reservoir	79.91	Acres

FLOW REGIME MODIFICATION

17040211 Goose

ID17040211SK000_02A	Little Cottonwood Creek	63.28	Miles

FLOW REGIME MODIFICATION

ID17040211SK002L_0L	Lower Goose Creek Reservoir	1005.99	Acres

FLOW REGIME MODIFICATION

ID17040211SK003_04a	Trapper Creek	0.34	Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17040212 Upper Snake-Rock

ID17040212SK000_02	1st and 2nd order tribs to Yahoo and Deep Creek	391.97	Miles

FLOW REGIME MODIFICATION

ID17040212SK001_07	Snake River - Lower Salmon Falls to Clover Creek	26.68	Miles

FLOW REGIME MODIFICATION

ID17040212SK005_07	Snake River - Box Canyon Creek to Lower Salmon Falls	16.51	Miles

FLOW REGIME MODIFICATION

ID17040212SK007_02	2nd order segments of Briggs Creeks and Cedar Draw	31.06	Miles

FLOW REGIME MODIFICATION

ID17040212SK007_07	Snake River - Rock Creek to Box Canyon Creek	18.3	Miles

FLOW REGIME MODIFICATION

ID17040212SK010_03	Mud Creek - Deep Creek Road (T09S, R14E) to mouth	1.07	Miles

FLOW REGIME MODIFICATION

ID17040212SK012_03	Cedar Draw - source to mouth	2.93	Miles

FLOW REGIME MODIFICATION

ID17040212SK013_04	Rock Creek -river mile 25 (T11S, R18E, Sec. 36) to mouth	4.63	Miles

FLOW REGIME MODIFICATION

ID17040212SK013_05	Rock Creek -river mile 25 (T11S, R18E, Sec. 36) to mouth	20.19	Miles
FLOW REGIME MODIFICATION			
ID17040212SK014_02	North/Dry Cottonwood Creek - source to mouth	37.64	Miles
FLOW REGIME MODIFICATION			
ID17040212SK014_04	Cottonwood Creek - 4th order segment	6.26	Miles
FLOW REGIME MODIFICATION			
ID17040212SK015_03	McMullen Creek - source to mouth	9.41	Miles
FLOW REGIME MODIFICATION			
ID17040212SK016_04	Rock Creek	8.31	Miles
FLOW REGIME MODIFICATION			
ID17040212SK019_07	Snake River - Twin Falls to Rock Creek	12.58	Miles
FLOW REGIME MODIFICATION			
ID17040212SK020_07	Snake River - Milner Dam to Twin Falls	21.31	Miles
FLOW REGIME MODIFICATION			
ID17040212SK022_03	Dry Creek - source to mouth	9.85	Miles
FLOW REGIME MODIFICATION			
ID17040212SK023_02	West Fork Dry Creek - source to mouth	10.72	Miles
FLOW REGIME MODIFICATION			
ID17040212SK031_02	Sand Springs	4.6	Miles
FLOW REGIME MODIFICATION			
ID17040212SK033_02	Billingsley Creek - source to mouth	8.13	Miles
FLOW REGIME MODIFICATION			
ID17040212SK034_04	Clover Creek - Pioneer Reservoir Dam outlet to Snake River	10.1	Miles
FLOW REGIME MODIFICATION			
ID17040212SK035_04	Pioneer Reservoir	228.92	Acres
FLOW REGIME MODIFICATION			
ID17040212SK040_03	Calf Creek - source to mouth	6.57	Miles
FLOW REGIME MODIFICATION			

17040213 Salmon Falls

ID17040212SK000_02	1st and 2nd order tribs to Yahoo and Deep Creek	391.97	Miles
FLOW REGIME MODIFICATION			

ID17040213SK000_04 Cedar Creek-reservoir to Salmon Falls Creek 9.1 Miles

FLOW REGIME MODIFICATION

17040214 Beaver-Camas

ID17040214SK002_05 Camas Creek - Spring Creek to Beaver Creek 40.87 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17040214SK003_05 Beaver Creek - canal (T09N, R36E) to mouth 10.56 Miles

FLOW REGIME MODIFICATION

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

ID17040214SK015_05 Beaver Creek - Rattlesnake Creek to Dry Creek 2.9 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

17040215 Medicine Lodge

ID17040215SK012_03 Irving Creek - source to mouth 2.56 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

17040216 Birch

ID17040216SK001_04 Birch Creek - Reno Ditch to playas 24.64 Miles

FLOW REGIME MODIFICATION

17040217 Little Lost

ID17040217SK022_03 Wet Creek - Squaw Creek to mouth 8.36 Miles

FLOW REGIME MODIFICATION

17040218 Big Lost

ID17040218SK002_06 Big Lost River-Spring Creek to Big Lost River Sinks (playas) 72.19 Miles

FLOW REGIME MODIFICATION

ID17040218SK003_06 Spring Creek - Lower Pass Creek to Big Lost River 17.1 Miles

PHYSICAL SUBSTRATE HABITAT ALTERATIONS

FLOW REGIME MODIFICATION

ID17040218SK020_03 Willow Creek - source to mouth 4.05 Miles

FLOW REGIME MODIFICATION

ID17040218SK024_05	Big Lost River - Burnt Creek to Thousand Springs Creek	18.99	Miles

FLOW REGIME MODIFICATION

ID17040218SK046_02	Antelope Creek - Spring Creek to mouth	49.58	Miles

FLOW REGIME MODIFICATION

ID17040218SK047_04	Antelope Creek - Dry Fork Creek to Spring Creek	3.56	Miles

FLOW REGIME MODIFICATION

17040219 Big Wood

ID17040219SK004_05	Big Wood River - Seamans Creek to Magic Reservoir	39.26	Miles

FLOW REGIME MODIFICATION

ID17040219SK007_05	Big Wood River - North Fork Big Wood River to Seamans Creek	28.87	Miles

FLOW REGIME MODIFICATION

ID17040219SK008_02A	Quigley Creek	9.62	Miles

FLOW REGIME MODIFICATION

ID17040219SK027_03	Croy Creek - source to mouth	8.36	Miles

FLOW REGIME MODIFICATION

ID17040219SK030_03	Black Canyon Creek - source to mouth	24.17	Miles

FLOW REGIME MODIFICATION

17040220 Camas

ID17040220SK011_03	Soldier Creek - Wardrop Creek to mouth	12.72	Miles

FLOW REGIME MODIFICATION

ID17040220SK023L_0L	Mormon Reservoir	1583.81	Acres

FLOW REGIME MODIFICATION

ID17040220SK025_02	McKinney Creek - source to Mormon Reservoir	17.49	Miles

FLOW REGIME MODIFICATION

17040221 Little Wood

ID17040221SK001_05	Little Wood River	26.86	Miles

FLOW REGIME MODIFICATION

ID17040221SK001_05a	Little Wood River	29.69	Miles

FLOW REGIME MODIFICATION

Upper Snake

ID17040221SK001_05b	Little Wood River	5.66	Miles
FLOW REGIME MODIFICATION			
ID17040221SK002_05	Little Wood River	25.8	Miles
FLOW REGIME MODIFICATION			
ID17040221SK003_05	Little Wood River - West Canal (north) to West Canal (south)	15.67	Miles
FLOW REGIME MODIFICATION			
ID17040221SK006_03	Fish Creek - Fish Creek Reservoir Dam to mouth	2.68	Miles
FLOW REGIME MODIFICATION			
ID17040221SK006_04	Fish Creek - Fish Creek Reservoir Dam to mouth	16.6	Miles
FLOW REGIME MODIFICATION			
ID17040221SK007L_0L	Fish Creek Reservoir	349.53	Acres
FLOW REGIME MODIFICATION			
ID17040221SK008_04	Fish Creek - source to Fish Creek Reservoir	1.36	Miles
FLOW REGIME MODIFICATION			
ID17040221SK009_03	West Fork Fish Creek - source to Fish Creek Reservoir	3.33	Miles
FLOW REGIME MODIFICATION			
ID17040221SK010_05	Little Wood River - Little Wood River Reservoir Dam to Carey	4.31	Miles
FLOW REGIME MODIFICATION			
ID17040221SK012L_0L	Little Wood River Reservoir	598.94	Acres
FLOW REGIME MODIFICATION			
ID17040221SK022_02	Dry Creek - source to mouth	39.64	Miles
FLOW REGIME MODIFICATION			
ID17040221SK022_03	Dry Creek - source to mouth	11.61	Miles
FLOW REGIME MODIFICATION			

Category 5 (§ 303(d) List): Waters do not meet applicable water quality standards for one or more beneficial uses due to one or more pollutants and a TMDL is needed.

2018/2020 Integrated Report - Category 5 (§ 303(d) list)

Bear River

16010102 Central Bear

ID16010102BR002_03 Pegram Creek - source to mouth 6.27 Miles

SEDIMENTATION/SILTATION

ID16010102BR007_02a Giraffe Creek - headwaters to WY line 6.46 Miles

SEDIMENTATION/SILTATION

7/14/17 (HH): All particles were silt and clay in 2015 Wolman Pebble Count. In site photos, water appears turbid and no woody riparian vegetation is observed. Activities observed that may contribute to excess sedimentation include recreation and grazing. Site comments indicate "cattle everywhere. . . extremely opaque and muddy water".

ID16010102BR008_02 Sheep Creek - source to mouth 22.42 Miles

ESCHERICHIA COLI (E. COLI)

6/11/2019 (RE): Six E. coli samples collected 8/30/2017 through 9/26/2017 had a geometric mean of 742.1 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

16010201 Bear Lake

ID16010201BR002_02 Bennington Canyon and unnamed tributaries 182.09 Miles

SEDIMENTATION/SILTATION

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID16010201BR002_02b Wood Canyon Creek - headwaters to groundwater 7.24 Miles

SEDIMENTATION/SILTATION

6/13/2019 (RE, JC): BURP site 2016SPOCA027 received a site condition rating of 1.50, indicating cold water aquatic life is not supported (Idaho's WBAG III, section 6.4.3). The Wolman Pebble Count from 2016SPOCA027 indicated that silt and sand made up 60% of particles in riffles and that silt, sand, and VFP made up 73% of particles in riffles.

ID16010201BR002_02d Dunns Creek 10.5 Miles

CAUSE UNKNOWN

ID16010201BR002_05 Bear River-railroad bridge (T14N, R45E, Sec. 21) to Ovid Cr. 57.47 Miles

TEMPERATURE

Exceeded State Water Quality Standards for salmonid spawning and cold water aquatic life. See temperature data in IDASA.

ID16010201BR002_06 Bear River - Ovid Creek confluence to Alexander Reservoir 44.09 Miles

TEMPERATURE

Exceeded State Water Quality Standards for salmonid spawning and cold water aquatic life. See temperature data in IDASA.

ID16010201BR006_02d Stauffer Creek - Beaver Cr to Spring Cr 5.25 Miles

ESCHERICHIA COLI (E. COLI)

ID16010201BR006_02e Spring Creek 5.53 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID16010201BR010_02a Copenhagen Creek 12.33 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID16010201BR010_02b Emigration Creek - HW to North Creek 7.55 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID16010201BR011_03a Middle Mill Creek 1.99 Miles

FECAL COLIFORM

ID16010201BR013_02a Sleight Canyon 11.46 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID16010201BR014_03 Bloomington Creek - lower 14.92 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID16010201BR014_03a Bloomington Creek - above USFS boundary 2.57 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID16010201BR016_02a St Charles Creek - headwaters to Snowslide Canyon 15.62 Miles

TEMPERATURE	Exceeded State Water Quality Standards for salmonid spawning. See temperature data in IDASA.

ID16010201BR016_03 St. Charles Creek - Little Creek to Spring Creek 2.75 Miles

TEMPERATURE	Exceeded state Water Quality Standards for salmonid spawning. See documentation in IDASA.

ID16010201BR016_03a St Charles Creek - Little Creek to Bear Lake 2.67 Miles

TEMPERATURE	Exceeded state Water Quality Standards for salmonid spawning. See documentation in IDASA.

ID16010201BR016_03b St Charles Creek - Snowslide Canyon to Little Creek 9.2 Miles

TEMPERATURE	10/27/2014 (Greg Madenka) - Water temperature monitoring records from 6/9/2001 - 11/7/2001 indicated spring salmonid spawning criteria was exceeded 19% of the spring salmonid spawning season which is April 15 through July 1.

ID16010201BR018_02b Indian Creek 5.77 Miles

ESCHERICHIA COLI (E. COLI)	6/11/2019 (RE): Five E. coli samples collected 8/30/2017 through 9/19/2017 had a geometric mean of 624.7 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Primary Contact Recreation.
SEDIMENTATION/SILTATION	

ID16010201BR020_02 Montpelier Creek Tributaries - source to mouth 32.79 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	
ESCHERICHIA COLI (E. COLI)	The five-sample geometric mean collected 9/14/2004 had a value >2,400 cfu/100mL, which is greater than the 126 cfu/100mL criterion value. Therefore, the recreational use of this water body is considered impaired by bacteria.

ID16010201BR020_02a	Little Beaver Creek	3.64	Miles

ESCHERICHIA COLI (E. COLI)

ID16010201BR020_02b	Whiskey Creek - headwaters to Montpelier Creek	5.39	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ESCHERICHIA COLI (E. COLI) — 6/11/2019 (RE): Five E. coli samples collected 8/28/2017 through 9/14/2017 had a geometric mean of 644.6 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID16010201BR020_02d	Home Canyon	13.19	Miles

ESCHERICHIA COLI (E. COLI)

ID16010201BR020_02e	Montpelier Creek - headwaters to Whiskey Creek	4.11	Miles

ESCHERICHIA COLI (E. COLI)

ID16010201BR020_03	Montpelier Creek - lower	5.3	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ESCHERICHIA COLI (E. COLI) — See DEQ BURP bacteria data. Failed Geometric mean in 2004.

SEDIMENTATION/SILTATION

ID16010201BR020_03a	Middle Montpelier Creek	8.92	Miles

ESCHERICHIA COLI (E. COLI)

ID16010201BR020_03b	Montpelier Creek	4.4	Miles

ESCHERICHIA COLI (E. COLI)

ID16010201BR022_02b	Upper Georgetown Creek - headwaters to left hand fork	10.86	Miles

SELENIUM — Se listed based on DEQ data. See DEQ 2006 Selenium Project Southeast Idaho Phosphate Mining Resource Area.

ID16010201BR022_03a	Lower Georgetown Creek - left hand fork to mouth	3.91	Miles

ESCHERICHIA COLI (E. COLI)

16010202 Middle Bear

ID16010202BR003_02b	Deep Creek	4.91	Miles

ESCHERICHIA COLI (E. COLI)

ID16010202BR003_03	Cub River - Sugar Creek to Maple Creek	5.28	Miles

ESCHERICHIA COLI (E. COLI)

ID16010202BR005_01L	Foster Reservoir	131.7	Acres

MERCURY — 2/18/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.389 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID16010202BR005_02L	Glendale Reservoir	203.11	Acres

MERCURY	2/18/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.565 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID16010202BR006_06	Bear River-Oneida Narrows Reservoir Dam to Idaho/Utah border	36.09	Miles

TEMPERATURE	Exceeded State Water Quality Standards for salmonid spawning and cold water aquatic life. See temperature data in IDASA.

ID16010202BR009_02b	Alder Creek - headwaters to mouth	17.72	Miles

FECAL COLIFORM	

ID16010202BR009_06	Bear River - Alexander Reservoir Dam to Densmore Creek	15.62	Miles

TEMPERATURE	Exceeded State Water Quality Standards for salmonid spawning and cold water aquatic life. See temperature data in IDASA.

ID16010202BR009_06a	Bear River - Denismore Cr to above Oneida Reservoir	21.37	Miles

TEMPERATURE	Exceeded State Water Quality Standards for salmonid spawning and cold water aquatic life. See temperature data in IDASA.

ID16010202BR014_02c	Shingle Creek	10.48	Miles

ESCHERICHIA COLI (E. COLI)	10/6/2015 (NED) - The five-sample geometric mean E. coli samples collected on Shingle Creek in 2002 had a value of 385 cfu/100mL, which is greater than the 126 cfu/100mL criterion value.
SEDIMENTATION/SILTATION	4/7/17 (HH): 2015 BURP site had 52% bank stability, and fine sediments < 6 mm made up 85% of particles in riffles. These data indicate that excess sedimentation is impacting cold water aquatic life and salmonid spawning in this AU.

ID16010202BR014_03a	Shingle Creek	0.84	Miles

ESCHERICHIA COLI (E. COLI)	

ID16010202BR018_02b	Swan Lake Creek	13.79	Miles

FECAL COLIFORM	The five-sample geometric mean E. coli sample had a value of 4,937 cfu/100mL, which greater than the 126 cfu/100mL criterion value. Therefore, the recreational use of this water body is considered impaired by bacteria.
SEDIMENTATION/SILTATION	

ID16010202BR019_02	Fivemile Creek - source to Dayton	9.51	Miles

ESCHERICHIA COLI (E. COLI)	

ID16010202BR019_02a	Fivemile Creek - Dayton to mouth	5.71	Miles

ESCHERICHIA COLI (E. COLI)	

ID16010202BR020_02L	Weston Creek Reservoir	111.42	Acres

MERCURY	2/18/2010 - (NED) Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.379 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID16010202BR021_02	Jenkins Hollow (Newton Creek)	14.1	Miles

SEDIMENTATION/SILTATION	

ID16010202BR021_02a	Steel Canyon	1.53	Miles

SEDIMENTATION/SILTATION

16010203 Little Bear-Logan

ID16010203BR001_02a	Beaver Creek	10.55	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

16010204 Lower Bear-Malad

ID16010204BR001_02b	Four Mile Canyon	7.6	Miles

SEDIMENTATION/SILTATION

ID16010204BR001_02c	West Cherry Creek - Malad River tributary	4.52	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ESCHERICHIA COLI (E. COLI)	6/11/2019 (RE): Five E. coli samples collected 8/24/2017 through 9/24/2017 had a geometric mean of 969.6 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID16010204BR001_02d	Henderson Creek	4.98	Miles

SEDIMENTATION/SILTATION

ID16010204BR002_02	Devil Creek - Devil Creek Reservoir Dam to mouth	10.24	Miles

ESCHERICHIA COLI (E. COLI)

ID16010204BR002_02a	Campbell Creek	2.87	Miles

FECAL COLIFORM

ID16010204BR002_03	Devil Creek - Devil Creek Reservoir Dam to mouth	25.63	Miles

ESCHERICHIA COLI (E. COLI)

ID16010204BR004_02	Devil Creek - source to Devil Creek Reservoir	14.36	Miles

ESCHERICHIA COLI (E. COLI)

ID16010204BR006_02a	First Creek	8.65	Miles

ESCHERICHIA COLI (E. COLI)

ID16010204BR007_02a	Third Creek - headwaters to Deep Creek	12.91	Miles

ESCHERICHIA COLI (E. COLI)

ID16010204BR010_02b	Upper Wright Creek - headwaters to Indian Mill Canyon	8.86	Miles

ESCHERICHIA COLI (E. COLI)

ID16010204BR010_03	middle Wright Creek - Indian Mill Canyon to Dairy Creek	2.72	Miles

FECAL COLIFORM

ID16010204BR010_04	Wright Creek - Dairy Creek to Daniels Reservoir	4.16	Miles

ESCHERICHIA COLI (E. COLI)

ID16010204BR011_03	Dairy Creek - source to mouth	5.41	Miles

SEDIMENTATION/SILTATION

16020309 Curlew Valley

ID16020309BR003_02	Rock Creek - source to mouth	61.83	Miles

SEDIMENTATION/SILTATION

17060108 Palouse

ID17060108CL020_02	Big Sand Creek - source to mouth	13.72	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060108CL021_02	North Fork Palouse River - source to mouth	13.96	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17060303 Lochsa

ID17060303CL001_05	Lochsa River - Deadman Creek to mouth	10.4	Miles

TEMPERATURE

ID17060303CL003_05	Lochsa River - Old Man Creek to Deadman Creek	6.96	Miles

TEMPERATURE

ID17060303CL008_05	Lochsa River - Fish Creek to Old Man Creek	6.93	Miles

TEMPERATURE

ID17060303CL009_05	Lochsa River - Indian Grave Creek to Fish Creek	19.65	Miles

TEMPERATURE

ID17060303CL013_05	Lochsa River- Warm Springs Creek to Indian Grave Creek	11.96	Miles

TEMPERATURE

ID17060303CL020_05	Lochsa River - confluence of Crooked Fork, White Sand Creek,	13.11	Miles

TEMPERATURE

17060304 Middle Fork Clearwater

ID17060304CL005_02	Kay Creek - source to mouth	8.58	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17060305 South Fork Clearwater

ID17060305CL003_04	Cottonwood Creek - source to Cottonwood Creek waterfall	5.4	Miles

ESCHERICHIA COLI (E. COLI)	11/4/2019 (JW): Geometric mean E. coli concentrations measured at the tribal boundary were 88.1 mpn/100 mL in April-May 2019, and 210.9 mpn/100 mL in Aug-Sept 2019. The Aug-Sept 2019 geomean exceeded the E. coli water quality standard (126 mpn/100 mL).

ID17060305CL006_03	Stockney Creek - source to mouth	6.44	Miles

ESCHERICHIA COLI (E. COLI)	11/4/2019 (JW): The geometric mean E. coli concentration measured at Kube Rd in April-May 2019 (149.8 mpn/100 mL) exceeded the E. coli water quality standard (126 mpn/100 mL).

ID17060305CL007_03	Shebang Creek - source to mouth	7.72	Miles

ESCHERICHIA COLI (E. COLI)	11/4/2019 (JW): The geometric mean E. coli concentration measured at Kube Rd in April-May 2019 (519.8 mpn/100 mL) exceeded the E. coli water quality standard (126 mpn/100 mL).

ID17060305CL081_02	Sally Ann Creek - source to and inc. Wall Creek	17.73	Miles

ESCHERICHIA COLI (E. COLI)	11/5/2019 (JW): A geometric mean E. coli concentration measured in July 2017 (1019.5 mpn/100 mL) exceeded the E. coli water quality standard (126 mpn/100 mL).

17060306 Clearwater

ID17060306CL006_02	Sweetwater Creek - source to Webb Creek	18.24	Miles

CAUSE UNKNOWN	Pesticides, Nutrients Suspected Impairment Low DO due to suspected Organic Enrichment
SEDIMENTATION/SILTATION	
TEMPERATURE	

ID17060306CL006_03	Sweetwater Creek - source to Webb Creek	0.22	Miles

FECAL COLIFORM	
SEDIMENTATION/SILTATION	
CAUSE UNKNOWN	Pesticides, Nutrients Suspected Impairment;Low DO due to suspected Organic Enrichment
TEMPERATURE	

ID17060306CL006_04	Sweetwater Creek - source to Webb Creek	3.89	Miles

TEMPERATURE	
SEDIMENTATION/SILTATION	
FECAL COLIFORM	
CAUSE UNKNOWN	Pesticides, Nutrients Suspected ImpairmentLow DO due to suspected Organic Enrichment

ID17060306CL007_02	Webb Creek - source to mouth	9.15	Miles

CAUSE UNKNOWN	Nutrients Suspected Impairment Low DO due to suspected Organic Enrichment
TEMPERATURE	
SEDIMENTATION/SILTATION	
FECAL COLIFORM	

ID17060306CL011_02	Mission Creek - source to mouth	17.1	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	

ID17060306CL024_02	Lawyer Creek - source to mouth	51.69	Miles

OIL AND GREASE	
SEDIMENTATION/SILTATION	
TEMPERATURE	
DISSOLVED OXYGEN	
AMMONIA, UN-IONIZED	
NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS	

ID17060306CL024_03 Lawyer Creek - source to mouth 9.71 Miles

OIL AND GREASE

SEDIMENTATION/SILTATION

ESCHERICHIA COLI (E. COLI)

CAUSE UNKNOWN Nutrients Suspected ImpairmentLow DO due to suspected Organic Enrichment

AMMONIA, UN-IONIZED

TEMPERATURE

ID17060306CL029_03 Eldorado Creek - 3rd Order 6.46 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060306CL039_03 Orofino Creek, including Rhodes, Cow Creek 11.41 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

TEMPERATURE

ID17060306CL039_04 Orofino Creek - source to mouth 25.45 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060306CL040_02a Whiskey Creek 20.8 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060306CL041_02 Bedrock Creek - source to mouth 17.44 Miles

SEDIMENTATION/SILTATION

OIL AND GREASE

CAUSE UNKNOWN Nutrients Suspected Impairment Low DO due to suspected Organic Enrichment

TEMPERATURE

AMMONIA, UN-IONIZED

FECAL COLIFORM

ID17060306CL041_03 Bedrock Creek - source to mouth 2.71 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060306CL043_02 Pine Creek - source to mouth 20.96 Miles

SEDIMENTATION/SILTATION

TEMPERATURE

FECAL COLIFORM

CAUSE UNKNOWN Nutrients Suspected Impairment Low DO due to suspected Organic Enrichment

ID17060306CL043_03	Pine Creek - source to mouth	4.42	Miles

SEDIMENTATION/SILTATION

CAUSE UNKNOWN	Nutrients Suspected Impairment

OIL AND GREASE

AMMONIA, UN-IONIZED

ID17060306CL057_03	East Fork Big Bear Creek - source to mouth	3.48	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060306CL066_02	Catholic Creek - source to mouth	1.72	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17060307 Upper North Fork Clearwater

ID17060307CL028_03	Moose Creek - Osier Creek to mouth	2.27	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17060308 Lower North Fork Clearwater

ID17060308CL031_02	Bull Run Creek - conf. of Squaw and Shattuck Creeks to mouth	7.44	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060308CL031_03	Bull Run Creek - conf. of Squaw and Shattuck Creeks to mouth	4.99	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060308CL032_02	Shattuck Creek - source to mouth	8.08	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060308CL033_02	Squaw Creek - source to mouth	18.29	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060308CL033_03	Squaw Creek - source to mouth	0.75	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17010104 Lower Kootenai

ID17010104PN001_02a	Fisher Creek	6.79	Miles
TEMPERATURE			
ID17010104PN001_08	Kootenai River - Shorty's Island to the Id/Canadian border	36.89	Miles
TEMPERATURE			
ID17010104PN004_02	Blue Joe Creek - source to Idaho/Canadian border	15.43	Miles
ZINC			
LEAD			
CADMIUM			
ID17010104PN009_03	Parker Creek - lower portion, agricultural area	0.64	Miles
BENTHIC MACROINVERTEBRATES BIOASSESSMENTS			
ID17010104PN010_03a	Trout Creek - lower portion below branch	2.93	Miles
TEMPERATURE			
SEDIMENTATION/SILTATION			
ID17010104PN012_08	Kootenai River - Deep Creek to and including Shorty's Island	5.74	Miles
TEMPERATURE			
ID17010104PN023_0L	McArthur Lake	336.47	Acres
MERCURY	2/18/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.650 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.		
ID17010104PN024_03	Dodge Creek	0.45	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			
TEMPERATURE			
ID17010104PN027_03	Brown Creek - lower, Twentymile Creek to Deep Creek	2.37	Miles
TEMPERATURE			
BENTHIC MACROINVERTEBRATES BIOASSESSMENTS			
ID17010104PN029_08	Kootenai River - Moyie River to Deep Creek	13.17	Miles
TEMPERATURE			

ID17010104PN031_08	Kootenai River - Idaho/Montana to Moyie River	10.78	Miles

TEMPERATURE

SELENIUM — 9/8/2020 (CN, RE): The U.S. Geological Survey (USGS) submitted selenium data during the 2018/2020 Integrated Report public comment period. Data were collected in September 2019 and downstream of USGS gaging station 12305000 (within Idaho). The average selenium concentration in the eggs and ovaries of nine mountain whitefish was 20.4 mg/kg dry weight, which exceeded the 15.1 mg/kg selenium egg-ovary criterion element (IDAPA 58.01.02.210.01a, Table 1 footnote I). Selenium has now been added as a cause of impairment to the cold water aquatic life beneficial use for AU ID17010104PN031_08.

17010105 Moyie

ID17010105PN001_05	Moyie River - Moyie Falls Dam to Kootenai River	1.88	Miles

TEMPERATURE

17010213 Lower Clark Fork

ID17010213PN001_08	Clark Fork River Delta - Mosquito Creek to Pend Oreille Lake	11	Miles

TEMPERATURE

ID17010213PN003_08	Clark Fork River - Cabinet Gorge Dam to Mosquito Creek	7.45	Miles

TEMPERATURE

ID17010213PN005_08	Clark Fork River - Idaho/Montana border to Cabinet Gorge Dam	0.55	Miles

TEMPERATURE

ID17010213PN021_02	Spring Creek - Headwaters to Lightning Creek	10.31	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17010214 Pend Oreille Lake

ID17010214PN001_08	Pend Oreille River - Priest River to Albeni Falls Dam	5	Miles

DISSOLVED GAS SUPERSATURATION

TEMPERATURE

ID17010214PN002_02a	Unnamed trib. to Syringa Creek - source to mouth	2.11	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS — 10/15/2014 (K. Larson) - The 2012 BURP data indicate that Aquatic Life Use Support (ALUS) is "Not Full Support", although the cause of impairment has not been established. Therefore, the cause of impairment is "Combined Biota/Habitat Bioassessments".

ID17010214PN002_03	Lower Hornby Creek	4.89	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS — 10/152014 (K. Larson) - The 2012 BURP data indicate that Aquatic Life Use Support (ALUS) is "Not Full Support", although the cause of impairment has not been established. Therefore, the cause of impairment is "Combined Biota/Habitat Bioassessments".

ID17010214PN002_08	Pend Oreille River - Pend Oreille Lake to Priest River	31.79	Miles
DISSOLVED GAS SUPERSATURATION			
TEMPERATURE			

ID17010214PN003_02	Hoodoo Creek - source to mouth	51.82	Miles
ESCHERICHIA COLI (E. COLI)	1/29/2010 (R. Steed, K. Stromberg, K. Keith, T. Clyne, R. Witherow) - 2006 BURP Escherichia coliform sample exceed Idaho Water Quality Standards numeric criteria. Geomean in 2005 was 1300 cfu/100mL.		

ID17010214PN010_03	Brickel Creek - Idaho/Washington border to mouth	5.62	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS	12/15/2009 (R.Steed, K. Keith, T. Herron, J. Bergquist, G. Pettit) - The lower portion of Brickle Creek has been straightened and otherwise modified. This modification has greatly contributed to the poor habitat conditions that exist, making it impossible to collect macroinvertebrates. It would be unreasonable to expect to get passing bug scores from habitat alone, or evaluate as a lotic water body. Other water quality issues are likely to exist upstream and stressor identification should be pursued.		

ID17010214PN011_03	Unnamed Tributary to Jewel Lake	1.83	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS	10/16/2014 (K. Larson) - The 2012 BURP data indicate that Aquatic Life Use Support (ALUS) is "Not Full Support", although the cause of impairment has not been established.		

ID17010214PN017_0L	Shepard Lake	97.18	Acres
MERCURY	3/15/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.586 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.		

ID17010214PN018_02b Boyer Slough	12.33 Miles
NITROGEN, TOTAL	11/3/2014 (K. Larson and R. Steed) - Based on Tier I data collected by DEQ during the summer of 2014, it was determined that total phosphorus and total nitrogen are responsible for the biological impairment. The data showed concentrations to be 3-4 times the concentrations observed in the Boyer Slough's receiving water (Kootenai Bay of Pend Oreille Lake). Total phosphorus concentrations were an order of magnitude greater than other streams and total nitrogen concentrations were 3-4 times that observed in other streams in the Panhandle of Idaho. Nonpoint sources of the total phosphorus and total nitrogen are runoff from a subdivision adjacent to Boyer Slough and from agriculture and ranchettes on tributaries to Boyer Slough. Point source nitrogen and phosphorus pollution is from the Kootenai-Ponderay Wastewater Treatment Plant. The pathway of nitrogen and phosphorus pollution into Boyer Slough is through runoff of nonpoint sources into tributaries and directly into Boyer Slough and direct discharge from the wastewater treatment plant. The high concentrations of phosphorus impair the recreation beneficial use due to excess growth of toxin-producing blue-green algae. The high concentrations of nitrogen and phosphorus impairs the aquatic life use due to the dominance of epiphytic and periphytic algae growth dominated by algae species that are not consumed by fish or macroinvertebrates.
PHOSPHORUS, TOTAL	11/3/2014 (K. Larson and R. Steed) - Based on Tier I data collected by DEQ during the summer of 2014, it was determined that total phosphorus and total nitrogen are responsible for the biological impairment. The data showed concentrations to be 3-4 times the concentrations observed in the Boyer Slough's receiving water (Kootenai Bay of Pend Oreille Lake). Total phosphorus concentrations were an order of magnitude greater than other streams and total nitrogen concentrations were 3-4 times that observed in other streams in the Panhandle of Idaho. Nonpoint sources of the total phosphorus and total nitrogen are runoff from a subdivision adjacent to Boyer Slough and from agriculture and ranchettes on tributaries to Boyer Slough. Point source nitrogen and phosphorus pollution is from the Kootenai-Ponderay Wastewater Treatment Plant. The pathway of nitrogen and phosphorus pollution into Boyer Slough is through runoff of nonpoint sources into tributaries and directly into Boyer Slough and direct discharge from the wastewater treatment plant. The high concentrations of phosphorus impair the recreation beneficial use due to excess growth of toxin-producing blue-green algae. The high concentrations of nitrogen and phosphorus impairs the aquatic life use due to the dominance of epiphytic and periphytic algae growth dominated by algae species that are not consumed by fish or macroinvertebrates.
AMMONIA-NITROGEN	02/2020 (B. Steed): Routine monitoring by DEQ CDA-CRO indicates Idaho Water Quality Standard criteria exceedances for total ammonia at two sites in Boyer Slough (Whiskey Jack Bridge, and Lower West Arm). Exceedences are for conditions with and without presence of juvenile young-of-year.

ID17010214PN018L_0L Pend Oreille Lake	80828.61 Acres
MERCURY	2/18/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.611 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID17010214PN022_02 West Gold Creek	9.62 Miles
SEDIMENTATION/SILTATION	Sediment TMDL developed for Gold Creek did not include West Gold Creek.

ID17010214PN038_02 Sand Creek - headwaters to Pack River	13.54 Miles
ESCHERICHIA COLI (E. COLI)	1/7/2010 (R. Steed, T. Clyne, and K. Stromberg) - E.coli data collected in 2005 at BURP site 2005SCDAA023 had a geometric mean of 346 cfu/100mL, which is greater than the 126 cfu/100mL criterion value.

ID17010214PN045_02	Caribou Creek - Headwaters to Pack R.	16.97	Miles

TEMPERATURE

12/11/2019 (CN) External temperature logger data submitted by the Pack River Water Quality Council, for site Caribou Creek 1, indicates a continued exceedance in the temperature criteria for bull trout. Cold water aquatic life and salmonid spawning for this AU remains "not supporting". 12/17/2019 Assessment by K. Larson DEQ-CRO: The temperature impairment associated with cold water aquatic life and salmonid spawning beneficial use will remain until it is evalutated under a review of the 2007 Pend Oreille Lake Tributaries Temperature Total Maximum Daily Loads: Addendum to the Pend Oreille Lake Subbasin Assessment and TMDL. The AU was assessed following the guidance provided in the Water Body Assessment Guidance, third edition, October 2016.

ID17010214PN054_03	Syringa Creek-Lower, 3rd order portion to Pend Oreille River	0.92	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17010214PN058_02	Johnson Creek - headwaters to Pend Oreille River	16.24	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17010214PN059_03	Riley Creek - Lower, to Pend Oreille R.	4.04	Miles

ESCHERICHIA COLI (E. COLI)

17010215 Priest

ID17010215PN002_03	Big Creek - source to mouth	3.59	Miles

TEMPERATURE

12/30/2019 (KL) Salmonid Spawning is not supporting based off temperature data collected by the Kalispel Tribe in 2017 that exceeds the temperature criteria. Assessment information is in attached documents.

ID17010215PN005_05	Lower Priest River - Priest Lake to Upper West Branch Priest	8.78	Miles

TEMPERATURE

10/13/17 (R. Steed): Temperature logger data collected by the Kalispel Tribe in 2014 and 2015 show that criteria is exceeded. 12/23/2019 (CN): External temperature logger data submitted by the Kalispel Tribe, for site OUT1, indicate continued exceedances in the temperature criteria. Cold water aquatic life and salmonid spawning for this AU remains "not supporting". Assessment information is in attached documents.

ID17010215PN027_03	Upper West Branch Priest River	5.06	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17010215PN029_03	Quartz Creek - source to mouth	3.2	Miles

TEMPERATURE

12/31/2019 (KL): Temperature logger data collected by the Kalispel Tribe in 2017 indicate exceedances in numeric temperature criteria for salmonid spawning, so this beneficial use is "not supporting". Assessment information is in attached documents.

17010216 Pend Oreille

ID17010216PN002_08 Pend Oreille River - Albeni Falls Dam to Idaho/Washington 3.8 Miles

TEMPERATURE

DISSOLVED GAS SUPERSATURATION

The pollutant "Total Phosphorus" was added as a cause of impairment on the 2008 Integrated Report. The assessment was based on available information at the time. Monitoring conducted by IDEQ during the summer of 2009 did not reveal any evidence of beneficial use impairment resulting from excess TP. Monitoring results conflict with the Total Phosphorus (TP) cause added in 2008. IDEQ is removing TP from the integrated report and will continue to evaluate Pend Oreille River status.

17010301 Upper Coeur d'Alene

ID17010301PN003_02 Beaver Creek - Headwaters and tributaries 44.89 Miles

CADMIUM

ZINC

ID17010301PN003_03 Beaver Creek- below White Creek 3.7 Miles

ZINC

LEAD

CADMIUM

ID17010301PN004_02 Prichard Cr., tributaries between Butte Gulch and Eagle Cr. 4.17 Miles

ZINC

ID17010301PN004_03 Prichard Creek - between Butte Gulch and Eagle Creek 5.45 Miles

COPPER

ZINC

LEAD

CADMIUM

ARSENIC

ID17010301PN004_04 Prichard Creek below Eagle Creek 2.94 Miles

ZINC

LEAD

CADMIUM

ID17010301PN005_02 Prichard Creek -headwaters and tributaries above Butte Gulch 24.34 Miles

CADMIUM

LEAD

ZINC

ID17010301PN005_03	Prichard Creek - between Barton Gulch to Butte Gulch	1.98	Miles

LEAD

ZINC

CADMIUM

17010302 South Fork Coeur d'Alene

ID17010302PN001_02	South Fork Coeur d'Alene River - Tributaries below Placer Cr	62.8	Miles

CADMIUM

ZINC

LEAD

TEMPERATURE

ID17010302PN001_03	South Fork Coeur d' Alene River-btw Placer Cr. and Big Cr.	7.6	Miles

CADMIUM

LEAD

ZINC

ID17010302PN001_03a	South Fork Coeur d'Alene River-Canyon Creek to Placer Creek	0.85	Miles

CADMIUM

LEAD

ZINC

ID17010302PN001_04	South Fork Coeur d'Alene River - btw Big Cr and Pine Cr	9.96	Miles

CADMIUM

LEAD

ZINC

ID17010302PN001_05	South Fork Coeur d'Alene River - btw Pine Cr and CdA River	2.23	Miles

CADMIUM

LEAD

TEMPERATURE

ZINC

ID17010302PN002_04	Pine Creek - East Fork Pine Creek to South Fork CdA River	5.31	Miles

CADMIUM

LEAD

ZINC

ID17010302PN003_03	Pine Creek - btw West Fork Pine Cr and East Fork Pine Cr	5.95	Miles

SEDIMENTATION/SILTATION

ID17010302PN004_02	East Fork Pine Creek headwaters and tributaries	22.54	Miles

CADMIUM

ZINC

LEAD

ID17010302PN004_03	East Fork Pine Creek below Douglas Creek	4	Miles

ZINC

LEAD

CADMIUM

ID17010302PN006_02	Government Gulch	3.54	Miles

CADMIUM

LEAD

ZINC

ID17010302PN007a_02	Big Creek headwaters and tributaries	22.76	Miles

TEMPERATURE

ID17010302PN007a_03	Big Creek btw Ink Creek and mining impact area	4.63	Miles

TEMPERATURE

ID17010302PN007b_03	Big Creek btw mining impact area and South Fork CdA River	2.54	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	5/04/17 (K Van de Riet) cold water aquatic life and salmonid spawning are designated uses. Cold water aquatic life is confirmed as an existing use based on the 2014 fish sample consisting of 100% cold water fish taxa. BURP data indicate cold water aquatic life and salmonid spawning are not fully supported according to WBAG3. Since the specific cause of impairment has not been determined, the cause of impairment is Combined Biota/Habitat Bioassessments.

ID17010302PN009a_02	Lake Creek headwaters to mining impact area	1.88	Miles

TEMPERATURE

ID17010302PN009b_02	Lake Creek from mining impact area to South Fork CdA River	1.54	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	5/05/2017 (K Van de Riet): Cold water aquatic life and salmonid spawning are designated uses. 2014 BURP data indicate cold water aquatic life and salmonid spawning are not fully supported according to WBAG3. Since the specific cause of impairment has not been determined, the cause of impairment is Combined Biota/Habitat Bioassessments.

ID17010302PN010_02	Placer Creek and tributaries	17.61	Miles

TEMPERATURE

ID17010302PN011_03	South Fork Coeur d'Alene R btw Daisy Gul and Canyon Cr	9.48	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17010302PN013_02	South Fork Coeur d'Alene R. headwaters and tributaries	10.26	Miles

TEMPERATURE

ID17010302PN014_02	Canyon Creek - from Gorge Gulch to South Fork CdA R.	8.64	Miles
CADMIUM			
LEAD			
TEMPERATURE			
ZINC	2004 BURP data indicate ALUS = not supporting.		
ID17010302PN015_02	**Canyon Creek from headwaters to Gorge Gulch**	**4.08**	**Miles**
TEMPERATURE			
ZINC			
LEAD			
CADMIUM			
ID17010302PN016_02	**Ninemile Creek and tribs except Ninemile Cr above East Fork**	**9.32**	**Miles**
CADMIUM			
LEAD			
TEMPERATURE			
ZINC			
ID17010302PN017_02	**Ninemile Creek above East Fork Ninemile Creek**	**1.79**	**Miles**
CADMIUM			
LEAD			
ZINC			
ID17010302PN018_02	**Moon Creek headwaters and tribs except West Fork Moon Cr**	**4.64**	**Miles**
CADMIUM			
LEAD			
TEMPERATURE			
ZINC			
ID17010302PN018_03	**Moon Creek btw West Fork Moon and South Fork CDA River**	**1.76**	**Miles**
ZINC			
CADMIUM			
TEMPERATURE			
LEAD			
ID17010302PN020_02	**Bear Creek headwaters and tributaries**	**13.64**	**Miles**
TEMPERATURE			
ID17010302PN020_03	**Bear Creek, lower**	**2.12**	**Miles**
COMBINED BIOTA/HABITAT BIOASSESSMENTS			

17010303 Coeur d'Alene Lake

ID17010303PN001L_0L	Coeur d’Alene Lake	22977.37	Acres

MERCURY	12/17/19 (KV, RS, CN): Fish tissue data collected 6/16/16-8/17/16 according to Final QAPP Coeur d'Alene Basin Fish Tissue Sampling May 2016 (2016BFK1249).In the northern lake, 4 of 30 samples exceeded 0.3 mg/kg. In the central lake, 7 of 40 samples exceeded 0.3 mg/kg. The highest concentration was 0.798 mg/kg in a bass sample from the central lake. These data informed an updated human health advisory from IFCAP and Idaho Dept. Health and Welfare finalized in 2019. Since the water quality numeric criterion is exceeded, the designated uses primary contact recreation, cold water aquatic life, and salmonid spawning are not supported due to mercury.
LEAD	
CADMIUM	
ZINC	

ID17010303PN005_02	Fighting Creek - headwaters to Tribal boundary	12.85	Miles

ESCHERICHIA COLI (E. COLI)	2010 (R. Steed, K. Keith) - In 2008, Bellgrove Creek was BURP'd and assessed for beneficial use support, and results from the process concluded beneficial uses are not supported. Just above the sampling site is a confined elk feeding operation that has been documented through enforcement actions to be the primary source of the high E. coli. Visual observations during both rain-on-snow events showed gully erosion from the property into Bellgrove Creek.
SEDIMENTATION/SILTATION	2010 (R. Steed, K. Keith) - In 2008, Bellgrove Creek was BURP'd and assessed for beneficial use support, and results from the process concluded beneficial uses are not supported. The creek is currently listed on Idaho's 2008 Integrated Report as impaired for E. coli. Just above the sampling site is a confined elk feeding operation that has been documented to be the primary source of the high E. coli. Visual observations during both rain-on-snow events showed gully erosion from the property into Bellgrove Creek. These observations, along with E. coli exceedances, make it reasonable to conclude that this facility is contributing to sediment observed during monitoring. This information and the combination of recent failing BURP scores and instantaneous turbidity exceedences based on data from other creeks in the area lead to the recommendation that Bellgrove Creek be listed on Idaho's 2010 Integrated Report for impairment of the Cold Water Aquatic Life beneficial use due to sediment.

ID17010303PN007_06	Coeur d'Alene River - Latour Creek to mouth	32	Miles

ZINC	
SEDIMENTATION/SILTATION	
LEAD	
TEMPERATURE	
CADMIUM	

ID17010303PN008L_0L Anderson Lake	541.35 Acres
LEAD	2012 (K. Keith and R. Steed) - Coeur d' Alene Regional Office conducted monitoring on the Coeur d'Alene River lateral lakes on August 29-31, 2011. Dissolved lead concentration in the photic zone of Anderson Lake was 4.80 ug/L and it was 5.83 ug/L in the anoxic zone. Both values exceed the chronic water quality criteria for aquatic life for lead of 0.54 ug/L at a hardness less than 25 mg/L (the hardness in Anderson Lake was 23.9 mg/L and 24.6 mg/L in the photic zone and anoxic zone, respectively). No dissolved oxygen water quality standard exceedances were observed in Anderson Lake. Due to the above described exceedances, Anderson Lake was listed as impaired for lead for the aquatic life beneficial use.

ID17010303PN009L_0L Black Lake	201.72 Acres
LEAD	2012 (K. Keith and R. Steed) - Coeur d' Alene Regional Office conducted monitoring on the Coeur d'Alene River lateral lakes on August 29-31 2011. Dissolved lead concentration in the photic zone of Black Lake was 8.14 ug/L which exceeded the chronic water quality criteria for aquatic life for lead of 0.56 ug/L at the hardness observed in the photic zone in Black Lake (25.7 mg/L). Dissolved lead concentration in the anoxic zone of Black Lake was 4.70 ug/L which exceeded the chronic water quality criteria for aquatic life for lead of 0.68 ug/L at the hardness observed in the anoxic zone in Black Lake (30.6 mg/L). No dissolved oxygen water quality standard exceedances were observed in Black Lake.

ID17010303PN010L_0L Cave & Medicine Lakes	987.47 Acres
LEAD	2012 (K. Keith and R. Steed) - Coeur d' Alene Regional Office conducted monitoring on the Coeur d'Alene River lateral lakes on August 29-31 2011. Dissolved lead concentration in the photic zone of Medicine Lake was 6.62 ug/L and it was 2.80 ug/L in the anoxic zone. Both values exceed the chronic water quality criteria for aquatic life for lead of 0.54 ug/L at a hardness less than 25 mg/L (the hardness in Medicine Lake was 15.6 mg/L and 14.7 mg/L in the photic zone and anoxic zone, respectively). No dissolved oxygen water quality standard exceedances were observed in Medicine Lake. Dissolved lead concentration in the photic zone of Cave Lake was 0.87 ug/L and it was 1.30 ug/L in the anoxic zone. Both values exceed the chronic water quality criteria for aquatic life for lead of 0.54 ug/L at a hardness less than 25 mg/L (the hardness in Cave Lake was 16.5 mg/L and 16.9 mg/L in the photic zone and anoxic zone, respectively). No dissolved oxygen water quality standard exceedances were observed in Cave Lake.
ZINC	2012 (K. Keith and R. Steed) - Coeur d' Alene Regional Office conducted monitoring on the Coeur d'Alene River lateral lakes on August 29-31 2011. Dissolved zinc concentration in the anoxic zone was 38.6 ug/L, which exceeded the chronic water quality criteria for aquatic life for zinc of 36 ug/L at a hardness less than 25 ug/L. No dissolved oxygen water quality standard exceedances were observed in Medicine Lake.

ID17010303PN016_06 Coeur d'Alene River-South Fork Coeur d'Alene River to Latour	8.29 Miles
CADMIUM	
LEAD	
TEMPERATURE	
ZINC	

ID17010303PN022L_0L Killarney Lake 498.72 Acres

LEAD	2012 (K. Keith and R. Steed) - Coeur d' Alene Regional Office conducted monitoring on the Coeur d'Alene River lateral lakes on August 29-31, 2011. Dissolved lead concentration in the photic zone of Killarney Lake was 0.69 ug/L, which exceeded the chronic water quality criteria for aquatic life for lead of 0.55 ug/L at the hardness observed in the photic zone of Killarney lake (25.2 mg/L). No dissolved oxygen water quality standard exceedances were observed in Killarney Lake.
MERCURY	3/20/17 (R. Steed): Data supplied by EPA Region 10 confirm the presence of methyl mercury in Fish Tissue in concentrations that exceed Idaho toxics criteria. 01/15/2020 (KV, RS, CN): Fish tissue data collected 6/16/16-8/17/16 according to Final QAPP Coeur d'Alene Basin Fish Tissue Sampling May 2016 (2016BFK1249). There were 3 of 26 samples that exceeded 0.3 mg/kg. The highest concentration was 0.941 mg/kg in a bass sample. These data informed an updated human health advisory from IFCAP and Idaho Dept. Health and Welfare finalized in 2019. Since the water quality numeric criterion is exceeded, the existing uses primary contact recreation and cold water aquatic life are not supporting due to mercury.

ID17010303PN023L_0L Swan Lake 435.22 Acres

MERCURY	12/17/19 (KV, RS, CN): Fish tissue data collected 6/16/16-8/17/16 according to Final QAPP Coeur d'Alene Basin Fish Tissue Sampling May 2016 (2016BFK1249). There were 5 out of 40 samples that exceeded 0.3 mg/kg. The highest concentration was 0.753 mg/kg in a bass sample. These data informed an updated human health advisory from IFCAP and Idaho Dept. Health and Welfare finalized in 2019. Since the water quality numeric criterion is exceeded, the existing uses primary contact recreation and cold water aquatic life are not supporting due to mercury.

ID17010303PN025L_0L Thompson Lake 173.6 Acres

MERCURY	01/15/2020 (KV, RS, CN): Fish tissue data collected 6/16/16-8/17/16 according to Final QAPP Coeur d'Alene Basin Fish Tissue Sampling May 2016 (2016BFK1249). There were 2 out of 32 samples that exceeded 0.3 mg/kg. The highest concentration was 0.472 mg/kg in a bass sample. These data informed an updated human health advisory from IFCAP and Idaho Dept. Health and Welfare finalized in 2019. Since the water quality numeric criterion is exceeded, the existing uses primary contact recreation and cold water aquatic life are not supporting due to mercury.
ZINC	2012 (K. Keith and R. Steed) - Coeur d' Alene Regional Office conducted monitoring on the Coeur d'Alene River lateral lakes on August 29-31, 2011. Dissolved zinc concentration in the photic zone of Thompson Lake was 34.6 ug/L, and it was 54.0 ug/L in the anoxic zone. The anoxic zone sample exceeded the chronic water quality criteria for aquatic life for zinc of 36 ug/L at a hardness less than 25 mg/L. No dissolved oxygen water quality standard exceedances were observed in Thompson Lake.
LEAD	2012 (K. Keith and R. Steed) - Coeur d' Alene Regional Office conducted monitoring on the Coeur d'Alene River lateral lakes on August 29-31, 2011. Dissolved lead concentration in the photic zone of Thompson Lake was 3.20 ug/L in the photic zone, and it was 4.30 in the anoxic zone. Both values exceed chronic water quality criteria for aquatic life for lead of 0.54 ug/L at a hardness less than 25 mg/L (the hardness in Thompson Lake was 23.1 mg/L and 23.5 mg/L in the photic zone and anoxic zone, respectively). No dissolved oxygen water quality standard exceedances were observed in Thompson Lake.

ID17010303PN034_03 Fernan Creek - source to Fernan Lake 3.14 Miles

SEDIMENTATION/SILTATION	3/17/2015 (KL) - There is excessive erosion/sedimentation and bedload aggradation to Fernan Creek. Also contributing to excess sediment is the significant channel bank erosion and midstream channel deposition due to the over widening of Fernan Creek.

17010304 St. Joe

ID17010304PN013_03	Tyson Creek - source to mouth	2.14	Miles

ESCHERICHIA COLI (E. COLI)

ID17010304PN022_02	Olson Creek - source to mouth	12.76	Miles

TEMPERATURE

ID17010304PN024_03	Renfro Creek - locally known as Davis Creek	1.22	Miles

ESCHERICHIA COLI (E. COLI)

ID17010304PN041_02a	Sherlock Creek	2.23	Miles

SEDIMENTATION/SILTATION

ID17010304PN041_02i	St Joe River 2nd order above Yankee Bar	4.81	Miles

TEMPERATURE

12/12/2017 (CN): This AU was included in the "St. Joe River Subbasin Temperature Total Maximum Daily Loads Addendum to the St. Joe River Subbasin Assessment and Total Maximum Daily Loads and St. Maries River Subbasin Assessment and Total Maximum Daily Loads, Appendix A. Watersheds Meeting Total Maximum Daily Load Targets" approved by EPA on December 5, 2011. The recommendation in Table 23 is to move to category 2.

ID17010304PN041_02j	1st order tribs to the 2nd order portion of St. Joe River	19.24	Miles

TEMPERATURE

12/12/2017 (CN): This AU was included in the "St. Joe River Subbasin Temperature Total Maximum Daily Loads Addendum to the St. Joe River Subbasin Assessment and Total Maximum Daily Loads and St. Maries River Subbasin Assessment and Total Maximum Daily Loads, Appendix A. Watersheds Meeting Total Maximum Daily Load Targets" approved by EPA on December 5, 2011. The recommendation in Table 23 is to move to category 2.

17010305 Upper Spokane

ID17010305PN002_02	Cable Creek - source to Idaho/Washington border	12.05	Miles

ESCHERICHIA COLI (E. COLI)

ID17010305PN003_04	Spokane River - Post Falls Dam to Idaho/Washington border	5.67	Miles

LEAD

PHOSPHORUS, TOTAL

ZINC

ID17010305PN004_04	Spokane River - Coeur d'Alene Lake to Post Falls Dam	9.04	Miles

PHOSPHORUS, TOTAL

ZINC

LEAD

ID17010305PN008_02	Mokins Creek - source to mouth	7.82	Miles

TEMPERATURE

1/19/2010 (R. Steed, K. Keith, T. Clyne, and K. Stromberg) - Temperature data were submitted by U.S. Forest Service, Idaho Panhandle National Forests, Coeur d'Alene River Ranger District as response to DEQ request for data. These data were assessed as Tier 1 by K. Stromberg and K. Duncan (DEQ intern) in 2009. The analysis can be found in a report attached and data are available at CDA Regional Office. Salmonid spawning as existing beneficial use was confirmed by USFS staff. Temperature data in this AU exceeded Idaho water quality standards for salmonid spawning criteria. Based on WBAGII, we concluded this AU not fully supporting for cold water aquatic life and salmonid spawning.

ID17010305PN009_02	Nilsen Creek - source to mouth	3.08	Miles

TEMPERATURE

1/19/2010 (R. Steed, K. Keith, T. Clyne, and K. Stromberg) - Temperature data were submitted by U.S. Forest Service, Idaho Panhandle National Forests, Coeur d'Alene River Ranger District as response to DEQ request for data. These data were assessed as Tier 1 by K. Stromberg and K. Duncan (DEQ intern) in 2009. The analysis can be found in a report attached and data are available at CDA Regional Office. Salmonid spawning as existing beneficial use was confirmed by USFS staff. Temperature data in this AU exceeded Idaho water quality standards for salmonid spawning criteria. Based on WBAGII, we concluded this AU not fully supporting for cold water aquatic life and salmonid spawning.

ID17010305PN010_02	Tributaries to Hayden Creek	35.25	Miles

TEMPERATURE

1/19/2010 (R. Steed, K. Keith, T. Clyne, and K. Stromberg) - Temperature data were submitted by U.S. Forest Service, Idaho Panhandle National Forests, Coeur d'Alene River Ranger District as response to DEQ request for data. These data were assessed as Tier 1 by K. Stromberg and K. Duncan (DEQ intern) in 2009. The analysis can be found in a report attached and data are available at CDA Regional Office. Salmonid spawning as existing beneficial use was confirmed by USFS staff. Temperature data in this AU exceeded Idaho water quality standards for salmonid spawning criteria. Based on WBAGII, we concluded this AU not fully supporting for cold water aquatic life and salmonid spawning.

ID17010305PN010_03	Hayden Creek -source to mouth	5.04	Miles

TEMPERATURE

1/19/2010 (R. Steed, K. Keith, T. Clyne, and K. Stromberg) - Temperature data were submitted by U.S. Forest Service, Idaho Panhandle National Forests, Coeur d'Alene River Ranger District as response to DEQ request for data. These data were assessed as Tier 1 by K. Stromberg and K. Duncan (DEQ intern) in 2009. The analysis can be found in a report attached and data are available at CDA Regional Office. Salmonid spawning as existing beneficial use was confirmed by USFS staff. Temperature data in this AU exceeded Idaho water quality standards for salmonid spawning criteria. Based on WBAGII, we concluded this AU not fully supporting for cold water aquatic life and salmonid spawning.

ID17010305PN011_02	Sage Creek and Lewellen Creek - source to mouth	35.69	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17010305PN012_03	Rathdrum Creek - Twin Lakes to mouth	3.47	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

1/7/2010 (R. Steed) - This AU was previously assessed as cold water aquatic life and secondary contact recreation in the "Fully Supporting" category. The 2008 BURP cold water aquatic life suggests "Not Fully Supporting". Assessment was performed following the WBAG II protocol, and this AU is in the Not Fully Supporting category for cold water aquatic life and in the Fully Supporting category for SCR. The cause of impairment is unknown at this time and a Stressor Identification study should be conducted.

ID17010305PN017_02	Lost Lake, Howell, and Lost Creeks - source to mouth	13.25	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	1/7/2010 (R. Steed) - This AU was previously unassessed. The 2006 BURP ALUS suggests "NFS". Assessment was performed following the WBAG II protocol, and this AU is in the Not Full Support category for COLD and in the Full Support category for SCR. The cause of impairment is unknown at this time and a Stressor Identification study should be conducted.
ESCHERICHIA COLI (E. COLI)	1/29/2010 (R. Steed) - 2006 BURP Escherichia coli sample exceed Idaho Water Quality Standards numeric criteria. The Geomean was 293 cfu/100mL.

ID17010305PN018_02	Hauser Creek - upper	15.33	Miles

ESCHERICHIA COLI (E. COLI)	1/7/2010 (R. Steed) - This AU was previously NFS for primary contact recreation. The 2006 BURP ALUS suggests "NFS". Assessment was performed following the WBAG II protocol, and this AU is in the Full Support category for cold water aquatic life and remains in the Not Full Support category for primary contact recreation. The cause of impairment remains e. coli. MST monitoring during summer of 2009 by Coeur d' Alene Regional Office confirms high bacteria counts.

ID17010305PN018_03	Hauser Creek - lower, mainstem portion	2.65	Miles

ESCHERICHIA COLI (E. COLI)

17060101 Hells Canyon

ID17060101SL003_08	Snake River - Hells Canyon Dam to Sheep Creek	17.93	Miles

MERCURY	9/18/2014 (HS) - Mercury data submitted by Idaho Power had a mean mercury concentration in smallmouth bass >200mm of 0.328 mg/kg, which exceeds the human health criterion of 0.3 mg/kg.

ID17060101SL004_03	Deep Creek - 3rd order (Lake Creek to mouth)	6.78	Miles

COPPER	12/30/2014 (NED and HS) - DEQ visited Deep Creek four times in 2014 to collect metal samples from below the Red Ledge Mine. Results showed dissolved copper concentrations to be exceeding both the acute and chronic water quality criteria for aquatic life on three out of four visits. The highest dissolved copper concentration measured on October 2, 2014 was 72 microgram/L. With a hardness of 48 mg/L, both the acute and chronic criterion was exceeded at 8.5 microgram/L and 6.1 microgram/L, respectively.

ID17060101SL018_02	Kurry Creek - source to mouth	12.96	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060101SL020_03	Big Canyon Creek - source to mouth	3.76	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17060103 Lower Snake-Asotin

ID17060103SL001_08	Snake River	6.26	Miles

TEMPERATURE

ID17060103SL004_08	Snake River - Salmon River to Cottonwood Creek	7.12	Miles

TEMPERATURE

17060201 Upper Salmon

ID17060201SL048_03	Basin Creek - East Basin Creek to mouth	2.36	Miles

SEDIMENTATION/SILTATION

ID17060201SL085_03	Pole Creek - source to mouth	5.15	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060201SL089_02	Williams Creek - source to mouth	12.88	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060201SL103_02	East Fork Salmon River - Germania Creek to Herd Creek	59.92	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17060202 Pahsimeroi

ID17060202SL003_03	Lawson Creek-confluence of North and South Fork Lawson Creek	1.82	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060202SL005_02	South Fork Lawson Creek - source to mouth	11.91	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS — 8/7/2015 (MH and NED) - Evidence indicates that water exists in this reach infrequently and sinks rapidly into the alluvium when present. It was original listed based on a single Beneficial Use Reconnaissance Program (BURP) score in 1997. The determining factor was a borderline SMI score. Natural water limitations appear to be the primary impairment; however, data identifying other potential impairments are lacking. Combined biota/habitat bioassessments will remain in Category 5 until conclusive data is collected to determine the potential stressors and/or pollutants (if any) in South Fork Lawson Creek.

ID17060202SL023_03	Burnt Creek - Long Creek to mouth	5.06	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060202SL024_02	Burnt Creek - source to Long Creek	23.23	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060202SL029_02	Donkey Creek - source to mouth	12.56	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060202SL035_02	Patterson Creek - source to and including Inyo Creek	28.36	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17060203 Middle Salmon-Panther

ID17060203SL001_07	Salmon River - Panther Creek to Middle Fork Salmon River	11.85	Miles

TEMPERATURE

ID17060203SL002_05	Panther Creek - Big Deer Creek to mouth	12.98	Miles

TEMPERATURE — 8/22/17 (TS, JW): Temperature logger data collected in 2015 showed exceedances of salmonid spawning temperature criteria.

ID17060203SL005_03	Big Deer Creek - South Fork Big Deer Creek to mouth	2.98	Miles

COPPER — This stream is impacted by the Blackbird Mine. It is actively being remediated but still exhibits exceedances of the copper standard. Data can be reviewed by contacting the Blackbird Mine Project officer at the Idaho Falls regional DEQ office at 208.528.2650.

ID17060203SL007_02	South Fork Big Deer Creek - Bucktail Creek to mouth	0.52	Miles

ESCHERICHIA COLI (E. COLI) — 8/24/17 (TS, JW): The geometric mean of five E. coli samples collected in 2013 was 1003 cfu/100 mL, which exceeds the 126 cfu/100 mL E. coli criterion.

COPPER

ID17060203SL010_05	Panther Creek - Napias Creek to Big Deer Creek	6.08	Miles

TEMPERATURE — 12/27/2019 (AB) Temperature logger data from adjacent AUs (both upstream and downstream) show exceedances of salmonid spawning temperature criteria.

ID17060203SL011_04	Panther Creek - Blackbird Creek to Napias Creek	5.5	Miles

TEMPERATURE — 8/22/17 (TS, JW): Temperature logger data collected in 2015 show exceedances of salmonid spawning temperature criteria.

ID17060203SL014_03	Panther Creek - Porphyry Creek to Blackbird Creek	1.89	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17060203SL014_04	Panther Creek - Porphyry Creek to Blackbird Creek	4.76	Miles
TEMPERATURE	8/22/17 (TS, JW): Temperature logger data collected in 2015 indicate exceedances of salmonid spawning temperature criteria.		
ID17060203SL017_03	Panther Creek - source to Porphyry Creek	11.6	Miles
TEMPERATURE	8/22/15 (TS, JW): Temperature logger data collected in 2015 show exceedances of cold water aquatic life and salmonid spawning temperature criteria.		
ID17060203SL024_03	Napias Creek - Arnett Creek to and including Moccasin Creek	5.51	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			
ID17060203SL029_07	Salmon River - Indian Creek to Panther Creek	17.89	Miles
TEMPERATURE	8/22/17 (TS, JW): Temperature logger data collected in 2015 show exceedances of cold water aquatic life and salmonid spawning temperature criteria.		
ID17060203SL032_07	Salmon River - North Fork Salmon Creek to Indian Creek	11.8	Miles
TEMPERATURE			
ID17060203SL039_07	Salmon River - Carmen Creek to North Fork Salmon River	16.11	Miles
TEMPERATURE	12/12/2019 (AB): Temperature logger data gathered in 2013 captured exceedances of the salmonid spawning temperature criteria; Salmonid Spawning is therefore not fully supporting.		
ID17060203SL041_07	Salmon River - Pollard Creek to Carmen Creek	5.94	Miles
TEMPERATURE	12/12/2019 (AB): Temperature logger data gathered in 2013 captured exceedances of the salmonid spawning temperature criteria; Salmonid Spawning is therefore not fully supporting.		
ID17060203SL042_06	Salmon River - Williams Creek to Pollard Creek	8.92	Miles
TEMPERATURE	12/12/2019 (AB): Temperature logger data gathered in 2013 captured exceedances of the salmonid spawning temperature criteria; Salmonid Spawning is therefore not fully supporting.		
ID17060203SL046_06	Salmon River - Twelvemile Creek to Williams Creek	6.39	Miles
TEMPERATURE	12/12/2019 (AB): Temperature logger data gathered in 2013 captured exceedances of the salmonid spawning temperature criteria; Salmonid Spawning is therefore not fully supporting.		
ID17060203SL047_06	Salmon River - Iron Creek to Twelvemile Creek	12.64	Miles
TEMPERATURE	12/12/2019 (AB): Temperature logger data gathered in 2013 captured exceedances of the salmonid spawning temperature criteria; Salmonid Spawning is therefore not fully supporting.		
ID17060203SL053_06	Salmon River - Pahsimeroi River to Iron Creek	18.89	Miles
TEMPERATURE	12/12/2019 (AB): Temperature logger data gathered in 2013 captured exceedances of the salmonid spawning temperature criteria; Salmonid Spawning is therefore not fully supporting.		

17060204 Lemhi

ID17060204SL011_04	Basin Creek	1.71	Miles

ESCHERICHIA COLI (E. COLI)	12/05/2019 (AB) The geometric mean E.coli concentration calculated from five samples collected from 8/29-9/25/2017 was 291.6 MPN/100ml, which exceeds the bacteria criterion of 126 E.coli organisms per 100 mL and indicates Secondary Contact Recreation is not supported (Idaho's WBAG III, section 7.2).

ID17060204SL030_05	Lemhi River (East Branch)-Eighteenmile & Texas Ck Confluence	10.39	Miles

ESCHERICHIA COLI (E. COLI)	12/03/2019 (AB) The geometric mean E.coli concentration calculated from five samples collected from 8/17-9/14/2016 was 263.4 MPN/100ml, which exceeds the bacteria criterion of 126 E.coli organisms per 100 mL and indicates Primary Contact Recreation is not supported (Idaho's WBAG III, section 7.2).

ID17060204SL036_03	Texas Creek	14.93	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	
ESCHERICHIA COLI (E. COLI)	10/30/2019 (AB) The geometric mean E.coli concentration calculated from five samples collected from 8/29-9/25/2017 was 643.8 MPN/100ml, which exceeds the bacteria criterion of 126 E.coli organisms per 100 mL and indicates Secondary Contact Recreation is not supported (Idaho's WBAG III, section 7.2).
SEDIMENTATION/SILTATION	

ID17060204SL041_04	Eighteenmile Creek - Hawley Creek to mouth	2.21	Miles

ESCHERICHIA COLI (E. COLI)	11/13/2019 (AB) The geometric mean E.coli concentration calculated from five samples collected from 8/17-9/14/2016 was 542.4 MPN/100ml, which exceeds the bacteria criterion of 126 E.coli organisms per 100 mL and indicates Secondary Contact Recreation is not supported (Idaho's WBAG III, section 7.2).

ID17060204SL051b_03	Canyon Creek - source to diversion (T16N, R26E, Sec.22)	8.81	Miles

ESCHERICHIA COLI (E. COLI)

ID17060204SL058_04	Agency Creek - source to Cow Creek	4.01	Miles

ESCHERICHIA COLI (E. COLI)	12/05/2019 (AB) The geometric mean E.coli concentration calculated from five samples collected from 8/29-9/25/2017 was 141.8 MPN/100ml, which exceeds the bacteria criterion of 126 E.coli organisms per 100 mL and indicates Secondary Contact Recreation is not supported (Idaho's WBAG III, section 7.2).

17060205 Upper Middle Fork Salmon

ID17060205SL012_05	Bear Valley Creek - 5th order	11.22	Miles

TEMPERATURE

ID17060205SL025_02	Knapp Creek - source to mouth	28.1	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17060206 Lower Middle Fork Salmon

ID17060206SL024_03	West Fork Camas Creek - source to mouth	5.21	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17060208 South Fork Salmon

ID17060208SL023_02	East Fork of the South Fork Salmon River - 1st and 2nd order	25.16	Miles

ARSENIC

1/29/2013 (NED) - Based on data collected by USGS between September 2011 and August 2012 at the gage station located in the 2nd order portion of the East Fork of the South Fork of the Salmon River (station 13310800), 4 of 6 unfiltered arsenic samples exceeded Idaho's human health criterion of 10 micrograms/L for consumption of water and organisms. The sample results were: 9/19/2011 - 11.8 micrograms/L, 10/17/2011 - 10.2 micrograms/L, 12/14/2011 - 11.9 micrograms/L, 8/28/2012 - 11.9 micrograms/L Although the average scores of the BURP data collected in 2004 and 2008 were greater than 2, which according to DEQ's Water Body Assessment Guidance is considered fully supporting, this AU is being listed due to a numeric exceedance. 6/9/2015 (Hawk Stone) - The data collected by USGS between September 2011 and August 2012 shows arsenic samples to be exceeding Idaho's human health criterion of 10 micrograms/L for consumption of fish. Therefore, secondary contact recreation is impaired for arsenic.

ID17060208SL023_03	East Fork of the South Fork of the Salmon River - 3rd order	2.53	Miles

ANTIMONY

1/29/2013 (NED) - Based on data collected by USGS between September 2011 and August 2012 at two gage stations located in the 3rd order portion of the East Fork of the South Fork of the Salmon River (stations 13311000 and 13311250), 6 of 8 unfiltered antimony samples exceeded Idaho's human health criterion of 5.6 micrograms/L (for water and organisms) at gage station 13311000 and 7 of 7 at gage station 13311250. The sample results at gage station 13311000 were: 9/22/2011 - 6.0 micrograms/L 9/22/2011 - 6.0 micrograms/L 10/18/2011 - 10.1 micrograms/L 12/14/2012 - 13.3 micrograms/L 5/18/2012 - 10.3 micrograms/L 8/28/2012 - 6.25 micrograms/L The sample results at gage station 13311250 were: 9/21/2011 - 25.2 micrograms/L 9/22/2011 - 25.0 micrograms/L 10/18/2011 - 25.7 micrograms/L 12/15/2012 - 27 micrograms/L 5/18/2012 - 16.6 micrograms/L 6/14/2012 - 11.3 micrograms/L 8/29/2012 - 25.5 micrograms/L.

ARSENIC

1/29/2013 (NED) - Based on data collected by USGS between September 2011 and August 2012 at two gage stations located in the 3rd order portion of the East Fork of the South Fork of the Salmon River (stations 13311000 and 13311250), 8 of 8 unfiltered arsenic samples exceeded Idaho's human health criterion of 10 microgram/L (for consumption of water and organisms) at gage station 13311000 and 7 of 7 at gage station 13311250. The sample results at gage station 13311000 were: 9/20/2011 - 32.4 microgram/L, 9/22/2011 - 31.0 microgram/L, 9/22/2011 - 33.0 microgram/L, 10/18/2011 - 22.3 microgram/L, 12/14/2012 - 23.7 microgram/L, 5/18/2012 - 15.9 microgram/L, 6/13/2012 - 13.0 microgram/L, 8/28/2012 - 32.9 microgram/L. The sample results at gage station 13311250 were: 9/21/2011 - 72.0 microgram/L, 9/22/2011 - 78.0 microgram/L, 10/18/2011 - 54.0 microgram/L, 12/15/2012 - 62.9 microgram/L, 5/18/2012 - 26.5 microgram/L, 6/14/2012 - 22.4 microgram/L, 8/29/2012 - 70.8 microgram/L. 6/9/2015 (Hawk Stone) - The data collected by USGS between September 2011 and August 2012 shows arsenic samples to be exceeding Idaho's human health criterion of 10 microgram/L for consumption of fish. Therefore, secondary contact recreation is impaired for arsenic.

ID17060208SL023_05	East Fork South Fork Salmon River - 5th order	14.47	Miles

SEDIMENTATION/SILTATION

3/8/2013 (HS and NED) - This sediment impairment was not addressed by any of the South Fork Salmon River TMDL documents. According to the five year review of the South Fork Salmon River Subbasin TMDL, page 26, "Mass wasting events have clearly contributed large amounts of sediment to this AU." When resources permit, DEQ will conduct additional work on determining sediment sources to this AU. Due to the lack of information, no changes are recommended to the Integrated Report.

ID17060208SL029_03	Sugar Creek - 3rd order (Cane Creek to mouth)	2.79	Miles

ARSENIC	1/29/2013 (NED) - Based on data collected by USGS between September 2011 and August 2012 at the gage site located in the 3rd order portion of Sugar Creek (station 13311450), 4 of 6 unfiltered arsenic samples exceeded Idaho's human health criterion of 10 µg/L for consumption of fish. The sample results were: 9/21/2011 - 22.5 µg/L, 10/18/2011 - 20.4 µg/L, 12/15/2011 - 32.7 µg/L, 8/29/2012 - 20.7 µg/L. Although the average scores of the BURP data collected in 2004 and 2007 were greater than 2, which according to DEQ's Water Body Assessment Guidance this AU is considered fully supporting, this AU is being listed due to an arsenic numeric exceedance.
MERCURY	1/29/2013 (NED) - The aquatic life chronic criterion in effect for Idaho's waters for purposes of the Clean Water Act is 0.012 µg/L; as set by EPA's December 12, 2008 letter, disapproving DEQ's removal of mercury acute and chronic freshwater aquatic life criteria. Based on the data collected by USGS between September 2011 and November 2012 at gage station 13311450, and applying the 0.012 µg/L criterion above, 5 of 6 unfiltered mercury samples are exceeded. 9/21/2011 - 0.017 µg/L, 5/18/2012 - 0.76 µg/L, 6/14/2012 - 0.1 µg/L, 8/29/2012 - 0.02 µg/L, 11/7/2012 - 0.041 µg/L.

17060209 Lower Salmon

ID17060209SL008_07	Salmon River - Slate Creek to Rice Creek	27.88	Miles

MERCURY	The Me-Hg human health criterion is protective of aquatic life. Since Idaho is relying on the Me-Hg criterion to protect aquatic life, for 303(d) listing purposes, if human health use is impaired aquatic life use will be assumed to be impaired as well. (2008 Integrated Principals & Policies Document page 27). The value of 0.3 mg Me-Hg per Kg of fish tissue (wet weight) is set at a level to protect the general public from adverse effects during a lifetime of exposure. The Section 5 (303(d)) listing for this assessment unit is based on USGS methyl Hg data USGS (2004-2007) single species 10 fish composite samples. Results are 0.4 mg Me-Hg/Kg. The data were evaluated following the 2008 Integrated Report Principals & Policies Document; page 28 for recreational use and aquatic life use impairment.

ID17060209SL057_02	John's Creek - 1st and 2nd order tributaries	44.3	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	3/2010 (CB) - During the development of the Lower Salmon River and Hells Canyon Tributaries Assessments and TMDLs, an analysis of the dominant benthic macroinvertebrate community from a 2008 BURP survey within John's Creek identified pollutant tolerant taxa that are able to occupy habitats with low dissolved oxygen and high nutrient concentrations. Additionally, visible slime growths were observed during site visits, and nuisance vegetation growths are occurring in stream. This implies that impairment to the cold water aquatic life beneficial use may be a result of excessive nutrient loading. Lack of nutrient data restricts the ability to adequately calculate loads and any necessary load reductions. For additional information, refer to page xxiv of the TMDL.

ID17060209SL062_03w	Deer Creek - upstream from waterfall	4.5	Miles

SEDIMENTATION/SILTATION

17050101 C.J. Strike Reservoir

ID17050101SW003_03	Browns Creek - 3rd order	4.21	Miles

SEDIMENTATION/SILTATION

ID17050101SW003_04	Browns Creek - 4th order	4.06	Miles

SEDIMENTATION/SILTATION

ID17050101SW004_02	Browns Creek - 1st and 2nd order tributaries	63.59	Miles

SEDIMENTATION/SILTATION

ID17050101SW004_03	Browns Creek - 3rd order	15.75	Miles

SEDIMENTATION/SILTATION

ID17050101SW006_02	Sailor Creek - 1st and 2nd order	267.35	Miles

SEDIMENTATION/SILTATION

ID17050101SW006_03	Sailor Creek - 3rd order	34.53	Miles

SEDIMENTATION/SILTATION

ID17050101SW006_04	Sailor Creek - 4th order	22.85	Miles

SEDIMENTATION/SILTATION

ID17050101SW008_02	Deadman Creek - 1st and 2nd order	92.69	Miles

SEDIMENTATION/SILTATION

ID17050101SW008_03	Deadman Creek - 3rd order	38.45	Miles

SEDIMENTATION/SILTATION

ID17050101SW010_03	King Hill Creek - 3rd order (West Fork to mouth)	11.41	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050101SW011_02	West Fork King Hill Creek - entire drainage	29.41	Miles

TEMPERATURE

ID17050101SW019_02a	Rattlesnake Creek above Mountain Home Reservoir	28.91	Miles

ESCHERICHIA COLI (E. COLI)	9/18/2014 (HS) - A 5-sample geometric mean of 409 cfu/100mL was collected at the US20 crossing. This result is greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17050101SW024_03	Long Tom Creek - 3rd order	10.5	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17050102 Bruneau

ID17050102SW002_05	Jacks Creek-Little Jacks Ck to CJ Strike Reservoir	12.29	Miles

TEMPERATURE

ID17050102SW004_05	Big Jacks Creek - upper 5th order	24.09	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050102SW009_06	Bruneau River - 6th order (Hot Creek to mouth)	16.9	Miles

TEMPERATURE	(HS) - Temperature was listed based on the Bruneau River Subbasin Assessment and TMDL, approved March 13, 2001. For additional information refer to page 3 of the TMDL.

ID17050102SW014_04	Sheep Creek - 4th order	25.48	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050102SW015_02L	Grasmere Reservoir	114.35	Acres

MERCURY	2/16/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.319 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID17050102SW016_04	Marys Creek - 4th order	29.4	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050102SW017_02	Bull Creek - 1st and 2nd order tributaries	29.36	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	2/4/2015 (HS) -The 2004 BURP data indicated that this reach does not support its aquatic life use support. This support status was confirmed by 2012 BURP data, which had good bugs and habitat, but poor fish. This was evidenced by the fish community being comprised entirely of bridgelip suckers. Therefore, this AU will remain in Category 5 for combined biota/habitat bioassessments.

ID17050102SW018_02	Pole Creek - 1st and 2nd order	33.04	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050102SW019_02	Cat Creek - 1st and 2nd order	17.79	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050102SW022_02	Cougar Creek - 1st and 2nd order	40.78	Miles

SEDIMENTATION/SILTATION

ID17050102SW022_03	Cougar Creek - 3rd order	20.02	Miles

SEDIMENTATION/SILTATION

ID17050102SW023_02	Dorsey Creek - 1st and 2nd order	33.22	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050102SW025_02	Poison Creek - 1st and 2nd order	60.67	Miles

SEDIMENTATION/SILTATION

ID17050102SW025_03	Poison Creek - 3rd order	16.66	Miles

SEDIMENTATION/SILTATION

ID17050102SW028_04	Clover Creek - 4th order (Deadwood Creek to Buck Flat Draw)	29.63	Miles

TEMPERATURE	This was part of EPA's 1998 303(d) list temperature addition. Hawk 2/1/10

ID17050102SW028_05	Clover Creek (East Fork Bruneau River) - 5th order	24.75	Miles

TEMPERATURE

ID17050102SW030_02	Big Flat Creek - 1st and 2nd order	49.22	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050102SW030_04	Big Flat Creek - 4th order	3.56	Miles

ESCHERICHIA COLI (E. COLI)	12/30/19 (DM): 2018 geomean data submitted by the BLM Jarbidge office shows that E. coli levels exceed the 126 cfu/100 mL water quality criterion. Therefore, the recreation use is not fully supported .

ID17050102SW031_03	Three Creek - 3rd order	6.99	Miles

ESCHERICHIA COLI (E. COLI)	12/30/19 (DM): Secondary Contact Recreation is presumed due to unlikelihood of immersion/ingestion of water. 2018 geomean data submitted by the BLM Jarbidge office shows that E. coli levels exceed the 126 cfu/100 mL water quality criterion. Therefore, the recreation use is not fully supported.

ID17050102SW033_02	Deer Creek - 1st and 2nd order	18.43	Miles

ESCHERICHIA COLI (E. COLI)

ID17050102SW034_03	Deadwood Creek - 3rd order	4.1	Miles

ESCHERICHIA COLI (E. COLI)	12/30/19 (DM): 2018 geomean data submitted by the BLM Jarbidge office shows that E. coli levels exceed the 126 cfu/100 mL water quality criterion. Therefore, the contact recreation use is not fully supported.

17050103 Middle Snake-Succor

ID17050103SW001_07	Snake River - Marsing (RM425) to State Line	16.09	Miles

TEMPERATURE	From 2004 TMDL, page 70: The Snake River is designated for cold water aquatic life, but supports a primarily warm and cool water fishery. Elevated temperatures above the cold water aquatic life temperature standard are typically observed in July and August. The maximum weekly average temperature during the first week of August 1997 was 23 degrees C. Figure 2.4 July 14, 2002: Fish kill on the Snake River at Walters Ferry In 1992, a drought year, an instantaneous maximum of 29 degrees C was reached downstream of Swan Falls Dam. In early July 2002, following several days of extremely hot weather, instantaneous temperatures exceeded 26 degrees C below Swan Falls Dam. These temperatures resulted in a large fish kill of mountain whitefish (Figure 2.4). This event occurred after several days of extremely hot weather and water temperatures >26 degrees Celsius. This picture is not meant to imply that these fish kills occur on an annual basis, nor is it necessarily representative of conditions in the tributaries to the Snake River. Whitefish are subject to lethal effects at temperatures above 26 degrees C. An Idaho Power study on the habitat of the Snake River Plain states that whitefish kills are common in the Swan Falls area in the summer and are primarily due to elevated temperatures (IPC 2002). As shown in Figure 2.5, the Snake River exceeds the cold water maximum daily average temperature of 19 degrees C (USGS 2000). The Snake River is proposed for temperature listing on the section 303(d) list. A TMDL is not being written at this time in order to allow time to adequately assess the thermal site potential of the river.

ID17050103SW001_07a	Snake River - State line to Boise River	4.19	Miles

TEMPERATURE

From 2004 TMDL, page 70: The Snake River is designated for cold water aquatic life, but supports a primarily warm and cool water fishery. Elevated temperatures above the cold water aquatic life temperature standard are typically observed in July and August. The maximum weekly average temperature during the first week of August 1997 was 23 degrees C. Figure 2.4 July 14, 2002: Fish kill on the Snake River at Walters Ferry In 1992, a drought year, an instantaneous maximum of 29 degrees C was reached downstream of Swan Falls Dam. In early July 2002, following several days of extremely hot weather, instantaneous temperatures exceeded 26 degrees C below Swan Falls Dam. These temperatures resulted in a large fish kill of mountain whitefish (Figure 2.4). This event occurred after several days of extremely hot weather and water temperatures >26 degrees Celsius. This picture is not meant to imply that these fish kills occur on an annual basis, nor is it necessarily representative of conditions in the tributaries to the Snake River. Whitefish are subject to lethal effects at temperatures above 26 degrees C. An Idaho Power study on the habitat of the Snake River Plain states that whitefish kills are common in the Swan Falls area in the summer and are primarily due to elevated temperatures (IPC 2002). As shown in Figure 2.5, the Snake River exceeds the cold water maximum daily average temperature of 19 degrees C (USGS 2000). The Snake River is proposed for temperature listing on the section 303(d) list. A TMDL is not being written at this time in order to allow time to adequately assess the thermal site potential of the river.

ID17050103SW002_04	Lower Succor Creek - 4th order (state line to mouth)	5.51	Miles

TEMPERATURE

9/19/2014 (HS) - Temperature data submitted by Idaho Power showed a maximum daily average of 21.7 degrees C and a maximum temperature of 26.0 degrees C, which exceed the water quality criteria of 19 degrees C and 22 degrees C.

ID17050103SW006_07	Snake River - C.J. Strike Dam to Castle Creek	23.84	Miles

TEMPERATURE

From 2004 TMDL, page 70: The Snake River is designated for cold water aquatic life, but supports a primarily warm and cool water fishery. Elevated temperatures above the cold water aquatic life temperature standard are typically observed in July and August. The maximum weekly average temperature during the first week of August 1997 was 23 degrees C. Figure 2.4 July 14, 2002: Fish kill on the Snake River at Walters Ferry In 1992, a drought year, an instantaneous maximum of 29 degrees C was reached downstream of Swan Falls Dam. In early July 2002, following several days of extremely hot weather, instantaneous temperatures exceeded 26 degrees C below Swan Falls Dam. These temperatures resulted in a large fish kill of mountain whitefish (Figure 2.4). This event occurred after several days of extremely hot weather and water temperatures >26 degrees Celsius. This picture is not meant to imply that these fish kills occur on an annual basis, nor is it necessarily representative of conditions in the tributaries to the Snake River. Whitefish are subject to lethal effects at temperatures above 26 degrees C. An Idaho Power study on the habitat of the Snake River Plain states that whitefish kills are common in the Swan Falls area in the summer and are primarily due to elevated temperatures (IPC 2002). As shown in Figure 2.5, the Snake River exceeds the cold water maximum daily average temperature of 19 degrees C (USGS 2000). The Snake River is proposed for temperature listing on the section 303(d) list. A TMDL is not being written at this time in order to allow time to adequately assess the thermal site potential of the river.

ID17050103SW006_07a	Snake River - Castle Creek to Swan Falls	13.28	Miles

TEMPERATURE

9/19/2014 (HS) - Temperature data submitted by Idaho Power showed a maximum daily average of 23.8 degrees C and a maximum temperature of 25.0 degrees C, which exceeds the temperature criterion of 19 degrees C and 22 degrees C.

ID17050103SW006_07b Snake River - Swan Falls to Marsing (RM425) 36.13 Miles

TEMPERATURE

From 2004 TMDL, page 70: The Snake River is designated for cold water aquatic life, but supports a primarily warm and cool water fishery. Elevated temperatures above the cold water aquatic life temperature standard are typically observed in July and August. The maximum weekly average temperature during the first week of August 1997 was 23 degrees C. Figure 2.4 July 14, 2002: Fish kill on the Snake River at Walters Ferry In 1992, a drought year, an instantaneous maximum of 29 degrees C was reached downstream of Swan Falls Dam. In early July 2002, following several days of extremely hot weather, instantaneous temperatures exceeded 26 degrees C below Swan Falls Dam. These temperatures resulted in a large fish kill of mountain whitefish (Figure 2.4). This event occurred after several days of extremely hot weather and water temperatures >26 degrees Celsius. This picture is not meant to imply that these fish kills occur on an annual basis, nor is it necessarily representative of conditions in the tributaries to the Snake River. Whitefish are subject to lethal effects at temperatures above 26 degrees C. An Idaho Power study on the habitat of the Snake River Plain states that whitefish kills are common in the Swan Falls area in the summer and are primarily due to elevated temperatures (IPC 2002). As shown in Figure 2.5, the Snake River exceeds the cold water maximum daily average temperature of 19 degrees C (USGS 2000). The Snake River is proposed for temperature listing on the section 303(d) list. A TMDL is not being written at this time in order to allow time to adequately assess the thermal site potential of the river. 9/18/2014 (HS) - This listing was confirmed by Idaho Power temperature data. Temperature loggers were deployed at Marsing, Celebration Park, and Murphy.

ID17050103SW009_03 Reynolds, Salmon and Wilson Creeks - 3rd order segments 16.15 Miles

ESCHERICHIA COLI (E. COLI)

Stream listed because of 5 e-coli results: 948.8, 162.4, 76.6, 45.5, 125.9. Taken over a one-month period on different days.

ID17050103SW009_04 Reynolds Creek - 4th order (Salmon Creek to Snake River) 11.26 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050103SW016_02 Pickett Creek - 1st & 2nd order 27.53 Miles

SEDIMENTATION/SILTATION

ID17050103SW019_02 Brown Creek - 1st & 2nd order 79.81 Miles

SEDIMENTATION/SILTATION

ID17050103SW019_03 Brown Creek - 3rd order 7.64 Miles

SEDIMENTATION/SILTATION

ID17050103SW019_04 Brown Creek - 4th order 6.42 Miles

SEDIMENTATION/SILTATION

ID17050103SW021_02 Birch Creek and tributaries - 1st and 2nd order 65.99 Miles

SEDIMENTATION/SILTATION

ID17050103SW024_03 Shoofly and Poison Creeks - 3rd order 28.47 Miles

SEDIMENTATION/SILTATION

ID17050103SW025_02 Corder Creek - 1st and 2nd order 63.34 Miles

ESCHERICHIA COLI (E. COLI)	12/29/2014 (HS) - In October 2014, DEQ collected five E. coli samples from Jack Creek at the ID67 crossing near Grand View. The geometric mean of the samples, collected in accordance with IDAPA 58.01.02.251.01.a was 1,108 cfu/100mL which is greater than the 126 cfu/100mL criterion value. Therefore, the recreational use of this water body is considered impaired by bacteria.
SEDIMENTATION/SILTATION	1/9/2014 (HS) - Sediment was first listed on the 1994 303(d) list which was promulgated by EPA. The sediment listing was based on an evaluation (no actual data). The evaluation was most likely conducted in the (wet) 3rd-order reach.

ID17050103SW026_02 Rabbit Creek (north side of Snake River) - 1st and 2nd order 12.99 Miles

SEDIMENTATION/SILTATION

17050104 Upper Owyhee

ID17050104SW005L_0L Juniper Basin Reservoir 241.79 Acres

ESCHERICHIA COLI (E. COLI)

ID17050104SW012_03 Little Blue Creek - 3rd order 4.49 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050104SW014_02L Shoofly Reservoir 87.82 Acres

MERCURY	2/16/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.502 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported. 8/1/17 (DM, JW): 12 fish tissue samples (from cutthroat trout) were taken from Shoofly Reservoir on 5/21/13 by the USEPA Region 10 Monitoring team. These samples averaged 0.3180 mg/Kg of Hg, above the 0.3 mg/Kg limit for recreation.

ID17050104SW024_02 Dry Creek - entire drainage except reservoir 26.29 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050104SW025_03 Big Springs Creek - 3rd order 3.99 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	9/23/2014 (HS) - The 2011 BURP site had excellent bugs and habitat (score 3 out of 3 each), but failed the fish index. The unusual combination caused DEQ to revisit the site in 2014 for repeat electrofishing. However, the result was the same, and only 2 perch were found.

ID17050104SW026_02a Deep Creek - 1st and 2nd order forested tributaries 80.27 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS	9/18/2014 (HS) - BURP site 2011SBOIA003 shows poor scores. The site was in a downcut gully with unstable banks. Although the fines were not excessive, the particles were highly embedded. There was very little riparian shade.

ID17050104SW030_03 Camel Creek - 3rd order 2.12 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050104SW031_03 Nickel, Thomas & Smith Creeks - 3rd order sections 9.7 Miles

AQUATIC PLANT BIOASSESSMENTS	The 2003 TMDL used an analysis of periphyton to conclude that this assessment unit may be impaired by metals.

ID17050104SW033_02 Beaver Creek - 1st and 2nd order 47.54 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17050108 Jordan

ID17050108SW001_05	Jordan Creek - Williams Creek to State Line	13.35	Miles

MERCURY

3/22/2018 (AS): Mercury listing is based on the DEQ report "Analysis of Total Mercury Concentrations in Fish Samples from Jordan Creek and Non-Jordan Creek Sites" (Dai and Ingham, Revised November 2009). Fish tissue taken at sampling location JC-2005-01, which is located within this AU, resulted in an average fish total mercury value of 0.717 mg/kg, which exceeds the human health criterion of 0.3 mg/kg. This AU should have been listed in a previous cycle, but was somehow overlooked.

ID17050108SW002_02	Lone Tree Creek and tributaries - 1st and 2nd order	29.22	Miles

ESCHERICHIA COLI (E. COLI)

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050108SW004_02	Jordan Creek, Upper - 1st and 2nd order tributaries	102.35	Miles

MERCURY

2/18/2010 (NED) - Mercury listing based on the DEQ report, "Analysis of Total Mercury Concentrations in Fish Samples from Jordan Creek and Non-Jordan Creek Sites" (Xin Dai and Michael Ingham, Revised November 2009). A Mercury level of 0.551 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID17050108SW004_03	Jordan Creek - Jacobs Gulch to Louse Creek	13.41	Miles

MERCURY

2/18/2010 (NED) - Mercury listing based on the DEQ report, "Analysis of Total Mercury Concentrations in Fish Samples from Jordan Creek and Non-Jordan Creek Sites" (Xin Dai and Michael Ingham, Revised November 2009). A mercury level of 0.511 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID17050108SW004_05	Jordan Creek - Big Boulder Creek to Williams Creek	3.37	Miles

MERCURY

2/18/2010 (NED) - Mercury listing based on the DEQ report, "Analysis of Total Mercury Concentrations in Fish Samples from Jordan Creek and Non-Jordan Creek Sites" (Xin Dai and Michael Ingham, Revised November 2009). A Mercury level of 0.590 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID17050108SW010_04	Rock Creek - 4th order (Meadow Creek to Josephine Creek)	0.48	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

4/18/2011 (NED) - BURP site 2003SBOIA0432 had a SFI score below minimum threshold levels, therefore DEQ automatically determines the water body as not fully supporting.

ID17050108SW013_03	Rock Creek above Triangle Reservoir - 3rd order	12.5	Miles

TEMPERATURE

Temperature standards are exceeded based on temperature data supplied to DEQ by BLM. In 2004, BLM temperature data indicated 32% of the dates exceeded the 22 degrees C maximum daily maximum temperature (MDMT) criteria, and 22% exceeded the 19 degrees C maximum daily average temperature criteria (MDAT).

ID17050108SW014_02	Louisa Creek - entire drainage	13.81	Miles

SEDIMENTATION/SILTATION

17050111 North and Middle Forks Boise

ID17050111SW001_02b	Montezuma Creek and Quartz Gulch	4.95	Miles
ARSENIC	12/8/2009 (HS) - Data were provided by Idaho Conservation League that show the drinking water, and contact recreation standards for Arsenic were violated 85% of the time below a 100m mixing zone on Montezuma Creek.		

17050112 Boise-Mores

ID17050112SW004_05	Boise River - 5th order (North Fork to Arrowrock)	10.95	Miles
TEMPERATURE	(HS) - Listing based on Twin Springs temperature logger data submitted to DEQ by the City of Boise.		
ID17050112SW014_04	Granite Creek - 4th order (Woof Creek to mouth)	5.19	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			
ID17050112SW016_03	Daggett Creek - 3rd order (Sheep Creek to mouth)	3.77	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			

17050113 South Fork Boise

ID17050113SW004_03	Dixie and Deer Creeks - 3rd order sections	9.85	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			
ID17050113SW005L_0L	Anderson Ranch Reservoir (Boise River)	4605.37	Acres
MERCURY	2/18/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.367 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.		
ID17050113SW010_03a	Moores and Big Springs Creeks - 3rd order sections	4.62	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			
ID17050113SW018_03	Little Smoky, Salt & Grindstone Creeks - 3rd order sections	10.99	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			
ID17050113SW032_03	Smith Creek - 3rd order (Mule Gulch to SF Boise River)	16.45	Miles
ESCHERICHIA COLI (E. COLI)			

17050114 Lower Boise

ID17050114SW001_02	Dixie Slough	20.16	Miles
TEMPERATURE			

ID17050114SW001_06 Boise River - Indian Creek to mouth 44.91 Miles

TEMPERATURE	12/30/19 (DM): 2017 temperature logger data submitted by the City of Boise shows water temperatures of twenty-two (22) degrees C or greater with instances of maximum daily average temperatures of greater than nineteen (19) degrees C. These temperatures indicate that cold water aquatic life is not supported (IDAPA 58.01.02.250.02.b). AU will remain impaired by temperature. 3/13/2015 (HS) - DEQ analyzed temperature data from a logger deployed above Dixie Slough between June 27, 2014 and January 15, 2015 (2015 City of Boise). Water temperature was measured every 15 minutes using DEQ protocols. The data are quality controlled and assured using USGS methods and provide sufficient data to calculate daily maximum and daily average temperatures. The continuous temperature data during the last five years showed the following: (1) The daily maximum temperature exceeded 22 degrees C 62% of the time between June 27 and September 21 and; (2) The daily average temperature exceeded 19 degrees C 76% of the time between June 27 and September 21.

ID17050114SW002_04 Indian Creek - Sugar Avenue to Boise River 11.91 Miles

CAUSE UNKNOWN	1/29/2013 (NED) - This segment (WQLS 2731) was first listed for nutrients on the 1994 section 303(d) list which was promulgated by EPA as part of the first TMDL lawsuit. However, when DEQ migrated to the 2002 cycle the nutrients listing was erroneously deleted. DEQ has an obligation to relist this segment for nutrients (cause unknown) since no rationale was provided that demonstrated nutrients were no longer impairing beneficial uses. Therefore, for the 2012 Integrated Report DEQ relisted cause unknown (nutrients suspected) in Category 5 until such time that either: 1) water quality data demonstrates that beneficial uses are no longer impaired by nutrients; 2) a TMDL is developed; or 3) readily available data and information shows the original listing was made in error.
TEMPERATURE	12-14-16 (JW) - Based on temperature logger data collected by the DEQ above Riverside Canal between May 8, 2011 and February 7, 2012, the maximum daily average exceeded the allowed standard of nineteen degrees C 17 times, and exceeded 22 degrees C 2 times.

ID17050114SW003a_04 Indian Creek - New York Canal to Sugar Avenue 6.39 Miles

TEMPERATURE	12-14-16 (JW) - Site-specific criteria for water temperature apply to this AU and require a maximum weekly maximum temperature (MWMT) of 13 C to protect brown trout and rainbow trout spawning and incubation, and applies from October 15 through June 30. Based on temperature logger data collected by DEQ between October 15, 2011 and February 5, 2012, the MWMT exceeded 13 C.
CAUSE UNKNOWN	1/29/2013 (NED) - This segment (WQLS 2731) was first listed for nutrients on the 1994 section 303(d) list, which was promulgated by EPA as part of the first TMDL lawsuit. For the 2002 cycle, because DEQ had not identified the limiting nutrient impairing the water body, EPA and DEQ agreed that the nutrient listing would be changed to "cause unknown" with the comment "nutrients suspected." However, during the 2010 cycle, cause unknown was delisted and replaced with temperature-overlooking the fact that cause unknown was a placeholder for nutrients. Since DEQ did not provide a rationale demonstrating that nutrients were no longer impairing beneficial uses, DEQ has an obligation to relist this segment for cause unknown (nutrients suspected). Therefore, for the 2012 Integrated Report, DEQ relisted this segment for cause unknown (nutrients suspected) in Category 5 until such time that either: (1) water quality data demonstrate that beneficial uses are no longer impaired by nutrients, (2) a TMDL is developed, or (3) readily available data and information show the original listing was made in error.

ID17050114SW005_02 Mill Slough and East Hartley Gulch 52.94 Miles

TEMPERATURE	5/8/2012 (HS) - DEQ deployed a thermograph in Mill Slough located in Middleton between 4/1/11 and 10/31/11. The maximum weekly maximum temperature (between November 1 and May 30) was 15.8 degrees C. This exceeds the 13 degrees C water quality criterion for salmonid spawning.

ID17050114SW005_06	Boise River - Veterans Memorial Parkway to Star Bridge	36.89	Miles

TEMPERATURE

02/07/2020 (DM): Data submitted by the City of Boise in 2019 showed that the temperature exceeded criteria for cold water aquatic life in 2013 and 2015 and salmonid spawning in 2015 and 2016 at Eagle Road Bridge. This assessment unit was in Category 5 for temperature in the 2016 Integrated Report. At that time, it was determined that elevated temperature was impairing aquatic life. That assessment further stated that the assessment unit will remain listed for temperature pending additional data collection further down the unit, towards Star Road. Due to the fact that there were still exceedances in the criteria, and no additional data was collected in a downstream representing area, the AU will remain impaired for temperature.

ID17050114SW005_06a	Boise River-Star to Middleton	11.34	Miles

TEMPERATURE

12/30/19 (DM): 2016 temperature logger data submitted by the City of Boise shows maximum water temperatures of twenty-two (22) degrees C or greater and instances of maximum daily average temperatures of nineteen (19) degrees C or greater. These temperatures indicate that cold water aquatic life is not supported (IDAPA 58.01.02.250.02.b). AU will remain impaired by temperature.

ID17050114SW005_06b	Boise River-Middleton to Indian Creek	7.84	Miles

TEMPERATURE

12/30/19 (DM): 2018 temperature logger data submitted by the City of Boise shows maximum water temperatures of twenty-two (22) degrees C or greater and instances of maximum daily average temperatures of nineteen (19) degrees C or greater. These temperatures indicate that cold water aquatic life is not supported (IDAPA 58.01.02.250.02.b). AU will remain impaired by temperature.

ID17050114SW006_02	Mason Creek - entire watershed	29.83	Miles

CHLORPYRIFOS

1/31/10 (HS) - According to the 'Pesticide Residue Water Quality Report', Lower Boise River Tributaries (Kirk Campbell, ISDA, December 2009): "There were eight detections of chlorpyrifos with two of the detections (0.062 ug/L and 0.052 ug/L) exceeding the EPA acute (0.05 ug/L) and chronic (0.04 ug/L) guidance benchmarks for invertebrates. The presence of toxic substances in concentrations that impair beneficial uses is a violation of Idaho's narrative standard for toxic substances.

TEMPERATURE

(HS) - Temperature impairment added based upon data submitted by City of Boise.

CAUSE UNKNOWN

Nutrients suspected impairment.

ID17050114SW007_04	Fifteenmile Creek - 4th order (Fivemile Creek to mouth)	3.73	Miles

CHLORPYRIFOS

1/13/2010 (Hawk Stone) - According to the 'Pesticide Residue Water Quality Report', Lower Boise River Tributaries (Kirk Campbell, ISDA, December 2009): "The highest detection of chlorpyrifos (0.053 ug/L) exceeded both the EPA acute (0.05 ug/L) and chronic (0.04 ug/L) guidance benchmarks for invertebrates. Chlorpyrifos also had a detection of 0.044 ug/L, which exceeded the chronic invertebrate benchmark. The presence of toxic substances in concentrations that impair beneficial uses is a violation of Idaho's narrative standard for toxic substances. In addition to the chlorpyrifos detections, ethoprop was detected at levels that exceeded the EPA chronic invertebrate benchmark (0.8 ug/L) and although the methomyl level did not exceed any EPA benchmarks, several detections were very close to the chronic invertebrate benchmark. Also, malathion was detected in the 2010 study (W-39), but not in the 2011 (W-43) study. It will remain unlisted for now.

ID17050114SW008_03	Tenmile Creek - 3rd order below Blacks Creek Reservoir	29.49	Miles

CAUSE UNKNOWN	1/29/2013 (NED) - This segment (WQLS 2736) was first listed for nutrients on the 1994 section 303(d) list which was promulgated by EPA as part of the first TMDL lawsuit. During the 2010 cycle, it was determined that sediment was the cause of the biological impairment and cause unknown was delisted. However, what was overlooked was that cause unknown was a place holder for nutrients. Since DEQ did not provide rationale that demonstrated that nutrients were no longer impairing beneficial uses, DEQ has an obligation to relist this segment for nutrients (cause unknown). Therefore, for the 2012 Integrated Report DEQ relisted cause unknown (nutrients suspected) in Category 5 until such time that either: 1) water quality data demonstrates that beneficial uses are no longer impaired by nutrients; 2) a TMDL is developed; or 3) readily available data and information shows the original listing was made in error.
CHLORPYRIFOS	3/22/2012 (HS) - Tenmile Creek is impaired due to presence of toxic substances in concentrations that impair beneficial uses (IDAPA 58.01.02.200.02). The toxin of concern is chlorpyrifos, which was found at a level that exceeds EPA's Aquatic Life Benchmarks for acute toxicity to aquatic life. The Aquatic Life Benchmarks are based on toxicity values reviewed by EPA and used in the EPA's most recent risk assessments developed as part of the decision making process for pesticide registration. Each Aquatic Benchmark is based on the most sensitive, scientifically acceptable toxicity endpoint available to EPA for a given taxon. Chlorpyrifos was detected six times by ISDA sampling in 2011, and at its highest concentration, exceeded the acute Aquatic Life Benchmark by a factor of 1.42. (Source: ISDA Technical Report Summary W-43: Pesticide Residue Evaluation for Fifteenmile Creek Tenmile Creek, and Fivemile Creek 2011).

ID17050114SW009_02	Blacks Creek and Bryans Run - 1st and 2nd order	56.19	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050114SW009_03	Blacks Creek - 3rd order	7.13	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050114SW010_03	Fivemile Creek - 3rd order	22.63	Miles

CHLORPYRIFOS	3/22/2012 (HS) - Fivemile Creek is impaired due to presence of toxic substances in concentrations that impair beneficial uses (IDAPA 58.01.02.200.02). The toxin of concern is chlorpyrifos, which was found at level that exceeds EPA's Aquatic Life Benchmarks for acute toxicity to aquatic life. The Aquatic Life Benchmarks are based on toxicity values reviewed by EPA and used in the EPA's most recent risk assessments developed as part of the decision making process for pesticide registration. Each Aquatic Benchmark is based on the most sensitive, scientifically acceptable toxicity endpoint available to EPA for a given taxon. Chlorpyrifos was detected four times by ISDA sampling in 2011, and at its highest concentration, exceeded the acute Aquatic Life Benchmark by a factor of 1.36. (Source: ISDA Technical Report Summary W-43: Pesticide Residue Evaluation for Fifteenmile Creek Tenmile Creek, and Fivemile Creek 2011).
CAUSE UNKNOWN	1/29/2013 (NED) - This segment (WQLS 2734) was first listed for nutrients on the 1994 section 303(d) list, which was promulgated by EPA as part of the first TMDL lawsuit. For the 2002 cycle, because DEQ had not identified the limiting nutrient impairing the water body, EPA and DEQ agreed that the nutrient listing would be changed to "cause unknown" with the comment "nutrients suspected." However, during the 2010 cycle, cause unknown was delisted and replaced with sediment- overlooking the fact that cause unknown was a placeholder for nutrients. Since DEQ did not provide a rationale demonstrating that nutrients were no longer impairing beneficial uses, DEQ has an obligation to relist this segment for cause unknown (nutrients suspected). Therefore, for the 2012 Integrated Report, DEQ relisted this segment for cause unknown (nutrients suspected) in Category 5 until such time that either: (1) water quality data demonstrate that beneficial uses are no longer impaired by nutrients, (2) a TMDL is developed, or (3) readily available data and information show the original listing was made in error.

ID17050114SW012_02	Stewart Gulch, Cottonwood and Crane Creeks - 1st & 2nd order	63.71	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050114SW012_03	Cottonwood Creek - 3rd order (Fivemile Creek to Boise River)	5.87	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050114SW016_03	Sand Hollow Creek (C-Line Canal to I-84)	5.55	Miles

CAUSE UNKNOWN	Nutrients Suspected Impairment Low DO due to suspected Organic Enrichment

ID17050114SW017_06	Sand Hollow Creek - Sharp Road to Snake River	3.68	Miles

CAUSE UNKNOWN	Nutrients Suspected Impairment

17050115 Middle Snake-Payette

ID17050115SW002_02	Homestead Gulch	21.26	Miles

ESCHERICHIA COLI (E. COLI)	9/18/2014 (HS) - The five-sample geometric mean collected in the spring of 2014 had a value of 287 cfu/100mL, which is greater than the 126 cfu/100mL criterion value. Therefore, the recreational use of this water body is considered impaired by bacteria.

ID17050115SW003_03	Ashlock Gulch - 3rd order	2.21	Miles

ESCHERICHIA COLI (E. COLI)	9/18/2014 (HS) - The five-sample geometric mean collected in the spring of 2014 had a value of 641 cfu/100mL, which is greater than the 126 cfu/100mL criterion value. Therefore, the recreational use of this water body is considered impaired by bacteria.

ID17050115SW004_02	Hurd and Big Whitley Gulches	24.73	Miles

ESCHERICHIA COLI (E. COLI)	9/18/2014 (HS) - The five-sample geometric mean collected in the spring of 2014 had a value of 888 cfu/100mL, which is greater than the 126 cfu/100mL criterion value. Therefore, the recreational use of this water body is considered impaired by bacteria.

17050120 South Fork Payette

ID17050120SW001_02	SF Payette River - 1st and 2nd order:Lowman to Garden Valley	115.78	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050120SW001_05	South Fork Payette River - 5th order	23.95	Miles

SEDIMENTATION/SILTATION

17050121 Middle Fork Payette

ID17050121SW007_02	Silver Creek - 1st and 2nd order	23.91	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17050122 Payette

ID17050122SW001_06	Payette River - Black Canyon Reservoir Dam to mouth	66.8	Miles

TEMPERATURE

9/18/2014 (HS) - According to the Lower Payette River 5-year review (page 86) the temperature criteria exceedance appears to be driven by, or closely related to, impoundments. Data collected from the outlet of Black Canyon Reservoir, North Side Irrigation Canal, Payette Ditch, the mainstem river (AU 001_06) at LPR-001 (near the dam outfall), LPR-003 (Letha Bridge), and LPR-007 (near Payette) indicate that the water delivered to the lower Payette River by the Black Canyon Reservoir exceeds beneficial use criteria by 4 degrees C (15%) from June to November. The north-side tributaries with the most impoundments, Big Willow Creek (AU 017) and Little Willow Creek (AU 018_04), also exceed temperature criteria for beneficial use support from May through July and contribute water to the Payette Ditch and the lower Payette River that exceeds criteria. Bissel Creek (AU 015_03a) and numerous north- and south-side irrigation system drains contribute water that meets temperature criteria for support of beneficial uses.

ID17050122SW002_02	Tributaries to Black Canyon Reservoir	18.13	Miles

ESCHERICHIA COLI (E. COLI)

ID17050122SW003_02a	Dry Buck, Peterson & Fleming Creeks - 1st & 2nd order	29.38	Miles

ESCHERICHIA COLI (E. COLI)

8/4/17 (DM, JW): A single E. coli sample collected 7/9/15 had a concentration of 2,419.6 cfu/100 mL. Five E. coli samples collected 8/11/15 - 8/28/15 had a geometric mean of 1,840 cfu/100 mL, which exceeds the 126 cfu/100 mL E. coli criterion.

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050122SW011_03	Little Squaw Creek - 3rd order (North Fork to Soldier Creek)	9.69	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050122SW012_03	Soldier Creek - 3rd order	2.02	Miles

SEDIMENTATION/SILTATION

ID17050122SW015_02	Bissel Creek - 1st and 2nd order	28.47	Miles

SEDIMENTATION/SILTATION

ID17050122SW016_03	Sand Hollow - 3rd order	2.72	Miles

ESCHERICHIA COLI (E. COLI)

9/18/2014 (HS) - E.coli data collected in 2013 showed a geomean of 1,124 cfu/100mL which is greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

17050123 North Fork Payette

ID17050123SW006_02	Beaver Creek - 1st and 2nd order	19.32	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050123SW010_02	Kennally, Rapid and Sloans Creeks - 1st and 2nd order	91.87	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050123SW010_04	Kennally Creek - Rapid Creek to Gold Fork River	6.22	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050123SW011_03	Boulder Creek - 3rd order (Louie Creek to mouth)	11.55	Miles

TEMPERATURE

ID17050123SW012_02	Lake Fork below Little Payette Lake - 1st and 2nd order	12.14	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050123SW015_02	Mud Creek - 1st and 2nd order	26.75	Miles

ESCHERICHIA COLI (E. COLI)

ID17050123SW015_03	Mud Creek - 3rd order (Norwood to Reservoir)	7.26	Miles

ESCHERICHIA COLI (E. COLI)	Bacteria sample at BURP site exceeded the cut-off for repeat sampling, so six further samples were taken. Additionally, DEQ's Cascade Satellite Office took bacteria samples on three occasions. The geometric mean of all samples taken from 6/18/02 through 9/23/02 was 316 col/100 mL, a violation of the bacteria standard of 126 col/100 mL. Cows were seen grazing at or near the bacteria sample site.

ID17050123SW016_04	North Fork Payette River - Payette Lake to Cascade Reservoir	20.41	Miles

TEMPERATURE	02/07/2020 (DM): The cause parameter for this AU was updated from ‘combined biota/habitat bioassessments.’ Data collected by the DEQ in 2019 shows temperature exceedances for both cold water aquatic life and salmonid spawning criteria.

ID17050123SW017L_0L	Payette Lake	4986.89	Acres

MERCURY	2/18/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.305 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

17050124 Weiser

ID17050124SW001_06a	Weiser River - Galloway Dam to Snake River	16.98	Miles

ESCHERICHIA COLI (E. COLI)	7/24/2015 (MH) - E. coli sampling in the Weiser River produced a geomean of 311 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion value. Individual samples ranged from 228 - 435 cfu/100 mL and were collected 6/29/2015 through 7/16/2015 with 3-7 days between samples.

ID17050124SW002_02	Cove Creek - entire watershed	44.74	Miles

SEDIMENTATION/SILTATION

ID17050124SW012_02	Grays Creek - 1st and 2nd order	45.72	Miles

ESCHERICHIA COLI (E. COLI)	4/26/2012 (HS) - Bacteria samples collected during August and September 2011 showed a geometric mean of 1,052.5 cfu/100 mL which is greater than the 126 cfu/100 mL criterion value.

ID17050124SW012_03	Grays Creek - 3rd order (Sucker Creek to mouth)	3.76	Miles

ESCHERICHIA COLI (E. COLI)	4/26/2012 (HS) - Bacteria samples collected during August and September 2011 showed a geometric mean of 1014.2 col/100 mL which is greater than the 126 col/100 mL criterion value.

ID17050124SW014_03	Middle Fork Weiser River - lower 3rd order (rangeland)	8.66	Miles

FISH BIOASSESSMENTS

ESCHERICHIA COLI (E. COLI)

ID17050124SW025_03	Rush Creek - 3rd order (Beaver Creek to mouth)	6.29	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050124SW028_03	Hopper, Deer and Keithly Creeks - 3rd order	4.99	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050124SW028_04	Keithly Creek - 4th order (Deer Creek to mouth)	1.82	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17050124SW030_03	Mann Creek - 3rd order	16.6	Miles

ESCHERICHIA COLI (E. COLI)

ID17050124SW033_03	Monroe Creek - 3rd order	15.38	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17050201 Brownlee Reservoir

ID17050201SW001_08	Hells Canyon Reservoir	2510.21	Acres

MERCURY	9/18/2014 (HS) - Mercury data submitted by Idaho Power confirmed this impairment. The mean mercury concentration in smallmouth bass >200mm was 0.421 mg/kg, which exceeds the human health criterion of 0.3 mg/kg. 2/18/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A mercury level of 0.522 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID17050201SW002_08	Oxbow Reservoir	1106.23	Acres

MERCURY	9/18/2014 (HS) - Mercury data submitted by Idaho Power had a mean mercury concentration in smallmouth bass >200mm of 0.339 mg/kg, which exceeds the human health criterion of 0.3 mg/kg.

ID17050201SW003_02	Tributaries to Snake River - 1st and 2nd order	108.39	Miles

ESCHERICHIA COLI (E. COLI)	9/18/2014 (HS) - E. coli impairment confirmed in 2012 by 5-sample geometric mean value of 1,239 cfu/100mL, well in excess of the Idaho water quality criterion of 126 cfu/100mL.
COMBINED BIOTA/HABITAT BIOASSESSMENTS	

ID17050201SW003_08	Brownlee Reservoir, Lower (Porters Flat to Brownlee Dam)	13193.87	Acres

MERCURY	9/18/2014 (HS) - The Idaho Power mercury study conducted in May 2013 found the mean mercury concentration in smallmouth bass >200mm to be 0.275 mg/kg. Although this value is slightly below the human health criterion of 0.3 mg/kg, additional multi-species information is warranted before mercury can be proposed for delisting. (H. Stone) - Mercury listing based on the DEQ reports "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" Essig and Kostermann, May 2008) and "Brownlee Reservoir Mercury TMDL Fish Tissue Study, Results and Field Summary".

ID17050201SW005_02 Jenkins Creek - entire watershed	22.95 Miles
ESCHERICHIA COLI (E. COLI)	10/1/2014 (HS) - The five-sample geometric mean E. coli samples collected in the summer of 2014 all exceeded the 126 cfu/100mL criterion value. The lower site had a value of 624 cfu/100mL, and the two upper sites had values of 1,566 cfu/100mL and 1,196 cfu/100mL. Therefore, the recreational use of this water body is considered impaired by bacteria.
CHLORPYRIFOS	3/22/2012 (HS) - Jenkins Creek is impaired due to presence of toxic substances in concentrations that impair beneficial uses (IDAPA 58.01.02.200.02). The toxin of concern is chlorpyrifos, which was found at level that exceeds EPA's Aquatic Life Benchmarks for acute toxicity to aquatic life. The Aquatic Life Benchmarks are based on toxicity values reviewed by EPA and used in the EPA's most recent risk assessments developed as part of the decision making process for pesticide registration. Each Aquatic Benchmark is based on the most sensitive, scientifically acceptable toxicity endpoint available to EPA for a given taxon. Chlorpyrifos was detected six times by ISDA sampling in 2007, and at its highest concentration, exceeded the acute Aquatic Life Benchmark by a factor of 1.36. (Source: ISDA Technical Report Summary W-20: Evaluation of Pesticide Residues Within Weiser Flat, Weiser, Idaho, December 2007).

ID17050201SW006_03 Scott Creek - 3rd order	14.39 Miles
ESCHERICHIA COLI (E. COLI)	10/1/2014 (HS) - The five-sample geometric mean E. coli samples collected in the summer of 2014 had values of 629 cfu/100mL (lower site) and 146 cfu/100mL (upper site). Both values are greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17050201SW007_03 Warm Springs Creek - 3rd order	5.31 Miles
ESCHERICHIA COLI (E. COLI)	10/1/2014 (HS) - The five-sample geometric mean E. coli samples collected in the summer of 2014 had values of 407 cfu/100mL (lower site) and 236 cfu/100mL (upper site). Both values are greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17050201SW008_02 Hog Creek - 1st & 2nd order	34.41 Miles
ESCHERICHIA COLI (E. COLI)	

ID17050201SW008_03 Hog Creek - 3rd order section	2.89 Miles
ESCHERICHIA COLI (E. COLI)	10/1/2014 (HS) - The five-sample geometric mean E. coli samples collected in the summer of 2014 had values of 190 cfu/100mL (lower site) and 589 cfu/100mL (upper site). Both values are greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17050201SW010_02 Rock Creek and Tributaries - 1st and 2nd order	63.02 Miles
ESCHERICHIA COLI (E. COLI)	4/26/2012 (HS) - Bacteria samples collected during August and September 2011 showed a geometric mean of 2145.5 col/100mL which is greater than the 126 col/100 mL criterion value.

ID17050201SW010_03 Rock, Little Rock and Henley Creeks - 3rd order sections	7.31 Miles
ESCHERICHIA COLI (E. COLI)	4/26/2012 (HS) - Bacteria samples collected during August and September 2011 showed a geometric mean of 662 cfu/100mL which is greater than the 126 cfu/100 mL criterion value. Therefore, the recreational use of this water body is considered impaired by bacteria.

17040104 Palisades

ID17040104SK008_02	Snake River - Palisades Reservoir Dam to Fall Creek	77.83	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

SEDIMENTATION/SILTATION

17040105 Salt

ID17040105SK003_03	Tincup Creek - source to Idaho/Wyoming border	19.04	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

TEMPERATURE	12/4/19 (GAM): Continuous temperature data was collected from 6/22/2018 to 9/26/2018 on Tincup Creek (ID17040105SK003_03). Daily maximum water temperature exceeded 22 degrees C on 12 of 95 days sampled (13%). On average, the daily maximum water temperature was 18.0 degrees C (standard deviation = 3.5). The daily mean water temperature never exceeded the criteria for Cold Water Aquatic Life of 19 degrees C (mean = 15.1, standard deviation = 2.7).

ID17040105SK005_02c	Deer Creek	4.82	Miles

ESCHERICHIA COLI (E. COLI)	6/11/2019 (RE): Four E. coli samples were 8/24/2016 through 9/14/2016 and had a geometric mean of 2061.3 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040105SK006_02e	Hyde Canyon	7.03	Miles

SEDIMENTATION/SILTATION	7/18/17 (HH, JW): Sediment impairment determination based on Wolman Pebble Counts and bank stability assessment. Stream very impacted by cattle grazing. Banks often very unstable. Water cloudy to murky.

ID17040105SK006_02i	Horse Creek	10.21	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040105SK008_04	Crow Creek - Deer Creek to border	10.44	Miles

SELENIUM	10/23/2015 (GM) - Crow Creek was sampled near the lower end of this reach in 2010 through 2014, resulting in selenium concentrations of 0.00766, 0.00217, 0.00781, 0.0124 and 0.0128 mg/L, respectively. Given that the selenium criterion has been exceeded in 4 of these 5 years, DEQ has listed this AU as impaired by selenium.

ID17040105SK009_02	North Fork Sage Creek	12.43	Miles

SELENIUM	11/4/2015 (GM) - The selenium concentration downstream of the confluence with Pole Creek was 0.041 mg/L in May of 1998. This exceeds the selenium criterion of 0.005 mg/L (Idaho Mining Association Selenium Subcommittee Final 1998 Regional Investigation Report, December 1999).

ID17040105SK009_02c	Sage Creek	1.81	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040105SK009_02d	Pole Canyon Creek	3.62	Miles

SELENIUM

ID17040105SK009_02e	South Fork Sage Creek	7.95	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS — 1/20/10 - Added based on failing BURP score in 2006.

SELENIUM — Listing based on May 24, 2007 "Supplemental Surface Water Monitoring Data Transmittal" from Newfields.

ID17040105SK009_03	Sage Creek - confluence with North Fork Sage Creek to mouth	3.22	Miles

SELENIUM

17040201 Idaho Falls

ID17040201SK007_05	Crow Creek - source to Willow Creek	9.24	Miles

SEDIMENTATION/SILTATION

ID17040201SK013_02	Snake River - river mile 856 to Dry Bed Creek	20.39	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17040202 Upper Henrys

ID17040202SK025_02	Henrys Lake Outlet - Henrys Lake Dam to mouth	34.12	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040202SK030_02	Twin Creek - source to mouth	8.55	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040202SK035_03	Timber Creek - source to mouth	3.37	Miles

ESCHERICHIA COLI (E. COLI)

17040203 Lower Henrys

ID17040203SK013_04	Sand Creek - Pine Creek to mouth	9.96	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17040204 Teton

ID17040204SK011_02	Warm Creek - source to mouth	5.77	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

FECAL COLIFORM

ID17040204SK034_02	Warm Creek - source to mouth	17.59	Miles

FECAL COLIFORM

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040204SK046_02	Dick Creek spring complex	3.59	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040204SK048_02	Teton Creek - Idaho/Wyoming border to Highway 33 bridge	7.28	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17040205 Willow

ID17040205SK005_02	Willow Creek - Birch Creek to Bulls Fork	57.41	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040205SK005_04	Willow Creek - Birch Creek to Bulls Fork	2.3	Miles

TEMPERATURE

ID17040205SK008_02	Willow Creek - Mud Creek to Birch Creek	27.76	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ESCHERICHIA COLI (E. COLI)

ID17040205SK008_04	Willow Creek - Mud Creek to Birch Creek	8.84	Miles

TEMPERATURE

ID17040205SK009_02	Mud Creek - source to mouth	9.77	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040205SK019_04	Grays Lake outlet - Brockman Creek to Homer Creek	12.49	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040205SK021_02	Grays Lake - Order 1 & 2 tributaries	96.58	Miles

TEMPERATURE	11/9/2017: (AS, TS) ID17040205SK021_02 contains first and second order segments of Willow Creek, Bridge Creek, NF Eagle Creek and Clark Creek. Originally listed in 1998 as impaired through Combined Biota/Habitat Assessments, investigation by regional office staff suggest any existing Salmonid Spawning impairments result from temperature exceedances rather than other pollutants such as sediment. In 2016, the AU was found to violate temperature criteria for salmonid spawning 31 days throughout the spring and fall spawning seasons (data file attached at AU-level). So, the AU was de-listed for the Combined Biota/Habitat Assessments for both cold water aquatic life and salmonid spawning and listed as impaired for temperature. A temperature PNV TMDL anticipated completion date is 2018.

ID17040205SK024_02	Brockman Creek - Corral Creek to mouth	20.03	Miles

ESCHERICHIA COLI (E. COLI)

ID17040205SK030_02	Bulls Fork - source to mouth	23.38	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17040206 American Falls

ID17040206SK001L_0L	American Falls Reservoir (Snake River)	31724.26	Acres

SEDIMENTATION/SILTATION

NUTRIENT/EUTROPHICATION BIOLOGICAL INDICATORS

DISSOLVED OXYGEN

ID17040206SK002_02	Bannock Creek - source to American Falls Reservoir	132.97	Miles

FECAL COLIFORM

ID17040206SK002_03	Bannock Creek - source to American Falls Reservoir	14.24	Miles

ESCHERICHIA COLI (E. COLI)

ID17040206SK002_04	Bannock Creek - source to American Falls Reservoir	0.81	Miles

FECAL COLIFORM

ID17040206SK005_02	Sunbeam Creek - source to mouth	24.02	Miles

ESCHERICHIA COLI (E. COLI)	6/11/2019 (RE): Five E. coli samples collected 8/23/2017 through 9/11/2017 had a geometric mean of 1108.2 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040206SK005_03	Sunbeam Creek	2.82	Miles

SEDIMENTATION/SILTATION

ID17040206SK009_02	Knox Creek - source to mouth	23.85	Miles

ESCHERICHIA COLI (E. COLI)	6/11/2019 (RE): Five E. coli samples collected 8/23/2017 through 9/11/2017 and had a geometric mean of 135.4 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040206SK009_03	Knox Creek - source to mouth	7.83	Miles

ESCHERICHIA COLI (E. COLI)	6/11/2019 (RE): Five E. coli samples collected 8/23/2017 through 9/11/2017 had a geometric mean of 161.1 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040206SK010_02	Rattlesnake Creek - source to mouth	50.82	Miles

ESCHERICHIA COLI (E. COLI)

ID17040206SK010_02b	Rattlesnake Creek	1.1	Miles

ESCHERICHIA COLI (E. COLI)

ID17040206SK010_03	Rattlesnake Creek - source to mouth	9.95	Miles

ESCHERICHIA COLI (E. COLI)

ID17040206SK010_04	Rattlesnake Creek - lower	1.27	Miles

ESCHERICHIA COLI (E. COLI)

ID17040206SK022_04	Snake River	108.17	Miles

MERCURY	03/16/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue and Water from Idaho's Major Rivers: A Statewide Assessment" (Essig, October 2009). A mercury level of 0.317 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

17040207 Blackfoot

ID17040207SK007_04	Grizzly Creek - source to mouth	2.78	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040207SK010_02a	State Land Creek - headwaters to Blackfoot River	9.08	Miles

SELENIUM	Se listed based on DEQ data. See DEQ 2006. Selenium Project Southeast Idaho Phosphate Mining Resource Area.

ID17040207SK010_04	Blackfoot River - headwaters to Slug Creek	13.82	Miles

SELENIUM

ID17040207SK010_05	Blackfoot River	20.72	Miles

DISSOLVED OXYGEN	6/4/2015 (NED) - Nighttime dissolved oxygen exceedances are due to water temperature exceedances. Any temperature reductions achieved through implementation of the temperature TMDL will naturally result in improved DO concentrations. Therefore, the temperature TMDL will serve as a surrogate to improve the existing DO impairment.
SELENIUM	Se listed based on DEQ data. See DEQ 2006. Selenium Project Southeast Idaho Phosphate Mining Resource Area.

ID17040207SK011_03	Trail Creek - source to mouth (Below Findlayson Ranch)	7.85	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040207SK012_02a	Johnson Creek - upper	4.85	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040207SK012_02b	Goodheart Creek	7.54	Miles

SELENIUM	Se listed based on DEQ data. See DEQ 2006. Selenium Project Southeast Idaho Phosphate Mining Resource Area.

ID17040207SK013_02a	Dry Valley Creek	6.43	Miles

SELENIUM

ID17040207SK013_02b	Chicken Creek (tributary to Dry Valley Creek)	2.85	Miles

SELENIUM

ID17040207SK013_03	Dry Valley Creek - source to mouth	4.98	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

SELENIUM

ID17040207SK014_02	Maybe Creek - source to mouth	5.23	Miles

SELENIUM	Montgomery Watson and others working under CERCLA- related water quality monitoring documented chronic selenium standard violation. Livestock (horses) fatalities have been documented. There are no fish in this stream. Rather than a TMDL, a consent order with clean-up plan was finalized in 1998.

ID17040207SK015_02	Spring Creek (Blackfoot River tributary)	7.3	Miles

SELENIUM	Selenium listed based on DEQ 2006 data. Selenium Project Southeast Idaho Phosphate Mining Resource Area.
TEMPERATURE	

ID17040207SK015_02a	East Mill Creek	2.44	Miles

SELENIUM	Se listed based on DEQ data. See DEQ 2006. Selenium Project Southeast Idaho Phosphate Mining Resource Area. Plus additional data sources.

ID17040207SK015_02b	lower Mill Canyon	1.03	Miles

SELENIUM	Se listed based on DEQ data. See DEQ 2006. Selenium Project Southeast Idaho Phosphate Mining Resource Area. Plus additional data sources.

ID17040207SK015_03	lower Spring Creek	0.05	Miles

TEMPERATURE	Exceeded state Water Quality Standards for salmonid spawning and cold water aquatic life. See documentation in IDASA.
SELENIUM	Selenium listed based on DEQ 2006 data. Selenium Project Southeast Idaho Phosphate Mining Resource Area.

ID17040207SK016_02a	upper Diamond Creek	4.43	Miles

TEMPERATURE	Exceeded state Water Quality Standards for salmonid spawning. See documentation in IDASA.

ID17040207SK016_03	Diamond Creek - lower	19.29	Miles

TEMPERATURE	Exceeded state Water Quality Standards for salmonid spawning. See documentation in IDASA.

ID17040207SK016_03a	Diamond Creek - middle	10.63	Miles

TEMPERATURE	Exceeded state Water Quality Standards for salmonid spawning. See documentation in IDASA.

ID17040207SK018_02d	Corrailsen Creek	3.91	Miles

ESCHERICHIA COLI (E. COLI)	10/16/2014 (Greg Mladenka) - A five-sample E. coli geomean of 169 cfu/100mL was collected 8/20 through 9/15/2014. This value is greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17040207SK018_04	Lanes Creek - Chippy Creek to Blackfoot River	9.41	Miles

ESCHERICHIA COLI (E. COLI)	10/16/2014 (Greg Mladenka) - A five-sample E. coli geomean of 334 cfu/100mL was collected 8/20 through 9/15/2014. This value is greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17040207SK021_02a	Olsen Creek - upper (Blackfoot River tributary)	3.05	Miles

ESCHERICHIA COLI (E. COLI)	10/16/2014 (Greg Mladenka) - A five-sample E. coli geomean of 128 cfu/100mL was collected 8/20 through 9/15/2014. This value is greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.
TEMPERATURE	Exceeded state Water Quality Standards for salmonid spawning. See IDASA for documentation.

ID17040207SK022_02a	South Fork Sheep Creek	1.84	Miles

SELENIUM	7/1/2015 (LVE) - Water sample data collected on South Fork Sheep Creek for P4 Production, LLC (Monsanto) as part of their environmental monitoring requirements at the S. Rasmussen Ridge Mine and Horseshoe Overburden Disposal Area from June 1999 through June 2011 showed that 37 of 57 samples collected above the confluence of this tributary with the 3rd order reach of Sheep Creek exceeded the chronic total recoverable selenium criterion of 0.005 mg/l. (Data source: Final Source Characterization Report, Horseshoe Overburden Area, South Rasmussen Ridge Mine, Caribou Co., Idaho, Rev. 5., Newfields, August 2013).

ID17040207SK022_03 Sheep Creek - below confluence of South Fork Sheep Creek 2.55 Miles

SELENIUM	6/24/2015 (LVE) - Since 2006, DEQ has been collecting water quality data as part of the annual spring-time synoptic sampling regime. The data collected at Lanes Creek Road has shown that 5 of 10 years have exceeded the 4-day average concentration of 0.005 mg/L chronic selenium criteria. Additional water quality data collected by Agrium and Monsanto on the South Fork of Sheep Creek drainage confirmed that South Fork Sheep Creek-which sits below both Agrium's Rasmussen Ridge Complex and Monsanto's Horseshoe Overburden Disposal Area (and is tributary to this AU)-is the primary contributor to selenium impairment in the Sheep Creek drainage.

ID17040207SK023_02a Rasmussen Creek 6.27 Miles

SELENIUM	Se listing based on DEQ data. See Annual TMDL baseline monitoring reports for Se.

ID17040207SK023_02b Angus Creek - upper, headwaters to Rasumussen Creek 7.81 Miles

SELENIUM	Selenium listing based on 4-day average selenium water column concentration > 5 ppb during IDEQ sampling events in 2005 and 2006
TEMPERATURE	Exceeded state Water Quality Standards for cold water aquatic life and salmonid spawning. See IDASA for documentation.

ID17040207SK023_04 Lower Angus Creek - Rasmussen Creek to Blackfoot River 3.46 Miles

TEMPERATURE	Exceeded state Water Quality Standards for cold water aquatic life and salmonid spawning. See documentation in IDASA.

ID17040207SK025_02c Clarks Cut - Sheep Creek to Grays Lake 1.92 Miles

SEDIMENTATION/SILTATION

ID17040207SK030_02 Wolverine Creek - source to Jones Creek 32.89 Miles

ESCHERICHIA COLI (E. COLI)	10/16/2014 (Greg Mladenka) - The five-sample geometric mean collected 8/6/14 throught 8/25/14 had a value of 415 cfu/100mL, which is greater than the 126 cfu/100mL criterion value. Therefore, the recreational use of this water body is considered impaired by bacteria.

17040208 Portneuf

ID17040208SK001_02c Papoose Creek - headwaters to Portneuf River 3.01 Miles

ESCHERICHIA COLI (E. COLI)	Failed Idaho Water Quality Standards for bacteria in 2007.

ID17040208SK001_05 Portneuf River - Marsh Creek to American Falls Reservoir 24.46 Miles

DISSOLVED OXYGEN

TEMPERATURE

ID17040208SK002_02 City Creek - source to mouth 6.48 Miles

ESCHERICHIA COLI (E. COLI)	12/5/2019 (GAM): Five E. coli samples collected by the DEQ between 5/5/2015 and 6/2/2015 had a geometric mean of 551 cfu/100 mL, indicating that SCR is not being met.

ID17040208SK004_02a Kinney Creek - headwaters to Mink Creek 2.58 Miles

ESCHERICHIA COLI (E. COLI)

ID17040208SK004_02c South Fork Mink Creek - headwaters to Mink Creek 6.75 Miles

ESCHERICHIA COLI (E. COLI)	6/13/2019 (RE): Five E. coli samples collected 8/15/2017 through 9/07/2017 had a geometric mean of 557.2 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040208SK004_02d East Fork Mink Creek, 2nd order 7.35 Miles

ESCHERICHIA COLI (E. COLI)	10/16/2014 (Greg Mladenka) - A five-sample E. coli geomean of 373 cfu/100mL was collected 7/21 through 8/12/2014. This value is greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17040208SK004_03a Mink Creek - S. Fk to E. Fk Mink Creek 2.82 Miles

ESCHERICHIA COLI (E. COLI)	10/16/2014 (Greg Mladenka) - A five-sample E. coli geomean of 540 cfu/100mL was collected 7/21 through 8/12/2014. This value is greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17040208SK004_04a Mink Creek - East Fork to USFS bdy (Portneuf tributary) 1.52 Miles

ESCHERICHIA COLI (E. COLI)	6/13/2019 (RE): Five E. coli samples collected 7/13/2016 through 8/1/2016 had a geometric mean of 1401.9 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040208SK006_02 Marsh Creek - source to mouth - Second order tributaries 211.36 Miles

ESCHERICHIA COLI (E. COLI)	7/13/17 (JW, HH): Five E. coli samples collected 7/1/15-7/27/15 had a geometric mean concentration of 329 cfu/100 mL, which is greater than the water quality criterion of 126 cfu/100 mL.

ID17040208SK006_02a Arkansas Creek 2.61 Miles

NITROGEN, TOTAL	DEQ water quality sampling indicates high total nitrogen (>7 mg/L) and total phosphorus mean concentrations (>0.12 mg/L)
PHOSPHORUS, TOTAL	IDEQ water quality sampling indicates high total nitrogen (>7 mg/L) and total phosphorus mean concentrations (>0.12 mg/L)
SEDIMENTATION/SILTATION	DEQ water quality sampling indicated total suspended sediment of 130 mg/L during 27 June 2006 site visit.

ID17040208SK006_03 upper middle Marsh Creek 11.11 Miles

DISSOLVED OXYGEN

TEMPERATURE

ID17040208SK006_03a Marsh Creek - Rt Fk to Red Rock Pass 3.78 Miles

TEMPERATURE

DISSOLVED OXYGEN

ID17040208SK006_04 Lower Marsh Creek 17.69 Miles

TEMPERATURE

DISSOLVED OXYGEN

ESCHERICHIA COLI (E. COLI)

ID17040208SK006_04a	**Lower Middle Marsh Creek**	**19.76**	**Miles**
DISSOLVED OXYGEN			
TEMPERATURE			
ID17040208SK010_02a	**upper Garden Creek - headwaters to Garden Creek Gap**	**9.5**	**Miles**
ESCHERICHIA COLI (E. COLI)			
ID17040208SK011_02	**Hawkins Creek - Hawkins Reservoir Dam to mouth**	**23.58**	**Miles**
ESCHERICHIA COLI (E. COLI)	6/13/2019 (RE): Five E. coli samples collected 8/23/2017 through 9/13/2017 had a geometric mean of 2175.5 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.		
ID17040208SK011_03	**lower Hawkins Creek**	**9.11**	**Miles**
ESCHERICHIA COLI (E. COLI)	1/3/2018 (HH, AS): 2008 E. coli geometric mean indicates recreational use is not supported (1634 cfu/100 mL),		
ID17040208SK012L_0L	**Hawkins Reservoir**	**67.42**	**Acres**
DISSOLVED OXYGEN	Based on field sampling in 2007, TP is very high (mean=0.19), one chlorophyll a sampling event=60, and there were several exceedences of DO in the upper 80% of the column.		
ID17040208SK013_02b	**Yellow Dog Creek - headwaters to Hawkins Creek**	**6.01**	**Miles**
ESCHERICHIA COLI (E. COLI)			
ID17040208SK014_03	**Cherry Creek - lower**	**1.57**	**Miles**
ESCHERICHIA COLI (E. COLI)			
ID17040208SK014_04	**Birch Creek from Cherry Creek to Marsh Creek confluences**	**2.74**	**Miles**
ESCHERICHIA COLI (E. COLI)			
ID17040208SK015_03	**Birch Creek - source to mouth**	**3.96**	**Miles**
ESCHERICHIA COLI (E. COLI)			
ID17040208SK015_03a	**Birch Creek - Mill Creek to I-15 road crossing**	**2.8**	**Miles**
ESCHERICHIA COLI (E. COLI)			
ID17040208SK016_02b	**East Bob Smith Creek**	**6.73**	**Miles**
ESCHERICHIA COLI (E. COLI)			
ID17040208SK016_02c	**West Bob Smith Creek**	**4.09**	**Miles**
ESCHERICHIA COLI (E. COLI)	7/14/17 (HH, JW): Five E. coli samples collected 7/12/2016 through 8/1/2016 had a geometric mean of 310 cfu/100 mL, which exceeds the E. coli water quality criterion of 126 cfu/100 mL.		
ID17040208SK016_03	**Portneuf River- Chesterfield Reservoir to Toponce Creek**	**5.52**	**Miles**
TEMPERATURE			
ID17040208SK016_04	**Portneuf River- hist. channel, Toponce to Twentyfour Mile Ck**	**2.82**	**Miles**
TEMPERATURE	Based on the sonde data collected on the section of the Portneuf River upstream of Marsh Creek. Exceeded 24 days in 2004 and 25 days in 2006.		

ID17040208SK016_05	Portneuf River- Twentyfour Mile Creek to Marsh Creek	52.21	Miles

MERCURY	03/16/2010 (NED) - Mercury listing based on the DEQ report, "Upper Portneuf River Fish Tissue and Water Column Mercury Sampling Results 2007". A Mercury level of 0.396 mg/kg for Brown Trout collected from the Topez reach was reported. This result exceeds the human health criterion of 0.3 mg/kg.
TEMPERATURE	

ID17040208SK017_02d	Dempsey Creek	18.42	Miles

ESCHERICHIA COLI (E. COLI)	
COMBINED BIOTA/HABITAT BIOASSESSMENTS	12/2/2019 (GAM): Salmonids less than 100 millimeters were not collected at BURP site 2016SPOCA053, indicating Salmonid Spawning is not supported (Idaho's WBAG III, section 6.5.2).

ID17040208SK021_02e	upper Toponce Creek	5.59	Miles

ESCHERICHIA COLI (E. COLI)	6/13/2019 (RE): Five E. coli samples collected 8/15/2016 through 9/07/2016 had a geometric mean of 156.4 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040208SK022_03a	North Fork Pebble Creek	0.98	Miles

ESCHERICHIA COLI (E. COLI)	6/13/2019 (RE): Five E. coli samples collected 7/13/2016 through 8/1/2016 had a geometric mean of 1095.5 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040208SK023_02d	Sawmill Creek	4.28	Miles

ESCHERICHIA COLI (E. COLI)	12/5/2019 (GAM): This AU was sampled for E. coli on 8/22, 8/29, 9/1, 9/7, and 9/13/2016. The geometric mean was 2419.2 cfu/100 mL which is greater than the water quality criterion of 126 cfu/100 mL.

ID17040208SK023_02e	upper Moonlight Creek	2.76	Miles

ESCHERICHIA COLI (E. COLI)	

ID17040208SK023_02f	lower Moonlight Creek	0.71	Miles

ESCHERICHIA COLI (E. COLI)	

ID17040208SK023_02g	West Fork Rapid Creek	6.58	Miles

ESCHERICHIA COLI (E. COLI)	6/13/2019 (RE): Five E. coli samples collected 7/13/2016 through 8/1/2016 had a geometric mean of 241.6 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040208SK023_02i	North Fork Rapid Creek	4.87	Miles

ESCHERICHIA COLI (E. COLI)	8/24/2020 (GM): Five E. coli samples collected 7/13/2016 through 8/1/2016 had a geometric mean of 934 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion, and indicates non-support of Secondary Contact Recreation.

ID17040208SK024_03	lower Pocatello Creek	2.91	Miles

ESCHERICHIA COLI (E. COLI)	12/9/2019 (RE, GAM): Primary Contact Recreation is presumed due to likelihood of immersion/ingestion of water. 2016 BURP depth measurements were also greater than 24 inches, which is the minimum depth recommended for Primary Contact Recreation by WBAG 3. A single E. coli sample was collected on 8/29/2016 and had a concentration of 107.1 cfu/100 mL, which is less than the 406 cfu/100 mL concentration required to trigger additional sampling, however, the DEQ and the City of Pocatello have collected E. coli samples that show impairment to secondary contact recreation, as stated in the City of Pocatello's MS4 / NPDES 401 certification (IDS-028053) issued 5/20/2019.

ID17040208SK024_03a middle Pocatello Creek - Fks to Outback Driving Range 2.02 Miles

ESCHERICHIA COLI (E. COLI)

12/9/2019 (GAM, RE): Secondary Contact Recreation is presumed due to the unlikelihood of immersion/ingestion of water. 2017 BURP depth measurements were also less than 24 inches, which is the minimum depth recommended for Primary Contact Recreation by WBAG 3. A single E. coli sample was collected on 9/11/2017 and had a concentration of 307.6 cfu/100 mL, which is less than the 576 cfu/100 mL concentration required to trigger additional sampling, however, the DEQ and the City of Pocatello have collected E. coli samples that show impairment to secondary contact recreation, as stated in the City of Pocatello's MS4 / NPDES 401 certification (IDS-028053) issued 5/20/2019.

ID17040208SK026_02a North Fork Pocatello Creek - headwaters to Pocatello Creek 10.53 Miles

ESCHERICHIA COLI (E. COLI)

17040209 Lake Walcott

ID17040209SK004L_0L Lake Walcott (Snake River) 8384.71 Acres

MERCURY

2/18/2010 (NED)- A mercury level of 0.332 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported for the samples of Small Mouth Bass that were collected June 2005.

ID17040209SK007_03 Fall Creek - source to mouth 0.66 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040209SK008_03 Rock Creek (Spring Creek and tributaries) 9.04 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040209SK008_04 Rock Creek - lower (Rockland Valley) 12.53 Miles

ESCHERICHIA COLI (E. COLI)

10/16/2014 (Greg Mladenka) - A five-sample E. coli geomean of 1,079 cfu/100mL was collected from August 7 through August 25, 2014. This value is greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17040209SK011_02 Snake River - American Falls Reservoir Dam to Rock Creek 31.64 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040209SK011_03 Snake River - American Falls Reservoir Dam to Rock Creek 2.82 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040209SK012_02 Warm Creek - source to mouth 23.07 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ESCHERICHIA COLI (E. COLI)

12/13/2019 (TW) - The geometric mean for samples collected during the 2017 field season is 340 cfu/100mL, which is above the criterion of 126 cfu/100mL for E. coli (WBAG III Section 5.2.6). Therefore the use is considered not supporting.

ID17040209SK013_02 Copper Creek 113.48 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040209SK013_03 3rd order Cottonwood Ck in the Craters of the Moon Complex 13.37 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17040210 Raft

ID17040210SK006_02	Clyde Creek - source to mouth	24.87	Miles

ESCHERICHIA COLI (E. COLI)	12/13/2019 (TW) : The geometric mean for samples collected during the 2017 field season is 1720 cfu/100mL, which is above the criterion of 126 cfu/100mL for E. coli (WBAG III Section 5.2.6). The use will remain not supporting.

ID17040210SK006_03	Clyde Creek - source to mouth	4.32	Miles

ESCHERICHIA COLI (E. COLI)	12/13/2019 (TW): The geometric mean for samples collected during the 2017 field season is 1309 cfu/100mL, which is above the criterion of 126 cfu/100mL for E. coli (WBAG III Section 5.2.6). Therefore the use is considered not supporting.

ID17040210SK021_03	Sublett Creek - source to Sublett Reservoir	5.9	Miles

ESCHERICHIA COLI (E. COLI)	3/2/2012 (S. Woodhead) - Sublett Creek was monitored to determine if it was meeting the secondary contact recreation beneficial use during the 2011 monitoring season. After assessing the data, the E. coli data showed a geomean of 310 col/100 mL which is greater than the 126 col/100 mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

17040211 Goose

ID17040211SK002L_0L	Lower Goose Creek Reservoir	1005.99	Acres

MERCURY	2/18/2010 (NED) - Mercury listing based on the DEQ report, "Arsenic, Mercury, and Selenium in Fish Tissue from Idaho Lakes and Reservoirs: A Statewide Assessment" (Essig and Kostermann, May 2008). A Mercury level of 0.378 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported.

ID17040211SK007_02	Trout Creek - source to Idaho/Nevada border	19.92	Miles

SEDIMENTATION/SILTATION

17040212 Upper Snake-Rock

ID17040212SK000_03A	Yahoo Creek	2.23	Miles

SEDIMENTATION/SILTATION	
ESCHERICHIA COLI (E. COLI)	10/17/2014 (NED) - E. coli criteria values were developed to be as protective as the fecal coliform criteria and were directly calculated by translating fecal coliform criteria using ratios of observed water quality data from EPA epidemiological studies. Recent E. coli data show a geomean of 811 cfu/100mL which is greater than the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria. Due to change in the water quality standard, fecal coliform is being delisted and E. coli is being listed in Category 5.

ID17040212SK010_03	Mud Creek - Deep Creek Road (T09S, R14E) to mouth	1.07	Miles

TEMPERATURE

ID17040212SK012_03	Cedar Draw - source to mouth	2.93	Miles

TEMPERATURE

ID17040212SK014_02	North/Dry Cottonwood Creek - source to mouth	37.64	Miles

TEMPERATURE

ID17040212SK015_02	McMullen Creek - source to mouth	49.99	Miles
TEMPERATURE			
ID17040212SK015_03	McMullen Creek - source to mouth	9.41	Miles
TEMPERATURE			
ID17040212SK020_07	Snake River - Milner Dam to Twin Falls	21.31	Miles
TEMPERATURE			
ID17040212SK022_03	Dry Creek - source to mouth	9.85	Miles
TEMPERATURE			
ID17040212SK034_04	Clover Creek - Pioneer Reservoir Dam outlet to Snake River	10.1	Miles
TEMPERATURE	1/28/2010 - EPA add January 2001.		
ID17040212SK035_04	Pioneer Reservoir	228.92	Acres
ESCHERICHIA COLI (E. COLI)	3/20/2009 (NED) - Fecal coliform has been delisted and E.coli has been listed as the impairment due to a change in DEQ's water quality standards from a criterion associated with fecal coliform to a more specific criterion for E. coli.		
TEMPERATURE			
ID17040212SK036_02	Clover Creek - source to Pioneer Reservoir	72.84	Miles
TEMPERATURE			
ID17040212SK038_02	Catchall Creek - source to mouth	15.86	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			
ID17040212SK040_02	Calf Creek - source to mouth	35.9	Miles
TEMPERATURE			
ID17040212SK040_03	Calf Creek - source to mouth	6.57	Miles
CAUSE UNKNOWN	Nutrients Suspected Impairment		
TEMPERATURE			
FECAL COLIFORM			
SEDIMENTATION/SILTATION			

17040213 Salmon Falls

ID17040213SK007_06	Salmon Falls Creek	0.94	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			

17040214 Beaver-Camas

ID17040214SK006_03	Ching Creek - source to mouth	11.93	Miles
COMBINED BIOTA/HABITAT BIOASSESSMENTS			
ESCHERICHIA COLI (E. COLI)			

ID17040214SK008_02 Crooked/Crab Creek - source to mouth 30.04 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040214SK008_03 Crooked/Crab Creek - source to mouth 10.83 Miles

ESCHERICHIA COLI (E. COLI)

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040214SK009_02 Warm Creek - Cottonwood Cr. to mouth and East Camas Creek 11.69 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

FECAL COLIFORM

ID17040214SK010_03 East Camas Creek 4.26 Miles

ESCHERICHIA COLI (E. COLI)	9/30/2014 (JF) - E. coli geometric mean sampling conducted in 2012 resulted in a calculated geometric mean of 134.6 cfu/100mL, which exceeds the 126 cfu/100mL criterion value.

ID17040214SK013_02 West Camas Creek -source to Targhee National Forest Boundary 52.54 Miles

SEDIMENTATION/SILTATION	12/14/2009 (SR) - Wolman Pebble Count data indicates a high percentage of sand/silt in nearly all streams in this AU.

ID17040214SK013_03 West Camas Creek -source to Targhee National Forest Boundary 6.54 Miles

ESCHERICHIA COLI (E. COLI)	9/30/2014 (JF) - E. coli geometric mean sampling completed in 2012 resulted in a geometric mean concentration of 282.2 cfu/100mL, which exceeds the 126 cfu/100mL criterion value. Therefore, the recreational use of this water body is considered impaired by bacteria. 6/29/17 (JW, TS): A single E. coli sample collected 8/11/13 had a concentration of 308 cfu/100 mL.

ID17040214SK016_02 Rattlesnake Creek - source to mouth 56.84 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040214SK016_03 Rattlesnake Creek - source to mouth 10.51 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040214SK017_02 Threemile Creek - source to mouth 23.1 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040214SK017_03 Threemile Creek - source to mouth 1.82 Miles

FECAL COLIFORM

ID17040214SK018_02 Beaver Creek - Miners Creek to Rattlesnake Creek 40.25 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040214SK018_04 Beaver Creek - Miners Creek to Rattlesnake Creek 8.93 Miles

ESCHERICHIA COLI (E. COLI)	9/30/2014 (JF) - E. coli geometric mean sampling in 2012 resulted in a geometric mean concentration of 333.6 cfu/100mL, which exceeds the 126 cfu/100mL criterion value.

ID17040214SK019_03 Miners Creek - source to mouth 0.97 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040214SK020_02	Beaver Creek - Idaho Creek to Miners Creek	12.84	Miles

ESCHERICHIA COLI (E. COLI)

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040214SK021_02	Beaver Creek - source to Idaho Creek	68.41	Miles

ESCHERICHIA COLI (E. COLI)

9/30/2014 (JF) - The five-sample geometric mean E. coli samples collected on West Modoc Creek in 2012 had a value of 433.3 cfu/100mL was. This value exceeds the 126 cfu/100mL criterion value; therefore the recreational use of this water body is still impaired by bacteria.

ID17040214SK023_02	Pleasant Valley Creek - source to mouth	23.67	Miles

ESCHERICHIA COLI (E. COLI)

9/30/2014 (JF) - E. coli geometric mean sampling in 2012 on School Section Creek resulted in a geometric mean concentration of 1829.1 cfu/100mL, which exceeds the 126 cfu/100mL criterion value.

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17040215 Medicine Lodge

ID17040215SK005_02	West Fork Indian Creek - source to mouth	24.46	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040215SK008_02	Middle Creek - source to Dry Creek	12.12	Miles

SEDIMENTATION/SILTATION

ID17040215SK009_02	Dry Creek - source to mouth	5.2	Miles

SEDIMENTATION/SILTATION

ID17040215SK012_02	Irving Creek - source to mouth	13.69	Miles

ESCHERICHIA COLI (E. COLI)

ID17040215SK013_02	Warm Creek - source to mouth	14.88	Miles

SEDIMENTATION/SILTATION

ID17040215SK013_03	Warm Creek - source to mouth	2.44	Miles

SEDIMENTATION/SILTATION

ID17040215SK014_02	Divide Creek - source to mouth	13.86	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040215SK015_02	Horse Creek - source to mouth	8.42	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

SEDIMENTATION/SILTATION

ID17040215SK018_02	Deep Creek - source to mouth	77.08	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

SEDIMENTATION/SILTATION

ID17040215SK018_03	Deep Creek - source to mouth	8.98	Miles

SEDIMENTATION/SILTATION

ID17040215SK021_02	Crooked Creek - source to mouth	53.1	Miles

SEDIMENTATION/SILTATION

ID17040215SK021_03	Crooked Creek - source to mouth	3.67	Miles

SEDIMENTATION/SILTATION	11/26/2019 (RE): Crooked Creek was incorrectly placed in Category 4a for sedimentation/siltation during the 2008 Integrated Report. There are no sediment load allocations associated with this AU in the Medicine Lodge Subbasin Assessment and TMDL (2003) and there is no reference to a sediment TMDL approval in EPA's TMDL approval letter (May 6, 2003). During the summer of 2019, DEQ collected McNeil sediment samples from this AU and found that percent fines were exceeding the 28% threshold, indicating a sedimentation/siltation impairment. Therefore, DEQ is placing sedimentation/siltation in Category 5.

17040216 Birch

ID17040216SK002_04	Birch Creek - Pass Creek to Reno Ditch	9.08	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17040217 Little Lost

ID17040217SK001_02a	Warm Spring Creek	8.01	Miles

TEMPERATURE	12/30/2019 (AB): Temperature data collected by the BLM in 2018 show exceedances of salmonid spawning temperature criteria. Salmonid spawning is therefore not fully supported in this AU.

ID17040217SK019_03	Summit Creek - source to mouth	9	Miles

ESCHERICHIA COLI (E. COLI)	11/12/2019 (AB): The geometric mean concentration of E.coli cells from 5 water samples collected in 2017 was 204.2 MPN/100ml, which exceeds the criteria for Secondary Contact Recreation support (Idaho's WBAG III, section 7.2).

ID17040217SK023_02	Squaw Creek - source to mouth	25.89	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17040218 Big Lost

ID17040218SK009_02	Pass Creek - source to mouth	50.12	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040218SK009_03	Pass Creek - source to mouth	10.22	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ESCHERICHIA COLI (E. COLI)	8/8/17 (TS, JW): Five E. coli samples collected 8/28/13 through 9/24/13 had a geometric mean concentration of 140 cfu/100 mL, which exceeds the 126 cfu/100 mL E. coli criterion.

ID17040218SK024_02	Big Lost River - Burnt Creek to Thousand Springs Creek	101.04	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040218SK024_03	Big Lost River - Burnt Creek to Thousand Springs Creek	1.4	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040218SK025_02	Big Lost River - Summit Creek to and including Burnt Creek	30.41	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040218SK032_04	Fall Creek - source to mouth	2.22	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040218SK035_02	Star Hope Creek - Lake Creek to mouth	17.1	Miles

ESCHERICHIA COLI (E. COLI)	2/14/2016 (JW) - Five E. coli samples collected 8/14/2014-8/28/2014 by WWP had a geometric mean value of 587 cfu/100 mL, which exceeds the 126 cfu/100 mL criterion value.

ID17040218SK035_04	Star Hope Creek - Lake Creek to mouth	7.63	Miles

ESCHERICHIA COLI (E. COLI)	8/8/17 (JW, TS): Five E. coli samples collected 8/14/14 through 8/28/14 had a geometric mean of 346.2 cfu/100 Ml, which exceeds the water quality standards criterion value of 126 cfu/100 mL.

ID17040218SK036_02	Star Hope Creek - source to Lake Creek	20.41	Miles

ESCHERICHIA COLI (E. COLI)	Five E. coli samples collected 8/14/2014-8/28/2014 by WWP had a geometric mean value of 248.7 cfu/100 mL, which exceeds the water quality standards criterion value of 126 cfu/100 mL.

ID17040218SK037_02	Muldoon Canyon Creek - source to mouth	25.94	Miles

ESCHERICHIA COLI (E. COLI)	Five E. coli samples collected by WWP 8/12/2014-8/28/2014 had a geometric mean value of 339.1 cfu/100 mL, which exceeds the water quality standards criterion value of 126 cfu/100 mL.

ID17040218SK041_02	Corral Creek - source to mouth	18.03	Miles

ESCHERICHIA COLI (E. COLI)	9/30/2014 (JF) - 2012 E. coli data collected on Corral Creek show a geomean of 206 cfu/100mL, which exceeds the 126 cfu/100mL criterion value, therefore the recreational use of this water body is considered impaired by bacteria.

ID17040218SK049_04	Cherry Creek-confluence of Left Fork Cherry and Lupine Creek	13.46	Miles

ESCHERICHIA COLI (E. COLI)	8/8/2017 (TS, JW): Five E. coli samples collected 9/9/15 through 10/5/15 had a geometric mean concentration of 188.7 cfu/100 mL, which exceeds the 126 cfu/100 mL water quality standards criterion value.

ID17040218SK055_02	Right Fork Iron Bog Creek - source to mouth	16.29	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

17040219 Big Wood

ID17040219SK007_03	Elkhorn Gulch	8.5	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040219SK027_02	Croy Creek - source to mouth	37.36	Miles

ESCHERICHIA COLI (E. COLI)	06/13/2017 (SW, JW): Five E. coli samples collected in July 2015 had a geometric mean of 563.08 cfu/100 mL, which exceeds the E. coli criterion of 126 cfu/100 mL.

ID17040219SK030_02 Black Canyon Creek - source to mouth 107.39 Miles

CAUSE UNKNOWN	Nutrients Suspected Impairment
TEMPERATURE	
TOTAL SUSPENDED SOLIDS (TSS)	

ID17040219SK030_03 Black Canyon Creek - source to mouth 24.17 Miles

CAUSE UNKNOWN	Nutrients Suspected Impairment
TOTAL SUSPENDED SOLIDS (TSS)	

17040220 Camas

ID17040220SK005_02 Willow Creek - source to Beaver Creek 53.23 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040220SK005_03 Willow Creek - source to Beaver Creek 4.84 Miles

SEDIMENTATION/SILTATION	1/9/2018 (RB, SW, AS): Bank instability was greater than 30% for both 2011 and 2015 BURP surveys, indicating that sedimentation is likely impacting cold water aquatic life and salmonid spawning.
TEMPERATURE	6/20/17 (RB, JW): A temperature logger deployed 4/11/2014 to 9/15/2014 indicated temperature exceeded criteria for both cold water aquatic life and salmonid spawning (Table 40, 2016 Camas Subbasin 5 year review)

ID17040220SK012_03 Soldier Creek - source to and including Wardrop Creek 6.52 Miles

TEMPERATURE	1/9/2018 (RB, SW, AS): 2014 temperature data show exceedances for both cold water aquatic life and salmonid spawning, not meeting criteria (Table 88, 2016 Camas Subbasin Review).

ID17040220SK023L_0L Mormon Reservoir 1583.81 Acres

MERCURY	2/22/2010 (NED) - A mercury level of 0.33 mg/kg, which exceeds the human health criterion of 0.3 mg/kg, was reported from the fish tissue samples collected in April 2007.

17040221 Little Wood

ID17040221SK009_03 West Fork Fish Creek - source to Fish Creek Reservoir 3.33 Miles

CAUSE UNKNOWN	Nutrients Suspected Impairment; Low DO due to suspected Organic Enrichment.
FECAL COLIFORM	
SEDIMENTATION/SILTATION	

ID17040221SK015_04 South Fork Muldoon Creek - Friedman Creek to mouth 3.17 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040221SK016_02 South Fork Muldoon Creek - source to Friedman Creek 21.83 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

ID17040221SK020_02A Cold Spring Creek 16.78 Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

Upper Snake

ID17040221SK023_03	Silver Creek - source to mouth	30.86	Miles

COMBINED BIOTA/HABITAT BIOASSESSMENTS

Bioaccumulation trends of arsenic and antimony in a freshwater ecosystem affected by mine drainage

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Research Paper

Bioaccumulation trends of arsenic and antimony in a freshwater ecosystem affected by mine drainage

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Environmental context. The food web behaviours of As and Sb are poorly understood. We compare As and Sb bioaccumulation in a contaminated freshwater ecosystem. Metalloid accumulation decreased with increasing trophic level. Bioprecipitated minerals in microbial mats represent a direct route of uptake (by ingestion) of metalloids to tadpoles, which contained the highest concentrations ever reported. We demonstrate food web bioaccumulation, but not biomagification, of As and Sb. We also report an unexpectedly high tolerance of tadpoles to metalloid toxicity.

Abstract. We compared As and Sb bioaccumulation and biomagnification when these metalloids co-occurred at varying environmental concentrations in a stream and wetlands near a contaminated mine site in Idaho (USA). We measured As and Sb concentrations in water and substrate samples, and in tissues of organisms representing several trophic levels. Bioaccumulation of both As and Sb was observed in stream organisms with the following trend of bio-diminution with increasing trophic level: primary producers $>$ tadpoles $>$ macroinvertebrates $>$ trout. We also note reductions in metalloid concentrations in one of two stream remediation reaches engineered within the past 17 years to ameliorate metalloid contamination in the stream. Several wetlands contained thick microbial mats and were highly populated with boreal toad tadpoles that fed on them. The mats were extremely contaminated (up to 76 564 mg kg^{-1} As and 675 mg kg^{-1} Sb) with amorphous As- and Sb-bearing minerals that we interpret as biogenic precipitates from geomicrobiological As- and Sb-cycling. Ingested mat material provided a direct source of metalloids to tadpoles, and concentrations of 3867 mg kg^{-1} (As) and 375 mg kg^{-1} (Sb) reported here represent the highest whole body As and Sb levels ever reported in living tadpoles. The bulk of tadpole metalloid burden remained in the gut despite attempts to purge the tadpoles prior to analysis. This study adds to a number of recent investigations reporting bioaccumulation, but not biomagnification, of As and Sb in food webs. Moreover, our results suggest that tadpoles, in particular, may be more resistant to metalloid contamination than previously assumed.

Additional keyword: tadpoles.

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Introduction

Mining and smelting are major sources of trace metal contamination in freshwater systems. The toxic metalloids arsenic and antimony, either individually or in combination, have caused adverse environmental effects in the vicinity of contaminated mines around the world.[1–8] Arsenic is a ubiquitous poison and environmental contaminant and Sb, a toxic element of emerging environmental concern, is increasingly mined for a variety of industrial applications.[9] Both elements are classified as pollutants of priority interest by the U.S. Environmental Protection Agency (EPA), which sets the maximum contaminant level (MCL) for As and Sb in drinking water at $<$10 and $<$6 μg L^{-1} respectively.[10] The two metalloids occur in the same group of the periodic table and they exhibit similar, but not necessarily identical, geochemical and toxicological properties that vary with chemical form and oxidation state. In natural waters, these metalloids are present primarily as the pentavalent oxyanions arsenate (As^{V}) and antimonate (Sb^{V}) in oxygenated settings, or as trivalent arsenite (As^{III}) and antimonite (Sb^{III}) under anoxic conditions.[9,11] Arsenic and Sb are chalcophilic elements that frequently co-occur in sulfidic mineral phases, such as arsenopyrite (FeAsS) or stibnite (Sb_2S_3), associated with hydrothermal ores.[9,12] The oxidative weathering and dissolution of As- or Sb-bearing sulfide minerals in subaerially exposed mine waste is a common point source for contamination of aquatic ecosystems.

The behaviour of As and Sb in aquatic ecosystems is complex, with the former element being better studied than the latter. Both metalloids can bioaccumulate in freshwater food chains but they are not known to bio-magnify, and in some cases they are reported to undergo bio-diminution with increasing trophic level.[5,6,8,13–15] The primary routes of As and Sb uptake into the food chain are through direct contact of organisms with

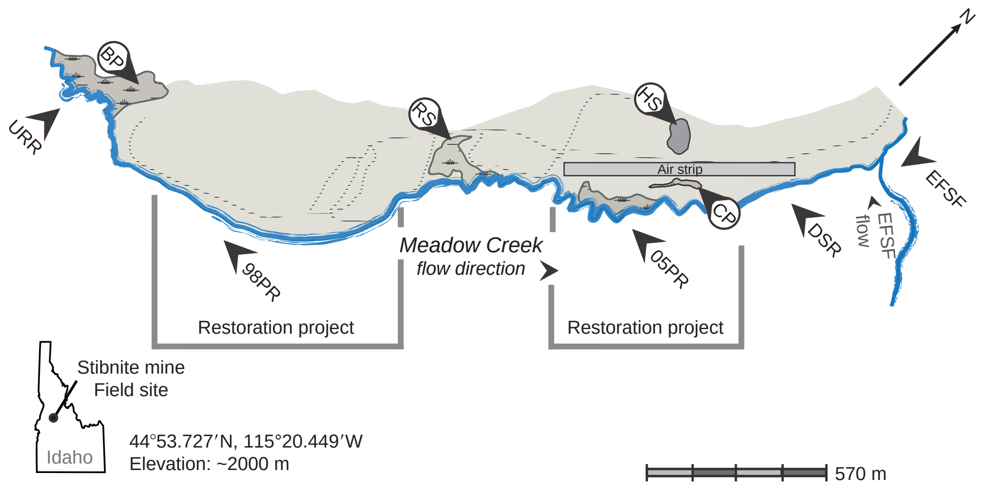

Fig. 1. Map of the Stibnite Mine field site showing the extent of mine tailings (shaded area), restoration projects and wetlands. Dotted lines are service roads. Sampled reaches in this study are labelled with site name abbreviations (see *Field Site* in the *Experimental* section). Sites GH, OP and MPW are not within map range, and are located ~1 km northeast of the tailings.

contaminated water and sediment, or through the consumption of contaminated autotrophs (e.g. biofilm, algae and macrophytes) by invertebrates.[5,6,16] Conflicting reports exist regarding the comparative bioaccumulation of As and Sb. Fu et al.[8] reported higher bioaccumulation of As than Sb from water to algae, water to fish, and terrestrial soil to earthworms around an active Sb mine. Telford[5] also reported greater uptake of As than Sb in aquatic plants in the vicinity of a gold and Sb mine. However, consistently higher bioaccumulation of Sb (compared to As) has been observed in bryophytes, benthic macroinvertebrates, and fish in a river ecosystem affected by a historic realgar mine.[6] In general, there have been few and conflicting studies documenting the environmental behaviour of Sb, or the bioconcentration of As and Sb when both metalloids are present.

The primary objective of this study is to compare As and Sb bioaccumulation and biomagnification in aquatic organisms from several trophic levels when these metalloids co-occur at varying environmental concentrations. Our study site consisted of a freshwater creek (Meadow Creek) and wetlands near the As- and Sb-contaminated Stibnite Mine in central Idaho (Fig. 1). We assessed As and Sb concentrations and redox speciation in surface water, and concentrations in sediment and stream or wetland biota including: riparian tree leaves, biofilm, algae, submergent macrophytes, benthic macroinvertebrates, frog and toad tadpoles and predatory fish (trout). We sought to determine if As and Sb bioaccumulate or biomagnify in stream or wetland food chains, and to draw inferences with respect to pathways of biological As and Sb uptake in the ecosystem. We note particularly elevated metalloid concentrations in frog and toad tadpoles resulting from the ingestion of microbial mats that contain abundant microbiologically precipitated As- and Sb-bearing minerals. In 1998 and 2005 stretches of Meadow Creek adjacent to the mine tailings were engineered in an attempt to ameliorate toxic metalloid concentrations. Therefore, as a secondary objective, we compare our water, sediment and biota concentrations of As and Sb with values reported pre-remediation, to evaluate the effectiveness of these different restoration strategies in reducing the metalloid burden in the stream ecosystem.

Experimental

Field site

The Stibnite Mine (also referred to as the Yellow Pine Mine) is located in Valley County, Idaho within the Payette National Forest (44°53.727′N, 115°20.449′W; Fig. 1). The mine operated intermittently from 1931 to 1995 to extract gold, antimony and tungsten ore. Arsenic, Sb, cyanide (CN^-), and other toxic metals leached from mine tailings into nearby Meadow Creek where it flows through 3.2 km of tailings that were piled in a 0.64-km^2 area near the mine. Between the 1980s and 2000, concentrations of As and CN^- in the creek consistently exceeded the EPA aquatic chronic level and often exceeded the aquatic acute level for stream dwelling organisms.[17] From 1995 to 1999, elevated levels of As, Sb, Hg and CN^- were documented in Meadow Creek water, sediment, fish and nearby wetlands (Table 1).[18] In 2001, the EPA proposed that the mine area be added to the National Priorities List as a potential ‘Superfund’ site. The South Fork of the Salmon River and its tributaries, including Meadow Creek, are designated critical habitat for three species listed under the *US Endangered Species Act*: Snake River chinook salmon (*Oncorhynchus tshawytscha*), Snake River steelhead (*Oncorhynchus mykiss*) and Columbia River bull trout (*Salvelinus confluentus*).

In 1998, the USDA Forest Service (USFS), EPA and responsible mining companies engineered a stretch of Meadow Creek adjacent to the tailings in an attempt to ameliorate toxic metalloid concentrations in the stream. They excavated a 1.4-km-long, straight flowing, low gradient stream channel in Meadow Creek to a depth below the mine tailings, and installed a sand filter between the tailings and the stream. The streamside was then armoured with rock substrate. A second project, completed in 2005, diverted the stream channel around the tailings in a 1.6-km-long reach downstream from the 1998 project. The 2005 reach was constructed with greater attention to natural substrates, meanders and gradients, and included a riparian zone between the stream and mine tailings that was constructed with transplanted soil and tree seedlings. We sampled biotic and abiotic components of five reaches of Meadow Creek near the tailings (Fig. 1): (1) an upstream reference reach (URR) that was not affected by the tailings,

Table 1. Aqueous As and Sb concentration (μg L^{-1}) ± standard deviation and pH levels in surface water from Meadow Creek and wetland sites

n is the number of samples analysed. En-dashes represent no measurement taken. Meadow Creek Sites: an upstream reference reach (URR) that was not affected by the tailings, the 1998 restoration project reach (98PR), the 2005 restoration project reach (05PR), a non-remediated reach downstream of the mine tailings (DSR) and a tributary stream, the East Fork of the South Fork of the Salmon River (EFSF)

Site	Date	*n*	pH	As	Sb
Meadow Creek flow direction ↓					
URR	2011	3	6.8	$<2^{\mathrm{A}}$	3.1 ± 0.03
	2012	2	8.3	$<2^{\mathrm{A}}$	4.0 ± 2.8
98PR	2010	1	8.3	$<2^{\mathrm{A}}$	$<1.4^{\mathrm{A}}$
	2011	4	7.8	7.9 ± 2.0	3.8±0.1
	2012	2	8.6	$<2^{\mathrm{A}}$	$<1.4^{\mathrm{A}}$
05PR	2010	1	9.3	40.4	4.9
	2011	3	7	35.6 ± 0.4	7.9 ± 0.7
	2012	2	8.6	27.9 ± 3.3	6.7 ± 1.7
DSR	2010	1	9.3	41.6	6
	2011	3	6.8	36.4 ± 1.3	9.9 ± 0.4
	2012	2	8.4	28.1 ± 4.2	6.1 ± 0.5
EFSF	2011	3	–	9.3 ± 0.1	3.9 ± 0.4
	2012	1	–	10.3	9.6
Wetland					
Channel pond	2010	1	8.7	147.1	324.5
	2011	3	7.8	138.4 ± 1.0	453.8 ± 16.4
	2012	2	8.2	168.2 ± 10.5	206.8 ± 149.4
Heap Seep	2010	2	10.4	27 373.3 ± 1639.3	1127.9 ± 35.5
	2011	4	8.6	18 788.9 ± 169.2	239.1 ± 5.3
	2012	1	9.4	10 870	1042
Glory Hole	2010	1	8.1	64.9	21.2
	2011	3	6.4	53.7 ± 2.8	21.0 ± 1.3
	2012	2	8.1	70.6 ± 9.0	20.7 ± 2.0
Mine Pit wetland	2010	2	7.7	191.3 ± 7.2	115.5 ± 3.9
	2011	3	6.3	23.8 ± 1.7	68.6 ± 2.4
	2012	2	7.9	104.4 ± 10.4	164.4 ± 23.7
Office Pond	2012	2	7.4	395.7 ± 94.2	28.0 ± 6.5
Red Seep	2012	1	8	1243.1	1034.7
Boulder Pond	2012	2	8.3	21.5 ± 6.8	11.9 ± 0.9

$^{\mathrm{A}}$Below current instrument detection limit (As, <2 μg L^{-1}; Sb, <1.4 μg L^{-1}).

(2) the 1998 restoration project reach (98PR), (3) the 2005 restoration project reach (05PR), (4) a non-remediated reach downstream of the mine tailings (DSR) and (5) a tributary stream, the East Fork of the South Fork of the Salmon River (EFSF).

Low lying areas around the tailings contain ephemeral and permanent ponds, as well as groundwater springs that emerge along the edge of the tailing's piles. We sampled seven of these wetlands (Fig. 1) representing a range of different habitats and communities. We assigned descriptive designations to these locations as follows: (1) Channel Pond (CP), a small, permanent pond between Meadow Creek and the tailings, located in the pre-restoration stream channel of the 05PR reach, (2) Heap Seep (HS), a seasonally flooded, shallow (5–20 cm deep) impoundment that receives direct drainage from the largest tailings heap, (3) the flooded mine pit known locally as the Glory Hole (GH), through which Meadow Creek flows before leaving the mine area, (4) the Mine Pit Wetland (MPW), a marsh immediately downstream of the mine pit, (5) Office Pond (OP) a small permanent pond near the location of the mining company office but outside of the immediate tailings area, (6) Red Seep, (RS) a small spring that emerges from the edge of the tailings and is coloured bright red from precipitated realgar mineral (As_2S_3) and (7) Boulder Pond (BP), a larger pond (1100 m^2) located at the upstream end of the mine tailings piles.

Sample collection

Samples were collected during the summers of 2010 through 2012, except for EFSF, OP, RS and BP samples which were collected in 2012 only. Surface water samples from each location were collected for As and Sb concentration and speciation analysis by filtering through a 0.45-μm nylon syringe filter (Fisher, Co., Hampton, NH, USA) into 5-mL evacuated tubes (Vacutainer, BD Company, Franklin Lakes, NJ, USA) to prevent contact with air during storage.[19] Water samples for As and Sb speciation were preserved by adding 50 μL of 0.125 Methylenediaminetetraacetic acid (EDTA).[20] Water samples were collected approximately 15 cm below the air–surface interface. Sediment samples (0–15 cm below the sediment–water interface) were collected using a garden trowel and sealed in completely filled glass jars. Water and sediment samples were stored on ice in the dark for transportation to the laboratory, where they were stored at 5 °C and analysed within one week of collection. Biological samples included the following primary producers: riparian tree leaves (alder, *Alnus* sp.; and willow, *Salix* sp., the main source of allochthonous primary production in the stream), submergent macrophytes (mosses and algal streamers) and biofilm (a mixture of attached microalgae, bacteria and fine inorganic detrital material referred to as periphyton). Tree leaves and macrophytes were collected in sealable plastic bags. Biofilm was collected by scraping a 3.45-cm^2 area of rock and collecting scraped material and rinse water onto Whatman 0.45-µm glass fiber filter paper (GE Healthcare Bio-Sciences, Pittsburgh, PA). Benthic macroinvertebrates were dislodged from substrates, collected in a Surber sampler (Morris and Lee, Inc., Yulee, FL, USA), and Tricoptera (*Arctopsyche* sp.) and Ephemeroptera (*Drunella* sp.) larvae (primarily filterer and shredder–gatherer functional feeding groups respectively) were placed in sealable plastic bags. Predatory stream-dwelling fish (rainbow trout, *Oncorhynchus mykiss*), stream-dwelling Rocky Mountain tailed frog tadpoles (*Ascaphus montanus*; primarily an algavore), pond-dwelling toad tadpoles (Boreal toad, *Anaxyrus boreas*) and Columbia spotted frog tadpoles (*Rana luteiventris*) were collected using nets. All biological samples were transported on ice to the laboratory and then frozen until analysis. Live tadpoles collected in 2012 were held in source water (2 L) for 24 h in the laboratory after collection, in an attempt to purge tadpole gut content prior to freezing and subsequent analysis.[21]

Sample preparation and analysis

All acids and reagents used were trace metal grade. Water samples for total As and Sb determination were acidified (2 %) using nitric acid (HNO_3) prior to measurement by inductively coupled plasma–mass spectrometry (ICP-MS) or inductively coupled plasma–optical emission spectroscopy (ICP-OES). Instruments were calibrated daily with National Institute of Standards and Technology (NIST) traceable standards. A second-source NIST-traceable standard was analysed after every tenth sample to verify accuracy within 10 % standard error. A deionised water blank was also run after every tenth sample to monitor baseline drift. Water samples from the site that were spiked with known concentrations of As and Sb were used to verify that there was no interference to the detection of these elements from the sample matrix. Surface water samples for determination of As and Sb redox speciation were measured by high performance liquid chromatography with inductively coupled plasma–mass spectroscopy (HPLC-ICP-MS).[7,20] Sediment samples (~10 g wet weight) for the determination of total As and Sb concentration were oven dried (65 °C for 72 h) and ground using a mortar and pestle. Dried and ground sediment (0.5 g) was digested using microwave assisted digestion with a 3 : 1 (v/v) mixture of concentrated HNO_3 and HCl according to US EPA Method 3052.[22] Digestions were filtered and diluted prior to As and Sb analysis by ICP-OES.

Biological samples were thawed and rinsed using deionised water to remove residual sediment and source water. Rinse water was dried from the exterior of specimens using lint-free tissue paper and initial (wet) sample weight was recorded. For riparian plants, whole leaves were analysed. For submergent macrophytes we analysed roots and shoots together. Biofilm samples were processed and digested on the filters used for sample collection. For macroinvertebrates, tadpoles and fish, whole body samples were analysed. To examine tadpole gut metalloid concentrations, samples from CP, HS and OP ponds were thawed, rinsed and dissected under a stereoscope for the removal, digestion and analysis of the intestinal tract (extending from bottom of the esophagus to the anus). Biological samples were freeze-dried using a *Labconco FreeZone* (Labconco Co., Kansas City, MO, USA) 4.5-L freeze drying system for 48 h and reweighed to obtain the sample dry weight. Samples were acid digested by refluxing with a mixture of concentrated HNO_3 and HCl on a hotplate at 50 °C for up to five days until samples were completely dissolved.[23] The acid was then evaporated at 70 °C, the residue was reconstituted in 10 mL of 2 % HNO_3 and filtered (0.45 µm) prior to As and Sb analysis. Elemental values were normalised to sample dry weight. The biological concentration factor (BCF) was calculated for all biological samples as the average metalloid concentration in the organism divided by the average concentration in the water.[6]

Identification of minerals in microbial mats and tadpole intestinal tracts was conducted by electron microprobe (EMP) analysis. Prior to analysis, samples were freeze-dried for 48 h and homogenised using a mortar and pestle. Microprobe samples were mounted on polished (6 µm) graphite rods in a sample–ethanol mixture and carbon coated prior to analysis.

Analytical

Elemental analyses in 2010 were conducted using a Perkin–Elmer ELAN II ICP-MS (Perkin–Elmer, Inc, Waltham, MA, USA). Analyses in 2011 and 2012 utilised a Perkin–Elmer ELAN 6000 ICP-MS or a Varian VISTA-MPX ICP-OES (Agilent Technologies Inc., Santa Clara, CA). Arsenic and Sb speciation were measured in water by HPLC-ICP-MS using a Perkin–Elmer Series 200 HPLC interfaced with a Perkin–Elmer ELAN II ICP-MS with chromatography conditions described in Kulp et al.[19] Amorphous mineral identification was conducted using a JOEL 8900 Superprobe electron microprobe (JEOL Co., Freising, Germany).

Results

Stream results

Surface water and sediment

Average As concentrations in stream water ranged from <2 to 41.6 µg L^{-1}, whereas Sb concentrations occurred in the range of <1.4 to 9.9 µg L^{-1} (Table 1). Average background water concentrations (URR) were below instrument detection limits for As during 2011 and 2012, with corresponding Sb concentrations of 3.1–4.0 µg L^{-1}. Downstream from the reference site, we found progressive increases in As and Sb concentrations (Fig. 2). Both elements were slightly elevated in the 98PR reach in 2011compared to the URR, but remained below the drinking water MCL (<10 and <6 µg L^{-1} respectively) and were below detection limits in other years. However, further downstream in the 05PR and DSR reaches, we found elevated As (27.9–41.6) and Sb concentrations (4.9–9.9 µg L^{-1}). Compared to historic (pre-1999) values, dissolved As and Sb concentrations in the 98PR reach were lower in all three years of our study (Table 1 and Fig. 2a). Further downstream (i.e., 05PR and DSR reaches) there was no significant post-remediation reduction in dissolved As, but Sb concentrations were reduced by as much as 71 % compared to historic data. Measurements of dissolved As and Sb redox speciation in surface water samples collected in 2010 show that the pentavalent ions (As^{V} and Sb^{V}) were the dominant valence states in solution, and in most stream reaches they were the only forms of the metalloids present (Table 2). However, in the 05PS and DS reaches, As^{III} accounted for 30–37 % of the total measured aqueous As. Antimonate (Sb^{V}) was the predominant aqueous Sb species, with Sb^{III} detected only in minor amounts (5.0 %) at 05PS.

Similarly to dissolved As, sedimentary As concentrations increased in a downstream direction through the tailings area (Table 3). Sediment Sb concentrations were not elevated above the range typically reported for uncontaminated sediments.[9]

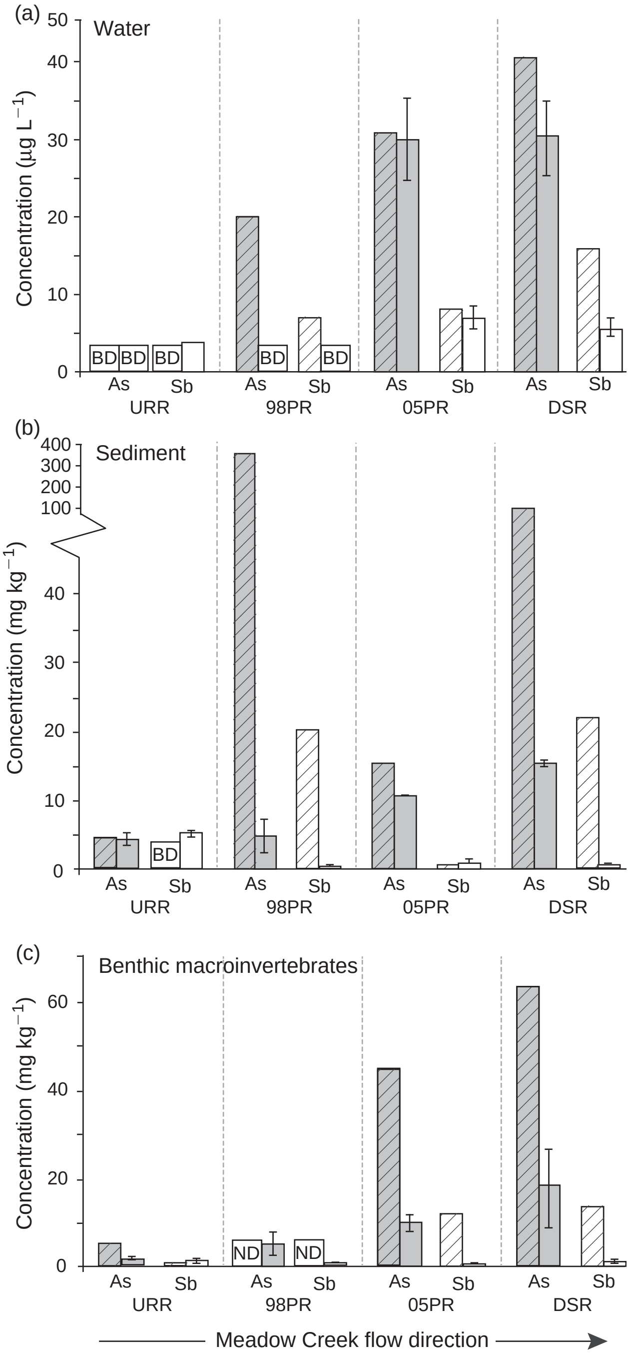

Fig. 2. A comparison of As and Sb concentrations in water (a), sediment (b) and benthic macroinvertebrates (c). Samples collected in 2012 (solid bars) and between 1996 and 1999[18] (patterned bars). BD, below detection; ND, not determined. Error bars represent standard deviation.

Sedimentary As and Sb concentrations were highly variable among all reaches in the pre-remediation data set, possibly reflecting localised inputs of tailings into the creek channel prior to its diversion (Table 3). The 98PR and DSR reaches had notably lower concentrations of sediment-associated As and Sb in 2012 compared to those measured pre-remediation (Fig. 2b). Sediment metalloid concentrations in the 05PR reach were low pre-remediation (15 and 1.0 mg kg^{-1} for As and Sb respectively) and exhibited little change between pre-1999 and 2012 measurements.

Stream primary producers

Arsenic concentrations in submerged macrophytes (i.e. vascular submergent plants, mosses and algae) and biofilm averaged 6.6 ± 0.6 mg kg^{-1} (dry weight, DW) in the URR section and were between 3.1 ± 1.8 and 46.8 ± 11.6 mg kg^{-1} (mean ± standard deviation) in the downstream reaches (Table 4). The Sb concentration of all vascular plants was <4 mg kg^{-1}. Average As concentrations were 19.9 ± 6.2 mg kg^{-1} in biofilm and 5.8 mg kg^{-1} in algal streamers from the URR. Algae and biofilm exhibited a wide range in downstream reaches with the highest concentrations observed in the 05PR reach (Table 4).

Both metalloids were below detection in alder and willow leaves from the URR, but were elevated in leaves collected from downstream reaches, as well as the EFSF tributary stream (Table 4). Concentrations of both As and Sb were less than 6 mg kg^{-1} in all leaves except for willow leaves from the 05PR riparian zone, which contained an average As concentration of 29.3 ± 2.8 mg kg^{-1}. Metalloid concentrations were higher in willow compared to alder leaves, with the exception of Sb in the 98PR reach.

Stream macroinvertebrates

Benthic macroinvertebrates contained As levels <2.3 mg kg^{-1} and Sb levels <1.5 mg kg^{-1} in the URR and the EFSF (Table 5). Macroinvertebrates from sites adjacent to the tailings area (98PR, 05PR and DSR) had elevated levels of both metalloids, with DSR macroinvertebrates exhibiting the greatest concentrations (up to 66.4 mg kg^{-1} for As and 5.3 mg kg^{-1} for Sb). No difference in As or Sb uptake was observed between the two insect genera. In stream reaches where pre-remediation data were available, As and Sb concentrations in benthic macroinvertebrates were reduced compared to the historic data (Fig. 2c). The insect genera sampled in the earlier dataset are not known.

Stream tadpoles and trout

Arsenic concentrations in juvenile trout were not elevated in the downstream reaches of Meadow Creek relative to the URR reference site (Table 5). Antimony was below detection in fish from all reaches.

Tailed frog tadpoles, which primarily graze on periphyton or biofilm, contained much higher metalloid concentrations than macroinvertebrates or trout (Table 5). Tadpoles in the URR had an average whole-body As concentration of 6.7 ± 0.30 mg kg^{-1} and an average Sb concentration of 0.16 ± 0.003 mg kg^{-1} in 2011 samples. Metalloid concentrations in the 2012 tadpoles were all below detection in the URR. The highest metalloid concentrations in tailed frog tadpoles (637.4 ± 173.2) were measured at the 98PR site in 2011. Whole body As concentrations in tadpoles were elevated (>80.8 ± 29.5 mg kg^{-1}) in all reaches adjacent to the mine tailings (98PR, 05PR and DSR) compared to URR concentrations. Antimony concentrations in tadpoles from the downstream reaches measured up to 7.7 ± 3.6 mg kg^{-1} in 2011 but were notably lower in 2012 (Table 5).

Stream bioaccumulation trends

We selected the 05PR site in 2012 to illustrate bioaccumulation trends for As and Sb in the contaminated reaches of Meadow Creek. The concentration of both metalloids generally decreased from biofilm, to tadpoles, to macroinvertebrates, to trout, although tadpoles and macroinvertebrates had similar Sb concentrations (Fig. 3a). The BCF for each organism is

Table 2. Total As and Sb concentration and redox speciation (µg L^{-1} (%)) in surface water from Meadow Creek and wetland sites in 2010 from one analysed sample per site

Values in parenthesis report the percent recovery of total As or Sb represented by each oxidation state. See *Field Site* in the *Experimental* section for site abbreviations. bd, below instrument detection limit (As, <1 µg L^{-1}; Sb, <1 µg L^{-1})

Site	Arsenic (µg L^{-1} (%))			Antimony (µg L^{-1} (%))		
	Total	As^{V}	As^{III}	Total	Sb^{V}	Sb^{III}
Meadow Creek flow direction ↓						
URR	1.84	1.8 (100)	bd	0.45	0.5 (100)	bd
98PR	1.64	1.6 (100)	bd	0.65	0.7 (100)	bd
05PR	30.2	19.1 (63.35)	11.1 (36.7)	7.96	7.6 (95.5)	0.4 (5.0)
DSR	31.3	22.1 (70.5)	9.3 (29.5)	9.55	9.6 (100)	bd
Wetlands						
CP	136.96	128.5 (93.8)	5.1 (3.7)	436.1	435.5 (99.9)	0.57 (0.1)
HS	22 730.78	21 902.2 (96.4)	350.5 (1.5)	1508.89	1503.4 (99.6)	5.54 (0.4)

Table 3. Total sedimentary mean As and Sb concentrations (mg kg^{-1}) ± standard deviation from Meadow Creek and wetland sites in 2012

URR, reference site, upstream; *n* is the number of samples analysed. See *Field Site* in the *Experimental* section for site abbreviations

Site	*n*	Arsenic	Antimony
URR	2	4.4 ± 0.8	0.6 ± 0.2
Meadow Creek			
98PR	2	4.9 ± 2.4	0.4 ± 0.3
05PR	2	11.5 ± 0.004	1.4 ± 0.3
DSR	2	15.6 ± 0.4	0.8 ± 0.01
EFSF	2	19.9 ± 4.4	0.8 ± 0.2
Wetland			
CP	2	292.6 ± 21.6	203.5 ± 42.6
HS	2	1388 ± 192.5	43.1 ± 17.1
OP	2	149.6 ± 41.9	10.4 ± 0.5
BP	1	1860	45.2
GH	1	4728	4.1
MPW	1	15 192	20.5

presented in Fig. 3b. Bioaccumulation of As is 10–100 times greater than bioaccumulation of Sb in biofilm, tadpoles and macroinvertebrates. Antimony was not detectable in trout from this stream.

Wetland results

Surface water and sediment

Several wetlands in this study were characterised by aqueous As and Sb concentrations up to three orders of magnitude greater than in Meadow Creek (Table 1). The HS site accounts for the highest of these concentrations, which ranged from 10 870 to 27 373 µg L^{-1} for As and 239.1 to 1127.9 µg L^{-1} for Sb over the three study years. Aqueous metalloid concentrations were also highly elevated at the RS and OP sites (Table 1). The CP location was unique among all sites in that it had dissolved Sb concentrations that were consistently higher than As during all three years. As^{V} and Sb^{V} were the predominant aqueous redox states of the two metalloids in the wetland surface waters, accounting for >96.3 % of dissolved As and >99 % of dissolved Sb, with the remaining balance present as As^{III} or Sb^{III} (Table 2).

Sedimentary As and Sb concentrations in wetlands were two to three orders of magnitude higher than in stream sediments (Table 3). The greatest sedimentary concentrations for As occurred at MPW, whereas the highest sedimentary Sb concentrations were observed at CP. Consistent with the dissolved aqueous concentrations reported above, the CP location was unique in having more Sb than As in sediments.

Wetland primary producers

Due to differences in sample availability, submergent macrophytes were analysed from the CP and OP ponds, whereas photosynthetic microbial mats were analysed from the CP, RS and HS sites. The results are reported in Table 6. Pond plants at CP averaged 171.6 ±11.1 mg kg^{-1} As and 24.9 ± 4.9 mg kg^{-1} total Sb (DW), whereas As and Sb concentrations in CP algae were higher at 1735 ± 129 and 47.3 ± 1.7 mg kg^{-1} respectively. Two plants collected from OP showed a high variability in As concentration (608.4 and 1244 mg kg^{-1}) but contained similar total Sb concentrations (73.0 and 83.7 mg kg^{-1}). The highest total As and Sb concentrations measured in this study occurred in microbial mats at the RS and HS locations (Table 6). The RS mat contained 76 564 mg kg^{-1} total As and 674.9 mg kg^{-1} total Sb, whereas the HS mat concentrations were 3366 ± 200 mg kg^{-1} total As and 30.2 ± 5.9 mg kg^{-1} total Sb. At the RS site, red, amorphous realgar (As_4S_4) and other As- and Sb-sulfide mineral phases are actively precipitating in microbial mats and sediments that surround the spring. Microbial mats containing flocculated As- and Sb-bearing minerals were also observed at the HS location. The precipitation of these minerals appears to be the primary mechanism of As and Sb enrichment in the sediments and mats from the pond and spring sites. Electron microprobe analyses showed that high concentrations of As in the microbial mat samples were associated with amorphous, flocculated As-sulfide minerals in the mat material (Table 7), whereas Sb was associated mainly with amorphous Fe-oxides.

Wetland tadpoles

Boreal toad tadpoles, primarily sediment grazers, were abundant in the wetlands and had extremely elevated metalloid concentrations (Table 6). Tadpoles in the HS and CP ponds exhibited whole body As and Sb concentrations higher than any previously reported for tadpoles. Tadpoles at HS displayed whole-body As concentrations ranging from 1532 ± 435 to 3043 ± 523 mg kg^{-1} (DW) and average Sb concentrations between 33.5 ± 5.3 and 75.6 ± 56.8 mg kg^{-1}. Arsenic concentrations in CP tadpoles were 786.0 ± 161.8 and 1124 ± 488.6 mg kg^{-1} in 2011 and 2012 respectively and were particularly notable for their elevated Sb concentrations of >200 mg kg^{-1} (Table 6). In 2012, tadpoles from the OP and

Table 4. Mean As and Sb concentrations ± standard deviation and range in primary producer samples (dry weight) from Meadow Creek sites
Site abbreviations: see *Field Site* in the *Experimental* section. *n* refers to the number of samples; bd, below instrument detection limit

Organism	Site	*n*	Collection years	As (mg kg^{-1})		Sb (mg kg^{-1})	
				Mean	Range	Mean	Range
Alder leaves (*Alnus* sp.)	URR	3	2012	bd		bd	
	98PR	3	2012	2.5 ± 0.4	2.0–2.7	0.9 ± 0.2	0.7–1.1
	05PR	3	2012	5.7 ± 1.3	4.9–7.2	3.1 ± 1.2	2.0–4.2
	EFSF	2	2012	2.4 ± 0.003	2.35–2.36	2.2 ± 0.2	2.0–2.3
Willow leaves (*Salix* sp.)	URR	3	2012	bd		bd	
	98PR	3	2012	3.0 ± 0.5	2.4–3.4	bd	
	05PR	2	2012	29.3 ± 2.8	27.3–31.3	5.3 ± 0.8	4.7–5.9
	EFSF	2	2012	4.4 ± 0.9	3.7–5.1	3.3 ± 0.08	3.3–3.4
Vascular submergent plants	98PR	2	2011	3.1 ± 1.8	1.8–4.3	0.33 ± 0.18	0.2–0.5
	05PR	2	2011	46.8 ± 11.6	38.5–55.1	3.8 ± 0.7	3.3–4.2
	EFSF	1	2011	43.1		1.7	
	URR	2	2012	6.6 ± 0.6	6.1–7.0	bd	
Algae	DSR	2	2011	120.0 ± 31.0	98.1–141.8	11.2 ± 1.4	10.2–12.2
	URR	1	2012	5.8		bd	
	98PR	2	2012	20.0 ± 3.1	17.7–22.1	bd	
	05PR	1	2012	30.1		bd	
	EFSF	1	2012	18.8		bd	
Biofilm	URR	3	2012	19.9 ± 6.7	13.4–26.9	2.1 ± 0.2	1.9–2.3
	98PR	3	2012	32.7 ± 8.2	26.5–42.0	1.6 ± 0.6	1.2–2.2
	05PR	2	2012	323.3 ± 56.2	283.5–363.0	3.5 ± 2.5	1.7–5.3
	EFSF	2	2012	38.7 ± 10.9	31.0–46.4	2.3 ± 0.5	1.9–2.7

Table 5. Mean As and Sb concentrations ± standard deviation and range in animal samples (dry weight) from Meadow Creek sites
Site abbreviations: see *Field Site* in the *Experimental* section. *n* refers to the number of samples; bd, below instrument detection limit

Organism	Site	*n*	Collection years	As (mg kg^{-1})		Sb (mg kg^{-1})	
				Mean	Range	Mean	Range
Benthic Macroinvertebrates	URR	5	2010	1.3 ± 0.3	0.97–1.9	0.16 ± 0.11	0.05–0.30
	05PR	6	2010	27.1 ± 16.2	20.9–53.1	0.55 ± 0.30	0.21–1.1
	DSR	6	2010	30.5 ± 21.9	8.2–66.4	1.5 ± 2.0	0.25–5.3
	EFSF	6	2010	2.1 ± 0.90	1.2–3.5	0.14 ± 0.09	0.02–0.16
	URR	5	2011	1.2 ± 0.14	0.96–1.3	0.09 ± 0.04	0.04–0.14
	98PR	5	2011	11.0 ± 6.2	2.1–12.6	1.0 ± 0.34	0.71–1.5
	05PR	5	2011	8.8 ± 6.3	3.8–19.3	1.2 ± 0.9	0.62–2.7
	DSR	5	2011	13.6 ± 8.7	6.9–27.6	3.2 ± 1.1	1.7–4.3
	EFSF	5	2011	2.4 ± 1.2	1.1–4.3	0.8 ± 0.7	0.24–1.9
	URR	2	2012	2.3 ± 0.2	0.78–1.0	0.91 ± 0.45	0.12–0.75
	98PR	3	2012	6.7 ± 3.9	3.1–10.9	0.23 ± 0.05	0.19–0.28
	05PR	5	2012	10.0 ± 1.8	7.3–11.2	0.25 ± 0.12	0.13–0.44
	DSR	5	2012	19.2 ± 8.2	7.5–26.8	0.52 ± 0.21	0.34–0.82
	EFSF	2	2012	5.2 ± 0.25	5.0–5.4	0.46 ± 0.10	0.39–0.53
Trout	URR	3	2012	3.2 ± 1.2	2.3–4.6	bd	
	98PR	1	2012	bd		bd	
	05PR	2	2012	3.9 ± 0.4	3.6–4.2	bd	
	DSR	3	2012	4.2 ± 0.9	3.2–5.0	bd	
Tadpoles (*Ascaphus montanus*)	URR	2	2011	6.7 ± 0.30	6.5–6.9	0.16 ±0.0	0.16–0.16
	98PR	2	2011	637.4 ± 173.2	514.9–759.9	7.7 ± 3.6	5.2–10.3
	DSR	2	2011	142.0 ± 74.7	89.1–198.8	7.0 ± 3.5	4.5–9.5
	EFSF	2	2011	46.9 ± 13.7	37.2–56.6	0.38 ±0.0	0.37–0.38
	URR	3	2012	bd		bd	
	05PR	3	2012	80.8 ± 29.5	59.9–101.6	0.32 ± 0.45	0–0.6
	DSR	3	2012	90.3 ± 36.7	51.2–124.2	0.31 ± 0.53	0–0.91
	EFSF	3	2012	bd		bd	

BP ponds were also measured and contained highly elevated As (>390 mg kg^{-1}) and Sb (>20 mg kg^{-1}) concentrations.

Dissection of seep and spring pond tadpoles revealed that the intestinal tracts were filled and affected with sediment and mat material, despite our attempts to purge the animals prior to analysis (Fig. 4). The majority of the concentration for both metalloids was located in the intestinal tracts of the tadpoles, which accounted for >89.8 % of whole body As and >83.8 % of whole body Sb (data not shown). Electron microprobe analysis of HS gut material showed that the high gut As concentrations were associated with amorphous As–S–Fe minerals, whereas the Sb was associated primarily with amorphous Fe-oxides (Table 7). Table 7 reports the weight percent (wt-%) of Sb, As, S and Fe in the gut material normalised to Si, Al, K, Mg and Ca, which are associated with the clay mineral matrix of the HS sediment. The same As- and Sb-bearing amorphous mineral phases identified in the gut were also present in the HS mat samples (Table 7; Fig. 4).

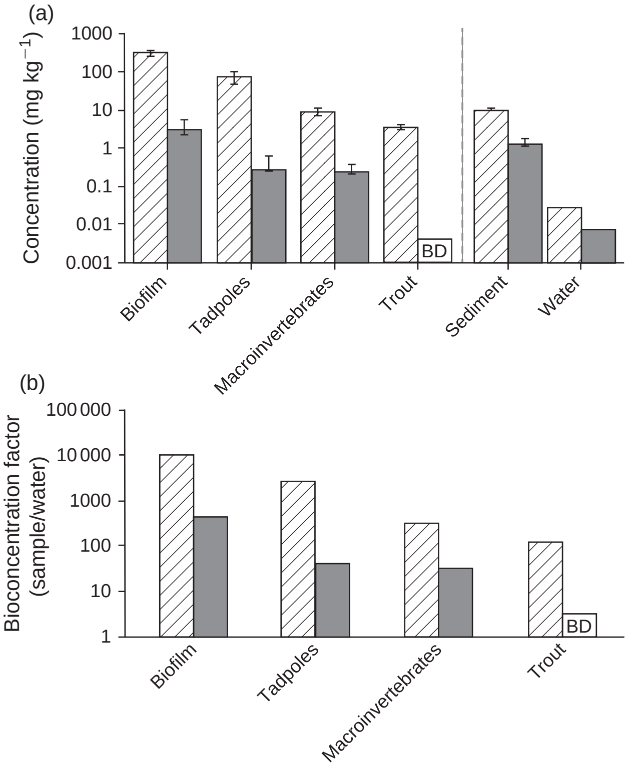

Fig. 3. A comparison of mean concentrations of As (patterned bars) and Sb (solid bars) in biofilm, tadpoles, macroinvertebrates, trout, sediment and water in the 2005 restoration project reach (05PR) reach of Meadow Creek during 2012 (a), and the bioconcentration factors of the two metalloids in each genera relative to water concentrations (b). Error bars represent standard deviation.

Discussion

Bioaccumulation of As and Sb in the stream ecosystem

The tailings piles at Stibnite Mine continue to be a source of high As and Sb concentrations in the surrounding watershed. Five to seven years post-remediation, dissolved As concentrations were still significantly elevated and exceed their respective MCL concentrations for human consumption in reaches downstream from the tailings and in the area of the flooded mine pit. Nonetheless, dissolved As concentrations in all stream reaches were below the EPA aquatic life standard (150 µg L^{-1}). Antimony concentrations were likewise below the proposed aquatic life standard of 30 µg L^{-1}. Despite meeting these aquatic life standards, metalloid concentrations in organisms downstream of the mine tailings were considerably elevated compared to upstream organisms. These findings demonstrate that As and Sb can bioaccumulate to significant levels in the food web even when aqueous concentrations are within levels deemed acceptable for wildlife.

Arsenic was present in water, sediment and biota with the following decreasing pattern of accumulation: primary producers > tadpoles > sediment > macroinvertebrates > trout > water. This is in agreement with previous reports that As is bioavailable at all trophic levels but does not bio-magnify in the food web.[5,8,14] Antimony was present at much lower concentrations than As, making the pattern of Sb accumulation in the stream difficult to discern. However, Sb concentrations were notably higher in biofilm and grazing tadpoles compared to water, sediment and other organisms. The BCF of organisms to water was considerably higher for As than Sb in all organisms. Arsenic is bioaccumulated to a greater extent than Sb into the photosynthetic base of the food web. These results are in agreement with previous reports of higher bioaccumulation of As than Sb for transfer from water to algae[8] and water to plants.[5]

Arsenic and Sb in benthic macroinvertebrates generally followed water concentrations with the 05PR and DSR reaches

Table 6. Mean As and Sb concentrations ± standard deviation and range in biological samples (dry weight) collected from wetland sites
Field Site in Experimental. *n* refers to the number of samples; bd, below instrument detection limit. For Algae–algal mat data, algae were used as the sample for CP and algal mats were used as the sample for HS and RS

Organism	Site	*n*	Collection dates	As (mg kg^{-1})		Sb (mg kg^{-1})	
				Mean	Range	Mean	Range
Submergent pond plants	CP	2	2011	171.6 ± 11.1		24.9 ± 4.9	
	OP	2	2012	926.6 ± 450.0	608.4–1244	78.4 ± 7.6	73.0–83.7
Algae–algal mat	CP	2	2012	1735 ± 129.8	1643–1827	47.3 ± 1.7	46.1–48.5
	HS	4	2012	3366 ± 200.4	3087–3558	30.2 ± 5.9	25.7–38.9
	RS	1	2012	76 564		674.9	
Tadpole whole body (*Anaxyrus boreas*)	HS	5	2010	2477 ± 378.0	2015–2777	54.8 ± 36.2	11.8–100.7
	CP	7	2011	786.0 ± 161.8	615.3–1113	283.6 ± 63.4	211.2–377.4
	HS	6	2011	1531 ± 435.6	906.2–2061	33.5 ± 5.3	25.2–41.1
	CP	5	2012	1124 ± 488.6	529.2–1815	200.4 ± 124.3	0–294.0
	HS	6	2012	3043 ± 523.7	2601–3866	75.6 ± 56.8	0–145.5
	OP	6	2012	396.3 ± 205.6	bd–417.0	21.4 ± 12.4	bd–28.6
	BP[A]	3	2012	732.3 ± 100.9	615.8–793.9	23.5 ± 3.1	21.6–27.1

[A] BP tadpoles are *Rana luteiventris*.

exhibiting the highest values, but trends were less pronounced than for the primary producers (Fig. 2). Antimony accumulation in the macroinvertebrates was quite low (average Sb concentration was <3.2 mg kg^{-1}), and the BCF of As in these organisms was higher than that of Sb by up to two orders of magnitude (Fig. 3b). The benthic macroinvertebrate larvae examined were mayflies (*Drunella* spp.), representing the shredder–gatherer functional feeding group, and filter feeding caddisflies (*Arctophyche* spp.). These feeding types are reported to accumulate higher concentrations of metals than omnivores or predators.[5,6] Likely food sources for these genera are submergent plants, algae, biofilm and riparian leaves that fall into the stream. We measured a wide range in metalloid concentrations within both genera for individuals collected from the same reach, but average concentrations of the two genera were similar in reaches where both were present. The macroinvertebrate concentrations reported in Table 4 represent data from pooled mayfly and caddisfly samples, and therefore provide an estimate of the As and Sb burden in a large proportion of the macroinvertebrate community that is available as prey for fish.

Trout did not exhibit biomagnification of As or Sb, nor did they display significantly elevated metalloid concentrations downstream compared to our reference reach (URR). However, whole body As concentrations in Meadow Creek trout ranged from 2.3 to 5.0 mg kg^{-1} (DW), slightly higher than values in fish reported from several other studies. For example, *Salmo trutta* from a mining affected river in France (Presa River) accumulated 1.92 mg kg^{-1} (DW) of As in whole body samples.[6] Telford et al.[5] reported flat-headed gudgeon (*Philypnodon grandiceps*) from a contaminated mining creek in Australia (As water concentration 46 ± 2 µg L^{-1}) to have 1.6 ± 0.4 mg kg^{-1} (DW), and in a moderately As-contaminated mining area in China, Fu et al.[8] reported As values in fish of 0.266 ± 0.109 mg kg^{-1}. However, fish muscle (*Channa striata*) from a highly contaminated pond in Thailand was reported to have As concentrations up to 22.2 mg kg^{-1}.[24] Trout did not display any discernable trends of As bioaccumulation as a function of water concentrations, possibly because they move between stream reaches.

Antimony bioaccumulation data for freshwater fish are limited. Telford et al.[5] reported that fish in their study had an average Sb value of 0.3 ± 0.3 mg kg^{-1}. The Presa River *S. trutta* samples had an average maximum Sb concentration of 0.45 ± 0.17 mg kg^{-1}.[6] In our study, trout Sb concentrations were all below detection (Table 5). We note that the fish sampled in our study were young (snout–fork length <5 cm), which may have precluded metalloid accumulation. Consequently, our values may underestimate tissue metalloid concentrations in older individuals if concentrations increase with age.

Studies on metal concentrations in tadpoles, and particularly on As and Sb concentrations, are also limited. Burger and Snodgrass[21] reported bullfrog tadpoles (*Rana catesbeiana*) from a contaminated Savannah River site (South Carolina, USA) to have average As concentrations of 3.1 ± 0.202 mg kg^{-1} (DW). Clark et al.[25] measured cricket frogs (*Acris crepitans*) with average As concentrations of 51.3 mg kg^{-1} (DW) in an As-contaminated lake. Telford et al.[5] measured As and Sb concentrations from two unidentified tadpole (*Anuran*) samples showing average concentrations of 62 ± 2 and 174 ± 10 mg kg^{-1} (DW) respectively. Arsenic and Sb concentrations in tailed frog tadpoles from the downstream sites were elevated compared to the URR, and this species had the highest metalloid concentrations in the stream food chain after the primary producers. Arsenic concentrations in tadpoles from the downstream reaches were consistently higher than those reported in previous studies, with notably high concentrations

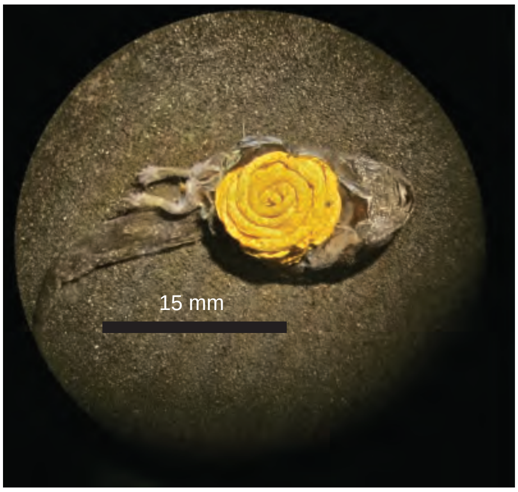

Fig. 4. *Anaxyrus boreas* tadpole under 0.7× magnification displaying ventral body cavity and affected gut containing microbial mat, sediment and flocculated As- and Sb-bearing mineral precipitates.

Table 7. Electron microprobe quantitative analysis (wt-%) from Heap Seep site microbial mat material and *Anaxyrus* tadpole intestinal tract (gut) material

Analyses are normalised to remove Si, Al, K, Mg and Ca associated with the silicate-sediment matrix

Analyte	Heap Seep mat material				Heap Seep gut material			
	As–S-rich		Sb–Fe-rich		As–S–Fe-rich		Sb–Fe-rich	
	wt-%	Normalised	wt-%	Normalised	wt-%	Normalised	wt-%	Normalised
Si	2.01	–	16.25	–	1.36	–	4.07	–
Al	1.48	–	9.72	–	0.70	–	2.75	–
K	0.30	–	0.60	–	0.22	–	1.99	–
Mg	0.00	–	0.73	–	0.00	–	0.12	–
Ca	0.04	–	6.97	–	0.12	–	1.43	–
Sb	4.64	11.56	43.16	65.85	0.01	0.01	28.32	78.76
As	21.62	53.82	2.06	3.14	36.11	39.06	0.65	1.82
S	13.24	32.97	0.14	0.21	20.17	21.82	0.06	0.17
Fe	0.66	1.64	20.19	30.81	36.15	39.11	6.92	19.25
Total	44.00	100	99.82	100	94.83	100	46.32	100

(637.4 ± 173.2 mg kg^{-1}) measured in 2011 at 98PR. Antimony concentrations in the stream tadpoles, on the other hand, were much lower than those reported by Telford.[5]

Effectiveness of the remediation projects

Engineered remediation projects conducted in 1998 and 2005 have reduced metalloid concentrations in Meadow Creek water, sediment and biota compared to pre-remediation values. Data collected prior to and immediately following the first remediation project in 1998 show that dissolved metalloid and sediment concentrations in the 98PR reach have decreased by 10 fold, to uncontaminated levels, since 1999. We infer that diversion and the installation of a sand filter at this site has been effective in reducing the metalloid burden to this short reach of Meadow Creek. In contrast, the strategies used in engineering the 05PR reach appear to be less effective in reducing dissolved metalloid and sediment concentrations in that reach, or in the more downstream DSR site. This could be the result of greater ground water input into the DSR than is delivered to the 98PR reach. This is supported by our finding that the 05PR and DSR are the only reaches that contain a significant proportion (30–37 %) of dissolved As in the form of reduced As^{III}, which we interpret to indicate that reducing groundwater is a predominant source of As to these stretches. The installation of a sand filtration barrier or other similar mechanism in the 05PR could reduce contaminated groundwater flow into that reach of the stream. Comparison of metalloid concentrations in macroinvertebrates from this study to values collected prior to and immediately after the 1998 remediation project show that insect larva concentrations have decreased in the 05PR and DSR. No prior macroinvertebrate data were available for the 98PR, but macroinvertebrate As concentrations in that reach were lower than the two more downstream reaches. Antimony levels in macroinvertebrates from all reaches in 2012 were not significantly elevated above the URR values.

Occurrence of As and Sb in wetlands

The most contaminated sites in this study were wetlands that occurred around the margins of the tailings heaps. The water in several of these wetlands contains dissolved As and Sb concentrations in the parts per million (mg L^{-1}) range. These extremely contaminated waters actively precipitate As- and Sb-bearing mineral phases which become incorporated into microbial mats, algae and sediment resulting in As concentrations in the parts per thousand (g kg^{-1}) range, and Sb concentrations of hundreds of parts per million (mg kg^{-1}). Metalloid concentrations in the base of the wetland food web are therefore largely reflective of the mineral precipitates that are dispersed throughout the mats, algae and sediments, rather than of direct biological assimilation.

These contaminated mats and sediments represent a direct source of As and Sb, by ingestion, to boreal toad tadpoles. Whole body concentrations in these tadpoles were up to 75.5 times higher in As and 2.2 times higher in Sb than the highest values that, to our knowledge, have been previously reported.[5] Purging methods had little effect on the removal of contaminated intestinal contents based on observations during dissection and direct analysis of intestinal metalloid concentrations. Our findings of high metal concentrations located in the gut, along with the ineffectiveness of purging, are in agreement with previous reports.[21,26,27] Electron microprobe analyses identified the same amorphous As-sulfide phases and Sb associated with iron-oxide minerals in both the HS microbial mat and in tadpole intestinal tracts from that location. The extreme metalloid concentrations in these tadpoles are therefore associated with ingestion of flocculated As- and Sb- bearing mineral precipitates contained within microbial mats.

Several prior studies have demonstrated the precipitation of amorphous As-bearing sulfide minerals resulting from microbiological As^{V} reduction to As^{III} in sulfidic conditions.[28,29] Similarly, recent work by Kulp et al.[19] demonstrated the precipitation of amorphous stibnite mineral (Sb_2S_3) during biological Sb^{V} and sulfate reduction by sediment bacterial communities from this study site. Others have shown that two crystalline polymorphs of Sb_2O_3, senarmontite and valentinite, are precipitated during bacterial Sb^{V} reduction in the absence of sulfide.[30] We attribute the high concentration of As- and Sb-bearing mineral phases in the contaminated algal and microbial mats of the ponds to geomicrobiological As- and Sb-cycling by microorganisms in the mat community. The biologically induced precipitation of these mineral phases represents a direct mechanism of concentration for As and Sb in the base of the food web, and these minerals are actively consumed along with the mat material by tadpoles. The apparent resistance of these larval amphibians to extremely high concentrations of As and Sb in water, food and sediment reinforces the suggestion by Kerby et al.[31] that the commonly presumed high sensitivity of amphibians to trace metal contamination may not apply to all taxa.

Conclusions

Tailings derived from gold, antimony and tungsten mining activity can leach high concentrations of As and Sb to nearby streams and wetlands. Remediation efforts, such as those completed along Meadow Creek, can be effective in reducing water metalloid concentrations to levels below EPA aquatic life standards. In this study the more effective remediation design was that which incorporated water filtration (e.g. sand filters). Infiltration of groundwater appears to be a direct source of As and Sb to the remediated reach that did not include a sand filter.

Arsenic bioaccumulates at all trophic levels in the stream food web, but it does not bio-magnify and it generally diminishes with increasing trophic level. Antimony accumulates to a lesser extent than As and accumulates most readily in lower trophic levels (e.g. biofilm and plants). Extremely elevated metalloid concentrations in two species of tadpoles (one stream-dwelling and one pond-dwelling species) are caused by ingestion of algal and microbial mat material and sediment that are highly contaminated with As- and Sb-bearing minerals. These minerals are interpreted to be the biogenic products of microbiological As and Sb cycling in the mats, and are a primary source of metalloid uptake for these tadpoles. Contaminated sediments and mat material remained present in the tadpole gut even after purging the live animals by conventional methods, and account for the highest whole body As and Sb concentrations ever recorded in live tadpoles. This study adds to the growing number of investigations reporting bioaccumulation and food web diminution of As and Sb in freshwater ecosystems, and suggests that tadpoles may be far more resistant to metalloid contamination than was previously assumed. Future studies should investigate the mechanisms of unexpectedly high resistance to metalloid toxicity in these tadpoles.

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NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT

COMPARISON OF ROAD SURFACE EROSION MODELS WITH MEASURED ROAD SURFACE EROSION RATES

TECHNICAL BULLETIN NO. 988

JULY 2011

by
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PRESIDENT'S NOTE

NCASI is committed to finding practical management solutions to meet its members' environmental objectives. One continuing challenge is forest roads. Roads are essential to the economic and sustainable management of forests, but the forestry community has long recognized the potential of roads to be sources of increased sediment to nearby streams. The first NCASI Technical Bulletin that focused on forest water quality (Technical Bulletin No. 322, published in 1979) contained a summary of research findings on forest roads and their impact on sediment. It also included a discussion about models being used to assess forest management impacts. Today all state forestry Best Management Practices contain specific practices designed to minimize increases in sediment coming from roads. Because of the scope of forest road systems, models are often used to assess their impacts and to project the benefits of applying sediment control practices. NCASI has supported research both to develop models capable of assessing erosion from roads and to collect data that can be used to calibrate and test road models.

This report represents a forest watershed community-wide effort to synthesize road erosion and runoff data and use them to test road model performance, defining the capabilities and limitations of three popular road erosion models. NCASI partners cooperating in this effort include Temple-Inland Corporation, Plum Creek Timber Company, the USDA Forest Service, Stephen F. Austin State University, Colorado State University, Oregon State University, Oklahoma State University, Watershed GeoDynamics, and W.F. Baird and Associates Ltd. This Technical Bulletin provides an important comparison of model data needs, capabilities, ease of application, and performance. Without local calibration, none of the models predicted absolute values of annual erosion well at all of the sites. Two performed better at between-road segment comparisons, but there were still unexplained differences between observed and predicted sediment losses from the road datasets tested. This comparison of model performance with measured road erosion highlights the need for additional research and the limitations of model-only assessments of forest road impacts.

Ronald A. Yeske

July 2011

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NOTE DU PRÉSIDENT

NCASI s'applique continuellement à trouver des solutions pratiques pour aider ses membres à atteindre leurs objectifs en matière d'environnement. Les chemins forestiers constituent un défi permanent. Ils sont essentiels à l'économie et à l'aménagement durable des forêts, mais peuvent potentiellement contribuer à une augmentation des sédiments dans les cours d'eau à proximité, une situation que la communauté forestière reconnaît depuis longtemps. Le premier bulletin technique de NCASI portant sur la qualité de l'eau en forêt (Bulletin technique n^{o} 322, publiée en 1979) contenait un sommaire des résultats obtenus de travaux de recherche réalisés sur les chemins forestiers et leur impact sur les sédiments. Il traitait également des modèles utilisés pour évaluer l'impact de l'aménagement des forêts. Aujourd'hui, les meilleures pratiques d'aménagement forestier adoptées dans tous les états américains intègrent des mesures spécifiques conçues pour réduire la quantité de sédiments provenant des chemins forestiers. En raison de l'étendue du réseau de chemins forestiers, on utilise souvent des modèles pour évaluer l'impact de ces chemins et estimer les avantages d'appliquer des mesures de contrôle des sédiments. NCASI a soutenu des travaux de recherche sur l'élaboration de modèles capables d'évaluer l'érosion causée par les chemins forestiers et sur la cueillette de données pouvant servir à calibrer et à tester les modèles s'appliquant aux chemins forestiers.

Le présent rapport est le résultat d'un effort communautaire pour synthétiser les données sur l'érosion et le ruissellement des chemins forestiers à l'échelle d'un bassin versant forestier dans le but de les utiliser pour tester la performance des modèles sur les chemins forestiers, notamment pour définir les capacités et les limites de trois modèles largement utilisés en matière d'érosion. Les partenaires de NCASI qui ont collaboré à cet effort sont *Temple-Inland Corporation, Plum Creek Timber Company*, le service des forêts du département américain de l'agriculture, *Stephen F. Austin State University, Colorado State University, Oregon State University, Oklahoma State University, Watershed GeoDynamics,* et *W.F. Baird and Associates Ltd.* Le présent bulletin technique présente une analyse comparative fouillée sur les besoins en données, les capacités, la facilité d'application et la performance des modèles. Sans calibration locale, aucun des modèles n'a été en mesure de bien prédire les valeurs absolues d'érosion annuelle à tous les sites étudiés. Deux modèles ont affiché une meilleure performance lorsqu'on a comparé leurs résultats pour différents segments de chemins, mais il y avait quand même des différences inexpliquées entre les pertes de sédiments observées et celles prévues à partir de l'ensemble des données testées. Cette comparaison de la performance des modèles à l'aide de mesures sur l'érosion des chemins illustre bien le besoin d'effectuer d'autres travaux de recherche et fait ressortir les limites des évaluations de l'impact des chemins forestiers à partir de modèles seulement.

Ronald A. Yeske

Juillet 2011

COMPARISON OF ROAD SURFACE EROSION MODELS WITH MEASURED ROAD SURFACE EROSION RATES

TECHNICAL BULLETIN NO. 988
JULY 2011

ABSTRACT

Surface erosion from unpaved roads can adversely affect water quality and aquatic resources. Since direct measurement of surface erosion is difficult and time-consuming, most practitioners use models to estimate erosion based on the characteristics of the road and locale, including width, length, surfacing, traffic, ditch and cutslope condition, climate, and underlying geology. We compare measured road surface erosion and runoff data from nine sites across the United States with erosion calculated using the WEPP, GRAIP, and SEDMODL2 models to test ease of model use, ability to predict absolute value of erosion, and ability to predict relative changes in erosion under different road management conditions.

The easiest model to use is the Internet-based WEPP:Road interface developed by the US Forest Service. This interface has limited choices for road conditions, but it is convenient for modeling a few segments or testing the sensitivity to different input values. The PC-based WEPP, GRAIP, and SEDMODL2 require installation on a PC. The PC interface of WEPP provides the user with the ability to vary a large number of input variables, but most users do not have the detailed soil and management data needed to select appropriate values for many of the variables. GRAIP uses site-specific road condition data as well as a local estimate of surface erosion rates. SEDMODL2 uses GIS data, and can be run with generalized or site-specific road conditions.

None of the models predicted the absolute value of average annual runoff or erosion at all of the sites well, suggesting that data to calibrate the surface erosion models at a particular site is helpful if absolute values are needed. The WEPP (PC interface) model has the ability to predict storm-based runoff and erosion, and produced better results for individual storms than for long-term averages. The GRAIP and SEDMODL2 models performed generally well for between-segment variations, and were developed to make comparison of different management conditions relatively simple.

The road surface erosion models we tested are appropriate for the relative comparison of erosion between segments and between management conditions. If accuracy and precision are needed for a particular application, measurement of surface erosion to provide calibration data at a particular site is an appropriate solution.

KEYWORDS

erosion control practices, modeling, road surface erosion, runoff, sediment

RELATED NCASI PUBLICATIONS

Technical Bulletin No. 483 (February 1986). *A study of the effectiveness of sediment traps for the collection of sediment from small forest plot studies*.

Forest roads and aquatic ecosystems: A review of causes, effects, and management practices. NCASI Forest Watershed Task Group white paper. http://www.ncasi.org/Publications/Detail.aspx?id=2610.

Canadian watershed handbook of control and mitigation measures for silvicultural operations. Version 1. http://www.ncasi.org/Publications/Detail.aspx?id=3170

ANALYSE COMPARATIVE DE MODÈLES PRÉDISANT L'ÉROSION DE SURFACE DE ROUTES À L'AIDE DE TAUX D'ÉROSION DE SURFACE MESURÉS

BULLETIN TECHNIQUE N^{O} 988
JUILLET 2011

RÉSUMÉ

L'érosion de surface des routes non pavées peut compromettre la qualité de l'eau et affecter les ressources aquatiques. Comme la mesure directe de l'érosion est difficile et exige beaucoup de temps, la plupart des professionnels en foresterie se servent de modèles pour estimer l'érosion en s'appuyant sur les paramètres locaux et les caractéristiques de la route, notamment la largeur, la longueur et le revêtement de la route, la densité du trafic, la condition des fossés et des pentes, le climat et les caractéristiques géologiques sous-jacentes. Dans la présente étude, nous comparons des données sur l'érosion de surface et le ruissellement provenant de neuf sites aux États-Unis avec des données sur l'érosion calculées à l'aide des modèles WEPP, GRAIP et SEDMODL2 afin d'évaluer la facilité d'utilisation de ces modèles, leur capacité à prédire une valeur absolue d'érosion et leur capacité à prédire les changements relatifs dans l'érosion sous différentes conditions d'aménagement de routes.

Le modèle le plus facile à utiliser est l'interface Internet WEPP:Road développée par le service américain des forêts. Cette interface offre un choix limité de conditions de route, mais elle est commode pour modéliser quelques segments ou pour tester sa sensibilité à différentes valeurs d'entrée. Dans le cas des modèles WEPP, GRAIP et SEDMODL2, il faut les installer sur un ordinateur. L'interface du modèle WEPP donne la possibilité à l'utilisateur de faire varier un très grand nombre de variables d'entrée, mais la plupart des utilisateurs n'ont pas les données détaillées sur le sol et l'aménagement de la route dont ils ont besoin pour être en mesure de choisir les valeurs appropriées de bon nombre de variables. Dans le cas du modèle GRAIP, il faut utiliser les conditions propres à chaque route et faire une estimation locale du taux d'érosion de surface. Le modèle SEDMODL2 fait appel à des données du système d'information géographique (GIS). On peut utiliser des conditions générales ou les conditions d'une route particulière.

Aucun des modèles n'a été en mesure de bien prédire les valeurs absolues d'érosion annuelle moyenne ou de ruissellement annuel moyen à tous les sites étudiés, ce qui semble indiquer que les données utilisées pour calibrer ce type de modèle à un site particulier sont utiles si on cherche à obtenir des valeurs absolues. Le modèle WEPP (interface sur ordinateur) a la capacité de prédire l'érosion et le ruissellement causés par une tempête. Il donne de meilleurs résultats lorsqu'on cherche à prédire l'impact de tempêtes individuelles que lorsqu'on cherche à obtenir des moyennes à long terme. Les modèles GRAIP et SEDMODL2 ont généralement bien fonctionné lorsqu'on faisait varier les conditions entre des segments de route. Ces modèles ont été développés pour comparer différentes conditions d'aménagement relativement simples.

Les modèles sur l'érosion de surface des routes non pavées que nous avons testés conviennent pour effectuer une comparaison relative de l'érosion entre des segments de route et entre différentes conditions d'aménagement. Cependant, s'il faut obtenir des résultats exacts et précis pour une application particulière, la mesure de l'érosion de surface pour obtenir des données de calibration à un site donné peut s'avérer une solution appropriée.

MOTS-CLÉS

érosion de surface des chemins, mesures de contrôle de l'érosion, modélisation, ruissellement, sédiment

AUTRES PUBLICATIONS DE NCASI

Bulletin technique n° 483 (février 1986). *A study of the effectiveness of sediment traps for the collection of sediment from small forest plot studies.*

Forest roads and aquatic ecosystems: A review of causes, effects, and management practices. Article du groupe de travail de NCASI sur les bassins versants forestiers. http://www.ncasi.org/Publications/Detail.aspx?id=2610.

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COMPARISON OF ROAD SURFACE EROSION MODELS WITH MEASURED ROAD SURFACE EROSION RATES

1.0 INTRODUCTION

Road erosion can be a large source of anthropogenic sediment in watersheds managed for forest production (Megahan and Kidd 1972; Swanson and Dyrness 1975; Reid and Dunne 1984; Megahan and Ketcheson 1996). The fine-grained sediment produced by road surface erosion has the potential to adversely affect water quality and aquatic resources. Direct measurement of surface erosion is a time-consuming and labor-intensive process and is not feasible on a large scale. As a result, most analyses of road surface erosion utilize models to estimate erosion based on the characteristics of the roads, climate, and soils in the study areas. Fu, Lachlan, and Ramos-Sharrón (2010) provided a recent review of several road surface erosion models. The most widely used road surface erosion models in the United States include Water Erosion Prediction Project (WEPP), Geomorphic Road Analysis and Inventory Package (GRAIP), Sediment Model Version 2 (SEDMODL2), and Watershed Characterization System (WCS). These models have been developed based on physical principles and empirical data, but have not been extensively compared to measured road erosion data sets. This relative lack of model calibration/validation has led to uncertainty about model results, despite their widespread use for management and regulatory decisions such as Total Maximum Daily Load (TMDLs) (USEPA 2001), watershed analyses, Habitat Conservation Plans (HCPs), forest practice applications (Pruitt et al. 2001), and road management plans (Riedel and Vose 2003).

Selection of a road surface erosion model for a particular application should take into account:

- availability of input data to run a model
- time and effort required to run a model and time and effort available
- accuracy of model predictions for roads with similar characteristics
- intended use of model results

This report discusses the WEPP, GRAIP, and SEDMODL2 models and compares sediment production and (where applicable) road runoff predictions to measured road erosion and runoff data sets from across the United States. This provides insights into how well each model predicts road erosion and runoff, as well as the strengths and limitations of each model for different purposes. The following questions are covered for each model:

- What are the data input requirements?
- How easy is the model to use?
- How well does the model predict the absolute value of road surface erosion across multiple sites?
- How well does the model predict the relative change in surface erosion in response to management differences (e.g., road surfacing, traffic, grading) among roads within a study site?

2.0 ROAD SURFACE EROSION MODELING

Factors that determine the amount of sediment eroded from a given road segment include the interaction of:

- erodibility and infiltration characteristics of underlying geology/soil
- precipitation amount, intensity, and form (snow vs. rain)

- length, width, and gradient of road prism components (tread, ditch, cutslope, fillslope)
- tread surfacing
- cutslope and fillslope cover
- ditch condition (vegetated, rocked, check dams)
- disturbance history (new road, traffic amount/type/timing, grading, ditch cleaning, maintenance)
- micro-topography of road drainage patterns (insloped/outsloped/crowned, ruts, tire tracks)
- upslope area draining to road segment
- interception of groundwater by cutslope

Some of these factors are relatively easy to measure or characterize and model; others are more difficult. Past researchers have found that one or more of these factors control the variability in measured road erosion data at their particular sites. Due to the difficulty in measuring and/or modeling all of these factors, several of the existing road surface erosion models simplify model calculations or user input requirements to include the most readily available road characteristics.

Available models to estimate road runoff and sediment yield fall into two classes: empirical and physically based. Empirical models estimate erosion based on statistically derived relationships between observed patterns in erosion and different road conditions, designs, and treatments. Physically based models use basic understandings of water flow and sediment movement to estimate erosion amounts. Physical model parameters regarding infiltration capacity and sediment detachability are related to soils, weather, and treatments through small-scale experiments. In this sense physically based models have an empirical component, but conceptually these parameters are more easily transferable to different climates and geologies than the more thoroughly integrated “parameters” of empirical models. A fundamental difference is that empirical models acknowledge the need for calibration data. In order to apply empirical models to new areas, however, more expertise or judgment may be required. While physically based models should not conceptually require additional calibration for use in new areas, in practice calibration data are useful for reducing errors.

Attempts to quantify surface erosion from disturbed sites in the United States began in the 1960s with development of the Universal Soil Loss Equation (USLE) for cropland and agricultural sites (Wischmeier and Smith 1965). The USLE is an empirical model using a series of factors that represent climate, gradient, soil, and disturbance characteristics to compute expected erosion. Continued refinement of the USLE and development of other, more use-specific empirical models has resulted in the Revised Universal Soil Loss Equation (RUSLE), SEDMODL2/Washington Road Surface Erosion Model (WARSEM), GRAIP, and WCS models. Several of these have incorporated geographic information systems (GIS) to provide users with large land holdings a method to estimate erosion even if site-specific data are lacking. Empirical models are generally simple to apply, but are theoretically less reliable outside the conditions used for model development and ideally require observations of the processes of interest (e.g., direct measurements of erosion) for calibration.

Physically based models use equations governing the physics of surface erosion to calculate runoff, surface erosion, and transport, so theoretically they require fewer observations for calibration. The WEPP and the Distributed Hydrology Soil and Vegetation Model (DHSVM) are two examples with different underlying hydrologic representation. Physical models provide a solution to some of the constraints on extrapolation posed by empirical models. The disadvantage of physically based models is that they require a large amount of input data not always readily available across wide areas and, in reality, they do require some calibration data for precision. To enable these models to be utilized by users with limited input data, interfaces that simplify model input parameters have been developed, such as WEPP:Road and Disturbed WEPP (Elliot, Hall, and Scheele 1999a).

Different models make different types of predictions. All of the evaluated models address variability of road surface erosion due to design, maintenance, and traffic (e.g., management differences) within a site. Some also address differences in erosion due to variability in precipitation and soils (e.g., differences between sites and years), and the WEPP model has the ability to model single storms. Users should consider both the intended use and the precision of the model when determining which model to use for a particular purpose. For instance, just because a model performs well describing differences due to management differences does not mean it will perform well without additional validation at another site, nor that one can predict erosion in a different year with as much precision. While the designed purposes for the models are outlined herein, discussion of the performance for each task is discussed in later sections.

2.1 Models Examined

2.1.1 *Sediment Model Version 2 (SEDMODL2) and Washington Road Surface Erosion Model (WARSEM)*

After many years of collaboration with resource agencies, tribal representatives, and landowners, the Washington Department of Natural Resources (WDNR) implemented its Watershed Analysis Methodology to gain a watershed-wide understanding of the effects of timber harvest and road use in forested basins (WDNR 1997). The Watershed Analysis methods included an assessment of road surface erosion using a series of empirical relationships. These relationships were initially developed from the R1-R4 model (Cline et al. 1981), which is based heavily on research by Megahan and Kidd (1972) and Megahan (1974). The basic R1-R4 model eventually evolved into a group of location-specific models commonly used by National Forests (e.g., WATSED, BOISED, NEZSED, WWSED). Boise Cascade developed a GIS-based program (SEDMODL) to automate the WDNR road erosion calculations for landowners with extensive road networks. The goal was to create a sediment model that was flexible enough to be used at many spatial scales, with either very little site-specific input data or with detailed road inventory data. NCASI furthered SEDMODL with development of Version 2 in cooperation with Boise Cascade (NCASI 2003).

SEDMODL2 is an empirical road surface erosion model that uses GIS layers to select road segments with the potential to deliver sediment to streams in a watershed. Erosion and delivery of sediment is calculated based on a series of empirical relationships. SEDMODL2 includes an Access™ database application that users can employ to determine changes in erosion/delivery as a result of different road treatments.

SEDMODL2 calculations were used as the basis of WDNR's Washington Road Surface Erosion Model (WARSEM) that lets users in Washington State calculate road surface erosion with or without the GIS interface (Dubé, Megahan, and McCalmon 2004). WARSEM is an Access database application that allows users to enter and calculate road surface erosion on a single road segment or on multiple segments. WARSEM also allows users to apply and track BMPs and road improvements to estimate changes in road surface erosion through time. Both SEDMODL2 and WARSEM use these formulas to calculate road surface erosion and delivery:

> Total sediment delivered to a stream from each road segment (in tons/year) = (tread and ditch sediment + cutslope sediment) x road age factor
>
> Tread and ditch = geologic erosion factor x tread surfacing factor x traffic factor x segment length x road (tread + ditch) width x road gradient factor x rainfall factor x delivery factor
>
> Cutslope = geologic erosion factor x cutslope cover factor x segment length x cutslope height x rainfall factor x delivery factor

Numeric values of each of the factors were derived from road erosion measurements, and were described in detail by Dubé, Megahan, and McCalmon (2004).

2.1.2 *Geomorphic Road Analysis and Inventory Package (GRAIP)*

GRAIP analyzes risks from multiple erosion processes for forest roads, including surface erosion, gullying, landslides, and stream crossing failure, in a GIS environment based on road inventory and terrain data (Prasad et al. 2005). The surface erosion model in GRAIP shares its form and parentage from the R1-R4 model with SEDMODL2 (Black, Cissel, and Luce 2010). It uses information from Luce and Black (1999) on road slope and length. Erosion for an individual road segment is estimated as a function of surfacing, flow path condition (e.g., rutted road surface, ditch vegetation), road slope, and segment length. GRAIP further estimates the downslope movement and accumulation of fine sediment in stream networks to give a map of the spatial distribution of road sediment from the perspective of the stream network.

GRAIP requires a base rate that incorporates the effects of precipitation amount, form, and intensity with soil infiltration and erodibility characteristics. As a consequence of this design, GRAIP best shows the relative effects of design and maintenance practices on road erosion. Estimates of the base rate are best obtained from a series of local observations to give an annual average, or relating the annual variability to characteristics of precipitation. Existing literature (e.g., Megahan and Kidd 1972; Megahan 1974; Luce and Black 1999, 2001a) provides reasonable estimates as well. The base rate is closely akin to the geologic erosion factor in SEDMODL2 but also recognizes that erosion is a function of precipitation differences beyond those captured by precipitation amounts. Surface erosion is estimated from:

> Sediment production = base rate (kg/m/year) x road length (m) x road slope (m/m) x flow path vegetation factor x road surfacing factor

The flow path vegetation factor is set at 1 if the flow path veg ≤25% and at 0.14 if flow path veg >25% (Luce and Black 1999). Common flow paths are the ditch line, which can have a great deal of vegetation if it has been a long time since the ditches were bladed or little if bladed recently, and wheel tracks or ruts, which rarely have vegetation. The road surfacing factor is 1 for crushed rock, gravel, cinder, or vegetated roads, 5 for native geology or dirt roads, and 0.2 for paved roads.

2.1.3 *Water Erosion Prediction Project (WEPP)*

WEPP is a physically based model developed by a number of federal agencies (Agricultural Research Service, Natural Resources Conservation Service, United States Forest Service, Bureau of Land Management, and United States Geological Survey). It estimates soil erosion, runoff, and sediment yield with inputs of soil, climate, ground cover, and topographic conditions. WEPP calculates vegetation cover, surface residue, soil water content, infiltration, runoff, and erosion for each day in multiple-year runs. Based on these calculations, the model determines runoff and erosion from the hillside. Two basic forms of WEPP are currently available: hillslope and watershed. The hillslope version allows users to model erosion from a single profile. The watershed version allows the user to enter multiple hillslope polygons, channels, and impoundments to model erosion and routing. A GIS version of the watershed format, GeoWEPP, has also been developed to allow spatially derived input to the WEPP model.

The model is available in a number of different user interfaces. These provide the user with files containing much of the complex input data required. The user can select climate and soil files with pre-specified input data for many locations and soil types, then input site-specific topographic data for the location of interest. Some interfaces allow the user to alter the pre-specified climate and soil file information. The most commonly used forms for road surface erosion include WEPP for Windows (http://www.ars.usda.gov/Research/docs.htm?docid=10621) and WEPP:Road online interfaces (http://forest.moscowfsl.wsu.edu/fswepp/). GeoWEPP is also available for users with GIS (http://www.geog.buffalo.edu/~rensch/geowepp/). Two WEPP interfaces were applied in the current study: WEPP:Road and the watershed configuration within WEPP for Windows Version 2006.5.

The WEPP:Road interface runs online and is the simplest to use. It provides several options for road configuration, soil, climate, traffic use, gradient, length, and width as well as fillslope and buffer characteristics. Input data files cannot be manipulated, but management and slope files have parameters that the model developers felt were most appropriate for forest road conditions (Elliot, Hall, and Scheele 1999b).

WEPP for Windows includes the option to run a hillslope or a watershed configuration (Elliot and Hall 1997). The hillslope configuration models runoff and erosion over a single slope element and is appropriate for use on outsloped roads where the road cutslope, tread, and ditch can be visualized in cross section as a complex slope. It allows up to ten slope components, each with varying length, gradient, soil, and management input files. Several different management and soil files with parameters that the model developers felt were most appropriate for forest road conditions are included in the model download package; the user can change values within each of these files. There is no simple method to include traffic or grading activities, but the user can modify one of the existing management files to include periodic disturbance.

The watershed configuration within WEPP allows users to model erosion and routing from a number of slope polygons, channels, and impoundments. This configuration is appropriate to apply to insloped roads; the cutslope and road tread are modeled as slope polygons that deliver to the ditch, which is modeled as a channel. The same soil and management files are available for the watershed configuration. Again, there is no simple way to include traffic or grading activities, but the user can modify one of the existing management files to include periodic disturbance.

2.2 Data Input Requirements and Ease of Use

Each of the models was evaluated for the type of input data and level of detail needed to run the model, as well as how user-friendly the model was based on experiences in this study (Table 2.1).

SEDMODL2 and GRAIP are GIS-based models that require a computer running ESRI GIS software as well as GIS input layers. These two models are more complex to get up and running, but allow users to model and analyze road erosion spatially and can be run over large areas.

SEDMODL2 requires the user to provide GIS coverages for roads and streams, a watershed boundary, and a Digital Elevation Model (DEM – a 10 meter or finer DEM is best); inclusion of soil/geology, annual rainfall, and culvert coverages is optional. The model can be run in a screening mode with few site-specific data or in a more detailed mode with additional data on road and culvert conditions.

GRAIP requires GIS coverages of road lines and drain points that describe water flow paths along and off of the road. The coverages have a specific format and can be derived from existing GIS data, but are more easily obtained using a global positioning system (GPS) in the field. GPS tools allow for simplified data input in the field, where the information can be verified. GIS-based tools allow for data quality control from the field and automated analysis of field data to produce erosion and mass wasting risk estimates. Data with the proper format can be created for proposed roads by a skilled GIS operator.

WARSEM and the WEPP Windows interfaces (hillslope and watershed) are run on a PC and do not require GIS. WARSEM allows batch import and export of data files, but only has rainfall data for Washington State. Data requirements are very flexible, allowing general estimates with minimal road condition data or more specific estimates with additional input data.

The WEPP Windows interfaces can be run using default soil and management files or with site-specific data. They do not provide batch input file capabilities.

The WEPP:Road model is run online, so it does not require the user to download or install any special software. This is the easiest and most user friendly model tested. A batch input mode was recently added to the interface. It allows a user to import and run multiple road segments (for a single climate station), then export the output to a spreadsheet program.

Table 2.1 Model Input Requirements and Ease of Use

Input Requirements	Flexibility	Relative Ease of Use
Empirical Models		
SEDMODL2 is GIS-based Required input: 10 m DEM, roads, streams, watershed boundary Optional input: soils, geology, rainfall, culverts	Flexible input data requirements (can use generalized or site-specific road data)	Moderately easy to use, but can be finicky for new users (very specific GIS data format)
WARSEM is Access-based Required inputs: road length, width, traffic, surfacing, gradient, delivery, cutslope height and cover, ditch width Optional inputs: geology, construction year, ditch condition, BMPs applied	Has climate data only for Washington; can model and track changes to road conditions through time (surfacing, traffic, BMPs)	Non-GIS Windows interface and relatively easy to use; allows importing/exporting of batch input files from spreadsheet or database programs; runs are saved in a log file
GRAIP requires GPS-based field data collection and some measure of local road surface erosion for calibration	Specific GPS inputs as class data describing road topology, vegetation, and surfacing; substantial flexibility in describing most sites	Data collection can be conducted by trained field crews using data dictionary in GPS; model runs in GIS with pushbutton interface and can be executed with limited training; software assists with data quality control; cumbersome for a single segment but efficient, easy to use, and comprehensive for basin-scale evaluations
Physically Based Models		
WEPP:Road Required input: climate, soil texture, road design, surfacing, traffic, tread, fillslope and buffer length, width, and gradient	Less input flexibility than other models	Very easy to use web interface; can run in batch mode for multiple road segments; can save log file of runs for export to PC
WEPP hillslope and watershed Requires climate, soil, management, and hillslope input files	User can edit many parameters in each file if data are available	Windows interface; relatively easy to run, but limited prepared data files and instructions for varying input parameters for forest road use

2.3 Previous Model Calibration/Verification Studies

Several researchers have compared measured surface erosion and runoff with modeled values. The majority of those studies have used small data sets from a single geographic area.

Elliot, Foltz, and Luce (1995) compared runoff and erosion produced by a rainfall simulator at five plots in Idaho and Colorado with an early version of the WEPP hillslope model as part of development of forest road input files. The model produced comparable results, and they identified several areas for further study and calibration, including road erodibility and hydraulic conductivity.

Tysdal et al. (1999) used the WEPP Watershed configuration to model sediment yield and plume length for 74 road erosion plots in the Oregon Coast Range. They determined that the predicted sediment yield values were reasonable approximations for measured yields, but WEPP appeared to overestimate sediment plume lengths.

Riedel and Vose (2002) measured sediment yield from 13 road segments in Georgia and Tennessee over four months and compared adjusted annual yield to estimated annual yield from the WCS model. The model was run with a variety of DEM resolutions to determine model sensitivity and comparison with measured yield. They concluded that the WCS sediment tool overestimated sediment yield from forest roads, and 90 and 30 meter DEMs were too coarse to provide reliable predictions.

Amann (2004) measured runoff and sediment yield from nine road segments in the Oak Creek watershed, Oregon. Measured values were compared to WEPP:Road and SEDMODL2 predictions of annual sediment yield. He concluded that WEPP:Road was easy to use but overestimated sediment production, and SEDMODL2 was more difficult to use but provided closer estimates of sediment yield.

Busteed (2004) measured runoff and sediment yield from two road segments in the Ouachita Mountains, Oklahoma, over eighteen months. He ran the WEPP Watershed model for each of the 76 storm events that occurred during the monitoring period, modeling road surface, cutslope, and ditch with model-supplied soil and climate files. He found that total annual sediment yield was similar to WEPP predictions, but modeled runoff was half of the observed runoff. For individual storms, WEPP under-predicted yield on smaller storms and had reasonable agreement on larger storms.

Peranich (2005) selected four unpaved, rural roads in the Stillwater Creek watershed, Oklahoma, and measured runoff and sediment yield for 26 storms from June through November. He used rainfall data collected during the study to create site-specific files for individual storms and modeled runoff/erosion for each storm using the WEPP hillslope model with four different soil and management scenarios. The WEPP hillslope model under-predicted both erosion and runoff, and scenarios that included a provision for road grading activities had the best agreement of the four tested.

Grace (2007) and Grace and Elliot (2008) compared WEPP model runs with measured road erosion for sites in Alabama and Georgia. Grace (2007) collected sediment yield from 24 cutslope or fillslope sites with different erosion control treatments for eight years and sediment yield and runoff from three road tread plots during eight storm events. He compared measured values to WEPP hillslope model predictions for annual losses (cutslope/fillslope sites) and storm losses (road surface sites). He concluded that WEPP predicted erosion reasonably well, but under-predicted runoff. Grace and Elliot (2008) measured sediment deposits (plumes) downhill from 16 road segments in Alabama to determine deposition patterns and travel distance. They used the WEPP:Road model to estimate sediment deposition amounts in buffer strips downhill from roads with characteristics similar to the measured segments. They found generally good agreement if they used high traffic levels, but the model underestimated sediment amounts deposited, particularly if low traffic levels were modeled.

3.0 ROAD EROSION DATA SETS USED FOR COMPARISON WITH MODEL RUNS

Road erosion/runoff data sets were obtained from a number of researchers across the United States (Table 3.1, Figure 3.1). These data were compiled into a database that includes information on study site locations, road segment characteristics, and measured erosion and/or runoff data. More detail on study sites, database design, and data availability is available elsewhere (Dubé et al. 2008).

Table 3.1 Summary of Road Surface Erosion/Runoff Data Sets

Site Name	State	Elevation (m)	Average Annual Precipitation (mm)	Number of Segments	Sediment Data Collected?	Runoff Data Collected?
Klamath Falls	OR	1,500	750	15	Yes	No
Coast Range – Low Pass	OR	400	1,900	112	Yes	No
Coast Range – Windy Peak	OR	700	2,150	23	Yes	No
Coast Range – Sand Bar Gap	OR	700	1,400	5	Yes	No
Ouachita Mountains	OK	300	500-1,300	5	Yes	Yes
Southern Appalachians	GA	400-500	1,600-2,300	10	Yes	Yes
	TN	300-500	1,600-2,300	4		
Rocky Mountains	MT	1,100-1,900	400-1,700	20	Yes	No
Oak Creek Watershed	OR	250	1,500	9	Yes	Yes
Alto Watershed	TX	100	1,170	9	Yes	Yes
Sierra Mountains	CA	1,380-1,670	1,300	3	Yes	No

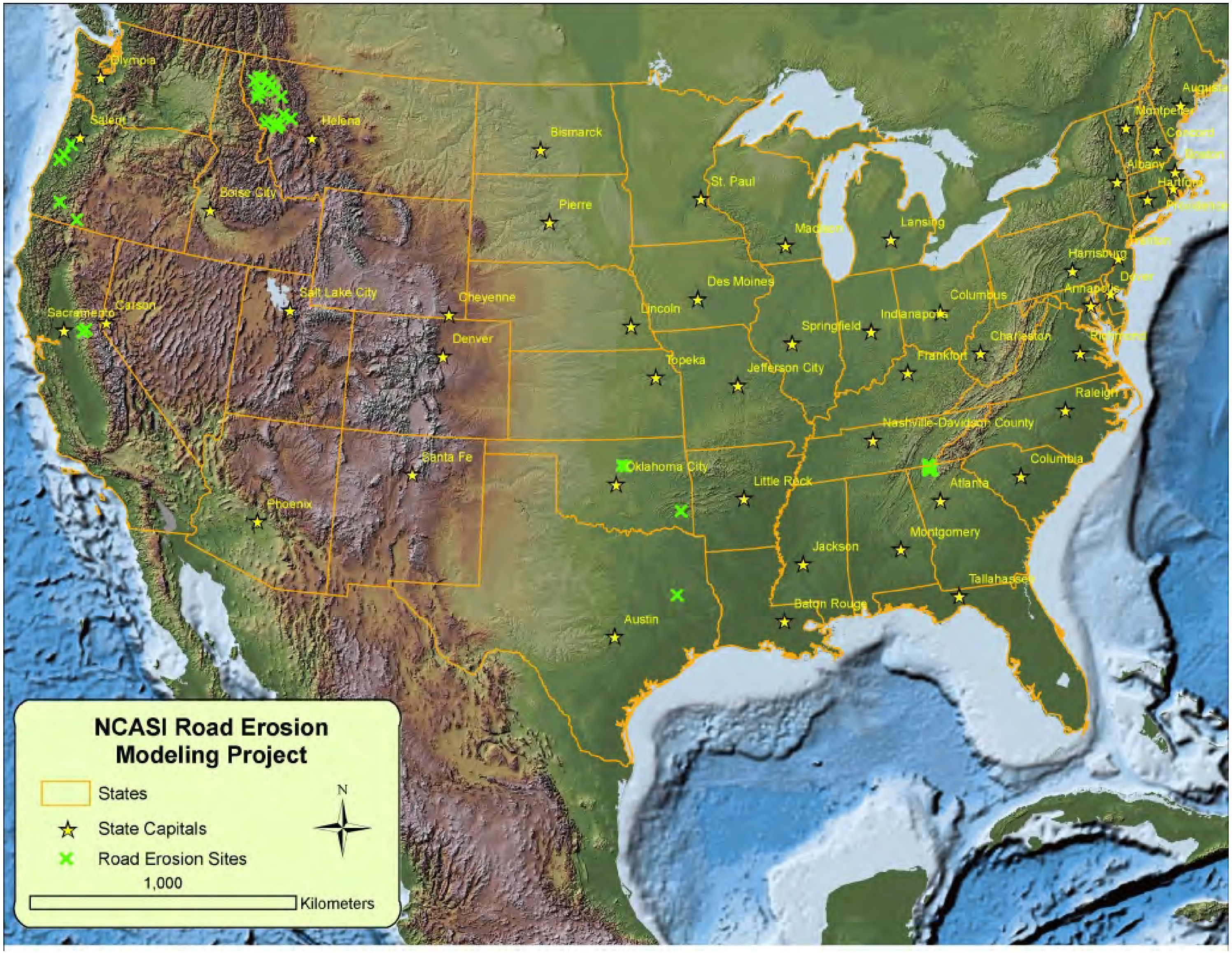


Figure 3.1 Location of Road Sample Sites

3.1 Data Sets Used

3.1.1 *Klamath Falls, Oregon*

Data were collected on erosion from 15 road segments in the Klamath Basin with different surfacing using the methods of Luce and Black (1999).

3.1.2 *Coast Range, Oregon (Low Pass, Windy Peak)*

Surface erosion data from several road segments of different lengths, slopes, cutslope heights, traffic patterns, vegetation coverages, and times since grading operations were collected in the Oregon Coast Range. Many of these data have been presented in several papers (Luce and Black 1999, 2001a, 2001b).

3.1.3 *Medford, Oregon (Sand Bar Gap)*

Surface erosion data from five road segments of varying cutslope heights were generated using the same methods as Luce and Black (1999).

3.1.4 *Ouachita Mountains, Oklahoma*

Road runoff and surface erosion data were collected from forest road and rural, unpaved road segments at two sites in the Ouachita Mountains by Oklahoma State University personnel (Busteed 2004; Peranich 2005).

3.1.5 *Southern Appalachians, Georgia and Tennessee*

The USFS Southern Research Station collected road surface erosion and runoff data from 13 forest roads in the Conasauga Watershed in 2001. This road data set has been used to calibrate WCS locally (Riedel and Vose 2002).

3.1.6 *Rocky Mountains, Montana*

Plum Creek Timber Company collected three years of road surface erosion data from 20 sites in western Montana in collaboration with researchers at the University of Montana (Sugden and Woods 2007).

3.1.7 *Oak Creek, Oregon*

Surface erosion and runoff from nine road segments in the Oak Creek Watershed were measured by Oregon State University students from November 2002 through June 2003. These data have been compiled and compared to SEDMODL2 and WEPP (Amann 2004).

3.1.8 *Alto Experimental Watershed, Texas*

One year of surface erosion data were collected by Temple Inland and Stephen F. Austin University in the Alto Study Watershed in northeastern Texas. The study included nine road segments covering high, medium, and low traffic and gradient conditions. Storm-based runoff and erosion data were available.

3.1.9 *Sierra Mountains, California*

Researchers at Colorado State University collected road surface erosion data from three road segments in the Sierra Mountains of California (Coe 2006).

3.2 Road Runoff and Erosion Data Summary

The road erosion database contains nearly 1000 records of road erosion and/or runoff measurements from over 200 road segments. Data in two of the studies were collected from individual storms (Alto Watershed, TX, and Ouachita Mountains, OK); other data were reported seasonally or annually.

Runoff (flow) data were collected at four of the study sites (Table 3.1). Individual runoff measurements, normalized to liters per square meter (L/m^2), were plotted against precipitation over the measurement period, which ranged from a single storm to an entire year at different sites (Figure 3.2). Normalized runoff generally increased with increasing precipitation, but varied over several orders of magnitude under a given precipitation regime.

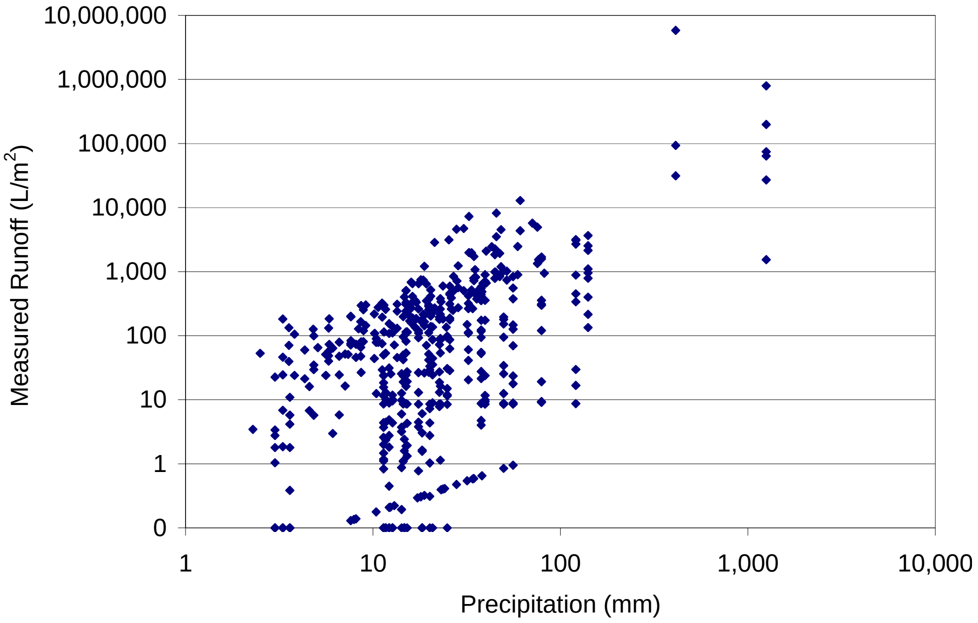


Figure 3.2 Measured Runoff vs. Precipitation for Individual Measurements

The measured erosion data display a similar large variability. Sediment yield per unit area from individual segments ranged over six orders of magnitude, with precipitation also ranging over six orders of magnitude during either storm events or over a year (Figure 3.3). Runoff from some of the sites exceeded the precipitation volume that fell on the road prism draining to the collection point, suggesting that interception of shallow groundwater from the cutbank or overland flow from the hillside contributing to the road segment was likely to be occurring at those sites.

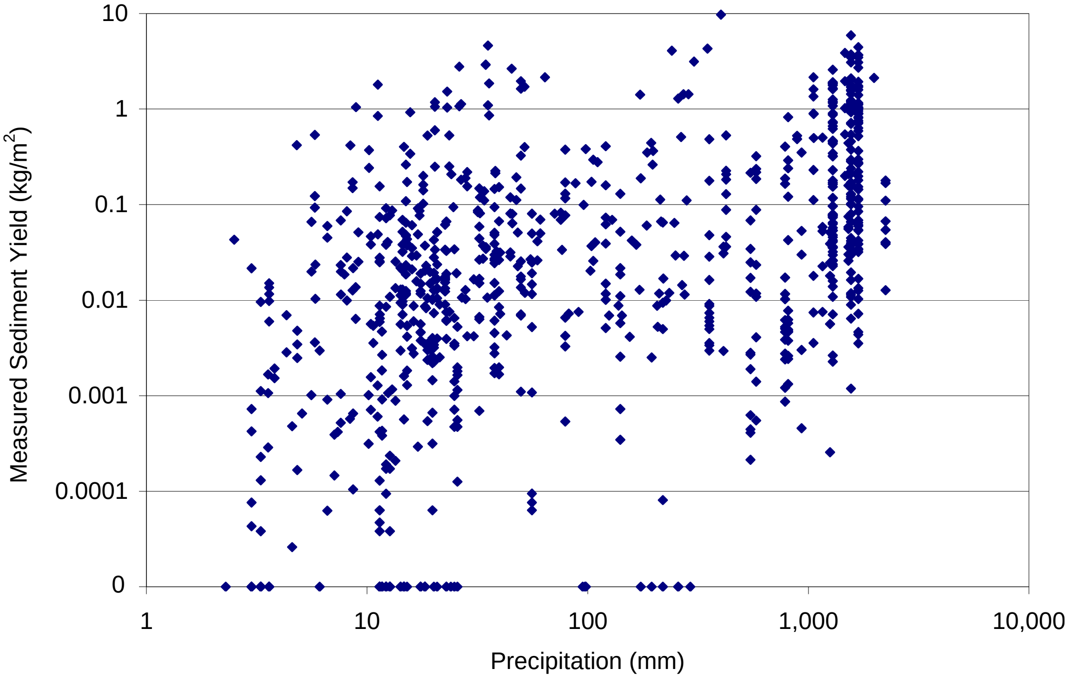


Figure 3.3 Measured Sediment Yield vs. Precipitation for Individual Measurements

To further explore the variability of sediment yield, total sediment measured over the entire period of record at each plot was summed and normalized for road area and tread gradient (kg/m^2/slope). These data were plotted against total measured precipitation for each plot over the period of record (Figure 3.4). The period of record for some sites included up to three years of summed precipitation and erosion data. This reduced variability somewhat, but the data collected at sites under the same precipitation conditions still ranged over three orders of magnitude.

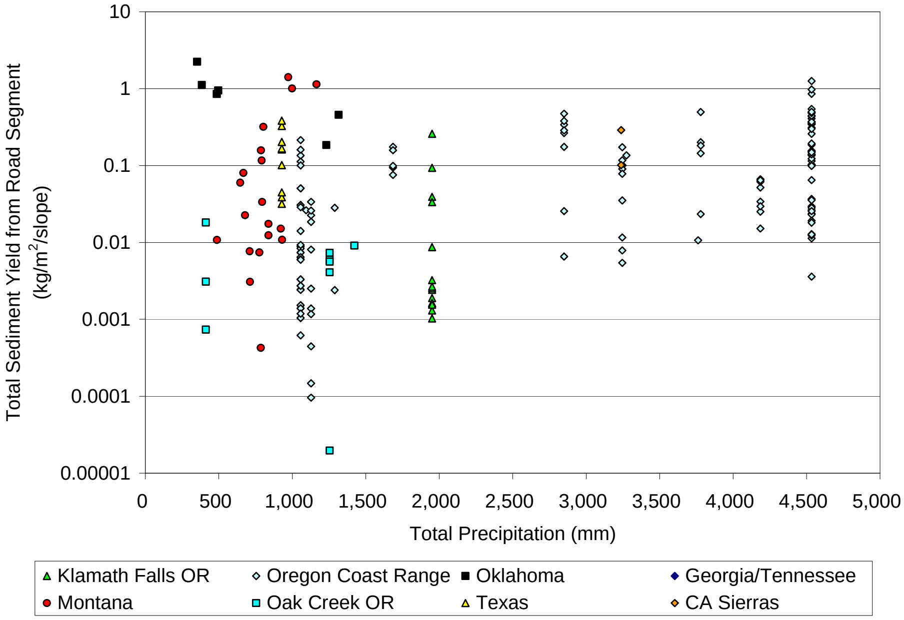


Figure 3.4 Normalized Total Sediment Yield vs. Precipitation for Each Road Segment

4.0 METHODS

Road erosion/runoff models were run for each of the road segments in the database using the supplied road characteristics and climate data (Table 4.1). Results were evaluated in two ways: how well the model predicted for all segments and sites; and how well it predicted within a given site. These two tests get at questions about how well the model estimates the effects of variation in soils and climate and how well it estimates the effects of variation in road design and maintenance factors. The GRAIP erosion model does not predict between different soils or different weather and was only evaluated for its performance at each site. While some data sets were appropriate for evaluating within-site variation, some (e.g., Montana) had variation in soils/geology or weather and could only be assessed in that context.

Table 4.1 Road Surface Erosion/Runoff Model Runs

Model	Time Series Modeled	Output Parameters	Data Sets Modeled
SEDMODL2/ WARSEM	Average annual	Sediment yield	All
GRAIP	Average annual	Sediment yield	Alto, Oak Creek, Oklahoma, Oregon Coast Range, Klamath Falls, Southern Appalachians
WEPP:Road	Average annual	Sediment and runoff	All
WEPP Watershed	Storm and average annual	Sediment and runoff	Average annual – all; Storm – Alto, Oklahoma

The SEDMODL2 and WEPP:Road models require users to select climate, geology/soil, surfacing, and traffic levels from a set of pre-defined choices. Selections were made based on the attributes reported for each road segment.

WEPP Windows has a much larger range of potential input variables. The user selects a climate, soil, slope, and management input file and then has an opportunity to modify each of the many parameters therein. Because most users do not have site-specific data regarding the parameters in the files, this study ran the model with the unmodified input files that most closely matched site conditions reported for each road segment. Climate files were generated from the included CLIGEN routine (Ver. 4.3) based on averaging the closest stations to the actual latitude/longitude location of the road segment in the Map sub-routine. The watershed version of the WEPP model was used, with cutslope and road tread modeled as hillslopes draining to the ditch, which was modeled as a channel. The included soil files labeled “road cutslope,” “road surface,” and “insloped road” with either vegetated or unvegetated ditch and appropriate soil types were used for the cutslope, tread, and ditch, respectively. The “forest road bladed annually” management file was used. Slopes were modeled as simple straight slopes.

The GRAIP model requires a base erosion rate at each site and year measured. To produce a sediment yield estimate for each road segment, the base rate is modified by segment length, gradient, surfacing, and ditch vegetation. The base erosion rate for each site was estimated by regressing erosion against L (road segment length) x S (road segment slope) for the data at each site in each year analyzed. LxS can be more reliably estimated from GPS and DEM than LxS^2 and the regression is only slightly poorer, so it was used in the model. Because of this treatment of the base rate estimate, GRAIP was only tested for how well it analyzed data within a given site, not for between-site variability.

The models were also evaluated for their ability to predict relative differences in erosion rates within a single study area for roads with different traffic and surfacing characteristics. This was done by comparing the relative change (percent increase or decrease) in measured and predicted erosion between road segments with different traffic or surfacing attributes.

4.1 Adjustments of Measured Runoff/Erosion to Compare with Average Annual Model Predictions

All of the models estimate average annual sediment yield or runoff (Table 4.1). Because the measured erosion/runoff data were collected for periods of a few months to three years, measured values needed to be adjusted to compare to average annual model estimates. The measured erosion/runoff amounts were adjusted to approximate average annual amounts by multiplying measured amounts by the ratio [measured precipitation/average annual precipitation]. This introduced some amount of imprecision into the comparison of measured and modeled rates, as runoff and erosion are sensitive to both the amount and intensity of precipitation and large, infrequent storms probably result in disproportionately high runoff and erosion that are not captured in short-term measurements.

4.2 Model Efficiency Statistics

The Nash-Sutcliffe efficiency parameter (Nash and Sutcliffe 1970) was used to quantify how well each model predicted runoff or sediment yield. Model efficiency (E) is calculated as:

$$E = 1 - \sum(Y_{obs}-Y_{pred})^2 / \sum(Y_{obs}-Y_{mean})^2$$

where: Y_{obs} = measured sediment yield or runoff
Y_{pred} = predicted sediment yield or runoff
Y_{mean} = mean of measured sediment yield or runoff for each study site

Model efficiency ranges from $-\infty$ to 1, with 1 indicating a perfect fit between measured and predicted values. An E value of 0 indicates that the mean value of sediment yield or runoff is as good a predictor as the model. Negative values indicate that the mean value is a better predictor than model results. A negative model efficiency can be obtained in two ways: if the mean of the modeled and predicted responses are dramatically different or if the relationship between modeled and observed is negative. Graphic interpretation of the results is useful in combination with the Nash-Sutcliffe index.

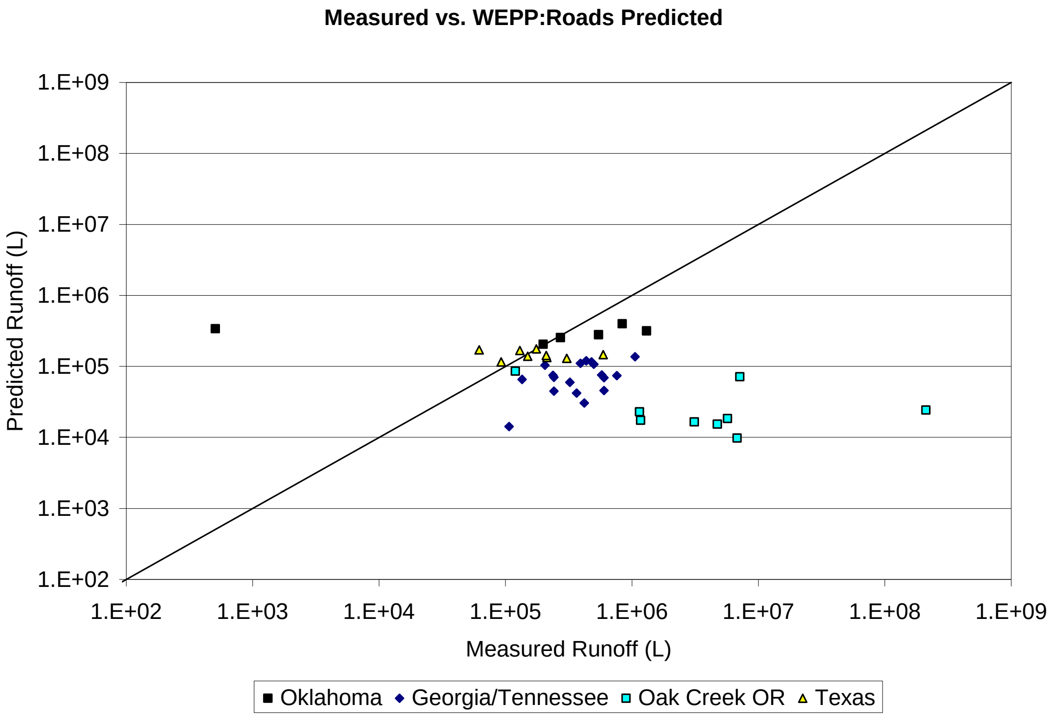
5.0 RESULTS

5.1 Runoff

The WEPP model (WEPP:Road, WEPP Windows-based watershed interfaces) was the only tested model that estimated road runoff. The WEPP:Road interface estimates average annual runoff; the hillslope and watershed interfaces can estimate average annual or storm-based runoff.

5.1.1 *Average Annual Runoff*

Runoff was modeled at the four study sites that included runoff measurements (Alto, TX; Ouachita Mountains, OK; Southern Appalachians, GA/TN; Oak Creek, OR). WEPP:Road estimates of average annual runoff were generally less than measured values for most of the sites (Figure 5.1), similar to results reported in previous studies. Model efficiencies were negative, indicating that the mean value of measured runoff is a better predictor of runoff than the modeled values (Table 5.1). While some of the negative efficiencies could result from poor estimates of the mean (e.g., from a poor estimate of precipitation or infiltration capacity), the model also showed nearly no relationship between modeled and observed runoff, with two sites (Oak Creek and Alto) actually showing negative relationships; that is, less observed runoff with greater predicted runoff.



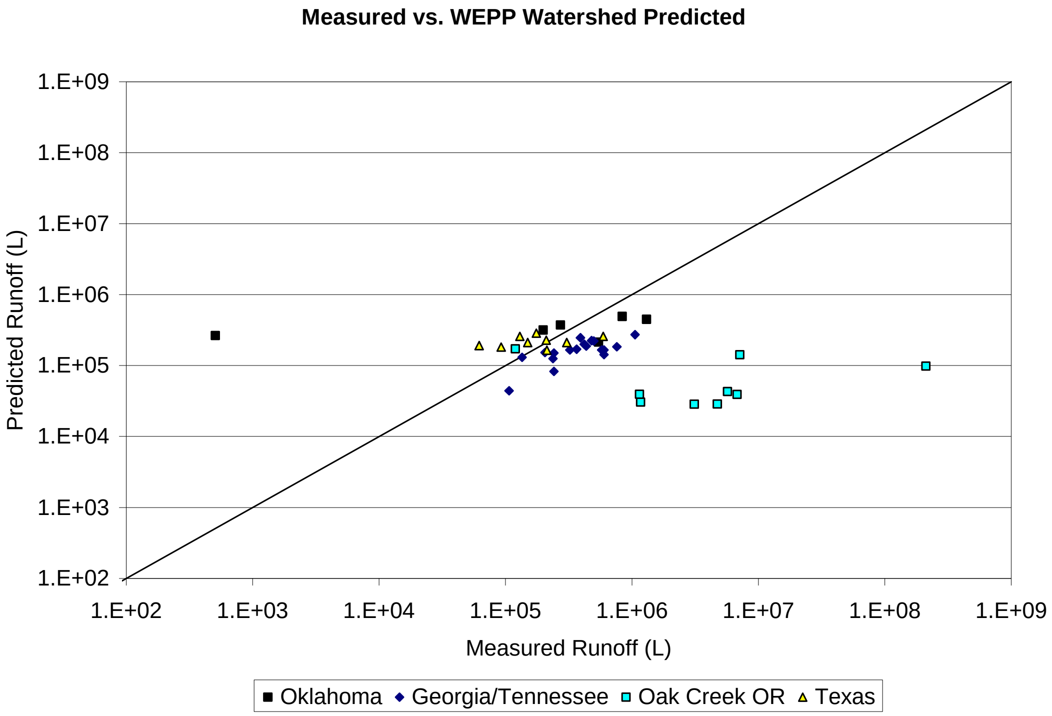


Figure 5.1 Measured vs. Predicted Average Annual Runoff

Table 5.1 Model Efficiency (Nash-Sutcliffe E) Statistics for Runoff Predictions

	WEPP:Road	WEPP Watershed	
Site	Average Annual	Average Annual	Storm
Oklahoma	-0.18	0.08	0.12-0.34[a]
Georgia/Tennessee	-2.2	-0.1	n/a
Oak Creek Oregon	-0.17	-0.17	n/a
Alto Texas	-0.26	0.1	0.57

[a] Analysis from Busteed 2004 and Peranich 2005.

The watershed option of the WEPP Windows interface was also run for these four study sites to predict average annual runoff. A site-specific climate file was generated within the WEPP model (Cligen Ver. 4.3) for each of the sites. The road treads and cutslopes were modeled as hillslopes draining to the ditch. The WEPP Watershed interface produced slightly closer agreement with measured values than the WEPP:Road interface for the Texas, Oklahoma, and Georgia/Tennessee sites (Figure 5.1 and Table 5.1) but still tended to under-predict runoff for the Oak Creek and Georgia/Tennessee sites. The small positive efficiencies for Oklahoma and Texas reflect a good estimate of the mean along with a very slight positive slope. The relationship was stronger for the Georgia/Tennessee data ($R^2 = 0.55$), but was negative for the Oak Creek data.

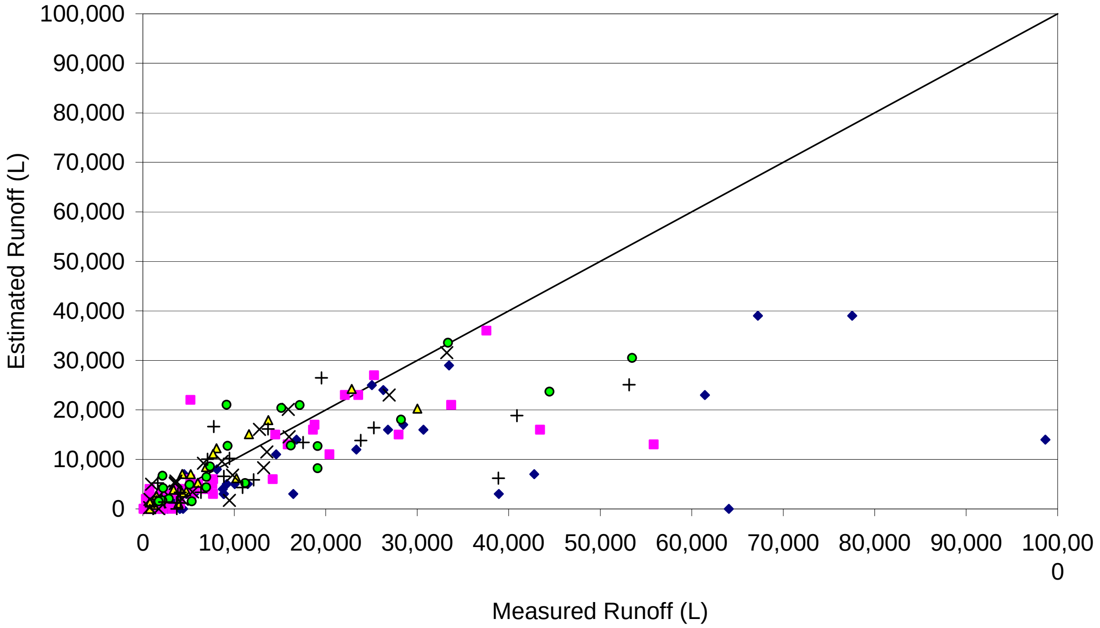
5.1.2 *Storm Runoff*

The WEPP Watershed interface was run using single-storm climate files for the Oklahoma segments and the Alto segments for each measured storm (Table 5.2). (Oklahoma segments were run and reported in Busteed 2004 and Peranich 2005). The storm-based estimates of runoff were generally better than the average annual estimates, with at least a positive trending relationship on most segments (Figure 5.2). The storm-based model tended to under-predict runoff from the largest storms, but did a better job with smaller storms.

Table 5.2. Total Storm-Based Runoff and Erosion Measured and Predicted by WEPP Watershed over Measurement Period (6 to 12 months)

	Runoff (L)		Erosion (kg)	
Segment	Measured	Predicted	Measured	Predicted
Oklahoma				
A	1,150,000	420,000	700	600
B	610,000	380,000	500	500
19th St NE	150,000	160,000	5,300	3,600
19th St NW	200,000	190,000	14,200	5,700
32nd St NE	320,000	260,000	6,900	2,300
32nd St NW	320,000	210,000	5,900	1,800
Texas				
1	100,000	185,500	60	430
2	50,000	141,700	30	440
3	140,000	198,200	90	790
4	150,000	144,900	410	550
5	70,000	130,600	210	370
6	170,000	122,900	120	290
7	120,000	152,000	150	340
8	470,000	177,600	230	590
9	170,000	161,200	50	460

Oklahoma



Alto Texas

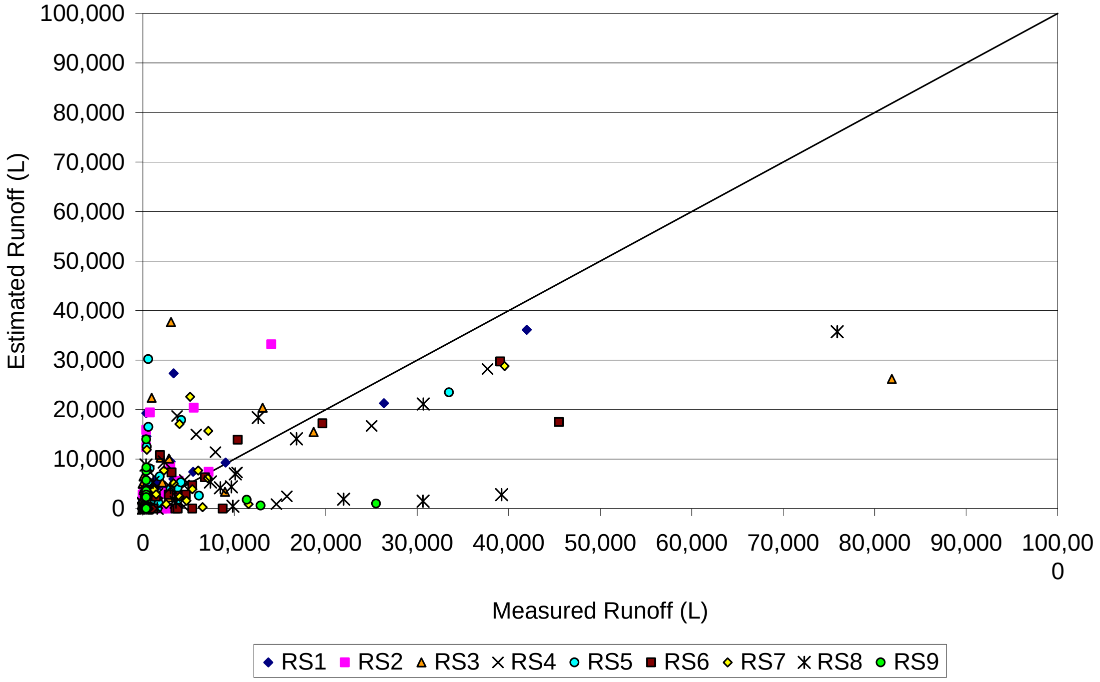


Figure 5.2 Measured vs. Predicted Storm Runoff
(Oklahoma data reported in Busteed 2004 and Peranich 2005)

5.1.3 *Sediment Yield*

Average annual sediment yield was modeled for each road segment. Storm-based yield was modeled using the WEPP for Windows watershed interface for the Alto and Oklahoma sites that reported storm-based erosion.

5.1.4 *Average Annual Erosion – Patterns between Sites and Segments*

Patterns of average annual erosion were tested across all sites (Tables 5.3 and 5.4, Figures 5.3 and 5.4). Inter-site comparisons revealed poor performance of the models in predicting the observed erosion at every segment (Figure 5.3). Table 5.3 reveals poor model efficiencies at most sites, which indicates that the model predictions are poorer than using the mean of the observation. Much of the issue is that the models do not predict differences between sites well and do a poor job of even estimating mean erosion at a site (Figure 5.4, Table 5.4).

While the primary image in Figure 5.3 shows the overall plot of points nearly horizontal and above the 1:1 line, there is some information to be seen by looking at individual studies. All three models show a horizontal pattern (no correlation) for the Montana data, which were collected at widely spaced segments across the state with different soils and weather. The large group of Oregon Coast Range plots also has some variability in weather and soils that was not captured well by the models. If it were even marginally captured, the groups of points highlighted by varying colors would array along the 1:1 line. Looking at the individual groups of points, there is some indication of slight positive trends within some of the groups, but clear mismatches in the means (the center of the points is not near the 1:1 line), which would speak to an inability to estimate the effects of differences in weather and soil between sites.

Table 5.3 Model Efficiency (Nash-Sutcliffe E) Statistics for Erosion Predictions across Sites

	SEDMODL2/ WARSEM	WEPP: Road	WEPP Watershed	
Site	Average Annual	Average Annual	Average Annual	Storm
Klamath Falls Oregon	-1.1	-1.7	-11	n/a
Coast Range Oregon				
Low Pass	-2.2	-4.6	-5.2	n/a
Wind Peak	-7.0	-65	-110	n/a
Sand Bar Gap	-0.16	-5.8	0.7	n/a
Oklahoma	-0.91	-0.13	-0.85	0.4-0.61[a]
Georgia/Tennessee	0.15	-0.02	-0.12	n/a
Montana	-35	0.44	-0.05	n/a
Oak Creek Oregon	-7040	-1030	-850	n/a
Alto Texas	-490	-32	-15	-18
Sierra Mts. CA	-3700	-73	-302	n/a

[a] Analysis from Busteed 2004 and Peranich 2005.

Table 5.4 Measured and Predicted Mean Normalized Erosion

	Mean Normalized Erosion (kg/m^2-slope)			
Site	Measured	SEDMODL2	WEPP: Roads	WEPP Watershed
Klamath Falls OR	0.01	0.03	0.04	0.07
Low Pass OR	0.08	0.18	0.22	0.27
Sand Bar Gap OR	0.08	0.06	0.21	0.10
Windy Peak OR	0.02	0.16	0.23	0.45
Oklahoma	1.20	0.17	0.55	0.60
GA/TN	0.34	0.21	0.22	0.21
Montana	0.07	0.47	0.04	0.04
Oak Creek OR	0.01	0.19	0.08	0.12
Alto TX	0.20	1.54	0.62	0.61
Sierras CA	0.08	0.40	0.06	0.16

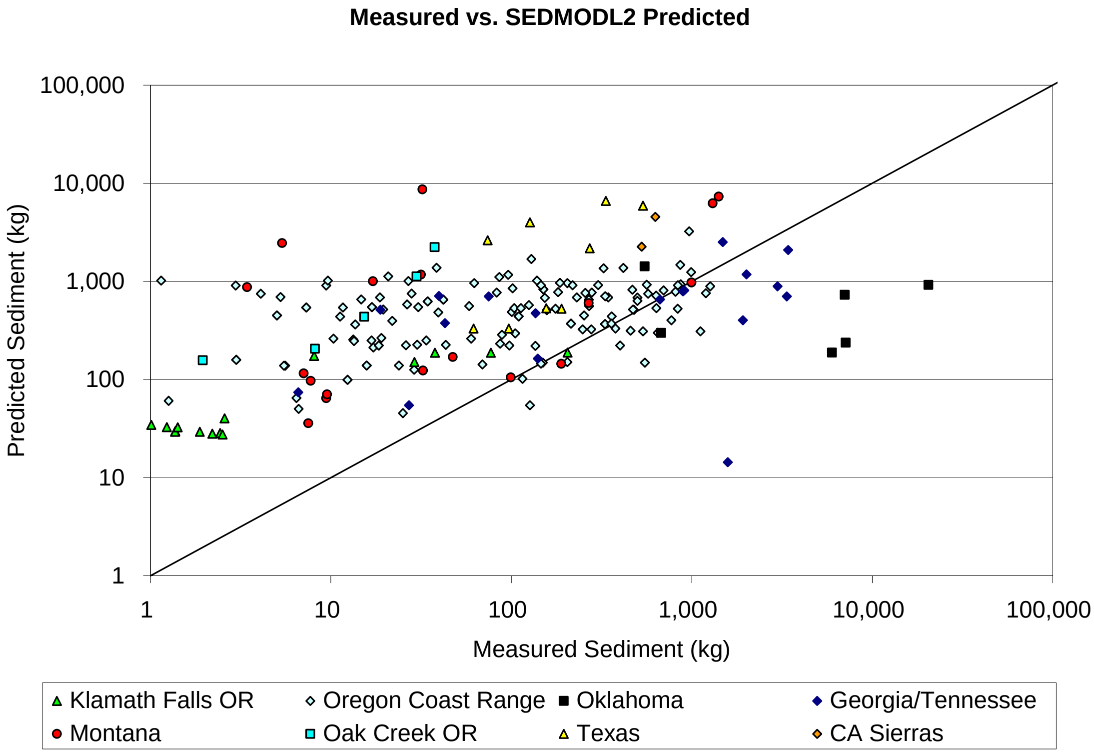


Figure 5.3 Measured vs. Predicted Average Annual Sediment Yield
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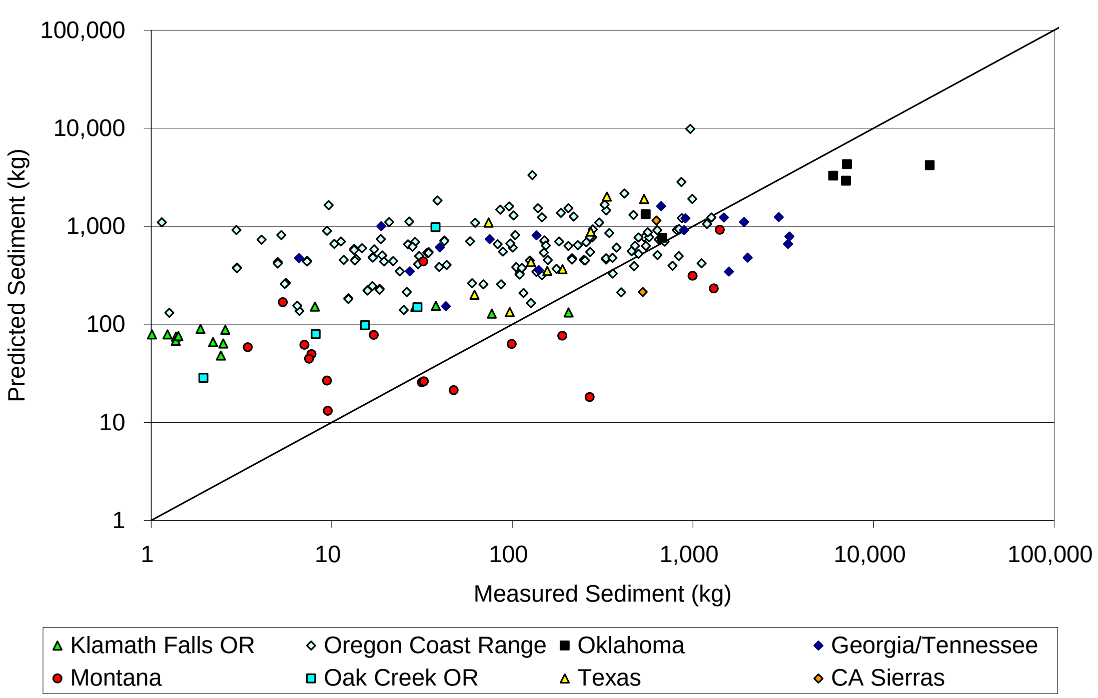

Measured vs. WEPP:Roads Predicted

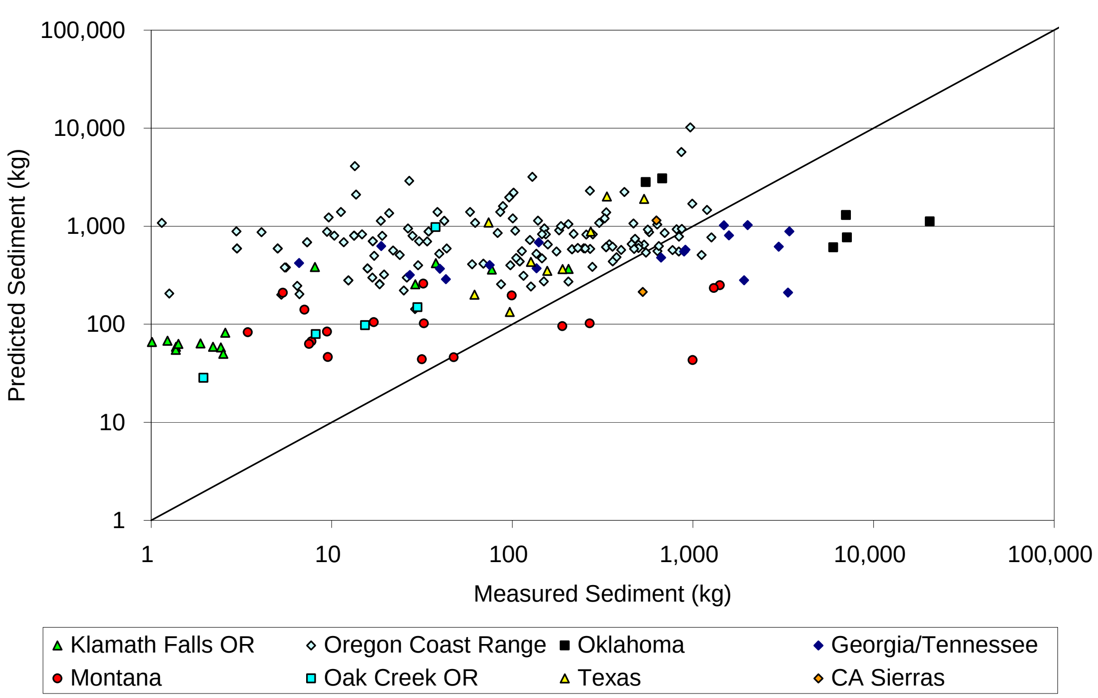

Measured vs. WEPP watershed Predicted

Figure 5.3 (continued) Measured vs. Predicted Average Annual Sediment Yield

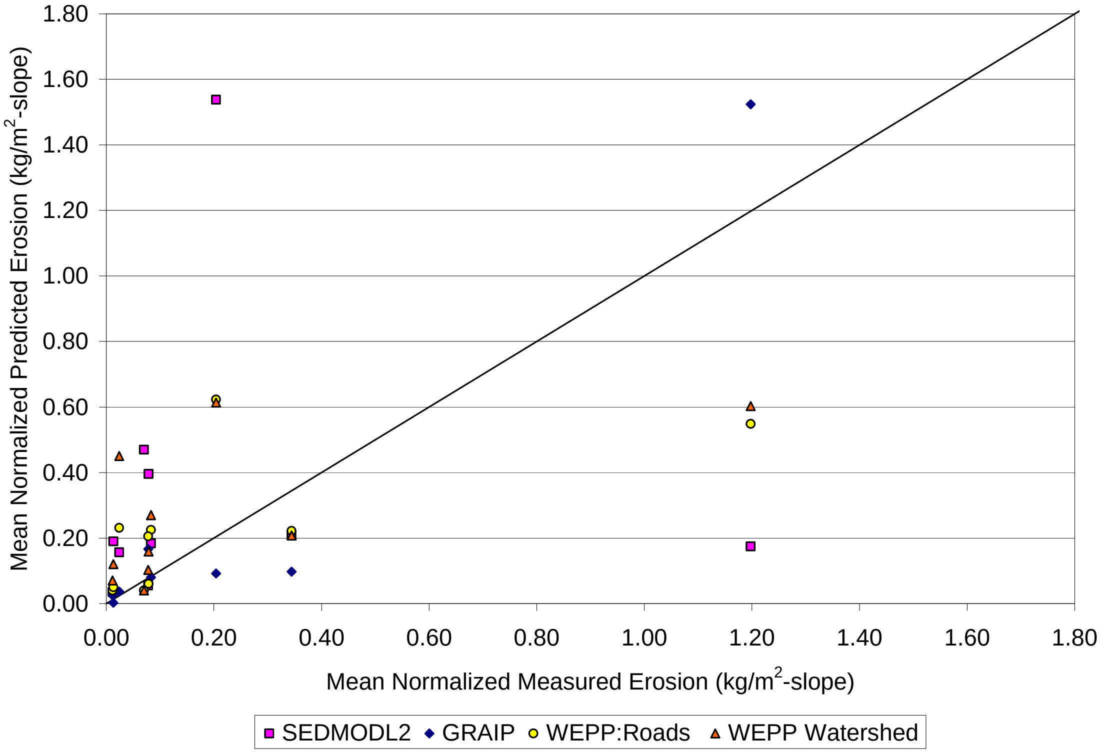


Figure 5.4 Measured and Predicted Mean Normalized Erosion at Each Study Site

5.1.5 *Average Annual Erosion – Patterns between Segments at a Site*

Another utility of erosion models is in being able to compare road segments in an area with similar climate and soil characteristics. Even if the mean value were missed for a site, the question would be how well do predictions trend with observations. Coefficient of determination (R^2) and slope values for each model at each site as determined from a power-law regression are shown in Table 5.5. The slope is the exponent in the power-law relationship. Figures 5.5 through 5.8 show the relationship between observed and predicted data at each site. Again, the location relative to the 1:1 line is not as important in this discussion as the slope and the coefficient of determination. A strong relationship suggests that the model gives a good indication of relative differences, and a slope close to 1 suggests a linear scaling between predictions and observations; that is, ratios of predictions are comparable to ratios of observations. Larger and lower values suggest non-linear behavior, which makes interpretations of ratios of sediment production difficult. For example, a project that is predicted to produce twice as much sediment could actually produce four times as much for a slope of 2. Negative slopes would be particularly problematic, implying an inverse relationship. Realistically, a model producing a negative relationship would not be informative.

GRAIP gave the best R^2 or was within 2% of the best R^2 at five sites. The only site for which it provided a poor relationship was Oklahoma, where two of the other models produced negative slopes. SEDMODL posted a similar pattern in R^2 values, and gave the best R^2 or was within 4% at four sites. WEPP:Road again gave a somewhat similar pattern, and gave the best R^2 or was within 1% at three sites, but it was substantially off the lead at the other three and gave the poorest relationship at one site. It was the only model that did well for the Oklahoma data. WEPP Watershed was within 3% of the best R^2 at one site, but produced the poorest relationship at five sites, if one interprets a strong negative relationship as a poor relationship.

GRAIP produced slopes consistently close to 1 except in Oklahoma and Texas, and had an average deviation from 1.0 of 0.24, with a median of 0.09. SEDMODL was the next best, with an average deviation of 0.56 and median 0.52. Both WEPP:Road and WEPP Watershed had average deviations of about 0.8 and medians of 0.44 and 0.57, respectively. The patterns in differences in slope were not similar between the two, however. Slopes less than 1 often show a greater range in predictions than the observations, and slopes greater than 1 are often the opposite.

All told, the analysis shows that SEDMODL and GRAIP, although empirical models, predict relative differences well. WEPP:Road had largely non-linear relationships with the observations, but gave only slightly poorer relationships. WEPP Watershed was the poorest on the basis of more non-linear relationships and poorer strength of relationship.

Table 5.5 Coefficient of Determination (R^2) and Slope for Power Law Relationships between Observed and Modeled Sediment Production

Site	SEDMODL	GRAIP	WEPP Road	WEPP Watershed
R^2				
Klamath Falls	0.84	0.82	0.6	0.81
Georgia/Tennessee	0.15	0.15	0.17	0.11
Low Pass	0.24	0.43	0.19	0.16
Oak Creek	0.83	0.87	0.74	0.35
Oklahoma	0.02	0.08	0.85	0.66
Texas	0.37	0.5	0.49	0.05
Slope				
Klamath Falls	1.8	0.88	3.6	1.79
Georgia/Tennessee	0.62	0.99	1.4	1.47
Low Pass	0.72	0.94	0.79	0.9
Oak Creek	0.96	0.94	0.79	1.04
Oklahoma	-0.24	0.46	1.91	-1.77
Texas	0.35	0.38	0.52	0.34

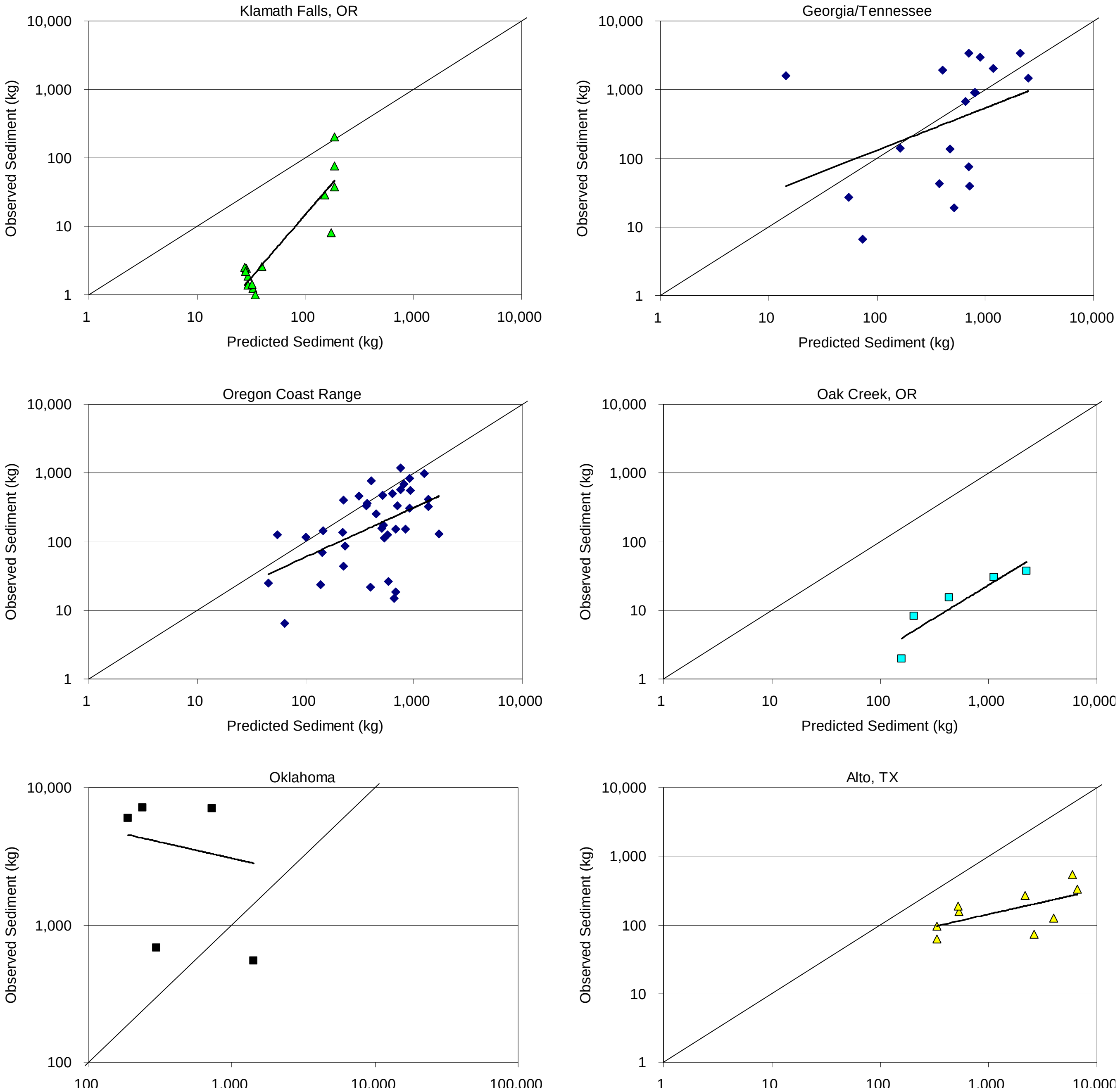


Figure 5.5 SEDMODL2 Predictions for Each Site

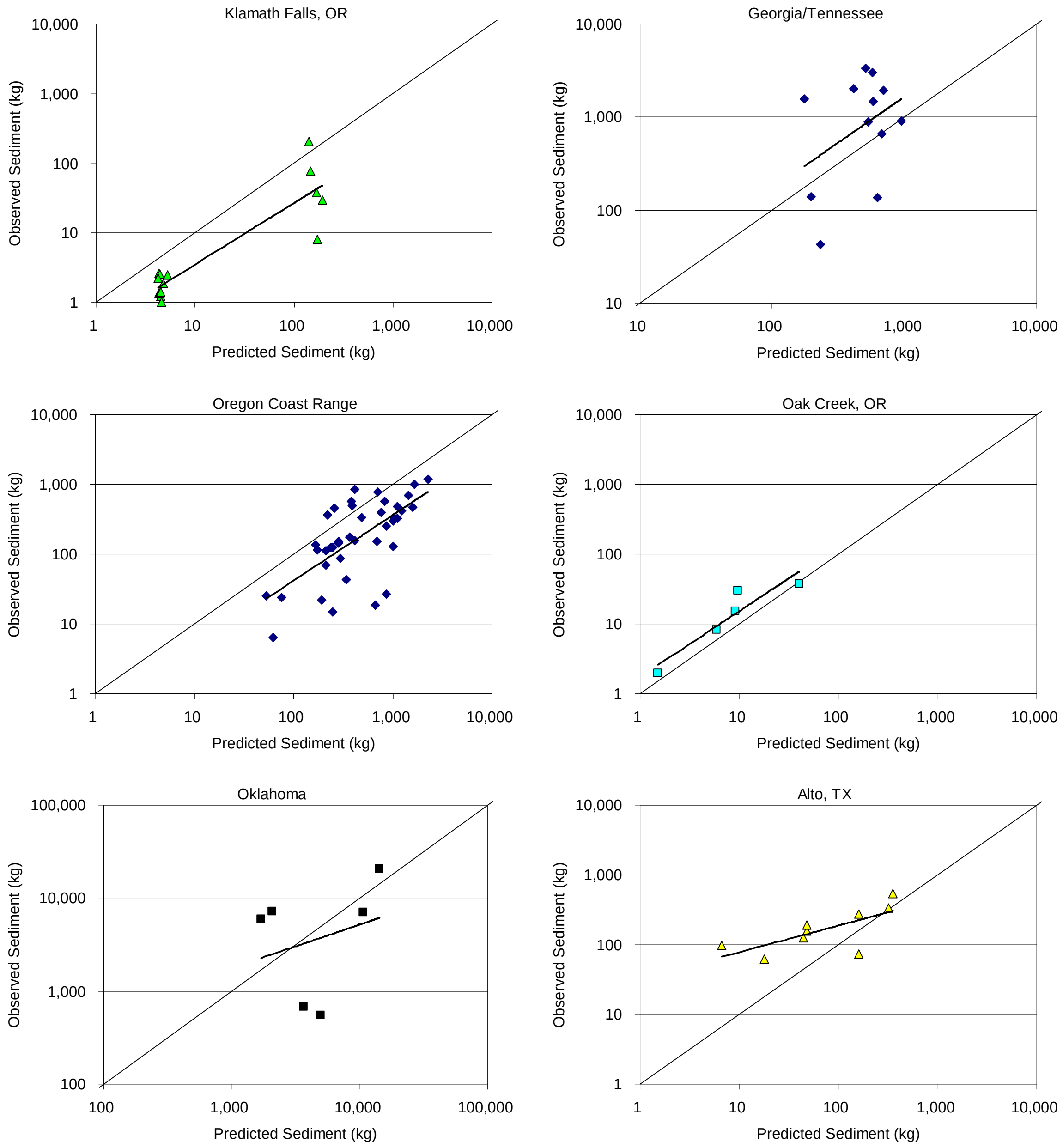


Figure 5.6 GRAIP Predictions for Each Site

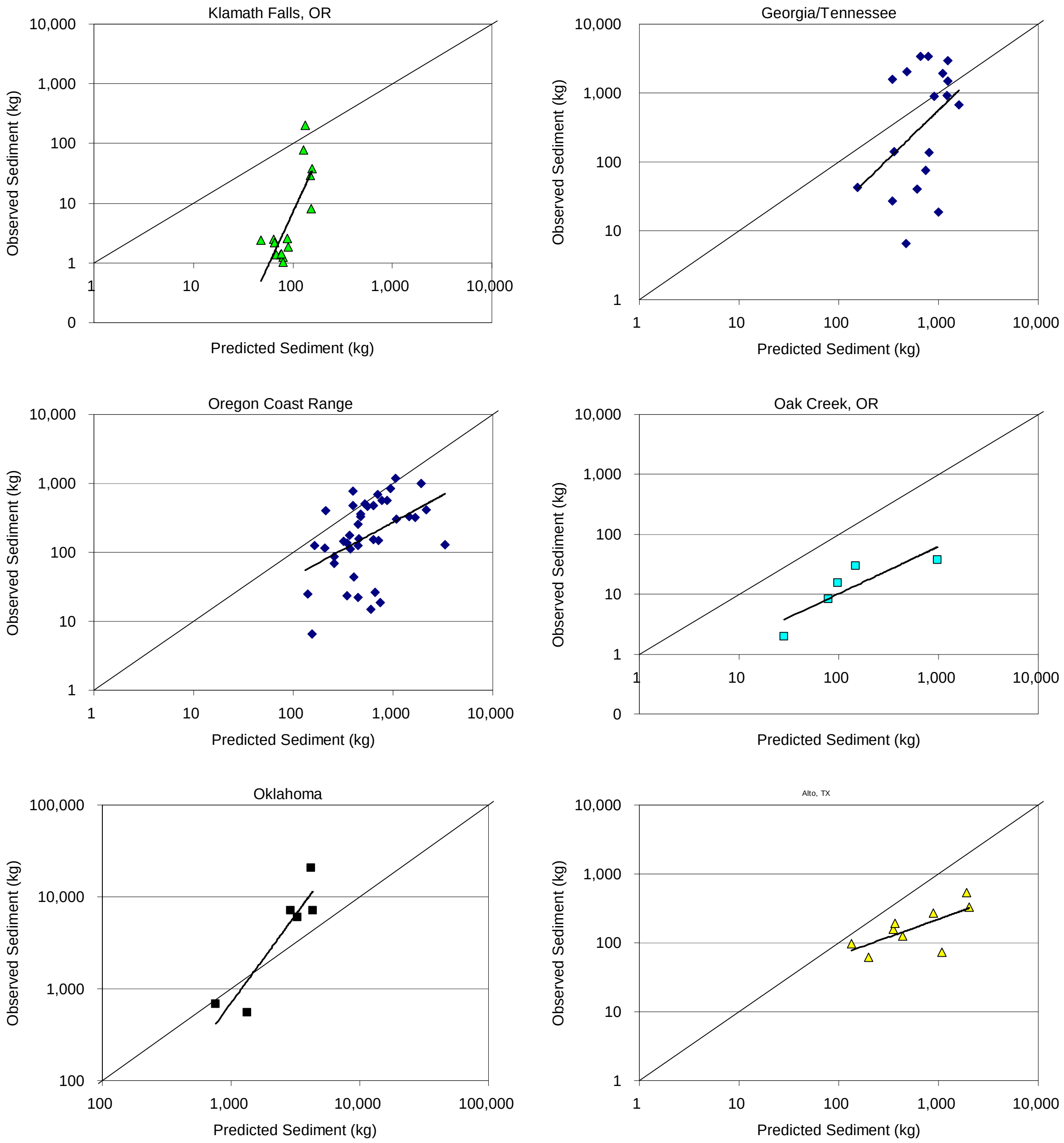


Figure 5.7 WEPP:Road Predictions for Each Site

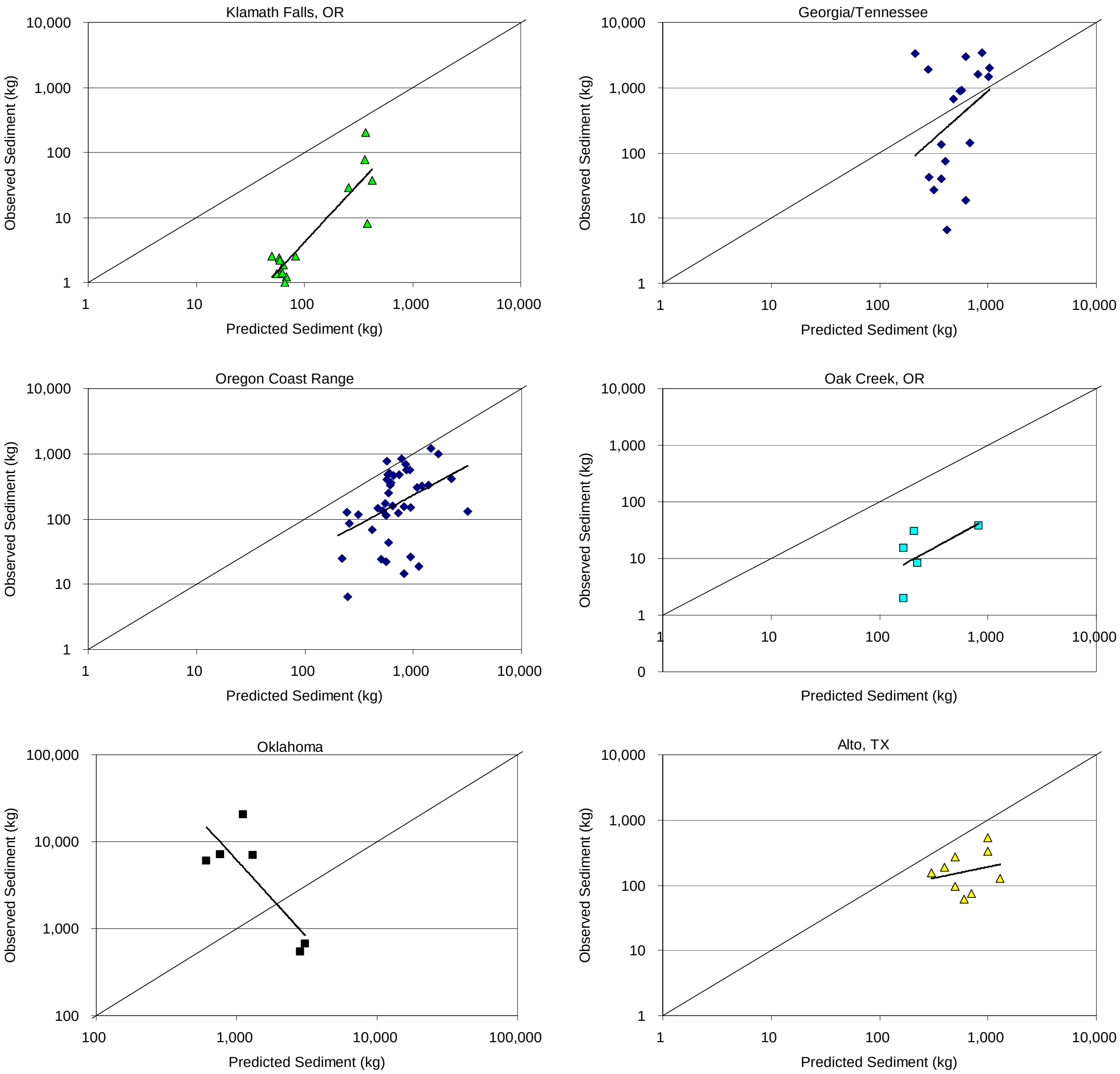


Figure 5.8 WEPP Watershed Predictions for Each Site

5.1.6 *Storm Erosion*

Storm-based sediment yields were modeled using the WEPP Windows watershed interface for each road segment at the Oklahoma and Alto sites. The model generally under-predicted erosion for the Oklahoma segments (which had high sediment yields) and over-predicted erosion for the lower-yield Alto segments (Figure 5.9). Model efficiency statistics indicated moderate performance for the Oklahoma site and poor performance for the Alto site (Table 5.3). Figure 5.9 reveals that while there is at least a positive relationship between what was measured and predicted for each storm on a particular segment in Oklahoma, there is no hint that the storm-to-storm variability is captured by the model for the Texas data. Peranich (2005) noted that increasing soil erodibility to simulate grading activity on the road segments in his study at two of the Oklahoma sites resulted in better agreement between measured and WEPP-modeled erosion. A detailed examination of storm-based runoff and erosion for the Alto site shows fair agreement between measured and WEPP Watershed-predicted runoff for most storms, but general over-prediction of erosion (Figure 5.10).

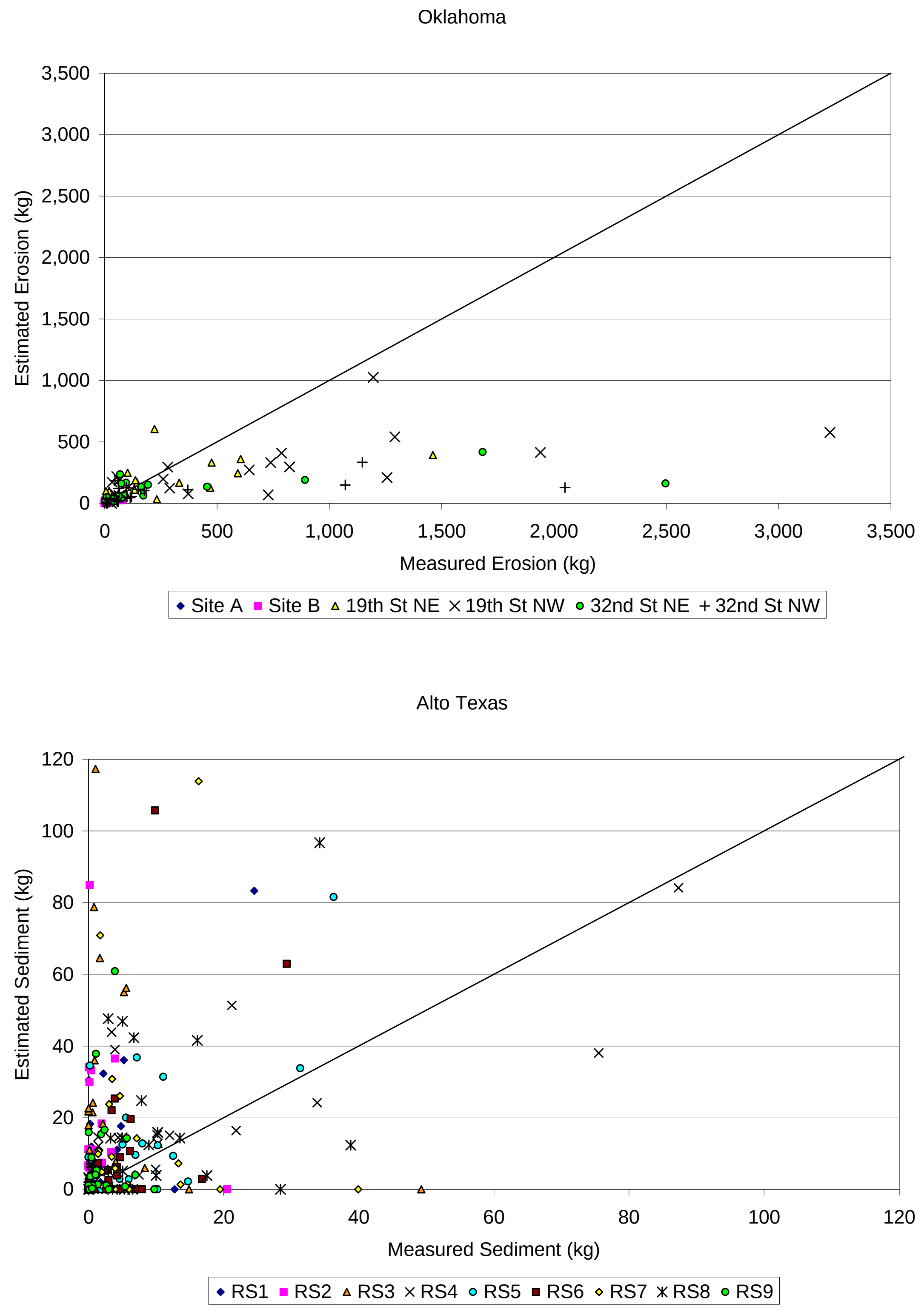


Figure 5.9 Measured vs. Predicted Storm Erosion for Oklahoma and Texas Road Segments (Oklahoma data reported in Busteed 2004 and Peranich 2005)

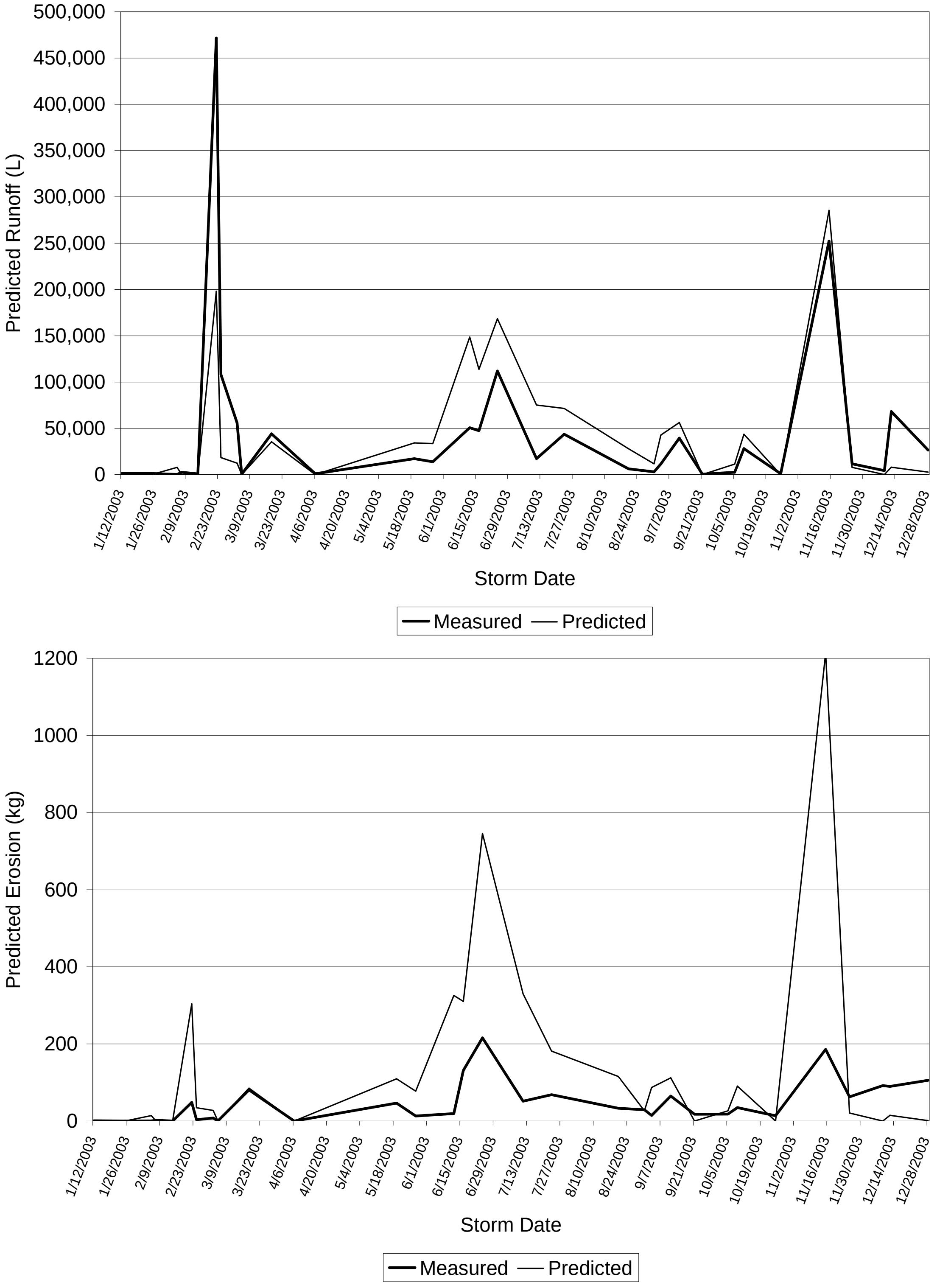


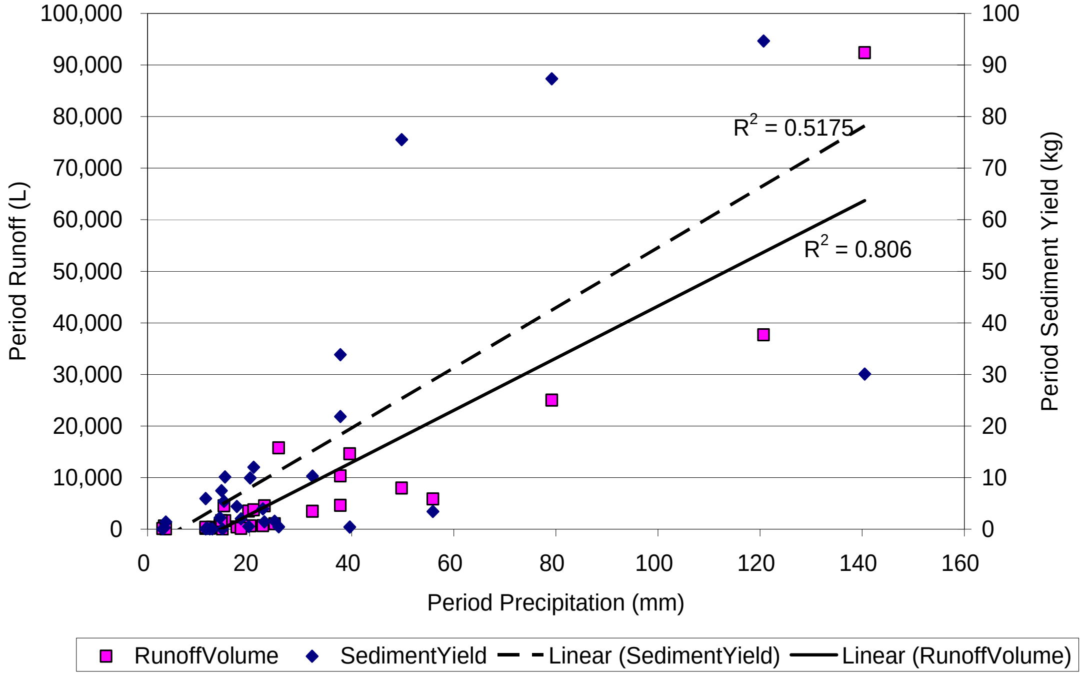
Figure 5.10 Measured vs. WEPP Watershed-Predicted Storm Runoff and Erosion for Alto Texas Site (sum of nine segments)

One possible cause of model over-prediction is that observations and measurements of erosion on roads indicate that disturbance of surfaces by traffic (particularly during rainfall events) or grading results in an increase in sediment available for erosion, and erosion rates increase. However, if the disturbance ceases or decreases due to reduced traffic or time since the last grading, the road, ditch, and cutslope surfaces relatively quickly become supply-limited systems and erosion rates decrease. This can be seen in the Alto data set. A comparison of precipitation with runoff and sediment yield for each storm shows relatively good positive correlation between precipitation and runoff as well as a fair positive correlation between precipitation and sediment yield for a road segment with a bare ditch and the highest traffic use (Figure 5.11, Segment 4). However, a road segment with a grassed ditch and low traffic levels has a fair positive correlation between precipitation and runoff and a poor negative correlation between precipitation and erosion (Figure 5.11, Segment 3).

Reid (1981) documented the effects of temporary reductions in traffic levels by sampling runoff from mainline roads that were heavily used for log haul during weekdays and not used during weekends. She found that erosion dropped to 13% of the heavy use rate during the weekends, even during rainfall events. Luce and Black (2001a) noted a 90% decrease in sediment concentrations within an hour of traffic cessation.

Road surface erosion models predict erosion based on input values that include precipitation, general road tread, cutslope, and ditch cover characteristics, and average traffic use values. These findings suggest that process-based models may need to track detailed disturbance timing and armoring trajectories relative to precipitation intensity variations, and that empirical models need to find an effective parameter describing the averaged effect of traffic in different seasons.

Alto Watershed Texas, Segment 4
11% gradient, rutted tread, bare ditch, highest traffic



Alto Watershed Texas, Segment 3
10% gradient, vegetated ditch, low traffic

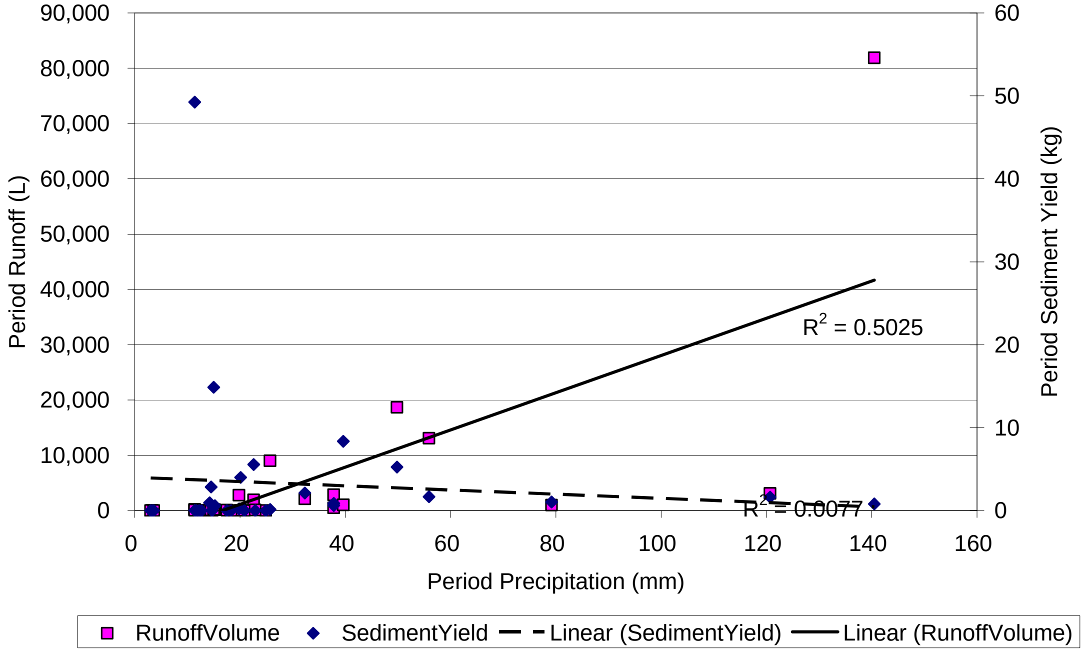


Figure 5.11 Single Storm Runoff and Erosion for Two Alto Texas Road Segments

5.2 Effects of Road Management and Maintenance Practices

Road managers often look to management or maintenance practices to reduce road erosion and sediment delivery to streams. Common practices that have been shown to reduce surface erosion include:

- changing road surfacing material to gravel or asphalt (Reid and Dunne 1984; Swift 1984b; Kochenderfer and Helvey 1987; Burroughs and King 1989; Foltz 1996)
- reducing traffic (Reid 1981; Sullivan and Duncan 1981; Reid and Dunne 1984; Foltz 1996; Luce and Black 2001a)
- reducing road segment length by installing culverts, drivable dips, waterbars, etc.
- re-grading to crown or outslope an insloped road
- reducing the frequency of cutslope or ditch grading to encourage vegetation growth (Burroughs and King 1989; Megahan et al. 1992; Luce and Black 1999, 2001a, 2001b; Megahan, Wilson, and Monsen 2001; Grace 2002)
- armoring or vegetating the cutslope or ditchline (Burroughs and King 1989; Luce and Black 2001b; Grace 2002)
- installing sediment traps in the ditchline or at the culvert outfall (Bilby, Sullivan, and Duncan 1989; NCASI 2000; Grace 2002)

All of the models allow users to evaluate the effects of reducing road segment lengths or tread shape by modifying the lengths or widths of the road surface being modeled. SEDMODL2/WARSEM, GRAIP, and WEPP:Road have the most easily understood choices for modeling different traffic and surfacing/cover differences (Table 5.6). WEPP’s hillslope and watershed interfaces provide virtually unlimited abilities to vary properties of the soil and management input files to simulate different management conditions. However, there are so many variables that can be changed and usually little data available on appropriate input values that it is not a simple task to determine appropriate changes to model particular management conditions.

Table 5.6 Modeling Differences in Road Management/Maintenance

Model	Surfacing	Traffic	Ditch/Cutslope Vegetation	Comments
SEDMODL2 WARSEM	User can choose asphalt, gravel, gravel with ruts, pitrun, native, native vegetated, or native with ruts	User can choose from six traffic categories ranging from heavy to no use	User can enter percent cutslope cover; does not calculate ditch erosion separately	User documentation details differences between various input choices
GRAIP	User can choose gravel/vegetated, native, or paved and specifies flowpath location and cover	Traffic effects not directly modeled, however flowpath changes by traffic affect flowpath vegetation cover; traffic can also be addressed by varying base rate	User can choose between bare or vegetated flowpath (ditch or wheel rut); cutslope not modeled	User documentation describes how to update parameter values to account for local data or specific processes
WEPP:Road	User can select native, gravel, or paved	User can select high, low, or no traffic	User can select bare or vegetated ditch; cutslope not modeled	User documentation of differences in input values is brief
WEPP Hillslope and Watershed interfaces	User can select pre-determined unsurfaced or gravel tread; also can customize soil file to account for gravel surface	Not specifically addressed; user can change soil erodibility or management file, but appropriate values not specified	User can select bare or vegetated ditch, and can alter vegetation cover in ditch or cutslope	User can vary many parameters in soil and management files, but determining appropriate values for these fields is not simple

5.2.1 *Surfacing*

The quality and type of road surfacing has been shown to affect sediment production. Addition of gravel, chipseal, or asphalt generally reduces sediment production from the road surface. Published research on the effects of road surfacing has been compiled by Burroughs and King (1989), with additional work by Swift (1984a), Kochenderfer and Helvey (1987), Foltz and Burroughs (1990), and Foltz (1996). The Klamath Falls data set in this report includes both native and gravel-surfaced roads (Table 5.7). Foltz and Truebe (2003) found that the quality of gravel surfacing had a large effect on both runoff and sediment production from road test plots. Runoff and erosion varied over two orders of magnitude between the lowest and highest quality gravel tested, and rutting was a major factor associated with increased erosion.

Table 5.7 Effects of Road Surfacing on Road Erosion

Reference	Road Condition	Results
Kochenderfer and Helvey (1987)	3″ clean gravel	10-13% of native road
Kochenderfer and Helvey (1987)	3″ crusher run gravel	13-16% of native road
Klamath Falls (herein)	gravel	2% of native road
Swift (1984a)	gravel	20% of native road
Burroughs and King (1989)	4″ gravel	22% of native road
Foltz (1996)	good gravel	13% of marginal gravel road
Foltz and Truebe (2003)	good gravel	34-80% of marginal gravel road
Burroughs and King (1989)	dust oil treated	15% of native road
Burroughs and King (1989)	bituminous surface	3.5% of native road
Reid and Dunne (1984)	asphalt	0.4% of gravel, heavily used road
Burroughs and King (1989)	rutted	200% of un-rutted road
Foltz and Burroughs (1990)	rutted	200-500% of un-rutted road
Swift (1984a)	grass	50% of native road

The GRAIP model has three surfacing categories associated with numerical factors that are used to predict erosion: crushed rock, gravel, cinder, vegetated = 1; native, dirt = 5; and paved = 0.2. SEDMODL has seven surfacing categories/factors: asphalt = 0.03; gravel = 0.2; gravel with ruts = 0.4; pitrun = 0.5; vegetated native = 0.5; native = 1; and native with ruts = 2.

The WEPP:Road model allows the user to select native, gravel, or asphalt road surfaces. The WEPP hillslope and watershed interfaces have sample input files for native and gravel road surfaces and the user can alter the soil input files to simulate other surfacing characteristics if appropriate input values are known. In the WEPP models, changes in surfacing are simulated by changing the rock content and hydraulic conductivity of the soil input file.

Klamath Falls, which included native and gravel road sections, was the only site in this study where it was possible to test the models' abilities to predict differences in surfacing. The data set included 10 road segments with aggregate surfacing and five native surfaced segments. The measured and modeled output for each of the road segments is shown in Figure 5.12. All models predicted more erosion from native surfaced roads than from gravel road segments. Measurements from the Klamath Falls segments showed that gravel surfaced roads produced 2% of the sediment of native surfaced roads. Ratios of predicted gravel:native roads for the models were: GRAIP 3%; SEDMODL 18%; WEPP:Road 54%; and WEPP Watershed 18%.

The 98% reduction in erosion from the gravel surfaced roads at the Klamath Falls site is a much greater reduction than reported in most studies (Table 5.7). The ratio of gravel:native road erosion in other studies ranged from 10 to 22%, closer to the ratios predicted by SEDMODL and WEPP Watershed. In part the difference in erosion is due to changes in drainage flow paths caused by differences in surfacing. The native surfaced roads in Klamath Falls had ruts that did not grow vegetation, whereas the surfaced roads had ditches with vegetation cover. The combined effects of these two processes drove the difference in sediment yields. Luce and Black (1999, 2001a, 2001b) found that changes in the traveled way rarely yielded as great an effect on sediment yield as changes in the primary down-road flow path (ditch or rut). There is a need for experimental data that show the effects of varying surfacing interacting with varying flowpath treatments.

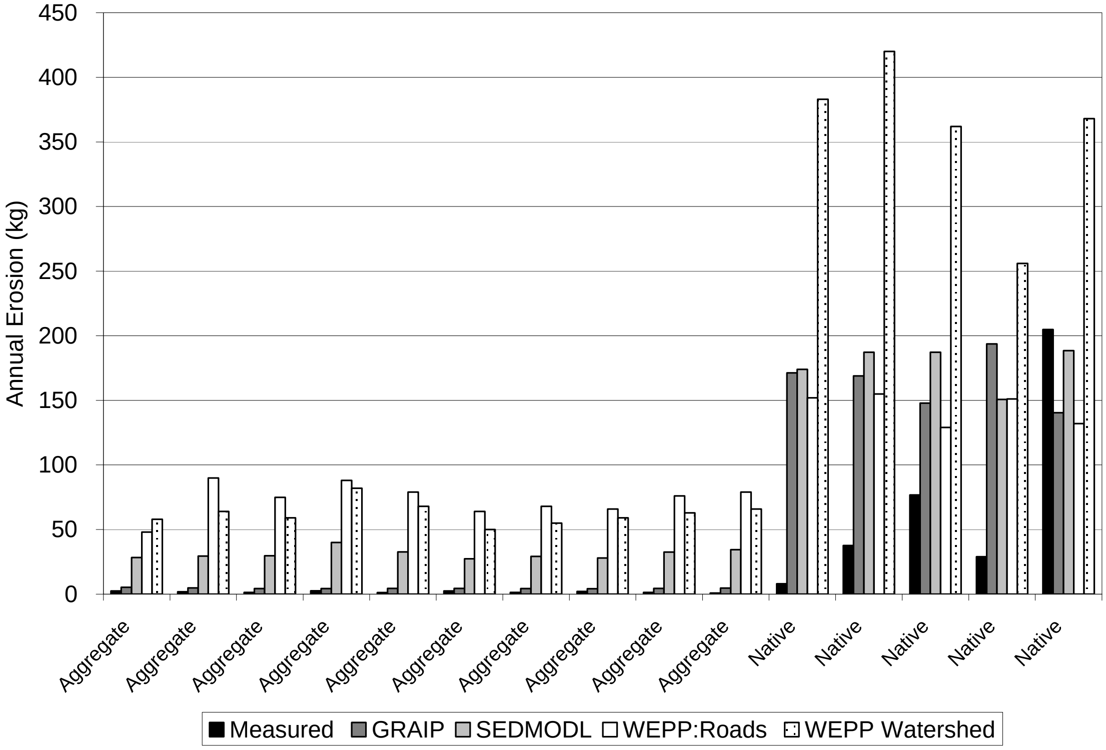


Figure 5.12 Measured and Modeled Erosion from Gravel and Native Klamath Falls Road Segments

5.2.2 *Disturbance: Traffic and Grading*

Traffic use or grading of a road can increase runoff and erosion by disturbing and breaking down the road surface. Traffic use can also create ruts in the road that concentrate water and increase erosion. When disturbance ceases, the surface of a roadway develops an armor layer of larger particles that are resistant to erosion as runoff removes smaller, more easily erodible particles. Traffic during precipitation or runoff events results in continuous disruption of the road surface with consequent high erosion rates. Traffic during dry weather breaks down the road surface into smaller particles that are carried away during the next runoff event, but if traffic is discontinued during wet weather the road surface quickly armors and limits further erosion.

Large-scale disturbances such as new road construction, road reshaping, and regrading of road tread, cutslope, and ditches have been shown to greatly increase erosion in the first two years following disturbance (Megahan and Kidd 1972; Dyrness 1975; Ketcheson, Megahan, and King 1999; Luce and Black 1999, 2001b). Increases in the first year ranged from five to twelve times the long-term erosion rate, and second year yields were one to two times the long-term rate.

There have been several studies of the effects of traffic levels on surface erosion in different parts of the country. Early studies noted large increases in suspended sediment loads leaving roadways that were actively used by truck traffic. Wald (1975) noted that roads used by log trucks generated 13 times more sediment than a control (no traffic). He also noted that runoff following grading of the road had 3.6 times as much sediment as runoff prior to grading. Wooldridge (1979) found increased sediment levels in streams below forest roads during work days with precipitation, but no increased levels of suspended sediment in the creek on the following weekend day (no traffic) despite heavier rainfall. Research by Reid (1981), Sullivan and Duncan (1981), Reid and Dunne (1984), and Foltz (1996) was specifically aimed at determining the effects of traffic on road erosion. Reid's work was done in the Clearwater River watershed on the Olympic Peninsula (average 3,886 mm of rain per year during study), on worn gravel roads underlain by Tertiary sedimentary rocks. Sullivan and Duncan's study area was the Deschutes and Chehalis River watersheds on gravel roads underlain by glacial outwash and basalt, respectively. Average annual precipitation is 1,295 mm in the Deschutes basin and 2,794 mm in the Chehalis basin. Traffic rates in the studies included heavy mainline roads (over four log trucks/day), moderate use (one to three trucks/day), light administrative use (less than one log truck plus pickup traffic), and abandoned/inactive (blocked) roads with no use. In addition, Reid collected data from heavily used roads during temporary non-use periods when log trucks were not running.

Three of the data sets from the current study provide data on the effects of different traffic levels. The Montana, Oregon Coast Range, and Alto sites included road segments with varying traffic use rates. Annual normalized erosion (kg/m^2) vs. average number of truck axles/day was plotted for the 20 road segments from the Montana study (Figure 5.13). Erosion generally increased with traffic levels, particularly at sites with three or more truck axles/day. The large variability is due to the study simultaneously varying multiple factors in addition to traffic, including grading, precipitation, soil, slope, and other site characteristics.

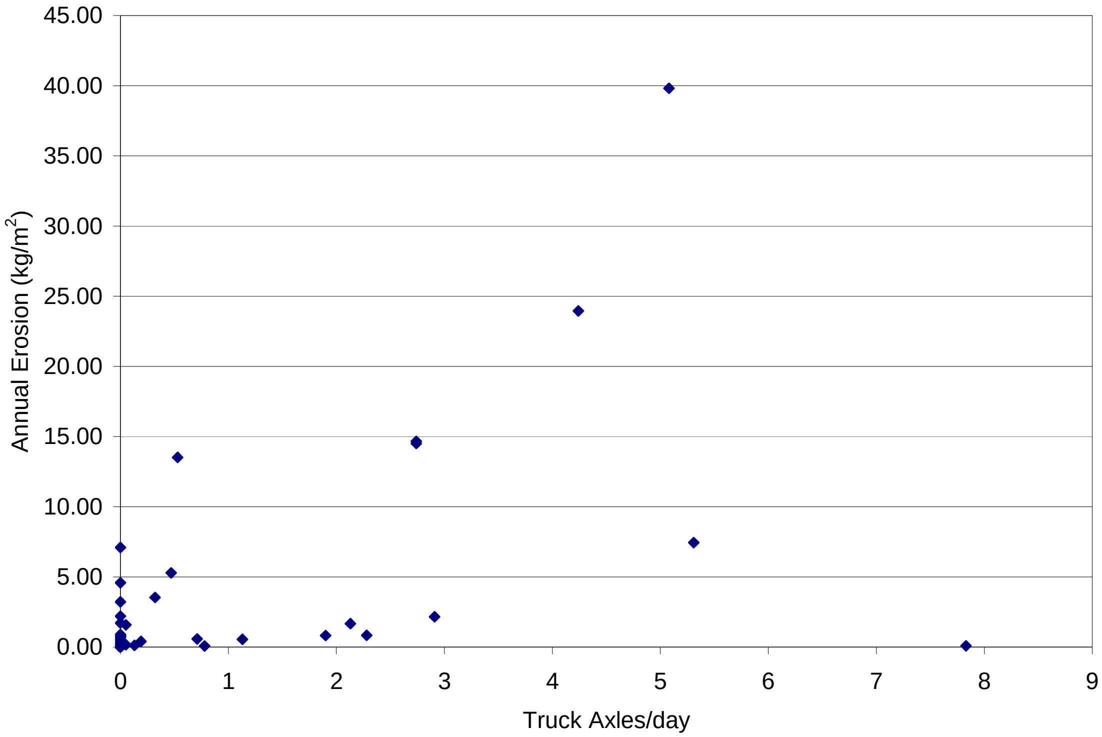


Figure 5.13 Annual Sediment Yield at Montana Sites vs. Average Truck Axles/Day

Because varying road gradient and surfacing introduced additional factors at the Alto site, total runoff and sediment yields from each of the nine sites were plotted separately (Figure 5.14). Runoff and erosion were higher for moderate and high traffic levels in each road gradient class compared to low traffic segments of similar gradient. Traffic use at this site produced ruts in the road segments with gradients over 10%, which probably contributed to higher erosion rates.

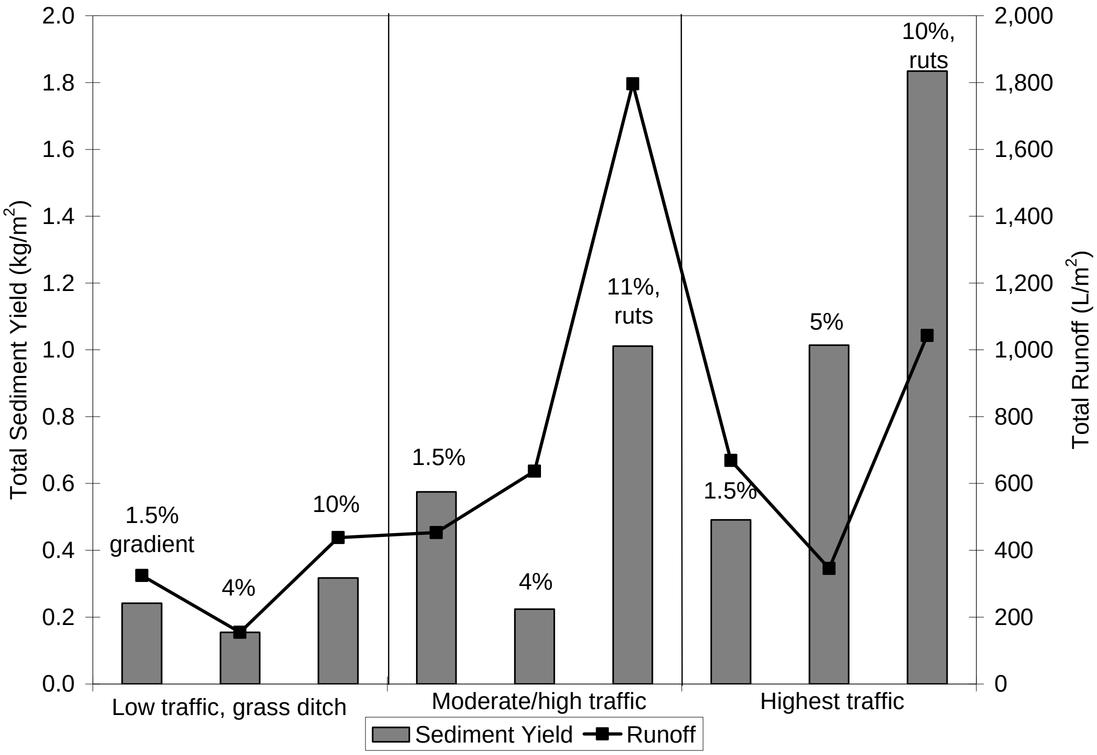


Figure 5.14 Annual Sediment Yield at Alto Texas Road Segments

Erosion rates from studies and sites reporting traffic differences were normalized to a light traffic rate of less than 1 load/day (Table 5.8). All studies showed increased erosion rates with increased traffic use. Variations in the rates of erosion between studies are probably caused by other factors such as gravel quality, as seen by the difference in erosion rates between the two surfacing types in the Foltz (1996) study (good quality gravel vs. pitrun marginal quality gravel).

The GRAIP model does not include a direct provision for different traffic levels; however, the effect can be modeled through a modified base rate for trafficked segments or by adding surfacing descriptions that describe an interaction between surfacing and traffic.

SEDMODL includes six traffic categories: heavy = 120; moderately heavy = 50; moderate = 10; light = 2; occasional = 1; and none = 0.1. It also includes a factor for new roads: roads 0 to 1 year old = 10; roads 1 to 2 years old = 2; and roads over 2 years old = 1.

The WEPP:Road model allows users to select between high, low, or no traffic use. The model reduces the rill erodibility value in the soil input file by 75% on low and no traffic roads and includes 50% vegetation cover in the management file of no use roads. Users can change soil and management values in the hillslope and watershed versions of WEPP for Windows to simulate traffic or grading if appropriate values are known.

Table 5.8 Relative Erosion from Roads with Different Traffic Use (normalized to light traffic)

Use Rate	Gravel[a]	Pitrun[a]	Worn Gravel[b]	Gravel[c]	Alto[d]	Ungraded Gravel[e]	Graded Gravel[e]	Montana[d]
Heavy (>4 loads/day)			125	46		21	1.14	
Mod. heavy (3-4 loads/day)	9	12						
Moderate (2 loads/day)	2	8	10		2-3			5
Light (<1 load/day)	1	1	1	1	1	1	1	1
Abandoned (inactive)			0.13					
Temporary non-use (weekend)			16					

[a] Foltz 1996.
[b] Reid and Dunne 1984.
[c] Sullivan and Duncan 1981.
[d] Native surface.
[e] Luce and Black 2001a.

To examine how SEDMODL and WEPP:Road predict the effects of traffic, the models were used to simulate higher (log truck traffic), low (administrative use), and no (blocked/vegetated) traffic levels on a 100 meter long, 5% gradient, insloped road with a gravel surface (tread and ditch) and a native surface (tread and ditch). Predicted erosion relative to a low traffic use is shown in Table 5.9. Both models predict relative increases in erosion with log truck traffic that are within the range measured. Under the conditions modeled, the WEPP model predicted higher than measured erosion on roads with no use.

Table 5.9 Relative Predicted Erosion with Traffic Use (normalized to light traffic)

Use Rate	Range of Measured Rates	SEDMODL Factors	WEPP:ROAD Predicted
Heavy (>4 loads/day)	46-125	50-120	n/a
Mod. heavy (3-4 loads/day)	9-12	10	n/a
Moderate (2 loads/day)	2-10	2	3.5
Light (<1 load/day)	1	1	1
Abandoned (inactive)	0.13	0.1	0.8

The interactions of major disturbances such as grading and traffic pose an interesting problem. While both grading and traffic are known to increase sediment yield, the combination of the two is not much greater than recent grading alone (Luce and Black 2001a). SEDMODL and WARSEM both use a multiplicative interaction, where the total effect is an age factor (based on time since grading) and a traffic factor. Luce and Black (2001a) suggested that such a model could dramatically over-predict the effects of the two practices in concert and under-predict the individual effect of grading absent traffic. An additive model or a compensating model that accounts for the effects of grading but only accounts for traffic effects if grading is not recent may be appropriate.

5.2.3 *Ditch/Cutslope Cover*

The amount of vegetation, rock cover, or armoring in road ditches and on cutslopes has an effect on whether or not the cutslope or ditch erodes. Cover in ditches and cutslopes can be disrupted by grading activities, resulting in short-term increases in erosion. Road managers can control the frequency of ditch and cutslope grading activities or take measures to add cover to ditches or cutslopes to reduce erosion. Luce and Black (1999) measured about seven times as much sediment from recently graded roads as from undisturbed roads. Within a year, the relative increase had dropped to a factor between two and three (Luce and Black 2001b). They examined situations where both the road tread (gravel) and ditch had been graded and where only the tread was graded (without disturbance of the ditch) and found no effect from grading only the road tread.

The GRAIP and WEPP models allow users to model bare and vegetated/rocked ditches. The GRAIP model has two choices for ditch cover, with associated model factors: ditch vegetation less than 25% = 1; and flow path vegetation over 25% = 0.14. The WEPP:Road and WEPP for Windows interfaces allow the user to select a bare ditch or a rocked/vegetated ditch. The rocked/vegetated ditch has a higher critical shear value in the soil input file, resulting in less erosion from the ditchline.

Research on the effects of cutslope cover on erosion rates is included in Burroughs and King (1989), Megahan et al. (1992), Megahan, Wilson, and Monsen (2001), and Grace (2002) and is compiled in Figure 5.15.

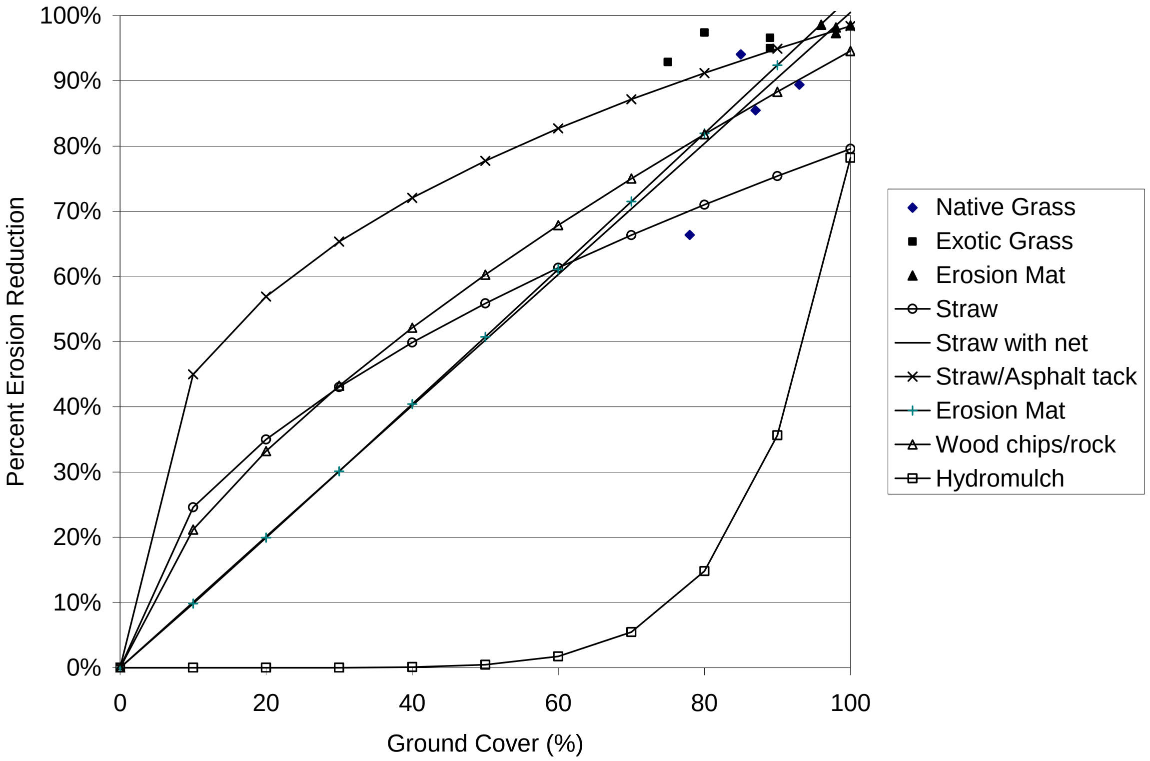


Figure 5.15 Erosion Reduction on Cutslopes with Varying Ground Cover
[data with lines from Burroughs and King 1989; data with solid points and no line from Grace 1999]

Cutslope cover can be modeled in SEDMODL and in the WEPP hillslope or watershed interfaces. Cover can be entered in 10% increments in SEDMODL and percent cover can be entered as part of the management file in WEPP for Windows.

6.0 DISCUSSION AND CONCLUSIONS

6.1 Model Performance

These model comparisons revealed information useful for model selection and use and important for defining future research objectives. There are two primary findings:

- None of the models predicted differences that might be attributed to variations in soil or climate well.
- The empirical models predicted differences between road segments at a given location better than the physically based models, although both types still showed substantial unexplained variance in some locations.

One important aspect of the first finding is that there was no indication that the physically based models performed any better than the empirical models for estimating differences between sites. WEPP uses soil texture as a predictor of runoff and erodibility. Because soils around forest roads are either altered by construction (road tread and ditch), from deep soil horizons (cutslope and ditch), or high in organic matter (upper cutslope), relationships derived for agricultural soils may be imprecise. In addition, such relationships can be complex and may depend not only on amount but geologic origin of clays (e.g., Burroughs, Luce, and Phillips 1992). Without calibration to a particular location (e.g., Luce and Cundy 1994), estimates of hydraulic conductivity based solely on soil texture may be in error.

It is not surprising that empirical models generally perform well for between-segment analyses, considering that these are the kinds of data from which they are usually developed. Plots of varying road characteristics are laid out within a relatively small area, providing control on soils and climate. The fact that some sites still have substantial unexplained variance while others were very well predicted suggests that some processes play out differently in different locations, and also serves as a reminder that there are road characteristics other than the ones that have been modeled that drive sediment production.

The physically based models estimated variations in annual runoff between and within sites poorly. The WEPP Watershed model run for individual storms produced slightly better results because the actual precipitation could be input; however, it estimated less variability in flows than was observed, predicting low flows during small storms, but also predicting low flows for the largest storms.

Evaluating the performance of models that predict “average” annual behavior by comparing them to observations that span from a few months to three years posed some challenges. Short-term records were annualized by the ratio of measured precipitation to average annual precipitation for each site. Some errors might be incorporated in this process because the effect of individual storms is not linearly related to the amount of precipitation. Most of these kinds of errors would relate to the position of a group of points using the same weather information relative to the 1:1 line, so could have substantial influence on the Nash-Sutcliffe score but little influence on the strength of the correlation and the slope between observed and measured. Because SEDMODL uses average annual precipitation as an input, the applied corrections fully compensate. Because WEPP’s road and watershed models use stochastic climate files, differences in intensity cannot be adjusted. However, results of the storm-based runoff analysis suggest that even perfect climate data would produce errors similar to those seen.

The primary implication for use of these models is that they are most appropriate for comparison in a relative sense unless calibration data are available. Because GRAIP requires calibration data for a particular site, it plots closer to the 1:1 line and has positive Nash-Sutcliffe scores for most sites. However, the kind of calibration performed does not affect the slope or R^2 value relating to within-site variability due to road slope or other factors. The other models have similar parameters that can be adjusted to move them closer to the 1:1 line while maintaining a similar relationship among the points. Methods for measurement of sediment data are robust and fairly inexpensive compared to mitigation treatments (see Black and Luce 2010 for specific methods). If regulations require accuracy and precision in modeling, calibration is a cost-effective solution.

A second implication for use is that selection of a model should tie primarily to the intended use, because there were not strong differences in predictive ability. If values for an individual segment or a few segments is needed, WEPP:Road is convenient. If distribution over a landscape and contributions to stream segments are needed, GIS based models such as SEDMODL or GRAIP would be more useful. GRAIP gives the best estimates of ratios in sediment production or delivery for evaluations of relative impacts.

Several research needs are highlighted in two areas: 1) improved prediction of inter-site variation driven by differences in soil and vegetation; and 2) improved prediction of interacting segment-scale design and operation. Improved inter-site predictions reduce the need for local calibration, and may refine just how “local” calibration needs to be. Ultimately, understanding the large-scale differences between sites as driven by variations in soil, geology, and climate is useful for transferring solutions found in one place to another and for designing effective road erosion treatments for the best cost, for example, applying climate and soil specific Best Management Practices. Improved prediction of interacting design/operation effects seems to be a continuing need. While there are many studies on the effects of varying individual treatments (e.g., surfacing or traffic), how combinations work is important to both modeling and treatment efficiency. For example, the results of Luce and Black (2001a) showing a tradeoff in effects of grading versus effects of traffic suggests that traffic regulation is only important when ditches have not been recently cleaned. Some example combination that might be priorities are surfacing x traffic, surfacing x traffic x maintenance, or cutslope height x surfacing. In the context of sediment limited or energy limited transport of materials, understanding these kinds of interactions are useful for either physically based or empirical models.

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Impact of flow regulation on stream morphology and habitat quality distribution

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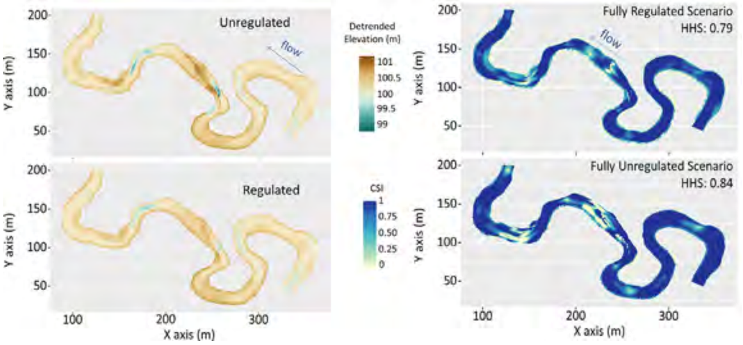
HIGHLIGHTS

- Regulated flows reduce amplitude and frequency of pools and bars.
- Regulated flows impact fish habitat by altering stream morphology.
- Hydrologic restoration can improve subdued topography in regulated rivers.

GRAPHICAL ABSTRACT

60 years of regulated flows formed a simpler and smother topography than that resulting from unregulated flows (left panels). The unregulated flows formed more complexy topography, with a 33 % increase in pool frequency, 92 % total pool volume and 43 % total bar volume compared to that of regulated flows. The combined effect of morphological changes and hydrology resulted in different spatial distributions of habitat suitability (CSI) and overall lower habitat quality (HHS).



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ABSTRACT

The importance of interactions among stream hydrology, morphology, and biology is well recognized in studies of stream ecosystems. However, when quantifying the impacts of altered flow on aquatic habitat, results are often based either on combined changes in topography and flow, or with altered flow over static topography. Here, we study the potential beneficial effects of restoring unregulated flows on salmonid habitat and separate the relative influences of changes in flow vs. topography. We hypothesize that flow restoration will increase topographic complexity and that the coevolution of topography with altered streamflow will produce stronger changes in habitat than predicted for static topography. We address this hypothesis by quantifying spawning and juvenile rearing habitat distributions for Chinook salmon (*Oncorhynchus tshawytscha*) from a set of quasi-three-dimensional hydromorphodynamic models for two morphologically distinct reaches along the Lemhi River, Idaho (USA): an engineered, straightened, plane-bed reach, and a less-altered, meandering, pool-riffle reach. Sediment transport was modeled with hydrographs predicted for actual interannual variability of flow and for a synthetic annual flow representing the ensemble actual hydrographs for 60 years of regulated and unregulated flows. The actual and synthetic hydrographs predicted from the model produced similar morphologic results, which implies that interannual flow variation and hydrograph order did not have a strong effect on the modeled topography. Unregulated hydrographs enhanced the geometry and frequency of pools in the meandering reach compared to regulated flows. These morphological changes did not increase habitat quality predicted

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from suitability indices, but the large growth of pools likely improved winter refugia for juvenile salmon. In the straight reach, both regulated and unregulated scenarios resulted in a plane-bed morphology, suggesting that flow restoration in highly altered reaches is not sufficient to improve ecological function.

1. Introduction

Human alterations of rivers have led to worldwide concern over degradation of aquatic ecosystems and the need for stream habitat enhancement (Geist and Hawkins, 2016). To aid in restoration design and site selection, quantifying aquatic habitat and the processes of habitat loss are critical to identifying potential impacts of restoration (Beechie et al., 2008; Roni et al., 2008). The natural flow regime, which represents the quantity, timing, and variability of flow, is a primary driver for physical habitat and ecological integrity in river ecosystems (Poff et al., 1997; Richter et al., 2003) and interruptions to functional flows can reduce physical and biological diversity (Hayes et al., 2018; Wohl, 2012). Flow regulation has been linked to an overall reduction in geomorphic complexity, decreases in channel area, and losses in river longitudinal and lateral connectivity (Brandt, 2000; Graf, 2006; Williams and Wolman, 1984). Reductions in flow have also decreased the number and area of high bars, increased channel stability and river straightening, and reduced competent flows for sediment transport (Church, 1995; Grant et al., 2003; Ligon et al., 1995). All of these geomorphic effects, coupled with reduced flows, have generated a decrease in fish abundance and habitat in human-altered rivers (Bunn and Arthington, 2002; García et al., 2011; Poff and Zimmerman, 2010). Therefore, in rivers with modified hydrographs, it is important to consider how channel morphology may adjust as the flow regime changes (Yarnell et al., 2015) because physical habitat, specifically depth, velocity, and bedforms, results from the interaction between hydrologic regimes, channel morphology, and hydraulics (Brierley and Fryirs, 2000; Pasternack and Brown, 2013).

Although the importance of river morphology to physical habitat, and specifically to salmon habitat, is known (Cram et al., 2017; Geist and Dauble, 1998; Hanrahan, 2007; Montgomery et al., 1999), habitat is often modeled in terms of altered flow over static topography (e.g., Bovee et al., 1998) or based on combined changes in topography and flow (e.g., García et al., 2011). As topographic data and morphodynamic modeling become more accessible, some studies have considered dynamic topography. Using repeat topographic surveys, Wheaton et al. (2009) monitored a restoration project after a spring flood event and found that areas of scour were associated with reduction in salmon spawning habitat and areas of deposition led to improved spawning habitat. Another study used a coupled hydraulic and sediment transport model to identify the unregulated flow conditions needed to scour fines and expose coarse spawning substrate for white sturgeon (McDonald et al., 2010). Despite these advances, results tend to focus on short-term changes (1-10 years), warranting additional studies that consider the long-term morphodynamics of a system and its influence on habitat (Kail et al., 2015), as well as separating the impacts of altered flow regime from morphological changes on habitat under future flow scenarios.

To study the effects of flow changes on topography, the hydrology in numerical modeling and laboratory flume studies has been characterized by either actual hydrographs depicting the full variability of a system or with representative repeated hydrographs to simplify calculations and to better constrain the impacts of specific hydrograph characteristics. Flume experiments have shown that increases in discharge variability, represented by multiple high flow hydrographs, increase channel width (Vargas-Luna et al., 2019), whereas variation in the order of hydrographs affects bedform morphology (Nelson et al., 2011). Duration and frequency of individual hydrographs can affect channel slope and topographic variability (Plumb et al., 2020), but conversely the shape and duration of repeated hydrographs may have little effect on channel characteristics such as slope and sediment transport rates (Nelson and Morgan, 2018; Wong and Parker, 2006). The effects of hydrograph characteristics vary in the literature and there is limited research directly comparing the morphologic impact of variable vs. cycled simplified hydrographs (Huthoff et al., 2010). Thus, work is needed to quantify differences between actual and synthetic hydrograph inputs on modeled geomorphic response and consequent aquatic habitat.

Altering flows in rivers also may have different effects depending on the existing morphology, which mediates the effectiveness of flow restoration strategies (Meitzen et al., 2013), highlighting the fact that the current morphologic condition of rivers must be considered when studying the potential effects of deregulated flows. For example, aquatic habitat in river reaches with more physical diversity, such as those with pools and riffles, is generally more resilient to changes in flow than habitat in plane-bed rivers (Hauer et al., 2012). Similarly, restoration of natural flow regimes may not be successful in cases where humans have confined channels through levees and other structures that alter the range of fluvial processes and channel morphologies compared to historic conditions (Wohl et al., 2015; Yarnell et al., 2015). Consequently, when assessing the potential effects of changing flow regimes, it is necessary to consider the range of existing morphologic conditions and how they may mediate the potential resulting topography because the interaction between morphology and flow regime impacts the temporal and spatial variability of local hydraulics with important ecological implications (Gostner et al., 2013, 2017, 2021).

In this study, to address the potential changes in physical habitat from alterations in both flow and morphology, we developed a set of morphodynamic models for two morphologically distinct reaches: (1) a straight, highly-altered reach and (2) a meandering, more-natural reach on the Lemhi River (central Idaho, USA). The Lemhi River is an ideal study area because flows have been regulated for decades by irrigation diversion throughout the system and the river supports anadromous fish species listed under the U.S. Endangered Species Act (NMFS, 2019). Our goal was to model the morphodynamic effects of regulated vs. unregulated flows on salmonid habitat and to separately understand the effects of altered hydraulics and morphology. We hypothesized that the current regulated riverbed morphology is subdued and that unregulated flows will increase topographic complexity and, through this altered morphology, improve the availability of suitable spawning habitat and juvenile overwintering habitat. We also tested the hypothesis that interannual hydrologic variability would affect the modeled morphodynamics; this was examined by comparing the results of predicted actual hydrographs (representing interannual variability) to cycled synthetic hydrographs (no interannual variability) for both regulated and unregulated flows. Improved understanding of geomorphic and hydraulic changes from flow deregulation, and the impact of these changes on salmonid habitat, could be used to help meet restoration goals through water management and dynamic channel response, as opposed to constructed habitat improvements, such as placement of wood debris or channel realignment.

2. Methods

2.1. Study area

The Lemhi River is a 100 km-long gravel-bedded river draining a 3300 km^2 basin before flowing into the Salmon River in Idaho, USA (Fig. 1). Like many streams in the western USA, it has a history of hydrologic regulation due to irrigation diversions that affect the magnitude and timing of flows throughout the year, but primarily cause reduced spring and summer flows. The entire river and its floodplain were mapped at 1 m resolution with the airborne topobathymetric LiDAR EAARL-B system in October 2013 during low flow and clearwater conditions (Tonina et al., 2019).

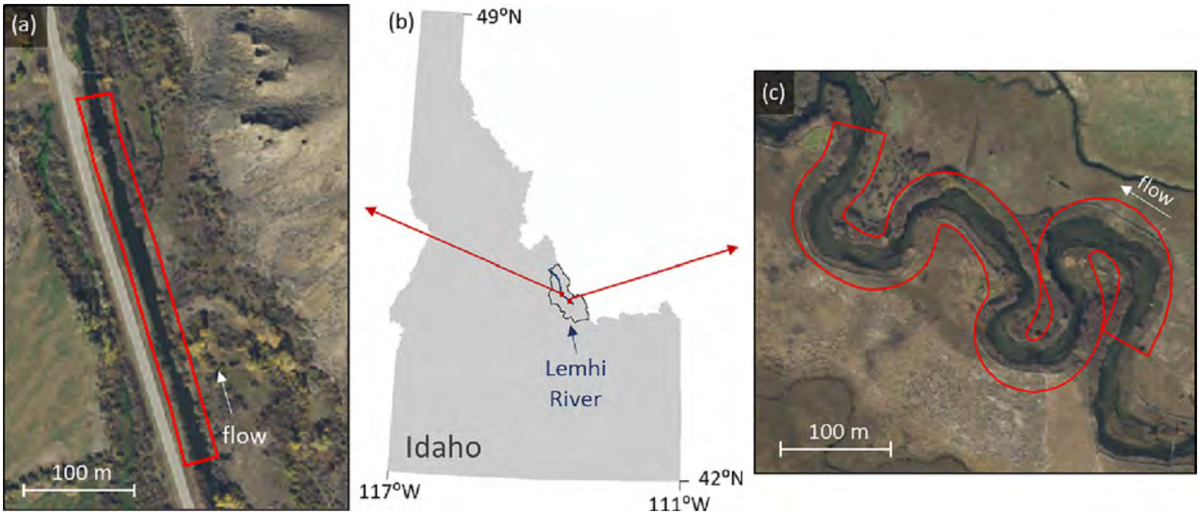

Fig. 1. Map of the modeling extent for the (a) straight and (c) meandering reaches and their locations within (b) the Lemhi watershed in Idaho (USA).

We selected two morphologically distinct reaches to encompass the degree of potential human alteration: an engineered straightened reach representative of the highly altered sections of river, and a less-altered, more natural and highly sinuous meandering reach (Fig. 1). The 350 m-long straight reach is channelized and flows along the highway with an average bankfull channel width of 14 m and a channel slope of 0.006 m/m. A surface median grain size (D_{50}) of 46 mm was measured in the reach during low flow in 2020 with (Wolman, 1954) pebble count, which was representative of the entire active area. The 650 m-long meandering reach, located ~20 km upstream of the straight reach, flows through a narrowed floodplain area confined by agricultural fields. This reach had a sinuosity of 2.8, average bankfull width of 15 m, and channel slope of 0.003 m/m. Due to limited access, a grain-size distribution was not available for this reach; instead, we used a D_{50} of 36 mm, which was measured with a Wolman pebble count in 2020 in a naturally meandering reach with a similar bankfull width, depth, and slope and was located 10 km downstream of our reach with no tributaries between the two reaches. We collected grains from subaerial and subaqueous topography, including bars, riffles, and pools during low flow when most of the channel was wadable.

2.2. Hydraulic modeling

We developed two reach-scale morphodynamic models using the Flow and Sediment Transport with Morphological Evolution of Channels (FaSTMECH) software developed by the U.S. Geological Survey and hosted by the International River Interface Cooperative (Nelson et al., 2016; Nelson et al., 2003). FaSTMECH is a quasi-steady, quasi-3D solver, that simulates sediment transport and channel bed evolution and efficiently handles long time scales. We input the 1 m resolution LiDAR point elevations into FaSTMECH and used template mapping, a curvilinear inverse distance interpolator, to interpolate the stream and floodplain topography. We selected model grid sizes for each reach based on preliminary testing for a resolution that created the most stable model. We used a 1 m by 0.4 m (downstream by cross-stream direction) and a 1.5 m by 1 m-averaged cell size for the curvilinear grid for the straight and meandering reaches, respectively. To create a stable downstream boundary in each model, we used a 10 m grid extension and forced no recirculation at the boundary. The upstream and downstream boundary conditions were set by the flow discharge and stage.

FaSTMECH requires characterization of the lateral eddy viscosity and a roughness value quantified by a drag coefficient, which remains constant for all discharges. The lateral eddy viscosity was quantified as $0.01uh$, where u and h are the reach-averaged flow velocity and water depth, respectively (Tonina and Jorde, 2013). The drag coefficient was selected to minimize the mean and standard deviation of the residuals between the measured and predicted water-surface elevations and velocities. In the straight reach, 15 measurements of depth and depth-averaged velocity were collected with an ADV (acoustic Doppler velocimeter) along the channel centerline during low flow conditions (~2.3 m^3/s). In the meandering reach, field measurements were limited; therefore, the drag coefficient was selected by comparing FaSTMECH hydraulics with 30 depths and velocities (at 1.5 m^3/s) extracted along the reach centerline from a larger whole-Lemhi River hydraulic model (Tonina et al., 2020). The whole-river model was calibrated with widely spaced depth and velocity field measurements, three of which were in our meandering reach and were used to validate the selection of the drag coefficient. In the straight reach, we selected a drag coefficient of 0.01, which resulted in a mean error of 0.01 m for the water-surface elevation and a standard deviation of 0.05 m. For velocity, the mean error was 0.13 m/s or 16 % of the mean relative error (mean of the residuals normalized by the measured velocity) and a standard deviation of 0.22 m/s or 29 % of the relative error. In the meandering reach, we selected a spatially constant drag coefficient of 0.015, which resulted in a water-surface mean error of −0.02 m and a standard deviation of 0.08 m, and a velocity mean error of 0.03 m/s or 10 % of the relative error and a standard deviation of 0.10 m/s or 21 % of the relative error. These errors are similar to those reported in the literature for similar river systems (Kammel et al., 2016; Tonina and Jorde, 2013).

2.3. Morphodynamic modeling

To simulate bedload transport, we selected the Yalin (1963) single-grain-size equation based on D_{50}, similar to Nelson et al., 2015b who found that this equation produced similar bars compared to a mixed grain-size model. This allowed faster and more reliable convergence of the numerical solution than using a multi-size bedload transport equation. For each model, we allowed the flow to develop fully before calculating sediment transport by setting sediment transport to begin 60 m (about 4 bankfull channel widths) downstream of the upstream model boundary. Due to a lack of bedload transport data for the reaches, we assumed that the sediment input at the transect where sediment transport begins was equal to the calculated transport rate at that location (e.g., Nelson et al., 2015b). As the streambed evolved, the local flow depth changed, not only as a function of discharge, but also from erosion and depositional processes. These changes affect the numerical stability of the model if they occur too suddenly. Thus, we ran the models with an initial time step of 8640 s (1/10 of a day) that was adjusted with the automatic time stepping option to limit change in water depth for each cell to 2 % of the previous time step.

After preliminary model runs, we found that the shear stresses on the bed were likely overpredicted because they resulted in sediment transport at low flows when no transport had been visually observed at the field sites and they created instabilities in the models at high flows. To reduce the shear stress, we used shear stress partitioning to determine the stress acting on the particles as opposed to that borne by topographic roughness of the bed and banks (e.g., Yager et al., 2012). For a channel composed of grain and bedform roughness, the ratio of the grain shear stress (τ') to the total shear stress (τ_0) can be determined from the following equation developed for dune-like bedforms (Bennett, 1995; Nelson et al., 1993; Smith and McLean, 1977)

$$\frac{\tau'}{\tau_0} = \frac{1}{1 + \frac{C_d}{2\kappa^2}\frac{\Delta}{\lambda}\left(\ln\left(\frac{0.368\Delta}{z_0}\right)\right)^2}, \tag{1}$$

where C_d is the bedform drag coefficient with a value of 0.2 for separated flow, κ is von Karman's constant with a value of 0.4, Δ is the height of the bedform, λ is the bedform wavelength, and z_0 is the gain-size roughness height calculated as $0.2D_{50}$. No actual dune-like bedforms were present in these reaches, but we found that a bedform height of 0.1 m and wavelength of 0.8 m produced the minimum reduction in shear stress (~13 % reduction in the straight reach and ~17 % in the meandering reach) needed for the regulated flows (see next section) to maintain pools that were of similar depths to those initially in the reaches which, in turn, improved model stability at high flows. The partitioning likely accounted for small-scale topographic variations in the bed that were smaller than those captured by the LiDAR survey and discretized by the numerical mesh. The impact of gravitational forces due to cross-stream topographic slope, e.g., bar and pool slopes, on transverse bedload transport is parameterized in FaSTMECH with a user-defined gravitational correction based on either a pseudo-stress or a slope correction. We adopted the slope correction option and ran a set of preliminary simulations with correction values ranging between 1.2 and 2 (Nelson et al., 2015a). Results showed that increasing the slope correction value produced more subdued topographical features, e.g., less deep pools and lower bars (Nelson et al., 2015a). We selected a constant value of 1.4 because it correctly simulated bed topography, i.e., pool sizes and pool slopes, observed in the field for regulated flow conditions.

2.4. Hydrology

We represented the hydrology with regulated and unregulated flow scenarios from a basin-wide hydrologic model, the Lemhi River Basin Model (LRBM), which was developed to evaluate diversion operations and tributary reconnections in the Lemhi River basin. The LRBM simulates daily water allocation and in-stream discharge in the system from October 1, 2007, to September 30, 2017, by accounting for: catchment inflows; routing of water within the stream network; and diversion operation, consumption, and return flows from irrigation. The LRBM was built using the DHI MIKE BASIN software (DHI, 2003, 2006) and included lumped rainfall-runoff models (Nedbør-Afstrømnings) to predict inflow to the system, and a water allocation model to route water in the stream network and account for agricultural water use. The stream network in the LRBM was determined from the national hydrography dataset, with delineation of catchments based on a 30 m digital elevation model (DEM) (DHI, 2006). The agricultural irrigation network, represented by 322 water user nodes, was constructed from known points of diversion, places of use, aerial photography, and consultation from local water authorities and stakeholders. Historic diversion records or full water rights were used for water demand, and consumptive rates were determined by crop coefficients and reference evapotranspiration records reported by ETIdaho (Allen and Robison, 2017). The unregulated flow regime was reconstructed from the regulated flow regime and historical water use information. Further details of the LRBM can be found elsewhere (DHI, 2006).

We ran each reach-scale morphodynamic model for 60 years to ensure that the models had enough time to reach dynamic equilibrium (defined as volumes of aggradation and degradation varying around a quasi-steady mean) and to model the long-term effects of the flow scenarios. To create our 60-year hydrograph inputs for the morphodynamic models, we used a 10-year LRBM simulation and repeated this sequence of flows six times for the regulated and unregulated flow scenarios (Fig. 2). Hydrographs were available for the straight reach, but not for the meandering reach. Instead, we used the hydrograph of the reference reach used to quantify the D_{50} of our meandering reach. No tributaries that would affect the magnitude of the hydrographs existed between the two meandering reaches; therefore, we used the available reference meandering reach hydrographs as a proxy for our reach even though some differences may exist from diversions. We define the hydrographs predicted from the LRBM as "actual" hydrographs to differentiate them from a set of synthetic annual hydrographs (see below). Comparison of duration curves for actual hydrographs in the straight reach showed a 45 % mean increase in flow for unregulated conditions compared to regulated flows. Unregulated flow also increased the base flow (90 % exceedance probability) by 106 %, the median flow by 22 %, the high flow (10 % exceedance probability) by 36 %, and flow variance by 30 % (Figs. S2a and b). In the meandering reach, the actual unregulated flow regime increased the mean flow by 60 %, base flow by 87 %, median flow by 22 %, high flow by 38 %, and flow variance by 24 %.

We ran each of our morphodynamic models with both actual hydrographs and a cycled, synthetic, annual hydrograph for both regulated and unregulated flows (Fig. 2). The topography resulting from the 60-year simulation of regulated flows was used as a reference for comparison with the other scenarios examined in the study. We also compared the results of the 60-year simulation of regulated flows with current topography to ensure that the numerical model properly predicts the observed streambed topography that has resulted from historic flow regulation. The actual hydrographs were used to represent interannual natural variability of flows, while the synthetic hydrographs represented the ensemble probability of flows that occurred within the 10 years of LRBM simulations and were repeated annually. We used these synthetic hydrographs to understand if the variability and sequence of annual flows affected the resulting topography. To create the synthetic annual hydrograph, we calculated the probability of all 10 years of daily flows and then subsampled probabilities, selecting a low flow at 97.5 % probability, then flows representing 5 % increments of probability from 95 % to 10 % exceedance. High flows were sampled with increasing frequency to accurately capture their occurrence down to the smallest probability of 0.027 %, which represents 0.1 day or the timestep of our model (for values see Supplementary Information). The shape of the synthetic hydrograph was based on a time-averaged (over 10 years) hydrograph for each of the actual regulated and unregulated scenarios. We shifted each of the 10 actual hydrographs in the series such that each annual peak flow occurred on the same day of the water year and then calculated the average daily flow over the 10 years. We used the shape of the averaged hydrograph for each scenario to create the synthetic hydrographs by arranging the subsampled flows into the same order of flows as the average hydrograph (see Supplementary Information). For each reach, a synthetic annual hydrograph was created for regulated and unregulated conditions and each synthetic hydrograph was repeated 60 times to create the full synthetic hydrograph time series.

2.5. Topographic analysis

For each reach, the models were run for 60 years of regulated and unregulated scenarios with both the actual and synthetic hydrographs for a total of four scenarios per reach. For each model scenario, we saved the stream topography at the end of each year and calculated the difference between each successive year's topographies to calculate the annual reach volumes of aggradation and degradation. We compared the final topography after 60 years among the scenarios by calculating the DEM of difference (DOD). To visualize all of the topographic data, we detrended the bed elevations by removing the reach slope from the topography and vertically translated the data by 100 m to create only positive detrended elevations.

We also extracted thalweg profiles through the final, 60-year topography of each model scenario. From these thalwegs, we identified pools by their residual depths, calculated as the difference between the deepest

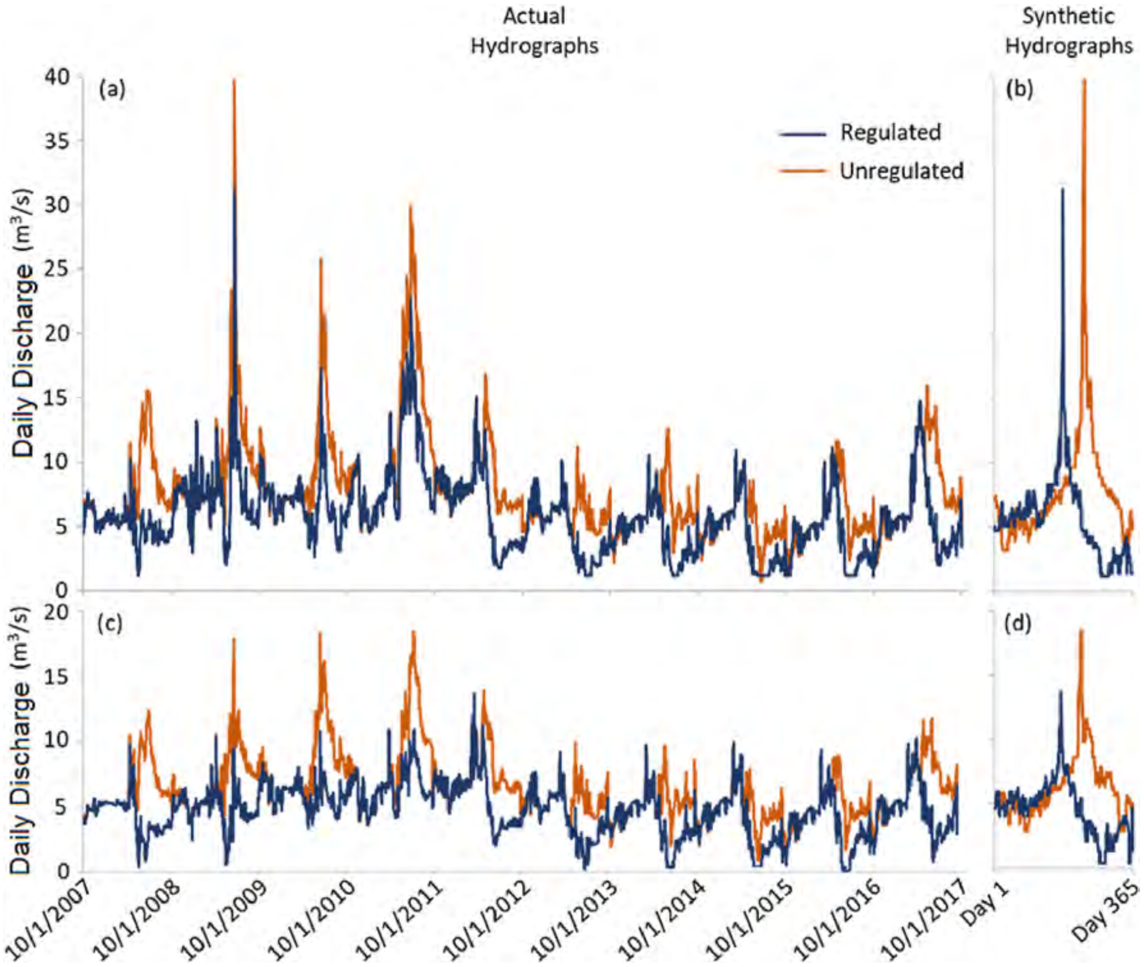

Fig. 2. Hydrograph scenarios used for the morphodynamic models. Hydrographs for the straight reach: (a) 10 years of actual regulated and unregulated hydrographs predicted from the LRBM (repeated six times for the model), and (b) the synthetic hydrograph for the regulated and unregulated water year (repeated 60 times for the model). Hydrographs for the meandering reach: (c) 10 years of actual regulated and unregulated hydrographs predicted from the LRBM (repeated six times for the model), and (d) the synthetic hydrograph for the regulated and unregulated water year (repeated 60 times for the model).

point in the pool and the downstream high point at the pool tail; features with residual depths larger than the threshold value of 0.4 of the reach-averaged bankfull depth (defined from the 1.5-year flow of a given scenario) were identified as pools (as defined in Duffin et al., 2021). A complimentary approach was used to identify bars from extracted longitudinal profiles of the highest point within each grid cross section after deleting points within a meter of the channel edge to reduce the effects of steep banks on residual bar heights. The highest point on each bar was compared to the downstream low point of the profile, with bars identified if they were larger than 0.4 of the reach-averaged bankfull depth.

2.6. Habitat analysis

In each reach, for both regulated and unregulated conditions, we quantified median flows in the fall (August and September) for both adult spawning and juvenile rearing of Chinook salmon (*Oncorhynchus tshawytscha*), as well winter flows (December and January) for juvenile rearing (Table 1). Using the hydraulic models for each reach, depths and velocities for each of these discharges were modeled on the final topographies developed from regulated and unregulated flows respectively. The fully regulated conditions represented the regulated fall or winter flows (Table 1) modeled on the final topography produced by regulated flows. Likewise, the fully unregulated conditions were the unregulated flows modeled on the final topography from unregulated conditions. To assess the relative impact of flow versus topography on habitat, the hydraulics for regulated flows were also modeled on the static, final, 60-year topography from unregulated flows and the hydraulics for unregulated flows were also modeled on the static, final, 60-year topography from regulated conditions. The habitat was assessed on the final topography produced from the actual hydrographs (further explained in the Results). For each reach and discharge, habitat quality was calculated for each model cell, CSI (cell suitability index), using suitability index curves for Chinook salmon that were empirically developed for the Upper Salmon basin (Maret et al., 2005) (see Appendix B for curves).

For each habitat discharge (Table 1), the suitability index of the *i*th cell within the model was quantified from the geometric mean of flow depth, *d*, and velocity, *v*; $\mathrm{CSI}_i = \sqrt[2]{d_i \cdot v_i}$. We then grouped the CSI values into categories: 0 to 0.2 — no habitat, 0.2 to 0.4 — low quality, 0.4 to 0.6 — moderate quality, 0.6 to 0.8 — high quality, and 0.8 to 1 — excellent quality habitat. For each reach and scenario, we calculated the total available habitat in

Table 1
Habitat discharges based on median flows for each season for regulated and unregulated scenarios in each reach.

Reach	Season	Regulated discharge scenario (m^3/s)	Unregulated discharge scenario (m^3/s)
Straight	Fall	3.5	7
Straight	Winter	5.5	5.5
Meandering	Fall	3.5	6
Meandering	Winter	5	5

terms of the weighted usable area (WUA) and hydraulic habitat suitability (HHS)

$$\mathrm{WUA} = \sum_{i=1}^{n} A_i \cdot \mathrm{CSI}_i, \tag{2}$$

$$\mathrm{HHS} = \frac{\mathrm{WUA}}{\sum_{i=1}^{n} A_i}, \tag{3}$$

where A_i is the area of each model cell. Note that CSI, WUA and HHS are all functions of discharge.

Overwintering juvenile salmonids may have different habitat needs from other seasons because low water temperatures and ice formation may limit foraging behavior and growth (Brown et al., 2011; Huusko et al., 2007). When water temperatures decline below 3–6 °C, fish shift behavior from rearing and foraging to conserving energy, resting, finding velocity refugia, and hiding from predators and anchor ice. During this period, their metabolism is quite slow, such that they may not fully digest captured prey. Consequently, habitat suitability curves used to quantify juvenile habitat, which only consider foraging and rearing, do not fully account for juvenile winter habitat needs, such as access to low velocities and deep water refugia (Favrot et al., 2018; Huusko et al., 2007). Therefore, we also assessed winter juvenile habitat in terms of specific habitat features, such as pool depths and volumes.

3. Results

3.1. Model validation: topographic change

All model scenarios for the straight and meandering reaches attained dynamic equilibrium by the third decade for the unregulated flows, and within one decade for the regulated flows, shown by net zero sediment volume change each year or the balance between aggradation and degradation (Fig. 3). After dynamic equilibrium was attained, only small topographic changes occurred for regulated conditions. We repeated in-channel topographical surveys for the straight reach and for a meandering reach similar to that studied here but with easy access between 2011 and 2013. Comparison among years showed no in-channel elevation changes >10 cm. This confirms that the lack of annual topographic change predicted for the regulated scenarios reasonably represents current river conditions, where the D_{50} is rarely mobile, and the current channel morphology is mostly stationary due to a long history of flow regulation. No unregulated field sites were available to test topographic results of the unregulated scenarios.

3.2. Sediment transport

The morphodynamic models only predicted substantial movement of the D_{50}, in more than just a few cells of the model, at the highest flows present in each reach: flows above ~23 m^3/s and 17 m^3/s for the straight and meandering reaches, respectively. These flows have recurrence probabilities of 0.94 % and 0.10 % for unregulated and regulated conditions, respectively, in the straight reach and 0.21 % and 0 % for the meandering reach. Before the models reached dynamic equilibrium, there was sediment transport at lower discharges, but after dynamic equilibrium was met only the high flows resulted in substantial sediment transport. Cumulative curves of annual aggradation and degradation increased smoothly for the synthetic hydrographs and in a stepped manner for the actual hydrographs in both reaches (Fig. 3). The latter resulted from the fact that sediment-mobilizing flows occurred during three consecutive years each decade for the actual hydrographs, whereas sediment-mobilizing flows occurred every year (albeit for a shorter duration) for the synthetic hydrographs, producing a relatively smooth increase in cumulative annual aggradation and

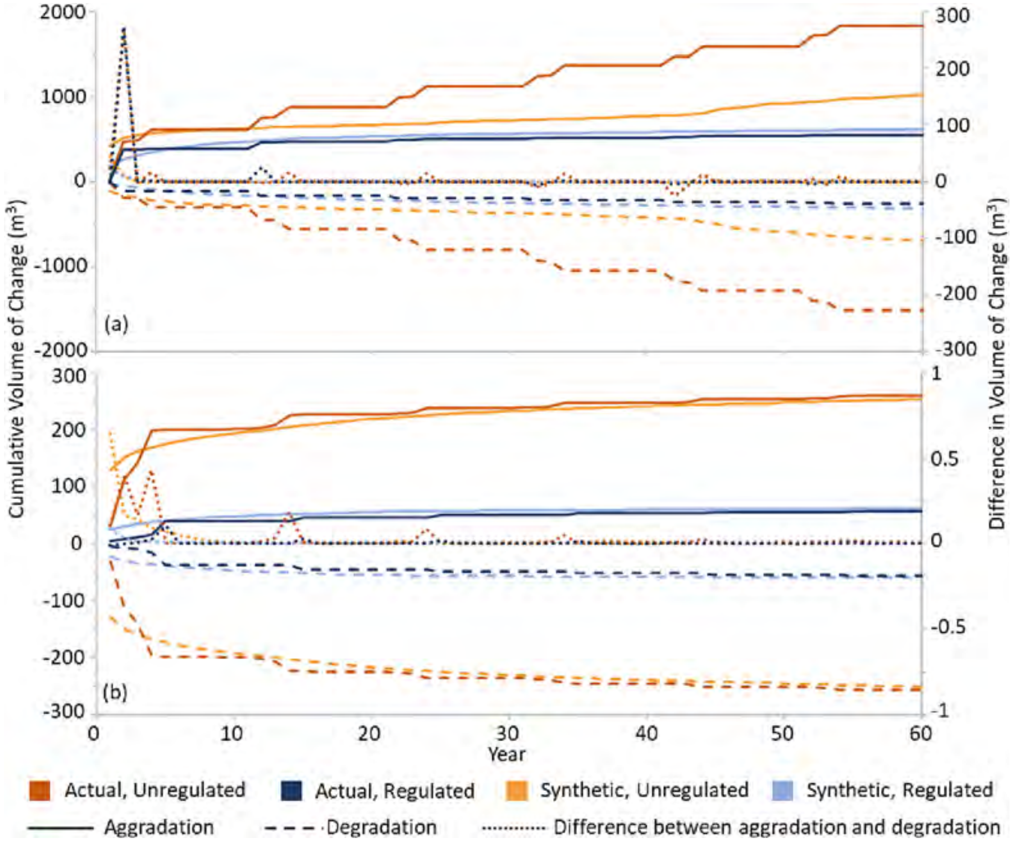

Fig. 3. Annual total aggradation and degradation over time for the (a) straight plane-bed reach and (b) meandering pool-riffle reach. Each hydrograph scenario is represented by a different color, cumulative aggradation over time is shown by the solid lines, cumulative degradation is shown by the dashed lines, and the annual difference between the aggradation and degradation is shown by the dotted lines.

degradation. In both reaches, unregulated flow produced substantially more cumulative aggradation/degradation than regulated flows (Fig. 3), but reach-specific differences in behavior were also predicted.

In the straight reach, the final aggradation and degradation volumes were similar for the regulated flow scenarios (Fig. 3a). In contrast, larger volumes of aggradation and degradation occurred for actual flows than synthetic ones during unregulated conditions in the straight reach (Fig. 3a). In the unregulated actual scenario, after the first decade of model adjustment, the first high flow of each decade washed out a series of subdued bedforms (proto-bars and pools) and topographic undulations, and then the second and third high flows rebuilt these subdued bedforms, but the topography at the beginning and end of a given decade was similar. This pattern of washing out and rebuilding subdued bedforms in the straight reach did not occur with the unregulated synthetic hydrographs, which resulted in less aggradation and degradation over time.

In the meandering reach, the actual and synthetic hydrographs produced similar final volumes of aggradation/degradation for a given flow scenario, with unregulated flow exhibiting larger cumulative volumes (Fig. 3b). Fully formed pool-riffle topography in the meandering reach resulted in a more stable bed (less volumetric change over time) and no appreciable difference in the effects of actual vs. synthetic hydrographs compared to the repeated washing out and rebuilding of proto-bedforms in the straight, plane-bed reach during unregulated flow with actual hydrographs.

3.3. Actual versus synthetic hydrographs: morphologic differences

Here, we compare the effects of actual versus synthetic hydrographs on the final channel topography for each flow scenario (regulated or unregulated). The effects of the flow scenarios on channel morphology are examined in the next section.

In the straight reach, actual and synthetic hydrographs produced a similar, final, plane-bed topography (Figs. 4g and h) with comparable thalweg profiles (Fig. 5a). Specifically, 82 % and 97 % of the model cells exhibited less than ±0.1 m difference in elevation between topographies developed from actual vs. synthetic hydrographs for the unregulated and regulated flows respectively. In the unregulated scenario, the larger differences in topography between synthetic and actual hydrographs (Fig. 4g) resulted from location differences in the pattern of the final topography rather than development of different overall morphologic patterns. This is highlighted by the thalweg differences between the actual and synthetic hydrographs for the unregulated scenario, specifically at 200 m where a subdued pool-like bedform created by the actual hydrographs is not present in the synthetic hydrograph profile but is instead shifted downstream to 240 m (Fig. 5a).

Similarly, differences in elevation for the final topography of the meandering reach were small for actual vs. synthetic hydrographs (Figs. 6g and h) and the thalweg profiles were comparable for a given flow scenario (regulated or unregulated, Fig. 5b). Most model cells exhibited ±~0.1 m difference in elevation for actual vs. synthetic hydrographs, with aggradation and degradation localized to areas of forced pools and bars. For example, in the unregulated scenario, only 0.2 % of the model cells exhibited large differences in elevation (±~0.5 to 1 m) between topographies produced from the actual and synthetic hydrographs, with these differences caused by a shift in the location of the pools or bars (Figs. 6a, d, and g).

The above results indicate that the interannual variability and sequence of hydrographs did not greatly affect the final topography in either of the study reaches and that both synthetic and actual hydrographs can be used to represent the hydrology when modeling morphology for a given flow scenario (regulated or unregulated). Consequently, to simplify the remaining analyses, results will be based on the topography produced by actual hydrographs from this point forward, recognizing that the findings would be similar for synthetic hydrographs.

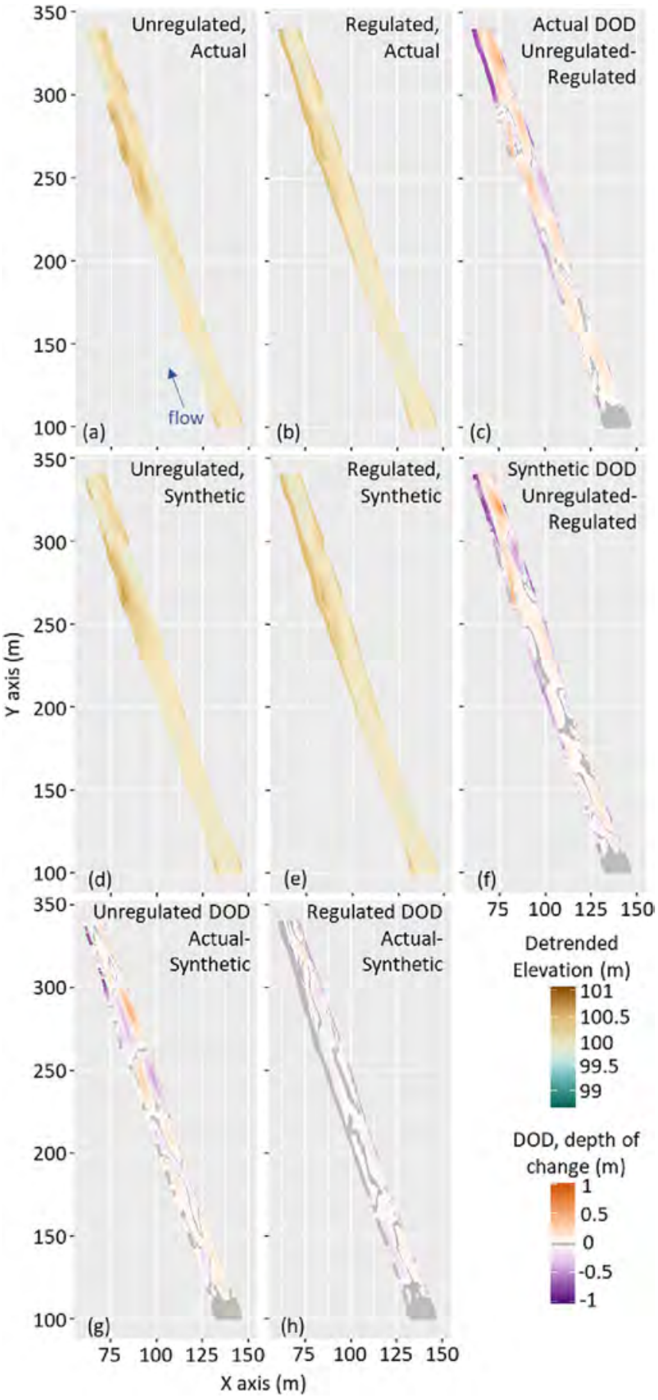

Fig. 4. The final, 60-year, modeled straight reach topography for each hydrograph scenario: (a) unregulated, actual hydrographs, (b) regulated, actual hydrographs, (d) unregulated, synthetic hydrographs, and (e) regulated, synthetic hydrographs. Digital elevation models (DEMs) of difference (DODs) between the different final topographies are shown for (c) unregulated minus regulated actual scenarios, (f) unregulated minus regulated synthetic hydrographs, (g) actual minus synthetic unregulated scenarios and (h) actual minus synthetic regulated scenarios. Note that the detrended elevations and DOD maps are shown on the same scale as the meandering reach in Fig. 6, which has a wider range of elevations and depths of change.

3.4. Regulated versus unregulated flows: morphologic differences

The final topography of the straight reach exhibited a plane-bed morphology with no significant pools or bars for both regulated and unregulated flows. For all scenarios in the straight reach, the final detrended

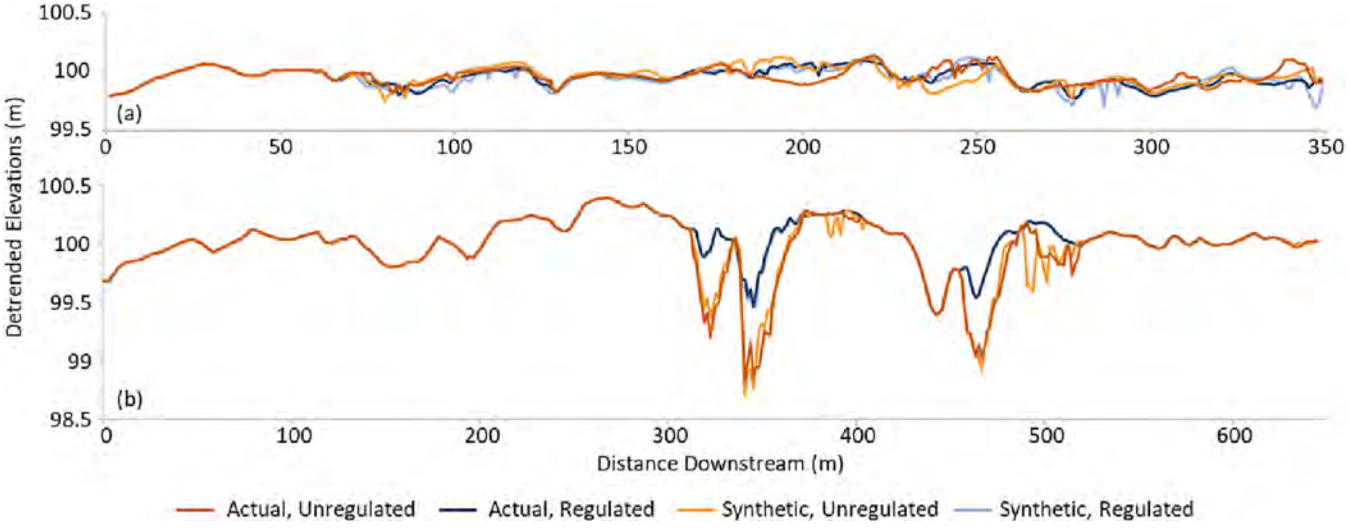

Fig. 5. Detrended thalweg profiles for the final topography in the (a) straight plane-bed reach and (b) meandering pool-riffle reach. The profiles for each hydrograph scenario are shown in different colors; some lines are not visible where they overlap other lines.

thalwegs show 0.35 m of vertical range with a standard deviation of 0.07 m (Fig. 5a). Comparison of the final topographies for regulated vs. unregulated flows showed mostly small differences in elevation for actual and synthetic hydrographs (Figs. 4c and f, respectively); 66 % of model cells had differences in elevation less than ±0.1 m, with some larger differences (never larger than 0.6 m) due to either slight shifting in the topographic patterns or to locations at the downstream end of the reach, which may be affected by the downstream model boundary.

In the meandering reach, regulated flows formed more subdued pool-riffle morphology compared to unregulated flows. Topographic variability in the detrended thalweg profile increased from a vertical range of 1.00 to 1.55 m between regulated and unregulated flows and the standard deviation increased from 0.18 to 0.27 m (Fig. 5b). The unregulated flows scoured pools deeper than the regulated scenario and the scoured sediment built larger downstream bars, resulting in 8.6 % of model cells having differences in elevation greater than ±0.1 m between topographies generated from regulated and unregulated flows for both actual and synthetic hydrographs (Figs. 6c and f). Pool and bar geometry (area, volume, and maximum depth/height) all increased between regulated and unregulated flow (Fig. 7), and a new pool formed during unregulated flow, resulting in a 33 % increase in pool frequency. Total pool volume increased by 92 % and total bar volume increased by 43 % between regulated and unregulated flows.

For both the regulated and unregulated conditions, the meandering reach showed more topographic variability and complexity than the straight reach, which is highlighted by the final thalweg profiles (Fig. 5)

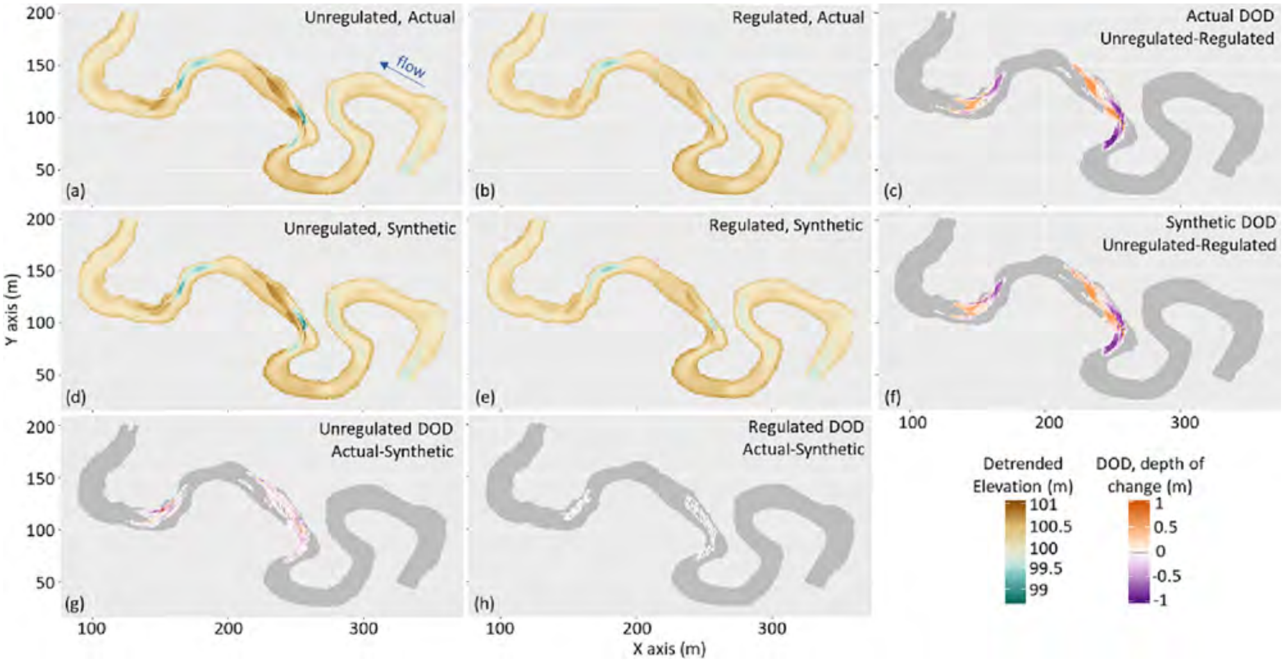

Fig. 6. The final, 60-year, modeled meandering reach topography for each hydrograph scenario: (a) unregulated, actual hydrographs, (b) regulated, actual hydrographs, (d) unregulated, synthetic hydrographs, and (e) regulated synthetic hydrographs. Digital elevation models (DEMs) of difference (DoDs) between the different final topographies are shown for (c) unregulated minus the regulated actual scenarios, (f) unregulated minus the regulated synthetic hydrographs, (g) actual minus the synthetic unregulated scenarios and (h) actual minus the synthetic regulated scenarios.

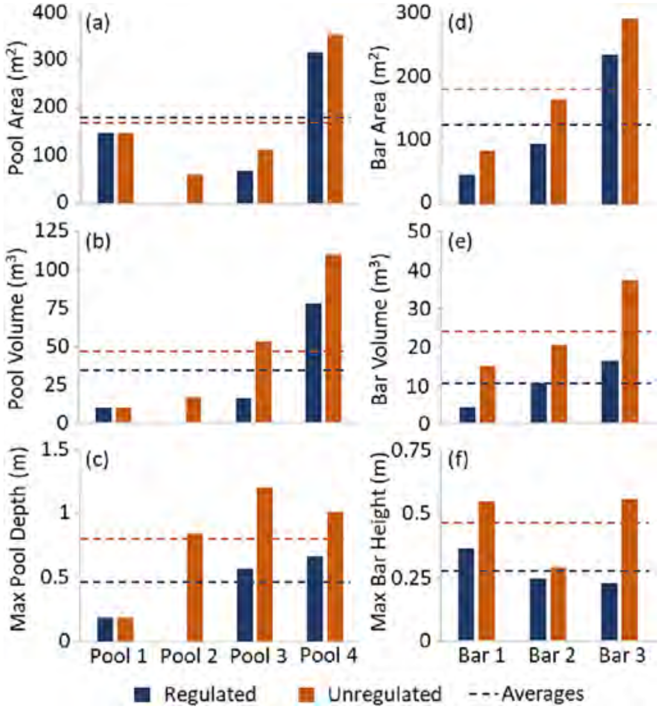

Fig. 7. Distributions of pool and bar geometry in the meandering reach for regulated and unregulated flows: (a) pool area, (b) pool volume, (c) maximum pool depth, (d) bar area, (e) bar volume, and (f) maximum bar height. Color indicates flow type (regulated vs. unregulated) and dashed lines are average values of each distribution.

and by comparing the elevation ranges for the final topographies, where the straight and meandering reaches had total detrended elevation ranges of 1.05 and 2.32 m, respectively (Figs. 4 and 6).

In both reaches, differences in regulated vs. unregulated flow conditions produced stronger changes in sediment transport and final reach topography than choice of actual vs. synthetic hydrographs (Figs. 3–6). Furthermore, unregulated flow resulted in greater topographic variability in the meandering reach by scouring deeper pools and depositing higher bars than the topography formed by regulated flow. In contrast, the plane-bed morphology of the straight reach was less responsive to differences in flow condition (regulated vs. unregulated).

3.5. Regulated versus unregulated flows: habitat differences

The fully regulated condition (i.e., regulated flows on topography developed from those flows) in the straight reach produced more suitable habitat for fall spawning of Chinook salmon (HHS = 0.41) and a greater abundance of high-quality habitat than the fully unregulated condition (HHS = 0.15) (Figs. 8a and S3a–b). Regulated conditions produced lower fall flows that improved the spawning habitat quality and availability compared to higher flow velocities associated with unregulated flow. Furthermore, flow condition (regulated vs. unregulated) and the associated channel hydraulics were a stronger control on habitat than the effect of flow on the final topography; HHS values of 0.15 occurred for unregulated flow in the straight reach regardless of whether the final topography was produced from regulated or unregulated flow, and nearly identical HHS values of 0.41 and 0.42 resulted from regulated flow over the respective straight-reach topographies. In addition, the straight reach had little to no available winter habitat for juvenile Chinook salmon (HHS = 0.01) for all flow and topography conditions (Figs. 8c and S4a–b). The juvenile rearing habitat in this reach was greatly limited by high velocities in both the fall and winter, which were almost entirely outside the suitability range for juvenile Chinook salmon for both the regulated and unregulated flows regardless of the topography (Fig. S5b–d).

In the meandering reach, fall spawning habitat quality was adequate in all tested flow and topography conditions, but was higher for fully unregulated conditions (HHS = 0.84) than fully regulated (HHS = 0.79) (Figs. 8b and S3d–e). This increase in modeled habitat suitability was not due to differences in final topographies (i.e., whether they were formed by regulated or unregulated flow), but directly to differences in the hydraulics of those flows over the topography. High unregulated flows in the fall increased habitat on both topographies (both HHS = 0.84), whereas the relatively smaller regulated flows resulted in slightly lower HHS values of 0.79 for both topographies. Although the HHS values for the regulated and unregulated flows on the topography developed from unregulated flows were similar, the unregulated topography resulted in a 2–5 % increase (depending

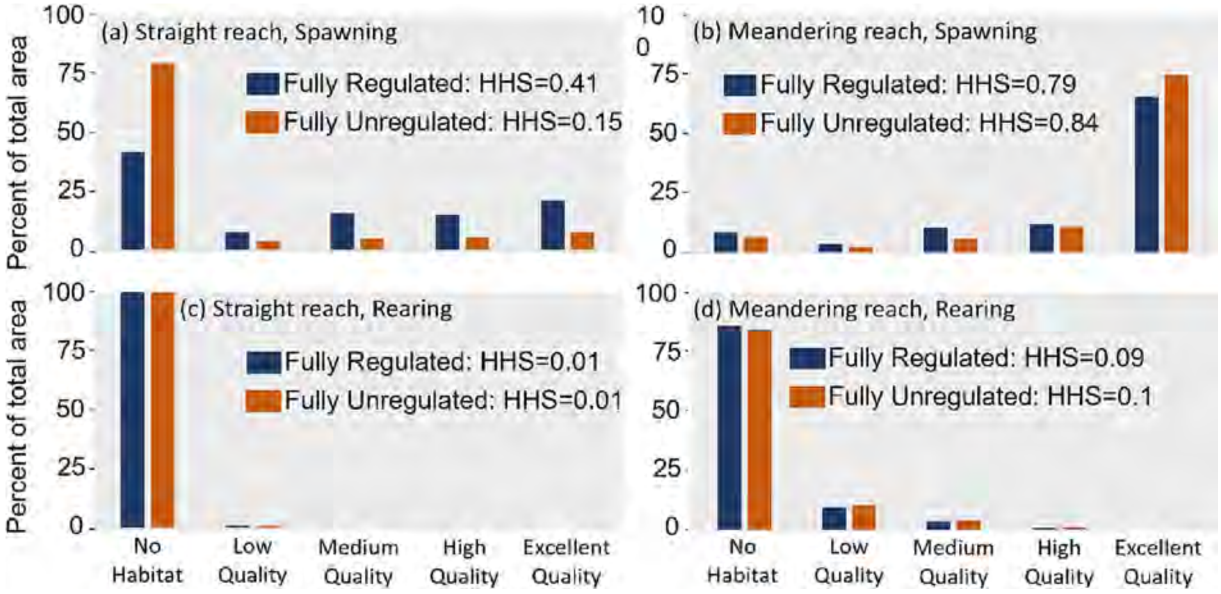

Fig. 8. Habitat quality distributions for fall spawning Chinook salmon (top panels) in (a) the straight and (b) meandering reaches and for winter rearing (bottom panels) in (c) the straight and (d) meandering reaches for regulated topography and regulated flow (i.e., fully regulated conditions; blue histograms) and for unregulated topography and unregulated flow (i.e., fully unregulated conditions; dark orange histograms). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

on flow condition) in excellent quality spawning habitat compared to the topography developed from regulated flows (Fig. 8b).

Availability of winter habitat for rearing of juvenile Chinook salmon remained similar between the fully regulated (HHS = 0.09) and fully unregulated (HHS = 0.10) conditions in the meandering reach (Figs. 8d and S4d–e). The regulated and unregulated winter flows were the same (Table 1); therefore, these small differences were entirely attributable to changes in the topography developed from each flow type. The high and excellent-quality winter juvenile habitat was mainly on the margins of the channel, where the velocities were low. In most of the meandering reach, velocities were too high in both the fall and winter to produce suitable juvenile rearing habitat for both the regulated and unregulated flows regardless of the topography (Figs. S5f and h). However, slightly more juvenile rearing habitat was available in the meandering reach than the straight one (cf. Figs. 8c and d; cf. Figs. S5b and d to f and h).

4. Discussion

Our hypothesis of subdued topography for regulated flows was borne out for the meandering reach, but not the plane-bed reach. However, the increased topographic variability produced by unregulated flows in the meandering reach did not substantially increase habitat availability and quality, at least in terms of HHS values; nevertheless, increased pool depths may provide important overwintering refugia for juvenile salmonids that is not detected by the HHS analysis. Surprisingly, the largest increases in spawning habitat availability and diversity were driven by lower velocities for the regulated flow in the plane-bed reach despite no substantial changes in topography, underscoring the relative roles of flow vs. topography and the fact that results can vary with channel type (plane-bed vs. pool-riffle).

4.1. Actual versus synthetic hydrographs

Our results show that actual hydrographs (representative of the natural interannual variability of flows) and synthetic hydrographs (a single, cycled, representative hydrograph) both produced similar morphologic patterns in each of our study reaches. Flume studies assessing the impact of the shape and duration of cycled hydrographs have found varying results; in some cases, those factors had little influence on bedform and channel characteristics (Nelson and Morgan, 2018; Wong and Parker, 2006), whereas other studies have found hydrograph shape and duration had an impact on bedload flux (Redolfi et al., 2018) and channel morphology (Waters and Curran, 2015; Zhang et al., 2020). Another study addressed the effect of flow order and found that changing the location of a uniform high-flow period within low flows resulted in similar bedform geometry (Nelson et al., 2011). A morphodynamic modeling study looking at the effects of cycled hydrographs found that a single, repeated, representative hydrograph produced aggradation and degradation outside of the range produced by hydrographs representing variability in discharge (Huthoff et al., 2010), but suggested the representative hydrograph may have been oversimplified by not including the full range of flows. Phillips et al. (2018) showed that bedload flux resulting from a variety of hydrograph shapes scaled with transport capacity, suggesting that maintaining transport capacity between hydrograph comparisons may provide more similar morphologic results; however, many of these studies did not hold transport capacity constant between their compared hydrographs, which may explain the variation in results. Therefore, representative designed hydrographs should preserve some physical properties of the hydrology, such as the peak discharge, volume of flows, and hydrograph shape that accurately represents the full probability of flows (Serinaldi and Grimaldi, 2011). The synthetic hydrographs presented in this paper accurately represented the full probability of flows present in the actual hydrographs and reproduced the hydrograph shape, therefore producing similar final bed elevations and topographic features compared to those resulting from temporally variable hydrographs. Fully and accurately representing the high flows in this system was important because the D_{50} only moved at the highest flows, which is similar to what has been observed in other similar systems (Andrews, 1994; Maturana et al., 2013; McKean and Tonina, 2013).

4.2. Regulated versus unregulated flows: morphologic differences

The meandering reach model showed that regulated flows resulted in more subdued topography, whereas the unregulated flows produced larger pool and bar geometry (i.e., greater area, depth/height, and volume), as well as increased pool frequency than the regulated scenarios. The current channel topography has adjusted to years of flow regulation with reduced magnitudes and durations of high flows that are needed to maintain pools and bars (e.g., Caamaño et al., 2009; MacWilliams et al., 2006; Sawyer et al., 2010). The current absence of high flows in the Lemhi River combined with our model results suggest that the river previously may have had more topographic variability, with deeper pools and more pronounced bars. Increasing the occurrence of high flows in regulated rivers will not only improve topographic variability, but also has important ecological effects. The unregulated high flows help to create an active river bed, which can remove fines and clean spawning gravels (Milhous, 1998; Reiser et al., 1989) and can break up armor layers (Parker and Klingeman, 1982; Ryan et al., 2005; Vericat et al., 2006; Yager et al., 2015). We did not measure the subsurface grain size distribution and therefore could not determine the extent of bed armoring. However, the median surface grain size only moved during high flows in our models, which implies a relatively stable surface layer particularly during the regulated flows. Given that the surface layer usually protects the finer subsurface layer from erosion, we would expect more fines to potentially accumulate in the bed during regulated than unregulated flows (Dikinya et al., 2008; Schälchli, 1992).

Topographic differences between the various flow scenarios were more pronounced in the meandering reach, where pools and bars were already present, than in the straight reach. The occurrence of topographic steering (Whiting and Dietrich, 1991), flow convergence (MacWilliams et al., 2006; Thompson and Wohl, 2009), or a combination of these effects (Brown and Pasternack, 2014) over the initial pool-riffle topography helped to maintain and further develop this topography in the meandering reach. In contrast, such processes do not emerge in the straight, planar reach. Consequently, restoration of flows alone may not be sufficient to regenerate or improve channel morphology in highly altered reaches (Wohl et al., 2015) such as the straight reach, where the existing variability in topography and lack of channel curvature is not sufficient to develop pools and bars in our simulations.

Results from modeling studies like this have limitations based on how the model is conceptualized and implemented. For example, we used a sediment transport model based on a single grain size, ignoring the potential effects of grain size interactions, such as particle hiding and size-selective transport, that could result in errors in bedload predictions (Durafour et al., 2014). Multi-size sediment transport may allow for the evolution of armor layers and formation of textural patches that may impact bar, riffle, and pool morphologies. However, the morphological effects of using a full grain-size distribution compared to a single grain size when modeling channel evolution may be minimal as shown by numerical modeling (Nelson et al., 2015b). Similarly, the adoption of a spatially constant drag coefficient may lead to the formation of bars with shorter wavelengths and higher amplitudes than those with a spatially variable roughness (Nelson et al., 2015b). Conversely, accounting for a full grain-size distribution with smaller sediment may reduce the modeled depths and volumes of pools as a result of low-flow sand deposition in the pools (Thompson et al., 1996). Including patch-based (e.g., riffle versus pool) grain-size information is also important in accurately predicting sediment transport, but may not be as important as the spatial variability in flow and shear stress (Monsalve et al., 2016), which was included in these models. Nor does our approach consider history-dependent critical shear stress values, which can impact bedload transport based on the previous flow magnitudes (Masteller et al., 2019; Reid et al., 1985; Turowski et al., 2011). Without large flow events regularly mobilizing the bed, channel stabilization can occur as the critical shear stress increases each year due to low and moderate flows (An et al., 2021; Masteller et al., 2019). The dependence of critical shear stress on flow magnitude and flood sequencing could affect the modeled morphological differences we saw between the synthetic and actual hydrographs. The interannual variability in flows in the actual hydrographs would affect the critical shear stress and the order of the flows could be more important than we showed, whereas the synthetic hydrographs, with annual high flows, would be less affected.

4.3. Regulated versus unregulated flows: habitat differences

Both regulated and unregulated flows produced moderate to high amounts of spawning habitat in both reaches, except for the fully unregulated scenario in the straight reach (HHS = 0.15). Furthermore, differences in topography developed from regulated vs. unregulated flows had very little effect on the availability of spawning habitat. The increased fall flows under the unregulated scenario affected the spawning suitability differently in each reach; spawning habitat was substantially reduced in the straight reach and slightly increased in the meandering reach.

Previous studies have shown that juvenile habitat, specifically overwintering habitat, is a limiting factor in the Lemhi River (Carmichael et al., 2020; Copeland et al., 2014). Contrary to our expectations that unregulated flow would increase habitat abundance and quality due to less subdued morphology compared to regulated conditions, we only predict a 1 % increase in habitat suitability for winter juvenile rearing between fully regulated and fully unregulated scenarios in the meandering reach. For all flow scenarios, the depth-averaged velocities were higher than suitable for juvenile Chinook rearing (Fig. S5), therefore no substantial increase in juvenile rearing habitat was predicted based on suitability curves. Nevertheless, changes in predicted pool geometry and frequency may be important. The 33 % increase in pool frequency, 36 % expansion in pool area, 92 % growth in pool volume, and 54 % increase in maximum residual pool depth between the regulated and unregulated scenarios in the meandering reach (Fig. 7) does not affect juvenile habitat suitability (Fig. 8d), but may have local benefits not detected by the suitability curves. In particular, diverse habitat with deep pools act as refugia from high velocities, create stable conditions during discharge changes (Moir et al., 2006), and increase the probability of overwintering survival for juvenile salmonids (Brown et al., 2011). Although the modeled HHS values for juvenile rearing habitat are unresponsive to regulated vs. unregulated conditions in the meandering reach, juvenile fish can use the lower velocities at the bottom of these deeper pools (Favrot et al., 2018). A study of microhabitat use in a similar stream found that Chinook parr disproportionally occupied the deepest water available during fall and winter rearing, specifically deep water areas >1.15 m (Favrot et al., 2018). During regulated fall flow (3.5 m^3/s) in the meandering reach, the area of the channel with depths >1.15 m increased from 1.7 m^2 to 104.2 m^2 (6029 % increase) between topographies developed from regulated vs. unregulated flow, and from 30.9 m^2 to 145 m^2 (372% increase) for the unregulated fall flow (6 m^3/s) on those topographies, highlighting the relative importance of the change in topography compared to the change in flows. For regulated and unregulated winter flows (5 m^3/s) in the meandering reach, the streambed area with depths >1.15 m increased from 13.0 m^2 to 130.5 m^2 (902% increase), resulting in a substantial increase in deep-water juvenile refugia for topography developed from unregulated flows.

4.4. Management implications

Our results show that unregulated flows could create more complex habitat through scouring of larger pools and increased pool frequency in the meandering reach. Instream restoration goals often include adding stream complexity by manually creating deep pool habitat and bars, and in regulated rivers, reintroduction of the highest flows may be an effective way to complete widespread restoration of subdued topography with minimal instream disturbance (Groll, 2017). We found that only the highest flows present in our reaches mobilized the D_{50} and resulted in meaningful morphologic changes. In the meandering reach, for the unregulated scenario, our models demonstrated that the pools developed quickly, much of the scour occurred during the first high flow, and the pools almost reached their maximum depths after three high flow years. Each of these high flows (larger than 17 m^3/s) lasted approximately one day each year. However, actual timescales for morphological change in natural rivers may differ from our modeled results due to factors not accounted for in our analysis, such as bed armoring, sediment supply effects, size-selective transport, and meander migration. Changes in riparian vegetation due to climate change and land use may also impact meander migration, which we did not model. Although caveats exist, the results showing rapid development of deep, large pools are promising for water management.

Large, extreme, disturbance events have the potential to produce large shifts in habitat (Reich and Lake, 2015). Consequently, avoiding diversion during high-water years may be enough to substantially improve juvenile habitat quality. Fulltime unregulated flows may not be necessary or beneficial for improving habitat; Carmichael et al. (2020) modeled bioenergetics for juvenile salmonids over multiple reaches along the Lemhi River and found that regulated flows produced more favorable conditions for juvenile growth than unregulated flows. Although Carmichael et al. (2020) did not account for potential changes in channel topography, they highlight the importance of slow water and lateral habitat refugia during unregulated flow conditions. We also show that the impact of flow restoration on instream morphology is not enough to reduce high velocities during fall and winter flows, which highlights the importance of lateral habitat reconnection and the potential addition of large wood to aid in velocity reduction if diversions were removed for extend periods of time.

Although we focused on the potential effects of unregulated flows on two reaches along the Lemhi River, restoration of natural flows at basin scales may have larger benefits. Our straight-reach model showed that channelized, highly-altered reaches may not improve with flow restoration (Groll, 2017; Wohl et al., 2015), but less altered reaches may have potential for morphologic improvement. Specifically, in the meandering reach, pool and bar volumes increased greatly from unregulated flows. To identify how much of the Lemhi River could possibly result in improved habitat from restoration of unregulated flows, we calculated the portion of the river having similar topographic variability to that of the meandering reach. A previous study on the Lemhi River found that small-scale wavelet power quantifies topographic variability of the thalweg and was representative of pool-riffle topography (Duffin et al., 2021). Based on the observed, small-scale, wavelet power of the meandering reach, we found that 93 % of the Lemhi River has similar or higher topographic variability. This portion of the river represents areas with existing pools, which are subdued from decades of flow regulation, while the remaining 7 % of the river is composed of highly-altered reaches without existing pool-riffle topography. Although 93 % of the river has similar (or better) topographic variability to the meandering reach, only 65 % of the Lemhi River is meandering (sinuosity >1.2) and it is unknown if the sinuous reaches have a stronger response potential than less sinuous locations. The potential to improve juvenile overwintering habitat through basin-wide flow restoration along this river by increasing channel complexity and increasing pool geometry and frequency is much larger than the potential effects of local, instream, habitat improvements (e.g., woody-debris placement or channel realignment) because of the considerable area that basin-wide flow restoration could impact. Increases in deep pool habitat could also improve the resiliency of the river to potential climate change stresses due to reduced flows (Walters et al., 2013) by providing consistent hydraulic and thermal refugia (Justice et al., 2017).

5. Conclusion

Hydromorphodynamic models can help to assess the effects of water management strategies on both stream hydraulics and morphology. Our analysis revealed the differences in reach topography, hydraulics, and habitat between regulated and unregulated flows applied over a 60-year period for an engineered, straightened, plane-bed reach and a more natural meandering reach. We tested a series of predicted hydrographs that represent the actual interannual variability of flows vs. a synthetic, cycled, annual hydrograph that is a composite of the actual flows. The actual and synthetic hydrographs after 60 years of simulation resulted in similar final modeled topographies for both reaches. The D_{50} was mobile only at the highest flows present in these reaches, with both the actual and synthetic hydrographs having the same probability for high-flow occurrence. We find that the sequence and interannual variability of flows was not as important as the occurrence of sediment-mobilizing high flows. Consequently, both hydrograph types (actual and synthetic) produced similar topographic results in a given reach.

For the straight reach, we found that the topography remained plane-bed between the regulated and unregulated flow scenarios, and spawning habitat quality for Chinook salmon was negatively affected by relatively higher unregulated discharges. Juvenile rearing habitat in the fall and winter was essentially non-existent for both the regulated and unregulated scenarios due to velocities that exceeded suitability.

In the meandering reach, unregulated flows resulted in more spatially variable topography than occurred for regulated flows, with a notable increase in pool depth, volume, and frequency. The change in topography between the regulated and unregulated flow scenarios had a negligible effect on Chinook salmon spawning habitat, which was high for both flow scenarios. Nevertheless, the increased pool geometry and frequency resulting from unregulated flows may benefit juveniles by providing greater fall and winter refugia.

Hydrologic restoration can improve subdued topography in currently regulated rivers like those examined in our study. Because high flows are capable of moving the D_{50} at our sites, increasing the frequency and magnitude of high flows may have the potential to scour subdued pools and build larger bars. Restoring unregulated high flows may improve in-channel morphology where bedforms are present (e.g., meandering pool-riffle channels), but is likely to have limited effect in reaches lacking bedforms or sinuosity, such as the engineered straightened reach. Instead, those sites may need more intervention than hydrologic restoration alone. A complex response between hydrology, topography and habitat exists; and the use of morphodynamic models, and the analysis of both hydrologic and morphologic changes together, can be a powerful tool to help water managers make informed decisions that will have the greatest benefit to the ecological function of rivers.

CRediT authorship contribution statement

JD ran the 2D modeling, CB ran the hydrological model, RB provided large scale 2D modeling, and DT envisioned the research and administered the funding. JD wrote the original version of the manuscript. All authors contributed to the interpretation of the results and in editing the manuscript.

Data availability

Data are available from Tonina et al. (2022) at the repository site HydroShare (http://www.hydroshare.org/resource/73fac6d628bc43e48a1801bad8f93f45).

Declaration of competing interest

Authors declare no competing interests.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.scitotenv.2023.163016.

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River temperature modelling: A review of process-based approaches and future directions

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River temperature modelling: a review of process-based approaches and future directions

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Abstract

River temperature has a major influence on biophysical processes in lotic environments. River temperature is expected to increase due to climate change, with potentially adverse consequences for water quality and ecosystems. Consequently, a better understanding of the drivers of river temperature space-time variability is important for developing adaptation strategies. However, existing river temperature archives are often of low resolution or short timespans, and the analysis of patterns or trends can therefore be difficult. In light of these limitations, researchers have increasingly used models to generate river temperature estimates suitable for addressing fundamental and applied questions in river science. Of these models, process-based approaches are well suited to helping improve knowledge of the mechanisms controlling river temperature, because of their ability to explore the energy (and water) fluxes responsible for temperature patterns. While process-based modelling approaches can often be more data intensive than their statistical counterparts, they offer significant advantages with regards to simulating the impacts of projected land-use or climate change, and can provide valuable insights for informing the development of statistical models at larger scales. However, a wide range of process-based river temperature models exist, and choosing the most appropriate model for a given investigation requires careful consideration. In this paper, we review the foundations of process-based river temperature modelling and critically evaluate the features and functionality of existing models with a view to helping river scientists better understand their utility. In conclusion, we discuss key considerations and limitations of currently available process-based models and advocate directions for future research. We hope that this review will enable river researchers and managers to make informed decisions regarding model selection and spur the continued refinement of process-based temperature models for addressing fundamental and applied questions in the river sciences.

1. Introduction

River temperature is one of the most important river habitat variables (Caissie, 2006; Hannah and Garner, 2015), controlling biogeochemical processes (Durance and Ormerod, 2009; Kaushal et al., 2010), ecosystem dynamics (Durance and Ormerod, 2007; Bärlocher et al., 2008; Dugdale et al., 2016) and water quality (Finlay, 2003; Bloomfield et al., 2006; Delpla et al., 2009). Quantifying river temperature is therefore key for improved understanding of fluvial environments. River temperature regimes in most locations are expected to change as a result of future climate change (van Vliet et al., 2013; Caldwell et al., 2015; Hannah and Garner, 2015; Muñoz-Mas et al., 2016) and other anthropogenic drivers (e.g. abstraction, impoundment, land-use change; Poole and Berman, 2001; Hester and Doyle, 2011). However, shortcomings in several key aspects of river temperature research mean that little is currently known about the complex nature of future temperature variability. River temperature science has in the past been based on data with low spatial and temporal resolution, frequently collected as a side product of water quality and/or ecological sampling. Water temperature data quality is consequently highly variable and elucidating the controls of river temperature remains difficult (Webb et al., 2004; Jonsson and Jonsson, 2009; Watts et al., 2015). Efforts have been made to resolve this using novel temperature logger networks (e.g. Isaak et al., 2010; Jackson et al., 2016; Boyer et al., 2016) or remote sensing techniques (see. Dugdale, 2016). While such investigations are fast becoming the new norm, process-based understanding has not always kept pace with methodological development, and the exact mechanisms controlling river temperature heterogeneity remain difficult to isolate (Hannah and Garner, 2015). Further research into river temperature dynamics is consequently of key importance with regards to predicting the impacts of future climate change on river environments.

Several key review papers (including Webb, 1996; Caissie, 2006; Webb et al., 2008; Hannah and Garner, 2015) summarise the current state-of-the-art with regard to the processes driving river temperature. At the fundamental level, river temperature is determined by so-called ‘first-order’ climatic and hydrological processes (Hannah & Garner et al., 2015) which govern the initial temperature of the stream at the headwater and control rates of downstream warming or cooling due to radiative, latent, sensible and advective heat exchanges. However, the degree with which a river channel responds to these broad scale climatic and hydrological processes depends upon ‘second-‘ and ‘third-order’ controls pertaining to the properties of the river basin (ie. land-use, hydrogeology, hydromophology), which influence energy and mass transfers at a range of nested scales (Figure 1). At the whole-river scale, riparian forests and steep topography act as ‘second-order’ controls on stream temperature by moderating incoming solar or longwave radiation (e.g. Leach and Moore, 2010; Benyahya et al., 2012; Garner et al., 2014; Garner et al., 2015). Topography also drives localised variability in precipitation (Hannah and Garner, 2015), in addition to controlling the distribution of advective inputs from tributaries or diffuse groundwater inputs (e.g. Webb and Zhang, 1999; Yearsley, 2009) through interactions with geology and subsurface stratigraphy (eg. Malcolm et al., 2008). At the reach scale, channel morphology and topology constitute ‘third-order’ controls on river temperature. Localised advective warming or cooling is driven by discrete or diffuse groundwater inputs (e.g. Torgersen et al., 1999; Dugdale et al., 2015) linked to channel morphology, or by hyporheic exchange (engendered by gravel bars; e.g Gooseff et al., 2006; Burkholder et al., 2008). Deep stratified pools may also create pockets of cool water (Matthews et al., 1994; Nielsen et al., 1994). When combined, these processes interact to create a mosaic of river temperature heterogeneity along a river’s length (ie. a river’s ‘thermal landscape’; Steel et al., 2017). However, although these processes are reasonably well understood in isolation, the way in which they interact to determine stream temperature is still the subject of considerable research. These mechanisms must therefore be unravelled to better understand river temperature patterns and processes.

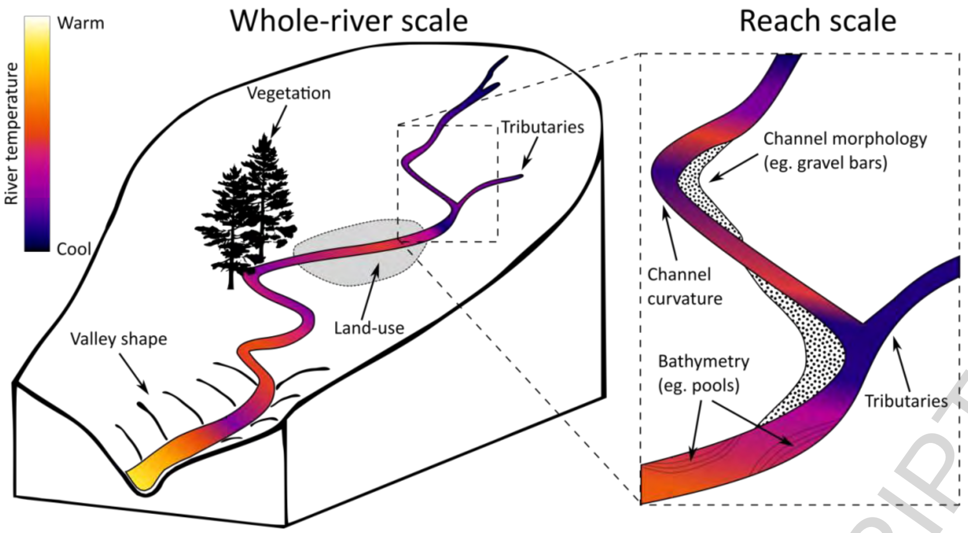

Figure 1. Basin controls on river water temperature heterogeneity across multiple scales

In light of such knowledge gaps, researchers have increasingly turned to models to explore space-time variance in river temperature patterns (e.g. Tung et al., 2006; Ruesch et al., 2012) and to yield process-based understanding of stream temperature dynamics (e.g. Garner et al., 2014). Because river temperature science is still a relatively data-poor domain, models are one of the few ways in which researchers can generate estimates of river temperature and its associated energy transfers suitable for answering these fundamental questions.

River temperature models can be divided into those based in statistics and those that simulate physical processes (alternately labelled 'deterministic', 'mechanistic' or 'process-based' models) to predict water temperature (Caissie, 2006). Benyahya et al. (2007) provide a detailed account of statistical water temperature models. Broadly speaking, they function through fitting statistical linkages between water temperature and a range of related covariates, either by parametric means (eg. regressive, correlative or autoregressive models) or through non-parametric approaches (eg. artificial neural networks, nearest-neighbours approaches; Benyahya et al., 2007). Statistical temperature models can generate accurate stream temperature predictions (e.g. Jeong et al., 2013; Daigle et al., 2015) and are particularly useful at large spatial scales where the data requirements of process-based models make their application unfeasible (eg. Isaak et al., 2015; Jackson et al. 2017; Steel et al., 2016). They can also be used to infer the drivers of river temperature variability (e.g. Hrachowitz et al., 2010; Imholt et al., 2013; Jackson et al., 2017). However, they are unable to reveal the specific energy transfer mechanisms responsible for stream temperature patterns, and their space-time transferability to dissimilar locations is limited. In contrast, process-based models simulate the processes controlling river temperature. Unlike statistical models, the intricacy of these processes means that such models are relatively data-intensive and highly parameterised (Benyahya et al., 2007), and they can be difficult to apply very large scales. However, they are particularly useful for a) providing process-based insights into the drivers of river temperature, b) for informing appropriate metrics to use in larger statistically based models and c) for predicting temperature response to climate or land-use change scenarios (e.g. Morin and Couillard, 1990; Caissie et al., 2007) in situations where statistical solutions may break down due to scenarios outside of their calibration range.

A range of process-based stream temperature models have been produced and published (often on a non-commercial basis) for use by the research community (Table 1). However, there are considerable differences between the types of models available and their utility for simulating water temperature in various contexts. Choosing the most appropriate model for a given investigation is therefore often difficult, due to differences in model functionality, features, outputs and data requirements. Furthermore, elucidating the key features of the various models is often laborious as important details regarding the functionality of some models can be buried within the grey literature. Consequently, a detailed understanding of the advantages and limitations of the various river temperature models is vital for making an informed choice of temperature model.

In this review, we aim to evaluate existing process-based stream temperature models with a view to helping researchers (and potentially managers) identify the most appropriate model for their given purpose, building on the previous meta-analyses presented in Norton and Bradford (2009) and Ficklin et al. (2012). To achieve this, the article is structured around four key objectives:

1. Review the foundations of process-based river temperature modelling.
2. Compare the ways in which currently available process-based temperature models represent the physical energy flux processes responsible for river temperature dynamics.
3. Document differences in model implementation, features and practicalities.
4. Discuss limitations, future prospects and key considerations regarding model use.

In an attempt to aid readability, citations for individual models are given by numbers (1 - 21) corresponding to the rows in Tables 1-6. Standard references for each model are given in Table 1. We only explicitly consider ‘named’ models that a) have been published in the peer-reviewed literature, b) have been used for more than one study and c) for which information is readily available. Every attempt has been made to gain accurate information about each model, although in some cases, the difficulty in elucidating the models’ technical details means that it has been necessary to simplify the contents of Tables 1-6. We do not examine models that have only been documented on single occasions or that only appear in the grey literature. Furthermore, we only detail the most up-to-date incarnation of a given model (or series of models), as an appraisal of a model’s evolutionary development is outside the scope of this article.

Table 1. List of reviewed process-based river temperature models (including programming language, source code and availability)

No.	Model name	Main reference(s)	Further reading	Language	Availability	Source code	URL for model download
1	BasinTemp	Allen (2008)	Allen et al. (2007)	N/a	Proprietary (Stillwater Sciences)		N/a
2	CE-QUAL-W2	Cole & Wells (2015)	Rounds (2007) Norton & Bradford (2009)	Fortran / Visual Basic	Free download	Yes	http://www.ce.pdx.edu/w2/
3	CEQUEAU	Morin & Paquet (2007)	Morin & Couillard (1990) St-Hilaire et al. (2000)	MATLAB / C++	Available on request	Yes	http://ete.inrs.ca/ete/publications/cequeau-hydrological-model
4	CrUSTe	LeBlanc et al. (1997)	LeBlanc & Brown (2000)	STELLA	N/a		N/a
5	Delft3D-FLOW	Deltares (2014)	Carrivick et al. (2012) Shen et al. (2014)	Fortran	Free download	Yes	http://oss.deltares.nl/web/delft3d/download
6	Heat Source	Boyd & Casper (2003)	Bond et al. (2015) Woltemade et al. (2016)	Python / Visual Basic	Free download	Yes	http://www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Tools.aspx
7	DHVSM-RBM	Sun et al. (2015) Yearsley et al. (2001)	Yearsley et al. (2009) Yearsley et al. (2012)	Fortran	Free download	Yes	http://www.hydro.washington.edu/Lettenmaier/Models/RBM/index.shtml
8	GIS-STRTemp	Sansone (2001)	Sridhar et al. (2004)	N/a	N/a		https://www.niwa.co.nz/freshwater-and-estuaries/our-services/catchment-modelling/water-allocation-impacts-on-river-attributes-waiora
9	HEC-RAS	Brunner (2016)	Drake et al. (2010)	Java	Free download		http://www.hec.usace.army.mil/software/hec-ras/
10	MIKE 11	DHI (2016)	Loinaz et al. (2013)	N/a	Commercially available		https://www.mikepoweredbydhi.com/products/mike-11
11	MNSTREM	Sinokrot & Stefan (1993)	Sinokrot & Stefan (1994)	Fortran	Free download	Yes	N/a
12	Qual2K	Chapra et al. (2012)	Kannel et al. (2007)	Fortran / Visual Basic	Free download	Yes	http://www.ecy.wa.gov/programs/eap/models.html
13	RAFT	Pike et al. (2013)	Danner et al. (2012)	N/a	N/a		N/a
14	RMA11	King (2016)	Lowney (2000)	Fortran	Proprietary (Resource Modelling Associates)		http://ikingrma.iinet.net.au/
15	SHADE-HSPF	Becknell et al. (1997)	Chen et al. (1998a) Chen et al. (1998b)	Fortran	Free download	Yes	https://www.epa.gov/exposure-assessment-models/hspf
16	SNTemp	Theurer et al. (1984)	Bartholow (1984) Norton & Bradford (2009)	Basic, Fortran	Free download	Yes	https://www.fort.usgs.gov/products/sb/7557
17	Streamline	Rutherford et al. (1997)	Rutherford et al. (2004)	Fortran / Visual Basic	Available on request		N/a
18	TVA-RMS	Deas et al. (2003)	Null et al. (2010)	C	Available on request	Yes	N/a
19	WAIORA	Jowett et al. (2004)	Davies-Colley et al. (2009)	Delphi	Free download		
20	WASP7	Wool et al. (2008)		Fortran	Free download	Yes	https://www.epa.gov/exposure-assessment-models/water-quality-analysis-simulation-program-wasp
21	WET-Temp	Cox & Bolte (2007)	Watanabe et al. (2005)	C++	Available on request	Yes	N/a

2. Basics of process-based water temperature models

2.1 Energy fluxes determining stream temperature

Stream temperature is determined by a series of energy and hydrological exchanges that act at the air-water and water-streambed interface (Eq. 1, Figure 2; Hannah et al., 2008). At the air-water interface, net radiative (longwave and shortwave energy) fluxes dominate (Caissie, 2006; Hannah et al., 2004). Incident shortwave radiation (H_{sw}) from the sun is typically the largest source of energy for a river system (particularly during summer months; Webb & Zhang, 1997), although bankside objects such as vegetation and/or topography can reduce the amount of solar radiation received by the river through providing shade (e.g. Garner et al., 2014, 2017). Longwave radiation (H_{lw}; thermal energy emitted by all objects with a temperature above 0 °K; Dugdale, 2016) can be both a heat source and sink, with downwelling longwave radiation from clouds, the land surface and bankside vegetation contributing to heat gains, and upwelling radiation from the water surface driving energy losses from the stream (e.g. Benyahya et al., 2012). Energy at the air-water interface is also gained or lost through non-radiative means (latent and sensible heat fluxes; Hannah & Garner, 2015). Latent heat flux (H_e) comprises energy lost (gained) by the stream during evaporation (condensation) as water moves from a higher to lower energy state (or *vice versa*). Sensible heat flux (H_s) encompasses mainly convective exchange between the air and water surface depending upon temperature differences and atmospheric mixing (Webb & Zhang, 1999).

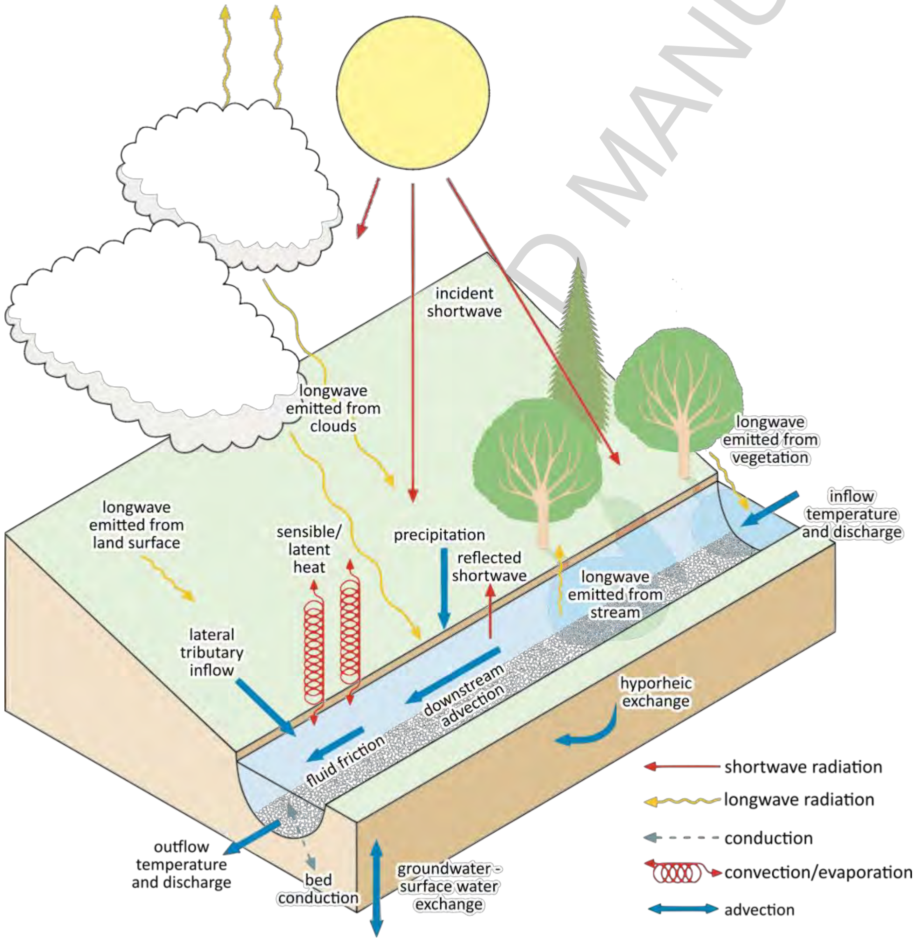

Figure 2. Energy and hydrological exchanges determining stream temperature (modified from Hannah et al., 2008)

At the water-streambed interface, heat is principally exchanged through advective (H_a) and conductive (H_{bhf}) processes. Advective heat transfers from groundwater exfiltration and hyporheic exchanges drive both river temperature warming and cooling (e.g. Hannah et al., 2009; Hébert et al., 2011). Because the temperature of groundwater is broadly stable over the year and the water column exhibits a sinusoidal annual cycle, streambed advective exchanges contribute to stream cooling in the summer and warming during winter months (Caissie, 2006). In addition to these advective processes, conduction between the water column and streambed also drives heat exchange. These fluxes generally act in the same direction as advective transfers, with heat being lost from the water column to the (comparatively) cooler bed in the summer (Webb & Zhang, 2004). However, radiative (shortwave) heating of the bed in in shallow streams can also drive positive conductive transfers from the bed to the water column (e.g. Evans et al, 1998). A final source of energy at the water-streambed interface is fluid friction between the water column and bed/banks. Friction gains are generally minor (e.g. Evans et al., 1998) and often considered negligible (Carrivick et al., 2012) for most rivers, but are sometimes observed in energetic environments (i.e. mountainous streams) with high roughness coefficients (Brown & Hannah, 2008) or large bed material (Chikita et al., 2010).

Taken together, the sum of these heat fluxes occurring at both the air-water and water-streambed interfaces exerts a direct control on the thermal regime of a river. However, the relative magnitude of the fluxes can vary substantially between locations (e.g. Webb & Zhang, 1999; Hannah et al., 2008; Hebert et al., 2011) as a function of variability in prevailing first-order climatic/hydrologic processes and their subsequent modification by second- and third-order river basin controls (Hannah & Garner, 2015). Consequently, the potential of a process-based river temperature model to provide accurate predictions of water temperature is reliant on its capacity to faithfully represent these energy transfers and their interaction with the physical environment through which the river flows.

2.2 Mathematical basis of stream temperature models

Process-based river temperature models function by simulating the addition (removal) of heat to (from) the river channel as a result of the processes detailed in section 2.1. This is achieved by calculating energy fluxes associated with each of these processes and subsequently computing the temperature change to a volume of water. Process-based models are based around two key equations which quantify these processes. Energy fluxes to or from the river channel are first calculated using an energy balance equation (see Webb and Zhang, 1997; Hannah et al., 2004) which describes the net energy gains or losses as a series of radiative, latent, sensible and advective heat exchanges:

(1) $$H_{total} = H_{sw} + H_{lw} + H_e + H_s + H_{bhf} + H_a$$

where H_{total} represents the total energy available for transfer to or from the river channel, H_{sw} is the net shortwave solar radiation flux, H_{lw} is the net longwave radiation flux, H_e is the net energy flux due to evaporation or condensation (latent heat flux), H_s is the net energy gain or loss from convection or conduction (sensible heat flux), H_{bhf} represents heat fluxes to or from the river bed and H_a is the energy gained or lost from groundwater or tributary inflows (all in W m^{-2}).

Depending on the complexity and scope of the river temperature model, some of these energy exchange terms may be omitted from the overall energy balance equation. Indeed, some models only compute surface fluxes and consider bed energy transfers to be negligible. Depending on available data, the individual heat flux terms in Equation 1 are computed using a mix of observed hydrometeorological values and values derived from these observations using empirical or physically based equations. Ouellet et al. (2014b) provide an in-depth review of the various formulae.

Once net heat flux has been calculated, the river temperature change resulting from this energy gain (loss) is computed using Equation 2. The literature contains many variations on this equation (e.g. Sinokrot and Stefan, 1993; Rutherford et al., 1997; Tung et al., 2006; Hebert et al., 2011; Garner et al., 2014) which attempt to account for variability in discharge and channel morphology or compute heat transport in multiple dimensions. However, the basic one-dimensional heat advection-dispersion equation for an open channel of constant cross section and flow is given by Sinokrot and Stefan (1993):

$$(2) \qquad \frac{\partial T_w}{\partial t} = -U\frac{\partial T_w}{\partial x} + D_L\frac{\partial^2 T_w}{\partial x^2} + \frac{H_{total}}{\rho \cdot c_p \cdot d}$$

where T_w is water temperature (°C) at time t, U is mean channel velocity (m s^{-1}), x is streamwise distance (m), D_L is an empirically derived longitudinal dispersion coefficient (m s^{-2}), ρ is the density of water (kg m^{-3}), c_p is the specific heat of water (41.8 x 10^3 J kg^{-1} $°C^{-1}$) and d is the mean channel depth (m). Equation 2 allows for Eulerian (temporal) computation of river temperature; its rearrangement in the form $\left(\frac{\partial T_w}{\partial x}\right)$ also permits the calculation of river temperature in a Lagrangian (spatial) framework (e.g. Garner et al., 2014). Provided that the channel is well mixed and does not contain notable lateral temperature gradients, the combination of Equations 1 and 2 can be used to simulate water temperature as a function of the input hydrometeorological and geomorphological data.

3. Representation of energy exchange processes

All process-based river temperature models use observed hydrometeorological data to calculate the energy fluxes detailed in Equation 1. However, there exists considerable disparity between the various energy flux terms included within each model and between the routines used to calculate them. This means that the numerical representation of the physical energy fluxes can vary substantially between different river temperature models, and has implications for both model complexity and the quality of river temperature simulations. In this section, we evaluate differences between the models in terms of how they represent the energy fluxes required to compute Equation 1.

3.1 Quantification of radiative fluxes

3.1.1 Incoming solar shortwave radiation

Typically, radiative fluxes (net shortwave and longwave radiation) dominate the heat budget of most river environments (Caissie, 2006), with solar shortwave radiation generally being the largest heat source for a river or stream (Morin and Couillard, 1990; Webb and Zhang, 1997, 2004). If observations of solar radiation are available for a given location, most models (2-5, 7, 9-12, 14-20; Table 2) allow for the direct input of such data. However, observations of incoming solar radiation are often scarce compared to other meteorological variables (i.e. air temperature, precipitation, wind speed, pressure). Consequently, many process-based river temperature models (1, 4-10, 13, 14, 16, 20, 21) contain complex routines capable of approximating the solar radiation received by a given point on the Earth's surface as a function of the date and time (see Boyd and Kasper (2003) for appropriate algorithms). Because such algorithms yield predictions of solar radiation uninfluenced by the atmosphere, these models include further functions allowing for solar radiation values to be corrected for atmospheric transmissivity resulting from a range of factors (e.g. cloud cover, atmospheric dust/water vapour scattering; see Theurer et al. (1984) and Boyd and Kasper (2003) for more detailed summary). Certain models (4, 5, 7, 9, 10, 14, 16, 20) even offer the facility to use both observed solar radiation values and computed data, aiding their flexibility for application in data-poor regions. However, care must be taken when using computed solar radiation values to ensure that they provide a good analogue of real data, either by comparing them to in-situ measurements acquired using a pyranometer or data from meteorological re-analysis programmes (eg. Rienecker et al., 2011). Model choice should therefore be informed by an appraisal of existing solar radiation data and (when using computed values) an appreciation of how well a given model is able to replicate observed data.

3.1.2 Net longwave radiation

While outgoing longwave radiation from the river channel represents a common heat sink, especially during night time or the winter months, studies have also demonstrated that incoming longwave energy from the atmosphere (and riparian vegetation) can mediate heat losses in certain circumstances (Benyahya et al., 2012; Hannah et al., 2008). The effect of longwave radiation must therefore be properly accounted for by the stream temperature model. Some studies involving process-based river temperature models (e.g. Garner et al., 2014) incorporate observations of longwave radiation acquired from net radiometers, but such data are rarely available from meteorological service databases. As a result, all of the river temperature models summarised in Table 1 offer the ability to compute longwave radiative fluxes as a function of other meteorological variables using a variant of the equation:

(3) $$H_{lw} = H_{lw\_atm} - H_{lw\_stream}$$

given:

(4) $$H_{lw\_atm} = (1 - R_L) \cdot \varepsilon_{atm} \cdot \sigma \cdot {T_a}^4$$

(5) $$H_{lw\_stream} = \varepsilon_w \cdot \sigma \cdot {T_w}^4$$

where ε_{atm} and ε_w (≈ 0.97) are the emissivity of the stream and the atmosphere respectively, R_L is the reflectance coefficient of the stream surface (given as 1 - ε_w), σ is the Stefan-Boltzmann constant (5.670367×10^{-8} W m^{-2} K^{-4}) and T_a and T_w are the air and water temperature (°K) respectively.

While these equations may appear relatively simple, complexities arise from the range of different formulae available for the calculation of ε_{atm} (Table 2). Most models (1-4, 7, 8, 10, 11, 14-20) calculate ε_{atm} as a function of either air temperature or vapour pressure using simple empirically derived formulae (air temperature; Swinbank, 1963; Idso and Jackson, 1969; vapour pressure; Brunt, 1932; Anderson, 1954), while others (6, 12) use the physically derived method of Brutsaert (1975) to compute ε_{atm} as a function of both air temperature and vapour pressure. Some models (5, 12) even offer multiple or composite methods for characterising ε_{atm}. Additionally, because atmospheric emissivity is heavily influenced by cloud cover, a number of models (1, 4, 6, 7, 12, 14-19) offer the ability to correct computed emissivity values for the effect of cloud cover using the approach of Bolz (1949), something that is particularly useful in regions where cloudy/overcast conditions dominate. However, several models (5, 9, 13, 21) omit information detailing the method (or derivation thereof) used to compute ε_{atm}. This, coupled with the wide choice of formulae available, means that the choice of river temperature model should therefore be informed by both the availability of data required by the given ε_{atm} equation and an *a priori* assessment of the importance of the longwave radiation contribution to the given river's energy budget. Indeed, particular care should be taken when attempting to apply a river temperature model in environments with potential for a high proportion of longwave fluxes (eg. those with substantial tree/vegetation cover, or cloud-dominated meteorology); in such instances, it may be advisable to quantify incoming radiative energy (eg. Hannah et al., 2008) using net radiometers.

3.1.3 Accounting for the effects of riparian vegetation/topography on radiative fluxes

The presence of near-stream vegetation and topography (ie. steep terrain such as canyons) can have a large influence on the amount of radiation received by a given river reach. Indeed, numerous studies have highlighted how shading from riparian tree cover or steep valley walls can moderate high temperatures, particularly in summer months (e.g. St-Hilaire et al., 2000; Malcolm et al., 2004; Hannah et al., 2008; Leach and Moore, 2010; Garner et al., 2014; Garner et al., 2015). As a result, it is necessary to account for the effect of trees and topographic shading on radiative fluxes when modelling stream temperature in such environments. While some models (3, 5, 9, 10, 13, 14, 20) do not contain any mechanism to account for the effect of vegetation/topography on radiation fluxes, most incorporate algorithms that are able to simulate the reduction in solar shortwave radiation received by the stream (Table 2). Although an in-depth appraisal of the various shading algorithms is beyond the scope of this article, it is pertinent to note that there are clear differences between them. Some models (16, 18, 19) compute the effects of shading using (amongst other variables) sun elevation, tree/topographic height and bank distance, canopy density and stream azimuth to compute a 'shade factor' coefficient that represents the fraction of radiation that does not reach the stream surface due to shading. This coefficient can then be applied to scale the solar radiation components of Equation 1. Other more complex algorithms (2, 6-8, 15, 17, 21) function similarly, but partition incoming solar radiation into its direct and diffuse components. The direct solar radiation received at the stream surface is subsequently calculated either through application of the 'shade factor' coefficient (2, 6, 17) or through modelling the amount by which the solar 'beam' is attenuated as it travels through the tree canopy (7, 8, 15, 21). The fraction of diffuse radiation received by the stream is then quantified separately, usually by means of an algorithm that computes the reach's sky view factor (e.g. 6, 7, 15, 21), a coefficient that represents the fraction of the hemisphere that is unblocked by tree cover/topography. Most shading algorithms are directly integrated within their given stream temperature model. However, some models (1, 4, 11, 12) require that the shading correction be computed externally. Generally, these models rely on GIS analysis or similar to compute either the shade factor coefficients (1, 11, 12) or canopy transmissivity values (4) which are then entered manually into the model. Although this additional step may mean that such models require more time to implement, the ability to manually enter shade correction values means that they are a) able to make use of advances in new shade correction algorithms or b) can be used with field-derived values for shade correction (e.g. Rutherford et al., 1997) that do not rely on the application of an algorithm.

Most shading algorithms are concerned with modifying solar radiation fluxes but some models also apply shading correction to longwave fluxes (4, 6, 7, 16, 17, 19, 21). Atmospheric longwave radiation is affected by riparian/topographic shading in much the same as the diffuse component of solar radiation flux (Hannah et al., 2008). As such, the impact of shading on the atmospheric longwave flux is generally calculated by computing a given reach's sky view factor (e.g. Cox and Bolte, 2007) and applying the resulting coefficient to scale the longwave flux given by Equation 4. Given that all objects with a temperature >0 °K emit longwave radiation, radiation from near-stream vegetation or topography can also represent a significant source of longwave energy. Indeed, studies show that longwave radiation from tree cover can contribute significantly to river temperature during night-time (in comparison to open reaches; Benyahya et al., 2012; Hannah et al., 2008). As a result, the same models also contain routines that compute incident longwave radiation from riparian tree cover and/or topography. This allows such models to estimate longwave radiation fluxes in tree-covered reaches with a high degree of accuracy, potentially improving their utility for predicting water temperature in steep headwater streams or heavily forested catchments.

An additional consideration concerns the spatial discretisation of the computed impacts of riparian vegetation on stream temperature. Because riparian vegetation can vary substantially along a river, any correction for riparian shading or longwave fluxes must account for spatial variability in riparian vegetation. All of the models reviewed here contain routines capable of generating such spatially explicit data using either GIS polygons, tree height rasters or shading coefficients as input data to correct radiative fluxes at the scale of the model's structure (see section 4.3). However, it is important that the chosen model's resolution is sufficiently high to encapsulate true spatial variability in the impacts of riparian vegetation on stream temperature. Similarly, the riparian vegetation data provided to the model must be of a resolution equal to or better than that of the model itself. Recent studies have demonstrated the utility of LiDAR data for providing high resolution raster datasets of riparian vegetation height/shading (eg. Wawrzyniak et al., 2017); such data are therefore particularly appropriate if attempting to model the fine-scale (ie. sub-reach) impacts of vegetation on stream temperature.

Table 2. Methods used to compute radiative flux by reviewed temperature models

		Solar radiation			Longwave radiation			
No.	**Model name**	**Computed or observed**	**Shading correction**	**Solar radiation partitioning (direct, diffuse)**	**Sky emissivity equation(s)**	**Sky emissivity corrected for cloud cover**	**Shading correction**	**Incident longwave from vegetation/ topography**
1	BasinTemp	Computed	Yes (computed externally)		Swinbank (1963)	Yes		
2	CE-QUAL-W2	Observed	Yes	Yes	Brunt (1932)			
3	CEQUEAU	Observed			Anderson (1954)			
4	CrUSTe	Both	Yes (computed externally)		Swinbank (1963)	Yes	Yes	Yes
5	Delft3D-FLOW	Both			Brunt (1932) Modified Brutaseart (1975)			
6	Heat Source	Computed	Yes	Yes	Brutaseart (1975)	Yes	Yes	Yes
7	DHVSM-RBM	Both	Yes	Yes	Swinbank (1963)	Yes	Yes	Yes
8	GIS-STRTemp	Computed	Yes	Yes	Idso and Jackson (1969)			Yes
9	HEC-RAS	Both			N/a			
10	MIKE 11	Both			Brunt (1932)			
11	MNSTREM	Observed	Yes (computed externally)		Idso and Jackson (1969)			
12	Qual2K	Observed	Yes (computed externally)		Brunt (1932) Brutaseart (1975) Koburg (1964)	Yes		
13	RAFT	Computed (from circulation model)			N/a			
14	RMA11	Both			Swinbank (1963)	Yes		
15	SHADE-HSPF	Observed	Yes	Yes	Swinbank (1963)	Yes		
16	SNTemp	Both	Yes		Brunt (1932)	Yes	Yes	Yes
17	Streamline	Observed	Yes	Yes	Swinbank (1963)	Yes	Yes	Yes
18	TVA-RMS	Observed	Yes		Swinbank (1963)	Yes		
19	WAIORA	Observed	Yes	Yes	Brunt (1932)	Yes	Yes	Yes
20	WASP7	Both			Brunt (1932)			
21	WET-Temp	Computed	Yes	Yes	Equation based on relative humidity		Yes	Yes

3.2 Modelling latent and sensible heat fluxes

3.2.1 Latent heat flux

Latent (evaporative) heat loss is a significant energy sink at the river surface (Webb and Zhang, 1997, 2004), particularly in large or open rivers (Maheu et al., 2013; Caissie, 2016). Because direct measurements of energy gains or losses from latent or sensible heat fluxes are rare (Maheu et al., 2013; Caissie, 2016), all of the river temperature models reviewed here derive net latent and sensible heat from meteorological observations. The majority of equations for calculating latent heat fluxes take the same initial form:

(6) $H_e = \rho W \cdot L_e \cdot \bar{E}$

where ρW is the density of water (1x10^3 kg m^{-3}), L_e is the latent heat of vaporisation (2.5x10^6 J kg^{-1}) and $\bar{E}$ is the rate of evaporation (m s^{-1}). However, differences in computed latent heat fluxes arise from the choice of equation used to compute $\bar{E}$ (Table 3). While some models (3) currently offer only relatively basic functionality for predicting evaporation rates as a function of air temperature and number of daylight hours (using the Thornthwaite (1948) formula), the majority (1, 2, 4, 5, 7, 9-21) use a variation on Dalton's equation for evaporation (see Lim et al., 2012) to compute evaporation rates using wind speed, actual vapour pressure and saturation vapour pressure. Most equations based around Dalton's equation involve some kind of empirical expression that estimates the adiabatic portion of evaporation as a function of wind speed and field-derived coefficients (referred to as the 'wind function', common coefficients for which can be found in Boyd and Kasper (2003) and Cole and Wells (2015). The accuracy of evaporation predictions can thus depend greatly upon the coefficients used.

In an attempt to reduce the uncertainty associated with such empirical approaches, other models (6, 8) offer the ability to use physically based equations (e.g. Penman, 1948; Monteith, 1965; Priestly and Taylor, 1972) that calculate evaporation rates based on a range of input hydrometeorological data (e.g. net irradiance, wind speed, saturation vapour pressure curve, aerodynamic conductance, etc). The use of a model that incorporates a physically-based evaporation routine may be advisable when implementing a river temperature model in an environment for which 'wind function' coefficients needed by Dalton-type approaches are unavailable. However, comparative studies present conflicting results regarding the relative accuracy of the various methods for computing evaporation (e.g. McJannet et al., 2013; Ouellet et al., 2014b; Alazard et al., 2015) meaning that is may not be advisable to apply these more complex routines unless evaporation rates predicted by simpler methods (e.g. Dalton's equation) are clearly erroneous. Conversely, while evaporative fluxes are generally of greater magnitude in warmer climates, they can represent a highly significant component of stream energy budgets in temperate regions (eg. Hannah et al., 2008). It may therefore be advisable to measure the importance of evaporative flux using an energy balance study (eg. Hannah et al., 2008) or evaporation pan experiments (eg. Maheu et al., 2014) prior to determining whether to apply a model with more complex routines for computing latent heat flux. As a result, model choice must be driven by a) an appreciation of the relative importance of evaporative flux in comparison to other heat fluxes and b) the availability of data required by a given model's evaporation routines.

Table 3. Methods used to calculate evaporation rate by reviewed river temperature models

No.	Model name	Evaporation rate equation
1	BasinTemp	Dalton's equation
2	CE-QUAL-W2	Dalton's equation
3	CEQUEAU	Thornthwaite (1948)
4	CrUSTe	Dalton's equation
5	Delft3D-FLOW	Dalton's equation
6	Heat Source	Dalton’s equation, Penman (1948)
7	DHVSM-RBM	Dalton's equation
8	GIS-STRTemp	Penman (1948)
9	HEC-RAS	Dalton's equation
10	MIKE 11	Dalton's equation (modified)
11	MNSTREM	Dalton's equation
12	Qual2K	Dalton's equation
13	RAFT	Dalton's equation
14	RMA11	Dalton's equation
15	SHADE-HSPF	Dalton's equation
16	SNTemp	Dalton's equation
17	Streamline	Dalton's equation
18	TVA-RMS	Dalton's equation
19	WAIORA	Dalton's equation
20	WASP7	Dalton's equation
21	WET-Temp	Dalton's equation

3.2.2 Sensible heat flux

The magnitude of energy lost or gained through sensible heat exchange is generally lower than radiative or latent fluxes (Caissie, 2006). However, sensible heat fluxes can nonetheless impose a non-negligible control on river temperature (e.g. Webb and Zhang, 1997), acting as both a heat sink in the winter and a heat source during summer months. All of the models reviewed here calculate sensible heat exchanges in essentially the same way following the method of Bowen (1926), either through multiplying the product of the wind function and the air-water temperature gradient by an empirical coefficient, or by applying the Bowen ratio (itself a function of air and water temperature and vapour pressure) to the evaporative flux. Consultation of the literature for the various temperature models documented here reveals minor discrepancies between the various sensible heat flux equations and coefficients used therein (e.g. 4, 9, 10, 15, 16), largely resulting from either unit conversions and/or the necessity of accounting for different wind function coefficients. There is consequently little effective difference in sensible heat flux estimates yielded by the various models discussed here, meaning that model selection is generally driven by other (greater magnitude) sources of thermal energy (eg. radiative, latent and advective fluxes).

3.3 Heat fluxes at the streambed interface

3.3.1 Bed heat flux

While generally smaller in magnitude than surface heat fluxes (Sinokrot and Stefan, 1994; Evans et al., 1998), energy exchange at the streambed-water interface has been noted an important component of the energy balance in some studies, particularly in the winter (e.g. Webb and Zhang, 1997; Hannah et al., 2004; Leach & Moore, 2014). Some river temperature models do not incorporate routines capable of calculating bed heat flux (Table 4), considering its effect on water temperature to be negligible (3-5, 8-10, 21). This is presumably because the majority of these models are designed for application in large river systems where the magnitude of heat exchanges at the streambed interface is particularly diminished in relation to other fluxes (Caissie et al., 2014). However, many other models (1, 2, 6, 7, 11-20) do incorporate bed heat fluxes into their energy balance computations. This is generally accomplished using a variation on Fourier's Law (eg. Story et al., 2003) whereby bed heat flux is computed as a function of the streambed thermal gradient (change in temperature between the streambed-water interface and a given depth within the streambed; Theurer et al., 1984) multiplied by the bed thermal conductivity (the product of bed sediment density, bed heat capacity and bed thermal diffusivity; Boyd and Kasper, 2003). Most of these models refer to this equation as quantifying heat flux arising from conduction between the bed and the water column. However, Hannah et al. (2004) note that it is extremely difficult to disaggregate bed conduction, convection and advection when estimating bed heat flux. Bed heat flux computed with this method may therefore be considered a combination of these three energy exchanges.

As with other heat fluxes detailed here, the quality of bed heat flux predictions is reliant on input data quality and availability. Bed temperature gradient is generally measured using temperature loggers installed at given depths within the bed or modelled numerically given *a priori* knowledge of the bed material and temperature gradients within the riverbed (e.g. Sinokrot and Stefan, 1993), while thermal conductivity is governed by the type of bed material (ie. lithology, porosity, etc) and derived from laboratory analysis of bed sediments (data for which are often available in the literature; Hondzo and Stefan, 1994). Observations of these parameters can be difficult to ascertain, and it is often necessary to provide estimates to the temperature model. However, owing to the high degree of heterogeneity often present in bed temperatures (eg. Birkel et al., 2016), obtaining even an average or estimate can be difficult. In such circumstances, care must be taken to ensure that modelled bed heat fluxes stay within realistic values. Furthermore, given the importance of conductive and advective (eg. hyporheic-driven) bed heat fluxes in some regions (eg. Leach & Moore, 2014), the use of such 'bulk' approaches for computing bed heat fluxes produces a highly simplified estimate of true bed energy transfer processes. Although recent research (eg. Kurylyk et al., 2016; Caissie and Luce, 2017) has proposed improved methods for quantification of bed heat fluxes (and subsequent partitioning into their conductive, convective and advective components), these approaches have not yet been integrated into existing river temperature models and accurate modelling of bed heat fluxes therefore remains a challenge.

In addition to the calculation of 'bulk' bed heat fluxes, some models (6, 13, 18) also include separate routines capable of estimating heat flux due to solar heating of the bed. In most cases, river temperature models function under the assumption that the channel is deep enough that all solar radiation is attenuated within the water column. However, in certain circumstances (ie. shallow headwater streams, streams with considerable exposed boulder material, very low turbidity environments; Chen et al., 1998a), solar warming of the streambed may contribute significantly to river temperature warming (e.g. Evans et al., 1998; Clark et al., 1999; Webb and Zhang, 1999; Johnson, 2004). Because the magnitude of such heat fluxes is both temporally or spatially variable (Webb and Zhang, 1997), it may be beneficial to choose a model that accounts for these processes when modelling temperature in environments where radiative streambed warming is thought to occur. Where possible, it is therefore advisable to quantify the magnitude of bed heat fluxes either by means of Fourier's law (eg. Story et al., 2003) or by using soil heat flux plates, in order to determine whether a) the use of a model capable of accounting for bed heat fluxes is necessary and b) the extent to which modelled fluxes approximate observed data.

Table 4. Details of reviewed river temperature models' capacity to include bed heat fluxes

No.	Model name	Computes bed heat flux	Computes flux from radiative warming of bed	Computes fluid friction with bed/banks
1	BasinTemp	Yes		
2	CE-QUAL-W2	Yes		
3	CEQUEAU			
4	CrUSTe			
5	Delft3D-FLOW			
6	Heat Source	Yes	Yes	
7	DHVSM-RBM	Yes		
8	GIS-STRTemp			
9	HEC-RAS			
10	MIKE 11			
11	MNSTREM	Yes		
12	Qual2K	Yes		
13	RAFT	Yes	Yes	
14	RMA11	Yes		
15	SHADE-HSPF	Yes		
16	SNTemp	Yes		Yes
17	Streamline	Yes		
18	TVA-RMS	Yes	Yes	
19	WAIORA	Yes		Yes
20	WASP7	Yes		
21	WET-Temp			

3.3.3 Fluid friction with the bed and banks

Heat gains from fluid friction can be a significant source of heat in steeper streams with high roughness coefficients (e.g. Hannah et al., 2004; Chikita et al., 2010; Khamis et al., 2015). Although only two publicly available models (16, 19) currently include routines for calculating fluid friction, a range of studies have used the same simple equation for manually estimating friction-driven heat fluxes (e.g. Marsh, 1990; Webb and Zhang, 1997; Hannah et al., 2004; Tung et al., 2006; Chikita et al., 2010; Cardenas et al., 2014). Should suspicions arise that the non-accounting for fluid friction by a given model is biasing temperature estimates (eg. in the case where the user is confident that all other heat flux parameters are accurately modelled but temperature simulations still do not match observed data), it should at least possible to estimate friction gains/losses outside of the model. Furthermore, many coupled hydraulic-water temperature models already include routines for quantifying fluid friction as part of their hydraulic computations. Given the ready ability to customise/script these models, it may be possible to devise routines which use the outputs of these computations to improve temperature estimates in high gradient streams. Nevertheless, with the exception of a few studies (e.g. Webb and Zhang, 1997, 1999) where fluid friction was estimated to be high, such heat exchanges are generally assumed to be minor and can be considered negligible for the majority of temperature modelling scenarios (e.g. Carrivick et al., 2012; Johnson et al., 2014). The ability of a model to account for fluid friction can therefore be considered a low priority during model selection, unless working in particularly high-energy environments.

3.4 Advective heat fluxes

Inflows from tributaries or subsurface inputs can engender substantial temperature gradients in river systems (e.g. Torgersen et al., 1999; Torgersen et al., 2001). All of the models covered in this review contain routines capable of computing advective heat fluxes (Table 5) using the same general equation:

(6) $T_{w,x} = \frac{(T_{w,x-1} \cdot Q) + (T_{in} \cdot Q_{in})}{Q + Q_{in}}$

where *Q and* Q_{in} are the discharge of the main channel and inflow respectively and T_{in} is the temperature of the inflow (Boyd and Kasper, 2003). However, differences between the various models arise from a) the way in which boundary conditions are assigned to advective inputs, b) the way in which inflows arriving from different sources are disaggregated and c) the resolution at which inflows can be assigned within the model.

In terms of assigning boundary conditions to advective inputs, the majority of temperature models require the user to manually input discharge and temperature data associated with inflows. These observations are relatively easy to obtain for surface inflows by means of temperature loggers and discharge gauges. Subsurface inputs are harder to quantify, given the scarcity of groundwater temperature records in many locations and the difficulty of quantifying groundwater flux. Groundwater temperature is therefore often assigned a value equal to mean annual air temperature given the close correlation between these two variables (e.g. Karanth, 1987). However, in regions where groundwater temperature departs significantly from this trend, advective heat fluxes resulting from groundwater inflows may be over- or under-represented. The need for flow or temperature observations can be minimised by using coupled hydraulic or hydrological models (e.g. 3, 7, 9, 10, 15; see sections 4.1 and 4.2) which are able to estimate the flows and temperatures associated with advective inputs. However, although these models are able to simulate surface water contributions with a reasonable degree of accuracy, the resolution of simulated groundwater inflows is often extremely course, requiring additional data on groundwater exfiltration/temperature to be manually entered.

In terms of the disaggregation of inflows resulting from different sources, some models discriminate between tributary inflows and those arising from groundwater processes, allowing tributary inflows to be assigned as point inputs, with groundwater inflows (or indeed, losses to the aquifer; Boyd and Kasper, 2003) modelled as diffuse inputs distributed along a given reach (e.g. 1, 4, 6, 8, 12, 19, 21). Because inflows from different subsurface zones (ie. hyporheic vs. shallow groundwater) have varying hydrologic characteristics (ie. groundwater flux generally involves a permanent change in water volume whereas hyporheic flux is characterised by recurrent exchanges to and from the bed over shorter distances and time periods), some models even offer the ability to model thermal inputs from different subsurface zones (ie. saturated vs unsaturated zones; 3; hyporheic flow; 7, 12, 18). However, other models (2, 5, 10, 14, 16-18, 21) require input of 'bulk' inflows at discrete intervals within the model which merge surface and groundwater inputs together. This means that the true location of a given inflow may not be accurately represented within the model as the 'merging' of several inflows will require that their input location is also a reflection of their combined values. Because subsurface inflows are often more diffuse than tributaries, the merging of advective inputs in this manner may result in a river temperature response that is not properly representative of true subsurface or surface water mixing processes (Pike et al., 2013). Assigning temperatures to these combined inflow data can be difficult given the likely temperature difference between surface and subsurface inflows owing to their different thermal characteristics. In such instances, it may therefore be advisable to apply Equation 6 to estimate the bulk temperature of the combined inflows before it is input into the model. However, it should be noted that through merging diffuse and discrete advective inputs in this manner, a model may produce a false representation of the location and magnitude of warm or cool water inputs which may have implications for certain studies focusing on such phenomena (eg. the ecological significance of cool water refuges; Dugdale et al., 2016).

The ability of a river temperature model to represent advective fluxes is also dependent upon its resolution and structure (covered in further detail in section 4.3). While less of an issue for models using a high resolution gridded structure (2, 5, 13, 14, 20) whereby inflows can be assigned to each grid cell (allowing for multiple advective inputs in a relatively small spatial scale), models operating at reach scales only allow for inflows to be assigned at the resolution of nodes/segments (2, 5, 7, 9, 12, 16-18, 20, 22). An appropriate segment resolution must be chosen in order to ensure that the river temperature response to local advective inputs is represented in the correct geographic location in order that modelled temperature accurate reflects observed data when conducting model calibration. Model selection should therefore be informed by an appreciation of both the relative importance of advective heat inputs (ascertained through flow accretion surveys, tributary gauging, piezometric measurements or similar techniques) and the distribution of these inputs along the study river; in the case of rivers found to have strong advective inflows, only those models capable of accurately representing these features should be considered.

Table 5. Details of reviewed river temperature models' capacity to include advective heat fluxes (bulk inflows vs. separate surface and groundwater inputs)

No.	Model name	Advective input separation	Details
1	BasinTemp	Separate	Can incorporate groundwater inputs, assumes linear mixing along model segment
2	CE-QUAL-W2	Bulk	
3	CEQUEAU	Separate	Hydrological model component allows for separate computation of inflows from surface and saturated and unsaturated subsurface zones
4	CrUSTe	Separate	Can incorporate groundwater inputs, assumes linear mixing along model segment
5	Delft3D-FLOW	Bulk	
6	Heat Source	Separate	Can incorporate point and diffuse groundwater inputs, hyporheic inflows
7	DHVSM-RBM	Separate	Hydrological model component allows for computation of groundwater inflows. Lagrangian (cellular) structure of model permits inflows from different sources (tributaries/groundwater) at each cell
8	GIS-STRTemp	Separate	Can incorporate groundwater inputs, assumes linear mixing along model segment
9	HEC-RAS	Separate	Models groundwater seepage/throughflow using Darcy's Law (see Drake et al., 2010)
10	MIKE 11	Bulk	Hydrological component allows for computation of groundwater inflows
11	MNSTREM	Bulk	
12	Qual2K	Separate	Can assign separate point and diffuse advective fluxes
13	RAFT	Separate	Lagrangian (cellular) structure of model permits inflows from different sources (tributaries/groundwater) an each cell
14	RMA11	Bulk	
15	SHADE-HSPF	Separate	Hydrological component allows for computation of groundwater inflows
16	SNTemp	Bulk	
17	Streamline	Bulk	
18	TVA-RMS	Bulk	
19	WAIORA	Separate	Can incorporate groundwater inputs, assumes linear mixing along model segment
20	WASP7	Bulk	
21	WET-Temp	Separate	Can incorporate groundwater inputs, assumes linear mixing along model segment

4. Model implementation

The differences between the available temperature models are not limited simply to their representation of physical energy fluxes. Indeed, there is also substantial variability in the ways in which the various models are implemented. These differences lie in their ability to model hydraulic (ie. flow velocity and wetted cross-section) and/or hydrological (ie. discharge or rainfall-runoff) data, their structure (ie. their spatio-temporal resolution and dimensionality; Figure 3), considerations regarding their calibration, and the degree to which the models are publicly available and/or open to customisation. These differences have substantial implications regarding the choice of a suitable river temperature model for a given purpose, and require careful consideration prior to a given model's application (see Table 6 for guidance regarding key model features and contexts in which they may be advantageous). In this section, we review these logistical and operational differences.

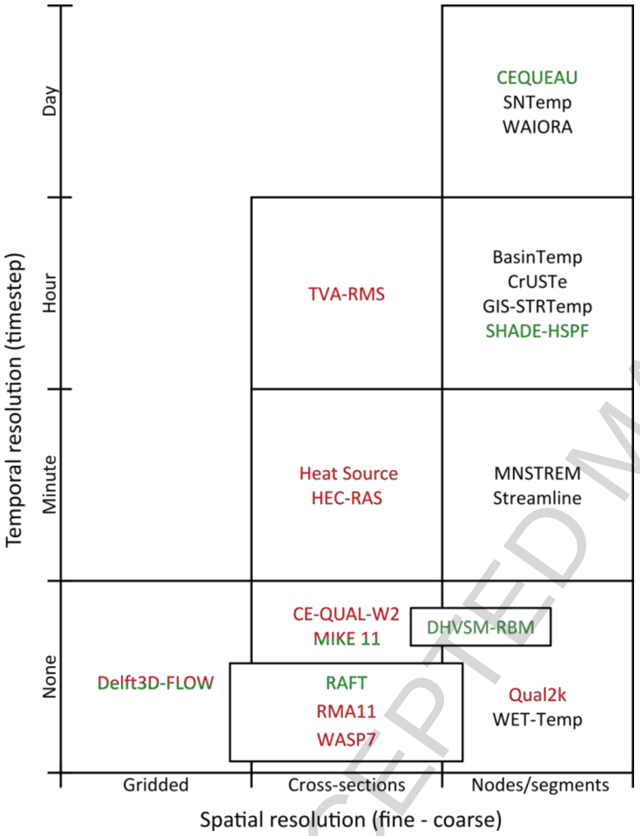

Figure 3. Spatial and temporal resolution of reviewed process-based river temperature models. Red text indicates model with hydraulic coupling, green text indicates hydrological coupling. Figure is greatly simplified for sake of clarity. We acknowledge that spatial resolution can be variable and that it is possible to have node/segment-based models with higher resolution than gridded models.

Table 6. Key model features and contexts in which they may be advantageous

Model feature	When/where is it advantageous?	Energy flux affected (where appropriate)
Ability to estimate incoming solar radiation as a function of date/time and location	Regions for which observations of solar radiation data are scarce.	Shortwave flux
Multiple methods for computation/correction of atmospheric emissivity	Areas prone to overcast conditions and/or significant cloud cover.	Longwave flux
Routines capable of accounting for riparian and topographic shading	Rivers in areas of high forest cover and/or steep topography (ie. valleys, canyons).	Radiative (shortwave and longwave) fluxes. NB. Riparian vegetation also impacts turbulent fluxes (through alterations to the riparian microclimate; see Dugdale et al., 2018), although no existing models account for this (see section 5).
Ability to enter external riparian/topographic shading data	Make use of advances in shading algorithms; input of direct shading observations (eg. from hemispheric photography; Garner et al., 2014).	Radiative (shortwave and longwave) fluxes
Physically based latent heat flux equations	When more basic (ie. Dalton-type) equations fail to provide a reasonable estimate of latent heat flux; areas with high latent heat flux.	Turbulent (evaporative and sensible) fluxes. Predominantly latent heat flux, but can also impact sensible heat flux through application of Bowen ratio (see section 3.2.2).
Ability to model bed heat flux	Rivers with significant groundwater or hyporheic contributions; regions with permeable bedrock and/or elevated water-table.	Bed heat flux
Ability to disaggregate advective inflows from multiple different sources (ie. surface vs groundwater)	Rivers with strong spatial temperature heterogeneity.	Advective flux
Hydraulic model coupling	Dynamic rivers; environments prone to rapid spatio-temporal changes in width:depth or velocity	-
Hydrological model coupling	Regions where hydrometric data are scarce; prediction of potential climate change impacts on rivers	-
Higher dimensionality (ie. 2D, 3D)	Rivers with strong vertical or lateral temperature gradients or stratification (eg. impounded rivers, estuaries)	-
Sub-daily model timestep	Generation of advanced thermal metrics (ie. degree hours, time spent above a given threshold)	-

4.1 Hydraulic model integration and representation of channel morphology

As accurate temperature predictions require a good representation of channel morphology, it is important to consider the methodology that a given temperature model uses to obtain these parameters. At the most basic level, a river temperature model requires input data concerning the area and time over which energy transfers occur (e.g. Theurer et al., 1984) in order to calculate total heat flux for a given section of river. Values of channel width, depth, and velocity for each element within a model must be available in order to compute Equation 2. While these data are generally derived from field measurements or GIS databases, one of the principal limitations of stream temperature models that require these data is their assumption that channel width, depth and velocity remain temporally stable. In reality, variations in discharge will inherently lead to changes in wetted cross-section and flow velocity, which will alter energy fluxes at the channel surface and bed. In ideal circumstances, time series of width, depth and velocity change (obtained using dataloggers or similar) would enable the appropriate values to be input into the model at each timestep, but such data (especially spatially distributed observations) are rarely available in practise. Instead, some temperature models have a limited ability to account for changes in wetted cross-section and/or velocity either through the use of Manning's equation (e.g. Robert, 2003) to compute changes in width/depth as a function of stream gradient and velocity (e.g. 21) or by using empirically derived discharge-width and discharge-velocity ratings curves (e.g. 13, 17). However, given that these methods rely on empirical or semi-empirical functions, the temperatures predicted by such models may only hold true in relatively steady-state environments where there is little spatio-temporal change in channel morphology or flow velocity.

In an attempt to address these limitations, many river temperature models are now coupled to hydraulic models (Table 7), allowing them to simulate flow velocity and wetted cross-section as a function of input channel morphology data for the entire range of discharges exhibited by the river (2, 5, 6, 9, 10, 12, 14, 18, 20). The ability to incorporate spatially and temporally explicit hydraulic data into the temperature model means that such models are able to calculate energy fluxes in more dynamic fluvial environments with a greater degree of accuracy, improving temperature predictions. However, such models are necessarily more complex, and their increased data requirements and higher parameterisation may mean that their use is beyond the scope of some river temperature studies. Additionally, the hydraulic model's velocity/stage predictions must also be thoroughly calibrated/validated against observed data, meaning that the implementation of such models can be time consuming when compared to more simplistic systems. Nevertheless, when working in environments that are particularly dynamic and/or prone to rapid changes in width/depth ratio which could greatly impact stream temperature (eg. upland environments), the selection of a hydraulically-coupled model may be advisable.

Table 7. Details of hydraulic/hydrological coupling, dimensionality, and spatial and temporal resolution/structure for reviewed river temperature models

No.	Model name	Hydraulically coupled	Hydrologically coupled	No. dimensions	Minimum timestep	Model structure
1	BasinTemp			1	Hourly	Nodes/segments
2	CE-QUAL-W2	Yes		2 (longitudinal, vertical)	None	Cross-sections with vertical cells (2D)
3	CEQUEAU		Yes	1	Daily	Gridded hydrological model, but 1D temperature (node-based)
4	CrUSTe			1	Hourly	Nodes/segments
5	Delft3D-FLOW	Yes	Yes	3	None	Gridded (2D/3D)
6	Heat Source	Yes		1	Minute	Cross-sections
7	DHVSM-RBM		Yes	1	None	Nodes/segments (each segment subdivided into cells for Lagrangian functionality)
8	GIS-STRTemp			1	Hourly	Nodes/segment
9	HEC-RAS	Yes		1	Minute	Cross-sections
10	MIKE 11	Yes	Yes	1	None	Cross-sections
11	MNSTREM			1	Minute	Nodes/segments
12	Qual2K	Yes		1	None	Cross-sections
13	RAFT		Yes	1	None	Cellular (Lagrangian)
14	RMA11	Yes		1 to 3	None	Nodes/segments (1D) or gridded (2D/3D)
15	SHADE-HSPF		Yes	1	Hourly	Nodes/segments
16	SNTemp			1	Daily	Nodes/segments
17	Streamline			1	15 minutes	Nodes/segments
18	TVA-RMS	Yes		1	Hourly	Cross-sections
19	WAIORA			1	Daily	Nodes/segments
20	WASP7	Yes		1 to 3	None	Nodes/segments (1D) or gridded (2D/3D)
21	WET-Temp			1	None	Nodes/segments

4.2 Hydrological model integration

In addition to hydraulic functionality, other river temperature models offer full hydrological coupling, enabling the simulation of discharge (as a function of input meteorology data) in addition to temperature (Table 7). Such models are useful for simulating river temperature in remote or sparsely gauged watersheds where hydrometric data are rare. Additionally, these models often allow for the representation of different thermal characteristics of multiple source water components, offering a high degree of utility for assessing the consequences of changing hydroclimatic conditions on stream temperature across watersheds with varying patterns of recharge and discharge. However, the prediction of water temperature is often not the prime function of such models. Indeed, of the coupled temperature-hydrological models detailed here, two were first conceived as hydrological models, with water temperature routines being added at a later date (3, 15), while (5) and (10) are principally hydraulic/hydrodynamic models which also offer routines for rainfall-runoff and water temperature simulation. This does not necessarily mean that temperature simulations from such models will be of lower accuracy than dedicated river temperature models. However, model implementation is generally more complex and the data requirements greater than dedicated water temperature models. Nevertheless, because coupled temperature-hydrological models allow for the simultaneous simulation of discharge and temperature, they offer increased utility with regards to predicting the effects of climate change to river ecosystems (e.g. Danner et al., 2012; van Vliet et al., 2012; Ficklin et al., 2014), given that climate change is expected to influence both of these metrics in the future. The use of a coupled temperature-hydrological model may therefore be advisable should the scope of a study extend to modelling the impacts of future climatic warming on river ecosystems or should temperature predictions be required for a river that lacks discharge measurements. However, the hydrological model's discharge simulations must be thoroughly calibrated/validated prior to use, a process which can be time consuming. This, coupled with the relative complexity of hydrological model implementation means that such models will generally be unnecessary for most 'conventional' stream temperature studies.

4.3 Model structure and resolution

4.3.1 Spatial resolution and dimensionality

The spatio-temporal resolution of river temperature simulations varies substantially between the various models discussed here (Figure 3). While some models are limited to providing temperature predictions at relatively coarse scales and time steps, others effectively offer no upper limit on resolution, allowing temperature predictions to be discretised at a scale of the user's choosing. In terms of spatial resolution, model choice is largely informed by the intended application. Models capable of providing data at fine spatial scales offer increased utility to understanding linkages between ecosystem dynamics and water temperature (through the use of models to locate cool or warm water refuges or determine the fine-scale response of stream temperature to vegetation), while lower resolution models may be more relevant for providing synoptic data to inform water resources management. In examining their spatial resolution, river temperature models can generally be separated into two classes: one-dimensional models, and multi-dimensional (gridded) models (Table 7).

In one-dimensional models (1, 3, 4, 6-13, 15-19, 21), the river channel is generally discretised as a series of segments or nodes of essentially homogeneous conditions whose length is dependent on the requirements of the study and/or the presence of longitudinal discontinuities (e.g. tributary inflows, substantial changes in channel morphology). Hydrometeorological data necessary for computing Equation 1 are attributed to each segment/node. Because meteorological observations are rarely discretised at the resolution of each segment/node, meteorological data are either attributed to each model segment/node manually (4, 6, 10, 12, 15-18) or by interpolation from one or more nearby weather stations (3, 7, 9, 21). Channel morphology and hydrometric data necessary for computing Equation 2 are also attributed to each node or segment; in the case of 1D coupled hydraulic-temperature models (6, 9, 10, 12, 18) nodes are assigned detailed measurements of channel cross-section required by the hydraulic computations. Where applicable, measurements of riparian vegetation necessary for the shading routines of the model are also attributed to each segment/node. Equations 1 and 2 are subsequently computed for each segment/node, yielding temperature simulations in a single (longitudinal) dimension. The longitudinal resolution of simulated temperatures is thus dependent upon either the length of the segments or the spacing between model nodes, and is generally a user-defined property. In theory, this means that such models should allow for predictions at extremely fine spatial resolution where required. However, in practise, the resolution of temperature predictions is driven largely by the resolution of the input channel morphology and hydrometeorological data. While interpolation can be used to increase the resolution of input data allowing for finer scale simulations, the memory and processing/programming limitations of the model may prohibit the use of very high resolutions. Although some one dimensional temperature models focus on providing simulations for single thread channels (4, 8, 11, 17), most also allow for the computation of river temperature across entire networks, through representing the river network as a directed graph (1, 3, 6, 7, 9, 10, 12, 13, 15, 16, 18, 19, 21). Such models are particularly useful for providing basin-wide predictions of water temperature, should such information be needed for management purposes or similar.

Gridded models (2, 5, 14, 20) allow for the simulation of temperature in multiple dimensions. This facility is often unnecessary in smaller rivers but such models are useful in larger systems where significant vertical and/or lateral temperature gradients exist such as impounded rivers with deep stratified channels and reservoirs (e.g. Wang and Martin, 1991; Hanna et al., 1999) or large rivers/estuarine environments (e.g. Ouellet et al., 2014a). Gridded models function in the same general manner as 1D models using Equations 1 and 2. However, Equation 2 also computes advection/dispersion in multiple dimensions and is necessarily more complex. Furthermore, because most gridded temperature models are based on hydraulic/hydrodynamic models, temperature simulations are provided at the same resolution as the bathymetric grid used for hydraulic simulations (e.g. Deltares, 2014). While this means that temperature predictions from gridded models can be of a higher resolution than their 1D counterparts, input hydrometeorological data used in Equation 1 are generally interpolated up to the resolution of the model grid. Therefore, despite the higher spatial resolution, the accuracy of temperature predictions is largely dependent on the quality of the interpolation, and may not be better than 1D simulations. Furthermore, at particularly fine resolution, the extremely small modelled temperature differences between successive grid cells may indeed be smaller than the error of the model itself. In light of this and the fact that 2D and 3D river temperature models are generally more complex to implement than simpler 1D models (and have substantially increased processing requirements), the additional functionality of gridded models may be redundant unless a study specifically requires the ability to simulate water temperature in multiple dimensions (eg. in the presence of significant stratification or highly variable turbulence/mixing patterns).

4.3.2 Temporal resolution

Temporal resolution is also an important consideration when choosing a river temperature model. While some applications (ie. stream thermal regime classification) require only simple daily metrics (eg. mean/maximum temperature) generated by models operating at low temporal resolution, higher frequency data are often important. Indeed, models operating at higher temporal resolution are able to generate more advanced thermal metrics (eg. period of time spent above a given threshold), which can be useful for detailed studies of stream thermal ecology or for informing river management decisions.

The difference between models in terms of their temporal resolution is considerably more limited than in terms of their spatial resolution (Table 7). The lowest temporal resolution models reviewed here (4, 17, 20) provide temperature simulations on a daily timestep, allowing for broad characterisation of river temperature metrics. However, the majority of models offer considerably shorter timesteps, simulating temperature on hourly or sub-hourly steps (1, 4, 6, 8, 9, 11, 15, 17, 18) or even offering no effective minimum temporal resolution (2, 5, 7, 10, 12-14, 20, 21). Such models are readily able to reproduce diurnal temperature variability and allow for the extraction of key temperature metrics relevant to fluvial ecology or water quality studies. However, similar to that noted in section 4.3.1, the minimum timestep of a model is essentially governed by the temporal resolution of the input hydrometeorological data used to drive it, meaning that model choice should be advised by both the requirements of the study and the available discharge and meteorology observations. Given that model runtime is intrinsically linked to the number of model timesteps (ie. the length of the simulation period divided by the temporal resolution), model selection must be made with an appreciation of the processing time required to generate a temperature simulation.

4.4 Model calibration/validation

Most river temperature models require calibration/validation to ensure that they produce an accurate representation of true river temperature. This is because models contain a simplified representation of true energy fluxes and basin physiography (see section 3, 4.1-4.3), meaning that simulations do not provide a perfect analogue of true river temperature. In order to ensure that simulated temperatures are as close to observed data as possible, the model must be calibrated by tuning coefficients related to the empirical elements of the heat budget equations (see Ouellet et al., 2014b) or channel morphology (e.g. bed thermal conductivity, Manning's roughness) of the study river. Descriptive statistics are then used to quantify the relative performance of the model against temperature observations recorded *in-situ*. Because of the strong seasonal component present in river temperature series, the use of the model's root mean-squared error (RMSE) is generally preferred to the Nash-Sutcliffe model efficiency coefficient (NSE; see Janssen and Heuberger, 1995) or other similar measures due to the fact that RMSE remains unbiased by seasonal cyclicity. Some river temperature models are relatively highly parameterised, meaning that model calibration can be laborious. In such cases, it may be advisable to calibrate the model using algorithmic approaches (e.g. Zheng and Wang, 1996; Hansen and Ostermeier, 2001; Arsenault et al., 2014) that optimise model calibration by iteratively refining parameters to minimise the difference between observed and predicted values (ie. by minimising RMSE). However, when using such algorithms, care must be taken to ensure that physically plausible bounds are used to constrain the calibration coefficients to ensure that the algorithm does not automatically arrive at a calibration which produces good temperature simulations at the expense of unrealistic energy fluxes. It may also be advisable, when calibrating highly parameterised models, to conduct sensitivity analyses to better understand how changes to the various parameters influence model predictions. Such an exercise may help to reveal not only important information regarding model functionality and the influence of various parameters on simulated temperatures, but may also infer the dominant processes controlling the thermal regime of the modelled river.

In terms of data required for model calibration/validation, the vast majority of studies involving river temperature modelling use temperature loggers to provide observations of true water temperature. Loggers are typically installed within the active channel and housed in shielding to prevent bias from solar radiation and damage from collision with bedload. The spatial distribution and logging frequency (temporal resolution) of temperature observations acquired using loggers is informed by the study and chosen model. While loggers are an appropriate source of data for calibration/validation in most studies, models operating at particularly fine longitudinal scales may require data at higher spatial resolutions. Indeed, spatially-continuous data from fibre-optic distributed temperature sensing (FO-DTS) technology (eg. Bond et al., 2015) or airborne thermal infrared (TIR) data (eg. Boyd and Casper, 2003; Cristea and Burges, 2009) have been successfully used as data sources for river temperature model calibration/validation (models 6, 12). However, it should be noted that all three of these methodologies (loggers, FO-DTS and airborne TIR) have limitations; loggers in terms of their inability to provide spatially-continuous data, FO-DTS in terms of the relatively short distance over which it can be used and airborne TIR in terms of its ability to provide only a temporal ‘snapshot’ of longitudinal river temperature variability. Where possible, efforts should therefore be made to combine these approaches for achieving the best possible model calibration/validation.

4.5 Model availability and customisability

Another key consideration when determining the most appropriate river temperature model for a given study is the model’s availability and potential for customisation to a specific application (Table 1). Of the models discussed in this paper, the majority are either publicly available (as of 2016) or have been made available at some point during their development cycle. However, it is necessary to differentiate between models that are freely available to download (2, 5-7, 9, 11, 12, 15, 16, 19, 20) or on request from the authors (3, 17, 18, 21) and those that are either proprietary (1, 14) or only available commercially (10). Although some studies will require the additional functionality of proprietary/commercial models (eg. full hydrodynamic integration; 10, 14), the range of publicly available models that now exists means that open-source/freeware alternatives are often the preferred option for studies involving river temperature modelling. Additionally, the source code of many publicly available models is also available for modification (2, 3 5-7, 11, 12, 15, 16, 18, 20, 21), allowing the user to edit the model routines and develop new modules as required. Such a facility offers increased flexibility to a given temperature model, with user-driven development of new functions allowing it to stay abreast of advances in river temperature research. For example, the authors are aware of at least one river temperature model where ready access to the model’s source code is driving user development of improved evaporative flux and canopy shading functions (see St-Hilaire et al., 2015).

5. Current limitations and opportunities for future research

Despite the generally high degree of accuracy with which modern process-based temperature models are able to simulate thermal processes in rivers (e.g. RMSE $\lesssim$1.0 °C at sub-hourly to hourly timesteps over seasonal to annual periods; Garner et al., 2014; Hébert et al., 2015; Woltemade and Hawkins, 2016), there remain several limitations to their application. Primarily, these limitations relate to issues associated with the energy balance calculations or input resolution (see sections 3 and 4.3). In terms of energy balance, models are often limited by the relative simplicity of their process representation. Surface fluxes usually dominate the energy budget (Caissie, 2006) and so models have focused on quantifying surface heat transfers with a good degree of detail. However, there is still room for improvement, particularly with regards to modelling the impacts of riparian vegetation on heat fluxes at the air-water interface. While most models are now capable of computing the impact of riparian tree cover on radiative fluxes, none are currently able to quantify how bankside vegetation alters turbulent heat fluxes through alterations to the riparian microclimate (eg. Dugdale et al., 2018). Improvements in this regard would aid model performance in forested regions and help efforts to understand future impacts of land-use or climate change on river temperature regimes.

Energy fluxes at the streambed interface are less well represented by currently available models, and many provide only a relatively generalised ability to quantify bed heat fluxes or advective heat transfer. Because of this, modelling river temperature in systems with major groundwater contributions requires special attention. The limited ability of currently available models to represent heat and mass transfers from different sources (eg. soil water, groundwater) coupled to the lack of large-scale estimates of certain inflow types (eg. hyporheic flow) is a major challenge, and future research should therefore focus on improving model representation of subsurface fluxes. The potential coupling of river temperature models to detailed groundwater-surface water flux routines (e.g. Kurylyk et al., 2014) could help to address this shortcoming, as could further research characterising the spatio-temporal variability (and driving mechanisms) of hyporheic fluxes (eg. Birkel et al., 2016). Such advances would help improve model performance in groundwater dominated regions and also shed new light on the role of subsurface hydrological processes in driving river temperature (a research gap noted by Hannah and Garner, 2015).

In addition to groundwater, the representation of energy advected by other phenomena such as precipitation (e.g. Null et al., 2013) or meltwater (e.g. Greene and Outcalt, 1985) is often omitted from the energy balance. While these energy transfers are sometimes covered by coupled hydrological-water temperature models (e.g. van Vliet et al., 2012), more ‘unusual’ fluxes such as heat generated through fluid viscosity (resulting from friction generated by the movement of water molecules against each other) or energy contributions from in-stream chemical and biological processes (Webb & Zhang, 1997) or precipitation are very rarely quantified. The development of model routines capable of computing these heat fluxes would help to ‘close’ the model’s energy balance, minimising errors resulting from the non-representation of such fluxes. Indeed, such data would reduce uncertainty regarding whether model errors arise from the simplicity of the model’s heat budget or from other sources. Further research is therefore needed into how best to implement these ‘unusual’ energy fluxes within river temperature models and the circumstances where they may represent a significant source (sink) of energy. However, it is important to remember that in the majority of cases, the conventional energy balance equation (Equation 1) produces a more-than-adequate representation of heat fluxes, and the addition of such extra layers of complexity is generally unnecessary.

Another limitation of current process-based river temperature models relates to the availability and resolution of input meteorological and physiographic data. Because process-based models require input meteorology or land-use data, their utility for modelling temperatures in remote locations is limited. Furthermore, even when data does exist, river temperature model inputs are often based on point data (i.e. single isolated meteorological stations or coarse-resolution land-use data) which are unable to encapsulate variability in hydrometeorology or basin physiography. Difficulties in scaling up model inputs from these point locations to the resolution of the chosen model can impact simulation quality. There is consequently a need to develop approaches for the acquisition and/or upscaling of data necessary for modelling temperatures in inaccessible regions or at increased resolutions. Geostatistical approaches have previously been used with success to upscale meteorological data (e.g. air temperature; Spadavecchia and Williams, 2009) and channel morphology (e.g. Legleiter and Kyriakidis, 2008; Merwade, 2009). However, neither of these approaches has been applied in a river temperature modelling context, and more research is therefore needed in order to facilitate the application of process-based models in data-poor regions. Similarly, while remote sensing has shown strong potential for deriving fine scale observations of meteorology (e.g. Rienecker et al., 2011; Vinukollu et al., 2011) and/or channel morphology (e.g. Marcus and Fonstad, 2008; Fonstad et al., 2013) that would be suitable as inputs to river temperature models, studies combining these remote sensing approaches with river temperature modelling are uncommon. Future research combining statistical upscaling methods with remote sensing should thus be prioritised with a view to generating high resolution meteorology and physiographic inputs necessary for improving river temperature model performance, particularly in remote locations. Given that remote sensing has been demonstrated useful both for deriving and providing fine scale temperature data needed for model calibration/validation (through the application of thermal infrared imagery; Handcock et al., 2012), the combination of river temperature models with remote sensing data (e.g. Vatland et al., 2015) clearly has potential.

A final limitation to the use of water temperature models concerns the necessity of specifying boundary conditions to the model and the implications of this for reach- to watershed-scale temperature models. In all process-based water temperature models, water temperature is both the product and a boundary condition of the energy balance because it is required for the calculation of outgoing longwave radiation, turbulent heat fluxes and bed heat flux (see sections 3.1.2, 3.2 and 3.3.1) which are in turn used to compute water temperature (Moore et al, 2005). This means that data concerning water temperature are actually required by the model to then simulate temperature. For small reach-scale models with few advective inputs, a single upstream temperature boundary condition may suffice. However, in the case of larger models with multiple inflows, it is necessary to attribute a temperature boundary condition to each of these inputs, meaning that additional input river temperature observations are required. Unfortunately, this can lead to considerable data requirements when modelling entire river networks. The use of coupled hydrological-water temperature models (which effectively simulate river discharge and temperature from source to confluence; e.g. 3, 7, 15) may alleviate this problem, as only the boundary condition required is the water temperature of the headwater exfiltration (which can be approximated by mean annual air temperature; e.g. Karanth, 1987). Alternatively, spatial regression models or spatial statistical network models (eg. Jackson et al., 2017; Isaak et al., 2015) could be used to provide boundary conditions at locations for which temperature observations do not exist. However, it is necessary to note that composite model approaches such as these may increase model error due to the multiple layers of uncertainty associated with the simulated data.

In their review paper, Benyaha et al. (2007) noted the importance of the newer generation of statistical models for understanding the influence of environmental variables on stream temperature. We suggest that process-based temperature models have an equally important role to play in the river sciences and that the two approaches are highly complementary. Because of process-based models’ unique ability to illuminate the fundamental processes driving river temperature dynamics, they are ideally positioned to inform appropriate metrics to be used in larger-scale statistical approaches. Conversely, statistical approaches provide a potential solution for addressing issues of data or boundary condition availability within process-based models. There is therefore substantial scope to combine statistical and process-based models in a complementary capacity, not only to improve the quality of river temperature simulations from existing models, but also to better identify and understand the fundamental linkages between hydrometeorology, river basin properties, and river temperature. Such advances will allow for more accurate river temperature projections in space and time, and will be of great use to water resource managers and other environmental practitioners charged with better understanding and protecting sensitive river environments. We hope that the information presented here spurs further investigations using process-based river temperature models, in terms of both their continued refinement and their use for addressing fundamental questions in the river sciences.

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