

COAL CREEK WATERSHED COALITION 2020-2021 REPORT





WATERSHED HEALTH & WATER QUALITY

WHY IS WATERSHED HEALTH IMPORTANT?

Coal Creek, the Slate River, and Washington Gulch are headwater streams, fed by the smallest seeps, springs, wetlands, and tributaries. Despite their relatively small size, our watersheds are massively important to both our community and the surrounding ecosystems. Headwater watersheds also have a strong influence on the quality and health of downstream rivers and lakes. When the quality of the headwaters is degraded, downstream drinking water supplies, fisheries, and ecosystem services can be compromised.

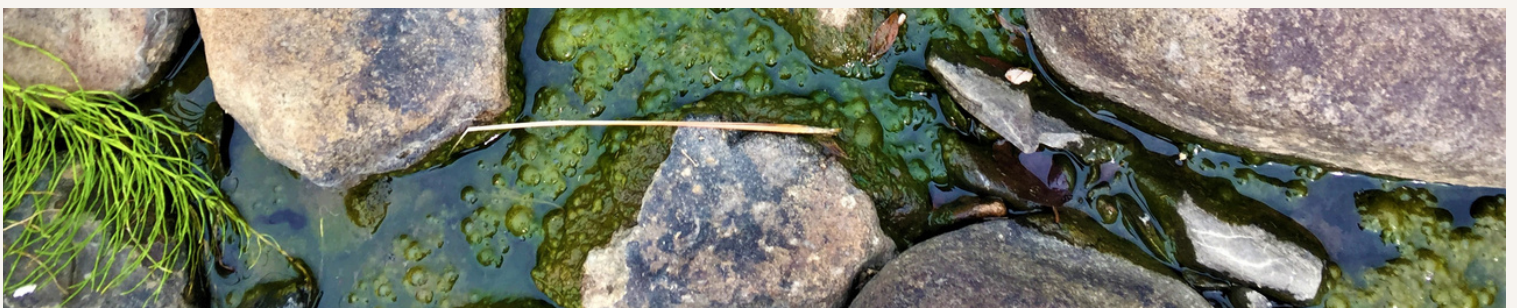
WHAT ARE ECOSYSTEM SERVICES?

An **ecosystem** is all the living things in a given area and the physical environment they interact with. **Ecosystem services** are the benefits humans directly and indirectly acquire from ecosystems. Examples of ecosystem services include physical items like food, timber, ecosystem processes like flood mitigation, air and water purification, and cultural services such as a sense of place or spiritual value.

WHY IS WATER QUALITY MONITORING IMPORTANT

The water quality in a stream is the result of complex interactions between climate, geology, topography, land uses, and human activities in the upstream portions of the watershed. Water quality changes through time in response to natural and human-caused events. Monitoring allows us to better understand water quality responses to natural and human-caused phenomena.

The Coal Creek Watershed Coalition (CCWC) collects water quality samples that are analyzed for metals and other constituents of concern in the Coal Creek, Slate River, and Washington Gulch watersheds. We share data with federal, state, county, municipal, and private stakeholders. By sharing data, CCWC helps assure that local water users and aquatic life are protected. CCWC also uses the data to identify water quality issues and implement solutions to improve water quality.



Coal Creek Watershed Coalition Water Quality Improvement Projects

HIGHLIGHTS FROM 2004 - 2021

Upper Slate River Watershed Plan

A comprehensive plan to address water quality issues. The plan was developed from existing information and stakeholder input.

Redwell Basin Drill Hole Closure

The Colorado Division of Reclamation, Mining and Safety (DRMS) closed the drill hole. CCWC collected data that demonstrates that the closure was effective and improved water quality.

Standard Mine Superfund Site

CCWC provided local expertise and community input during the EPA-led cleanup and continues to monitor Elk Creek to assess the benefits of the project.

Partnering to Restore the Mt. Emmons Gossan

A fire caused by welders at the Keystone Mine in the late 1970s disturbed this natural feature in the late 1970s. The gossan is one of the largest metal sources in the Coal Creek Watershed. The reclamation project aims to reduce metals mobilization from the gossan into Coal Creek by reestablishing vegetation, controlling erosion, and improving drainage pathways.

Backcountry Toilets

CCWC initiated a community-wide effort to install portable and permanent toilets, including the permanent toilets at Musicians' Camp and in Washington Gulch.

Gunsight Processing Area Reclamation

CCWC and partners - including DRMS & Bureau of Land Management - characterized contaminants, funded reclamation, and continue to monitor the site to prevent cadmium, copper, lead, and zinc from entering local waterways.

Diversion Structure Improvement Projects

CCWC and partners have worked to improve and restore the McCormick, Halazon, and Town of Crested Butte headgates.

Long Term Water Quality Monitoring

CCWC collects water quality samples from Coal Creek to assess changes in water quality and assure that aquatic life is protected. We sample 10-25 locations up to five times per year.

Mt. Crested Butte

Crested Butte



HISTORIC MINING AND MINE RECLAMATION

THE ISSUES

Coal Creek is critical to our community. Coal Creek is the raw water supply for the Town of Crested Butte's drinking water treatment facility. The Coal Creek Watershed supports diverse aquatic life and wildlife, while providing recreational opportunities to our community- whether it's cooling off at Totem Pole Park or fly-fishing in the beaver ponds near the "Y". Each of these water uses requires protection.

Historic mine sites, including the Keystone and Standard mines, and natural geologic features, like the iron fen and gossan, deliver metals to Coal Creek and its tributaries.

As a result, cadmium, copper, and zinc concentrations sometimes exceed the standards used to protect aquatic life, but not human-health standards.

At times, arsenic concentrations in Coal Creek are in excess of the human-health standard but the use as a public water supply is protected due to effective treatment practices.

WHAT WE'RE DOING

WATER QUALITY MONITORING

CCWC collects water quality samples to assess attainment with water quality standards, to identify natural and man-made sources of pollution, and to select and implement water quality improvement projects.

LOCAL EXPERTISE

CCWC provides technical expertise to the Town of Crested Butte and Gunnison County to assure that water quality is fully protected as we work collaboratively to eliminate the possibility of mining on Mt. Emmons.

GOSSAN REVEGETATION PROJECT

CCWC is currently working with partners to implement the Gossan Restoration Project. The project will reduce sediment and metals delivered from the Gossan to Coal Creek by reestablishing vegetation, controlling erosion, and improving drainage pathways.



COAL CREEK WATER QUALITY HIGHLIGHTS

Since 2012, CCWC has closely monitored the water quality standards used to protect aquatic life in lower Coal Creek. A decade ago, temporary modifications [1] to the cadmium, copper, and zinc standards applied year-round. Today, the aquatic life standards [2] for copper are met year-round and the cadmium and zinc temporary modifications only apply from April to June. These changes to the water quality standards are the result of improved water quality in Coal Creek and reduced pollution from the Keystone Mine site.

Since acquiring the Keystone Mine site in 2016, Mt. Emmons Mining Company (MEMC) has improved operations at the Keystone Mine Water Treatment Plant. In particular, these improvements have reduced metal concentrations in the plant's effluent during spring runoff. Monthly average concentrations of cadmium, copper, and zinc have declined substantially.

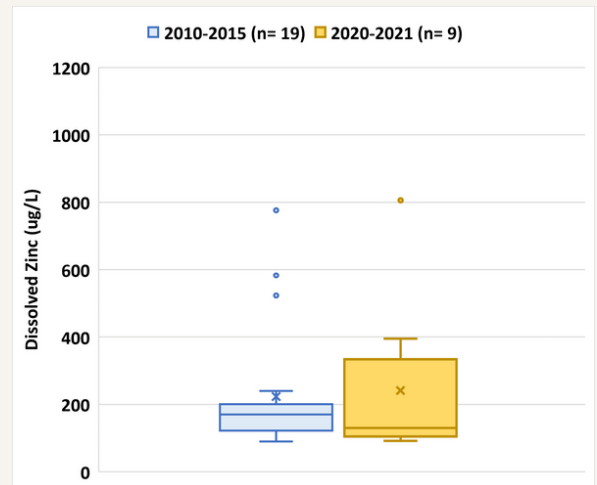
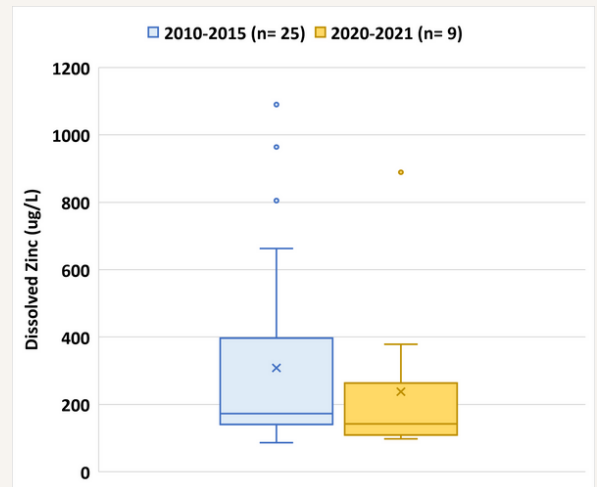
Coal Creek downstream of the Fen & Gossan & upstream of the Keystone Mine

The chart to the right presents two box and whisker plots, often used to visualize and interpret water quality data. The whiskers are the lines outside the box. The lower line is the measured minimum value. The upper line represents a near maximum value. Dots above this line are extreme high values, typically measured during runoff or following large precipitation events. The colored box shows that the middle 50% of data values fall within this range. For example, 50% of zinc concentrations were between 141 and 397 ug/L from 2010-2015. The horizontal line that splits the boxes in two is the median and the "x" in the box represents the mean, 173 and 308 ug/L respectively for the 2010-2015 dataset.

From 2010 to 2015 zinc concentrations ranged from 87 to 1,090 ug/L and between 2020 and 2021 concentrations ranged from 98 to 889 ug/L. So far, zinc concentrations have been less variable and slightly lower than 2010 to 2015 (notice that the orange box plot for 2020-2021 is narrower than the blue box plot for 2010-2015).

Coal Creek Downstream of the Keystone Mine

From 2010 to 2015 zinc concentrations ranged from 90 to 776 ug/L and between 2020 and 2021 concentrations ranged from 92 to 806 ug/L. While zinc concentrations have been variable in recent years, the median zinc concentration has declined from 170 to 130 ug/L (notice that median line in 2020-2021 plot is lower than the median line for 2010-2015). This is likely due to improvements at the Keystone Mine Water Treatment Plant. On-going waste rock remediation, revegetation, and maintenance work may also reduce zinc concentrations in stormwater runoff from the Keystone Mine site.



1. Temporary modifications are used to address uncertainty in streams where the concentration of the pollutant exceeds the water quality standard and a permitted discharger has a compliance issue.
2. Aquatic life standards are used to protect fish and aquatic insects. Because these species reside in the water, the standards to protect aquatic life are more stringent than other uses (e.g., water supply use).



ELK CREEK- HOME TO THE STANDARD MINE SUPERFUND SITE

Since 2005 several remediation activities have occurred to reduce the extent of environmental contamination at the Standard Mine and to improve water quality in Elk Creek. Briefly, the major activities include:

Removal Actions: From June 2006 to September 2008, the EPA moved approximately 35,000 cubic yards of tailings and waste rock into an upland repository. The bulk of the waste materials were located in the Elk Creek riparian area immediately downgradient of the Level-1 Adit. Approximately, 1,000 linear feet of Elk Creek, near Level 1, was realigned to its natural configuration. A half-acre wetland was constructed near the confluence of the Level-1 Outfall and Elk Creek (this area was previously an unstable tailings impoundment).



Level 1 in 2005 prior to the Removal Actions.



Level 1 in 2021 after the Removal Actions.

Phase I Remedial Actions: Between 2015 and 2017, EPA constructed a bypass adit in Level 1, installed a flow-through bulkhead in Level 1, sealed raises and winzes in Level 3 to reduce water infiltration into the lower mine workings, and constructed a drainage channel to convey drainage from the Level-3 Adit to the Level-1 Outfall Channel.

Additional Reclamation: From 2017 to 2019, Colorado Division of Reclamation Mining and Safety (DRMS) reclaimed Level 98 and Level 5. DRMS closed the portal and filled a large trench located below Level 98. Wetland restoration was completed in reclaimed areas at Level 98. At Level 5, DRMS closed the shaft, rerouted drainages to reduce interaction with waste rock, and revegetated disturbed areas. Collectively, these actions are intended to reduce surface water infiltration into the Standard Mine workings by directing surface flows to Elk Creek.



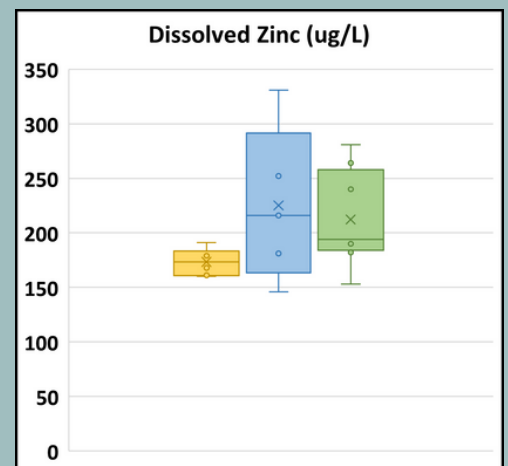
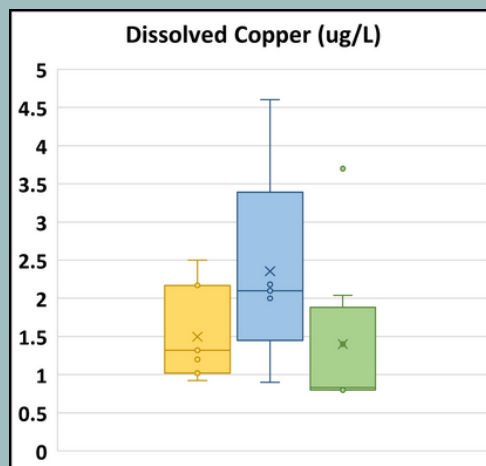
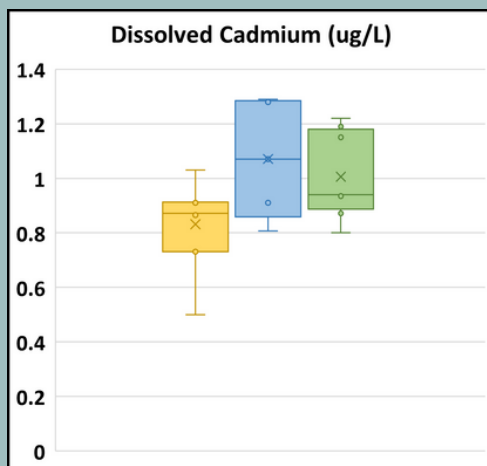


NEXT STEPS AT THE STANDARD MINE

A five-year interim monitoring period began in 2018, after the Phase I Remedial Actions were completed in 2017. The state of Colorado hired CCWC to collect water quality samples and prepare annual reports during the interim monitoring period. One of the objectives of the interim monitoring period is to determine how operations of the Level 1 Bulkhead affect water quality conditions in Elk Creek. Each year the bulkhead was managed as follows:

- In 2018 the bulkhead was closed and mine drainage was contained in Level 1. The annual snowpack and precipitation totals were far below average.
- In 2019 the bulkhead was open and mine drainage flowed freely from Level 1. The annual snowpack and precipitation totals were above average.
- In 2020 the bulkhead was metered to allow a maximum flow rate of 20 gpm. Mine drainage may have flowed from Level 1 during and immediately after runoff. The annual snowpack and precipitation totals were slightly below average.

Elk Creek Responded as expected. Cadmium, copper, and zinc concentrations in Elk Creek immediately upstream of the confluence with Coal Creek were generally lowest and least variable in 2018 when the bulkhead was closed (notice that the yellow box plots are lower and smaller in size), highest in 2019 when the bulkhead was open (the blue box plots are higher and larger), and moderate in 2020 when flow from the bulkhead was metered. The bulkhead is currently closed and will remain closed.





SLATE RIVER WATERSHED E. COLI STUDY

In 2021 CCWC completed a five-year study of E. coli concentrations. CCWC volunteers and staff collected 482 E. coli samples from 44 sites throughout the Coal Creek, Slate River, and Washington Gulch watersheds from 2016-2020.

E. coli concentrations exceeded the standard for primary contact recreation in the lower portion of Washington Gulch (see red segment on the map to the right). At times, E. coli concentrations in the Slate River and lower Coal Creek may also exceed the standard, but additional data collection is needed.

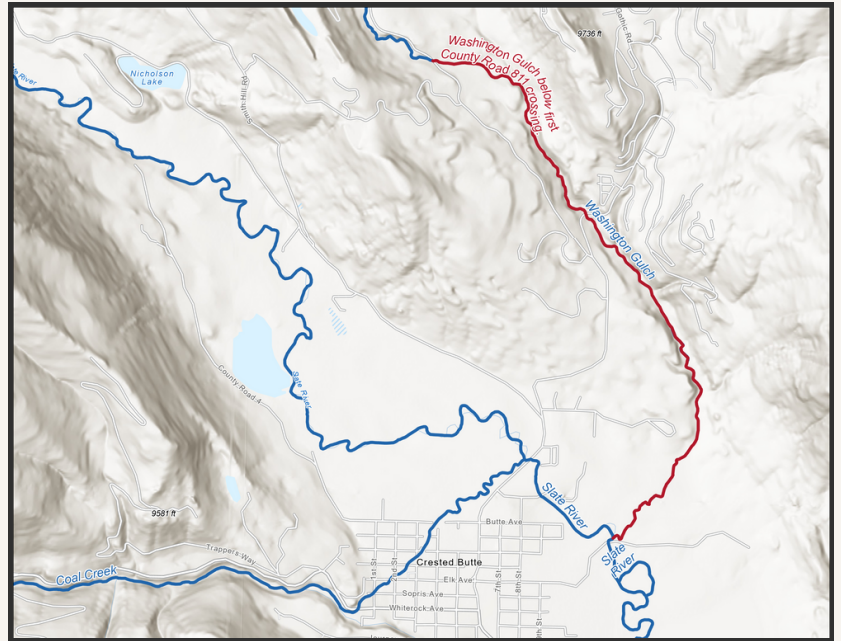
Several overlapping nonpoint sources (e.g., recreational use, cattle grazing) increase E. coli concentrations in Crested Butte's local watersheds. The primary sources of E. coli in lower Washington Gulch are agricultural land use, including the effects of grazing, irrigation diversions, flood irrigation, and return flows; improper disposal of human and pet waste generated by recreational users; and wildlife.

For the past several years, CCWC and other local partners have provided portable toilets to popular dispersed camping sites and trailheads in the Crested Butte area. CCWC is continuing to work with local stakeholders to provide toilets and backcountry waste management education to a growing number of recreational users.

WASHINGTON GULCH TOILET

In 2020, the CCWC partnered with the Town of Crested Butte, the US Forest Service, and the National Forest Foundation to install a permanent structure, with two vault toilets, in the Washington Gulch Watershed about 1.6 miles past the Long Lake Trailhead.

Based on pumping records from portable toilets at nearby sites, CCWC expects that the new permanent toilets will intercept about 800 pounds of human waste each year.



Primary contact recreational use includes activities such as swimming, rafting, kayaking, and water play where users, especially children, are likely to ingest small amounts of water.



Everybody Does It

A Quick Guide to Backcountry Human Waste Disposal



TOILETS

You've arrived at the trailhead and feel great. You have water, sunscreen, snacks, and a map of the area. There's a pit toilet available for use. You grab your hand sanitizer and walk right in (maybe holding your breath). The deed is done, and you are ready to enjoy the day!

Always use established toilets when available!



BAG

You're well into your day's journey. Maybe you're hiking up the East Maroon Trail, when you feel that certain sensation in your stomach. But you remembered your trusty poop bag, specially made for situations like this. You do the doo in the bag, wrap it up, zip it up, and toss it in your pack. You're on your way again with no mess and no stink!

Always carry a human waste disposal bag in the high alpine!



CAT HOLES

You've seen fluffy do this at home. You find a nice view 200 feet away from water, cliff, and camp and dig a hole 8" deep by 4" wide. You carry a spade for just such occasions. You do the deed, wipe with a small amount of TP (or natural materials!), bury it, camouflage it, and done! You return to your campsite victorious and ready to enjoy the sunset.

Only dig cat holes in sub-alpine and forest environments!

ALPINE ENVIRONMENTS

The alpine ecosystems surrounding much of Crested Butte lack the soil microorganisms necessary to quickly biodegrade human waste.

BAG IT AND PACK IT!

TOILET PAPER

Use only plain, white, non-perfumed toilet paper, use it sparingly, and pack it out if you didn't dig a cat hole.

TOILET PAPER SHOULD NEVER BE BURNED!

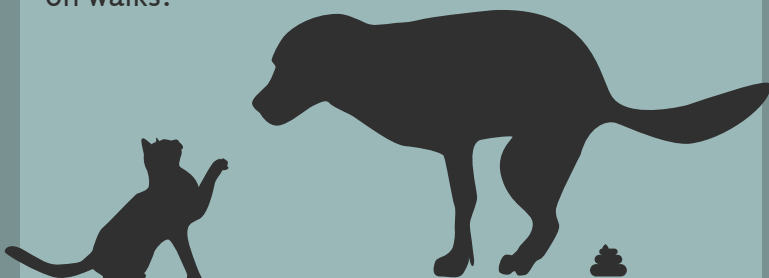
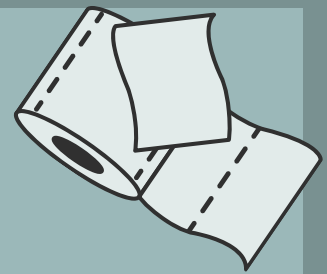
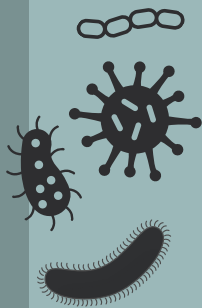
SCOOP THAT POOP!

Pet waste is also a source of E. coli and other unwanted pathogens and parasites! Pick up pet waste in your yard and always carry bags on walks!

PERIOD PRODUCTS

Carry a period-kit for your adventures. If you pack in pads, tampons or other products, please pack them out.

Menstrual cups, period underwear, and applicator-free tampons are great options for minimizing or eliminating period trash on the trail. For options to avoid your period all together, talk with your doctor.





HOW WILL CLIMATE CHANGE AFFECT OUR WATERSHEDS?

Our watershed provides essential ecosystem services that we often take for granted: clean water, clear streams, good fishing, irrigated pastures, and vibrant forests, the list goes on! However, climate change is projected to increase average winter temperatures in the Rocky Mountain Region by up to 6 °F in the winter and between 3-4 °F in the spring. In the headwaters of the Colorado River Basin, a 1-degree F increase in temperature will reduce streamflow by 3 to 8 percent (Rocky Mountain Climate Organization, August 2021).

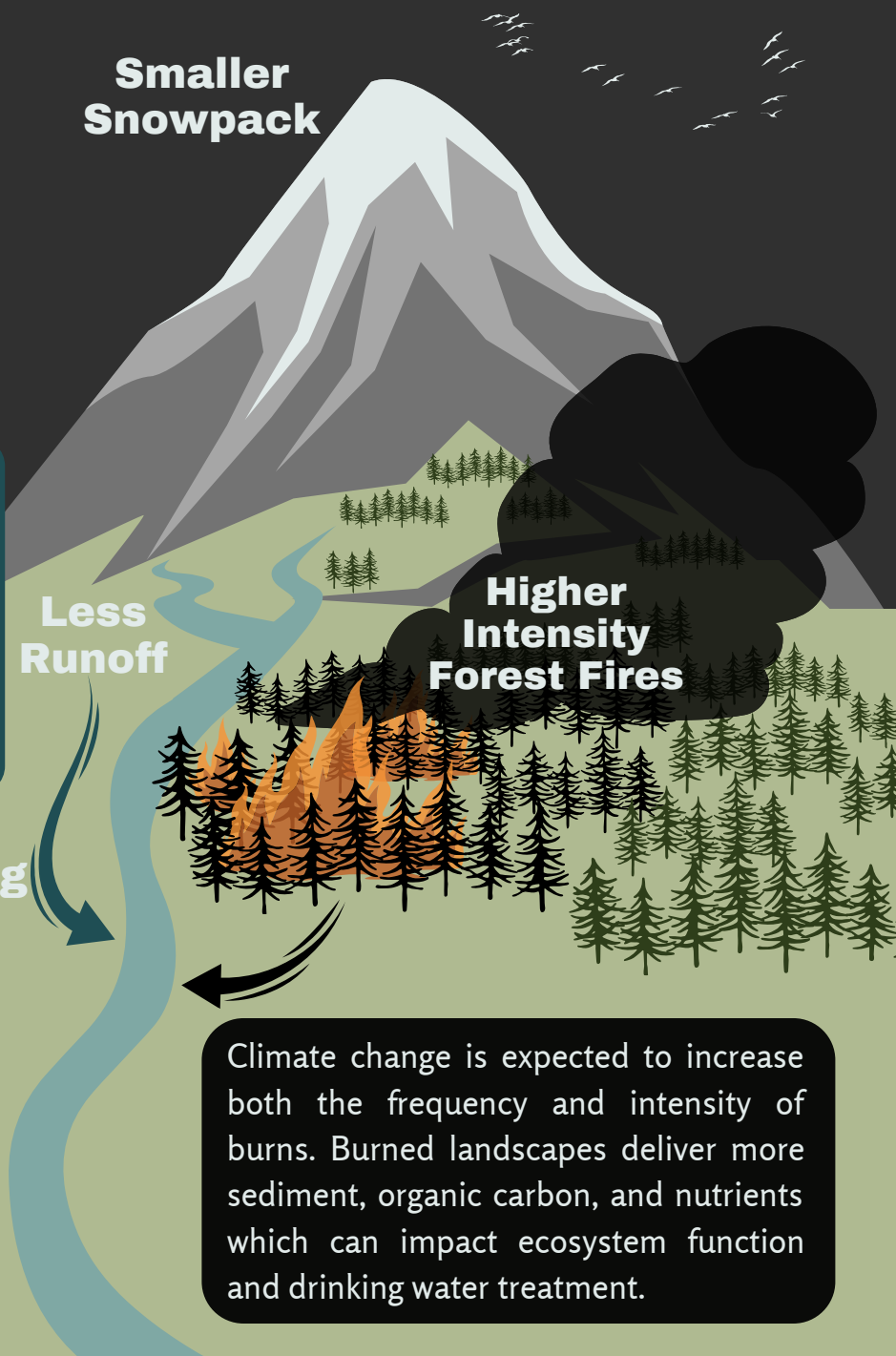


Changing Rain & Snow Patterns

Less runoff means less water in our streams, rivers, & reservoirs.

This can lead to:

- higher water temperatures,
- less dissolved oxygen for aquatic life,
- less dilution of potential contaminants,
- and reduced groundwater recharge.



Smaller Snowpack

Less Runoff

Higher Intensity Forest Fires

Altered Growing Season

Increased temperatures could cause growing seasons to start earlier and end later. Flow past headgates could be reduced and occur in a shorter time frame, reducing the viability of local irrigated agriculture.

Climate change is expected to increase both the frequency and intensity of burns. Burned landscapes deliver more sediment, organic carbon, and nutrients which can impact ecosystem function and drinking water treatment.