United States Department of Agriculture

SALMON-CHALLIS NATIONAL FOREST

ASSESSMENT REPORT

Forest Service Salmon- Challis National Forest July 2018

SALMON-CHALLIS NATIONAL FOREST ASSESSMENT REPORT

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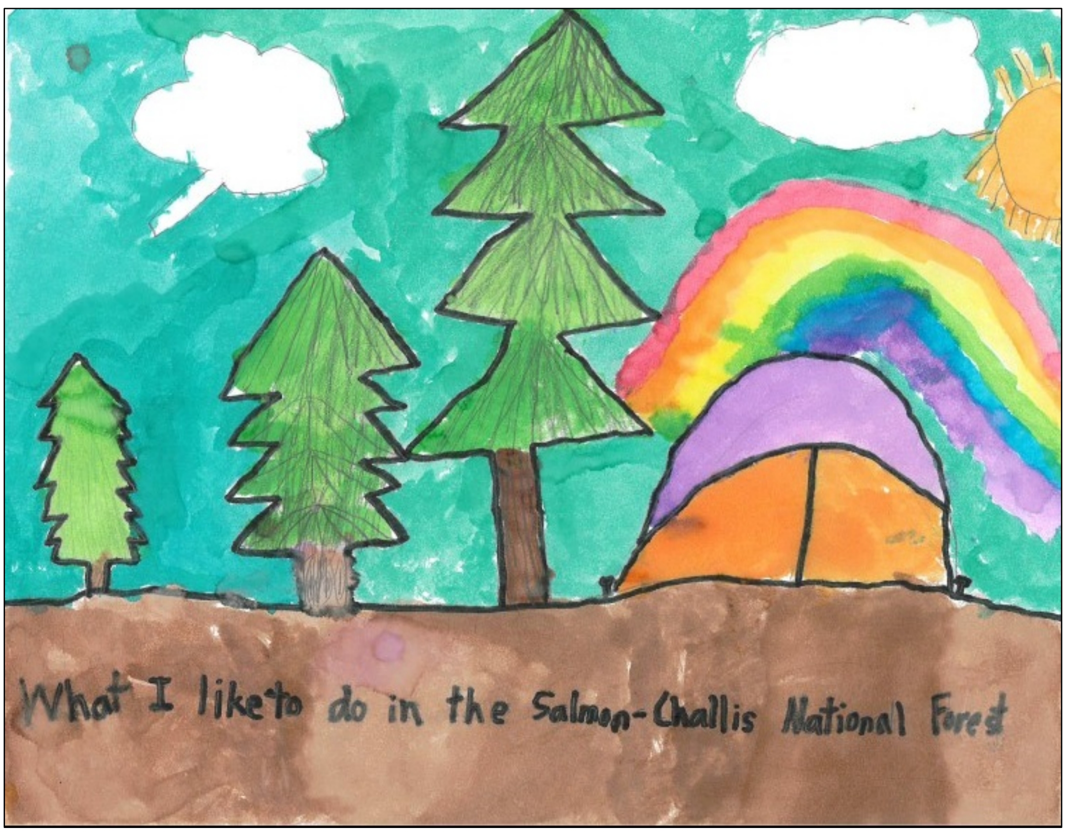


INTRODUCTION

BACKGROUND

The Salmon-Challis National Forest began revising its forest plan in January 2017 under the 2012 Planning Rule (36 CFR Part 219). Forest plans guide overall management of the Salmon-Challis and balance social, economic, and environmental concerns. The current forest plans for the Salmon National Forest and the Challis National Forest were created in the late 1980s. While some of the guidance in these plans is still relevant today, much has changed since the 1980s, and revision is needed to provide contemporary guidance for the Salmon-Challis.

The 2012 Planning Rule framework embraces a phased approach to revision. These phases are:

- assessment;
- plan revision and environmental impact statement preparation; and
- monitoring.

This phased approach to revision means that the Salmon-Challis does not simply launch headlong into writing a new forest plan or developing plan content. We begin by developing a basic understanding of what issues are important and can benefit from forest plan direction. In addition, our assessment includes a look back at what is or is not working under the previous plans. At its core, the assessment phase helps the Salmon-Challis National Forest and the public understand what matters the new forest plan should address.

DISCUSSION INCLUDED IN THE ASSESSMENT

This Assessment Report examines existing conditions of resources, uses, and influences on the Salmon-Challis National Forest. It also looks at the trends affecting those resources, uses, and influences. In addition to topics specific to the Salmon-Challis National Forest, the 2012 Planning Rule includes a list of 15 topics to be addressed in every assessment report:

1. Ecosystems and watersheds;
2. Air, soil, and water resources;
3. System drivers and stressors;
4. Carbon stocks;
5. At risk species;
6. Social, cultural and economic conditions;
7. Ecosystem Services;
8. Multiple uses;
9. Recreation;
10. Energy and mineral resources;
11. Infrastructure;
12. Areas of tribal importance;
13. Cultural and historical resources
14. Land status and ownership; and
15. Designated areas.

The 2012 Planning Rule directs that assessment reports should be prepared rapidly, use existing information, and involve the public. This Assessment Report is important because it serves as a starting point for revising the forest plan. In order for a forest plan to provide meaningful direction for the Salmon-Challis, it is important to start with a solid understanding of what matters should be addressed and why. Without this foundation, developing direction lacks purpose and results in guidance that is not easily understood by the public or forest managers.

WHAT DIRECTION DOES THE ASSESSMENT INFORM?

Forest plans guide management through plan components. The 2012 Planning Rule identifies five types of plan components: standards, guidelines, objectives, desired conditions, and suitability determinations.

These plan components serve as a basis for future forest management decision-making. Among other guidance, these components help guide actions the Salmon-Challis will take to manage for social, economic, and environmental desired conditions and outcomes. While this Assessment Report does not inform development of specific guidance, it does help inform what issues the new plan should address. These findings are summarized in the Need for Change document.

PUBLIC AND GOVERNMENTAL PARTICIPATION

The Salmon-Challis National Forest values the feedback of stakeholders. Stakeholders have shown a deep interest in forest planning. Beginning in February 2017, public meetings held throughout the planning area gave stakeholders the opportunity to tell Salmon-Challis staff what questions they thought the assessment should address.

In April 2017, public meetings centered on a summary of feedback heard during the February meetings and an introduction of the other processes required during plan revision—Wilderness Inventory and Evaluation, Wild and Scenic Rivers Eligibility and Suitability, and Species of Conservation Concern identification. A Draft Assessment Report and Need for Change Document was made available for 60 days of public review and comment starting November 3, 2017.

Based upon requests for additional time to provide comment, the comment period was extended another 120 days to May 4, 2018. In addition, the Salmon-Challis National Forest staff have:

- held 13 public meetings;
- presented five webinars;
- personally met with grazing permittees and Idaho Outfitters and Guides; and
- attended nine meetings held by two citizen groups formed specifically to work on forest plan revision the Central Idaho Public Lands Collaborative and the Lemhi-Custer Grassroots Advisory.

Figure 2. Stakeholders fill the conference room at the Salmon Regional Office of Idaho Department of Fish and Game for a public meeting Nov. 7, 2017.

The Salmon-Challis National Forest staff also held five meetings with a cooperating agency group made up of federal, state and local governments, including:

- Blaine, Butte, Custer, Lemhi and Valley counties;
- the Idaho Departments of Fish and Game, Agriculture, Lands, Environmental Quality, Parks and Recreation, and the Governor’s Office of Species Conservation;
- the Bureau of Land Management; and
- the Shoshone-Bannock and Nez Perce tribes.

Forest leadership and plan revision staff have also attended board of commissioner meetings in Blaine, Butte, Custer, and Lemhi counties, where we have provided plan revision updates and fielded questions. These interactions have included attending three Custer Board of County Commissioners meetings, five Custer Natural Resource Advisory Committee meetings, and a coordination workshop sponsored by Custer County. We have presented at the Lemhi County Commissioners meetings on five occasions and met with individual county commissioners or designated county staff numerous other times. Plan revision staff have attended one Blaine County commissioner meeting, and one Butte County Commissioner meeting to talk specifically about forest plan revision.

Over the last two years, forest plan revision has been a topic of discussion during regularly scheduled consultation and coordination meetings with the Shoshone-Bannock Tribes and the Nez Perce Tribe. Staff-to-staff meetings with the Shoshone-Bannock Tribes occurred on April 5, 2016, October 4, 2016, April 4, 2017, October 3, 2017 and March 21, 2018. Salmon-Challis National Forest staff also met with the Nez Pierce Tribe for a staff-to-staff meeting on May 24, 2017, and for a Government-to-Government meeting on March 28, 2018. Feedback received during these meetings has been incorporated into the assessment.

During the assessment phase, the Salmon-Challis National Forest received approximately 150 written comments from stakeholders. In response to comments, the organization and content of the assessment report has changed. For example, we’ve added discussions on existing plan direction, included a discussion on the major factors that influence the amount of grazing on the Salmon-Challis, and included additional detail on issues important to stakeholders. Stakeholder input on the Assessment has helped identify the dominate issues and matters that should be addressed as the Salmon-Challis National Forest begins plan development in the fall of 2018.

In addition to comments on the assessment, stakeholder feedback also included recommendations about direction for future management of the Salmon-Challis National Forest. Because the assessment focuses on existing conditions and trends, these recommendations are not fully reflected in this report. As the Salmon-Challis National Forest moves into plan development and preparation of an Environmental Impact Statement, our plan revision team will consider this feedback to inform the proposed action and alternatives.

BEST AVAILABLE SCIENCE

This Assessment Report uses the best available science to inform the need for change and identify the issues and matters that can benefit from forest plan direction. This information consists of journal articles, geographic information systems data, monitoring information, comments from public engagement, and experience under the existing forest plans.

More detailed scientific information and discussions will be included when developing plan direction and alternatives and preparing the environmental impact statement.

Figure 3. What I Love to Do on the Salmon-Challis National Forest, rendered by Stanley Elementary School eighth-grader Van Wilson, placed second out of 185 entries in a recent drawing contest sponsored by the Salmon-Challis National Forest.

UNIQUE ROLES & CONTRIBUTIONS

The Salmon-Challis National Forest encompasses nearly 4.4 million acres between 3,000 and 12,600 feet in elevation in East-Central Idaho. Included within the boundaries of the Salmon-Challis are 1.3 million acres of the Frank Church – River of No Return Wilderness Area, the largest contiguous wilderness area in the Continental United States.

Rugged and remote, this country offers adventure, solitude, and breathtaking scenery. Mount Borah, Idaho's tallest peak, can be found in the Lost River Ranger District near the community of Mackay. Two Wild & Scenic Rivers, the Main Salmon River and the Middle Fork of the Salmon River, flow through the Salmon-Challis. The Lewis and Clark National Historic Trail, the Nez Perce National Historic Trail, and the Continental Divide National Scenic Trail all cross the Salmon-Challis National Forest.

Exhibiting upwards of 7,000 feet of vertical relief, the Salmon River canyons are some of the deepest in the U.S., surpassing the Grand Canyon and ranking second only to the Snake River's Hells Canyon on the Idaho–Oregon border. A recent Dark Sky designation for Central Idaho recognized the value of the area being relatively free of light pollution.

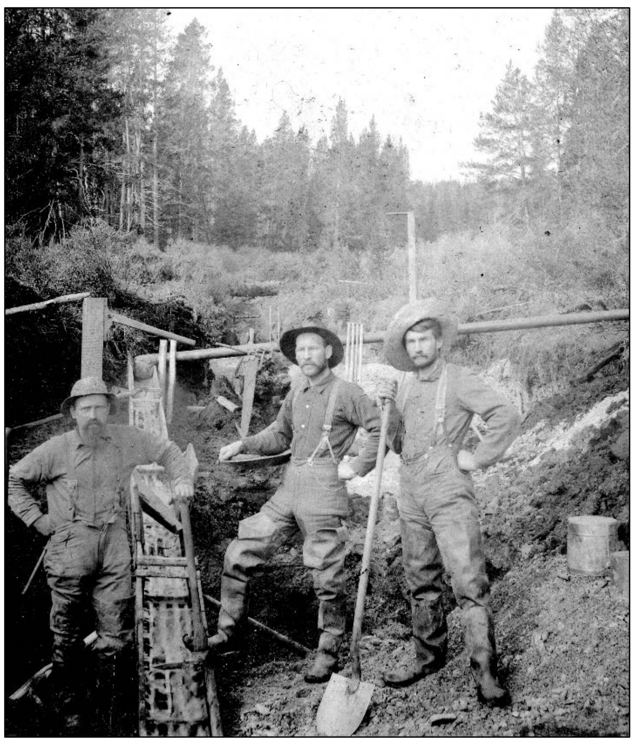
The Salmon-Challis shares boundaries with the Bureau of Land Management, private entities, the State of Idaho, and the Beaverhead-Deerlodge, Bitterroot, Payette, and Sawtooth National Forests. The communities within and adjacent to the Salmon-Challis are small, rural, and relatively isolated. Extremely low human population densities exist, so connectivity between the forest and similar ecosystems on adjacent lands is relatively intact with regard to development.

Figure 4. *What I Love to do on the Salmon-Challis National Forest*, rendered by Arco Elementary fourth-grader Julie Reynolds, placed 3rd in a recent drawing contest.

The Salmon-Challis National Forest offers many social and economic benefits, which have created a deep-rooted connection between this land and its people. Indigenous human populations are known to have been in the area for at least 12,000 years. Use of the area by the Shoshone-Bannock Tribes, the Nez Perce Tribe, and their predecessors has been well-documented.

Euro-American use of the area has occurred since at least 1805, when the Lewis and Clark Expedition passed through en route to the Pacific Coast. While in the area, the Corps of Discovery made contact with the Lemhi Shoshone, who provided horses and a guide over the mountains. Early fur trappers and miners searched for riches in the mid-1800s. By the late 1800s, mining drove settlement throughout the area that now constitutes the boundary of the Salmon-Challis National Forest. Farmers, ranchers, loggers, and those providing other essential services to miners and mining town residents put down roots. Many of the names of the early settlers persist today, generations later.

Figure 5. Gold miners Charlie Lual and the Wonderlick Boys pose next to their sluice box in Gibbonsville in 1880. Prospectors discovered gold in the Gibbonsville District in 1877 along Anderson Creek, and mining continued there well into the 20th Century.



Source: Lemhi County Historical Society

East-Central Idaho has been valued for generations by Native Americans, and later Euro-Americans, for salmon fishing and big game hunting. Publicity from a 1933 National Geographic expedition down the Salmon River attracted boating and fishing enthusiasts to central Idaho, just as the original farms and mines were feeling the economic pressures of the Great Depression. Some ranchers, farmers and miners became hunting guides and boat operators. The Salmon-Challis' contribution to this history is important in defining the social and economic structure of the landscape.

The Salmon-Challis National Forest has one of the largest range management programs in the Intermountain West, administering grazing permits for more than 100 livestock grazing permittees. Ranching, and the role that public lands grazing plays for area ranchers, has contributed to the social, cultural, and economic stability of the forest's neighboring communities.

Minerals and the geology of the Salmon-Challis National Forest continue to be nationally important. Cobalt, molybdenum, and gold mining operations have yielded substantial economic contributions in recent decades to industry and to local economies. The diverse geology present in areas like the Copper Basin attracts geology students and researchers, contributing to the advancement of science on a broader scale.

Recreational uses on the forest are important, both socially and economically. Although the Salmon-Challis receives few visitors in comparison to many other forests in the National Forest System, it offers some of the country's most sought-after recreational experiences.

Figure 6. *What I Love to Do on the Salmon-Challis National Forest*, rendered by Pioneer Elementary second-grader Carson Sheppard, garnered an honorable mention in a recent forest-sponsored drawing contest.

The Frank Church River of No Return Wilderness offers the largest roadless area in the continental U.S. for backcountry pursuits. Multi-day wilderness whitewater and fishing trips on the Wild & Scenic Middle Fork and Main Salmon Rivers attract visitors from across the country and around the world.

In addition to elk and deer hunting, the Salmon-Challis offers unique hunting opportunities for mountain goat and bighorn sheep. Half of Idaho's mountain goat tags and 73 percent of the State's Rocky Mountain bighorn sheep tags are located in units within the planning area. Steelhead fishing, and less frequently salmon fishing, attract anglers from throughout the State and the region.

Hunting and fishing, in combination with hiking, backpacking, camping, off-roading, mountain biking, wildlife viewing, and breath-taking landscapes, provide economic benefits and sustainability for local communities. Visitor spending supports jobs in local businesses and contributes to county sales tax revenues, which local governments use to provide important public services.

Some of the benefits of the Salmon-Challis are more easily appreciated than are others. For example, recreation and cultural opportunities, as well as a clean water supply, are enjoyed directly by individuals and communities. Other vital forest ecosystem services provide benefits that are less apparent in our daily lives but are important because they support and regulate the ecosystems and social environments in which we live.

The Salmon-Challis National Forest has three distinct ecological units: the Idaho Batholith, the Challis Volcanics, and the Beaverhead Mountains. The changing elevation across the forest, combined with the variability in aspect and slope, the variety of geology and soils, and the amount and timing of precipitation creates an extremely high diversity of ecosystems. The Salmon-Challis is home to more than 1300 plant species and provides habitat for 35 fish species and over 300 terrestrial wildlife species. This biodiversity is critical for the resilient and healthy forest ecosystems on which all social and economic contributions of the Salmon-Challis are dependent.

The Salmon-Challis has more than 14,000 miles of perennial and intermittent streams. Eighty-eight percent of watersheds contributing to those streams are considered functioning properly. Forest waters provide quality spawning and rearing habitat for Chinook salmon and steelhead, which migrate hundreds of miles from the Pacific Ocean via the Columbia River. Aquatic habitat on the Salmon-Challis is considered likely important cold water refugia for inland fish species given climate change scenario predictions. Alpine areas provide important ecological services by capturing snow and storing runoff to sustain the area's primary watersheds and downstream uses.

The contributions of the Salmon-Challis National Forest, even when they are not directly relatable to dollars that are spent or received, improve the quality of our lives.

Figure 7. *What I Love to do on the Salmon-Challis National Forest*, rendered by Mackay Elementary sixth-grader Thea Stevast, garnered an honorable mention in a recent forest-sponsored drawing contest.

SOCIAL & ECONOMIC CONDITIONS

The Salmon-Challis National Forest plays an important social, cultural, and economic role in East-Central Idaho. Native Americans prized the area for its plentiful salmon and bountiful hunting. The Corps of Discovery recounted some of the most memorable moments of their epic 1805 westward journey on these lands. Early fur trappers, then miners, searched for riches in the mid-1800s. By the late 1800s, mining drove settlement throughout the area that now constitutes the boundary of the Salmon-Challis National Forest. Farmers, ranchers, loggers, and those providing other essential services to miners and mining town residents put down roots in this rugged, isolated, and beautiful area. Many of the family names of the early settlers persist today, generations later.

INFORMATION SOURCES & NEEDS

Data sources for this assessment include various publicly available data from state, county, and federal sources as cited throughout. This includes, but is not limited to, the U.S. Department of Agriculture Forest Service, U.S. Department of Commerce Census Bureau, U.S. Department of Agriculture National Agricultural Statistical Service, Idaho Department of Labor, and Idaho Department of Education. The authors also used Headwaters Economics' Economic Profile System, a tool developed jointly with the Forest Service and Bureau of Land Management. The public engagement effort, in support of this report, was also a valuable resource informing the assessment of social, cultural, and economic conditions.

The Bureau of Economic Analysis made changes in the way they categorize industries in 2001, largely in an effort to account for the transition from a manufacturing economy to more of a service-related economy. Because of these changes, it is difficult to accurately portray trends by economic sector for the last three decades of the existing plans. Because of the few number of mining and forestry businesses in the area, information that may be proprietary is withheld, leaving some data gaps for these industries.

EXISTING FOREST PLAN DIRECTION

Neither the existing Challis nor the Salmon forest plans contain much direction that specifically addresses social and economic issues. The Challis National Forest plan includes direction about coordinating with state, local, federal, and tribal governments, as well as user groups. That plan also lists as a goal under Human and Community Development: "Support local communities through resource conservation work, employment and training opportunities, rural community planning development, and technical forestry assistance."

Like the Challis plan, the Salmon plan refers to encouraging coordination with other entities, volunteerism, and contributing to the stability of ranching in the area. Both plans contain direction to provide material to mills and to make firewood available, and the Salmon Plan provides direction to only offer timber sales that are economically viable. Several of the programs, such as the Senior Community Service Employment program named specifically in the Human and Community Development sections, are now obsolete.

SCALE OF ANALYSIS

The area of influence is the geographic area impacted by the management of the plan area. It is used during the land management planning process to evaluate social, cultural, and economic conditions.

The Salmon-Challis' primary area of influence includes three counties: Butte, Custer, and Lemhi counties in Idaho. The Salmon-Challis accounts for a large share of the land base in these counties. The economic contributions of forest uses, such as grazing, forest products, outdoor recreation, and mining occur primarily in these counties. For these reasons, the discussion of social and economic conditions and the trends that follows focus on this three-county area.

Additionally, discussions of social and economic trends of the Fort Hall and Nez Perce Reservations are included. The Shoshone-Bannock Tribes and Nez Perce Tribe's endowed treaty rights and special relationship to what are now lands and resources managed by the Salmon-Challis National Forest make it important to understand key indicators of these tribes' socioeconomic conditions.

Other counties in the region also experience economic contributions from Salmon-Challis National Forest activities, and these are presented later in this section under Contributions of Forest Resources & Uses.

CONDITIONS AND TRENDS

Measuring the human relationship with the ecological environment requires an understanding of the social and economic conditions in communities near the forest and the human uses of the forest and its resources.

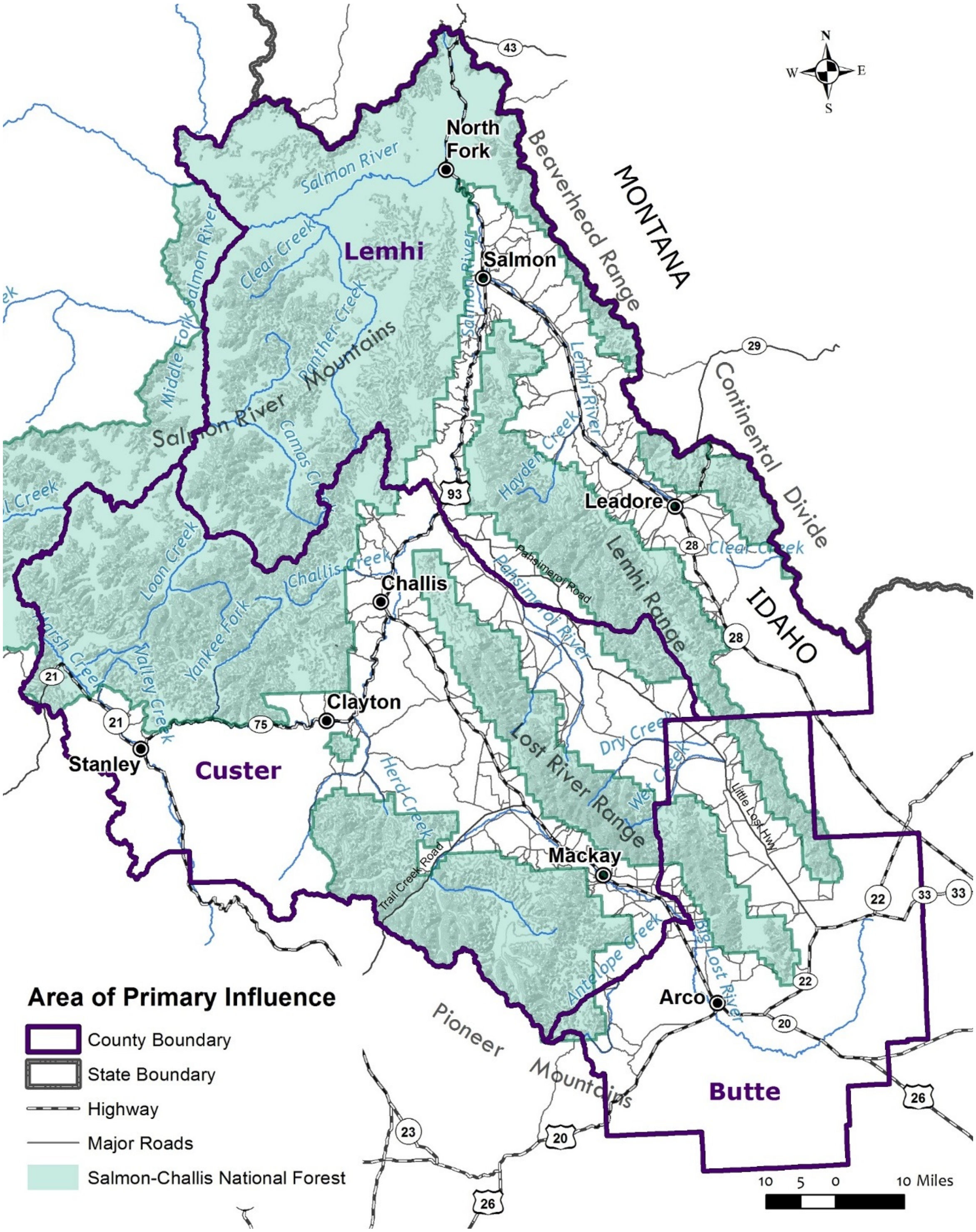
Population and Demographic Change

While many places in the American West have experienced rapid population growth in recent decades, all three counties in the area of influence are sparsely populated, with stable or declining populations. The communities within the area of influence are rural in character and, in many cases, geographically isolated. Butte County is home to about 2,500 people, Custer County is home to about 4,100 people, and Lemhi County is home to about 7,700 people. All three counties saw their populations decline between 2010 and 2015. Over the same period, Idaho's population grew by about six percent (U.S. Census Bureau 2015).

In Idaho, the median age is approximately 35 years, which is similar to the Nation overall. In contrast, the median age in the area of influence is above 40 years. In Custer and Lemhi counties, the median age is above 50. Nearly one-quarter of residents in the area of influence are 65 years or older, compared to only 14 percent of Idaho residents (U.S. Census Bureau 2015).

As a result of both the overall population decline and shift in population age, school populations have declined dramatically. Between 1991 and 2016, public schools in the three-county area lost 40 percent of their student enrollment (Idaho State Dept. of Education 2017).

Figure 8. Counties in the Salmon-Challis National Forest's Primary Area of Influence



The number of people with disabilities in all three counties is also higher than that of Idaho. Nearly 19 percent of people in the area of influence are disabled, as compared to almost 13 percent for Idaho (U.S. Census Bureau 2015).

Population structure in communities near the Salmon-Challis helps us understand local stakeholders. Communities with large numbers of retirees are likely to have different recreational preferences than those populated with young professionals or families with young children. The migration decisions of older people are less likely to be influenced by labor market conditions, such as number of available jobs, and more likely to be influenced by access to amenities, availability of services, quality of life, and affordability.

The forest provides natural amenities, such as open space, clean water, and recreational opportunities, that contribute to quality of life among area residents. These aspects of the region also contribute to a sense of place, which is a feeling of distinctive identity and unique character shared by the community.

Land Ownership

A small percentage of land is privately-owned across the area of influence. Approximately 12.4 percent of land in Butte County, 5.5 percent of land in Custer County, and 8.6 percent of land in Lemhi County is private. The vast majority of the remaining lands are federally-owned and -managed, primarily by the Forest Service and Bureau of Land Management. In Custer and Lemhi counties, National Forest System lands account for 70 percent of all lands.

Fiscal Relationship with Local Governments

County governments and local school districts receive payments from the federal government to compensate for the non-taxable status of public lands within their boundaries. Two payments are made for acres managed by the Salmon-Challis National Forest: the 25 Percent Fund revenue sharing payment and Payments in Lieu of Taxes.

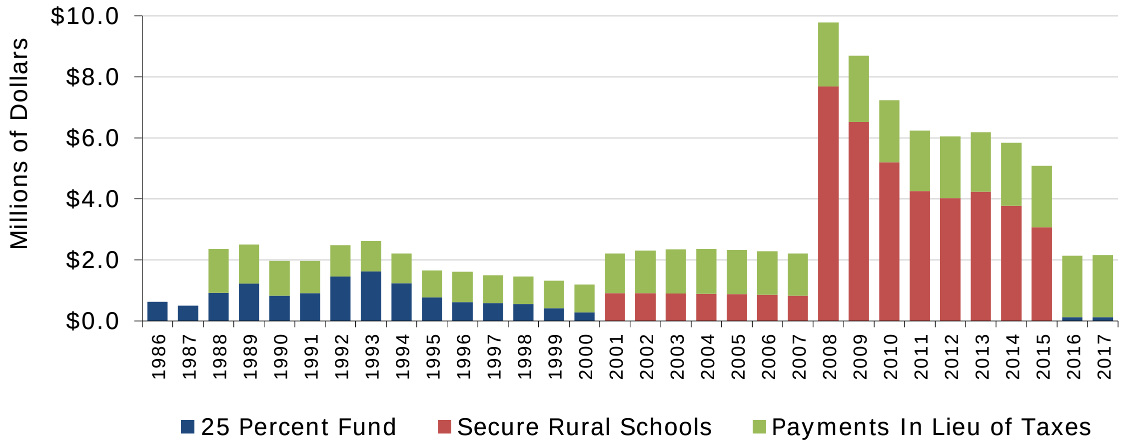
The 25 Percent Fund shares revenue generated from the sale of commodities produced on National Forest System lands with the counties and school districts that have public lands within their boundaries. These funds must be used to fund county roads and local schools.

In 1976, Congress authorized Payments in Lieu of Taxes in addition to revenue-sharing payments. Payments in Lieu of Taxes is permanently authorized, but Congress must appropriate funding on an annual basis. Payments in Lieu of Taxes is paid only to county governments and may be used for any governmental purpose.

Between 2001 and 2015, the 25 Percent Fund was replaced with the Secure Rural Schools and Community Self-Determination Act of 2000. The Act expired in 2016, but Congress passed a bill in 2018 to reauthorize Secure Rural Schools.

The Secure Rural Schools and Community Self-Determination Act was enacted in fiscal year 2001 to provide five years of transitional assistance to rural counties affected by the decline in revenue from timber harvests on federally-managed lands. The Secure Rural Schools payments expired at the end of fiscal year 2015. Counties reverted back to receiving 25 Percent Fund payments in 2016, but the 2018 reauthorization of Secure Rural Schools will provide funding for 2017 and 2018. The amount that will be distributed to the State and counties is not yet known.

Figure 9. Trend Of Payments To The Three-County Area Through 25 Percent Fund, Payments In Lieu Of Taxes, And Secure Rural Schools



Source: Headwaters Economics

The expiration of the Secure Rural Schools program caused a sharp decline in Forest Service payments to counties. The 2016 25 Percent Fund payments to the counties are more than 90 percent lower than the 2015 Secure Rural Schools payments.

Reduction in the Salmon-Challis's payments to counties can affect county services and place enormous strain on county governments. As a percentage of total county government revenue, federal payments averaged about 13 percent in Butte County, 21 percent in Custer County, and 24 percent in Lemhi County for the fiscal years 2014-2016 (Headwaters Economics 2017).

Economic Well-Being

The area of influence has lower median household incomes and higher rates of poverty than the state overall, as seen in Figure 10 and Figure 11, respectively. This indicates that economic insecurity is more common in the three-county area than in some parts of the state and compared to the state as a whole.

Figure 10. Median Household Income, 1990-2015

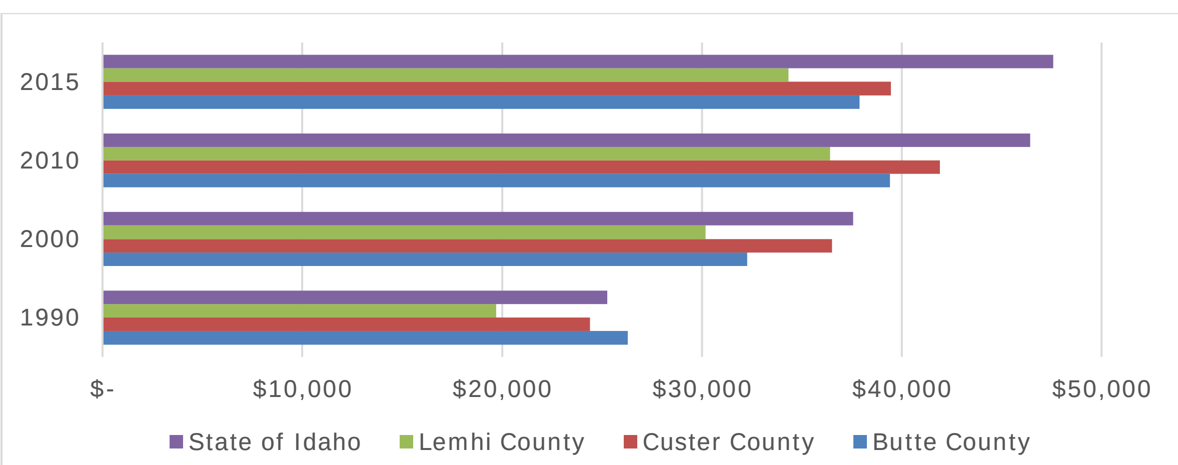
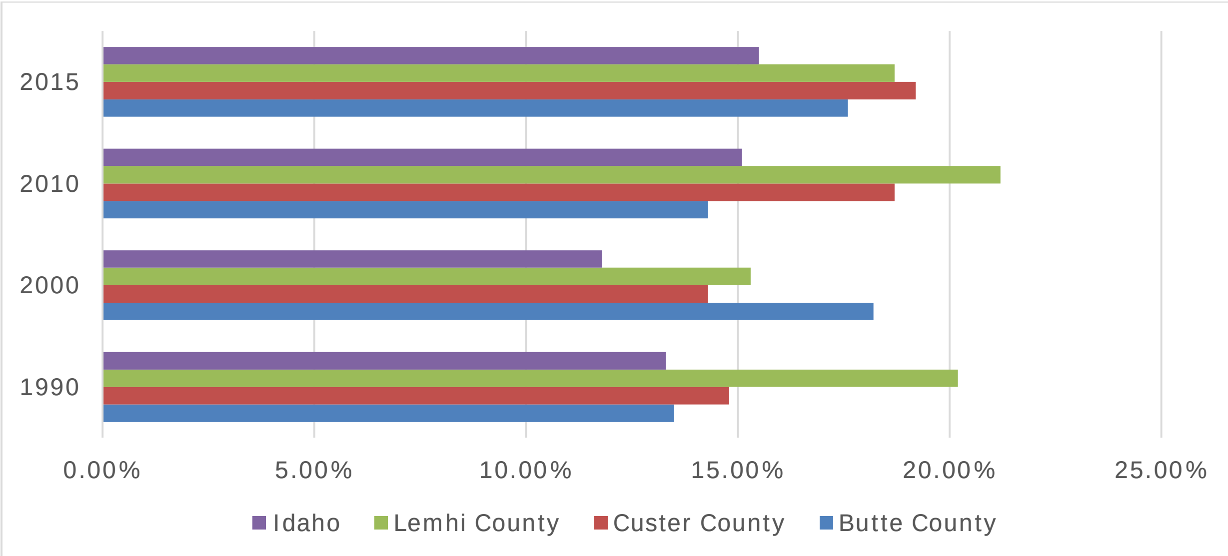
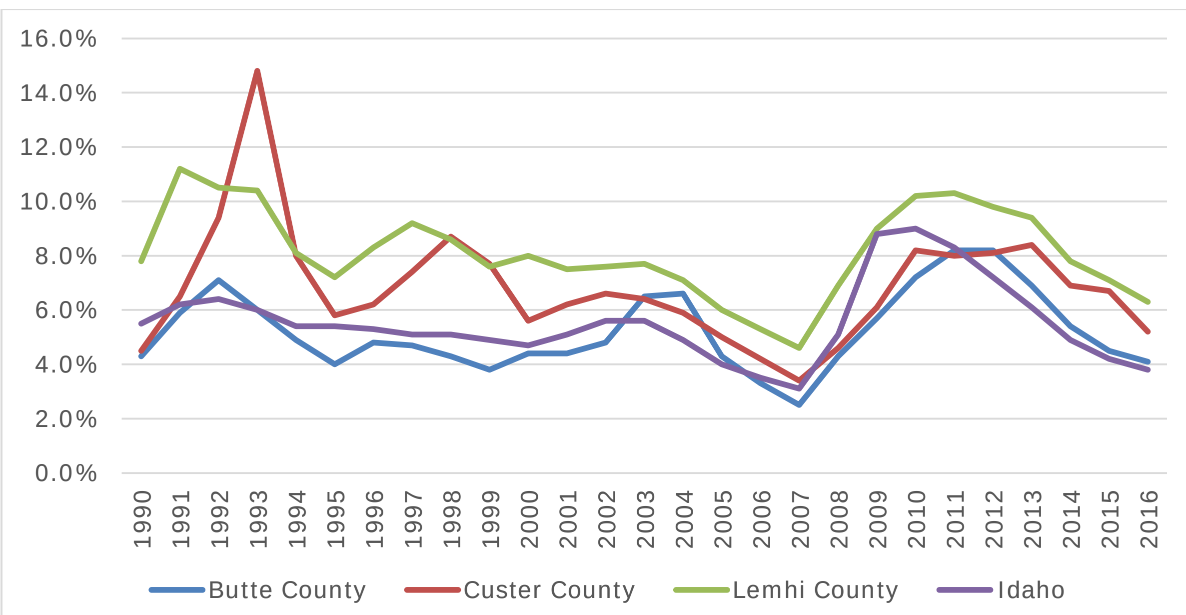


Figure 11. Percent of People Living in Poverty, 1990-2015



Butte County typically tracks the state-wide unemployment trends closely, but both Custer and Lemhi counties have usually experienced higher rates of unemployment and more dramatic fluctuations, as shown in Figure 12. Since the end of the recession, all three counties have seen their unemployment rates drop from about 8 to 10 percent to 4 to 6 percent. However, labor force participation people either employed or seeking work has declined in all three counties since 2010 (U.S. Bureau of Labor Statistics 2017). This may be the result of increased retirements or discouraged workers leaving the labor force because of lack of opportunity (Idaho Department of Labor 2017).

Figure 12. Unemployment Trends



Source: (U.S. Bureau of Labor Statistics 2017)

Industry Composition

Economic diversity generally promotes stability and offers more diverse employment opportunities. Highly specialized economies, like those that depend on one or very few industries for the bulk of employment and income, can be subjected to cyclical economic fluctuations and offer more limited job opportunities. Determining the degree of specialization in an economy is important for local decision-makers and planners, particularly when the dominant industry can be significantly affected by changes in policy. For Forest Service decision-makers, this is likely to be the case where the forest products industry, agriculture, or the tourism and recreation industries, for instance, are heavily dependent upon national forests and associated management and policy decisions.

In the three county area, Lemhi and Custer counties have relatively diverse economies. Butte County, home to the Idaho National Laboratory, has a much more specialized, less diverse economy. The magnitude of Idaho National Laboratory's influence on Butte County is immense and has been for decades. Butte County's population is about 2,500 people, but the number of full- or part-time jobs in the county is estimated at 8,189. The large majority of the income earned in Butte County is earned by people who live outside the county (U.S. Department of Commerce 2016).

Trends in several economic sectors have distinct ties to public land management in the three-county area. The broader social and economic contributions across the region are described later in this section under Contributions of Forest Resources and Uses.

Agriculture

Once the dominant economic sector in the region, agriculture accounts for a decreasing share of employment relative to non-farm sectors over the past several decades. This is true not just for the three-county area, but also for Idaho and the United States. Direct employment in the agriculture sector accounts for about 3 percent of workers in Butte County, almost 13 percent in Custer County, and about 10 percent in Lemhi County, compared to 4 percent in Idaho and 2 percent in the United States. From 1988 to 2016, the number of Butte County farm jobs dropped from 366 to 268, in Custer County, farm jobs dropped from 382 to 349, and in Lemhi County, farm jobs declined from 509 to 427. However, during that same time period, farm earnings increased in terms of 2017 dollars in each of the three counties (U.S. Department of Commerce 2017).

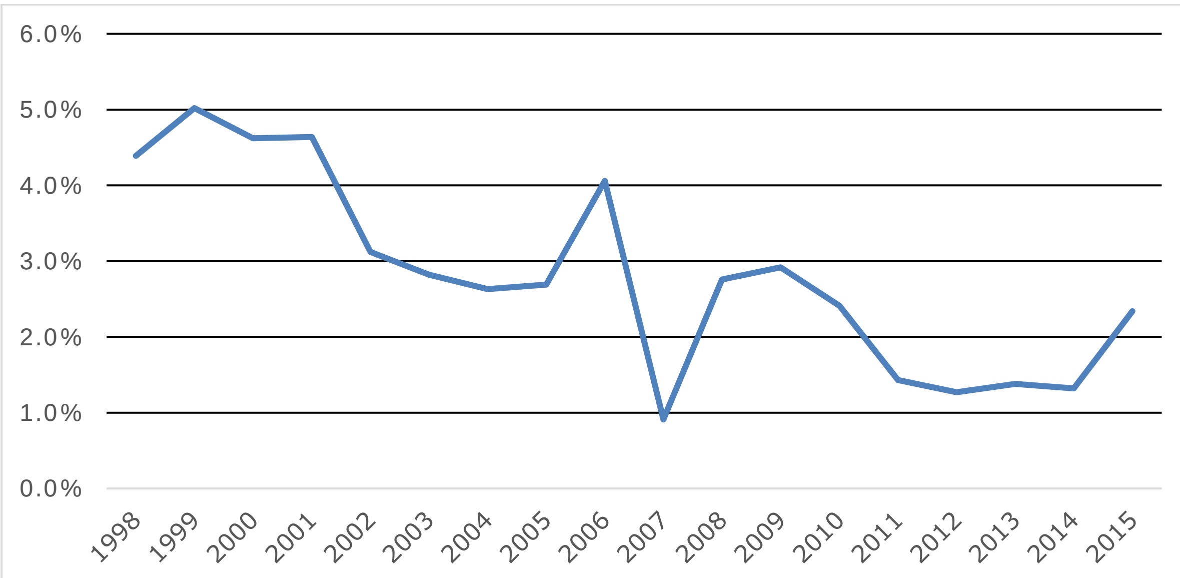
The Idaho Department of Labor notes that agriculture may not be one of the state's faster growing industries, but it is vital to the rural economy. The department concludes that every job added in animal production generates another job elsewhere in the economy, and the earnings multiplier is even greater at 2.22 (Idaho Department of Labor 2012).

Timber

Many residents of the three-county area fondly remember when small sawmills used to dot the landscape. The 1995 closure of the area's last larger sawmill, the Intermountain Mill in Salmon, meant the loss of about 40 jobs and, for some, a way of life (Spokesman-Review 1995).

Figure 13 shows that employment in timber-related industries in the three-county area has declined from about 5 percent of private sector employment in 1998 to about 2.5 percent in 2015. This includes timber-related employment on all land ownerships, not exclusively National Forest System lands. Nearly all of the employment benefits occur in Lemhi County.

Figure 13. Percent of Total Private Employment in Timber, 1998-2015



Source: (U.S. Census Bureau 2017)

Mining

Although local economies were built on mining in the late 1800s, today mining accounts for a small share of economic activity in the three-county area of influence. Since the 1980s-era Challis and Salmon Forest Plans were written, Custer and Lemhi Counties have experienced the cyclical nature of mining operations. The Thompson Creek Mine near Clayton experienced an extended closure in 1993 and 1994 and more recently in 2014. Prior to a drop in molybdenum prices in 2012, Thompson Creek is estimated to have employed about 400 people and made up nearly half of Custer County's tax revenue (Barker 2014). Custer County's mining jobs went from making up about 38 percent of total private employment in 1998 to only 10 percent in 2015.

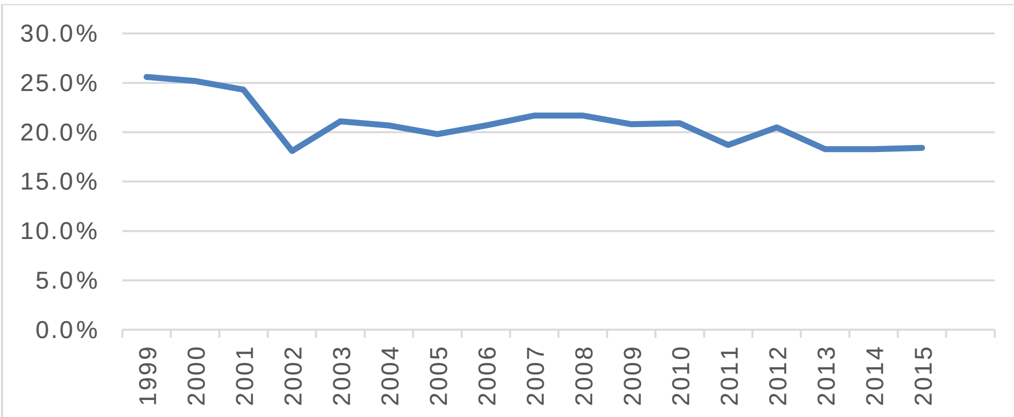
The Beartrack gold mine near Salmon closed in 2000, after employing an average of 170 people from 1994 to 1999. Lemhi County mining went from an 11 percent share of private employment in 1998 to less than 1 percent in 2015. The price of cobalt has doubled in recent years, putting the stalled Idaho Cobalt Project back in the headlines. With a mining site on Salmon-Challis National Forest lands about 22 miles northwest of Salmon, the Idaho Cobalt Project forecasts that construction and mine development will begin later in 2018. The company projects an investment of $187 million and the creation of 100 jobs in the local area and 30 additional jobs in Blackfoot where refining of the cobalt would take place.

Butte County has not had a measurable mining sector within recent decades.

Recreation

Travel and tourism-related jobs in Butte, Custer, and Lemhi counties account for approximately 18 percent of private sector employment in the three-county area, as seen in Figure 14. This exceeds the share of employment in travel and tourism-related sectors statewide (Headwaters Economics 2017).

Figure 14. Percent of Total Private Employment in Travel and Tourism Sectors in Three-County Region, 1999-2015



Within the area of influence, Custer and Lemhi Counties have the highest share of tourism-related employment with approximately 25 and 21 percent, respectively. Butte County has the lowest share, approximately 7 percent, despite having Craters of the Moon National Monument within its boundaries. These figures consist of sectors that provide goods and services to visitors as well as to the local population, so they should not be considered an absolute measure of travel and tourism industries.

Though the number of jobs in travel and tourism-related sectors in the three-county area has declined since 1999, it has been relatively stable over the last decade (U.S. Department of Commerce 2016).

There is a long tradition of outfitting and guiding in the area. In 1805, the explorers Lewis and Clark relied on a Shoshoni Indian named Old Toby to help the Corps of Discovery navigate north through Lemhi County and over Lost Trail Pass. Today, guides take thousands of people down the route that eluded Lewis and Clark the Salmon River.

In addition to the world-class whitewater opportunities on the Main and Middle Fork Salmon Rivers, hunting and fishing are also popular guided activities. The Salmon-Challis has issued special recreation use permits for activities such as mountain biking, backcountry ski yurts, and off-highway vehicle guided trips activities not envisioned in the existing 1980s plans. In all, the Salmon-Challis National Forest manages about 100 outfitter and guide permittees each year. Some of these outfitters and guides reside in the three-county area, and some maintain their operations from outside the area.

Idaho Department of Parks and Recreation monitors trends related to the economic impacts of recreation throughout the state. Recent economic studies point to the value of powerboating, snowmobiling, and off-highway vehicle use to the State. Butte, Custer, and Lemhi Counties realize far less economic activity than the top-ranking counties for motorized recreation, but there are areas where these motorized activities contribute significantly to the overall recreation economy.

The small community of Stanley in Custer County, for example, is a destination for powerboating on Redfish Lake, and its winter climate, coupled with its relative proximity to Boise and Sun Valley, lends itself to snowmobile recreation. Recent studies show that pattern affects bottom lines in Custer County by more than $2 million annually related to sales of powerboating goods and services (Black and others 2016), and more than $2.3 million annually related to sales of snowmobile-related goods and services (Black and others 2017).

Idaho off-highway vehicle enthusiasts took close to 1 million recreation trips in Idaho during 2012 and spent about $434 million. The three-county area of influence is capturing only a fraction of these expenditures. Butte County realized about $1.5 million in goods and services sales related to Off-Highway Vehicles, Custer County $2.7 million, and Lemhi County $4.7 million (Chris Anderson and Taylor 2014).

Government

Government employment, including federal, state, local, and military, makes up 18.5 percent of total employment in Custer and Lemhi counties, but is less than 3 percent of Butte County's employment. From 1988 to 2016, federal employment in Custer County grew from 144 jobs to 156 jobs. Lemhi County's federal workforce declined from 241 to 210 during the same time period (U.S. Department of Commerce 2016).

Non-Labor Income

Non-labor income accounts for approximately half of total personal income in the area of influence, as shown in Table 1. In Lemhi County, approximately 60 percent of income originates non-labor sources. As a comparison, non-labor income accounts for less than 40 percent of income for the State of Idaho. Non-labor income includes:

- dividends;
- interest;
- rent;
- age-related transfer payments, such as Social Security and Medicare;
- hardship-related transfer payments, such as unemployment insurance and Medicaid; and
- other transfer payments, such as Veteran's benefits and worker's compensation).

The vast majority of non-labor income in the area of influence is due to dividends, interest, rent, and age-related transfer payments (Headwaters Economics 2017). These data are consistent with the age demographics of the counties, which show that the area of influence is home to more of an older population than the state as a whole. Older people are more likely to receive non-labor income and live on a fixed income. In general, because they tend to be more dependent upon non-labor income, older populations can be sensitive to affordability and price fluctuation, especially in the areas of housing, utilities, and food.

Additionally, the Salmon-Challis National Forest provides amenities that may be attractive to retirees, such as open space, environmental quality, and outdoor recreation opportunities. The benefits that the Salmon-Challis National Forest provides to people in the area of influence and broader landscape are described in more detail in the subsequent section.

Table 1. Non-Labor Income Components as a Share of Total Personal Income

Location	Dividends, Interest & Rent	Age-Related Transfer Payments	Hardship-Related Transfer Payments	Other Transfer Payments
Butte County	20.7%	18.0%	5.9%	2.7%
Custer County	28.7%	14.9%	3.3%	2.5%
Lemhi County	31.7%	19.0%	5.6%	3.1%
Idaho	20.6%	11.2%	4.7%	2.8%

Source: (U.S. Department of Commerce 2016)

Tribal Social and Economic Conditions

Many of the descendants of the original inhabitants of the area, the Shoshone-Bannock Tribes and the Nez Perce Tribe, now reside at the Fort Hall Reservation in southeastern Idaho and the Nez Perce Reservation in north-central Idaho.

Population & Demographics

Fort Hall has a population of 6,061 people, and the Nez Reservation, headquartered in Lapwai, Idaho, has 18,754 people. Comparable to Idaho's median age of 35, Fort Hall's median age is approximately 36 years old, while the Nez Perce Reservation's median age is 46 years old. Like Custer and Lemhi Counties, the Nez Perce Reservation's percentage of residents who are 65 or older make up 23 percent of the population. Comparatively, only 14 percent of Idaho residents and 13 percent of Fort Hall residents are 65 or older. Figure 15 features a map of the two reservations in relation to the Salmon-Challis National Forest.

Fort Hall and Nez Perce Reservations have higher percentages of their population who have a disability. Nineteen percent of Fort Hall residents and 23 percent of Nez Perce residents are considered to have a disability, compared to less than 13 percent for Idaho.

Economic Well-Being

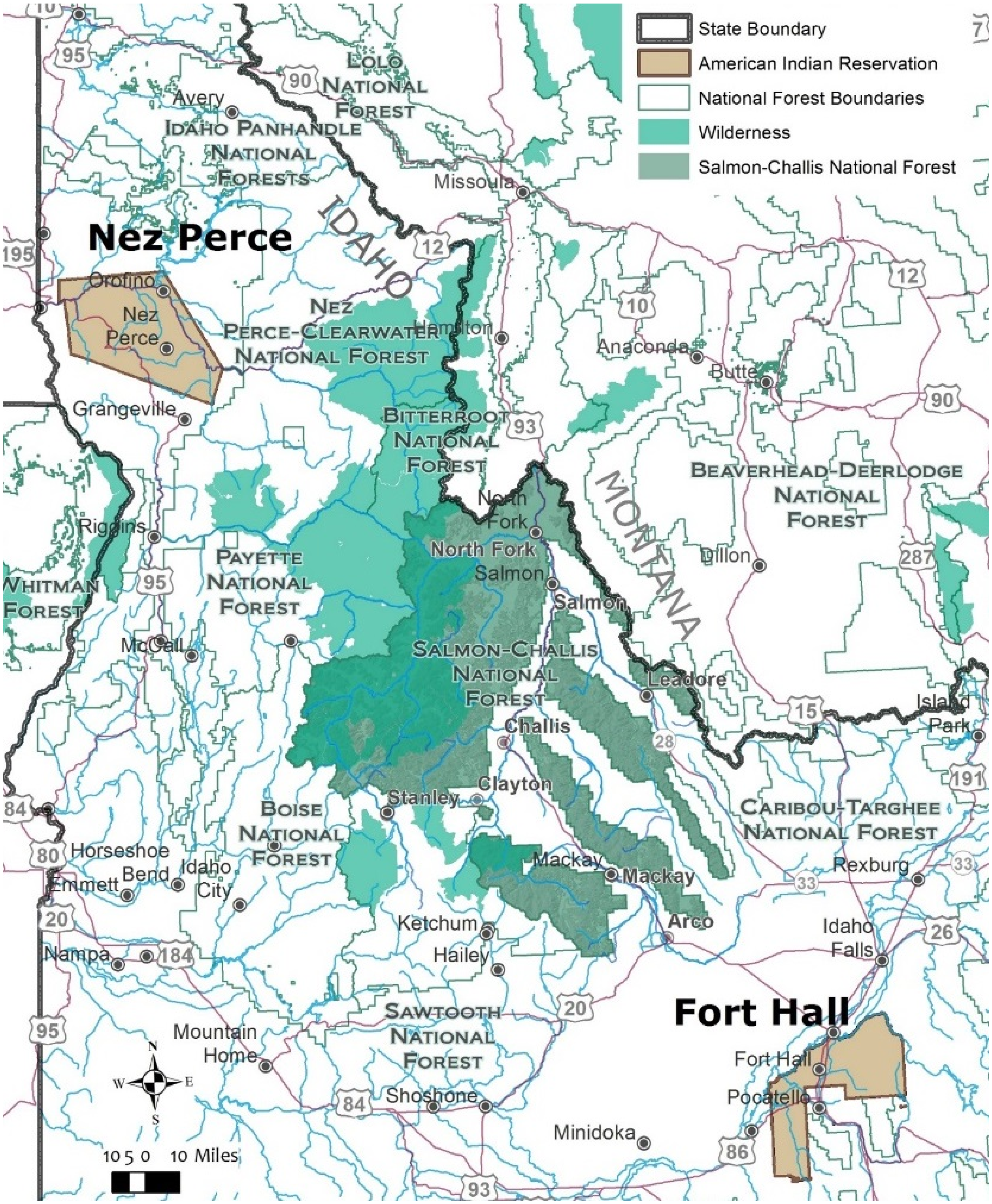
The median household income of the Fort Hall and Nez Perce Reservations lag behind the State of Idaho's. Fort Hall's median household income was $42,365, the Nez Perce Reservation's was $39,959, while Idaho's was $49,174.

The percent of people living in poverty in all of Idaho is about 15 percent, compared to about 22 percent in Fort Hall and about 17 percent on the Nez Perce Reservation.

Unemployment rates are higher on the reservations than for Idaho overall. Fort Hall's unemployment rate is 21 percent, and the Nez Perce Reservation's is almost 9 percent (U.S. Bureau of Labor Statistics 2017).

Like Butte, Custer, and Lemhi Counties, the Fort Hall and Nez Perce Reservations have indicators that point to higher levels of economic insecurity than in some other parts of the state and compared to the state as a whole.

Figure 15. Map of Fort Hall and Nez Perce Reservations in relation to the Salmon-Challis

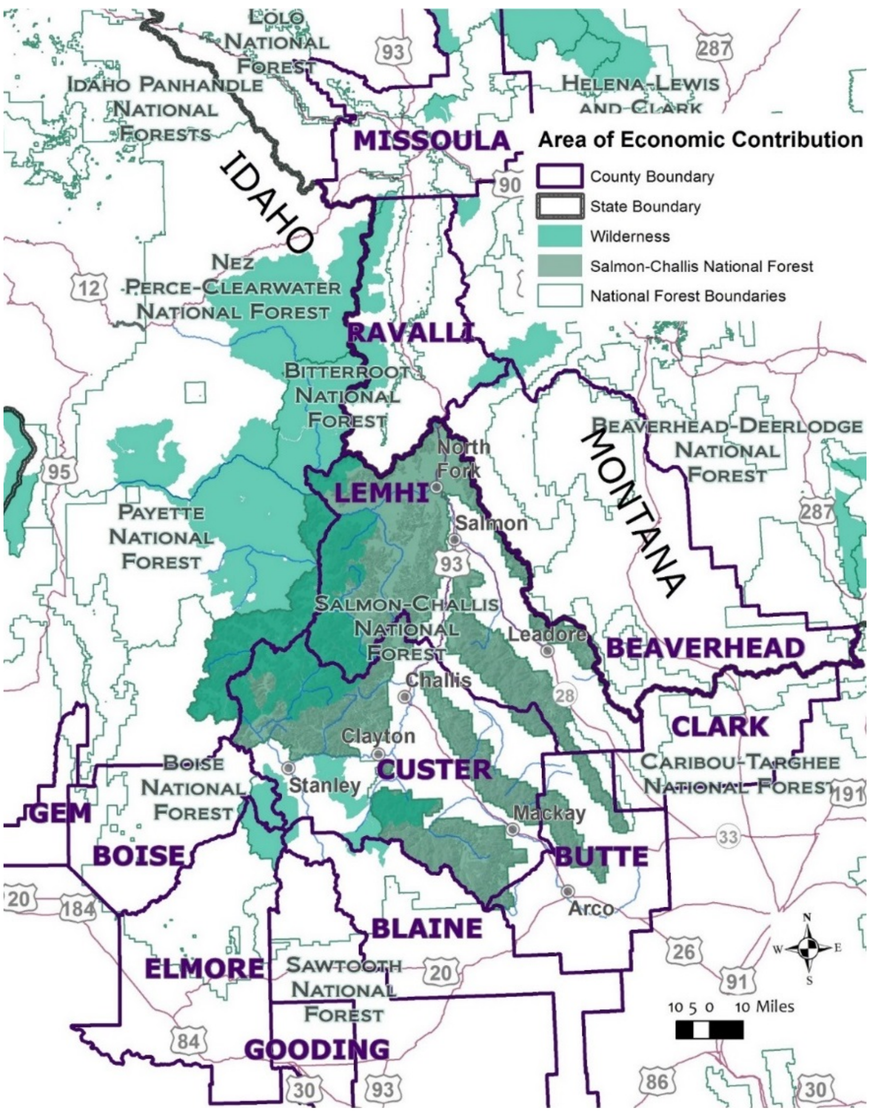


CONTRIBUTIONS OF FOREST RESOURCES & USES

To estimate jobs and labor income associated with forest resources and uses, economists use a software and data package called IMPLAN to characterize the structure of the area's economy and how the different pieces of the economy are interrelated. Agency data are added to the model for recreation, wildlife and fish, range, minerals, forest products, forest budgets, and payments to states. A model then estimates direct and ripple effect links between Forest Service resource management and the regional economy. Figure 16 shows the counties included in the model.

These counties are expected to be affected by Salmon-Challis National Forest resource management decisions. This economic area of influence is a contiguous set of counties where direct expenditures are made by the following groups of Salmon-Challis National Forest users: recreationists, range permittees, timber harvesters, timber processors, mineral and energy producers, and local governments.

Figure 16. Counties included in the IMPLAN Model for the Salmon-Challis Plan Area



Livestock Grazing

Permittees graze cattle, horses, sheep and goats on the Salmon-Challis. Economically, grazing permits provide income for the Salmon-Challis and raising livestock provides an income for permittees, but grazing also has sociocultural value and is an important aspect of community identity in this region. In the West, ranching cannot be entirely understood through a commercial agricultural lens because it provides non-market benefits, such as support for tradition and heritage (Raish and others 2003; A. H. Smith and Martin 1972).

Livestock grazing on the Salmon-Challis supports approximately 310 jobs and $8.1 million in labor income in the local economy. These include direct jobs on ranches as well as jobs in other businesses that provide goods and services to ranchers (U.S. Department of Agriculture, Forest Service 2017e).

Beyond direct economic contributions, the sociocultural benefits are significant and also more difficult to measure. Research has found that many ranchers identify the value of ranching as being closer to the earth, providing a desirable place to raise a family, and providing a satisfying way of life (A. H. Smith and Martin 1972). Studies have found social fulfillment through farming and ranching consistently ranks as a primary motivation to continue ranching despite low profits and development pressure. Farmers must balance economic and non-economic goals, which have historically benefited agriculture and ensured the persistence of family farms and ranches (Inwood 2013). Interaction with other ranchers builds networks and social capital (Ooi and others 2015). Such interpersonal relationships contribute to a sense of belonging and quality of life.

Ranching has a high degree of support in the State of Idaho. A 2014 poll conducted by the University of Idaho found that 90% of Idahoans approve of grazing on public lands (Reyna and others 2014).

The ability to graze livestock on public lands has helped some ranchers take creative conservation measures on their private lands, which often have some of the highly valued habitat in the region.

Settlement patterns in East-Central Idaho often meant ranching homesteads were on the most arable lands in or adjacent to chinook spawning areas or wet meadows that greater sage grouse rely upon. Floodplain habitat was converted to riparian pasture or tilled agricultural ground. Many of today’s cow and calf operations are situated on some of the most valuable occupied habitat for these Endangered Species Act listed animals. The ability to graze on public land relieves the pressure of concentrated livestock in these critical, yet privately owned, habitats.

Dozens of private landowners in the area have improved habitat for salmon, steelhead, bull trout, and sage grouse, while maintaining the economic viability of their livestock operations. Achieving this balance between economic viability and habitat conservation has resulted in fewer private land use conversions, from agricultural to residential, than many other parts of the West (Edmondson 2018). The open space that ranches provide benefits not only wildlife, but also humans who appreciate the scenic views (Charnley and others 2014).

Forest Products

Forest products include both timber products, like sawlogs, pulpwood and firewood, and non-timber forest products, such as fodder for animals, mushrooms, berries, and ornamental materials.

Timber harvested from federal lands supports employment in timber-related industries, such as logging and wood product manufacturing. Timber products are often used locally, but, because they can potentially be transported hundreds of miles depending on market conditions, sometimes this employment effect can be geographically dispersed well beyond the national forest. For example, sawtimber harvested from the Salmon-Challis National Forest may support employment in distant communities in Montana and northern Idaho. In 2015, Idaho forest products industry employment was estimated at 11,980 jobs, but most of this employment was concentrated in the northern part of the state (University of Idaho 2016).

The area of influence no longer has any large capacity sawmills. However, it does support smaller capacity and seasonal milling operations, such as the England Sawmill, and some secondary wood products manufacturing, such as QB Corporation, which generally sources raw materials from outside the area. In its census of primary wood using mills in operation in Idaho in 2015, the Bureau of Business and Economic Research listed three primary facilities in the area: a log home manufacturer in Custer County, a sawmill in Lemhi County, and a post and pole operation in Lemhi County (Simmons and Morgan 2017). In addition to employment in primary and secondary wood products manufacturing, timber harvest supports local employment in forestry, logging and trucking.

Like the timber harvest volume data presented in the Multiple Uses, the share of private sector employment in timber-related industries fluctuates but has generally trended downward in this region since the early 1990s. Timber-related employment is affected by numerous factors. Federal forest management affects timber supply in regions dominated by federal lands, and timber flowing from federal lands declined following peak harvests in the 1970s and 1980s.

This trend holds regionally for both the Forest Service's Pacific Northwest Region and the Intermountain Region and has been attributed to:

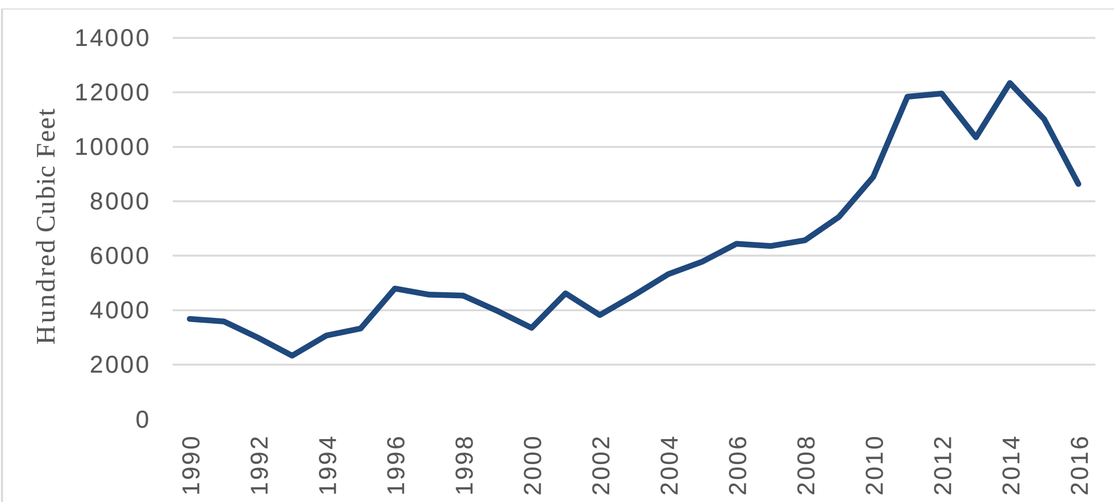
- litigation associated with the Endangered Species Act of 1973, especially in the Pacific Northwest;
- economic recession;
- a transition from timber-focused management to multiple use management;
- structural changes in the industry, including imports of lumber from Canada; and
- the rise of the U.S. Southeast as a dominant lumber producing region (Howard 2007; Wear and Murray 2004).

Federal timber harvest has been relatively stable in the region and in the area of influence over the last decade. State and private forest management, global trade, the housing market, and technological change in the forest industry are among the factors that influence the number of jobs in timber-related industries over time. For example, following the collapse of the housing market and subsequent economic downturn in 2008, softwood lumber production fell 43 percent, and the forest sector more broadly lost 1.1 million jobs (Woodall and others 2011).

Timber harvest on the Salmon-Challis National Forest supports approximately 80 jobs and $3.1 million in labor income in the local economy. These jobs include both direct employment, such as in logging, as well as indirect and induced employment in sectors that interact with the forest products industry (U.S. Department of Agriculture, Forest Service 2017e). Changes in timber harvests from the Salmon-Challis National Forest can affect county government revenue. The Forest Service remits a portion of timber receipts to county governments through the 25 Percent Fund payments program. When timber harvests decline, so do timber receipts and the associated payments to county governments.

In addition to sawtimber, fuelwood is removed from the Salmon-Challis National Forest, as shown in Figure 17. The forest offers personal use permits for $5 per cord, and commercial fuelwood is also removed as a component of timber harvest (U.S. Department of Agriculture, Forest Service 2015c). Unlike sawtimber, the volume of fuelwood cut on the forest reveals an overall upward trend. The increase of dead trees from insect and disease has contributed to this upward trend during the last 15-20 years.

Figure 17. Volume of Fuelwood Cut from Salmon-Challis NF, 1990-2016



Source: (U.S. Department of Agriculture, Forest Service 2016d)

Fuelwood from the forest offers an affordable fuel source for area households, as seen in Table 2. Butte, Custer, and Lemhi counties all have much greater percentages of households with wood heating than the state overall. While all four areas saw substantial declines in households reliant on wood heating between 1990 and 2000, the share of households using wood heating in the three counties has since increased. According to the latest available data, approximately one-third of households in the three counties use wood as their primary home heating fuel. In general, fluctuations in wood heating are correlated with fluctuations in the price of alternative heating options, especially fuel oil and propane.

Table 2. Share of Households with Wood as Primary Home Heating Fuel

	1990	2000	2010	2015
Butte County	30.8%	14.7%	17.6%	26.5%
Custer County	48.0%	32.8%	31.2%	41.0%
Lemhi County	60.2%	33.4%	38.6%	35.1%
Idaho	18.0%	7.7%	7.3%	7.9%

Source: (U.S. Census Bureau 1990, 2000, 2010, 2015)

In addition to its importance as an affordable heating source, fuelwood collected from the Salmon-Challis National Forest also has social and cultural value. Fuelwood collection may support family traditions and cultural heritage.

In addition to commercial timber harvesting and personal-use fuelwood collection, the Forest Service conducts restoration activities, including thinning and prescribed fire, to improve forest resilience to insects, disease, and uncharacteristic wildfire. Forest restoration activities improve firefighter and public safety, protect private property, and can help to protect ecosystem services. Collaborative efforts such as the Lemhi Forest Restoration Group and the Stanley Fire Collaborative have resulted in thousands of acres in restoration projects in the past decade.

Recreation

Recreational opportunities, facilities, and visitation patterns are described in detail in the Multiple Uses section of this assessment report.

The forest attracts both local residents and more distant visitors. Approximately one out of four National Visitor Use Monitoring survey respondents traveled 25 miles or less to recreate on the forest. Another quarter of recreation visitors traveled between 101 and 200 miles to visit the Salmon-Challis (U.S. Department of Agriculture, Forest Service 2016c). This suggests that the forest functions as a backyard for local people, but also draws tourists to the area from other places.

The amenities provided by the Salmon-Challis support economic activity in communities near the forest. Scenic beauty, clean water, and recreation opportunities associated with national forests can attract residents and businesses to communities near forests.

Visitors to the Salmon-Challis National Forest spend money on food, fuel, lodging, and souvenirs. Average visitor spending ranges from $33 for local day visitors to $514 for non-local overnight visitors staying off the Salmon-Challis (White and others 2013). These visitor expenditures support employment and labor income in recreation-related sectors. Recreation visitors to the Salmon-Challis National Forest support approximately 60 direct jobs and $1.8 million in direct labor income in the local economy (U.S. Department of Agriculture, Forest Service 2017d).

A particular recreational attraction is the Salmon River, which attracts thousands of recreational users to Idaho each year. Approximately 9,200 people float the Middle Fork of the Salmon River annually 4,500 commercial clients and 4,700 private users between 2012 and 2016. While the river crosses multiple national forests, the permit system is managed by the Salmon-Challis National Forest. Floaters, particularly commercial clients, spend considerably more than typical forest recreation visitors (White and others 2013). A recent economic analysis estimates that commercial floaters spend an average of $1,300 and private floaters spend an average of $900 per person in the local area during their trip (Neher 2016). Middle Fork floaters spend approximately $8.3 million in communities near the Salmon-Challis National Forest annually. Commercial clients pay an additional $1,800 per person on average in outfitter-guide fees, which accounts for a further $8.3 million in visitor expenditures (Neher 2016). In total, therefore, visitor expenditures associated with recreational use of the Middle Fork are estimated at $16.6 million annually.

The Forest Service also issues permits to float the Main Salmon River. Between 2012 and 2016, there were an average of 2,800 commercial clients and 5,400 private users each year. The Forest Service does not have data on visitor expenditures specific to Main Salmon River visitors, so this analysis assumes that their expenditures are consistent with Middle Fork visitors. Using this assumption, Main Salmon River visitors are estimated to spend $13.5 million on outfitter guide services, food, lodging, and other goods and services in the local area.

Not all of these expenditures remain in the communities. Many of the goods and services purchased by floaters and outfitter-guides are produced in distant areas. Spending by Middle Fork floaters are estimated to support approximately 116 jobs and $3 million in labor income and spending by Main Salmon floaters are estimated to support 95 jobs and $2.4 million in labor income in the broader economic area on an average annual basis. These contributions should not be added to the forestwide recreation-related employment and labor income estimates presented above. Some floaters are captured in the National Visitor Use Monitoring survey, so adding the employment and labor income estimates may double-count visitor expenditures.

Outdoor recreation opportunities on the Salmon-Challis contribute to visitors' quality of life and social well-being. The Salmon-Challis provides an area for friends and family to gather, to pass on traditions, and to strengthen relationships. Some activities, such as hunting and fishing, serve a dual purpose of recreation or leisure and supporting household well-being through the provision of food.

Commercial outfitters and guides play an important role in making recreational opportunities on the Salmon-Challis accessible to those who lack the experience and the ability to safely engage in activities such as whitewater rafting or hunting. Guides are instrumental in providing education and interpretative services on the Salmon-Challis, and helping to instill positive outdoor ethics in visitors. Outfitters help maintain trails and campsites, exemplifying shared stewardship of our natural resources. The seasonal jobs offered by commercial outfitters are attractive to young people, an important factor in a region with an aging population. And like livestock grazing, many outfitting businesses are inter-generational.

Wildlife and Fish

The Salmon-Challis provides habitat for a diverse range of organisms, including wildlife and fish. Wildlife and fish habitat contributes to social and economic well-being in the planning area counties and in the broader landscape. Wildlife and fish habitat are addressed in detail in the Terrestrial Ecosystems

Mining and Geology

Economically-valuable mineral deposits occur on the Salmon-Challis, including gold, cobalt, copper, and molybdenum. Mineral material sites, such as gravel pits, provide material to support road maintenance and construction on the Salmon-Challis.

There are no known economically-significant deposits of leasable fossil fuels on the Salmon-Challis National Forest. While there is some potential for geothermal development, the Salmon-Challis does not have abundant potential for suitable renewable resources, such as solar and wind power, compared to other national forests (Zvolanek and others 2013).

Mining on the Salmon-Challis accounts for a very small share of total mining jobs in the area of influence. Mining on the forest supports fewer than 10 jobs and less than $100,000 in labor income in the local economy (U.S. Department of Agriculture, Forest Service 2017d). The history of mining in the area has also led to a need for mine reclamation. Firms engaged in mine reclamation are part of the remediation services sector, so mine reclamation jobs are not captured in the employment and income estimates above.

Thompson Creek's molybdenum mine, near Challis, is not actively mining at this time. The mine continues to produce molybdenum by milling imported concentrates and is expected to continue such operations into the near future. There are undoubtedly indirect employment opportunities to the local communities as a result of continued maintenance and production. Thompson Creek Mine has been a notable economic influence in the Challis community and surrounding area.

The Idaho Cobalt Project, managed locally by Formation Capitol, has been planning and preparing for many years to mine for cobalt near Salmon. Groundwork has been completed for the production phase of mining. Assuming finances and market conditions attain desirable levels, this project has the potential to provide local employment to both Lemhi and Custer counties.

The hundreds of mines, large and small, that span back to the late 1800s have significantly shaped the culture dynamics of the local communities. Recreational gold panning, rock collecting, and visiting historic mine sites are activities that occur throughout the plan area. Several universities showcase the geology of the area by hosting geological field camps on the Salmon-Challis, particularly in the Copper Basin area of the Lost River Ranger District.

For more information see the Minerals & Energy Resources section.

Water Provision

The Salmon-Challis National Forest contributes to the supply of clean water for a variety of human uses. Because water is not traded in markets the way that other consumptive multiple uses are, this section is organized to qualitatively address:

- who benefits from water,
- how they benefit, and
- changes in demand for water provision from the Salmon-Challis.

Clean water provided by the Salmon-Challis is essential for the many agricultural producers in the planning area. Irrigation is essential for agricultural production in Idaho. Municipalities and individual households also rely on the Salmon-Challis for clean drinking water. Both municipalities and individual wells withdraw water from watersheds that overlap with the forest. Forest uses and management actions, such as grazing, mining, roads, and recreational use, have the potential to affect drinking water quantity and quality.

Surface water on the Salmon-Challis contributes to recreational use and enjoyment. Boaters, anglers, and other water-based recreation users are heavily affected by water quantity and quality. Eleven percent of visitors to the Salmon-Challis report fishing as their primary trip purpose and nearly 20 percent report fishing as one of their activities during their visit. Smaller shares of visitors report participating in other motorized and non-motorized water activities during their visit (U.S. Department of Agriculture, Forest Service 2016c).

Forest Service Infrastructure & Operations

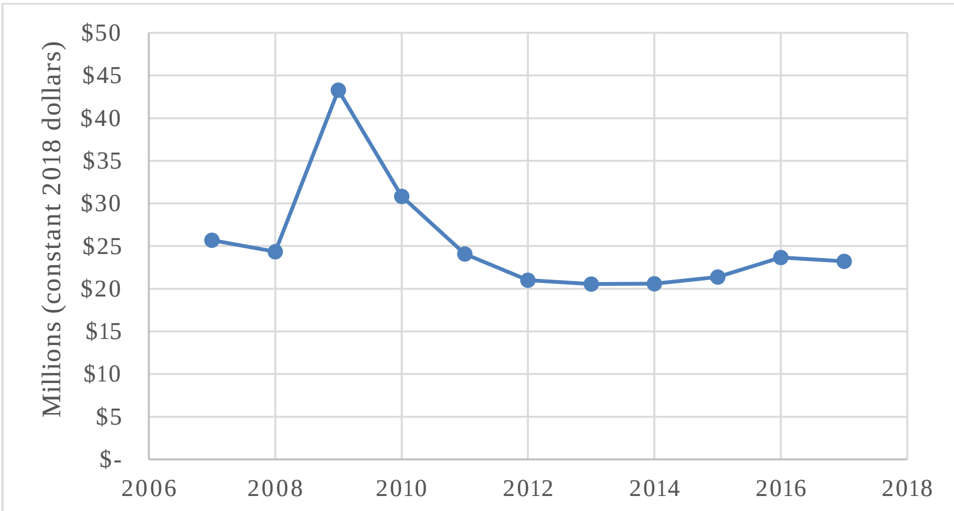
Forest operations and infrastructure include personnel, program activities, roads, and facilities that contribute to the use and enjoyment of the forest. The Salmon-Challis's annual budget has averaged about $25 million over the past decade. The Salmon-Challis's operational expenditures contribute to economic activity in the communities that surround the forest.

Forest Service employees live in these communities and spend their income on housing, food, and a variety of other local goods and services. Forest Service staff are active community members and contribute to their communities' social fabric. The Salmon-Challis's non-salary expenditures generate economic activity in businesses that supply goods and services to support Forest Service programs. Salmon-Challis expenditures support approximately 450 jobs and $18.2 million in labor income (U.S. Department of Agriculture, Forest Service 2017d). These jobs include both public and private sector jobs. In addition to Forest Service employees, these jobs include contractors and others who do business with the agency or its employees. For example, firms engaged in ecological restoration activities on the forest are included in these estimates. Additionally, Forest Service employees' household expenditures, such as on housing and food, are also included in these estimates.

Decisions regarding national forest budgets are not made in the forest plan revision process. The federal appropriations process determines the funding available to national forests to implement forest management actions. Figure 18 displays the Salmon-Challis

National Forest's budget from fiscal year 2007 through fiscal year 2017. Though there have been sizeable annual fluctuations, the trend has been declining budgets over the past decade. At the same time, wildfire, growth in the wildland-urban interface, forest restoration needs, and demand for recreational opportunities strain Forest Service resources.

Figure 18. Salmon-Challis National Forest Annual Budget, Fiscal Years 2007-2017



Source: (U.S. Department of Agriculture, Forest Service 2018b)

The impact of litigation on Salmon-Challis National Forest projects has been a topic of interest throughout the assessment's public involvement phases. The Forest Service has tracked lawsuits since 2003. Between 2003 and 2017, the Salmon-Challis faced 17 lawsuits:

- nine related to livestock grazing,
- two challenged wilderness operations,
- two related to a predator derby,
- two related to timber projects,
- one related to travel management, and
- one related to a mining operation.

The Forest has not experienced litigation related to timber projects for more than a decade (Service 2018).

The exact costs of litigation to the Salmon-Challis, permittees, and communities are not known. The Salmon-Challis National Forest range program calculated that for four range-related lawsuits between 2010 and 2015, forest personnel spent approximately 3,300 hours on analytical and administrative duties related to the litigation. This equates to more than $150,000 in forest staff time per case (Faith Ryan 2018a). A recent study of litigation in the Forest Service's Northern Region, found similar results, estimating for one case study that agency personnel spent more than 1,900 hours on analytical and administrative duties related to the Spotted Bear River litigation, resulting in costs of more than $95,000 (Todd Morgan and Baldridge 2015). Staff involved in the lawsuit on the Northern Region forests estimated that half of their regular workload was either forgone or delayed.

Forest infrastructure is an essential input in economic activity in the region. Recreational use of the Salmon-Challis relies on accessible roads, trails, and developed sites. Households and industries rely on cellular towers, water developments, pipelines, and transmission lines to conduct their business. Like water, Salmon-Challis infrastructure is not a separate category in the economic contribution analysis because it is embedded in nearly all market transactions associated with forest uses. Permittees rely on roads to access and manage their grazing allotments. Recreational visitors will not spend money in communities near the forest if they cannot access preferred recreational sites. New families and businesses will not move to the communities surrounding the Salmon-Challis if they lack access to infrastructure essential to modern life.

Partnerships address mutual interests on a range of topics as broad as the agency mission itself. Worldwide, there are partnerships that address almost every aspect of land management, scientific research and policy related to forests. This collaboration means that communities and their perspectives are incorporated into the work. The relationships that develop with partners ensure that the Forest Service is pursuing the right work in the right place at the right time.

The Salmon-Challis National Forest formally engages in partnerships through the grants and agreement process. Since 2000, the Salmon-Challis has averaged about 6 formal partnerships with national and local nonprofit organizations each year, most often working together on trails maintenance, forest and stream restoration, and wildlife monitoring. The Salmon-Challis also conducts work under formal agreements with the Shoshone-Bannock Tribes, county and city governments, rural fire departments, state agencies, and other federal agencies.

Living with Fire

Wildland fire is an essential ecological process in forests of the Intermountain West. However, “A century of widespread fire exclusion and changes in active forest management have resulted in a buildup of surface fuels and the overstocking of forests with trees and ladder fuels” (Forest Service U.S. Department of Agriculture and Department of Interior 2014b). This has contributed to large wildfire events with more extreme fire behavior than historically measured. At the same time, the wildland-urban interface has expanded and more people are living in proximity to forests (Stein and others 2013).

Wildland fire has a number of social and economic consequences, including threats to human safety and property, displacement, and effects to ecosystem services (U.S. Department of Agriculture, Forest Service and Department of Interior 2014a).

Federal wildland fire suppression cost approximately $2 billion annually, 85 percent of which is spent by the Forest Service (National Interagency Fire Center 2017). Adjusted for inflation, that figure is a nearly 300 percent increase in cost since 1985 (National Interagency Fire Center 2017). Much of the cost increase has been attributed to further development of the wildland-urban interface, changing climate, and management of forests.

Past large wildfires in and around the Salmon-Challis have cost tens of millions of dollars to suppress. The 2000 Clear Creek Complex Fire alone burned more than 200,000 acres of the forest and cost more than $70 million. In the 2012 fire season, two large fires, the Mustang Complex and Halstead fires, burned more than one-half million acres and cost about $65 million to fight.

Between 1995 and 2015, the percentage of the Forest Service budget spent on fire expanded from 16 to 52 percent (U.S. Department of Agriculture, Forest Service 2015d). Furthermore, suppression costs account for only a fraction of the total cost of wildfires. Wildfires often entail costs associated with rehabilitation, lost property, decreased business revenue, and human health effects. During wildfire events, tourism decreases due to evacuations, road closures, and negative publicity (Mercer and others 2000). Depending on the size and intensity of the wildfire, impacts to tourism may be long-lasting. The Clear Creek Complex Fire led to the closure of the Salmon River and invalidated river permits. The displacement of recreation users can reduce economic activity in small towns near the forest, which rely on tourism to support local businesses.

Communities in the West live with smoke, whether from wildfire or prescribed fire. Smoke can travel great distances and affect communities far away from the burn unit, sometimes persisting after the burn is completed. Ambient particulate matter concentrations increase substantially during a wildfire (I. Kochi, Loomis, and others 2010). Studies find increased hospital admissions linked to asthma and respiratory problems during wildfire events (Ikuho Kochi, Donavan, and others 2010). The timing of prescribed fires is predictable, the volume of smoke produced is typically far less than in a wildfire, and there is time to notify the public when burns will be implemented. As a result, adverse health consequences are less likely to result from prescribed fires than wildfires.

Wildfire can also damage wildlife habitat, water quality, cultural and archaeological sites, and soil (Morton and others 2003). The Western Forestry Leadership Coalition estimates that total wildfire-related expenses, when accounting for a variety of direct and indirect costs, range from 2-30 times the reported suppression expenditures (Western Forestry Leadership Coalition 2010). Changing climate and residential development in the wildland-urban interface are expected to contribute to rising fire suppression costs in the future.

The rising cost of federal wildland fire operations has caused the agency to shift expenditures from other mission critical activities, such as restoration and fuels reduction, research, and recreation, toward firefighting and fire management. Reduced funding for recreation, vegetation and watershed management, wildlife and fisheries habitat management, and other non-fire activities limits the ability of the Forest Service to contribute to improvements in ecosystem services and quality of life in communities near national forests. Beginning in fiscal year 2020, the Forest Service's wildfire suppression budget will be capped at just over $1 billion per year through fiscal year 2027. Fire suppression costs in excess of this amount will be funded through an emergency wildland firefighting account rather than through borrowing from other Forest Service program areas.

SUMMARY AND CONCLUSIONS

The Salmon-Challis National Forest contributes to the communities surrounding the forests by providing diverse landscapes, economic benefits, forest products, forage for grazing and cultural and recreational opportunities. These national forest lands make up about 70 percent of the land base in the area, making the resources the Salmon-Challis offers incredibly important to local communities, tribes, and the surrounding region.

Like many rural communities in the United States, the area of influence is experiencing a population decline. The demographic changes of an aging population and fewer school enrollees creates concern for the future.

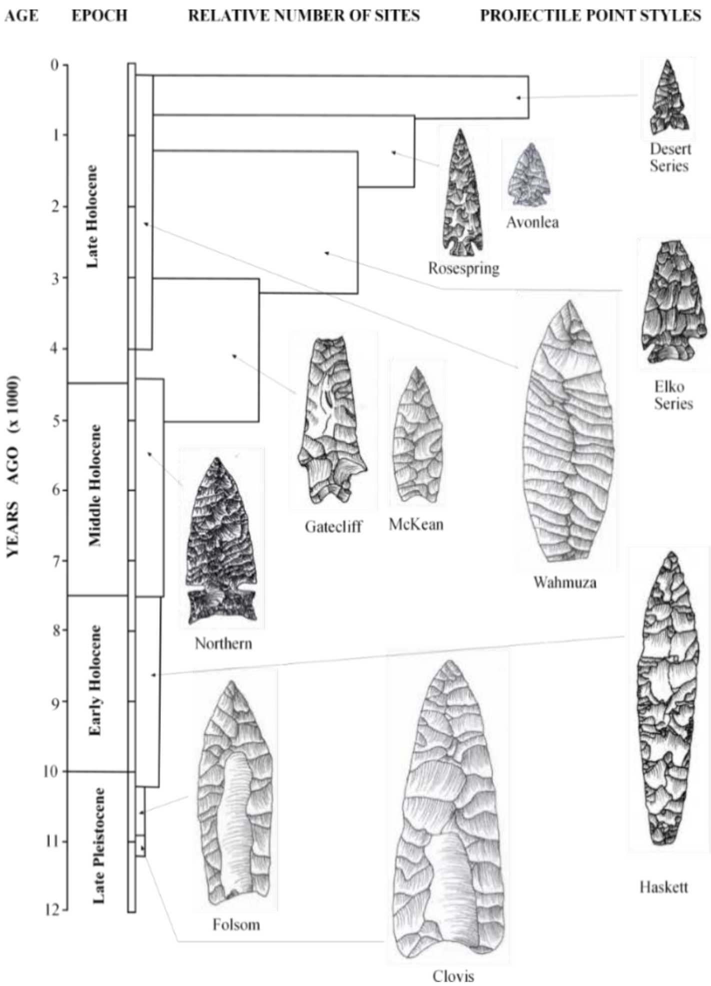
The predicted rise of more frequent and intense wildfires and the smoke that comes with those fires are also a cause for concern. Strategies can be developed that allow forests to achieve management objectives while simultaneously considering the effects on local wellbeing. Recreation, grazing, mining, and timber activities on National Forest System lands are vital contributions to the area's rural, struggling economies.

CULTURAL CONSIDERATIONS

The history and prehistory of the Salmon-Challis National Forest has been the subject of scholarly interest for many years.

Material remains associated with at least 12,000 years of tribal history, like those seen in Figure 19, have been found in the region. Use of the area by the Shoshone-Bannock Tribes, the Nez Perce Tribe, and their predecessors has been well documented.

Figure 19. Projectile Point Types Found in Central Idaho



Source: (Canaday 2012)

Euro-American use of the area has occurred since at least 1805, when the Lewis and Clark Expedition passed through the area. The Corps of Discovery, the special U.S. Army unit assembled for the expedition, crossed the Continental Divide at Lemhi Pass, descended Agency Creek to the Lemhi Valley, and proceeded north past present day Salmon, Idaho. Eventually, the team connected with what would become known as the Lolo Trail. While in the area, they made contact with the Lemhi Shoshone, who provided horses and a guide over the mountains.

Other Euro-American and Chinese immigrants settled in the area primarily for mining and agricultural pursuits starting in the late 1860s.

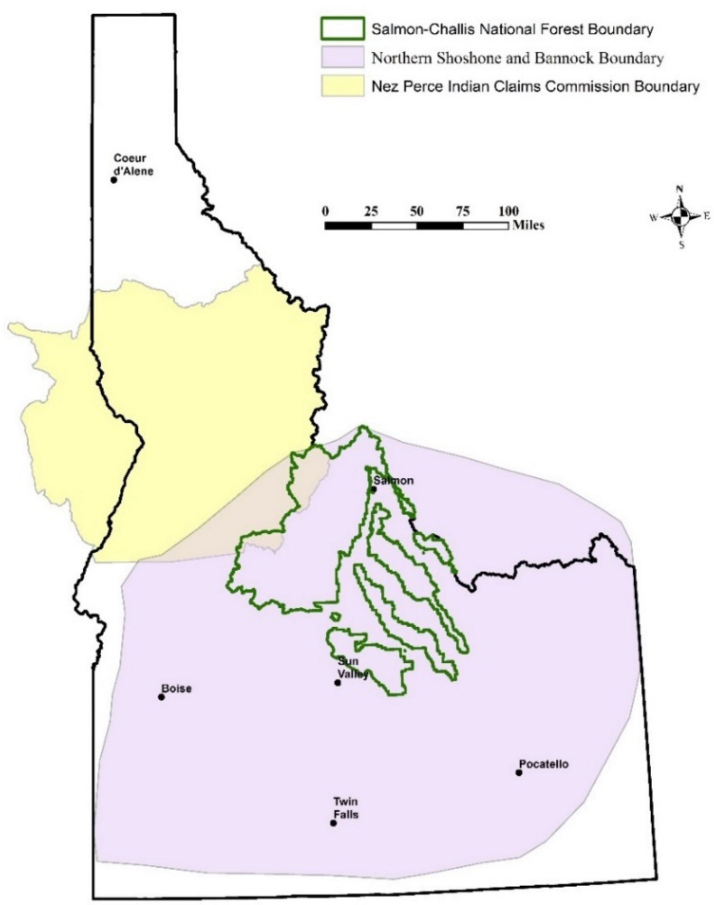
Archaeologists have identified a number of themes important to the history and prehistory of the Salmon-Challis (U.S. Department of Agriculture, Forest Service 2009, 2016b). These themes include:

- Native American Use and Occupation,
- Early Euro-American Exploration,
- Mining,
- Timber Production,
- Transportation,
- Agriculture and Ranching,
- the Civilian Conservation Corp,
- Forest Service Administration, and
- Recreation.

TRIBES

The Shoshone-Bannock and Nez Perce Tribes are the principal contemporary Native American groups with ancestral territories on the Salmon-Challis, as shown in Figure 20. Tribal history extends to at least 12,000 years before present (Butler 1986; Canaday 2012). Tribal use of and interest in the plan area continues to contemporary times.

Figure 20. Location of Salmon-Challis in Relation to Nez Perce Indian Claims Commission Boundary, Yellow, And Northern Shoshone and Bannock Territory, Purple, in the 19th Century



Source: Murphy and Murphy 1986

Information Sources & Needs

Some of the laws that address the agency's requirement for Government-to-Government consultation include:

- the American Indian Religious Freedom Act,
- the Archaeological Resources Protection Act,
- the National Forest Management Act,
- the Native American Graves Protection and Repatriation Act,
- the National Environmental Policy Act,
- the National Historic Preservation Act,
- 36 Code of Federal Regulations, Part 800 Protection of Historic Properties, and
- the Religious Freedom Restoration Act

Executive Orders, such as E.O. 13175, Consultation and Coordination with Indian tribal governments, and E.O. 13007, Indian Sacred Sites, also speak to the agency's responsibilities.

Other more recent authorities, directives and guidance relevant to forest management, collaboration and consultation include:

- the Tribal Forest Protection Act, 2004;
- the Food Conservation and Energy Act of 2008;
- the Report to the Secretary of Agriculture, U.S. Department of Agriculture Policy and Procedures Review and Recommendations: Sacred Sites, 2012; and
- a Memorandum of Understanding Among the Department of Defense, Department of Interior, U.S. Department of Agriculture, Department of Energy, and Advisory Council on Historic Places Regarding Interagency Coordination and Collaboration for the Protection of Indian Sacred Sites (U.S. Department of Agriculture 2016a).

Tribal issues and concerns are also addressed in the Forest Service Manual at FSM 1560 and the Forest Service Handbook at FSH 1509.13.

Existing Plan Direction

The Land and Resource Management Plans for the Salmon and the Challis National Forests are virtually silent regarding tribal concerns. Laws, regulations and policies enacted since then have begun to shine a light on issues important to tribes and tribal resources. Most important is the requirement for meaningful consultation with tribes prior to Federal undertakings.

Scale of Analysis

Our discussion of tribes is based on a forestwide assessment.

Conditions & Trends

The Federal Indian trust responsibility is a legally enforceable fiduciary obligation, on the part of the United States, to protect tribal lands, assets, resources, and reserved rights. The responsibility derived from Indian treaties, Supreme Court decisions, statutes, executive orders, and the historical relations with Indian tribes requires that the Federal Government consider the best interests of the tribes in its dealings with them and when taking actions that may affect them. The trust responsibility includes protection of the sovereignty of each tribal government (U.S. Department of Agriculture, Forest Service 2010b).

In June 1867, an executive order established the Fort Hall Indian Reservation as a collective place to consolidate the various bands of Shoshone, Bannocks and other tribes from their aboriginal lands. The Fort Bridger Treaty of July 3, 1868, between the Shoshone-Bannock Tribes and the United States, retained hunting and fishing rights to tribal members on “all unoccupied lands of the United States.”

In the Nez Perce Treaty of 1855, Article 3, the United States and the Nez Perce Tribe mutually agreed that the Nez Perce retain the exclusive right of “… taking fish at all usual and accustomed places in common with citizens of the Territory; and of creating temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing horses and cattle…”

The rights reserved in the treaties between the United States and the Shoshone-Bannock and the United States and the Nez Perce apply to all public domain lands that were reserved for the National Forest System and are still in effect. Management actions should continue to recognize these rights.

Areas of Known Tribal Importance

Sacred sites and traditional cultural properties are especially important to the tribes.

Sacred sites are locations on Federal land that have been formally identified by a tribe as sacred by virtue of its established religious significance to an Indian religion (U.S. Department of Agriculture, Forest Service 2016b). A traditional cultural property is one eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community.

While sacred sites and traditional cultural properties undoubtedly exist within the Salmon-Challis National Forest, the tribes have not formally identified them to our staff. In general, special places, such as hot springs or cultural resource sites containing pictographs, may be sacred, but designation of such is a tribal responsibility. The Tribes’ reluctance to identify these critically important places is due in part to a belief that the information will become public knowledge, allowing non-tribal people to intrude or to desecrate these areas.

During consultation and coordination meetings the tribes have identified a number of critical issues. In general, the tribes wish to be consulted for the following types of Federal undertakings:

- land transfers, disposal or exchanges that result in a net loss of Federal ownership, as these are seen as an erosion of treaty rights;

- projects designed for forest health, which they generally encourage;
- projects that have the potential to affect water quality, fish, wildlife and forest products; and
- projects that result in ground-disturbing activity, as they wish to ensure protection of tribal resources.

Summary & Conclusion

While there are no formally-identified sacred sites or traditional cultural properties on the Salmon-Challis, tribes have been more involved in identifying and resolving project effects on tribal resources.

Collaboration between the Salmon-Challis and the Shoshone-Bannock Tribes over the last ten years has resulted in several notable projects that benefit both the Salmon-Challis and the tribes. An interpretive program led by tribal members in the wilderness has been especially successful. In addition, a training program has been implemented for tribal youth interested in learning archaeological field methods. These programs should be expanded and improved upon and similar projects should be implemented with the Nez Perce Tribe.

Employment of tribal members should be increased. Tribal culture and viewpoints can aid in a more resilient forest landscape.

Increased recreation use on the Salmon-Challis increases potential for damage to tribal resources.

High intensity wildfire has the potential to destroy tribal resources, such as culturally modified trees, wickiups and pictograph panels. Since only 6 percent of the Salmon-Challis has been surveyed for cultural resources, severe fire activity could result in the loss of an unknown quantity of important tribal resources.

Derogatory names, such as “squaw” and “savage,” are hurtful, disrespectful and engender feelings of discrimination. Preliminary discussions with the Shoshone-Bannock Tribes has occurred. Suggestions of more appropriate place names that are sensitive to tribal heritage should be considered.

CULTURAL AND HISTORICAL RESOURCES

Cultural resources, both archaeological and historical, are those objects or locations important to the material life ways of cultural groups as specified by the Code of Federal Regulations, specifically 36 CFR 296.3. Cultural resources may refer to sites, areas, buildings, structures, districts, and objects which possess scientific, historic, and social values.

Information Sources & Gaps

Cultural resources are non-renewable; they are finite and irreplaceable. As such, Federal laws have been passed that prohibit disturbance of cultural sites and obligate Federal agencies to protect and manage cultural resource properties, including:

- The Antiquities Act of 1906, the Historic Sites Act of 1935;
- The National Historic Preservation Act of 1966, with its 1992 and 2000 Amendments;
- The Archaeological and Historic Preservation Act of 1974;
- The Archaeological Resources Protection Act of 1979; and
- The Native American Graves Protection and Repatriation Act of 1990.

Only about 6 percent, or 284,113 acres, of the Salmon-Challis has been surveyed for cultural resources. The vast majority of cultural resource surveys conducted on the Salmon-Challis National Forest have been associated with ground-disturbing activities, as required by Section 106 of the National Historic Preservation Act.

Existing Plan Direction

The existing Land and Resource Management Plans for the Salmon and Challis National Forests contain only general management direction for cultural and historic resources. Summaries of the existing condition are provided in both plans.

Both plans call for 100 percent forest inventories, which is an overly ambitious goal that would have been extremely difficult to meet under even the best fiscal circumstances. That goal was not met.

Both plans also stressed requirements to comply with Section 106 of the National Historic Preservation Act and ensuring that consultation with the State Historic Preservation Office occurred for all federal undertakings when ground disturbing activities were proposed. This goal was generally met.

As a result, the number of documented sites has more than tripled from 867 to 2,778, and the amount of cultural resource surveyed has increased dramatically from 28,854 to 284,113 acres over the intervening years.

Conditions & Trends

The cultural environment of the Salmon-Challis includes a diverse mix of Native American and Euro-American influences. Prehistoric American Indian sites identified within the Salmon-Challis include lithic scatters, camp sites, villages with house pit features, rock art, rock shelters, shell middens, hunting blinds, and ceremonial and vision quest sites.

Features common on historic sites include roads, trails, bridges, airstrips, ditches, mines, guard stations, ranger stations, lookouts, ranches, orchards, peeled trees, refuse scatters, fence lines, and cabins. Nearly twice as many historic versus prehistoric sites have been documented, as seen in Table 3.

Table 3. Site Types on the Salmon-Challis by District

Site Types*	North Fork	Salmon-Cobalt	Leadore	Challis-Yankee Fork	Lost River	Middle Fork	*TOTAL*
Prehistoric	189	92	130	213	269	74	*967*
Historic	424	598	100	303	173	103	*1701*
Multi-Component	39	13	7	23	13	15	*110*
TOTAL	*652*	*703*	*237*	*539*	*455*	*192*	*2778*

A total of 2,778 cultural resources have been recorded on the Salmon-Challis, as noted in Table 4, and 887 sites have been determined to be eligible for the National Register of Historic Places. Three sites are listed on the National Register, including:

- the Custer Historic District,
- the Lemhi Pass National Historic Landmark, and
- the Leesburg townsite and cemetery.

In addition, the Salmon-Challis has administrative responsibility for 135 known sites located on the Boise National Forest and 55 sites located on the Payette National Forest within the Frank Church River of No Return Wilderness. The majority of these sites are located along the Middle Fork Salmon River.

More than 23 percent of the known sites on the Salmon-Challis have not yet been evaluated for the National Register. These sites are assumed eligible until they can be formally evaluated.

Table 4. National Register Status of Sites on the Salmon-Challis by District

National Register Status	North Fork	Salmon-Cobalt	Leadore	Challis-Yankee Fork	Lost River	Middle Fork	TOTAL
Eligible	205	232	43	188	134	85	*887*
Listed	0	1	1	1	0	0	*3*
Not Eligible	309	345	97	209	227	53	*1240*
Unevaluated	138	125	97	141	93	54	*648*
TOTAL	*652*	*703*	*238*	*539*	*454*	*192*	*2778*

* Sacred sites and traditional cultural properties undoubtedly occur on the Salmon-Challis, but have not been formally identified. Continued consultation with the Shoshone-Bannock Tribes and the Nez Perce Tribe will be necessary to identify, protect and preserve these critically important sites.

On the Salmon-Challis, a total of 61 sites have been identified as Priority Heritage Assets. These assets are a subset of cultural resources designated to receive special agency management consideration. They contain distinct public value that should be actively maintained and meet one or more of the following criteria in accordance with FS Manual 2360.5:

- The significance and management priority of the property is recognized through an official designation, such as listing on the National Register of Historic Places or on a State register.
- The significance and management priority of the property is recognized through prior investment in preservation, interpretation, and use.
- The significance and management priority of the property is recognized in an agency-approved management plan.
- The property exhibits critical deferred maintenance needs, and those needs have been documented. Critical deferred maintenance is defined as a potential health or safety risk or imminent threat of loss of significant resource values.

The quantity, nature and location of these select assets reflect a cross-section of significant cultural resources representing multiple historic themes across all of the Salmon-Challis.

Table 5. Priority Heritage Assets Identified on the Salmon-Challis by District

Priority Heritage Assets	North Fork	Salmon-Cobalt	Leadore	Challis-Yankee Fork	Lost River	Middle Fork	*TOTAL*
Non-Wilderness	25	1	1	3	4	0	***34***
Wilderness	12	0	0	0	0	15	***27***
TOTAL	***37***	***1***	***1***	***3***	***4***	***15***	***61***

Site Conditions

A variety of processes affect site condition including natural weathering, erosion, wildfire, and trampling by game animals. Other effects have increased in the past century due to increases in population and use of the Salmon-Challis. Intensive livestock grazing, timber harvest and mining before and immediately after formation of the Salmon-Challis have undoubtedly affected the condition of both historic and prehistoric resources.

Data on the condition of Salmon-Challis sites is incomplete and based on relatively subjective site condition data included on site forms, some of which are more than 50 years old.

The most recent version of site form used by the Salmon-Challis uses the following categories to describe site condition:

- excellent, or virtually undisturbed;
- good, or 75 percent undisturbed;
- fair, or 50-75 percent undisturbed; and
- poor, or more than 50 percent disturbed.

The excellent category is rarely used, since most sites have at least some level of disturbance due to natural weathering. Overall, the system is difficult to apply, in part due to the inability to accurately assess the condition of buried or subsurface deposits.

The ability to monitor site condition of eligible sites that are not identified as priority heritage assets has been hampered over the years by a lack of funding and personnel assigned to those duties. Sites that happen to fall within the area of potential effects for a project receive condition updates. Those that do not occur within project areas may go decades between condition updates.

Table 6 contains a summary of known site condition for the 887 sites eligible for the National Register of Historic Places and the three already listed Salmon-Challis cultural resources.

Table 6. Site Conditions on the Salmon-Challis and Percentages in Each Category by District

Site Condition	North Fork	Salmon-Cobalt	Leadore	Challis-Yankee Fork	Lost River	Middle Fork	Total Forest
Excellent	26%	13%	2%	21%	17%	21%	6%
Good	22%	25%	7%	24%	16%	6%	29%
Fair	22%	34%	4%	18%	13%	8%	18%
Poor	21%	53%	2%	9%	12%	3%	11%
No Data	26%	18%	1%	20%	24%	11%	36%

Summary & Conclusions

The Salmon-Challis has many cultural issues with which it must contend.

Deferred maintenance of historic facilities is a problem for the Salmon-Challis. Many of our NRHP eligible historic buildings that are being utilized for administrative purposes have maintenance backlogs that may be decades old. Budget and workforce limitations constrain our ability to address deferred maintenance or to investigate, monitor, enhance, interpret and use cultural resources for agency and public benefit.

Unauthorized use, vandalism, looting and relic collecting are issues on the Salmon-Challis. The destruction of cultural resources and the removal of artifacts from their site locations by the public results in the loss of scientific information and tribal values.

Authorized and unauthorized recreational activities unintentionally impact sensitive cultural resources, such as in dispersed camping areas or along historic trail routes. Visitors also cause “wear and tear” impacts to popular interpretive sites.

Wildfires can negatively affect cultural resources. With the predicted increase in size and severity of wildfires, sensitive rock art sites and historic buildings are increasingly at-risk.

Accelerating effects of changing climate on cultural resources include prolonged aridity, drought, floods, debris flows, and increased fire severity. Each of these factors can result in increased erosion that can affect site deposits. Shifting or changing vegetation regimes may affect the visual integrity of some historic landscapes.

Improved methods and techniques for documentation of cultural resources has had both positive and negative effects. Geographic information system advances have resulted in more precise information about culturally-significant locations. Agency mandates for database reporting require increased daily attention, which affects the amount of time personnel can actually spend conducting assigned fieldwork.

MULTIPLE USES

RANGELANDS AND GRAZING

Rangelands support native plant communities, or vegetation types, that are typically non-forested. The predominant rangeland vegetation type on the Salmon-Challis National Forest is mountain big sagebrush. Other rangeland types are grasslands, mesic meadows and shrubs other than mountain big sagebrush. While aspen and ponderosa pine or Douglas-fir with an open canopy are forest types, they are also considered when managing livestock grazing on the Salmon-Challis.

Rangelands contribute to a variety of ecosystem services, most notably providing:

- livestock forage,
- wildlife habitat,
- watershed function,
- recreational experiences,
- carbon sequestration, and
- biodiversity conservation

Information Sources & Needs

Available information sources for range resource conditions summarized in this Assessment are:

Table 7. Resource Conditions data sources summarized in this assessment

Vegetation community	Method	Metrics Measured	Scale
riparian	Multiple Indicator Monitoring, Winward Greenline	Greenline ecological status and woody regeneration since 1992; bank stability since 2006.	Metrics collected at the allotment scale on 263 sites forestwide. Results discussed by Land Type Association.
sagebrush	Rooted nested frequency, point step, line intercept	Sagebrush cover, cover of dominant understory species.	Metrics collected on 368 sites across 68 allotments forestwide. Results discussed forestwide.

The Forest Service's Natural Resource Manager database was also used to summarize forestwide information on grazing permits, permitted use, authorized use, allotments, and allotment management. Individual files on ranger districts were used to verify the history of vacant allotments. Forest range staff annually field-validate a portion of the fences and water developments to improve management and to verify the records.

Additional information could provide a clearer picture of rangelands and grazing. The Central Idaho Aspen Working Group has been conducting aspen inventories on the North Zone of the Salmon-Challis since 2009. A summary of their findings is not included here. While livestock browsing of aspen can hinder regeneration, more information is needed to fully assess this impact, particularly on sites where we can reasonably expect aspen to persist as the climax community and on big game range (Walter F Mueggler 1988).

Most of the 76 allotment management plans pre-date the Endangered Species Act listings of steelhead trout, Chinook salmon, sockeye salmon and bull trout. Consequently, they also predate the plan amendments made in response to the 1995 decision notices for the protection strategies of anadromous and inland native fish, commonly known as PACFISH and INFISH.

Existing Plan Direction

Goals, Objectives and Desired Conditions

The primary range management goals of the two existing forest plans are to manage all allotments to maintain rangelands that are presently in satisfactory condition and to improve those in poor or fair condition. Terminology of range condition based on forage production has since changed.

An additional goal of both plans is to increase grazing levels in select allotments or management areas. This goal, in practice, was overshadowed by the listing of four endangered or threatened fish species between 1992 and 1998 and by the 1995 PACFISH and INFISH forest plan amendments. Both the grazing level goal and the range of desired riparian and aquatic conditions achievable on managed lands of the Salmon-Challis National Forest should be examined in the forest plan revision process, given the changed circumstances.

Other range goals specific to the Challis Plan are to provide for elk habitat needs and to improve aspen stand structure in nine management areas. In the Salmon Plan, wildlife habitat needs related to rangeland vegetation and aspen are to increase forage supply for mule deer and a moderately increased number of elk. In the Salmon Plan, one-tenth of aspen acres that support grazing are identified as needing improvement. These are examples of how livestock grazing management can contribute to wildlife habitat goals, which need updating.

Desired conditions for greater sage-grouse are displayed in Table 1 of the 2015 Greater Sage-grouse Record of Decision, which amended both forest plans. These conditions are very specific. In summer habitat, however, there is a problem with describing proper functioning desired condition as it applies to riparian areas and mesic meadows because these areas contain very different vegetation. This description is confusing, not fully defined, and very contradictory.

According to the accompanying environmental impact statement, the method used to determine desired conditions results in vegetation along streams and in wet meadows dominated by plant species that require soils saturated with water, such as deep rooted sedges and willows (U.S. Department of Interior, Bureau Land Management 1998a, 1998b). In contrast, sage-grouse preferred forbs, which are very different from sedges and willows (Stiver and others 2015), are found on mesic meadows, which have much different soils (Chambers and Miller 2011). Revised forest plan desired conditions need to make the distinction between wet meadows and mesic meadows. Any direction related to wet meadows associated with springs should take into account springs are developed for livestock use. The 2015 record of decision allows for forests to describe desired conditions for wet meadows if these conditions are appropriate for meeting sage-grouse habitat needs.

Both plans recognize the importance of controlling noxious weeds, but minimally so. Controlling invasive species is integral to maintaining key ecosystem characteristics of rangelands. A revised forest plan should establish direction for multi-faceted approaches to preventing, detecting, controlling, and where appropriate eradicating, invasive species.

Standards and Prescriptions

Since 1992, riparian grazing management practices have been modified by the listing of four fish species and the PACFISH and INFISH forest plan amendments. A revised forest plan could provide the opportunity for developing riparian management flexibility and accountability in meeting the intent of requirements such as defined by the Endangered Species Act as well as meeting the habitat needs for other fish species.

The Salmon-Challis' 2008 Riparian Strategy for riparian grazing management adopted an adaptive, "if A, then B" format to manage livestock within stream communities. The document parallels implementing direction for PACFISH and INFISH. The 2008 strategy, while not formally incorporated into the forest plans, has guided livestock grazing management for healthy riparian and aquatic communities.

Reevaluating prescriptions and standards in the existing forest plans is needed. Examples of prescriptions and standards that could be improved, include:

- reduce sagebrush and seed forage species to reach the goal of increasing grazing levels;
- no more than 50 percent alteration of age classes in browse stands shall occur within a 10 year period; and
- perpetuate aspen wherever it occurs.

A revised forest plan would avoid:

- prescribing just one tool;
- requiring difficult monitoring for results that do little to inform us of factors in a complex issues, such as browse age classes; and
- direction that overlooks ecological potential and that gives little to guide managers in priority setting.

A number of standards and guidelines give classic range management direction such as "improve livestock distribution." A revised forest plan might consider strategic use, if any, of these kinds of standards.

Use Standards as a Management Tool

The two existing plans were written when livestock use limits were described as use standards and were listed as such in the standards and guidelines section of each plan. Terminology today may use the phrase 'use indicator' for the same practice of limiting the intensity of use as a grazing management tool. This discussion uses the terminology of the existing plans and their amendments.

Forest Plan and Early Amendment Language

The two existing forest plans differ in their direction regarding use standards as a management tool. The Salmon Plan Amendment 2 describes adaptive management to identify use standards based on an allotment's grazing management system and the long-term resource conditions. The Challis Forest Plan directs use standards in three instances, each with a different approach:

- establish forage use at levels that will yield 90 percent inherent bank stability or make gains toward that objective;
- assure utilization standards that help meet objectives developed by an interdisciplinary team are in each allotment plan; and
- do not exceed 50 percent of new leader production within the riparian ecosystem.

Most helpful are the adaptive use standards in both plans. While the last standard listed serves a purpose, it is set and does not adjust in response to the varying status of riparian shrub communities we may find. Adaptive standards have helped the Salmon-Challis apply more meaningful limits to intensity of use, adjusting them to be responsive to the resources' status when affected by livestock. This approach could be considered in a revised forest plan.

Annual monitoring focuses on these use standards or limits. This may give rise to a belief by some that utilization is the singular focus of management, as if it were the goal or objective.

Greater Sage-grouse Forest Plan Amendment

This 2015 record of decision was developed with the Bureau of Land Management, intending a collaborative landscape-level conservation strategy. Required grazing upland use standards in this amendment are different for the breeding and nesting season compared to the brood-rearing and summer season. The habitat to which these standards apply also vary.

In breeding and nesting habitat the use standard is a 7- to 4-inch residual upland perennial grass height. The 7-inch requirement during the breeding and nesting season is based on literature describing nest success. The 4-inch upland perennial grass height applies when grazing occurs in breeding and nesting habitat after breeding season.

For all riparian and mesic meadow vegetation in sage-grouse habitat, irrespective of designated habitat management areas, the use standard is a 4-inch average stubble height. This use standard applies when grazing occurs after the breeding and nesting season. The use standard should not be measured on the greenline, which is the first line of perennial vegetation on or near waters' edge.

Monitoring

Both forest plans call for monitoring condition and trend of range vegetation, including riparian vegetation.

Though methods and use metrics have changed, monitoring has been conducted. The condition and trend focus has been on the riparian vegetation type. The results are used to update grazing management of riparian areas. Photo monitoring, which is identified as a method in the Salmon Plan, is regarded favorably by associated State of Idaho agencies and some permittees.

Monitoring for losses to predators does not inform forest management decisions. Monitoring for results of rangeland vegetation treatments, while of historical interest, is not currently a priority because of limited organizational capacity.

Considerations for the Revised Forest Plan

The following concepts in range and resource management are minimally, if at all, addressed in the existing forest plans:

- appropriate scale and range of riparian desired conditions, including seeps, springs, and ponds of high hydrologic potential;
- desired conditions for sage-grouse needs in mesic meadows relative to the current Greater Sage-grouse Forest Plan Amendment;
- exceptions to the essential aquatic habitat temperature and sediment limits, including inherent watershed characteristics;
- partnerships, such as a local version of All Lands All Hands, which is an interagency program for managing landscape scale species;
- the importance of managing cheatgrass as a priority;
- collaborative, forest-level version of the outcome based grazing concept particularly for resources where there is little guidance or new guidance needs developed, such as for lentic riparian resources and species of conservation concern;
- monitoring as indicated by the revised plan components, including cooperative monitoring; and
- guidance on grazing after fire.

Scale of Analysis

Although this assessment relies on data collected on allotments, the scale of analysis for range resource conditions, grazing activity, and rangeland capability and suitability is forestwide. A few exceptions are identified by ranger district.

Conditions & Trends

Rangelands comprise a variety of vegetation types. On the Salmon-Challis National Forest, livestock forage is provided on the following types of lands and vegetation communities:

- uplands, which are commonly sagebrush communities and, to a smaller degree, grasslands, deciduous shrublands, and desert scrub;
- riparian areas, which is vegetation adjacent to streams, seeps, and springs; and
- mesic meadows, where soils are more saturated than uplands but less saturated than the riparian vegetation types adjacent to water.

Aspen are also grazed where accessible to livestock. Other forested uplands that are grazed on the Salmon-Cobalt, North Fork, and Challis-Yankee Fork Ranger Districts include the ponderosa pine and Douglas-fir communities, where the tree canopy is relatively open.

Range Resource Condition

Range condition is an assessment of the health of the plant communities and the soils which support it. Range condition can be expressed as the degree of variation in current plant composition and abundance compared to potential or historic conditions.

Condition may be assessed for different purposes and values, including:

- watershed function,
- quality of sage-grouse habitat or big game range, or
- support of aquatic habitat.

The results of effectiveness monitoring, a periodic check-in on the condition or status of resources relative to long-term resource objectives, are presented here for riparian and the major upland vegetation type, mountain big sagebrush.

Riparian

Livestock directly affect three habitat metrics when grazing near streams. Two vegetation metrics are part of the desired conditions broadly described in the PACFISH/INFISH implementation direction (U.S. Department of Agriculture, Forest Service 1995) and the 2008 Riparian Strategy (Gamett and others 2008). The third metric are resource management objectives in the PACFISH and INFISH forest plan amendments.

Vegetation Metrics

The two vegetation metrics are the greenline ecological status and woody regeneration.

A greenline is the first line of perennial vegetation on or near the water's edge. An example of a greenline vegetation community in late seral status on the Salmon-Challis is one of sedges. Sedges and their roots form mats of vegetation that reduce surface erosion and provide streambank stability. Streamside vegetation reduces water velocities in the smaller streams that are common across most of the allotments (Platts 1983). A compact mass of streambank vegetation contributes substantially to the trapping and deposit of sediments needed to build and maintain streambanks (Beschta and Platts 1986; Clary and Webster 1989; Platts 1983). The density of herbaceous plant roots is responsible for most of the soil stability found in streambanks (Doumitt and Laye 2010; Dunaway and others 1984, 1994; Kauffman and Krueger 1984). Streambank vegetation, on stream types common to the Salmon-Challis, has a high influence on stability and therefore width/depth ratios and the resulting niche for fish habitat (Platts 1983; Rosgen 1994).

The ecological status of greenline vegetation is based on multiple factors, most notably including in-field evidence of its ability to withstand the erosive forces of water (Winward 2000). Late-seral status can withstand the erosive forces better than early or mid-seral status greenline vegetation. While change is often continual in riparian areas

(Winward 2000), managers seek late-seral status along a stream's length. In contrast, examples of natural changes that result in disturbed or open ground include:

- when stream channels move across the valley floor;
- as new sand or gravel deposits are left on the inside of a stream's curve after high flows; or
- with beaver dams being built and being abandoned.

Cottonwoods, along with some alder and willow species, initiate regeneration much better on this open ground. As a stream channel moves about, plant communities develop in response to the new environment, the new balance between soil and groundwater or water table features (Winward 2000). Long-term self-perpetuation of late-seral communities is, however, possible in low-gradient meadow streams where the balance between the stream and its soil and water environment is stable (Rosgen 1994; Winward 2000). Human-caused influences, such as grazing, recreation, and road use, usually involve changes in the water table or directly to the vegetation (Winward 2000).

Roots of woody riparian species also contribute to streambank stability. If the riparian site has the potential to support trees, then, as they mature and decay, they can supply woody debris to the stream for formation of pools and cover for fish, or become embedded in the bank. These are the major reasons for tracking how well woody riparian species are regenerating.

While woody vegetation is desirable for moderating stream temperature, not all riparian communities will support dense shrubs or trees along the water's edge. The roots of most riparian shrubs require a certain degree of oxygen. This requirement is commonly provided by coarse bank material, such as gravel or rocks. (Hall and Bryant 1995)

Bank Stability

Streambank stability helps a stream find the equilibrium between erosion and deposition. The more cover on a streambank, the higher its stability, the better able a stream can withstand stressors such as high runoff events. Streambank cover can be the vegetation metrics described above, large rock, or anchored large woody debris.

Monitoring Methods

Annual and long-term monitoring is conducted at representative designated monitoring areas. This kind of monitoring area is described as being representative of livestock use on streams similar in their physical characteristics and vegetation.

Monitoring areas were established in the early 1990s using a pioneering guide in riparian ecology and monitoring (Technical Riparian Work Group 1992). This guide evolved into one of two methods commonly used to evaluate greenline vegetation on the Lost River District (Winward 2000). The Multiple Indicator Monitoring method (Burton and others 2011), which is used across the Salmon-Challis, was first adopted about 12 years ago. Leadore, Salmon-Cobalt and North Fork Ranger Districts conduct long-term monitoring on at least 95 designated areas, Challis-Yankee Fork District monitors at least 60 designated areas, and Lost River monitors 108 designated areas.

Multiple Indicator Monitoring data is only a part of what is needed to understand condition and trend of riparian function. To inform the appropriateness of management, the three rangeland resource metrics and others in the Multiple Indicator Monitoring method need to be considered together, along with implementation and long-term monitoring of all the activities in the watershed that can affect riparian and aquatic qualities. (Burton and others 2011)

Annual implementation monitoring of grazing collects data on:

- the intensity of vegetation use on uplands and along the greenline,
- browsing use of woody riparian species, and
- the amount of streambank trampling.

Results of Long-Term Monitoring

Broad inferences are drawn here from best fit trend lines for each metric described as follows. The number of sites with data shown in parentheses varies because not all data and geologic land types were available on all sites. Approximately ten samples are available on the granitic geologic land type and is not discussed further.

<u>Woody regeneration</u>

The percent of individuals across three age classes seedling, young and mature show a relatively stable trend along streams in the major volcanic geologic land type and the less commonly sampled quartzite and sedimentary geologic land types. Woody regeneration along streams in the alluvium geologic land type shows a mixed trend line between the two non-mature age classes.

The best fit trend lines show mature as being the most common age class, and the young age class is next most common. The number of woody plants along the greenline are as important as age class. Numbers are available but not evaluated here because we must first account for a change in the plot size of most transects from 2006 forward.

<u>Greenline Ecological Status</u>

The ecological status of the vegetation at the greenline shows an upward trend along streams in the major volcanic geologic land type at 118 monitoring locations, the common alluvium geologic land type at 44 monitoring locations, and at 25 monitoring locations in the less commonly sampled sedimentary land type. A relatively stable trend exists at 50 monitoring locations on the quartzite geologic land type. The best fit lines for the ecological status rating on all geologic land types, except sedimentary, start and end above a score of 61. This score is the lowest score representing a late-seral rating.

<u>Bank Stability</u>

The best fit lines for bank stability indicate a stable trend since 2006 on the volcanic and alluvium geologic land types and an upward trend on the sedimentary and quartzite types. The objective for bank stability is 80 percent stable on those watersheds that are not anadromous fish habitat and 90 percent stable on the anadromous fisheries watersheds. The recent readings are found slightly below and above the 90 percent stable bank value.

Uplands

The majority of upland acres capable of supporting livestock grazing are sagebrush vegetation types on the Salmon-Challis National Forest. The mountain big sagebrush type is the most common, occupying deep, well-drained, and relatively dry soils (Rosentreter 2001). Further description of this and other rangeland shrub types is found in the Terrestrial Ecosystems section.

Effectiveness monitoring of sagebrush uplands on the Salmon-Challis National Forest is important for informing watershed and wildlife habitat management in addition to grazing management. The results presented here are from the last fifteen years.

Approximately 220,000 acres of priority Greater sage-grouse habitat is located on sagebrush uplands in 48 active grazing allotments, along with roughly 208,000 additional acres of general habitat. Grazing management of this habitat is identified in the 2015 Greater Sage-grouse Record of Decision, including the use standards discussed earlier.

Study sites are located to reflect what is happening on a larger area as a result of grazing and grazing management (Coulloudon and others 1999). Two measures of vegetation composition of the sagebrush uplands are frequency and cover.

Frequency describes the abundance and distribution of plant species and is most useful for detecting changes in plant communities over time. Table 8 shows the results of frequency studies collected during monitoring of the mountain big sagebrush vegetation type from 2007 to 2017.

Table 8. Results of frequency studies, expressed as average percent relative frequency, from monitoring on mountain big sagebrush vegetation type from 2007-2017

Timeframe	2007-2011	2012-2017
Number of Studies	**5**	**49**
Grasses	32 percent	34 percent
Shrubs	7 percent	9 percent
Forbs	61 percent	57 percent

Cover has many definitions. We monitor canopy cover, or the vertical projection to the ground of the perimeter of plant leaves. This measure, for non-woody plants, is sensitive to fluctuations in growing condition just as our lawns grow more when it rains. Because vegetation can overlap, canopy cover can be greater than 100 percent (Coulloudon and others 1999).

There are two herbaceous species whose dominance define the habitat types of mountain big sagebrush on the Salmon-Challis: bluebunch wheatgrass and Idaho fescue.

Bluebunch wheatgrass can grow several feet tall and helps hide nesting sage-grouse. Bluebunch wheatgrass is sensitive to grazing before it begins to flower. For this reason, it is important to manage grazing frequency and intensity in the spring (Loren D Anderson 1992; Walter F. Mueggler and Stewart 1980).

Idaho fescue is a valuable forage species, commonly dominant in many vegetation types across the western United States. With its deep extensive root system it retains its vigor well under drought with moderate grazing or heavier grazing with a rest rotation system. Idaho fescue is an important component in elk diets, on bighorn sheep winter range, and in low-elevation deer and elk winter range (Stannard and others 2007; Zouhar 2000). Because it initiates growth early in the spring, it is thought by some to provide competition for annual grasses (Stannard and others 2007). Table 9 displays the canopy cover of these three species plus forbs.

Table 9. Results of cover studies, expressed as average percent canopy cover, from monitoring of mountain big sagebrush vegetation type from 2003 to 2017

Timeframe	2003 to 2006	2007 to 2011	2012 to 2017
Number of Studies	**239**	**11**	**62**
Forbs	21 percent	28 percent	24 percent
Bluebunch Wheatgrass	13 percent	12 percent	27 percent
Idaho Fescue	9 percent	21 percent	28 percent
Mountain Big Sagebrush	19 percent	24 percent	26 percent

All sagebrush vegetation types exhibit a patchiness of variable sagebrush canopy. In each of these vegetation types, several other shrubs of dry sites may be present in relatively low amounts of cover.

Perennial bunchgrasses are expected to dominate the understory. Gaps that exist between the vegetation are a concern for establishment of cheatgrass, a very high threat to this vegetation type. A variety of forbs are present, also with a variety of responses to grazing. None are so common as to co-dominate. Cryptogams occupy some of the gaps between plants. Rock on the surface may be common and bare soil may not range much above 20 percent (Hironaka and others 1983; Walter F. Mueggler and Stewart 1980). Where bare soil is higher, it may be due to previous grazing pressure, parent material, or a combination of these and other factors.

The mountain big sagebrush vegetation type will respond to and is sustained by moderate grazing (Davies and others 2018). This is apparent from the monitoring results in Table 8.

Cheatgrass aside, fire management, ground cover, and the structure of the sagebrush are elements that bear attention as we consider how to best sustain all sagebrush vegetation types on the Salmon-Challis.

Trends Influencing Range Condition

Past use and management actions have influenced the rangeland conditions we see today. This includes from the period of unmanaged livestock grazing, which began in the 1880s, to a period of maximizing forage use, which occurred through the 1930s (Sayre 2017).

For much of the 1960s through the 1980s, both forests engaged in activities such as:

- writing and implementing allotment management plans;
- treating sagebrush to reduce cover which was greater than 20-30 percent, and seeding of forage species such as crested wheatgrass;
- developing upland livestock water sources, commonly associated with groundwater dependent ecosystems, such as seeps and springs; and
- constructing fences to enable control of timing of grazing.

Rangeland conditions vary by allotment, but some common considerations contribute to trend.

Where wildfire removes conifer overstory, forage can establish in early successional states. On the other hand, with historic fire suppression, conifers established in sagebrush reduce the herbaceous understory, and the quality of sage-grouse habitat. (Team 2016)

While known infestations of invasive species on active grazing allotments are relatively low, drivers such as changing climate and wildfire may change their rate of spread, particularly annual grasses. Cheatgrass is particularly aggressive.

Drought, which is prolonged dry weather when precipitation is less than 75 percent of the average (Society for Range Management 1998), results in lower forage production. Those moderately stocked allotments with a grazing system that varies timing of livestock use show less impact from periodic drought (Howery 1999).

Where livestock management is less intensive in riparian areas, livestock tend to use gentle terrain, such as valley bottoms, riparian, mesic meadows, footslopes, and ridgetops. (Swanson and others 2015)

Since the mid-1990s, the focus has been on managing grazing in the riparian zone, generally resulting in low levels of upland use. (U.S. Department of Agriculture, Forest Service 1992 - 2017)

Sagebrush cover greater than 30 percent and its associated lower cover of herbaceous species likely decreases the abundance of forbs for sage-grouse habitat quality.

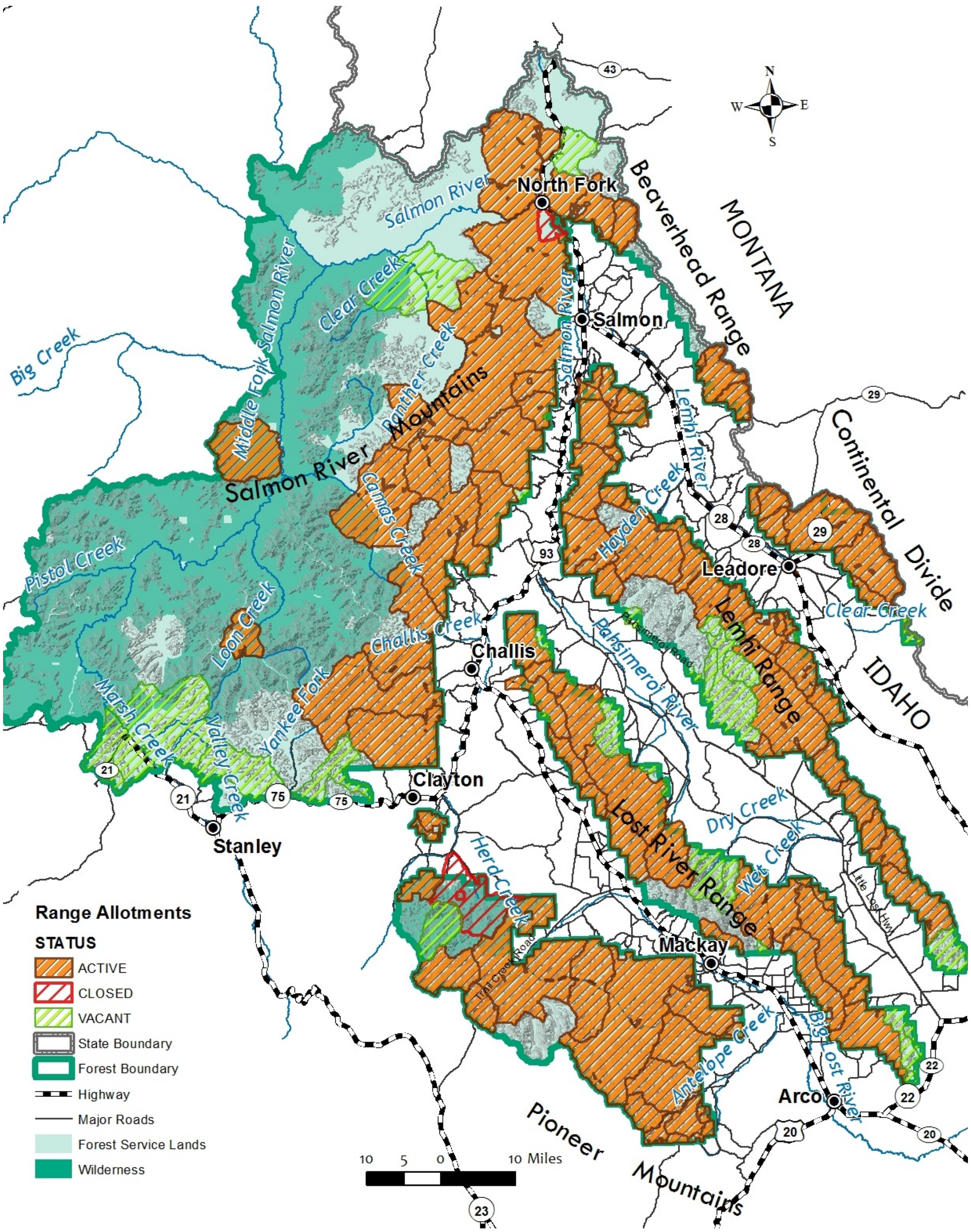
Sagebrush and grass vegetation types, per the Challis Forest Plan, had shown significant improvement due to improvement in grazing systems, grazing allotment administration, and prior treatment to reduce sagebrush density. Grazing management since, on these vegetation types, has not appreciably changed.

Level of Grazing Activity

Commercial livestock grazing on National Forest System lands is managed by allotment. An allotment is an area designated under a term grazing permit as available for grazing, where management practices are discretely directed and for which annual implementation and long-term effectiveness monitoring is conducted. The Salmon-Challis National Forest currently has 98 active allotments with term grazing permits, 31 vacant allotments, and 2 closed allotments.

Term grazing permits issued for allotments identify the number of livestock, the period of use that livestock can be grazed, and specific management requirements that must be followed. One hundred and three entities, known as permittees, hold term grazing permits on the Salmon-Challis National Forest. Collectively, they are permitted to graze approximately 31,040 head of cattle, 6,140 head of sheep, and 150 head of horses.

Figure 21. Active, Vacant and Closed Allotments on the Salmon-Challis.



An allotment is considered vacant when there is no permit authorizing grazing. Of the 31 vacant allotments, 12 may have incidental grazing on National Forest System lands because of grazing on adjacent Bureau of Land Management-managed lands, as seen in Table 10. Any term grazing permit may be transferred to another qualified applicant by first being waived back to the Government. In Table 10, waivers back to the Government with no preference resulted in the permit not being re-issued as no qualified applicant was named.

Table 10. Vacant Allotments on the Salmon-Challis National Forest

Number	Last grazed by sheep	Last grazed by cattle	Circumstances of Vacant Allotments	Total National Forest System Acres
7	n/a	n/a	May be grazed by cattle authorized on an adjacent Bureau of Land Management-managed allotment. Allotment was first recognized in 2013 as a result of spatial review	5,743
5	n/a	n/a	May be grazed by cattle authorized on an adjacent Bureau of Land Management-managed allotment. Evidence exists that allotment was previously permitted.	49,806
5	5	-	Waived, no preference. Some of these allotments are only useable when snow is available as a water source.	120,932
2	2	-	Waived, considered uneconomical by permittee. One includes a designated Research Natural Area.	16,922
2	1	1	Waived or expired. Applicant is not eligible or permittee is no longer eligible.	74, 272
6	1	4	Waived or expired. Grazing was associated with private land as a practical matter. Includes one horse allotment.	19,330
4	2	2	Records not clear. Allotments have not been grazed for more than two decades.	104,547

The time of these allotments going into vacant status is displayed in Table 11. An estimate was made where the record was not clear. Table 11 does not include the 12 vacant allotments identified in Table 10, where there may be grazing associated with adjacent Bureau of Land Management-managed allotments.

Table 11. Era of Allotment Vacancy, Salmon-Challis National Forest

Number of Allotments	Last grazed by sheep	Last grazed by cattle	First year of vacant status
2	2	-	Vacant Pre-1988
6	4	2	Vacant 1988 to 1999
7	4	3	Vacant 2000 to 2009
4	2	1 and 1 Horse Allotment	Vacant 2010 to 2017

Permitted and Authorized Animal Unit Months

Although grazing levels have varied across the Salmon-Challis, records indicate a decline in permitted animal unit months. An animal unit month standardizes occupancy across different classes of livestock and provides a comparison to the existing Salmon and Challis Forest Plans.

In 1988, there were 48,726 animal unit months under term grazing permit on the Salmon National Forest (1988 report on file). That same year 106,102 animal unit months were under term grazing permit on the Challis National Forest (1988 report on file). In 2017, total animal unit months under term grazing permit on the Salmon-Challis National Forest was 141,713 animal unit months. From 1998 to 2017 permitted use declined by 9 percent.

The Salmon Forest Plan has a goal of developing grazing capacity to 55,000 animal unit months. The Challis Forest Plan's goal is to increase grazing by 2,000 animal unit months. Within a few years after these forest plans were published, management focus for the Salmon and Challis National Forests shifted to managing livestock grazing along streams.

A bill for collection annually authorizes livestock use. This authorized use varies between years and is typically lower than permitted use. Some of the reasons for authorized use lower than permitted use include:

- drought,
- management opportunities for meeting resource objectives,
- imposed administrative requirements, and
- personal choice of the permittee.

See the Grazing Case Study section for further discussion of authorized animal unit months.

Sheep grazing has declined steadily on the Salmon-Challis. In the mid-1940s, an average of 82,613 head of sheep were permitted to graze on the Challis National Forest. At that time, about 27 percent of these numbers were in non-use. By the mid-1960s, sheep numbers had dropped to 28,509, and 18 percent of these were in non-use. When the Challis Forest Plan was published in 1987, it identified approximately 11,000 permitted head of sheep.

Currently 5,875 head of sheep are permitted only on the Lost River Ranger District, and about 53 percent are in non-use. According to the Challis Forest Plan, declines in sheep numbers were due to economic and labor challenges. The 1992-1995 phase-out of nearly 40 years of import tariffs, which provided a wool incentive to domestic producers, is an example of economics and policy contributing to declines.

The Salmon National Forest permitted 65,000 head of sheep in 1922 and 36,000 head of sheep in 1947. In 1960, permitted sheep were just shy of 6,000 head. The next available annual report, dated 1996, shows no sheep under term permit on the Salmon National Forest.

In the last ten years, management of disease on wildland range has reduced the traditional reliance of western sheep producers for summer grazing on other national forests in Idaho.

Conservation organizations over the last 15 years have encouraged sheep producers to waive their permits back to the Forest Service without preference for a new permittee. Such motivation for waivers, along with other actions, has resulted in eleven vacant sheep allotments on the Salmon-Challis National Forest.

Allotment Management

Several important tools are employed to manage livestock grazing on the Salmon-Challis National Forest.

Allotment Management Plans

An allotment management plan describes the long-term objectives and grazing management to meet or maintain those objectives, including the number and kind of livestock and the grazing season.

Of active allotments, 76 have an allotment management plan. These plans were written and approved in the following eras:

- five before the passage of National Environmental Policy Act in 1969;
- fifty-one between 1970-1987, before the Challis Forest Plan was signed mid-1987;
- fourteen between 1988-1994, after the Salmon Forest Plan was signed early in 1988 and before the 1995 PACFISH/INFISH forest plan amendments;
- six since 1995; and
- one in 2002.

The last one is a Cooperative Resource Management Plan that establishes shared grazing management with the Bureau of Land Management.

There is no allotment management plan for the remaining 22 active allotments. Five of these are the sheep allotments. While the other 17 are relatively small, they vary in complexity. Management on these allotments ranges from continuous grazing to rotation with associated Bureau of Land Management lands to rest rotation identified in Endangered Species Act consultation.

The 20 allotments with a post-1987 allotment management plan vary in the complexity of resource values and management. Seven of these more recent allotment management plans are on the present Challis-Yankee Fork District. Nearly all of the remainder are on the Leadore District. Nine allotments were changed to minimize effects on Endangered Species Act listed fish and their habitat.

The Challis Forest Plan restates 36 CFR 222.2(b), which indicates that every allotment have an allotment management plan. The Salmon-Challis still needs to update or address writing 98 allotment management plans. A number of changes could be made to address this situation, however, not all of these changes are within the purview of a revised forest plan. Potential topics in a revised forest plan that could make the process of developing allotment management plans more efficient include:

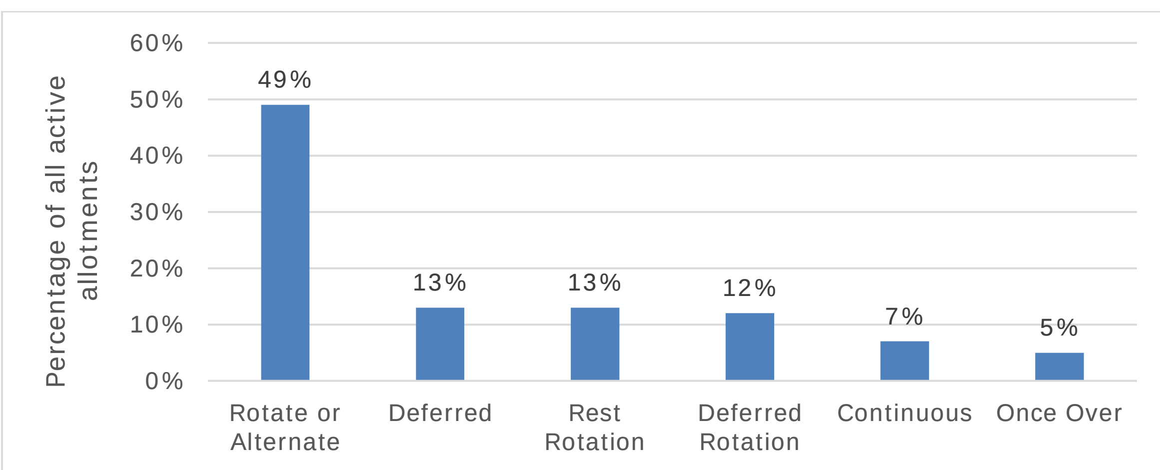
- identifying where and how programmatic cultural resource clearance is appropriate,
- emphasizing the use of field-based watershed assessments to prioritize management needs,
- providing guidelines to determine where an allotment management plan is not necessary and how to incorporate terms and conditions into grazing permits to meet the direction and intent of the Federal Land Policy and Management Act,
- prioritizing coordination with the Bureau of Land Management to advance seamless, flexible grazing management on habitat of landscape species of high interest, such as native fish and greater sage-grouse; and

Grazing Systems and Range Structures

Grazing management, before and since the existing forest plans were signed, has employed grazing systems as shown in Figure 22. The major benefit of a grazing system is to control the period of grazing relative to plant development and growth to provide for grazed plant health. Coordination is generally in place with the Bureau of Land Management to affect rotations and should be encouraged in the revised forest plan.

The Challis Forest Plan allows for continuous grazing, based on resources sustaining such use. The once-over grazing system can be effective for meeting soil, vegetation and riparian resource objectives on sheep allotments.

Figure 22. Grazing Management Currently Used on 98 Active Allotments

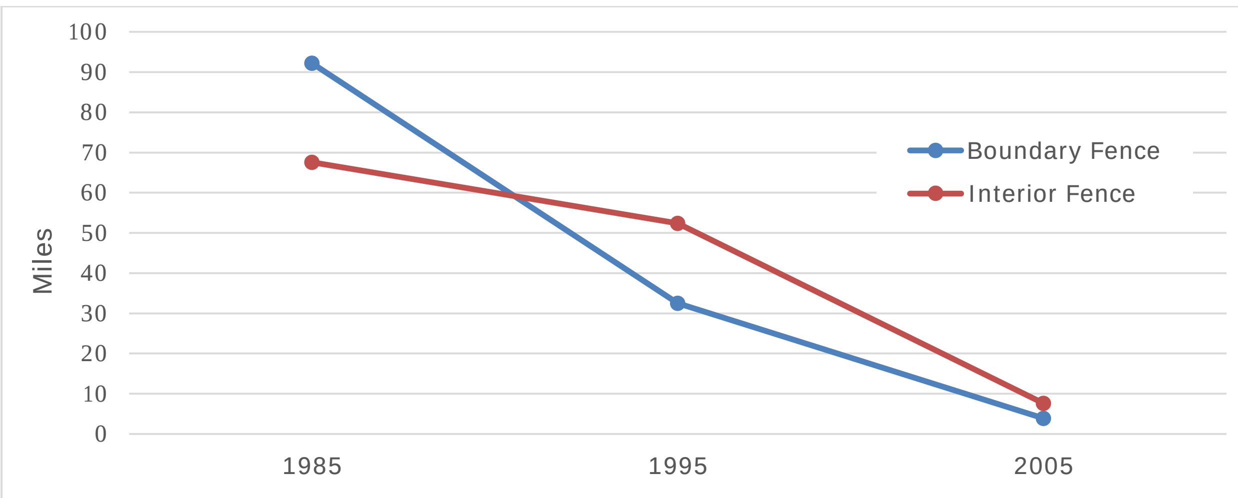


Permittees are responsible for year-to-year maintenance of range structures. The water developments provide for distribution of livestock and help protect streamside riparian areas. Fences aid in control of the timing and duration of grazing.

Prior to the 1980s, as allotments and their management were becoming established, 292 miles of allotment boundary fence, and 247 miles of interior division fence were built. Most fences are 3 or 4 strand wire fences. Approximately 15 percent are wood jack and rail fences. Figure 23 shows the pace of fence construction on the Salmon-Challis. Fences not accounted for in Figure 23 are electric fences, exclosures, and range or wildlife study plot fences. Roughly one half of all fence segments inventoried here have been inspected in the last 15 years, and conditions are reported as follows:

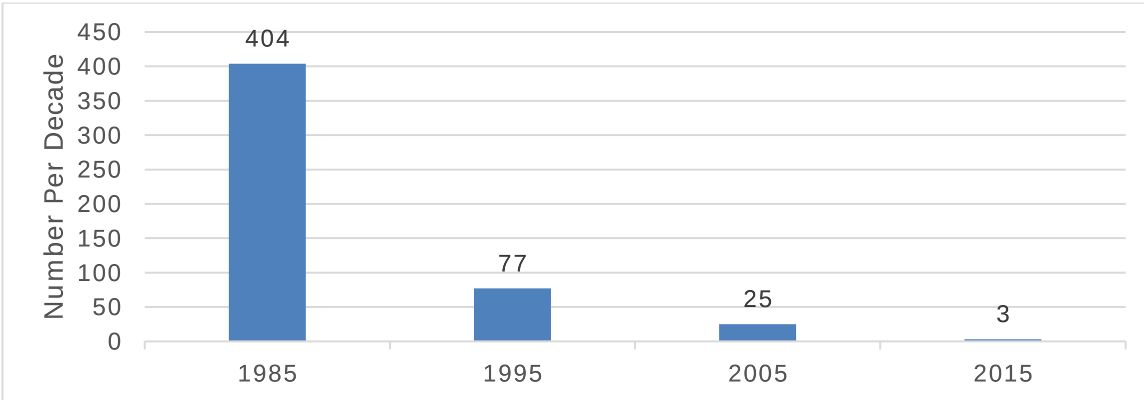
- 71 percent of these are noted in satisfactory or good condition,
- 28 percent need major repair or reconstruction, and
- 2 percent are identified for removal.

Figure 23. Allotment Boundary and Interior Pasture Division Fence Built since 1980



Prior to the 1980s, as management was being implemented, 1,395 water developments were constructed. Water developments vary. The most common types pipe spring water to a trough; others are earthen dugouts that store either run-off or groundwater. Figure 24 shows the pace of water developments on the Salmon-Challis. Not accounted for in Figure 24 are stockwater pipelines, which distribute water into areas of capable range. There are approximately 93 pipelines on 39 allotments. Three-quarters of these are on the Challis-Yankee Fork and Lost River Districts. One-third of the pipelines were built between 1980 and 1985.

Figure 24. New Water Developments Built since 1980



There is concern for the large near-term burden of reconstructing structures that have reached their end of service due to age. This concern is multi-faceted and includes:

- completing cultural resource clearances if an expanded area may be disturbed,
- assuring periodic maintenance has been completed to ensure longer life of the structure, and
- funding limitations, particularly since the Forest Service may, but is not obligated to, assist with up to 50 percent of the direct reconstruction cost.

To build new structures there also are concerns about organizational capacity to complete the appropriate level of National Environmental Policy Act analysis and to manage water rights in accordance with State of Idaho law. Examples may include structures not identified in allotment management plans or adaptation of structures, such as extending a drift fence to make it effective. Only a handful of such projects have been approved in the last few years. It may be possible that a revised forest plan could address one or several of these particular concerns.

Coordination with Bureau of Land Management

Fully 90 percent of the Salmon-Challis National Forest allotments are grazed by livestock that also graze on Bureau of Land Management-managed lands before and after grazing on the National Forest System lands. Additionally, 40 percent of the Salmon-Challis active allotments have a pasture containing Bureau of Land Management-managed lands. District range specialists usually meet together with the Bureau of Land Management and permittees prior to the Bureau of Land Management-authorized grazing season to coordinate management on these allotments. Examples of how a revised forest plan could further this coordination include:

- recognizing specific common resource outcomes, such as quality habitat for fish, sage-grouse, and advancing integration to achieve these outcomes;
- identifying circumstances under which a flexible season is appropriate; and
- prioritizing the updates of Memorandum of Understanding on allotments where management efficiencies for both agencies can be realized.

Monitoring

Implementation monitoring tells us if we are implementing management direction. Measuring of annual use indicators, such as forage and woody browse use, and use of streambanks as measured by hoof alteration is included in such monitoring. In addition to past measures of upland use as a percent of annual production, residual grass height in sagebrush communities and mesic meadows has been recently measured.

Range staff and trained seasonal employees typically measure annual use indicators metrics on approximately 180 designated monitoring riparian sites each year, including 44 allotments with Endangered Species Act Section 7 consultation. These sites are selected to be representative of livestock use on a typical stream reach important to fisheries within each pasture. Where required on these types of allotments, the results of monitoring is posted on the internet. On other allotments, an informal end of season report may include results of that season's grazing and monitoring.

A broad summary of use observations indicates that thresholds of upland use are rarely approached, including that for quality sage-grouse nesting habitat (U.S. Department of Agriculture, Forest Service 2012-2016).

Use in or near riparian communities is typically first to meet the limits identified in grazing permits. Livestock use in riparian communities now commonly drives the management of entire pastures, and, consequently, allotments.

Monitoring of this use began in the early 1990s (U.S. Department of Agriculture, Forest Service 1992 - 2017). This annual implementation monitoring has taken different formats since the forest plans were amended by PACFISH and INFISH in 1995, but monitoring has consistently measured the results of permittees' and Forest Service's efforts to control and minimize livestock use of the riparian communities adjacent to fish-bearing streams.

Effectiveness monitoring is a periodic check-in on the status of resources relative to long-term resource objectives. Ideally, it takes place every five years in riparian systems and every 10-15 years on uplands. Results show how resources are or are not meeting or moving toward resource objectives. Increased administrative duties, such as with litigation and Endangered Species Act consultations, has limited forest staff capacity to conduct inventories on springs, seeps, and aspen stands. While we were able to conduct long-term upland rangeland monitoring on 68 allotments since 2000, the opportunity to continue has been limited by these same factors.

Trends in Allotment Management

There is increased interest in the following topics relative to allotment management. These are minimally addressed, if at all, in the existing forest plans. Policy plays a role where identified.

Permittees and resource management specialists have expressed interest in forage reserve allotments, sometimes referred to as grass bank allotments. Forest Service policy directs how these are to be established. Examining resource needs and the available forage must be done through National Environmental Policy Act analysis. With the current vacant allotments, there may appear to be considerable opportunity to make unallocated forage available as forage reserves. However, limiting circumstances are identified in Table 10. A revised forest plan could direct how to prioritize creating forage reserves.

Monitoring is both essential and expensive. Permittees and other entities have expressed interest in grazing management monitoring beyond that of day-to-day operations, such as informal trigger monitoring. Opportunities for establishing cooperative monitoring programs are supported through a National Memorandum of Understanding with the Public Lands Counsel. Agreements for carrying out cooperative monitoring may be established at the allotment or multi-allotment level with permittees and other interested publics. The Central Idaho Rangeland Network, State agencies, and other cooperators are sources of ideas about implementing such practices. A revised forest plan could encourage or guide establishing and sustaining cooperative monitoring.

The basic premise of adaptive management has been used informally across the Salmon-Challis and largely without forest plan direction. An example is the 2008 Salmon-Challis' Riparian Strategy. Results of adaptive riparian grazing management should inform a revised forest plan. A revised forest plan could consider formalizing adaptive management to guide the opportunity for grazing management flexibility that would benefit priority landscape species' habitat needs. For example, direction could allow the Salmon-Challis to adjust grazing periods on a rotating basis to promote bluebunch wheatgrass on Bureau of Land Management-managed, spring-grazed sage-grouse nesting habitat.

Results of natural resource management are not isolated to the water and lands where management is applied. Quality habitat occupied by endangered and threatened fish species is a goal increasingly shared across agency and property boundaries. This goal can be better realized when Salmon-Challis management fosters opportunities for creating and maintaining crucial anadromous fish habitat on private land. The same perspective could be useful regarding habitat of other landscape species, to integrate the human dimension, increasing the likelihood for managers to adopt and operate grazing systems to an equal or greater extent than the underlying ecological drivers (Briske 2011).

Rangeland Capability and Suitability

Rangeland capability identifies the ecological capacity of the land to sustainably support grazing, and takes into account the accessibility of those lands by livestock. Capable rangelands produce forage, and, if accessible, can be grazed sustainably. Capability is not, however, an assessment of grazing capacity. An assessment of rangeland capability is used to show where the majority of grazing takes place and where most of the effects related to grazing are evaluated.

There are three categories of capable range: primary, secondary and transitory. Primary rangelands produce forage, are near water, and are where the majority of grazing activity occurs. Secondary rangelands produce forage but may be too far from water or access is impeded by natural barriers, such as rock or steep slopes. The current plans do not appear to promote management practices that would develop secondary rangelands for livestock use. Instead, the potential increase in permitted animal unit months is more related to improving range conditions or improving livestock distribution across primary rangelands. Developing livestock use of secondary rangelands could be addressed in the revised forest plan with consideration for managing grazing as a part of other appropriate uses, especially of riparian systems along streams or those associated with seeps and springs.

Transitory range is accessible to livestock and water, where forage is temporarily created by changed conditions, such as after wildfire or timber harvest. On the Salmon-Challis National Forest transitory range has typically not been evaluated, neither on a systematic nor an opportunistic basis. Guidelines to evaluate capability for providing livestock forage on a transitory basis could be provided in the revised forest plan.

There are 244,300 acres in grazing allotments on the Salmon-Challis National Forest. Nearly 39,200 acres are in vacant grazing allotments. Grazing allotment boundaries often make use of rough topography, rock outcrops or thick timber, thus minimizing the use of fence while still providing for control of livestock. These boundaries include rangelands, which have not been identified as capable. Lands not capable may be incidentally used as livestock travel between areas of capable range in an allotment.

Suitability is a determination where livestock grazing will occur as one of the acceptable set of multiple resource uses for a planning area based on the desired conditions. Identification of non-suitable rangelands is a specific decision to not allow grazing in specific locations. Designated campgrounds is an example. In essence, suitability determinations address how the sets of multiple uses fit together and whether some uses should take precedence. Determinations may be made in a forest plan or may be site specific.

Rangeland suitability is established to provide prescriptive management direction for project-level analysis and subsequent National Environmental Policy Act decisions, and to identify where grazing under certain parameters will take place. Typically, areas are reviewed to determine if livestock grazing is compatible with management area emphasis, forest plan desired conditions, and other uses and values. Suitability also considers other uses that may be reduced because livestock grazing is considered acceptable. Suitable lands can include both capable and non-capable lands.

The designation and management of Research Natural Areas is an example of forest plan direction precluding grazing in specific areas. Between the two forest plans, as amended, there are 29,050 acres in Research Natural Areas, of which 13,603 acres are within grazing allotment boundaries but not grazed by domestic livestock.

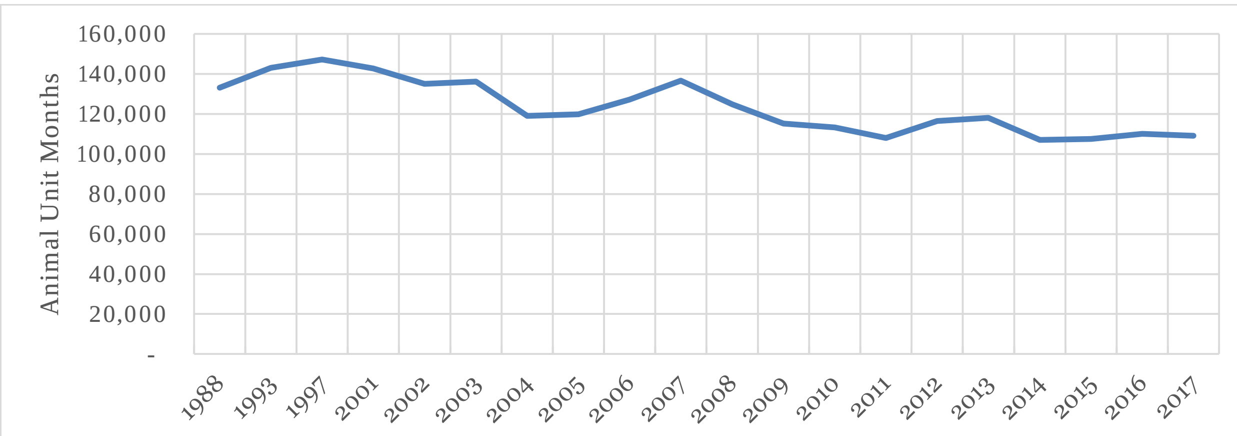
A 2014 analysis evaluated lands within all cattle and horse allotments for their capability to sustain grazing and their suitability for grazing (U.S. Department of Agriculture, Forest Service 2014). Approximately 60 percent of the total National Forest System acres on the Salmon-Challis is in grazing allotments. The 2014 analysis identifies approximately 17 percent of the total Salmon-Challis acres as capable range for cattle. This compares closely to the approximate 15 percent that was identified in the existing Salmon and Challis forest plans (U.S. Department of Agriculture, Forest Service 2014).

Grazing Case Study

Public feedback during the revision process indicates a deep interest in grazing on the Salmon-Challis National Forest. Much of this interest is due to the long history of grazing and its importance to communities and the economics in the area. Comments pointed out that both the Salmon and Challis Forest Plans included direction to increase permitted animal unit months. However, authorized use on the Salmon-Challis National Forest declined from about 133,000 in 1988 to 109,000 in 2017. In order to understand grazing trends and its influences, this section is a brief case study in grazing trends on the Salmon-Challis National Forest since the late 1980s, a discussion of some of the factors that influence public lands grazing, and what factors may be most influential to trends on the Salmon-Challis National Forest.

The historical amount of grazing specific to the Salmon-Challis is not known with specificity due to spotty recordkeeping until the 1980s. However, it was certainly greater than it is currently. The amount of grazing is commonly measured in animal unit months. An animal unit month is a forage allocation and is the amount of forage required by a 1,000-pound cow, or the equivalent, for 1 month. Since 1988, the number of authorized animal unit months has declined about 24,000 animal unit months. Table 12 shows animal unit months authorized each year from 1988 through 2017.

Table 12. Total Authorized Animal Unit Months on the Salmon-Challis National Forest



The highest year was 147,000 animal unit months in 1997 and the lowest was in 2014 with 107,000 animal unit months. In 2017, 109,000 animal unit months were authorized. Although the trend fluctuates, there is an overall decline from 1988 to 2017.

The demand and authorizations for public lands grazing is complex because it is influenced by both federal land management and outside factors. In Western States, some of the likely federal land management factors include:

- the National Forest Management Act;
- the Endangered Species Act and a focus on riparian area management;
- National Environmental Policy Act; and
- forest policy, staffing capacity, and priorities.

Other factors include market conditions, operational costs, weather, drought, market consolidation, and specific permit holder needs. While these overall factors are relevant at a Western States-scale, describing the magnitude of specific factors on authorized animal unit months on the Salmon-Challis National Forest with precision is extremely difficult.

It is not possible to attribute a specific number of animal unit months changing due to a specific factor. For example, forest staff cannot attribute a certain number of animal unit months declined because of the Endangered Species Act listings or National Environmental Policy Act procedures. It is also not possible to attribute specific number of animal unit months changing due to other factors, such as operational costs or weather. However, it is possible to describe the likely factors that influence authorized animal unit months on the Salmon-Challis National Forest and describe which factors are within the scope of forest planning.

After talking to permit holders and Salmon-Challis National Forest range staff, several factors were mentioned as being relevant to authorized animal unit months specifically on the Salmon-Challis National Forest. While the overall factors that influence public lands grazing described above do have influence, these factors were identified as being particularly influential on the Salmon-Challis National Forest.

First, Forest Service policy regarding season of use is a factor. Prior to 2005, permit administrators were able to flex on and off dates by two weeks to respond to annual range conditions and permit holder needs. From 2005 until 2017, this flexibility was not allowed. In 2017, the Regional Forester reinstated this flexibility. Because the grazing season can fluctuate based on annual conditions, being unable to easily adapt to these conditions from 2005 through 2017 is likely to influence the amount of grazing.

Another important factor is the influence of PACFISH and INFISH direction and the PACFISH/INFISH Biological Opinion in the mid- and late 1990s. This direction flowed from the Endangered Species Act listing of Chinook and sockeye salmon, steelhead, and bull trout. On grazing allotments with fish bearing streams, PACFISH and INFISH direction often resulted in shortening the season of use from September 15 to August 15. In addition, grazing use on allotments with fish bearing streams involved increased monitoring and management.

Permit holder needs and market conditions also influence the amount of grazing on the Salmon-Challis National Forest. Because grazing is carried out by permit holders, operating costs, market conditions, or specific permit holder needs influence how much grazing a permit holder proposes. In some instances, a permit holder may have an incentive to graze less than is allowed under their permit. For example, low prices or demand and permit holder capacity can influence whether a permit holder wants to graze to the maximum allowed under their permit in any particular year. Because billing is a function of authorized use the permit holder can avoid being billed for grazing below their maximum permitted use due to permit holder needs or market conditions.

Lastly, the drought in 2002 decreased forage production in nearly all Western States. The impacts of drought on forage production influenced the amount of grazing that was sustainable. Because sustainable grazing is heavily dependent on rainfall and forage production, the 2002 drought influenced the amount of grazing on the Salmon-Challis National Forest as well as other national forests.

To better understand the factors influencing the amount of grazing on the Salmon-Challis National Forest, it helps to categorize them as:

- factors that are likely to be influenced by forest planning;
- factors outside of forest planning but within Forest Service authority; and
- factors outside of forest planning and Forest Service authority.

Some of the factors within the scope of forest planning include riparian related direction and range condition objectives. Because authorized grazing must be consistent with the forest plan established conditions, these conditions influence the amount of authorized grazing in a given year. Factors outside of forest planning but within Forest Service authority mainly involve process related laws and regulation. For example, National Environmental Policy Act completion timeframes for grazing related actions or range program staffing and prioritization.

Outside factors are more difficult for which to account. While forest planning and forest service authority-related factors are evenly applicable to all grazing permit holders, the influence of outside factors can vary depending on the permit holder. For example, operational costs or ranch staffing and permit holder desires are different between permit holders. Although these factors have an influence, the magnitude of influence of these factors will depend on individual permit holder capacities, experiences, and grazing goals.

Summary & Conclusions

Livestock grazing on the Salmon-Challis National Forest has been an important part of the landscape, local economy and culture for over a century. The Challis Plan describes grazing management as being shared between the Forest Service and the grazing permittees. In a revised forest plan, we should keep in mind that it is the permittees who implement the plan on the ground. While there are more rules in managing grazing use today than when both forest plans were signed, changes on the ground are generally in a direction that aligns with our responsibility to manage for sustainable grazing and healthy functioning rangelands. Changes in grazing management should balance resource management and sustainability of ranching in local communities.

Management of rangelands has changed since the two existing forest plans were signed in the late 1980s and not to the degree anticipated in those plans. Riparian grazing management was a relatively new concept when the last plans were analyzed.

A revised forest plan needs riparian objectives that represent the varying potential of stream types and flows and include recognition of effects of established diversions, which can alter stream processes and aquatic metrics.

The revised forest plan also needs objectives for riparian areas associated with springs, accounting for those with high hydrologic potential and representing the diversity of both natural and managed landscape conditions.

Allotment management planning has been hampered by what was written as eighteen month direction and still is part of our direction today: the PACFISH and INFISH forest plan amendments. To manage long-term for PACFISH's and INFISH's singular values of seven riparian resource objectives has proved difficult at best. This is not to say that we've accomplished everything needed everywhere in riparian grazing management on the Salmon-Challis. Rather, the way that PACFISH and INFISH direction is written is not achievable nor, in every aspect, necessary. A revised forest plan can address this.

Rangelands of this area are a stronghold for sage-grouse, a key species of the sagebrush ecosystem. A changed condition from the existing forest plans is State and regional recognition of the need to improve sage-grouse reproductive success rangewide. Ranchers on private land in Oregon have demonstrated that grazing and providing sage-grouse habitat needs are compatible, adopting a philosophy that "what is good for the bird is good for the herd." A revised forest plan could provide for flexible grazing dates in the spring and cooperative rotation between Bureau of Land Management-administered lands and lower-elevation Salmon-Challis pastures. Such changes in grazing management would improve nesting habitat without regard to which federal agency is managing the land.

Using science, a revised forest plan needs to distinguish mesic meadows from wet meadows and needs to identify a desired condition for mesic meadows that reflects sage-grouse needs. The 2015 Greater sage-grouse Record of Decision provides this opportunity for mesic meadow management in individual forest plans. Resources and management would benefit from this clarity.

Cheatgrass is advancing on the Salmon-Challis National Forest. Conversion from both mixed ponderosa and sagebrush vegetation types to cheatgrass and annual weeds has already occurred along the Salmon River corridor below North Fork. On the south end of the Salmon-Challis, cheatgrass lines the roads in Copper Basin. This is a species that is fully competitive, aggressively advantaged over the native species of sagebrush and open conifer vegetation types. A revised forest plan needs to make managing cheatgrass, with every tool feasible, a priority. Our sagebrush and open coniferous forest vegetation types are at high risk of being lost, and irretrievably so given current knowledge applicable at a landscape scale.

The grazing use standards of Salmon Plan Amendment 2 adopted the practice of adaptive management. This principle is in use today. However, there is a need to update our adaptive management practices to include what we have learned about riparian grazing management; to incorporate riparian desired conditions and objectives; and to encourage discovery of solutions including what may lie beyond the realm of riparian grazing management. In practice, examples could include working together to:

- alternatively building and funding an efficient and effective process for completing National Environmental Policy Act analysis for allotment management plans;
- alternatively delivering water to those holding irrigation water rights in watersheds with high temperature and sediment; and
- developing means and practices that address a backlog of range structural improvement maintenance needs.

Current monitoring needs are well beyond what was anticipated in the existing forest plans. The revised forest plan should avoid metrics that would require new monitoring, such as "manage to provide 75 percent of natural stream shade provided by woody species" or "assure no more than 50 percent alteration in browse age classes over ten years." A forest plan that supports outcome-based management integrated across resources and monitoring accomplished in partnership with cooperators would help provide efficiencies in monitoring.

Desired conditions and objectives should recognize the variability of both natural systems and managed systems. The standards and guidelines in a revised forest plan need to be flexible to provide rangeland managers and those permitted to graze on the Salmon-Challis with tools to work for a range of achievable conditions. Flexible management would provide for adjusting to short- and long-term stressors, such as wildfire, changes in climate, and grazing management response to the habitat needs of new species of conservation concern.

Sustainable grazing depends on integrity and function of soil and watersheds. Most agreement is found in extreme examples of “this is good” or “this is terrible.” Given highly variable wildland systems, discerning the line between functioning, functioning-at-risk, and near the edge of non-functioning is where writing objectives in the forest plan revision process should be especially well-advised.

While both the Salmon and Challis forest plans contains some still-relevant direction for rangeland resources and grazing management, the forest plan revision process provides an opportunity to integrate rangelands and grazing use with updated objectives and an opportunity to address new resource challenges, such as cheatgrass. The goal is to sustain grazing while conserving habitat in sensitive and biologically important areas, such as riparian areas and groundwater dependent ecosystems.

RECREATION

Known for its remoteness, the Salmon-Challis National Forest is nationally-renowned for its Wild and Scenic Rivers, high alpine lakes, and tall rocky mountain peaks, including Mount Borah, Idaho's tallest mountain.

At the heart of the legendary Frank Church – River of No Return Wilderness, the forest is teeming with wildlife and rich with America's heritage. Historic cabins, ranger stations, lookouts, mining ghost towns, the Continental Divide National Scenic Trail, and the Lewis and Clark and the Nez Perce National Historic Trails all link today's visitor with the past. Modern facilities are typically rustic, complement both the cultural and natural setting, and are appreciated for "the way it's always been."

Recreation is a critical resource that the Salmon-Challis National Forest provides because of its:

- contributions and benefits to social, economic, and ecological sustainability;
- role in connecting people to the land;
- benefits to the mental and physical health of the public; and
- influence on public understanding of natural and cultural resources.

Information Sources & Needs

The recreation data used for this assessment comes from several sources.

The Forest Service infrastructure database, also known as INFRA, is a collection of web-based data entry forms, reporting tools, and mapping tools that enable forests to manage, inventory, and report information about constructed features and land units. Accuracy of the database is dependent on the accuracy of the data entered.

National Visitor Use Monitoring data provides information on visitor use and satisfaction. This information, collected most recently on the Salmon-Challis in 2009 and 2014, is collected every five years and provides an understanding about what types of activities people participate in and the quality of their experiences.

Additional information for this assessment came from:

- the Forest Geographic Information System database
- the Forest Service National Enterprise Data Warehouse.
- published university studies and research, and
- information provided by the State of Idaho and the U.S. Department of Agriculture.

The use of geographic information systems data allows us to visualize, analyze, and interpret data to reveal patterns and relationships. Data for this assessment was reviewed by the recreation staff on the six districts that comprise the Salmon-Challis National Forest. Employees verified general recreation trends, needs, and conditions on the Salmon-Challis. Members of the public also provided feedback on recreation settings, opportunities, access, and desired conditions.

Existing Plan Direction

Both the Salmon and Challis National Forest Plans contain a significant amount of direction for Recreation. This direction is often confusing, unclear, and either too vague to be useful or too specific to allow for the flexibility needed to adapt to changing conditions. Forest staff who plan and implement projects have indicated that because of these issues, the current forest plans are used infrequently to guide where and how projects are implemented.

One example of confusing, redundant, inconsistent and strict direction is the plan components covering boating facility construction in the Salmon National Forest Plan. Under desired future conditions, the plan states a laundry list of specific projects will occur, including new boating facility construction at two specific locations. Boating facility construction at these two specific locations are also listed in the forestwide objectives section.

One of these specific locations is Owl Creek. In the process of completing project-level analysis for new facilities at this location in the early 2000s, employees found cultural resource concerns on site. Building facilities at Owl Creek would have conflicted with existing law and cultural resources standards and guidelines. Owl Creek wasn't the public's preferred location for these facilities, and, because of river currents, the proposed ramp would have been prone to silt and sand deposition, making it harder to launch and retrieve boats. In response to these issues, boating facilities were built at Cove Creek approximately one mile upstream of the Owl Creek location (Bill 2018).

A better desired future condition would have been "provide excellent boating facilities that keep pace with user demands along the Main Salmon and Middle Fork Salmon Rivers" with an objective to "provide one to three boating facilities along the rivers in the next five to fifteen years." These types of plan components would provide recreation personnel sufficient direction to complete the project while being consistent with laws, Forest Service policy, and plan direction for cultural resources. These types of plan components also allow for the flexibility to respond to unforeseen issues that arise during project-level analysis.

Both plans talk about other specific projects to implement, and some of these projects never took place. Due to changing demands and desired experiences, some of these specific projects don't make sense to carry out at this time. Changed conditions over the past 30 years necessitate a new look at plan components.

Inconsistencies in current plans also cause confusion. For example, the Recreation Opportunity Spectrum referenced in the current Salmon National Forest Plan shows Semi-Primitive Non-Motorized, Semi-Primitive Motorized and Roaded Natural Recreation Opportunity Spectrum classes in the Frank Church River of No Return Wilderness. The Semi-Primitive Motorized and Roaded Natural classes allow motorized recreation, which is inconsistent with the Wilderness Act.

The existing plans also need to be updated due to changed conditions since the time the plans were written. The current plans have little or no mention of mountain biking, hang gliding, paragliding, backcountry skiing, winter trails grooming, and other modern uses.

The current Challis National Forest Plan prohibits the issuance of outfitter and guide permits for hunting or certain types of hunting in management areas 17, 19, and 21 without explanation as to why those areas are closed to this activity. Idaho Fish and Game issues hunting licenses for various game species in these management areas and has increased the number of licenses for certain species in some of these areas.

The current Salmon and Challis Forest Plans provide little trail-based direction. For example, the plans do not provide adequate direction for:

- the extent of new trail construction,
- decommissioning of unsustainable trails
- identifying appropriate areas for new or certain types of trails, or
- trail design.

Where trails are discussed in the plan, direction is not detailed enough to be useful. Forest Service employees and the public have indicated that updated trail direction would be helpful for planning and understanding how to focus time, energy and money in the future.

Forest staff need a useful plan that provides overall guidance for the types of projects we can pursue with increasingly limited budgets, staff, and time. The current plans do not adequately provide this guidance and, without it, there is a tendency for recreation employees to be scattered in approach and unfocused in their efforts. A new forest plan that guides recreation projects and management will help insure Salmon-Challis actions are consistent with other resource values and the public's values and priorities.

Scale of Analysis

The area of influence is the geographic area impacted by the management of recreation within the plan area.

Different recreational activities on the Salmon-Challis National Forest have different areas of influence. Rafting the Main Salmon and Middle Fork of the Salmon River, hunting, and long distance backpacking in the Frank Church attracts visitors locally, regionally, nationally, and internationally. For activities like cross-country skiing, bicycling, and off-highway vehicle use, the Salmon-Challis National Forest tends to attract more visitors locally and regionally.

Conditions & Trends

Recreational Opportunity Spectrum

The Forest Service uses the recreational opportunity spectrum to classify areas within the Salmon-Challis based on their setting characteristics and future desired setting characteristics. There are six distinct classes:

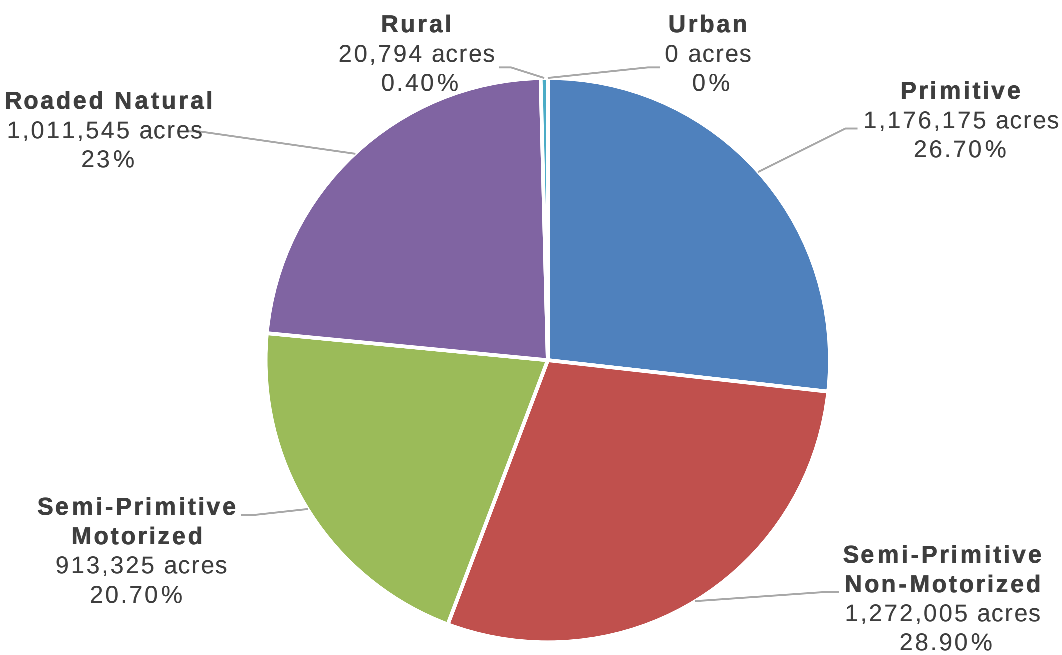
- Primitive – Large, remote, wild, and predominately unaltered landscapes; Areas provide for no motorized activity and little probability of seeing other people.
- Semi-primitive non-motorized – Areas of the Salmon-Challis managed for non-motorized uses, including hiking and equestrian trails, mountain bikes and other

non-mechanized equipment; Areas provide rustic facilities and opportunity for exploration, challenge, and self-reliance.

- Semi-primitive motorized – Backcountry areas used primarily by motorized users on designated routes; Roads and trails are designed for off-highway and high-clearance vehicles; Areas offers motorized opportunities for exploration, challenge, and self-reliance; Areas have rustic facilities and often provide portals into adjacent Primitive or Semi-Primitive Non-motorized areas.
- Roaded natural – Areas are often referred to as front country; Areas are accessed by open system roads that can accommodate sedan travel; Facilities are less rustic and more developed; areas often provide access points for adjacent Semi-Primitive Motorized, Semi-Primitive Non-motorized, and Primitive settings.
- Rural – Areas feature highly developed recreation sites and modified natural settings; they are easily accessed by major highway and located within populated areas where private land and other land holdings are nearby and obvious; Facilities are designed for user comfort and convenience.
- Urban – Areas with highly developed recreation sites and extensively modified natural settings; Areas are often located adjacent to or within cities or high population areas, providing few opportunities for solitude or silence.

As displayed in Figure 25, 77 percent of the Salmon-Challis is classified as some form of primitive in the existing Salmon and Challis National Forest Plans. The recreational opportunity spectrum classes were determined in the late 1980s. Since that time, there have been many changes to landscapes and management on the Salmon-Challis that may have changed the recreational opportunity spectrum.

Figure 25. Recreation Opportunity Spectrum Classes and Percent of Total Forest Area



Winter Recreation Opportunity Spectrum

A winter recreational opportunity spectrum has not yet been developed for the Salmon-Challis. However, the 2010 Forest Oversnow Use Map provides direction for winter recreation opportunities. The map designates when and where areas and routes are open or closed to oversnow motorized use. See the Motorized Oversnow Recreation section for more information.

Visitor Use

National Visitor Use Monitoring data, which is collected every five years, provides information about Salmon-Challis visitation. It helps us understand how many visitors come to the Salmon-Challis National Forest, what they do while they are here, where they come from, and what their satisfaction level was with their visit.

The Salmon-Challis is one of the least visited national forests in the nation, ranking 108th out of 114 forests in the Nation (U.S. Department of Agriculture, Forest Service 2016c). In 2014, an estimated 218,000 people visited the Salmon-Challis (U.S. Department of Agriculture, Forest Service 2016c), and, in 2016, the Salmon-Challis recorded an estimated 160,000 visits. One of the primary reasons for the Salmon-Challis's relatively low visitation is because of its distance from major population centers. The Salmon-Challis is a considered a destination forest, with 55.6 percent of its visitors coming from more than 75 miles away. Comparatively, only 33 percent of visitors to other Intermountain Region forests travel more than 75 miles.

According to the 2014 visitor data, recreation is the main purpose of visits to the Salmon-Challis. Table 13 lists the top ten recreation activities that visitors to the Salmon-Challis participated in during the 2014 survey and their responses compare to that of visitors to other national forests in the Intermountain Region. The Salmon-Challis has a noticeably greater participation than other forests in the region in activities like cross-country skiing, hunting, fishing, and developed camping.

Table 13. Main Recreation Activities of the 218,000 visitors Surveyed in 2014

Rank	Activity	Percentage of Salmon-Challis respondents reporting this as main activity	Percentage of Intermountain Region respondents reporting this as main activity
1	Viewing Natural Features	17	17.6
2	Cross-Country Skiing	16.2	1.9
3	Hunting	15.3	3.3
4	Hiking or Walking	13.1	19.0
5	Fishing	11.0	4.9
6	Relaxing	10.1	6.2
7	Driving for Pleasure	9.0	9.3
8	Viewing Wildlife	7.8	1.1
9	Developed Camping	7.1	3.4
10	Some other Activity	5.2	3.8

Source: 2014 National Visitor Use Monitoring data

For comparison, Table 14 lists the top ten recreation activities visitors pursued in 2009.

Table 14. Recreation Activities of the 276,300 Salmon-Challis Visitors Surveyed in 2009

Rank	Activity	Percentage of Salmon-Challis respondents reporting this as main activity
1	Hunting	25.8
2	Fishing	17
3	Viewing Natural Features	10
4	Driving for Pleasure	9
5	Developed Camping	6.2
6	Cross-Country Skiing	5.8
7	Non-Motorized Water	5.3
8	Hiking or Walking	4.6
9	Relaxing	4.6
10	Visiting Historic Sites	3.2

Source: 2009 National Visitor Use Monitoring data

In 2009, hunting was the most commonly listed primary activity. Between 2009 and 2014, visitor use data indicates a reduction in the number of people recreating on the Salmon-Challis and in the percentage of people identifying hunting and fishing as their primary activity. Due to the government furlough in the fall of 2014, National Visitor Use Monitoring was not conducted during hunting and fishing season. This may account for the reduction in the percentage of visitors reporting hunting or fishing as their primary activities in 2014.

Demographics

According to the National Visitor Use Monitoring data, visitors to the Salmon-Challis tend to be older, wealthier and less diverse than visitors to other forests in the Region.

Recreation Infrastructure Use

When visitors arrive on the Salmon-Challis, they often use infrastructure, including scenic byways, National Forest System roads and motorized dual-track trails. Table 15 lists the infrastructure that visitors are likely to use during a visit.

Table 15. Infrastructure Use by Visitors to the Salmon-Challis

Rank	Special Facility or Area	Percentage of respondents who reported using this infrastructure
1	Scenic Byway	32.7
2	National Forest System Roads	20.0
3	Motorized Dual-Track Trails	14.4
4	Interpretive Displays	12.4
5	Visitor Center or Museum	9.0

Source: 2014 National Visitor Use Monitoring data

Visitors who stay overnight in the area tend to camp on the Salmon-Challis at a much higher rate than on other forests in the Intermountain Region. More than 37 percent of visitors camp in a developed campground and another 26.4 percent camp in undeveloped forest areas.

Based on the National Visitor Use Monitoring data, visitors to the Salmon-Challis were primarily satisfied with the condition of the facilities and the forest in general (U.S. Department of Agriculture, Forest Service 2016c).

National and Regional Trends in Recreation Visitor Use

National trends in outdoor recreation show that the top five activities for anticipated growth are:

- developed skiing;
- undeveloped skiing;
- challenge activities, such as mountain biking, climbing, and caving; equestrian activities; and
- motorized water activities.

Nationally, the bottom five activities for anticipated growth are:

- hunting;
- motorized off-road activities;
- fishing;
- motorized snow activities; and
- floating in canoes, kayaks, or rafts (Bowker and others 2012).

Regional data collected from Idaho and six other western states show that the top activities in which people participated include viewing natural scenery, driving for pleasure, visiting nature centers, and viewing wildlife and flowers (Idaho Parks & Recreation 2013).

Visitor Use on Adjacent Lands

Recreational activities on the Salmon-Challis extend or are influenced by opportunities and visitation on adjacent public lands, including Bureau of Land Management-administered lands and other national forests. Popular recreational activities, such as recreational river boating, also originate and occur on Bureau of Land Management administered lands. Boating also occurs on the wild Main Salmon River within the Payette National Forest and the Nez Perce-Clearwater National Forest, where the permitted section ends.

The Chief Joseph Pass area is popular for oversnow activities and is managed by both the Beaverhead-Deer Lodge National Forest and the Salmon-Challis. The Continental Divide Trail snakes back and forth between the Beaverhead-Deerlodge, Salmon-Challis, and Bitterroot National Forests. In addition, over 1 million acres of the Frank Church-River of No Return Wilderness is located on adjacent national forests. Many trail segments are located on both National Forest System and Bureau of Land Management-managed lands. Visitors often don’t know or recognize when they cross these administrative boundaries.

> So get out there and hunt and fish and mess around with your friends,
> ramble out yonder and explore the forests, climb the mountains,
> bag the peaks, run the rivers, breathe deep of that yet sweet and lucid air,
> sit quietly for a while and contemplate the precious stillness,
> the lovely, mysterious and awesome space.
> -- Edward Abbey

Recreation Access and Trail Based Opportunities

Visitors access the Salmon-Challis in many different ways. Roads, motorized trails, non-motorized trails, rivers and airstrips provide access for visitors to walk, bike, ride, drive, boat, or fly to their destination.

Roads

The Salmon-Challis Travel Plan designates approximately 2,500 miles of road available for public use. These opportunities are displayed on the Forest Motor Vehicle Use Map, which shows where motorized recreation activities are allowed on the Salmon-Challis.

Roads are vital in providing recreational access to the Salmon-Challis. Some roads are more important to visitors than others due to the type of recreational activity to which they provide access. The Salmon River Road, National Forest Service Road 030 on the Forest Travel Plan, is a prime example. The Salmon River Road accesses popular boating launch sites, trailheads, and scenery on the northern portion of the Salmon-Challis.

Because some roads are more important than others, road maintenance is not evenly distributed across the forest. In 2016, the Salmon-Challis spent 44 percent of its roads budget on the Salmon River Road, and, in the last 10 years, the forest has received over $10 million in grant money from the Federal Highway Administration for specific projects on the Salmon River Road. On the southern portion of the Salmon-Challis, the Custer Motorway, which begins near the town of Stanley and travels through the historic mining camps of Bonanza and Custer to the town of Challis, is also one of the most popular roads. The Custer Motorway is popular for its mining history, historical sites along the route, and the access it provides to several trailheads.

Three Scenic Byways travel through the Salmon-Challis:

- the Salmon River Scenic Byway,
- the Sacajawea Scenic Byway, and
- the Peaks to Craters Scenic Byway.

The 2014 National Visitor Use Monitoring data listed Scenic Byways, with a ranking of 32.7 percent, as the top special facility that was used by Salmon-Challis visitors. The

Lewis and Clark Backcountry byway, a 39-mile byway providing access to the Continental Divide National Scenic Trail and the Lewis and Clark National Historic Trail, is also a very popular drive. Additional information about these roads can be found under the Designated Areas section.

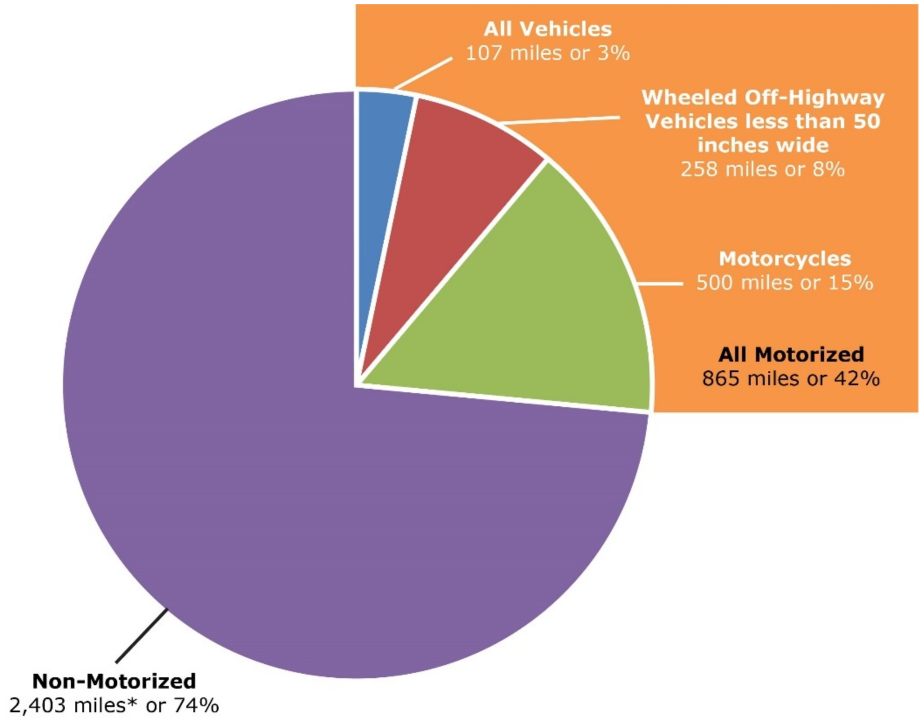
When recreation visitors to the Salmon-Challis were asked about what recreational activities they participated in, 29 percent said driving for pleasure (U.S. Department of Agriculture, Forest Service 2016c). Viewing natural features, listed by 52 percent of visitors surveyed, had the greatest amount of participation on the Salmon-Challis. Since this activity can also be done by vehicle, it is facilitated through road access. Road access is also an important contributor to the experience of people engaging in other types of recreational pursuits, like mountain biking, hiking, all-terrain vehicle use, and hunting.

Figure 26. Henry Creek Trail, trail number 6128, is a moderately-developed, non-motorized trail that can be accessed by National Forest System roads.

Trails

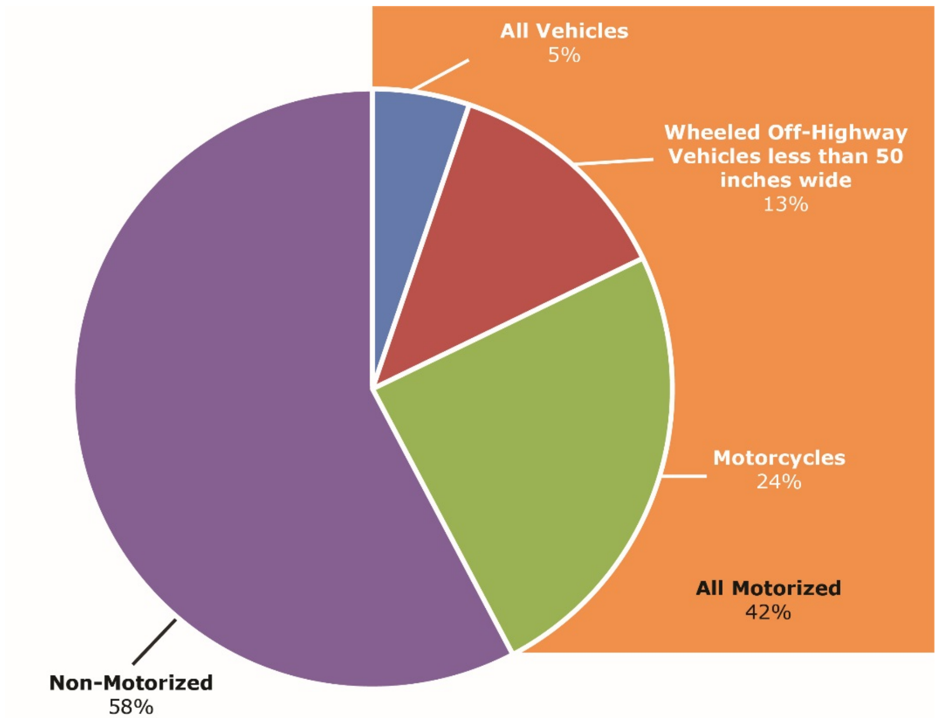
Excluding oversnow trails, there are approximately 3,300 miles of trail on the Salmon-Challis. Figure 27 shows the approximate mileage of trails by allowable use and the percentage of each trail type. Figure 28 shows the percentage of trail by allowable use outside of Wilderness. Some trails also have seasonal closures for wildlife and other resource concerns.

Figure 27. Mileage and Percentage of Each Trail Type on the Salmon-Challis



*1,182 miles outside of Congressionally Designated Wilderness and 1,221 miles within Wilderness

Figure 28. Percentage of Trail Type on the Salmon-Challis Outside of Designated Wilderness



Trails on national forests have a designed use indicative of what type of experience people will have on each trail. On the Salmon-Challis, including within designated Wilderness, approximately 2,240 miles of non-motorized trails are designed for pack and saddle stock. Slightly over 100 miles are designed for hikers, and less than 20 miles are designed for bicycle use. Motorized trails are designed for the largest type of vehicle that is allowed on that particular trail.

Trail maintenance on the approximately 3,300 miles of trail on the Salmon-Challis is completed by a combination of volunteers, non-governmental organizations and Forest Service employees. According to trail managers, the majority of the Forest Service employees involved in trail maintenance spend their time organizing, recruiting, and leading trail maintenance work trips. A declining budget has meant that there aren't large Forest Service trail crews to maintain trails.

Forest Service employees and the public have expressed a great deal of concern over the lack of trail maintenance and lack of funding for trail maintenance on the Salmon-Challis. There is a large trail maintenance backlog. Trails in the Frank Church–River of No Return Wilderness, where some trails exist on maps only and there is no sign of visible trail tread, are of particular concern. In 2016, Salmon-Challis trail managers reported only 11.4 percent of the trails, approximately 376 miles out of 3,300 miles, were maintained to Forest Service standards. In addition, wildfire, insects and disease infestations, and wind events have resulted in tree mortality across the forest that impacts trail conditions and accessibility at a large scale.

The public also doesn't understand how trail maintenance priorities and schedules are set. Stakeholders have expressed a desire for an easy way to share and update trail conditions and information. Some volunteers have expressed concerns that the Salmon-Challis National Forest makes it too difficult to volunteer to do routine trail maintenance and, as a result, the forest has missed out on opportunities to help address the backlog of trail maintenance.

Some trails on the Salmon-Challis may also be in areas that have impacted wildlife, watersheds, and other forest resources. The density of trails in certain areas may be too great to provide for effective wildlife habitat. Some trails also have negative impacts to riparian areas or wetlands because of their location. The large number and volume of trails in certain locations also have negative effects on the health of watersheds due to changes in drainage patterns caused by trails and sedimentation concerns. Due to these issues there may be a need to reroute trails, modify trails or otherwise address some of these issues in order to provide a trail system that is sustainable.

Creating additional connections from towns to the Salmon-Challis through additional trail heads has been identified by the public as a future goal, but such an effort would require pursuing public access easements through private property (Salmon Valley Stewardship 2015).

Many forest trail users have suggested developing a sustainable forest wide trails program to address issues, such as a declining budget, specialized uses, user conflicts, access issues, effectively using volunteers, and more.

Motorized Trails

There are approximately 865 miles of motorized trail on the Salmon-Challis. Of this, approximately 500 miles are open to motorcycles, 258 miles are open to wheeled off-highway vehicles 50 inches or less in width, and 107 miles is open to all vehicles. Wheeled motorized recreation also occurs across the Salmon-Challis on much of the road system that is open to the public.

A few concentrated areas provide more opportunities. These areas include a concentration of motorized single track trails on the north end of the Salmon-Challis, motorized trails near the Custer Motorway between the towns of Stanley and Challis, in the Lemhi Mountains between Big Eightmile Trail Head and Mill Creek Trail Head. The area surrounding Mackay is also popular for use by off-highway vehicles and has seen an increase in recent years in use of utility terrain vehicles greater than 50 inches in width on some full-sized vehicle trails and Forest roads.

Figure 29. In 2017, the community of Mackay hosted Rally in the Pines, a gathering of all-terrain and utility terrain vehicle enthusiasts. For the past couple of years, the event has included group rides on Salmon-Challis National Forest trails.

The towns of Challis, Mackay and Salmon have an interest in promoting and growing off-highway vehicle use on the forest. The aging population of Lemhi and Custer counties also increasingly uses motorized trails for forest access and enjoyment, as do disabled persons.

The amount of trail for all-terrain vehicle use is at least 15 miles, with 18 to 26 miles of trail being optimal. The average rider wants a three- to six-hour experience. Off-road motorcyclists prefer an average of 18-35 miles of trail. Those who want a full- or multi-day riding experience seek 35 to 80 miles of trail (Fogg 2002). The holder of a recreation special use permit for an off-highway vehicle event that has been held on the Salmon-Challis National Forest the last several years surveyed over 1,500 off-highway vehicle enthusiasts and asked them how many miles do they like to travel on a day ride. The majority of the 1136 respondents stated they liked to travel 50-plus miles while 395 people indicated that they like to ride 30 to 50 miles. Only 57 people indicated that they ride 16 to 29 miles and only 10 people said they like to ride 1 to 15 miles (Meg Ryan 2018b).

The motorized wheeled off-highway vehicle trails less than 50 inches wide in the area of the Custer Motorway have adequate mileage to provide quality experiences. However, the other concentrated areas of motorized trail opportunities have less than the desirable amount of trails to provide a quality opportunity for off-highway vehicles less than 50 inches wide. Motorized wheeled off-highway vehicle trails open to vehicles less than 50 inches wide are scattered throughout the Salmon-Challis and often connect to National Forest System roads, which allow motorized off-highway vehicle use.

The motorized single-track trails on the north end of the Salmon-Challis, those near the Custer Motorway, and those in the Lemhi Mountains have a sufficient amount of trails to provide a quality off-road motorcycle experience. Other areas on the Salmon-Challis contain scattered off-road motorcycle trails that often connect to National Forest System roads, which allow motorized off-highway vehicle use. Motorcycle users prefer trail to road, so this type of experience is less satisfying.

Table 16 shows the approximate mileage of motorized single-track trail and motorized wheeled off-highway vehicle trails for vehicles 50 inches or less in width available on nearby national forests (Cook 2018).

Table 16. Total Motorcycle and ATV Trails on Salmon-Challis and Nearby National Forests

National Forest	Motorcycle Trails	ATV Trails
Salmon-Challis National Forest	500 miles	258 miles
Boise National Forest	867 miles	412 miles
Caribou-Targhee National Forest	530 miles	913 miles
Payette National Forest	517 miles	100 miles
Sawtooth National Forest	760 miles	205 miles
Idaho Panhandle National Forest	565 miles	789 miles
Nez Perce-Clearwater National Forest	435 miles	991 miles

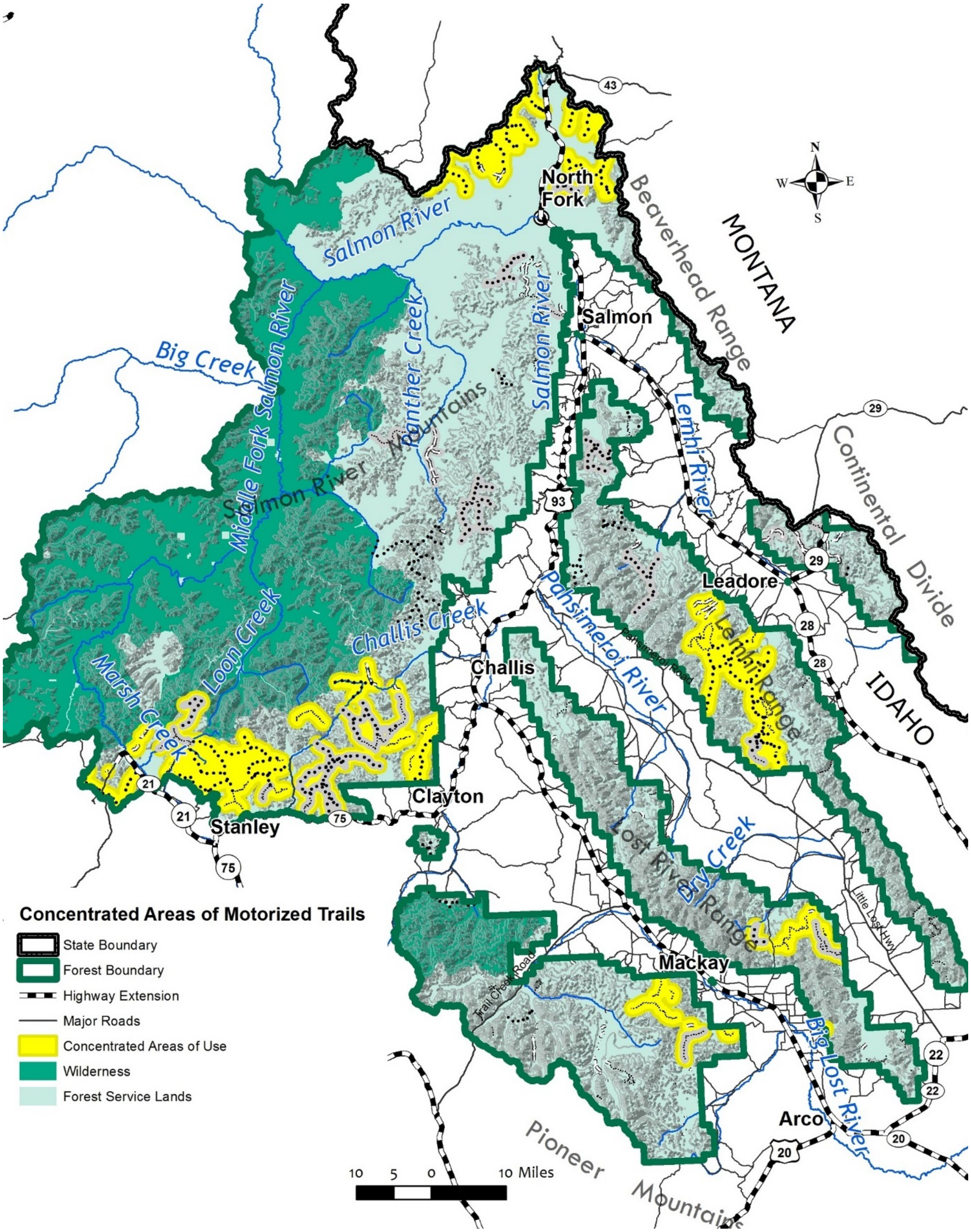
The Salmon-Challis has approximately 500 miles of motorcycle trails and 258 miles of all-terrain vehicle trails, which is in line with the amount of motorcycle and all-terrain vehicle trails available on nearby forests.

Trails open to full-size off-road vehicles are distributed throughout the Salmon-Challis and connect to National Forest System roads, which offer similar opportunities. There are approximately 2,500 miles of forest roads open to vehicle use.

Utility terrain vehicles are often smaller and narrower than a full-size vehicle but slightly larger and wider than an all-terrain vehicle. Many recreational utility terrain vehicles are 64 inches wide, although there are some models that are both narrower and wider. There are no trails on the Salmon-Challis to accommodate wheeled motor vehicles between 50 and 64 inches wide other than trails open to all full-size vehicles. Public feedback has indicated that people would like to see more opportunities for utility terrain vehicle use on trails in the Mackay area.

Motorized trails on the Salmon-Challis are often connected to each other by roads, meaning visitors seeking longer distance rides often have to use some full-size vehicle roads. Public feedback indicates that better trail-to-trail connectivity and loop opportunities would improve their motorized trail experience.

Figure 30. Concentrated Areas of Motorized Trails



Motorized Oversnow Recreation

While some motorized oversnow recreation occurs off-trail, the majority occurs either on trails and roads or uses trails and roads to access off-trail use areas. While Table 17 identifies the status of land available for motorized oversnow travel, The Salmon-Challis Oversnow Use Maps show where oversnow motorized recreation activities are allowed to take place within the forest. These maps are reviewed periodically and may be amended for a variety of reasons, including:

- issues and concerns for wildlife;
- conflict with other winter oversnow uses, such as cross-country skiing; or
- identified new opportunities for motorized oversnow use.

Table 17. Status of land available for over the snow motorized travel

Status	Approximate Acres
Open	2,004,500
Open Seasonal Restrictions	421,500
Prohibited Yearlong Except on Designated Routes	184,000
Prohibited Yearlong*	1,790,000

*Includes Wilderness

Some winter motorized routes near the town of Salmon are groomed for winter use by both motorized and non-motorized trail users. The grooming is being completed by the Lemhi County Trail Grooming program and is funded by Idaho Parks and Recreation through snowmobile registration funds for winter trails grooming. The Lemhi County Trail Grooming program has expressed concerns that many of the summer roads that are groomed and used in the winter as oversnow trails are being increasingly brushed in or are becoming impassable for their trail groomer in the winter due to lack of road maintenance. The public has expressed interest in increased winter trails grooming, including increased groomed-loop opportunities for groomed trail users and backcountry motorized enthusiasts.

Non-motorized Trails

There are approximately 2,403 miles of non-motorized trail on the Salmon-Challis, approximately 1,182 miles are outside of Wilderness and 1,221 miles are within the Wilderness. Non-motorized trails outside of designated Wilderness on the Salmon-Challis allow all non-motorized trail activities; whereas trails within the Wilderness prohibit bicycle use. Many non-motorized trail users have indicated that they are mostly satisfied with trail opportunities and that there is little conflict with motorized-trail users on multiple-use trails. Visitor use monitoring has shown that use is low on the Salmon-Challis, and this trend is expected to continue for the foreseeable future.

Since the majority of the non-motorized trails are designed for pack and saddle stock, we often manage for this use because the trail height and width clearance required for pack and saddle stock use accommodates a variety of other uses.

The optimal length of trail for a casual day hiker is 2-4 miles. For an advanced day hiker, the optimal length of trail is 5-9 miles, and the optimal trail length for a backpacking trip is 25-35 miles(Minnesota Department of Natural Resources Trails and Waterways 2007). The Salmon-Challis offers non-motorized trails that provide for all of these optimal hiking excursions and more. The Frank Church – River of No Return Wilderness offers ample opportunities for long-distance wilderness backpacking opportunities and is underused for this purpose.

Mountain biking is also a popular activity on the Salmon-Challis. The area around Salmon is especially popular in the spring and fall when trails in the surrounding communities are under snow. Table 18 shows the optimal amount of trail miles for different types of biking experiences. However, optimal lengths of trail mileage for mountain biking varies greatly based on fitness and skill level of the rider and the terrain (Minnesota Department of Natural Resources Trails and Waterways 2007).

Table 18. Optimal Trail Miles for Mountain Biking By Desired Experience

Type of Bicycle Ride	Miles
Casual Day User/Family Cyclist	No more than 8-10
Loop Trails	2.5-12
Half Day	15-25
Full Day	25-50

Mountain bikers, particularly in the Salmon area, would like to have additional trails designed specifically for bicycle use and would like to see improved trail-to-trail connections. This is especially true in the Wagonhammer area, near Cougar Point Campground in the Williams Creek Road area, and in the Twelvemile area, as seen in Figure 31. Mountain bike use has also increased near the town of Stanley.

Pack and saddle stock use of trails occurs regularly on forest because the Salmon-Challis is so remote and so popular with hunters. With the large amount of trail designed for pack and saddle stock use inside and outside of Wilderness, pack and saddle stock users have excellent trail opportunities on the Salmon-Challis. Equestrian users are the group most likely to experience trail conflict with other user groups (Cascade Environment Resource Group Limited 2012). Due to the low visitation and use of the Salmon-Challis, visitors and Forest Service employees don’t report many conflicts between other trail user groups and stock users. Some areas identified by mountain bikers for expanded trail systems such as the Wagonhammer and the Twelvemile area are also popular with saddle stock users.

Figure 31. Popular Areas for Bicycling on the Salmon-Challis

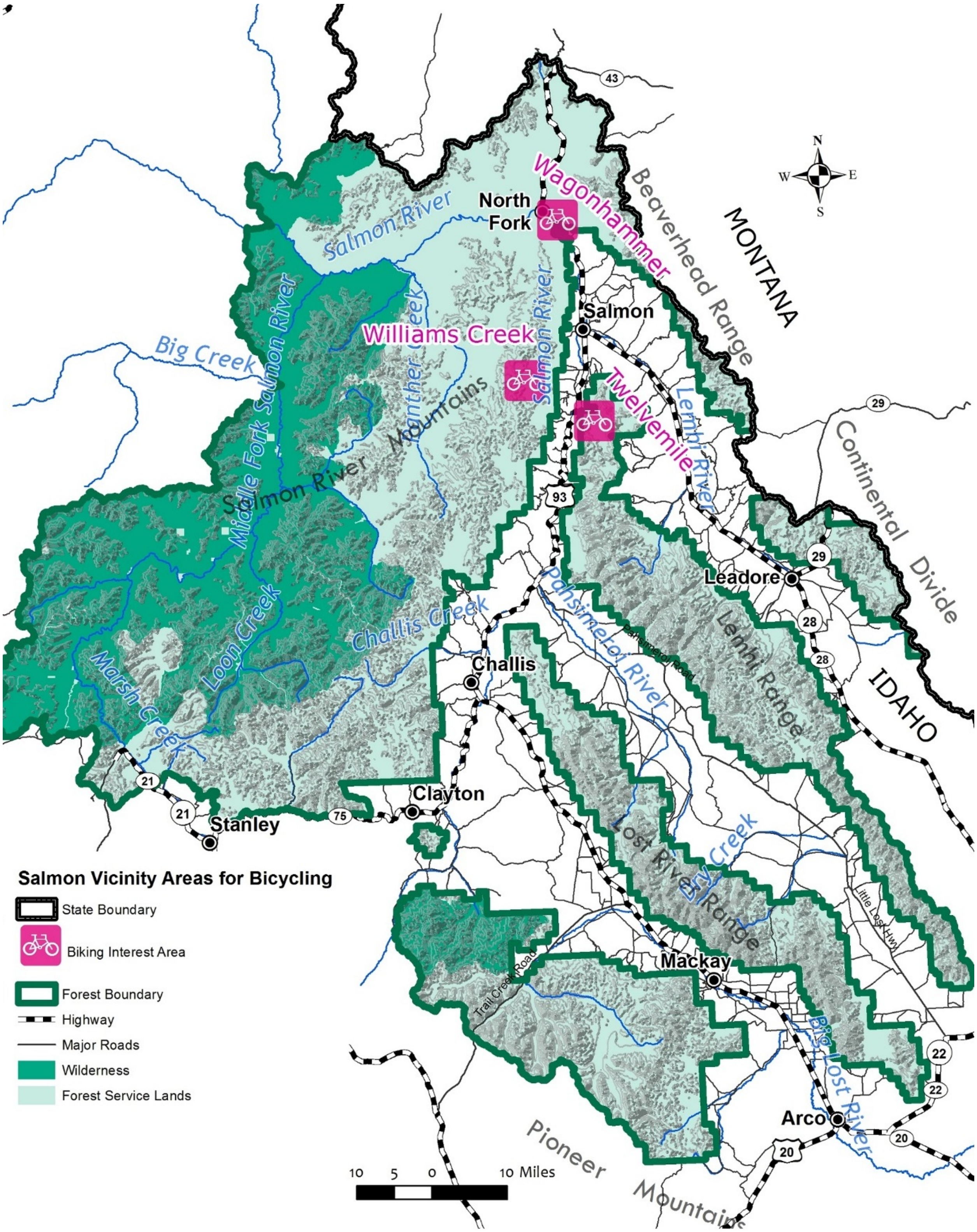


Figure 32. National Historic and National Scenic trails on the Salmon-Challis

The Nez Perce (Nee-Me-Poo) National Historic Trail stretches from Wallowa Lake, Oregon, to the Bear Paw Battlefield near Chinook, Montana. The trail was added to the National Trail System by Congress in 1986 and does not have specific management direction in the current Salmon National Forest Plan.

National Scenic Trail is a designation for protected trails with particular natural beauty. Approximately 50 miles of the Continental Divide National Scenic Trail lies within the Salmon-Challis.

The Continental Divide National Scenic Trail was established in 1978, and the trail extends 3,100 miles through the Rockies from Canada to Mexico. The current Salmon National Forest Plan does not contain specific management direction for the trail, but the current plan does say that it is managed in accordance with the 1985 comprehensive trail plan. In 2009 a new comprehensive plan for the Continental Divide National Scenic Trail was completed and replaced the 1985 Comprehensive Plan. Forest Service Manual 2353.44b requires the Salmon-Challis to establish a management area and specific plan direction for the Continental Divide National Scenic Trail. Direction must be broad enough to protect the trail's natural, scenic, historic, and cultural features. The Salmon-Challis must also establish a monitoring program to evaluate the trail's condition.

Non-motorized Oversnow Trail Recreation

Oversnow trail recreation occurs at many locations across the Salmon-Challis. In 2014, cross-country skiing was the second greatest activity people participated in while visiting the Salmon-Challis during the winter. Popular areas for cross-country skiing and snowshoeing include the Williams Creek area near Cougar Point Campground and the Chief Joseph Pass cross-country skiing area, which is partly on the Beaverhead-Deerlodge National Forest. The Salmon-Challis is proposing to expand the parking at the Chief Joseph Pass area in response to increased use. There has been little public demand for an increase in non-motorized oversnow trails, but there has been some feedback that the Forest Service could complete minor reroutes in the Williams Creek area to improve trail connectivity and to avoid some locations the snow melts out early in the winter season.

Figure 33. This oversnow trail, which crosses the bridge over Marsh Creek, is the most direct access route for winter renters of the Cape Horn Guard Station Cabin.

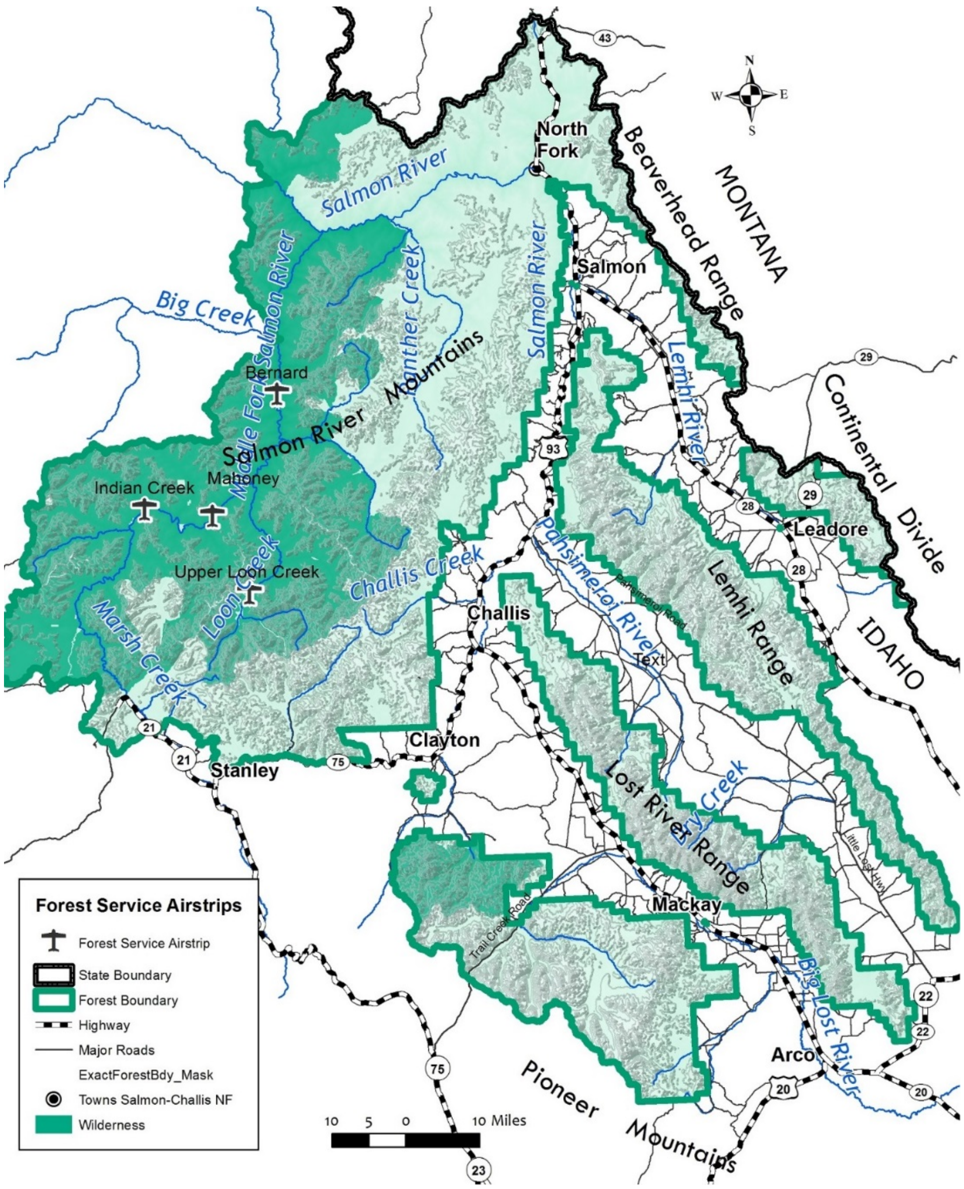
Airstrips

There are four airstrips on the Salmon-Challis that are open and maintained for public use, as seen in Figure 34. Three of them are within the Frank Church–River of No Return Wilderness, and one is directly adjacent to the Wilderness. Airstrips provide important access and are used fairly regularly to access the Wilderness.

Airstrip maintenance is challenging because the majority of the airstrips are located in Wilderness where mechanized or motorized maintenance is not allowed. Lack of funds to maintain the airstrips is also a problem.

There are several private airstrips on inholdings that also provide aircraft access to the Frank Church–River of No Return Wilderness. Feedback from the public and aviation groups has indicated a demand for additional airstrips on the Salmon-Challis.

Figure 34. Forest Service Airstrips Open to the Public on the Salmon-Challis



Recreational River Boating

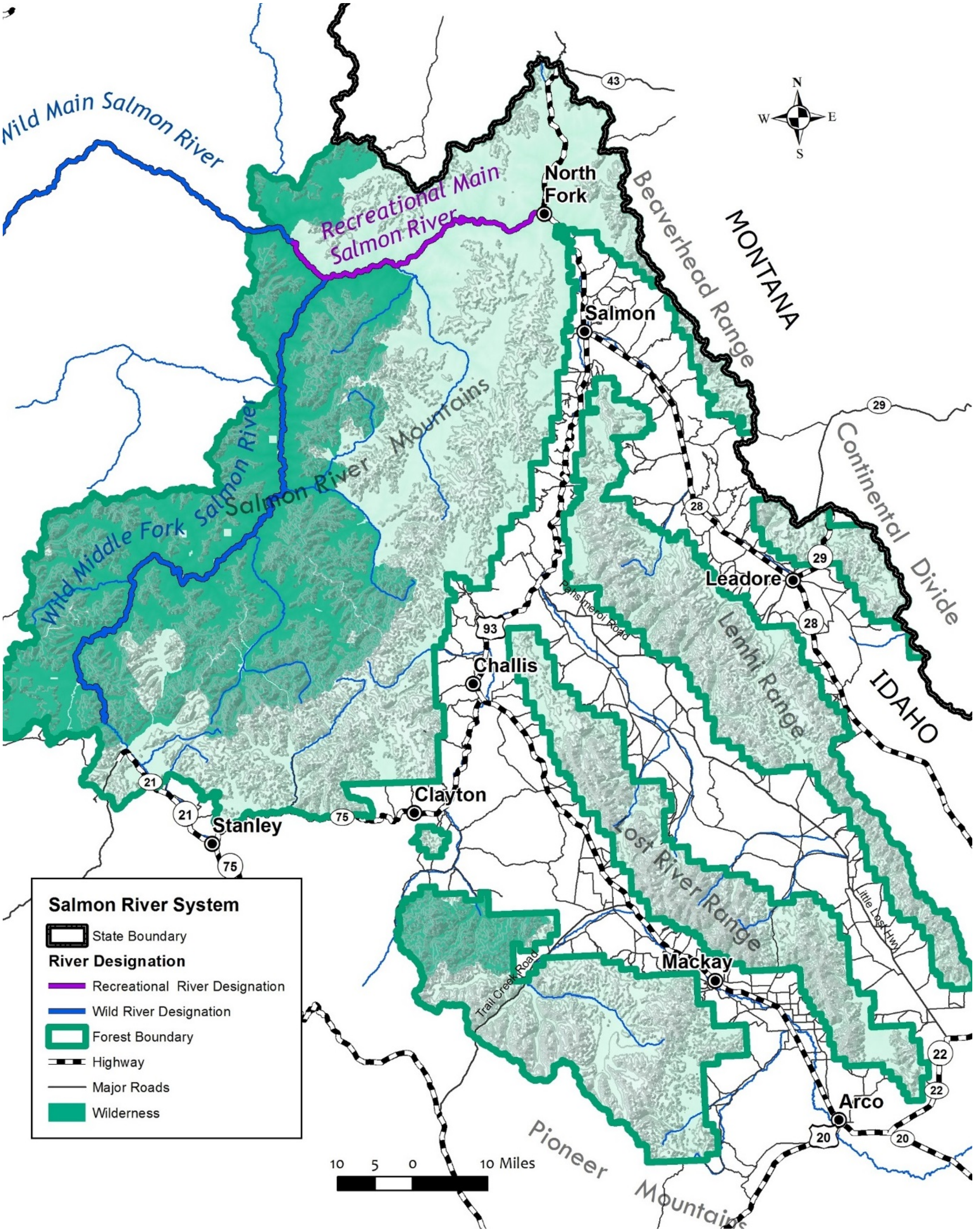
Rafting, kayaking, and paddle boarding on the Main Salmon and Middle Fork Salmon Rivers and jet-boating on the Main Salmon are extremely popular activities on the Salmon-Challis. Recreation.gov, the website through which private and commercial permits for both rivers are issued, shows that, in 2016, 9,606 people were permitted to go on Main Salmon River trips and 11,500 people were permitted to go on Middle Fork Salmon River trips.

Forest plan revision will not replace the Frank Church – River of No Return Wilderness Management Plan and its direction for recreational river boating or change the allocation of private or commercial river permits on the Wild Main and Wild Middle Fork Salmon rivers. Direction contained in the management plan regarding the limited river permits for the Wild Main and Wild Middle Fork Salmon rivers is in place to protect the natural resources, prevent crowding and protect the Wilderness resource.

Outside of the permitted section of the Main Salmon River, Wild and Scenic segments of the river classified for recreational use see moderate to high use during the summer months. River boating contributes significantly to the local economy in the form of hotel stays, commercial outfitting, restaurant visits and other tourist type activities.

Figure 35. The boat ramp at Boundary Creek is one of two main launch sites for trips down the Middle Fork of the Salmon River.

Figure 36. The Salmon River System



Middle Fork of the Salmon River

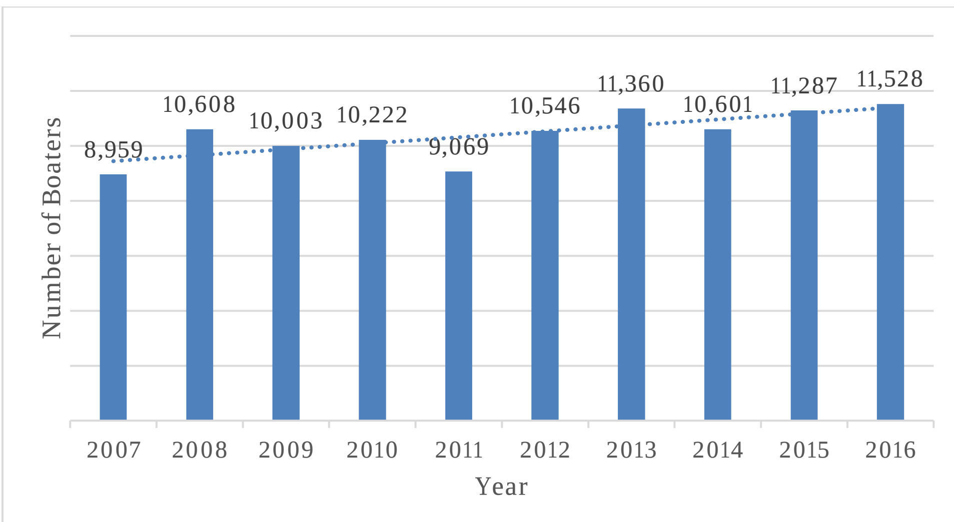
A permit is required year-round to float the Middle Fork of the Salmon River. The permitted stretch begins at Dagger Falls and ends at the Middle Fork's confluence with the Main Salmon River. For private float trips, only one permit per person per year is allowed during the lottery control season. A total of seven parties, commercial and non-commercial, are allowed to launch each day.

In 2017, 12,999 people applied for 387 private float trip permits during the control season. The overall odds of drawing one of these permits for a private float trip was 2.9 percent in 2017 (U.S. Department of Agriculture, Forest Service 2017b).

In 2016, approximately 64 percent of Middle Fork trip permits were issued for all private trips, and 40 percent of the people who floated the river before, during and after the lottery control season did so on a private trip. Commercial trips on the Middle Fork accounted for 36 percent of permits issued and 60 percent of people who floated the river. Groups on private trips were much smaller than groups on commercials trips (U.S. Department of Agriculture, Forest Service 2017b).

Figure 37 shows the overall numbers, both private and commercial, of people who have floated the Middle fork of the Salmon between 2007 and 2016. Public demand for outfitted trips on the Middle Fork of the Salmon River could also change in the future.

Figure 37. Number of Wild Middle Fork Salmon River Boaters from 2007 to 2016.



Main Salmon River

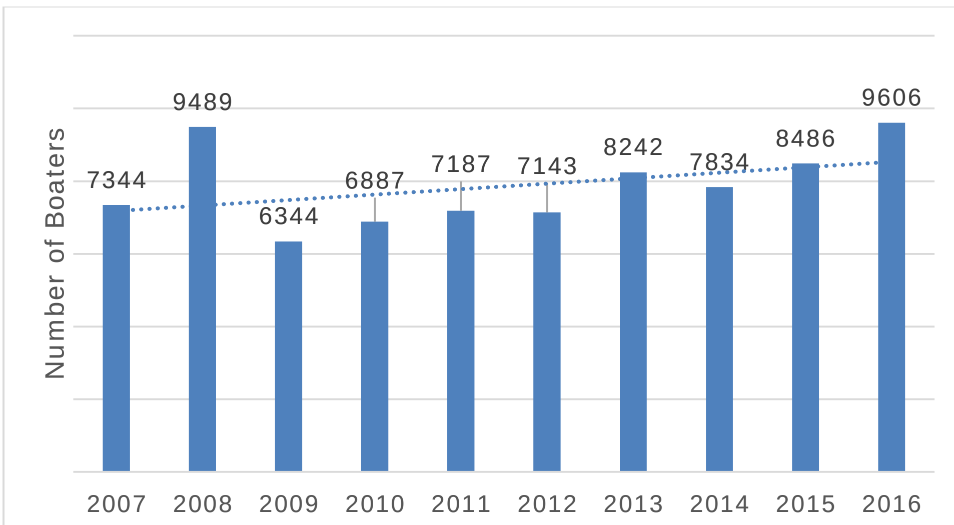
All boaters floating the wild section of the Main Salmon River are required to obtain a trip permit before launching at any time of the year. The wild section of river extends from Corn Creek to Long Tom Bar. During the lottery control season a maximum of eight float boat parties, commercial and non-commercial, are allowed to launch each day. Outside the lottery season, the number of launches is unlimited for float boaters. During both the control season and the non-control season private jet boat use on the Wild Main Salmon is limited to no more than six jet boats on this section at once.

The lottery period for the wild section of the Main Salmon River is from June 20 through September 7.

In 2017, 9,122 people applied for 310 private river trip permits during the lottery season. The overall odds of drawing one of the private river trip permits was 3.4 percent in 2017 (USFS, 2017 Four Rivers Lottery Statistics USDA 2017b).

In 2016, approximately 79 percent of Main Salmon trip permits were issued for private float- and jet-boat trips, and 64 percent of the people who floated the river before, during and after the lottery control season did so on a private trip. Commercial trips on the Main Salmon River accounted for 21 percent of permits issued and 36 percent of people who floated the river. Groups on private trips were much smaller than groups on commercials trips. Figure 38 shows the overall numbers of float boat users and jet boat users on the Main Salmon River between 2007 and 2016.

Figure 38. Number of Wild Main Salmon River Boaters from 2007 to 2016



Use of both the Wild Main Salmon and Wild Middle Fork Salmon Rivers has stayed fairly consistent to slightly increasing over the last ten years. Private boaters pay a $4.00 per person per day fee for floating on both of these rivers. Outfitters pay 3 percent of their gross revenue for the trip, and each person on an outfitted trip pays $4 per person per day. These fees go towards the cost of river management as well as river associated facilities such as the roads leading to the main launching areas for both Wild and Scenic River sections, launch ramps, and bathrooms. In 2017, the $4 daily river use fee paid by private boaters and those on outfitted trips provided approximately $355,435 in funds for operations, maintenance and improvements for the river program. The 2015 outfitter fees for the Wild Middle Fork Salmon, Wild Salmon River and Recreational section of the Salmon River were approximately $429,716.

Both private boaters and outfitters have expressed a need for maintenance of the facilities associated with river boating, especially access road maintenance and launching facilities. Boaters would like to see upgrades and improvements of these river-associated recreation facilities. Parking at some of these facilities, including Cache Bar Boat Launch and Corn Creek Boat Launch, is an issue during peak boating season.

While public demand for the float boating opportunities is evident in the number of people that apply for private trip permits, there may not be as much demand or need for outfitted trips on the Main Salmon River if commercially-permitted launches are not being used. The overall odds of an individual obtaining a private float trip permit are low. However, it is important to note that a common practice is for individuals who are part of a group who are wanting to float one of the two permitted river segments to all apply for a permit and hope that one person in their group draws a permit. The people who are part of that group, who didn't draw a permit would still be able to have the opportunity to float that permitted stretch of river that year.

Dispersed Recreation

Dispersed recreation includes a wide variety of activities that take place outside of developed recreation sites. The majority of visitors come to engage in dispersed recreation activities. According to the 2014 National Visitor Use Monitoring, the main dispersed recreation activities include: viewing natural features, hunting, fishing, cross-country skiing, and hiking.

Hunting was the most commonly listed primary activity during National Visitor Use Monitoring in 2009, when over one-fourth of visitors indicated as much. The Idaho Fish and Game Hunting units within the Salmon-Challis generally have a high success rate for harvest of big game, and the abundance of public land on which to hunt make the forest a popular hunting destination.

Dispersed camping on the Salmon-Challis was also a popular activity. Visitor use data in 2014 showed that 26.4 percent of visitors had stayed overnight on the Salmon-Challis and that they were more likely to do so when hunting or fishing.

Developed Recreation and Recreation Facilities

The most common types of developed sites on the forest are campgrounds, camping areas, and trailheads. Table 19 shows the approximate number of developed recreation sites and the number of fee sites by site type on the Salmon-Challis.

The most popular developed recreation opportunity on the Salmon-Challis is developed camping. The 2014 National Visitor Use Monitoring showed 7.1 percent of the respondents reported developed camping as the main activity in which they participated while visiting. Other popular developed recreation opportunities include the use of trailheads and boat ramps.

The Salmon-Challis does have a few facilities that, like the Mount Borah trailhead and the Cache Bar boat launch, receive greater use than they were designed to accommodate. There are also some developed recreation sites, such as Deep Creek, West Fork Upper Pahsimeroi, Morse Creek, and Lost Creek campgrounds, that do not receive the use for which they were designed.

Use at developed recreation facilities across the Salmon-Challis spikes during the fall big game hunting season. There are several smaller campgrounds and flat areas close to roads ideal for dispersed car camping that receive little use throughout the year until hunting season. The public has also expressed interest in maintaining and increasing the amount of developed recreation opportunities for the increasingly elderly population and those who are mobility impaired. These would include facilities like fishing sites, campgrounds, wildlife viewing areas, and trails that offer persons with disabilities enhanced opportunities to participate in these activities.

Table 19. Number of Developed Recreation Sites and Fee Sites by Site Type on the Salmon-Challis

Site Type	Total Number of Sites	Number of Fee Sites
Boating Site	2	0
Campground*	50	29
Camping Area	16	0
Day Use Area	4	0
Dump Station	1	0
Group Campground	2	2
Group Picnic Site	1	1
Horse Camp	1	0
Interpretive Site	3	0
Lookout/Cabin	3	3
Picnic Site	7	0
Trailhead	27	0

* Some campground complexes have boating sites associated with them, for example Corn Creek Campground Complex but is classified as a Campground.

At certain places on the Forest, personnel have noticed an increase in the use of larger recreational vehicles and larger trailers. This is in line with national trends, which show that campers are seeking more amenities, such as, larger sites, bathrooms, electricity hookups, cell phone reception, and suitable access (Fjelstul and others 2012; Garst and others 2012). Approximately one-half of all campers today are choosing to camp in an RV, caravan, cabin, or other type temporary shelter rather than camping in a tent (Brooker and Joppe 2014; Oh and others 2007).

There are concerns over lack of funding and the maintenance costs for recreational facilities across the Salmon-Challis. Fees are collected at some of these sites and help cover the cost of maintenance and operations. In 2015 approximately $60,000 in fees were collected on the entire forest at developed recreation sites. This helps offset some of the cost for maintaining these facilities but the forest is unable to adequately fund maintenance of these facilities. The rental of guard stations has become increasingly popular in the last few years. River daily use fees and outfitter fees also fund maintenance and improvements of boat launches and other developed recreation sites associated with river use.

In general, studies have shown that the majority of the people consider user fees acceptable (Fix et al. 2007). However, there is also strong evidence that fees influence the potential for displacement. Visitors who were interviewed at various sites mentioned that fees or the lack thereof was a reason for having chosen a specific site (Fix et al., 2007). Fees charged on the Salmon- Challis are similar to slightly lower than those charged on other surrounding National Forest System and Bureau of Land Management-managed lands. Table 20 shows a comparison of fees charged for a single camping site at a standard amenity fee campgrounds and similar campgrounds on the surrounding National Forest System and Bureau of Land Management-managed lands.

In 2006, the Salmon-Challis completed a facilities master plan (USFS, Salmon-Challis, Recreation Facilities Master Planning, 2006). This plan showed that, of the 58 campgrounds we had at that time, the Salmon-Challis only had funding available to maintain and to operate 39. The plan recommended that 19 campgrounds be decommissioned by 2011. Today, we have 50 campgrounds on the Salmon-Challis. The plan also showed that two of the 11 picnic sites and four of the 26 trailheads should be decommissioned. Today, we have seven picnic sites and 27 trailheads. Implementation of the 2006 facilities master plan was supposed to occur over a five-year period. The Salmon-Challis still has many opened developed recreation facilities that were scheduled for decommissioning.

Table 20. General Comparison of Fees Charged Per Day for a Single Camping Site on the Salmon-Challis and Campsites on Surrounding National Forest System and Bureau of Land Management-Administered Lands

National Forest	Fee Charged*
Salmon-Challis National Forest	$5-$10
Salmon Bureau of Land Management	Free -$10
Payette National Forest	$10
Sawtooth National Forest	$6-$16

* Standard Campground with water, vault toilets, picnic tables, and campfire rings with grill

Recreation Special Use Permits

Currently, there are approximately 115 active recreation special use permits (USDA). Table 21 shows the type of recreational special use permit and the number of that type of recreation special use permit that is authorized on the Salmon-Challis.

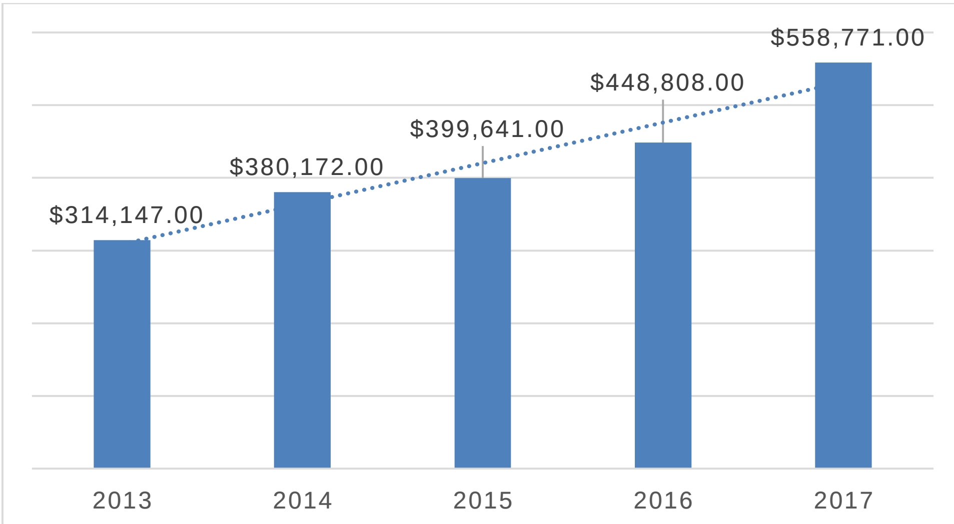
Table 21. Type and Numbers of Recreation Special Use Permits on the Salmon-Challis

Type of Special Use Permit	Number
Outfitter and Guide	95
Reoccurring or Single-Use Recreation Event	8
Single-Use Non-Commercial Group	2
Organization Camps	1
Resorts	6

Visitors looking to access or participate in an activity in remote areas of the Salmon-Challis will often look to an outfitter or guide for their specialized experience and knowledge. Commercial outfitters and guides contribute significantly to the local economy, as discussed in the Social & Economic Conditions section, and are important providers of employment in the communities surrounding the Salmon-Challis.

Recreation special use permittees pay fees totaling 3 percent of their gross revenue. Figure 39 shows approximately how much money in recreation special use permit fees was collected by the Salmon-Challis National Forest over a five year period from 2013 to 2017. The majority of these fees are collected through outfitting and guiding recreation special use permits.

Figure 39. Recreation Special Use Fees Collected by the Salmon-Challis from 2013 to 2017



Demand for outfitting and guiding services for hunting and fishing fluctuates annually, but demand is fairly strong and has increased in recent years. National trends show hunting and fishing declining in popularity, which could cause demand for hunting and fishing outfitters and guides to decrease.

There are 27 permitted outfitters for rafting and fishing on the Wild Middle Fork Salmon River and 29 permitted outfitters for rafting and fishing on the Wild Main Salmon River. There are eight permitted outfitters for rafting and fishing on the Main Salmon River recreational section, as seen in Figure 36.

During the control season, 320 outfitter launches are authorized through special use permits on the Middle Fork Salmon River and 330 outfitter launches are authorized through special use permits on the Main Salmon River. In 2016, 6,488 people utilized commercial outfitters to float the Middle Fork Salmon River. Commercial outfitters accommodated 3,056 people on float trips on the Wild Main Salmon River.

The current Challis National Forest Plan prohibits the issuance of outfitter and guide permits for hunting or certain types of hunting in management areas 17, 19, and 21. There is also no documentation of why outfitting is not allowed in those areas or parts of those areas. Idaho Fish and Game issues hunting licenses for various game species in these management areas and has increased the number of licenses for certain species since the inception of these plans in some of these areas.

National trends in outdoor recreation show that the top 5 activities for anticipated growth are developed skiing, undeveloped skiing, challenge activities (mountain biking, climbing, caving), equestrian activities and motorized water activities (Bowker et. al, IDSCORTP, 2013). On the Salmon-Challis National Forest, outfitting and guiding permits for these types of activities are currently minimal and if there is anticipated growth in these activities there may be a need for outfitters and guides to provide commercial services for these activities. There may be other activities that become popular on the forest, such as those that require specialized skills, expertise, or equipment, for which it would be appropriate to issue new recreation special use permits. Conversely, there may be areas on the forest where there are resource concerns or where outfitting and guiding for certain activities is not appropriate.

Scenery

The Salmon-Challis is renowned for its Wild and Scenic Rivers, high alpine lakes, and rocky mountain peaks offering spectacular scenery. The landscape of the Salmon-Challis ranges from open arid basins to the rugged, vertical peaks of the Salmon Break area and Lost River Range. Locals and visitors alike recognize the vast areas with little visible sign of man as a unique aspect of the scenery on the forest. Some of our most treasured and valued scenery includes:

- the Lost River Mountain Range, including Mount Borah, Idaho’s tallest mountain;
- the scenery along the two designated Wild and Scenic Rivers on the Salmon-Challis;
- the wide open spaces and forested mountains in the Frank Church–River of No Return Wilderness; and
- the views of the Continental Divide from the town of Salmon.

National Visitor Use Monitoring in 2014 placed viewing scenery as the main activity in which visitors participated (U.S. Department of Agriculture, Forest Service 2016c). Viewing wildlife and driving for pleasure also placed in the top ten, as seen in Table 13. When visitors were asked what special facilities or areas they used on the Salmon-Challis, scenic byways and forest roads were first and second, as seen in Table 15. The high percentage of people visiting the Salmon-Challis for scenery related reasons demonstrates the importance of maintaining treasured forest landscapes.

The Salmon-Challis currently uses the Visual Management System in all planning efforts. Forest Service direction is to use the Scenery Management System. This system differs from the Visual Management System in several ways, including updated findings and terminology. The primary difference, however, is that the Scenery Management System increases the role of the constituent in the process (USDA Forest Service 1996).

Changing Climate and Recreation

A changing climate may lead to changes in how and where people recreate in the future on the Salmon-Challis National Forest. A warmer climate may mean people looking to ski, snow shoe, snowmobile, or participate in other snow-dependent activities will have to travel to a higher altitude to reach suitable snow pack. If changing climate leads to a reduction of areas on the Salmon-Challis National Forest with suitable snow packs to participate in certain activities, more people from further away may travel to these fewer locations. This could mean more crowding at these locations or more or less winter visitation in certain areas.

People who would otherwise participate in snow-dependent activities may also switch to other types of recreational activities that aren't dependent on the snow, like biking, equestrian use, hiking or motorized recreation. Earlier snowmelt and a lower snowpack could also lead to early runoff and a changed rafting season on the Middle Fork salmon and Main Salmon Rivers. This would impact not only individual users but outfitters, guides, and local economies. These are just a few examples of how changing climate could impact recreational use patterns on the Salmon-Challis National Forest.

Facilities and infrastructure that provide recreation opportunities, such as roads, trails, campgrounds, and picnic areas, may also be affected by changing climate. Warmer temperatures leading to earlier and faster snow melt and more extreme weather events may cause flooding or damage to recreation facilities that are oftentimes located near water bodies. Extreme weather events can cause damage to trails or roads and lead to a loss of opportunities.

Summary & Conclusions

In order to provide sustainable and meaningful recreation opportunities that connect people to nature, the future of the Salmon-Challis National Forest cannot be everything to everyone everywhere. However, the Salmon-Challis National Forest can provide something for everybody, somewhere on the 4.4 million acres of public land that make up the Salmon-Challis National Forest. Whether visitors come here to explore the Frank Church – River of No Return Wilderness, ski at Lost Trail, climb Mount Borah, off-road, camp, whitewater raft, fish, or hunt, the Salmon-Challis offers recreational opportunities for everyone.

Recreation Opportunity Spectrum

The recreational opportunity spectrum classes were developed in the late 1980s. Since that time, there have been many changes to landscapes and management on the Salmon-Challis National Forest that may have caused changes to the recreational opportunity spectrum. Some of these changes include:

- a new Forest Travel Plan in 2014,
- road decommissioning,
- new wilderness designation with the Jim McClure-Jerry Peak Wilderness, and
- project-level activities.

In addition, desired conditions have likely changed from the late 1980s. An example of a new desired condition for an area of the Salmon-Challis might be a desire to have more of an emphasis on road decommissioning or road-to-non-motorized trail conversion that would eventually amend the travel plan after project-level planning and, ultimately, the recreational opportunity spectrum class for that specific area from Roaded Natural to Semi-Primitive Non-Motorized. Conversely, a desire to have new motorized trail construction in an area classified as semi-primitive non-motorized would lead to a change in recreational opportunity spectrum to Semi-Primitive Motorized. The 2009 Forest Travel Plan also has motorized routes in areas that are classified as semi-primitive non-motorized in the existing forest plans. Salmon-Challis staff will rework the recreational opportunity spectrum to accommodate these changes and complete a desired condition recreational opportunity spectrum for both summer and winter. The revised recreational opportunity spectrum will inform future summer and winter travel management decisions.

Visitor Use

The Salmon-Challis National Forest is one of the least visited national forests in the Nation. Hunting, fishing, viewing natural scenery, float boating, cross-country skiing, and driving for pleasure are the main activities people participate in on the forest. People come here from further away than is typical for a national forest, making this a destination for these types of activities. While some of these activities have higher anticipated growth in the future, such as cross-country skiing, many are expected to be towards the bottom in anticipated growth. This may mean that, compared to other national forests across the region and the Nation, the Salmon-Challis will remain one of the least visited national forests.

Cross-country skiing is listed as one of the main activities people participate in on the forest and at a much higher percentage when compared to other regional forests. Skiing is also recognized as one of the top 5 activities in expected future growth nationally. Managing for this popular activity should be an emphasis.

Figure 40. In 2014, 16.2 percent of visitors to the Salmon-Challis noted cross-country skiing as their primary activity during National Visitor Use Monitoring surveys.

Currently, popular forest activities, such as hunting, fishing and rafting, are anticipated to have a lower growth rate nationally. These activities are still expected to be popular activities here and contribute significantly to local economies. As the growth and change in recreational activities occurs in the future, the Salmon-Challis will have to adapt to these changes and focus on growth activities and changes in visitation patterns.

People tend to travel further to get here, and most Salmon-Challis visitors camp at a developed site or disperse camp at a greater rate than visitors to other forests. The facilities that most visitors use include scenic byways and National Forest System roads. Driving for pleasure is one of the main activities in which people participate. Roads and camping infrastructure and management should continue to be a priority for the Salmon-Challis. Scenic Byways, frequently used roads and interpretive displays, both in the top five of special facilities or areas visitors use, are often found together. Most of the interpretive displays are along one of the three scenic byways, the backcountry byway, and popular roads that travel through the Salmon-Challis. Maintaining and updating these interpretive displays should be a priority for us.

More than 14 percent of visitors also indicate they use motorized dual track trails. However, the 2014 National Visitor Use Monitoring data indicates that only 4.6 percent of the visitors listed motorized trail activity as their main use while visiting the Salmon-Challis. This means that a high percentage of motorized dual track trail users are using these trails for another reason, such as for hunting access, viewing natural features or to access deeper into the Salmon-Challis than possible by full-size vehicle to participate in other activities. This, along with the use of roads as having a high percentage of visitors who report use, speaks to the importance of access. The Salmon-Challis is one of the largest, most remote national forests and includes the largest wilderness area in the contiguous U.S., the Frank Church – River of No Return Wilderness Area. Many people are using roads and motorized trails to gain access to a certain point and then further accessing remote and rugged areas for other purposes.

Managing activities across administrative boundaries with adjacent landowners has challenges, and the Salmon-Challis has to collaborate with the Bureau of Land Management and other national forests on management of recreation activities to a great deal. Some of the challenges include:

- funding when one unit collects money and another unit has to manage some of the use;
- single unit management for common wilderness goals, as is the case with the Frank Church – River of No Return Wilderness Area; and
- site-specific issues including trail management for shared goals across Forest Service and Bureau of Land Management administrative boundaries.

When managing for recreational resources the Salmon-Challis should work across administrative boundary to manage for the resource holistically and work through issues with neighboring land managers. Resolving resource damage from overuse at Gold Bug Hot Springs is an example of a specific issue that requires coordination. Lemhi County manages the parking, the Bureau of Land Management manages most of the trail, and the Forest Service manages the hot springs and a portion of the trail.

Recreation Access and Trail based Opportunities

A lack of trail maintenance and funding for trail maintenance is one of the largest issues and sources of concern for recreation. The public has expressed a design for improvements in providing accurate and complete trail condition information, but this is something the Forest Service has little capacity to improve. The Salmon-Challis should continue to look for opportunities, such as working with partners and public-private partnerships to address trail maintenance needs and to provide accurate and complete trail condition information. Some trails on the Salmon-Challis may also be in areas that have impacted wildlife, watersheds and other forest resources. Trails with undue resource impacts in unsustainable locations should be rerouted, or impacts should be otherwise mitigated.

Providing more specific forest plan direction for trails in a new forest plan going forward would be beneficial in planning and development of trail opportunities.

People are generally satisfied with the trail opportunities on the Salmon-Challis, and analysis shows that there are generally adequate trail opportunities, with the following exceptions:

- Motorized trails are often connected to each other by full-size vehicle roads, some of the public would like to see increased connectivity and loop opportunities for all types of motorized vehicle trails.
- Some people would like to see more utility terrain vehicle trails, measuring 50 inches or greater in width, especially on the National Forest System lands in the areas surrounding Mackay and Challis.
- There is a desire to convert some wheeled off-highway vehicle trails that are open to vehicles 50 inches or less in width to accommodate vehicles 64 inches or less in width.
- There is a desire for more mountain bike trails and trails specifically designed for mountain bike use near the town of Salmon and, to some extent, near the town of Stanley.
- Regardless of trail type, people want to maintain and improve trail connections from local communities and Bureau of Land Management-managed lands to the Salmon-Challis.
- A comprehensive sustainable trails strategy for the forest may be needed.
- The Salmon-Challis should evaluate its partner trail maintenance program and continue to look for ways to make it easier for people to volunteer to complete trail maintenance while ensuring quality trail maintenance.
- There is a need for improved trail and access signage across the forest.
- There is a need for purpose-built trails for specific types of activities that still can accommodate multiple uses.

Of the two National Historic Trails and the one National Scenic Trail on the Salmon-Challis, only one, the Lewis and Clark National Historic Trail is its own management area and has specific management direction protecting it in the current forest plans. The other two trails, the Nez Perce National Historic Trail and the Continental Divide National Scenic Trail need to be their own management areas and contain specific management direction for the protection of their natural, scenic, historic, and cultural features.

Airstrips are and will continue to be important in providing recreational access on the Salmon-Challis. Since maintenance is a concern, the Forest Service should continue to pursue sources of funding with partners, such as towns, counties, the State, users, outfitters, and others, to fund airstrip maintenance.

Recreational River Boating Summary and Conclusions

Recreational boating is an iconic activity on the Salmon-Challis National Forest. There is a desire to improve maintenance and upgrade facilities associated with river boating activities. Special use authorization fees and the river daily use fee of $4.00 per person per day provide funding for maintenance and improvements, but this may not be enough to support the level of maintenance and improvements that are needed. There is a large public demand for limited float boating permits on the wild sections of the Main Salmon and Middle Fork Salmon Rivers. Demand could change for outfitted trips and private trips on the Middle Fork of the Salmon and Main Salmon Rivers. Forest plan revision will not replace the Frank Church – River of No Return Wilderness Management Plan or change the allocation of private or commercial river permits on the wild segments of the Main and Middle Fork Salmon rivers. However, the forest plan will provide direction that guides any amendment or revision of the Frank Church Management plan in the future.

Dispersed Recreation Summary and Conclusions

Since much of the visitation to the Salmon-Challis is based on participation in a dispersed recreation activity, we should manage for these activities, and direction for management of these activities should be provided. Different areas of the Salmon-Challis should be managed to emphasis types of dispersed recreation to ensure viability for these types of opportunities. This is especially true for hunting, which, despite declines in popularity nationally (Gude and others 2012; Shrestha and others 2012), is one of the most popular reasons for visiting the Salmon-Challis.

Developed Recreation Summary and Conclusions

Visiting developed recreation sites on the Salmon-Challis is not as popular on the Salmon-Challis as other dispersed recreation activities, such as hunting, fishing, river float boating and cross-country skiing. However, developed recreation sites often serve as portals to participate in dispersed recreation activities or as a place to camp overnight while visiting the forest to participate in other activities.

While the Salmon-Challis has a few developed recreation sites that are receiving high use, such as the Mount Borah trailhead and the Cache Bar boat launch, there are several underused and poorly-maintained developed recreation sites on the Salmon-Challis. These sites were identified for decommissioning in the 2006 facilities master plan but have not been decommissioned. Due to the age of the facilities master plan and the forest plan revision effort, which will likely establish a certain amount of changed recreation emphasis for different areas of the forest, emphasis on smart-sizing developed recreation sites and their associated infrastructure should be a priority.

Given year-round visitation patterns and seasonal spikes around hunting seasons, matching use with needed developed recreation infrastructure and available funding will help maintain the appropriate number of facilities to higher standards. Other mechanisms for funding maintenance and improvements to developed recreations sites should also be considered. Possible mechanisms include fees, fee increases, and public-private partnerships, including leasing or permitting to outfitters and other organizations who want to preserve facilities and provide public services. We should also consider decommissioning of developed recreation facilities that are underused, causing resource issues, or in poor condition.

Recreation Special Uses Summary and Conclusions

Commercial providers of recreation opportunities on the Salmon-Challis are important, giving people who lack the knowledge or specialized skill or equipment to participate in some of the most popular recreation activities the forest has to offer. Due to the large amount of wilderness, primarily on the Frank Church – River of No Return Wilderness Area, outfitters and guides play a crucial role in providing the public opportunities to access and use the wilderness area. There may be the need to adjust the amount and types of special use authorizations on the Salmon-Challis in the future due to changing demands, trends, new and changing activities, and resource concerns.

Visitors to the Salmon-Challis tend to be older, wealthier and less diverse then visitors to other forests in the region (USFS, 2016a). One of the primary purposes of outfitters and guides and commercial providers of recreation opportunities on national forests is to facilitate the use and enjoyment of the national forests for all people, particularly when these activities require specialized skills, expertise or equipment. Some of the primary activities in which people participate, such as hunting and recreational float boating require specialized equipment, skills and knowledge. Outfitter and guides could help provide opportunities to new forest visitors that are younger and more diverse. The Salmon-Challis should look for ways to make it easier for outfitter and guides to provide these types of opportunities.

Scenery Management

The Salmon-Challis should continue to update to the Scenery Management System and use it in future planning efforts. The scenery of the treasured places and valued landscapes on the forest should be conserved.

Climate Change and Recreation Summary and Conclusions

Considerations for a changing climate should be made when designing and planning recreation facilities and infrastructure in the future. For example, new over-the-snow trails and facilities serving winter recreationists should take into account a warming climate and be built at higher altitudes. Trails, roads, and campground infrastructure should be built expecting drainage features to handle larger amounts of water associated with extreme weather conditions.

TIMBER RESOURCES

The following discussion focuses on the forest vegetation as it relates to timber production goals established by the current forest plans. The current condition of forest vegetation across the Salmon-Challis forest is described in the Terrestrial Ecosystems section.

Information Sources & Needs

The following data sources were used to support the timber discussion presented in this section:

- the forested acres layer in the LANDFIRE database;
- the timber suitability, allowable sale quantity, commercial species topics in the Salmon and Challis forest plans;
- forest products information from the Timber Information Manager database; and
- the 2012 Planning Rule.

Existing Plan Direction

Of the approximately 1.6 million acres of forest outside of designated wilderness areas on the Salmon-Challis, approximately 507,000 acres, or 32 percent, have been identified in the current forest plans as lands suitable for timber production, or where timber production is the emphasis (U.S. Department of Agriculture, Forest Service 1987a). An additional 584,000 acres are identified where timber harvest is allowed. However, timber removal in these areas is consequent to meeting other resource objectives and will not occur unless the removal can be accomplished in a manner compatible with those objectives.

Suitable lands, as identified in a forest plan, constitute the land base for determining the allowable sale quantity and the vegetation management practices associated with regulated and scheduled timber production. Allowable sale quantity is the maximum quantity of timber that may be offered for sale from the area of suitable land for the time period specified in the plan. Allowable sale quantity is generally expressed on an annual basis. Under the current forest plans, an average annual allowable sale quantity has been established at 36,800 hundred cubic feet and 5,300 hundred cubic feet for the Salmon and Challis portions of the forest, respectively.

Existing plans also support other forest products programs in addition to sawtimber sales to meet the demands of local forest communities. Examples of these products include personal-use and commercial fuelwood and other roundwood product sales, like posts and poles. Generally, each plan’s guidance on fuelwood availability and access is related to the level of timber harvest and the amount of roads that remain open for post-timber sale use.

Timber harvest residues are considered valuable fuelwood sources, and the roads related to timber harvest allow access to this wood as well as other suitable material that does not result from harvest activities. Both plans authorize charge and free-use fuelwood areas, and the two plans combined estimate about 10,000 hundred cubic feet of personal-use and commercial fuelwood availability annually.

The Salmon plan stipulates that new road construction will primarily be to access timber harvest areas, declaring up to 500 miles in the first decade may be needed to support harvest activities. All newly-constructed roads will be closed when not actually being used for timber harvest or related timber management activities, except those roads left open for other needs as determined through the National Environmental Policy Act process. The Challis plan stipulates a transportation system to serve both cable and tractor logging areas. However, the Challis plan quantifies miles of new construction on an as needed basis to serve the resource management needs of the forest. Both plans allow for respective travel plans to be developed to address travel restrictions on the forests.

Both plans authorize even-aged and uneven-aged silvicultural systems to be used to manage timber resources. The silvicultural and logging systems used typically depend on stand conditions and economic factors and may require modification to meet specific land management direction. When such modifications are required, they are based on sound ecological and biological principle and should involve the least compromise of sound silvicultural practice possible, consistent with the land-use constraints specified. Issues that generally require the greatest need for modification are those involving wildlife habitat, fisheries habitat, visuals resource management, and soil and watershed management.

The plans stipulate that appropriate insect and disease management strategies be integrated into timber management prescriptions. Both plans promote vegetative diversity and improved growth, health, and vigor of timber stands through timber harvest and silvicultural treatments while maintaining or improving other resource values. All silvicultural practices are supported by a written prescription and approved by a certified silviculturist.

Finally, both plans recognize their respective forest's influence on community stability and culture through outputs from National Forest System lands that are related to timber harvest and fuelwood gathering. Both plans support output levels estimated to accommodate the demand from the identified area of influence.

Scale of Analysis

Assessment of timber resources was conducted at a forestwide scale.

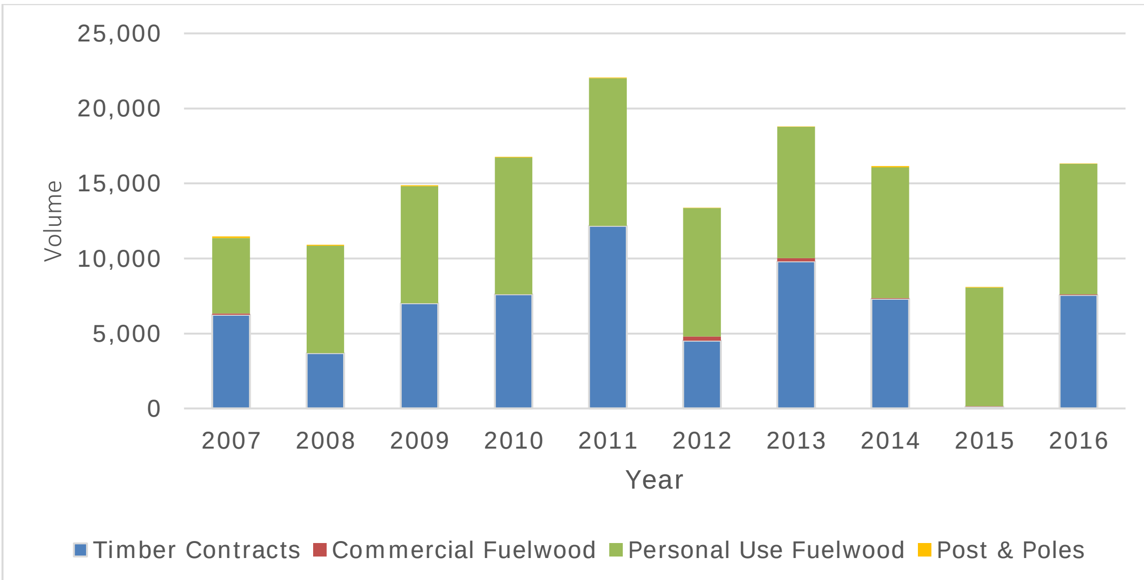
Conditions & Trends

The commercial timber species emphasized for regulated and scheduled timber production on suitable lands within the Salmon-Challis National Forest are Douglas-fir, lodgepole pine, ponderosa pine, Engelmann spruce, and to a lesser extent, subalpine fir. The primary forest products produced from all forested lands on the Salmon-Challis are fuelwood, posts and poles, and sawtimber.

Figure 41 displays the forest volume by product over the period 2007-2016. The total timber program quantity sold, including permits for personal-use fuelwood gathering, averages 14,900 hundred cubic feet over the ten-year period. Technically, fuelwood volume is not creditable towards the Salmon-Challis' calculated allowable sale quantity.

During the ten-year period in Figure 41, both personal-use and commercial fuelwood accounted for about 55 percent of the total volume; however, commercial fuelwood accounts for a very small percentage of the volume. When that is taken into account, the forest has been achieving approximately 16 percent of the established annual allowable sale quantity for the ten-year period.

Figure 41. Volume sold on the Salmon-Challis by product and fiscal year in hundreds of cubic feet



The success of the Salmon-Challis timber program in offering and awarding commercial timber sales since approval of the existing forest plans, has been influenced by many factors including:

- increased haul distance to large milling facilities;
- fluctuating market conditions;
- limited local processing infrastructure;
- limited access due to lack of roads and steep topography;
- relatively low site productivity and wood quality on much of the forest;
- increased resource restrictions; and
- recent trends in wildfire and insect, which are discussed in the Ecosystem Drivers and Stressors section.

When the current forest plans were written, there was substantially more milling capacity within the local communities, and demand supported extraction of sawtimber-sized trees. Beginning in the early to mid-nineties, however, several local mill closures effectively shifted large milling capacity further from the forest boundary. Haul costs are currently prohibitive to traditional timber sale offerings within much of the suitable timber base across the Salmon-Challis. In 2017, the forest advertised four relatively large timber sale offerings that received no bids.

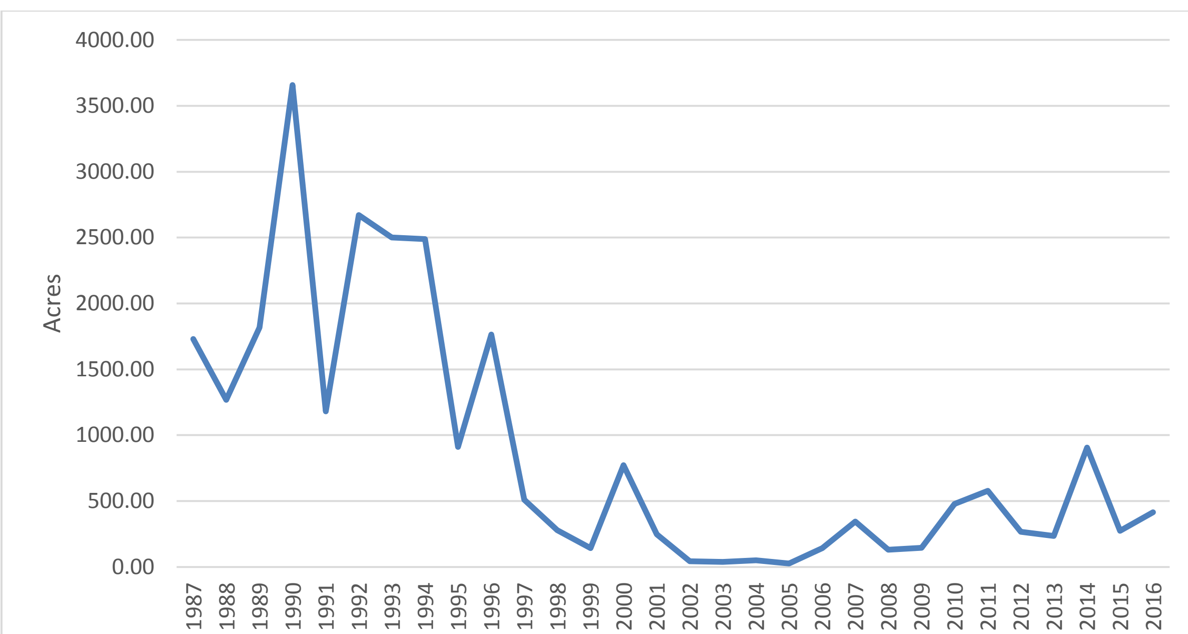
What is left of the local processing infrastructure is primarily configured to handle products other than sawtimber, such as posts and poles and fuelwood. Generally speaking, the capacity of this infrastructure is relatively limited and spread out over numerous small purchasers with varying degrees of investment in logging equipment and personnel. During the planning period, the Salmon-Challis has been relatively successful in adjusting sale location, sale sizes and product mixes to accommodate these two very different scales of production.

According to the existing plans, timber values would cover the costs of road construction necessary to access additional undeveloped areas within the suitable timber base. As distance to sawtimber markets extended with subsequent mill closures, relative timber values have not supported new road construction, and, consequently, there has been no new road construction on the forest since 1999. Large portions of the suitable timber base are still not accessible by road. Consequently, much of the forest's timber program efforts and sale quantity since 1999 have been concentrated where roads already exist.

A number of other issues have impacted timber production on the Salmon-Challis since the current forest plans were published. Several additions to the forest's threatened, endangered and sensitive species lists have had implications for fuelwood gathering and planning timber harvest projects. In 2001, the State of Idaho adopted a roadless rule that has restricted the amount of road building and timber harvest that can occur within designated areas, significant portions of which fall within the suitable timber base. Travel management decisions over the life of the plans have also impacted fuelwood gathering.

Figure 42 displays the trend in acres harvested since the approval of the current forest plans. Additional factors that affect trends in timber harvested from the Salmon-Challis are described in the Social and Economic section of the assessment.

Figure 42. Total Acres Harvested on the Salmon-Challis, 1987-2016



Summary & Conclusion

Timber production is the purposeful growing, tending, harvesting and regeneration of regulated crops of trees. Timber production activities can contribute to social, economic, and ecological sustainability. Timber production may offset some or all of the costs of silvicultural treatments and other forest management activities that:

- restore ecosystems to desired conditions,
- lower uncharacteristic fire and insect risk,
- increase understory plant diversity and abundance, and
- create cultural and employment opportunities.

Achievement of these goals is contingent upon many factors, including appropriated level of funding, national and local economic factors, and the dynamic natural and physical factors at work on the Salmon-Challis.

The National Forest Management Act requires that we determine the suitability of National Forest System lands for timber production and lists specific requirements for timber suitability analysis in land management planning. Timber requirements are further addressed in the 2012 Planning Rule. Scheduling of regulated timber harvest will be addressed in the National Environmental Policy Act analysis phase of the Salmon-Challis plan revision effort, including the calculation of an updated sustained yield limit, projected timber sale quantity, and the projected wood sale quantity.

Additional concerns related to the timber resource on the Salmon-Challis include:

- thoughtful and contemporary plan guidance concerning fuelwood availability and access in light of the deteriorating forest condition due to insects, disease and wildfire; and
- consistent guidance and expectation on new road construction as it relates to the resource management needs of the forest.

MINERALS & ENERGY RESOURCES

Minerals and energy resources are heavily influenced by:

- national and global economics;
- national, international and local politics;
- environmental policies;
- public perspectives of environmental impacts;
- cultural shifts toward laws and legal decisions; and
- national and international supply and demand for natural resources.

Commodity prices and the changing needs or desires of societies to produce and use mineral and energy resources also impact mining activities on the Salmon-Challis National Forest.

Information Sources & Needs

Mineral and energy resources are governed by mining laws, the Code of Federal Regulations, and Forest Service policy.

Additional information is necessary to provide a clearer picture of mineral and energy resources. Updated geographic data layers for known and potential locatable, leasable, and mineral material activities would be helpful. If demand for Federal mineral resources increases, supporting data related to surface resources may be necessary to document effects of exploration, development, and production activities. Information about public use of and amount of degradation to geologic areas of interest would also be useful. An increased knowledge about possible human health and safety implications resulting from geologic hazards could be considered.

Existing Plan Direction

The existing management plans are generally sufficient for locatable and leasable minerals and for addressing concerns about plans of operation. The Code of Federal Regulations, Title 36 Chapter II, Part 228, govern these concerns well.

Unified minerals and energy management direction would be beneficial for:

- locatable minerals, such as hardrock and placer;
- leasable minerals, such as conventional oil and gas, and coalbed methane;
- mineral material resources;
- personal-use materials collection, such as landscaping cobbles and petrified wood;
- renewable energy resources and related transmission corridors; and
- existing and potential Superfund sites related to past mineral and energy production activities.

The existing plans do not address geologic areas of interest, particularly cave, karst, and fossil resources. The plans also lack direction for geologic hazards, such as hazardous minerals, mass wasting, radon, and abandoned mine sites.

Scale of Analysis

Analysis for mineral and energy resources was completed on a forestwide scale.

Conditions & Trends

The Salmon-Challis National Forest lies within the Northern Rocky Mountain physiographic province. The landscape encompasses typical basin, mountain, and valley geography and contains rocks representing a large span of geologic time.

Minerals typically mined on the Salmon-Challis include gold, copper, lead, molybdenum and cobalt. The forest also features a wide range of secondary and gangue minerals, as well as thorium and rare earth minerals. Cobalt and rare earth minerals occur in large deposits and are on the draft list of 35 minerals deemed critical to U.S. national security and the economy. Secondary and gangue minerals on the draft list of critical minerals include barite, fluorspar, titanium, tungsten and uranium. Other critical minerals may occur in trace or unknown amounts.

Approximately 61 percent of the Salmon-Challis National Forest should be considered available for mineral and energy exploration. Approximately 39 percent is subject to constraints imposed by mineral rights, withdrawals, and constrained acres. Constrained acres include areas with power lines, surface rights, Weeks Law status, and designated wilderness.

Approximately 2.6 million acres of the Salmon-Challis are open to the general public for mineral entry. Of this available acreage, approximately 1.4 percent is actively claimed, and approximately 1/100th of a percent is undergoing active mineral operations.

Renewable Energy Resources and Trends

Aside from intermittent interest in geothermal resources, leasable and renewable energy resources are not known or present on the Salmon-Challis to an extent that warrants exploration or development.

Availability of apt resources is the primary driver affecting renewable energy activity in the planning area. The planning area does not have abundant potential for suitable renewable resources compared to other national forests (U.S. Department of Energy and U.S. Department of Agriculture 2005; Zvolanek and others 2013) due to exclusion factors such as Idaho Roadless Areas, Wilderness, National Historic Trails, Wild and Scenic Rivers, topographic slope, forested land, and proximity to infrastructure such as transmission lines.

Nonrenewable Energy and Mineral Resources

Locatable Minerals

Historical placer prospecting and exploration activities are abundant and have occurred across the planning area. Recent interest in placer exploration has been taking place within the Napias Creek, Moose Creek, Panther Creek, Hughes Creek, Sheep Creek, Alder Creek, and Yankee Fork of the Salmon River areas.

The Salmon-Challis currently has two permitted large-scale hard rock mining enterprises:

- Idaho Cobalt Project, a cobalt mining operation with ample reserves of cobalt for around 12 years of production; and
- Thompson Creek Mine, a molybdenum mining operation.

Several large mines performing reclamation include:

- Grouse Creek, a gold mine;
- Blackbird, a cobalt and copper mining operation; and
- Beartrack, a gold mine.

Locatable metals, such as gold, cobalt, thorium, and rare earth deposits, have potential for long-term production on the Salmon-Challis.

Casual collection activities and hobbyist-level operations are widespread and increasing in number.

Nonrenewable Energy Resources

Non-renewable energy resources are not present on the Salmon-Challis National Forest to an extent that warrant exploration or development.

Non-energy Leasable Minerals

Non-energy leasable minerals include phosphate, potassium, sodium, sulfur, Gilsonite, asphalt, and hard rock minerals on acquired lands where the subsurface is owned by the Federal Government. Non-energy leasable minerals are not present on the Salmon-Challis National Forest to an extent that warrants exploration or development.

Mineral Materials

The Salmon-Challis has approximately 100 mineral material sources that are commonly used for surfacing, riprap, and crushing material. Use and demand for mineral materials will likely increase over the life of a new forest plan.

Currently, the Salmon-Challis does not have an active mineral material pit management plan. A revised forest plan could provide consideration for identification and use of mineral material resources.

Geologic Areas of Interest

The Salmon-Challis has an active inventory, monitoring program and significance determinations of four known caves, which are managed under the Federal Cave Resources Protection Act. Vandalism occurred at two of these caves. Existing forest plan-level standards, guidelines, and other management direction do not address cave and karst resources.

There are approximately 28 hot springs within the planning area but no geothermal sites. Most of these sites are located in the Wilderness and some are used for recreation.

The Salmon-Challis National Forest also contains common fossil resources, managed under Title 36 Code of Federal Regulations, Part 291. The amount of collection and extent of these resources are currently not well known or delineated.

The agency's ability to manage and conserve the geologic and scientific integrity of these features will largely be influenced by availability of staff and funding.

Geologic Hazards

There is a lack of management direction in the current forest plans pertaining to geologic hazards. Major geologic hazards that occur on our forest include:

- landslides,
- rock falls,
- mud flows,
- debris flows,
- snow avalanches,
- earthquakes,
- karst collapse,
- volcanoes,
- flooding,
- acid-producing rock,
- subsidence,
- naturally-occurring gases and minerals,
- asbestos–like minerals, and
- radioactive elements.

Landslides

Landslides occur throughout the planning area. Debris flow guidance and monitoring of these features could be considered in areas where they may affect developments, private investments, or high-use recreation areas.

Abandoned Mines and Superfund Sites

The Salmon-Challis National Forest contains numerous abandoned mine sites, most of which are decommissioned. These areas are distributed across the forest. Superfund sites are also located on the Salmon-Challis. Continued site restoration efforts, monitoring, maintenance, and inventories would be required to ensure public safety.

Hazardous Minerals

Currently, neither existing plan provides management direction related to asbestos-like minerals or uranium exposure. Of particular concern could be the risk to human health from radioactive material becoming airborne as a result of wildfires. Though trace occurrences of asbestos-like minerals may be present on the Salmon-Challis, there are no officially documented occurrences. Future ground-disturbing management actions could consider the risk of hazardous minerals and the implications to public use and visitation.

Radon

Lemhi and Custer counties, including some Forest Service structures and facilities, have documented cases of radon levels exceeding the Environmental Protection Agency's accepted level. Standards, guidelines, and practices in the new plan would help ensure human health and safety concerns related to radon exposure are addressed.

Summary & Conclusions

Generally, management direction provided in both the original Salmon and Challis forest plans are sufficient. Existing direction for mineral resources, like locatables, are redundant to existing law, regulation, and policy. Some plan components in the existing plans are inappropriately identified. Other important geological or mineral considerations, such as geologic hazards and resources, are not included and may be worth considering.

Despite potential for improvements, existing management direction has been adequate to preclude or eliminate large-scale unacceptable resource effects while providing mineral resource opportunities.

Figure 43. Ground Disturbance Following a Trenching Project at Sage Creek in August 2016

Figure 44. Restoration Work Recently Completed at the Project Site in June 2018

INFRASTRUCTURE

In this section we identify the location and condition of infrastructure within the plan area, the trends and issues associated with infrastructure, and opportunities for improvement in our management.

INFORMATION SOURCES & NEEDS

Sources used for this section include:

- Forest Service Natural Resource Manager business applications and infrastructure database for roads, trails, bridges, buildings, dams, roads, wastewater systems, and water systems;
- National Forest System roads and trails geographic information systems data layers from the Salmon-Challis's current Motor Vehicle Use Map from the Forest Service Enterprise Data website;
- spatial information from Salmon River Electric Coop and Idaho Power;
- the Salmon-Challis Facilities Master Plan 2007; and
- the September 2009 travel management plan;
- the August 2014 travel management plan record of decision; and
- the 2005 Forest Service travel management rule.

EXISTING PLAN DIRECTION

National Forest System Roads and Trails

Existing plan direction emphasizes a roads and trails management program that provides for a safe, functional and environmentally sound transportation system and that serves the resource management needs of the Salmon-Challis.

Roads, road bridges, and trails plan objectives specify the inventory, planning, and design of the system; construction standards; and acquisition of rights-of-way.

Lack of funds and capacity hinder the ability to perform maintenance and reconstruction of roads and trails on the Salmon-Challis. Travel system plan standards and guidelines that protect water and other natural resources may need review and enhancement.

Roads

Road-specific direction includes identifying, treating, and closing roads not needed, entering into advantageous road maintenance agreements as opportunities arise, and maintaining the visual quality of the highway viewing corridors.

Direction specifies route corridor density limits in certain management areas. Plan objectives to construct and reconstruct specified mileages of roads and trails over specified time periods need to be revisited.

An overarching objective for the Salmon National Forest's transportation system is that planning and design would be determined by needs, and new road construction will primarily be for timber harvest areas. As timber harvest on forest curtailed, so did the need for new road construction.

Many factors compounded to arrive at the current situation. Distances to milling infrastructure increased in the 1990s. As hauling distances increased, the value of the timber could not support new road construction for access, so the focus of harvest activities shifted to areas with existing roads.

The Salmon forest plan's objective for new road construction is also outdated in light of the 2005 Forest Service travel management rule and the Salmon-Challis's subsequent travel management plan, which was last signed in 2014. The travel management rule emphasizes a system of designated open roads with access prohibited off the designated system. This represented a culture shift from the previous "open unless closed" system.

Further direction in Subpart A of the Forest Service travel management rule required the identification of a minimum road system that:

- met resource and management needs;
- reflected long-term funding expectations; and
- minimized adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance.

Subpart A also required the identification of unneeded roads to be decommissioned or considered for other uses, such as trails. Nationwide, the Forest Service was directed to focus on management and sustainability of the road system by assuring roads could be maintain within budget constraints and were in locations only where necessary to meet administration and access needs.

Trails

The current Salmon and Challis Forest Plans provide little trail-based direction. The forest is to provide for a range of trail opportunities in coordination with other Federal, State and municipal jurisdictions and private industries, using existing roads for trails where feasible.

Administrative Facilities

Because of the remote nature of the Salmon-Challis, personnel established many administrative sites from which they could access the land and manage resources. The Civilian Conservation Corps constructed many of the existing facilities in the 1930s (Wilson 2011). These structures are cultural resource sites and are being or have been evaluated for inclusion in the National Register of Historic Places.

Administrative facilities on the Salmon-Challis require considerable time and money for operation and maintenance, and there has been large past investment in this infrastructure to efficiently administer the Forest (Forest Service U.S. Department of Agriculture 1987b). Many administrative sites on this Salmon-Challis are old and have outlived their intended life. The current forest plans cited the need for an aggressive program of replacement, maintenance, or disposal. That need has only grown since the late 1980s. Addressing the need is severely hindered by lack of funding and capacity.

The existing forest plans also contained goals and objectives to:

- maintain and implement a facilities maintenance plan for the economic and efficient administration of the forest;
- construct, maintain, and manage facilities to meet the needs of resource management activities;
- replace substandard facilities and ensure that new site plans or redesigns of existing facilities include provisions for Americans with Disabilities Act accessibility;
- develop site plans and evaluate for potential developed recreation facilities, and trailhead facilities at popular locations on the Salmon-Challis; and
- identify and mitigate visually unacceptable conditions of facilities as opportunities arise.

Direction associated with construction or reconstruction of facilities should incorporate sustainable design principals and consider the visual impact of the structure to the surrounding natural and build environment.

SCALE OF ANALYSIS

The scale of this analysis is forestwide. Our analysis considers federally-managed infrastructure within the Salmon-Challis's administrative boundary.

CONDITION & TRENDS

National Forest System Roads and Trails

There are approximately 3,714 miles of National Forest System roads within the Salmon-Challis National Forest administrative boundary. National Forest System roads and trails are those the Forest Service determines are necessary for the protection, administration, and use of forest resources. Operation maintenance levels define the degree to which a National Forest System road is maintained.

Maintenance Level 1 – Basic Custodial Care

These roads are in storage. This level includes roads that are closed to all over the ground vehicular traffic for periods of greater than one year. These roads may have stream crossing structures removed and other storage stabilization methods applied. There are currently 1,211 miles of closed road on the forest.

Maintenance Level 2 – High-Clearance Vehicles

This level is assigned to roads open for use by high-clearance vehicles. The majority of the forest roads, approximately 2,105 miles, are in this maintenance level.

Maintenance Level 3 – Suitable for Passenger Cars

This level is assigned to roads open for and maintained for travel by a prudent driver in a standard passenger car. This maintenance level cover 354 miles of road on the Salmon-Challis.

Maintenance Level 4 – Moderate degree of user comfort

The level is assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Total miles of roads maintained at this level on-forest total 42.

Maintenance Level 5 – High degree of user comfort

This level is assigned to roads that provide a high degree of user comfort and convenience. The roads in this category are short segments accessing campgrounds, rest-stops, or other such sites and total less than 2 miles on the entire forest.

The travel plan, officially known as the Record of Decision Travel Planning and Off-Highway Vehicle Route Designation for the Salmon-Challis National Forest, was last updated with a revised record of decision in 2014. While our plan revision effort may inform future travel management decisions, the new plan will not be replacing any existing travel designations.

The current Motor Vehicle Use Map displays the roads and trails that are open to the public. Motor vehicle use off the designated system is prohibited. Motor Vehicle Use Maps are updated annually or as necessary.

Trends, Issues, and Opportunities with Roads:

The Salmon-Challis roads budget has trended downward. In 2001, the budget was roughly $1.5 million. In 2016, it was $700,000. Between 2001 and 2016, road maintenance and reconstruction costs doubled.

Most reconstruction is heavy road maintenance. The last new system road on the Salmon-Challis, excluding temporary road construction, was a road spur constructed in 1999 in support of logging operations. Temporary roads only support a specific project and are then decommissioned.

A large percentage of the Salmon-Challis's roads budget goes to maintenance on the Boundary Creek and Salmon River Roads. Other roads suffer from lack of maintenance as the funds are directed to maintain these two high-use roads.

Road Bridges

There are 123 road bridges on the Salmon-Challis.

Trends, Issues, Opportunities, and Successes with Road Bridges:

On average, forest bridges are 40-50 years old. Since the estimated lifespan of our bridges is 50 years, we anticipate the need to replace bridges in the immediate future.

Forest bridges must be inspected every 24 months. This is a significant workload that must be completed when water levels are low.

The Custer Motorway and Yankee Fork Road restoration and bridge improvement project was selected as a capital improvement project by the Idaho Federal Lands Access Program this year. Upon completion of the project, the road and bridges will transfer to Custer County. These types of programs have helped the Salmon-Challis complete vital road maintenance while improving community access and reducing National Forest System road inventory.

Administrative Facilities

There are over 500 facilities on the Salmon-Challis National Forest, including:

- offices,
- lookout towers,
- barracks and bunk houses,
- storage sheds and garages,
- pit and vault toilets,
- pavilions,
- tool storage buildings,
- barns,
- pump-houses,
- cabins,
- washhouses,
- kitchens, and
- communication systems storage.

Trends, Issues, Opportunities, and Successes with Facilities:

Historically, the Salmon-Challis established large numbers of administrative facilities to provide bases of operations and access for personnel in rugged and remote areas of the forest (Wilson 2011). These same factors complicate evaluating for historic significance, reconstructing, maintaining, and disposing of the facilities.

The number of buildings on the Salmon-Challis exceeds our administrative support needs, and we lack funding to maintain them all. Some of these structures are no longer used or are not structurally sound, but the unknown historical significance of these structures prevents us from decommissioning them.

We are in the process of updating our facilities master plan. Once the plan update is complete, we will start the preliminary project analysis process, during which we will determine the future of each unnecessary building. These structures may be repurposed, occupied by Salmon-Challis partners, sold exclusive of the land beneath them, or demolished. Unnecessary bunkhouses at former administrative sites may be converted into campgrounds for recreation vehicles. The State of Idaho may be able to help us fund this increase in recreational vehicle opportunities on the Salmon-Challis.

Among other things, the preliminary project analysis process includes as assessment of the cultural and historic value of each building and site. This information will help inform the final disposition of the buildings. The biggest challenge in this process will be obtaining funding to complete the process and implement the final disposition actions.

The Salmon-Challis currently occupies more office space than it is allowed by new regulations. Compliance with the new standard could have unintended consequences for the communities in which the forest leases its buildings.

The Salmon-Challis competed nationally to obtain funding for new bunkhouses in Challis and was awarded Forest Service capital improvement funds for the project. Construction is underway.

The Lost River Ranger District Office in Mackay was recently remodeled with Intermountain Region funds dedicated for energy-efficient projects.

Dams

There are eight dams on the forest. These are privately owned and operated irrigation impoundments to stabilize water flow. All of the dams operate under special use authorization and permits.

Powerline Corridors

Approximately 135 miles of power transmission lines cross the Salmon-Challis National Forest through all five ranger districts. The forest special uses database tracks transmission lines that supply forest administrative sites and facilities, such as:

- the Jessie Creek administrative site,
- the former Moyer Creek housing on the Salmon-Colbalt District,
- the Antelope administrative site on Lost River Ranger District,
- powerlines to designated communications sites, and
- current and former mining sites, such as the Blackbird and Cobalt mines.

Several underground powerlines are included in this overall total crossing Salmon-Challis lands, including:

- the Leadore to Grizzly Hill line,
- the powerline to North Baldy communications site, and
- the powerline to Lake Mountain buried in the right-of-way of Lake Creek road, route 60028.

SUMMARY AND CONCLUSIONS

The current plan direction for forest infrastructure is adequate overall. The main impediment to the amount of road, trail, and facility maintenance, reconstruction, and rehabilitation described in the current plan is less funding and less capacity.

The 2005 Forest Service Travel Management Rule changed our approach to designation of roads, trails, and areas open to motor vehicle use, including the use of off-highway vehicles. The rule shifted agency focus from an “open unless closed” to a sustainable, necessary road system that prohibited the use of motor vehicles off the designated system. Foreseeable future road construction will be to replace or move a road to a location accessing the forest and to minimize adverse environmental impacts accompanied with decommissioning the former routes.

The Salmon-Challis’s facilities management master plan, last published in 2007, is currently being updated. The forest is developing recommendations for individual buildings as part of the master plan update. The process of updating the facilities master plan includes ensuring it supports a revised forest plan.

LAND STATUS

This section describes the land status, ownership, use, and access patterns affecting the Salmon-Challis National Forest. The Salmon-Challis, located in one of the most remote areas of the lower-48 states, is comprised of large contiguous tracts of National Forest System lands. Totaling 4.4 million acres, the forest has less than 1 percent of other ownerships interspersed within the administrative boundary. The forested mountain lands and high desert sagebrush plateau that comprise the forest lay mostly within Lemhi and Custer Counties, with some of the Frank Church – River of No Return Wilderness extending into Valley County. Another 15 percent of acreage lies within Butte County, Idaho.

INFORMATION SOURCES & NEEDS

Sources used for this section include:

- the Automated Lands Program, an information management program that digitally tracks all Forest Service land status and survey data;
- Land and Resource Management Plan for the Salmon National Forest 1988;
- Salmon Forest Plan Amendments;
- Land Resource Management Plan for the Challis National Forest 1987;
- Challis Forest Plan Amendments;
- the Forest Service’s Land Management Planning Handbook;
- the Congressional Research Service’s Federal Land Ownership: Acquisition and Disposal Authorities; and
- the Forest Service’s Special Uses – Applying for a Permit website.

Several geographic information system data layers from the Forest Service Enterprise Data website were also used:

- Administrative Forest Boundaries,
- Ranger District Boundaries,
- National Forest Lands with Nationally-Designated Management or Use Limitations,
- National Forest System Land Units,
- National Wilderness Areas,
- Special Interest Management Areas, and
- Surface Ownership Parcels.

EXISTING PLAN DIRECTION

Land ownership and land status are the basic pattern of public and private ownership, both surface and subsurface, and legal restrictions and permissions on the use of the lands (U.S. Department of Agriculture, Forest Service 2015b).

The 1987 Challis forest plan states, "The ownership pattern is predominantly National Forest System lands with no isolated lands identified for disposal. The forest's ability to produce goods and services is unrestricted by current ownership patterns."

The plan prioritizes acquisition of lands within designated areas, such as in wilderness. Other priorities listed for land acquisition are for lands needed to:

- protect wetlands and floodplains,
- protect threatened and endangered species habitat,
- protect highly sensitive big-game habitat,
- protect cultural resources or provide developed recreational facilities,
- resolve public access needs to the forest,
- protect municipal watersheds, and
- consolidate forest lands through transfer, exchange, acquisition, donation, and disposal to provide for the most economical and logical land management units.

The Challis plan states that lack of access is a problem in some areas. Without specifying exactly where, the plan notes that easements on 60 existing roads and trails are needed. Ensuring for general public access and wilderness access, including across private inholdings and on roads and trails, are goals and objectives in the Challis forest plan, along with obtaining rights-of-way for public access.

The 1988 Salmon National Forest plan noted several impacts of the current land ownership pattern. In cases of private lands situated in canyon bottoms, administrative and public use of the forest lands located upstream may be restricted depending on landowners and existing agreements. In some cases, private owners trespass across landlines and build structures on forest land. An increase in areas of interior lands being approved and developed for recreational subdivision resulted in an increase in road use and maintenance. Requests for "support type" special use permits for use of areas adjacent to forest lands increased along with these subdivisions.

On the flipside the Salmon Forest Plan noted that over 98 percent of the land area within the administered forest boundary is National Forest System lands.

Overarching Salmon Forest Plan direction for lands was to:

- achieve an optimum land ownership pattern to provide for resource uses and to meet the needs of the public now and in the future;
- acquire rights-of-way, easements, or other agreements needed to provide for use and protection of forest resources;
- be responsive to public and private needs for uses; and
- authorize occupancy by special use permit when determined to be in the public's interest.

The 1988 Salmon forest plan estimated 270 road or trail rights-of-way easements to be acquired and further specified that the forest had a need to acquire access for roads or trails leading to forest lands in the Beaverhead and Lemhi Ranges.

SCALE OF ANALYSIS

The scale of this analysis is forestwide and only considers lands within or intersecting the Salmon-Challis's administrative boundary.

CONDITIONS & TRENDS

Distinct mountain ranges are geographically divided by the Main Salmon River and other river valleys, lands managed by the Bureau of Land Management, and state- and privately-owned lands. The Salmon-Challis contains parts of four of the highest mountain ranges in Idaho, the Pioneer, Lemhi, Lost River and Beaverhead mountain ranges. At 12,662 feet in elevation, the State's highest peak, Mount Borah, can be found on the Lost River Ranger District.

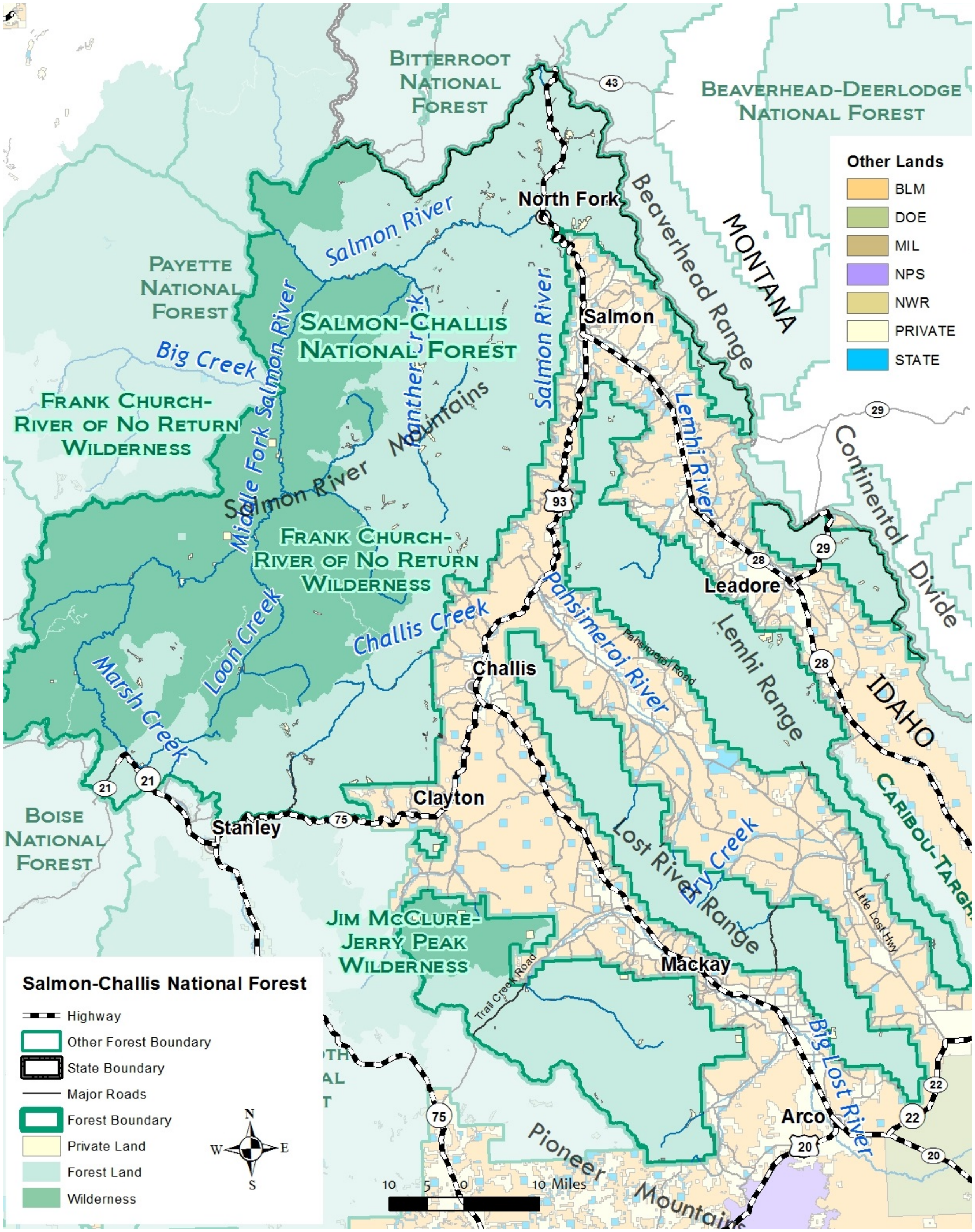
Within the administrative boundary, there are approximately 41,000 acres of non-forested lands, amounting to less than 1 percent of our total forest acreage. Of these non-forested lands, 7,400 acres is managed by the State of Idaho, and the remainder is privately-owned.

The Salmon-Challis comprises six ranger districts: North Fork, Salmon-Cobalt, Leadore, Challis-Yankee Fork, Middle Fork and Lost River. The Beaverhead Mountains of the Bitterroot Range make up the eastern edge of the North Fork and Leadore Ranger Districts and form the Continental Divide, which is also the state line between Montana and Idaho. The Lemhi Range, with Diamond Peak, the fourth highest peak in Idaho at 12,202 feet in elevation, forms the backbone of the Leadore Ranger District and lies between the Lemhi and Pahsimeroi River valleys. The Salmon-Cobalt and Middle Fork Ranger Districts contain some of the Salmon River Mountains and the Middle Fork of the Salmon River. The Lost River Ranger District comprises the Lost River Mountain Range, the Sawtooth Mountains, and a bit of the northern end of the Pioneer Mountains.

The Salmon-Challis is bordered by other national forest lands and wilderness on all sides except the interior river valleys and the southern edge of the Lost River Ranger District. Within the interior river valleys, much of the adjacent forest land is administered by the Bureau of Land Management, buffering the Salmon-Challis from zoning and development changes that could otherwise occur. The Frank Church–River of No Return Wilderness continues west and north of the forest boundary, and the new Jim McClure–Jerry Peak Wilderness is both within and on the southwest border of the forest. The Payette, Bitterroot, Beaverhead-Deerlodge, Caribou-Targhee, Sawtooth, and Boise National Forests make up the remaining adjoining forest lands.

Disposal authority of the Forest Service allows the conveyance of land no longer needed for a federal purpose or that might be chiefly valuable for another purpose (Congressional Research Congressional Research Service 2016). Salmon-Challis records maintained within the Automated Lands Program indicate that approximately 1,000 acres on forest have been disposed of since the existing forest plans took effect in 1987 and 1988. These dispositions have been in the immediate vicinity of private and other ownerships or associated with ongoing mining activity within and nearby the Salmon-Challis. During that same timeframe, the Salmon-Challis acquired a similar amount of land within the wilderness and along the Middle Fork wild and scenic river corridor.

Figure 45. Salmon-Challis National Forest, Adjoining Lands and Wilderness



Public access is a long-running concern across the National Forest System. While the current plans cite specific numbers to acquire, the land ownership pattern on the Salmon-Challis is large contiguous tracts of federally-managed land.

Land ownership changes often necessitate the pursuit of easements for private access. While Salmon-Challis staff are unaware of any potential changes at this time, securing this access is important in preparing for changes in land use status on surrounding lands. Approximately 28 road easements and several trail easements on the forest system were secured between 1987 and 2000 to improve access throughout the Salmon-Challis National Forest.

Due to the rugged terrain and the remote nature of the Salmon-Challis, access is limited to vast portions of the forest. Motorized vehicle bans in designated areas further limit access (Wilson 2011). The Main Salmon River is accessible by motorboat, as it is an allowed existing use in the Central Idaho Wilderness Act (1980).

Aircraft usage on the Salmon-Challis has increased over the past three decades. There are four Forest Service-maintained landing strips that are open to the public: Bernard, Indian Creek, Upper Loon Creek, and Mahoney Creek. These airstrips provide access to wilderness and the Middle Fork of the Salmon wild and scenic river corridor. More privately-owned and operated airstrips exist on inholdings within the wilderness and within the Salmon-Challis administrative boundary.

Figure 46. Motorized equipment is not allowed in the Frank Church – River of No Return Wilderness, so Lead Wilderness Ranger Raina Phillips and Wilderness Manager Jay Sammer, both of the Middle Fork Ranger District, perform maintenance on the Indian Creek Airstrip.

Helicopters are used for administrative purposes and fire operations. With the advent of the helicopter rappel program around 1995, the need for maintained helicopter spots on the Salmon-Challis diminished. In addition to the two helicopter bases in Salmon and Challis, three locations within the forest are regularly used for helicopter operations.

State highway 28 and US highway 93 provide access to a network of forest roads and trails, offering visitors a way to access forest lands. More information about the forest roads and trails is contained in the Recreation and Infrastructure sections.

Special Uses

The special uses program authorizes public occupancy, use, rights, or privileges on National Forest System lands while protecting natural resource values. A special use authorization is a legal document, such as a permit, term permit, or easement that is granted for a specific use and a specific period of time (Forest Service U.S. Department of Agriculture 2013).

This section focuses on non-recreation special uses. Information about recreation special uses can be found in the Recreation Special Use Permits section.

Approximately 300 non-recreation special use permits/authorizations are currently administered by the forest. Permits are issued for a variety of reasons, including, but not limited to:

- research study;
- utilities, such as electric transmission & distribution;
- easements;
- communications, such as broadcast radio, cellular, monitoring sites, fiber optical cable;
- water transmission and irrigation; and
- commercial filming and photography.

Issuance of special use permits and authorizations has remained relatively consistent since the 1980s. The bulk of the authorizations are for water transmission and irrigation. Most of the water transmission and irrigation permits are current and have been evaluated in accordance with the permitting process relative to potential impacts to anadromous fisheries.

We have seen a marked increase in demand for commercial filming and photography permits over the past 10 years.

Demand for communications permits has increased steadily since the 1980s. There is increased emphasis to group compatible communications uses at designated sites whenever possible. Forest plan direction on communications uses will help facilitate the orderly development of communication sites on the Salmon-Challis.

The Forest is phasing out some uses under permit, such as isolated cabins and convenience exclosures and enclosures.

SUMMARY & CONCLUSIONS

Very little acquisition and disposal of lands has occurred and few rights-of-way secured between the 1980s and present. The current plans indicate many more remain to be acquired. This need should be revisited during forest plan revision as demand and public access needs don't indicate the need to pursue any specific number of rights-of-way at this time.

The Salmon-Challis is fortunate to have a land ownership pattern that consists of large contiguous tracts. The Salmon plan further specified the need to acquire access for roads or trails leading to National Forest System lands in the Beaverhead and Lemhi Ranges. This potential need should be further evaluated.

The Salmon-Challis is somewhat buffered from possible future zoning and development changes because it is largely surrounded by federally-managed lands and designated wilderness.

While the amount of special uses permitted on the forest has remained the same, the forest has seen an increase in demand for communications, commercial filming and photography permits. Forest plan direction that emphasizes grouping compatible communications permits and equipment at designated sites will help facilitate orderly development of communication sites on the forest.

DESIGNATED AREAS

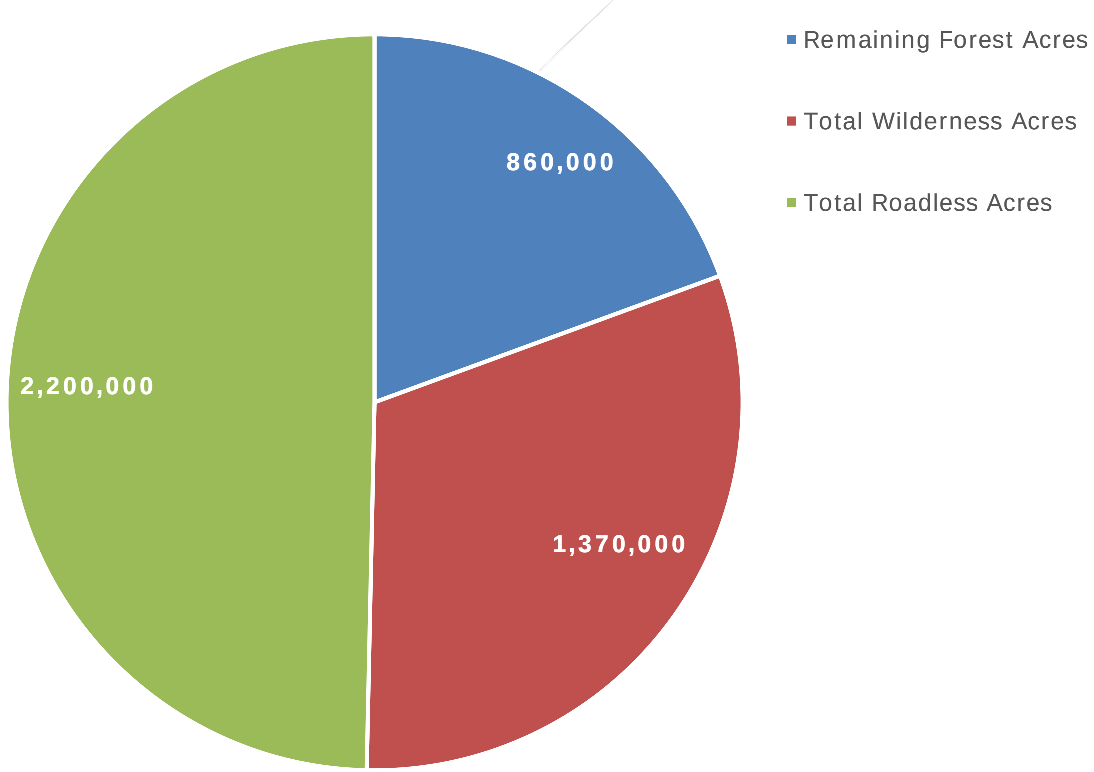
A designated area is an area or feature identified and managed to maintain its unique special character or purpose. Forest lands can be designated:

- by statute,
- by administrative action during the land management process, or
- by other administrative processes of the Federal executive branch.

Examples of statutorily designated areas are national heritage areas, national recreational areas, national scenic trails, wild and scenic rivers, wilderness areas, and wilderness study areas. Examples of administratively designated areas are experimental forests, research natural areas, scenic byways, botanical areas, and significant caves.

Largely unchanged from when the Lewis and Clark Expedition passed through the area two centuries ago, 80 percent of the Salmon-Challis National Forest is comprised of wilderness areas, lands covered by the Idaho Roadless Rule, and other designated lands. The forest also contains two premier undammed whitewater river corridors that are designated as wild and scenic rivers: the Main and Middle Forks of the Salmon River. This section describes the many types of designated areas, trails, and byways within or intersecting the Salmon-Challis.

Figure 47. Chart of Forest Acreage by Roadless Areas, Wilderness, and Remaining Forest



INFORMATION SOURCES & NEEDS

Sources used for this section include:

- Central Idaho Wilderness Act of 1980;
- The Sawtooth National Recreation Area and Jerry Peak Wilderness Additions Act;
- Jim-McClure Jerry Peak Environmental Assessment and Draft Wilderness Plan;
- The Frank Church-River of No Return Wilderness Management Plan;
- The Wild and Scenic Rivers Act of 1968;
- National Trails System Act of 1968;
- The 2009 Continental Divide National Scenic Trail Comprehensive Plan;
- The 1990 Nez Perce National Historic Trail Management Plan;
- Idaho Roadless Rule, 36 CFR 294;
- National Scenic Byways;
- America's Scenic Byways: Idaho;
- Land and Resource Management Plan for the Salmon National Forest 1988;
- Salmon Forest Plan Amendments;
- Land Resource Management Plan for the Challis National Forest 1987;
- Challis Forest Plan Amendments;
- the Forest Service's Land Management Planning Handbook;
- The 1982 Salmon Wild & Scenic River Management Plan;
- Lemhi Pass National Historic Landmark Management Plan and Salmon National Forest Land and Resource Management Plan Amendment #8.
- A User's Guide Frank Church – River of No Return Wilderness;
- Salmon-Challis National Forest Wild and Scenic Rivers Eligibility Study and Report Draft Eligibility Report;
- 50 CFR Part 222, Endangered and Threatened Species; Endangered Status for the Snake River Sockeye Salmon;
- 50 CFR Part 227, Endangered and Threatened Species; Threatened Status for Snake River Spring/Summer and Fall Chinook Salmon;
- 50 CFR Part 17, Endangered and Threatened Wildlife Plants; Designation of Critical Habitat for the Bull Trout; Final Rule;
- the Salmon-Challis National Forest Wild and Scenic River Evaluation Story map; and
- the Idaho Roadless Rule Areas within the Salmon-Challis National Forest Storymap.

Several geographic information system data layers from the Forest Service Enterprise Data website were also used:

- Administrative Forest Boundaries,
- Ranger District Boundaries,
- National Forest Lands with Nationally Designated Management or Use Limitations,
- National Forest System Land Units,
- National Wild and Scenic River Lines,
- National Wilderness Areas,
- Special Interest Management Areas,
- Surface Ownership Parcels, and
- Roadless Areas: Idaho Roadless Rule.

Little or no data exists to identify whether additional designated areas, specifically those other than designated wilderness, are needed on the Salmon-Challis National Forest. The forest is currently working through the process of inventorying and evaluating potential additional wilderness and the results of that evaluation are not yet available.

EXISTING PLAN DIRECTION

Existing plan direction on wilderness and wild and scenic rivers addresses already designated areas and proposed wilderness and eligible wild and scenic river corridors. Designated areas are managed in accordance with their management plans and enabling legislation. Specific direction addresses the management of proposed wilderness and eligible wild and scenic rivers to protect and retain the wilderness characteristics, free-flowing nature, ecological integrity, and outstanding resource values of these areas. Some direction on how to manage prescribed fire and natural ignitions occurring near or within these areas is also included.

Additional areas are proposed for wilderness in the existing plans, as well as a potential National Natural Landmark and National Recreation Trails. Existing plan direction for potential and recommended designated areas on the forest seems generally adequate and provides for protection and retention of the remarkable qualities of the areas.

The Salmon-Challis contains all or part of 57 roadless areas designated in the 2008 Idaho Roadless Rule. The current forest plans were not amended at that time, so the revision team will ensure that management direction aligns with and incorporates the roadless rule direction and prohibitions.

The Salmon National Forest plan stated as a desired condition that none of the existing inventoried roadless areas will be designated wilderness. As part of Forest Plan Revision under the 2012 Forest Service planning rule, the Forest is required to complete a wilderness inventory and evaluation process that will include these existing roadless areas. This process will be further described in this section.

The Salmon National Forest plan also has direction to protect the segment of the Salmon River determined to be eligible for addition to the Wild & Scenic Rivers System. Approximately 9 miles long, the segment stretches from North Fork upstream to the Forest boundary in the vicinity of Tower Creek. The Challis National Forest plan recommended no new wild, scenic, or recreation rivers be designated on the forest. The 2012 planning rule requires an inventory of eligible rivers for inclusion in the Wild and Scenic Rivers System, which is ongoing and further described in this section.

Research Natural Areas were established in current plan direction, along with goals and standards to protect their natural integrity and uniqueness.

National designated trails are to be managed in accordance with their respective management plans and have priority for trail maintenance.

SCALE OF ANALYSIS

The scale of this analysis is mainly forestwide and includes some landscape scale areas that extend beyond or bisect the forest.

CONDITIONS & TRENDS

Designated areas provide a wide variety of public benefits, including ecological, geological, scientific, educational, scenic, and historical. Along with providing for clean air and water and open space, these areas protect unique habitat and wildlife species and historically significant areas. Enabling legislation and management plans describe a respective designated area’s purpose, dictate how it is to be managed, and explain the area’s ecological and social benefits.

Congressionally-Designated Areas

Frank Church-River of No Return Wilderness

The Frank Church–River of No Return Wilderness was created on July 23, 1980, when President Carter signed the Central Idaho Wilderness Act. The Act combined the Idaho Primitive Area, the Salmon River Breaks Primitive Area, a portion of the Magruder Road Corridor and additional wild lands to form the River of No Return Wilderness. The area was later renamed in honor of U.S. Senator Frank Church, the Idaho senator who sponsored the original legislation.

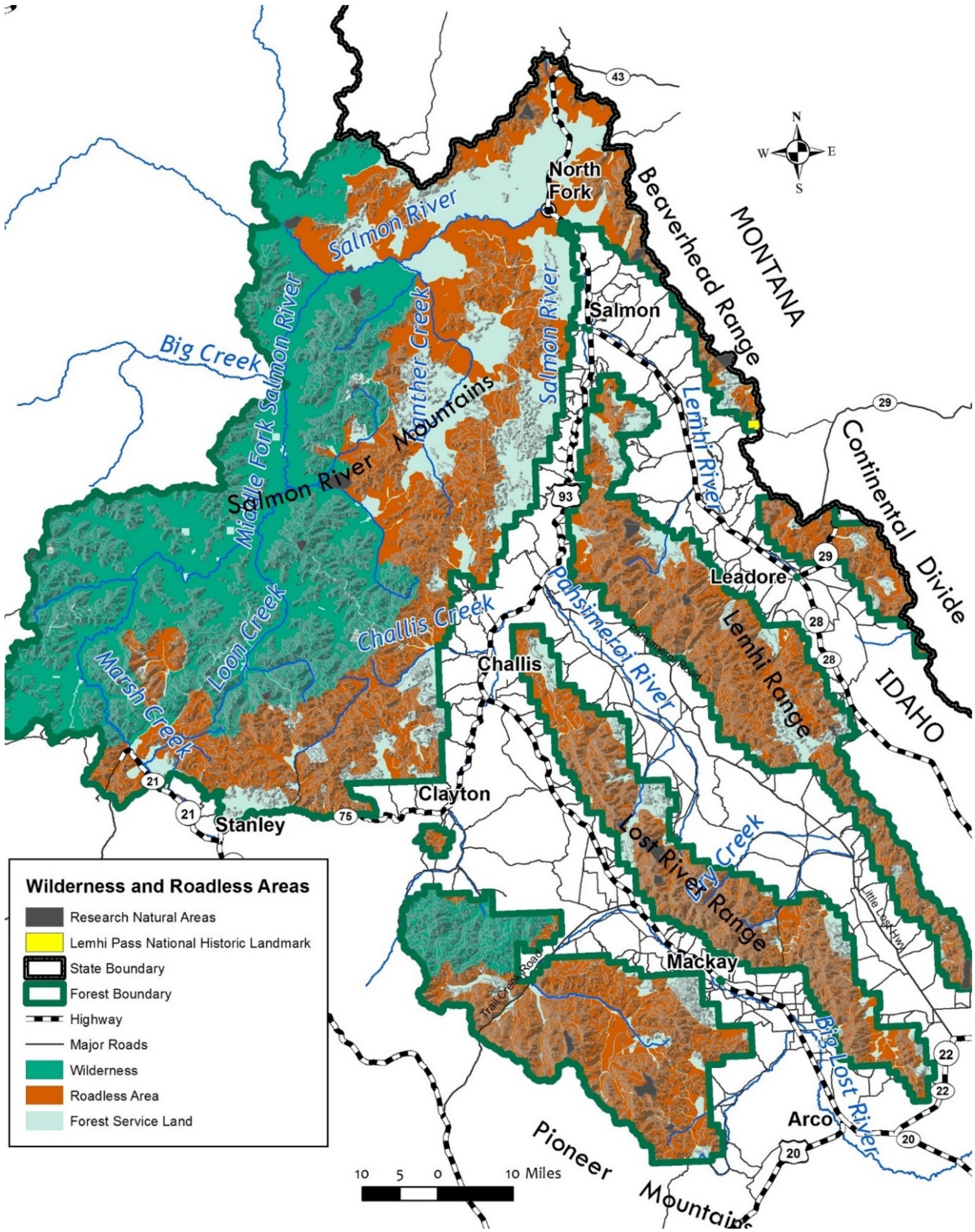
The Salmon-Challis National Forest administers the largest portion of the Frank Church–River of No Return Wilderness, which is the largest contiguous wilderness area in the Continental United States. The Frank Church–River of No Return Wilderness Management Plan, dated November 2003, provides direction for managing the area while preserving the wilderness character.

A collaboration born in 1980, the “Frank” is not your typical wilderness. Motorboats frequent the Main Salmon, one can fly into the backcountry, the majority of wilderness visitors are float boaters guided on the Middle Fork and Main Salmon Rivers, and a special mining management zone was created in the Clear Creek area.

Special Mining Zone

The Central Idaho Wilderness Act of 1980 provided for the Special Mining Management Zone Clear Creek, a 40,307-acre area for mining of cobalt and associated minerals. Management direction for this zone is also provided in The Frank Church–River of No Return Wilderness Management Plan, dated November 2003.

Figure 48. Map of wilderness and roadless areas on the Salmon-Challis National Forest



Note: An interactive version of this map is available online in our Open Data Gallery.

Jim McClure-Jerry Peak Wilderness

On August 7, 2015 the Sawtooth National Recreation Area and Jerry Peak Wilderness Additions Act designated three new wilderness areas, one of which occurs within the Salmon-Challis. The Forest administers 95,000 acres of the Jim McClure-Jerry Peak Wilderness named for Senator Jim McClure, a renowned steward of Idaho's natural resources. High mountain backcountry with crystalline lakes, rolling plateaus, and abundant wildlife are preserved within these newly designated wilderness areas.

The wilderness adjoins the Hemingway-Boulder Wilderness on the southwest and the Cecil D. Andrus-White Clouds Wilderness to the east. The act specifies that wilderness management plans for these areas should be developed within 3 years of designation. The wilderness planning process is on-going. The Jim-McClure Jerry Peak environmental assessment and draft wilderness plan documents are available for public review at this time.

Wild & Scenic Rivers

The Wild and Scenic Rivers Act of 1968 directs the Forest Service to preserve and protect certain rivers in free-flowing condition when they provide outstandingly remarkable values, such as: scenic, recreational, fish, wildlife, geologic, cultural, and other similar values. The act safeguards the special character of these rivers while recognizing the potential for their appropriate use and development.

In the 1980s and 1990s, approximately 282 miles of rivers on the Forest were determined to be eligible, and the respective outstandingly remarkable values identified for each of these rivers are managed for their protection. Two rivers on the Salmon-Challis have been designated by Congress as Wild and Scenic Rivers and management direction is provided for both of them in the 2003 Frank Church-River of No Return Wilderness Management Plan. The Middle Fork of the Salmon River, from its origin to its confluence with the main Salmon River, was designated and added to the Wild and Scenic Rivers System in the original Wild and Scenic Rivers Act of 1968. The Salmon River, from North Fork to Long Tom Bar, was incorporated into the National Wild and Scenic Rivers System by the Central Idaho Wilderness Act of 1980. The designated segment of river was broken into two classes: the recreational river portion and the wild river portion. Management direction for the recreational portion, which runs from North Fork to Corn Creek, is provided in Salmon Wild and Scenic River Management Plan dated 1982.

Nationally-Designated Trails

The Salmon-Challis contains sections of several national recreation, scenic, or other nationally-designated trails. All now part of the system created by the National Trails System Act of 1968, the trails are designated "to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the Nation." National historic trails were added to the National Trails System as a fourth category of trail in 1978.

The Forest contains the following nationally-designated trails:

- Bear Valley Lakes National Recreation Trail, #179;
- Knapp-Loon Creek National Recreation Trail, #036;
- Divide-Twin Creek National Recreation Trail, #108;
- Mill Creek National Recreation Trail, #082;
- Continental Divide National Scenic Trail, which was established in 1978 and is managed in accordance with the 2009 Continental Divide National Scenic Trail Comprehensive Plan;
- Nez Perce National Historic Trail, which was established in 1986 and is managed in accordance with the 1990 Nez Perce National Historic Trail Management Plan; and
- Lewis and Clark National Historic Trail, which was established in 1978 and, within forest boundaries, is managed in accordance with specific guidance in Salmon Forest Plan Amendments.

For more information on these trails, refer to the Recreation section.

Figure 49. Lemhi Pass on the Lewis and Clark National Historic Trail

Source: Bureau of Land Management Idaho photo

National Historic Landmark

Lemhi Pass National Historic Landmark, designated in 1960, is located on the Salmon-Challis. The landmark is a high point on the 3,700-mile Lewis and Clark National Historic Trail and serves as a passageway for people moving through the mountains of this region. The landmark is managed under the Lemhi Pass National Historic Landmark Management Plan and the Salmon National Forest Land and Resource Management Plan Amendment 8, dated January 2002.

Experimental Range Stewardship Area

The Challis Experimental Range Stewardship area is part of the National Experimental Range Stewardship Program, created under the direction of Congress in the Public Rangelands Improvement Act of 1978. The program encourages rangeland management innovation and incentives for improving conditions on public rangelands. Rangelands designated in the program are to be representative of the broad spectrum of range conditions, trends, and forage values. The program provides incentives for the holders of grazing permits and leases whose stewardship results in an improvement of the range condition of lands under permit or lease.

This area, roughly 800,000 acres in size, encompasses public lands managed by the Bureau of Land Management Challis Field Office and the Salmon-Challis National Forest Challis-Yankee Fork Ranger District. Approximately 37 percent of the experimental stewardship area is within the Salmon-Challis administrative boundary, and 100,000 acres of the overall stewardship area is now within the recently created Jim McClure-Jerry Peak Wilderness.

The Challis Experimental Range Stewardship program area was active in resolving conflicts and improving range management through the 1990s using methods such as outlined in the Act:

- cooperative range management projects between Federal and State agencies to better foster cooperation and coordination while working with private range users;
- payment of some percent of the amount due the government from grazing permittees in the form of range improvement work; and
- other incentives as deemed appropriate.

There have been no further projects in the area since the 1990s.

A required 1985 report to Congress recommended that the concepts and processes of the Experimental Range Stewardship Program be continued, expanded, and encouraged. The report also recommended that the concepts and processes of the program be incorporated in the planning processes of the Forest Service and the Bureau of Land Management.

Administratively Designated Areas

Critical Habitat under the Endangered Species Act

There are four Endangered Species Act listed fish that occur on Forest. These are:

- Snake River sockeye salmon, which are listed as endangered;
- Snake River spring/summer Chinook salmon, which are listed as threatened;
- Snake River steelhead, which are listed as threatened; and
- bull trout, which are listed as threatened.

Critical habitat has been designated for each of these species.

The National Marine Fisheries Service published the final rule designating critical habitat for Snake River sockeye salmon on December 28, 1993. The designated critical habitat is described in a narrative format and, on the Salmon-Challis, only includes the main stem Salmon River.

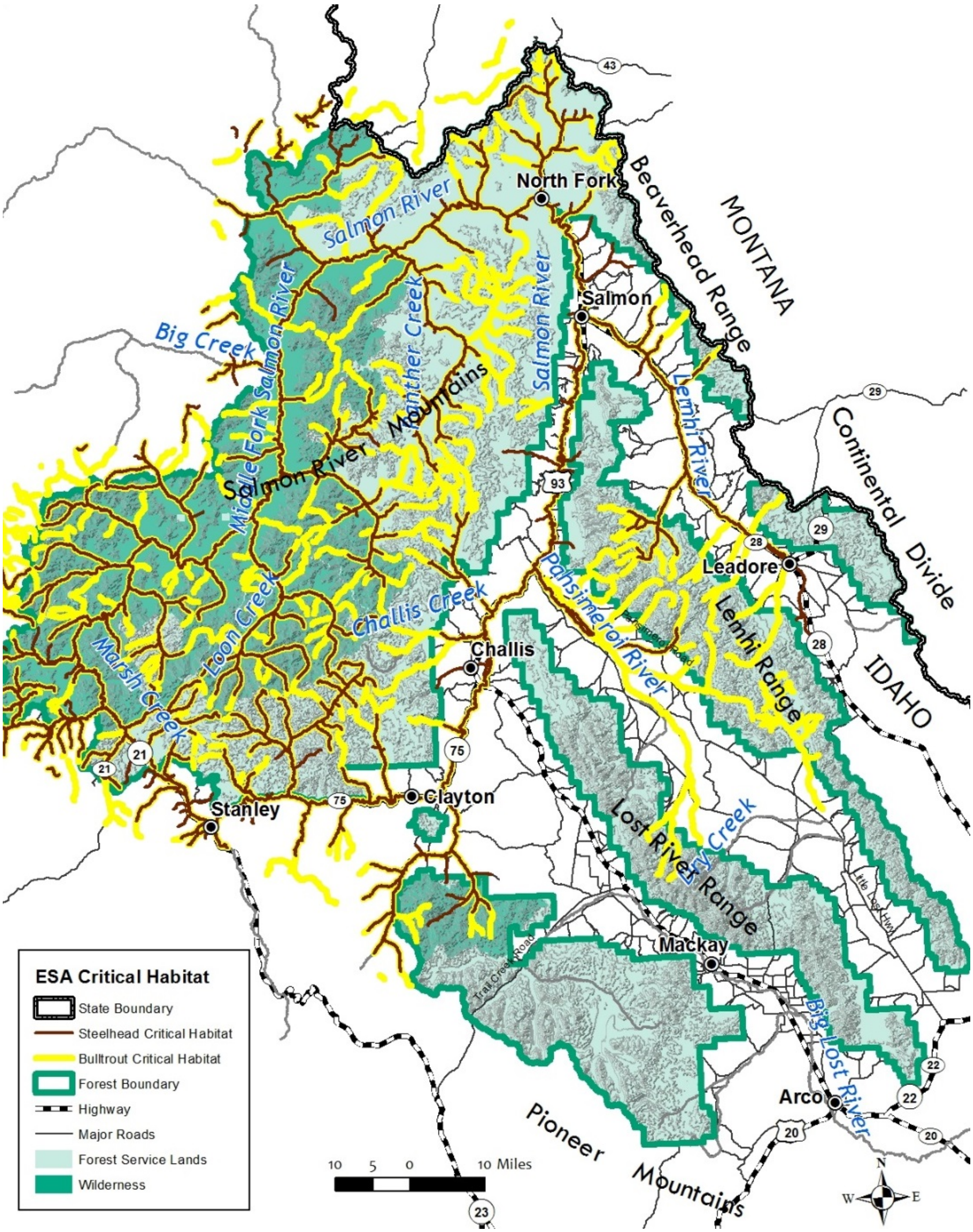
The National Marine Fisheries Service published the final rule designating critical habitat for Snake River spring/summer Chinook salmon on December 28, 1993. The designated critical habitat is described in a narrative format and includes “river reaches presently or historically accessible...to Snake River spring/summer Chinook salmon.” This description has led to confusion, debate, and disagreement on which streams are considered critical habitat on the Forest. In an effort to help resolve the ambiguity, the Salmon-Challis developed a process in 2010 to map designated critical habitat. This effort was not to designate critical habitat, which is the role of the National Marine Fisheries Service, but to delineate where on a map habitat matched the narrative description. The National Marine Fisheries Service published a final rule specifically excluding areas above Napias Creek Falls from designated critical habitat on October 25, 1999.

The National Marine Fisheries Service published a final rule designating critical habitat for Snake River Steelhead on February 16, 2000. The designated critical habitat was described in a narrative format and included “all river reaches accessible to listed steelhead in the Snake River and its tributaries in Idaho, Oregon, and Washington.” Later, they revised the critical habitat designation in a final rule that was published on September 2, 2005. The revised designation included specific descriptions and detailed maps of every stream reach that was designated as critical habitat.

The U.S. Fish and Wildlife Service published a final rule designating critical habitat for bull trout on September 26, 2005. The designated critical habitat did not include any waters on the Salmon-Challis National Forest. Later, the U.S. Fish and Wildlife Service revised the critical habitat designation in a final rule that was published on October 18, 2010. The revised designation did include waters on the Salmon-Challis National Forest and included specific descriptions and detailed maps of every stream reach that was designated as critical habitat. It is important to recognize that Bull Trout critical habitat includes lakes.

Figure 50. Examples of Designated Critical Habitat on the Forest: Marsh Creek on the left, and Big Timber Creek on the right

Figure 51. Map of Endangered Species Act designated Critical Habitat on the Salmon-Challis for Bull Trout and Steelhead



Source: U.S. Fish and Wildlife Service and National Marine Fisheries Service

Inventoried Roadless Areas

The Idaho Roadless Rule established management direction for designated roadless areas in the State of Idaho. The final rule, which took effect October 16, 2008, designated Idaho Roadless Areas and established five management themes that provide prohibitions or conditioned permissions governing road construction, timber cutting, and discretionary mineral development. The Idaho Roadless Rule management themes and the area of the Salmon-Challis they cover include:

Backcountry Restoration – approximately 1,800,000 acres

Permanent roads may only be constructed or reconstructed if there is:

- a reserved right or treaty,
- imminent threat,
- Comprehensive Environmental Response, Compensation, and Liability Act response,
- resource damage,
- safety need,
- federal highway-related need, or
- pre-2001 mineral lease.

General Forest, Rangeland, and Grassland – approximately 100,000 acres

Roads may only be constructed or reconstructed if allowed by forest plan direction. Timber may be cut, sold or removed if consistent with forest plan direction.

Primitive – approximately 20,000 acres

Roads may only be constructed or reconstructed if it is for personal/administrative use, incidental to, improves Threatened or Endangered Species habitat or ecological composition/structure, or if substantially altered.

Wild Land Recreation – approximately 300,000 acres

Roads may be constructed or reconstructed if there is a reserved right or treaty. Timber may only be cut, sold, or removed if it is for personal or administrative use or incidental to implementation of a management activity not otherwise prohibited under the Idaho Roadless Rule.

Special Areas of Historic or Tribal Significance – 0 acres under this rule

No roadless areas of this type are located within the Salmon-Challis National Forest. Roads may only be constructed or reconstructed in these areas if there is a reserved right or treaty. Timber may only be cut, sold, or removed if it is for personal or administrative use, or incidental to, improves Threatened or Endangered Species habitat or ecological composition/structure, or if substantially altered.

The Salmon-Challis contains all or part of 57 of the 250 designated roadless areas in the State of Idaho. Roadless areas cover roughly half of the Forest. A detailed story map of the entire forest with all named roadless areas by management themes is available online. Table 22 is a list of the roadless areas, the management themes of which they are comprised, and the percentage of each theme in each roadless area.

Table 22. Roadless areas broken down by themes and percent of area covered by each theme

Roadless Area Name	Management Theme	Percentage of Area
Agency	Backcountry Restoration	82.1
Agency	General Forest, Rangeland, and Grassland	17.9
Allan Mountain	Backcountry Restoration	95.4
Allan Mountain	Forest Plan Special Area	4.6
Anderson Mountain	Backcountry Restoration	100
Black Lake	Backcountry Restoration	100
Blue Bunch	Backcountry Restoration	100
Blue Joint Mountain	Primitive	100
Borah Peak	Backcountry Restoration	12.9
Borah Peak	Forest Plan Special Area	3.3
Borah Peak	Wild Land Recreation	83.7
Boulder White Clouds	Backcountry Restoration	50.5
Boulder White Clouds	Wild Land Recreation	49.5
Burnt Log	Backcountry Restoration	100
Camas Creek	Backcountry Restoration	100
Challis Creek	Backcountry Restoration	100
Cold Spring	Backcountry Restoration	100
Copper Basin	Backcountry Restoration	100
Deep Creek	General Forest, Rangeland, and Grassland	100
Diamond Peak	Backcountry Restoration	96.7
Diamond Peak	Forest Plan Special Area	3.3
Duck Peak	Backcountry Restoration	97.2
Duck Peak	Forest Plan Special Area	2.8
Goat Mountain	Backcountry Restoration	100
Goldbug Ridge	Backcountry Restoration	100
Greylock	Backcountry Restoration	100
Grouse Peak	Backcountry Restoration	100
Hanson Lakes	Backcountry Restoration	100
Haystack Mountain	Backcountry Restoration	80
Haystack Mountain	General Forest, Rangeland, and Grassland	20
Italian Peak	Backcountry Restoration	100
Jesse Creek	Backcountry Restoration	100
Jumpoff Mountain	Backcountry Restoration	100

Roadless Area Name	Management Theme	Percentage of Area
Jureano	Backcountry Restoration	83
Jureano	General Forest, Rangeland, and Grassland	17
King Mountain	Backcountry Restoration	100
Lemhi Range	Backcountry Restoration	98.9
Lemhi Range	Forest Plan Special Area	1.1
Little Horse	Backcountry Restoration	100
Long Tom	Backcountry Restoration	90.9
Long Tom	Forest Plan Special Area	9.1
Loon Creek	Backcountry Restoration	100
McEleny	Backcountry Restoration	100
Meadow Creek	Backcountry Restoration	100
Musgrove	Backcountry Restoration	88.3
Musgrove	General Forest, Rangeland, and Grassland	11.7
Napias	General Forest, Rangeland, and Grassland	100
Napoleon Ridge	Backcountry Restoration	32.9
Napoleon Ridge	Forest Plan Special Area	6
Napoleon Ridge	General Forest, Rangeland, and Grassland	61.1
Oreana	Backcountry Restoration	100
Pahsimeroi Mountain	Backcountry Restoration	100
Perreau Creek	General Forest, Rangeland, and Grassland	100
Phelan	General Forest, Rangeland, and Grassland	100
Pioneer Mountains	Backcountry Restoration	68.3
Pioneer Mountains	Forest Plan Special Area	2.9
Pioneer Mountains	Wild Land Recreation	28.8
Prophyry	Backcountry Restoration	100
Railroad Ridge	Backcountry Restoration	100
Red Hill	Backcountry Restoration	100
Red Mountain	Backcountry Restoration	99.6
Red Mountain	Wild Land Recreation	.4
Sal Mountain	Backcountry Restoration	100
Seafoam	Backcountry Restoration	100
Sheepeater	Backcountry Restoration	68.9
Sheepeater	Forest Plan Special Area	5.5
Sheepeater	General Forest, Rangeland, and Grassland	25.6
South Deep Creek	Back Country Restoration	61.6
South Deep Creek	General Forest, Rangeland, and Grassland	38.4
South Panther	Backcountry Restoration	100

Roadless Area Name	Management Theme	Percentage of Area
Spring Basin	Backcountry Restoration	100
Squaw Creek	Backcountry Restoration	100
Taylor Mountain	Backcountry Restoration	100
Warm Creek	Backcountry Restoration	100
West Big Hole	Backcountry Restoration	60.9
West Big Hole	Forest Plan Special Area	3.4
West Big Hole	General Forest, Rangeland, and Grassland	11.4
West Big Holes	Primitive	24.3
West Panther Creek	Backcountry Restoration	100
White Knob	Backcountry Restoration	100
Wood Canyon	Backcountry Restoration	100

National Scenic Byways

National scenic byways are recognized by the United States Department of Transportation for one or more of six “intrinsic qualities”: archeological, cultural, historic, natural, recreational, and scenic.

The Salmon-Challis National Forest and vicinity is home to several designated byways, listed below from north to south.

The Salmon River Scenic Byway begins at Lost Trail Pass on Highway 93, continues on Highway 93 until the junction with State Highway 75, then continues on State Highway 75 to Stanley, Idaho.

The Sacajawea Historic Byway, named for the Shoshone woman who became a trusted and valuable member of the Lewis and Clark Corps of Discovery Expedition, runs along parts of Idaho highways 28 and 33, paralleling the Continental Divide from Salmon to Interstate 15.

The Lewis and Clark Back Country Byway traces the 1805 route of the Lewis and Clark expedition through this area and comprises three segments: the Lemhi back road, Warm Springs Wood Road, and Agency Creek road.

The Peaks to Craters Scenic Byway begins on the Forest at the junction of Highway 93 and State Highway 75 and continues on Highway 93 South towards Arco.

Significant Caves

The Geologic Areas of Interest section provides information about caves on the Salmon-Challis that are considered significant according to 36 CFR 290.3.

Research Natural Areas

Research natural areas are relatively small land areas that typify important forest, shrubland, grassland, alpine, aquatic, geologic, and other natural features that have unique characteristics of scientific interest and importance. According to the Challis forest plan, activities in these areas are limited to research, education, and monitoring changes in natural conditions. These areas can be home to rare or endangered plant or animal species.

Objectives in designating these areas is to:

- preserve and maintain biological diversity, including threatened, endangered and sensitive species;
- protect against human-caused environmental disruptions;
- provide for research and education;
- preserve areas to serve as reference conditions for studying succession; and
- monitor effects of resource management techniques and practices.

At the time the current forest plans were released there were three research natural areas on the forest. Only one of the 19 research natural areas recommended in current plans has not since become a designated research natural areas on the Forest. Deadwater was not designated due to a large percentage of the site vegetation being non-native.

The Salmon-Challis now lists a total of 22 designated research natural areas, which cover 29,050 acres of its 4.4 million acres:

- Allan Mountain, 1630 acres
- Bear Valley Creek, 2397 acres
- Cache Creek Lakes, 792 acres
- Chilcoot Peak, 384 acres
- Colson Creek, 278 acres
- Davis Canyon, 1208 acres
- Dome Lake, 1706 acres
- Dry Gulch Forge Creek, 3279 acres
- Frog Meadows, 352 acres
- Gunbarrel, 1643 acres
- Iron Bog, 420 acres
- Kenney Creek, 1507 acres
- Mahogany Creek, 3567 acres
- Meadow Canyon, 272 acres
- Merriam Lake Basin, 737 acres
- Middle Canyon, 2271 acres
- Mill Lake, 708 acres
- Mystery Lake, 521 acres
- Sheep Mountain, 635 acres
- Smiley Mountain, 3105 acres
- Soldier Lakes, 173 acres
- Surprise Valley, 1465 acres

Listings of the habitat types, aquatic features, geologic features, rare or unusual characteristics, and screening criteria are provided for Frog Meadows, Mill Lake, Allan Mountain, Bear Valley Creek, Colson Creek, Dome Lake, Dry Gulch Forge Creek, Davis Canyon, and Kenney Creek in the Salmon forest plan and Salmon forest plan amendment #5.

Brief descriptions of Middle Canyon, Mahogany Creek, Merriam Lake Basin, Sheep Mountain, Surprise Valley, Smiley Mountain, Cache Creek Lakes, Soldier Lakes, and Mystery Lake are in the Challis forest plan and in the Challis National Forest plan amendments #2, # 14, #15, and #16.

Designated Communication Sites

The Salmon-Challis has designated sites for communications uses. These particular sites by definition are designated in a National Environmental Policy Act decision document, a land management plan, or an amendment to a plan. As designated sites, they have associated site management plans.

Designated communication sites on the Salmon-Challis National Forest include:

- Baldy Mountain
- Basin Butte
- Grouse Peak North
- Grouse Peak South
- North Baldy Mountain
- Howe Peak
- Long Tom Lookout
- Grizzly Hill
- Mount George
- Jump Off Peak
- Potaman Peak
- Sheephorn Lookout
- Windy Devil

Potential Need and Opportunity for Additional Designated Areas

Designated areas make-up 80 percent of Salmon-Challis National Forest, leaving 860,000 acres open for consideration for additional designation. The 2012 Planning Rule requires that assessment evaluate existing information relevant to the plan area for the potential need and opportunity for additional designated areas. For wilderness and wild and scenic rivers designations, the forest identifies the need and opportunities through concurrent processes. At present, the Salmon-Challis National Forest has a draft wilderness inventory and a draft list of rivers eligible for wild and scenic designations.

Wilderness Inventory and Evaluation

The Forest is required to complete a wilderness evaluation process to review and consider lands that may be suitable for wilderness designation and inclusion in the National Wilderness Preservation System. Most lands on the Salmon-Challis National Forest not already designated wilderness, including roadless areas, are being evaluated for their existing wilderness characteristics in this current on-going process.

Since Congress has reserved authority to make final wilderness designations, wilderness designation will not be made as part of this plan revision. If an area is recommended for wilderness designation during forest plan revision, the Salmon-Challis is required to manage the area in a manner that will not impair the area’s wilderness characteristics until Congress either designates the area as wilderness or releases the area from consideration. Current plans have specific direction regarding how proposed wilderness is to be managed.

The Challis Forest Plan proposed three new areas for wilderness in 1987:

- Borah Peak, 119,000 acres;
- Boulder/White Clouds, 34,000 acres; and
- Pioneer Mountains, 48,000 acres.

Most of the Boulder/White Clouds is now a part of the Jim McClure- Jerry Peak Wilderness. The other areas are being evaluated in this on-going process. No areas were proposed for additional wilderness by the Salmon National Forest in 1988. In fact, the plan stated as a desired future condition that none of the existing inventoried roadless areas would be designated wilderness.

Wild & Scenic River Inventory & Evaluation

As part of the Forest Service's 2012 planning rule, the Salmon-Challis must also evaluate rivers for their inclusion into the Wild and Scenic River System when completing a forest plan. The inventory of rivers to be studied must include all named rivers on a standard U.S. Geological Survey quadrangle map. We are currently evaluating eligibility and suitability for approximately 5,200 miles of river across the Forest. A draft eligibility report was released in November 2017 detailing the preliminary eligibility and classification phases of the process. This report, as well as an interactive web map, detail and display river segments found eligible in prior studies and the segments currently found eligible in this 2017 process.

The current plans, specifically the Challis Forest Plan, recommended the trail up Corral Creek, connecting to Big Hat Creek Trail, be nominated as a National Recreation Trail. The plan also anticipated that a Borah Quake National Natural Area or geologic area would be established to protect fault scarp. There are no known efforts to bring these before Congress, but these remain proposals.

The Forest is unaware of any other proposals or published documents that identify a need for additional designated areas. Nor has a need been identified in proceedings or plans of States, Tribes, or counties and local governments. The Jim McClure-Jerry Peak Wilderness, having been enacted in August 2015, is the most recently designated area on the Salmon-Challis.

SUMMARY & CONCLUSIONS

Designated areas provide ecological and social benefits while preserving unique areas, habitats, areas of historical significance, and opportunities for solitude and wilderness recreation experiences for future generations. The Salmon-Challis, steeped in vital American heritage and comprised of a diversity of habitats and rugged mountain terrain, contains a wide variety of designated areas. The designation of some of these areas has been controversial, and there is indication they will continue to be as the Salmon-Challis contemplates potential for additional designated areas on the remaining 20 percent of the forest.

ECOSYSTEMS ASSESSMENT

An ecosystem is composed of living organisms, such as plants, animals, and microbes. The composition, diversity, and abundance of those organisms in any given location is a product of their immediate environment. Terrestrial ecosystems are affected by climate, geology, soils, and topography. Aquatic and riparian ecosystems are affected by pH levels, dissolved organic matter, and the composition of bases on which aquatic organisms live. These components interact so that each system:

- captures and stores energy as biomass, or fuel;
- has a trophic structure, or food chain;
- circulates nutrients; and
- changes over time, which is also known as ecological succession.

Integrity of these systems is measured by whether or not the dominant characteristics of the ecosystem:

- are within the range of what would occur naturally, or natural range of variation; and
- can stay within that natural range of variation as each ecosystem is influenced by stressors, like a changing climate, development, and other uses of the Forest.

KEY ECOSYSTEM CHARACTERISTICS

Ecosystems have integrity when their dominant characteristics, or key ecosystem characteristics, occur within a natural range of variation and can recover from most natural or human-induced disturbances. The key ecosystem characteristics we use to assess ecological integrity on the Salmon-Challis include: composition, structure, function, and connectivity.

Ecosystem composition refers to the biological makeup of plant and animal communities. Ecosystem structure is the organization and arrangement of physical features, such as snags, downed wood and vegetation layers within our Forest. Ecosystem function describes processes, such as nutrient cycling, soil development, and natural disturbances.

Connectivity is the ecological conditions that exist at several spatial and temporal scales that provide landscape linkages that permits:

- the exchange of water flow, sediment exchange, and nutrient cycling;
- the daily and seasonal movements of animals within home ranges,
- the dispersal and genetic interchange between wildlife and plant populations,
- the long distance range shifts of species, such as in response to a changing climate

ECOSYSTEM DRIVERS AND STRESSORS

Ecosystem drivers are the dominant ecological processes that change our landscape. Ecosystem stressors are factors that may degrade the integrity of our key ecosystem characteristics. Combinations of drivers and stressors shape the terrestrial, aquatic and riparian ecosystems present on the forest.

The primary drivers and stressors on the Salmon-Challis National Forest are:

- changing climate;
- succession, or cycles of plant community establishment, growth and mortality;
- wildland fire and fire suppression;
- insects and disease;
- management activities, such as livestock grazing and timber harvest;
- introduction and establishment of invasive species; and
- infrastructure or developments that inhibit species movement.

Climate

Climate is a system driver. Changes in climate can be an ecosystem stressor and are important to consider when assessing ecological integrity. Weather patterns help to shape our landscape, and significant shifts from historical weather patterns can impact key ecosystem characteristics.

The Intermountain Adaptation Partnership recently compiled and published a report about the vulnerability of National Forest System lands to changing climate and adaption in the Intermountain Region (Halofsky 2018). This report splits the Intermountain Region into seven smaller subregions. The Salmon-Challis, Sawtooth, Boise and Payette National Forests fall within the Middle Rockies Subregion, as seen in Figure 52.

Forest level analyses and projections are hampered by limited and intermittent records. In addition, climate is a global phenomenon, and the larger the area considered, the more accurate and precise the predictions (Charles H Luce 2018).

To project the future climate and impacts to resources in the Intermountain Region, including the Salmon-Challis, the Intermountain Adaptation Partnership used Representative Concentration Pathway 4.5 and 8.5, emissions scenarios. These scenarios capture possible moderate and high future warming, respectively. Although pathways predicting lower warming exist, the 4.5 and 8.5 pathways were chosen because they are, in comparison, well-studied. They also provide a large set of projections that enhance our understanding of the possible range in future climate (Halofsky 2018). This represents best available science for the Salmon-Challis with regard to a changing climate .

Although uncertainty exists about the magnitude and rate of a changing climate (Behrens and others 2018), warming temperatures are the most certain consequence of increased carbon dioxide in the atmosphere (Joyce and Talbert 2018; Muir and others 2018).

Figure 52. National forests within the Middle Rockies Subregion of the Intermountain Adaptation Partnership region

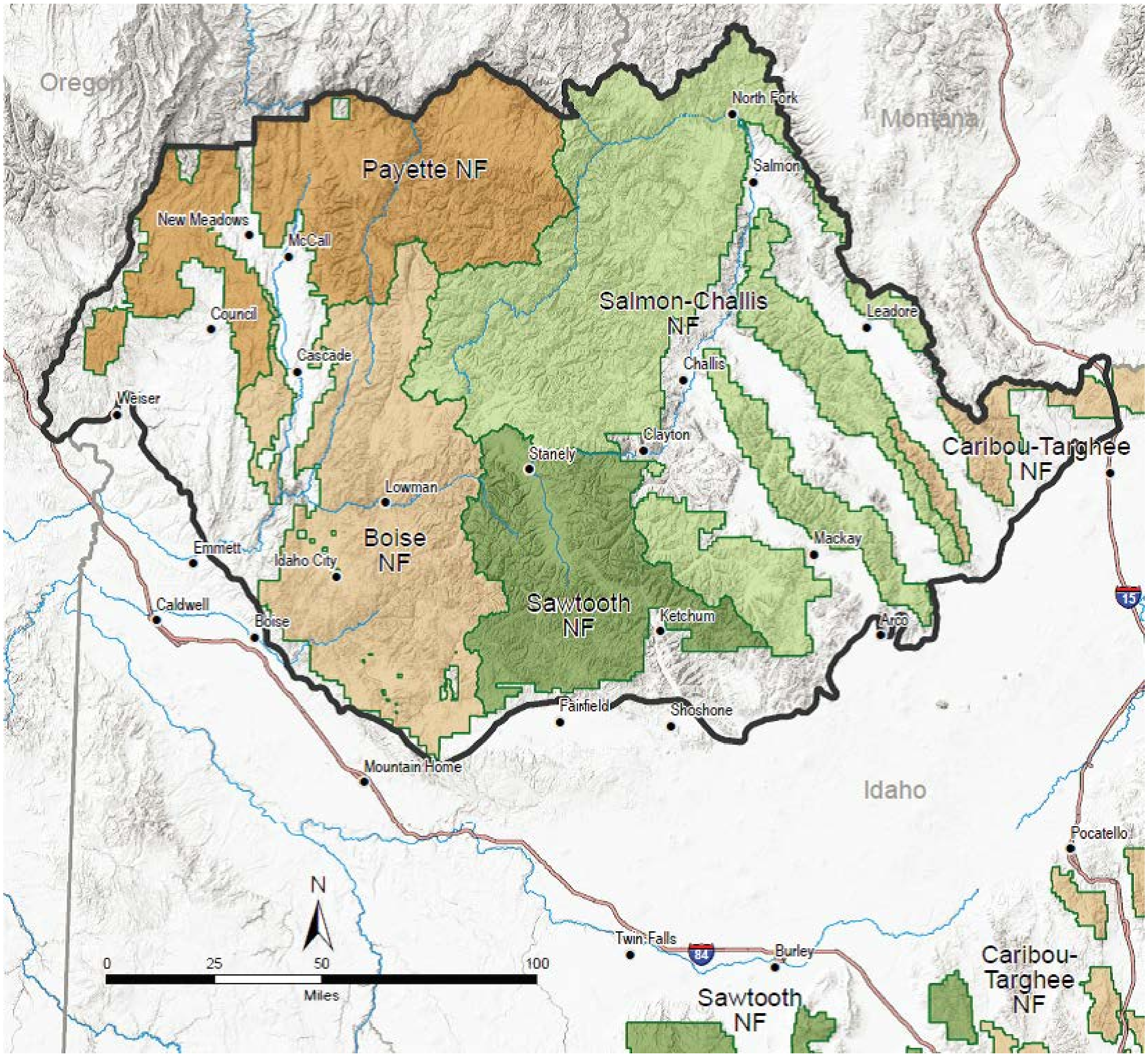
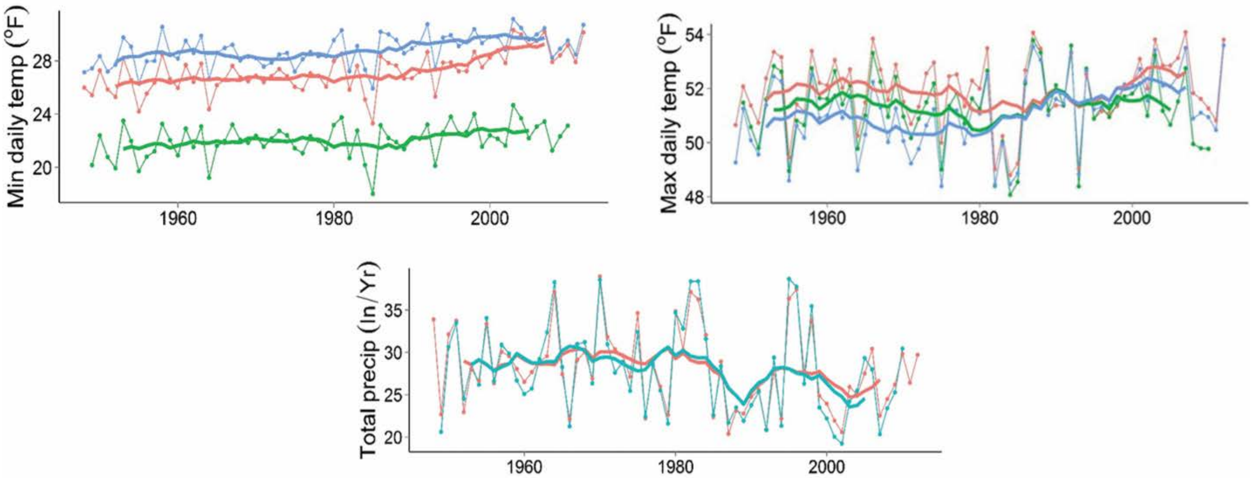


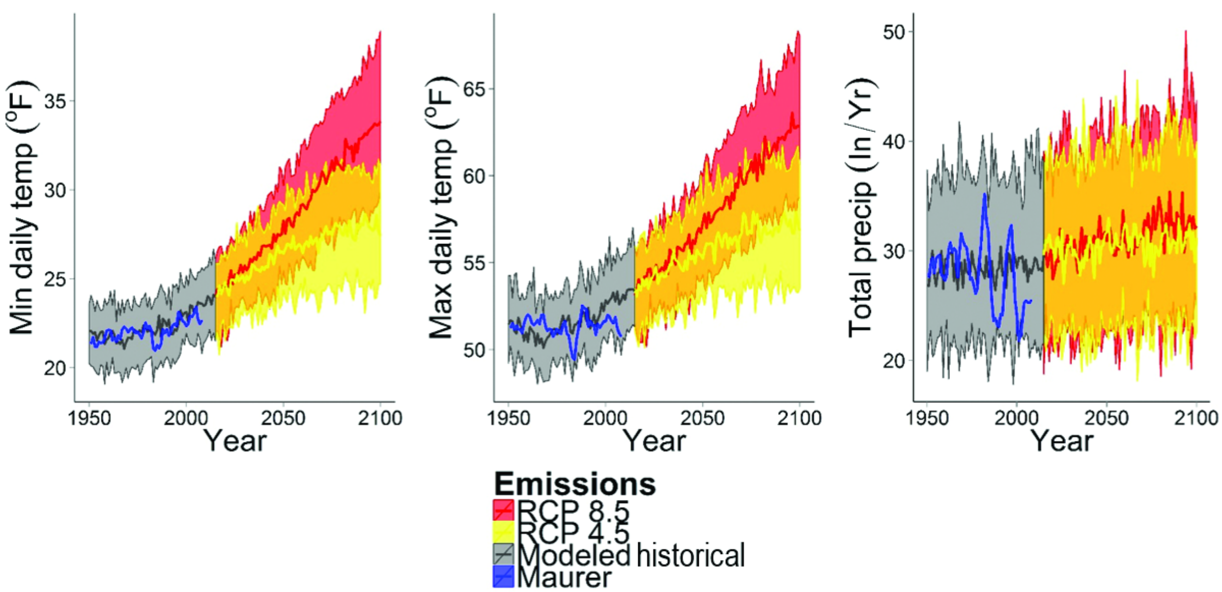
Figure 53. Annual Historical Mean Monthly Minimum Temperature, Annual Historical Mean Monthly Maximum Temperature, and Historical Total Annual Precipitation Data for the Middle Rockies Subregion.



Source: (Halofsky 2018)

By 2100, median, minimum and maximum temperatures in the Middle Rockies subregion are projected to rise about 5-6 degrees Fahrenheit under the moderate warming scenario and about 10 degrees Fahrenheit under the high warming scenario. Regardless of scenario, the greatest departure from historical seasonal minimum temperatures occurs in the summer. Annual precipitation projections are highly variable. No discernible trend is evident under moderate warming, and a slightly increasing trend is projected with high warming (Joyce and Talbert 2018).

Figure 54. Historical modeled and projected annual mean monthly minimum temperature, annual mean monthly maximum temperature, and total annual precipitation for 1950-2100 in the Middle Rockies Subregion.



Source: (Halofsky 2018)

Although precipitation is projected to increase under the high warming scenario, the pattern may be of drying on the upwind side of major mountain ranges, with moistening limited to valleys on the leeward side. Because mountain areas are where most of the precipitation falls and where streamflow originates, this is a potentially important aspect of future changes (CH Luce and others 2013). Trends in water flow of the Salmon River in Salmon, Idaho, provide a good indicator of trends to date. From 1948 to 2011 the mean flow has declined by 21 percent, and flow in low flow years has declined by 40 percent (CH Luce and others 2013; Charles H Luce and Holden 2009). Others have also noted declines in flows of the Salmon River (Clark 2010).

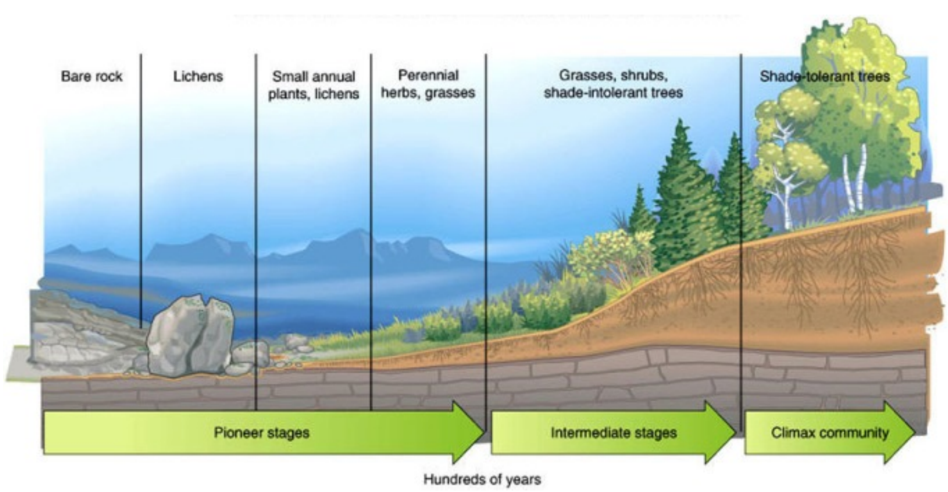
Under a changing climate, aquatic and terrestrial ecosystems, including riparian areas, wetlands, and groundwater-dependent ecosystems, like springs and fens, would be affected by projected lower base flows, lower snowpack depth and earlier snowmelt, increased periods of drought, increased sediment, and higher midwinter floods (Muir and others 2018). Physical and biological processes and attributes of soil would also be affected.

Wildland fires are projected to increase in size, severity, and frequency, which, depending on the magnitude, could alter forest structure, increase grasslands, and increase the prevalence of invasive grasses. Responses of pathogens and insects and impacts to ecosystems are difficult to project, but current warming temperatures have directly influenced bark beetle-caused tree mortality in some areas of western North America (Behrens and others 2018) . Water stress would increase plant vulnerability to pathogens and invasive insects. It is also projected to increase plant mortality and reduce reproduction, regeneration, and growth.

Succession and Disturbance Cycles

Cycles of plant succession and natural disturbances are system drivers influenced by climate and location. Succession is the predictable and progressive change in species composition and plant community structure over time. Naturally-occurring disturbance cycles periodically interrupt succession and keep plant communities from becoming overcrowded and stagnant by recycling nutrients of living and dead organic matter.

Figure 55. Stages of Succession

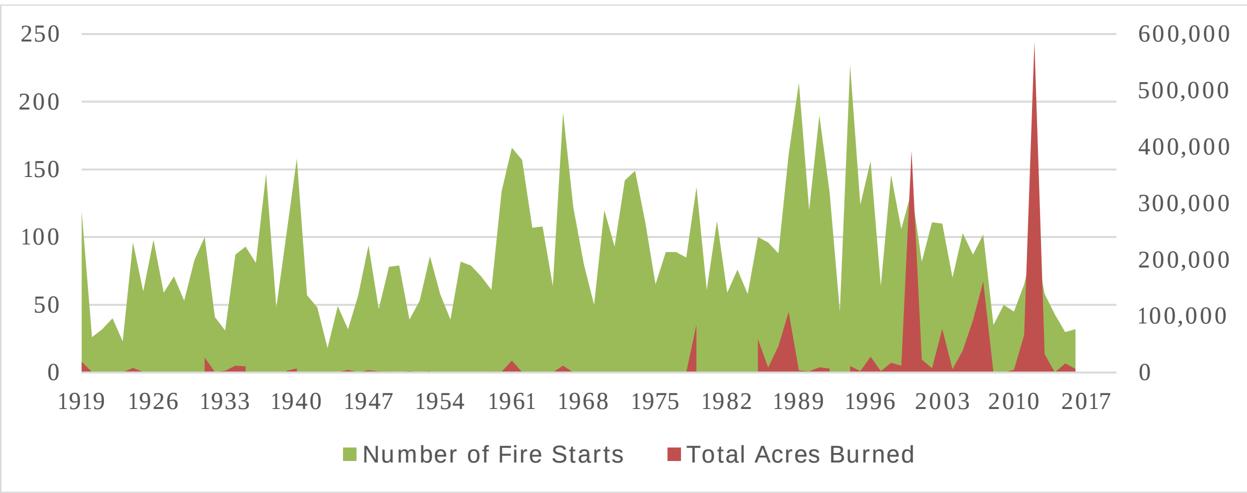


The constant ebb and flow of plant communities moving through the difference stages of growth results in a mosaic of varied ecosystems across the landscape. This diversity in structure and composition determines the quality of our forest resources and wildlife habitat.

Wildland Fire

Fire is a natural driver of the ecosystems present on the Salmon-Challis. As the primary disturbance cycle on the forest, wildland fire provides an essential service to plant communities by creating openings for a diverse arrangement of plants to grow, reducing and rearranging organic matter accumulations, and recycling nutrients from dead and decaying trees and plants. Wildfire has played a vital role in shaping plant diversity, distribution, and function across landscapes throughout the western United States (J. K. Agee 1998; Turner and others 1994). These intricate patterns are microsite to watershed in scale and are a result of ecosystems evolving with a wide variety of fire effects over the course of centuries.

Figure 56. Number of Fires and Fire Sizes on the Salmon-Challis from 1919-2016



Suppressing wildland fires puts stress on our ecosystems by altering the fire cycles these systems evolved with and the amount and arrangement of fuels historically present on our landscape. Without regular cycles of different-sized fires to create opportunities for plant and tree diversity, we are seeing forests and shrublands become overcrowded and stagnant.

Ecologically, fire exclusion has resulted in a change in species composition and forest structure on the Salmon-Challis. Composition on the forest has shifted from early-seral, shade-intolerant tree species to late-seral, shade-tolerant species. Forest structure has also shifted from single-layer canopies to multiple-layer canopies, effectively providing a fuel ladder from the ground to tree crowns. Vegetation densities, organic matter, and number of woody species have increased. Excluding fire from the landscape has also allowed forests to expand into shrublands and can promote the persistence of invasive grasses (R. E. Keane and others 2002). These compositional and structural changes impact ecosystem function and connectivity.

Fire seasons are defined by seasonal changes in temperature and precipitation, both of which influence the moisture conditions for live and dead vegetation, commonly known as fuels. Over two-thirds of the fires over the last four decades have been caused by lightning, as seen in Table 23. Fires per decade by cause class.. The number of fire starts per decade has been declining since the 1960s, with the exception of the 1990s.

Table 23. Fires per decade by cause class.

Fire Cause Classification	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	2010-2016	Percentage of Total
Lightning	667	814	843	1091	735	302	77
Equipment	4	22	17	21	3	3	1
Smoking	20	33	21	13	5	2	2
Campfire	57	165	85	130	83	24	9
Debris Burning	20	14	40	27	7	7	2
Arson	13	5	7	3	9	0	1
Children	0	3	2	10	1	0	0
Miscellaneous	19	18	10	21	37	16	2
Unknown	312	0	0	1	0	0	5
Fires per Decade	1112	1074	1025	1317	880	354	100

Although the number of fires has declined over the last two decades, the number of fires over 1,000 acres has increased significantly, as seen in Table 24. This increase is correlated to changes in temperature and precipitation, an increased abundance of fuel, and an increased flammability of fuel. Recent studies suggest that climatic influences and fuels conditions, rather than lightning strikes, are the primary control of regional area burned by lightning-caused fires across much of the western United States (Abatzoglou and others 2016; Riley and others 2013). Northern Rockies mid-elevation forests are predicted to continue to have a higher risk of climate-induced large fire events as a result of mean annual temperature increase and mean annual precipitation decrease over the last three decades (Westerling and others 2006).

Table 24. Fires by size class per decade on the Salmon-Challis from 1960-2016

Fire Size Class by Acres	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	2010-2016	Percentage of Total
Less than 1/4	848	893	630	837	562	208	69
1/4-10	195	135	322	373	206	86	23
10-100	46	37	42	57	23	27	4
100-300	8	2	7	16	19	6	1
300-1000	10	3	9	14	19	6	1
1000-5000	4	2	9	16	25	11	1
Greater than 5000	1	2	6	4	26	10	1
Fires per Decade	1112	1074	1025	1317	880	354	100

The fire danger index energy release component is an indicator used to describe fuel conditions based on climatological changes. This value represents the available energy per unit area within the flaming front at the head of a fire (Bradshaw and others 1983) 1983). An energy release component index is used in the National Fire Danger Rating System to provide an approximation of dryness based on estimates of fuel moisture in heavy dead fuels (Andrews and others 2003).

An analysis using Fire Family Plus 4.1 was conducted using data collected by Remote Automated Weather Stations to calculate energy release component values for the years 1960 to 2016. Remote Automated Weather Stations are located across the Salmon-Challis National Forest and collect daily weather and fuel conditions. Both 90th and 97th percentile Energy Release Component conditions were used to determine differences from May 1 through October 31 for two time periods. Large fires over 1,000 acres have increased five times from 1963 to 1986 compared to 1987 to 2016 and is directly linked to the dramatic increase in mean energy release component values for the last 30 years, as seen in Table 25.

Table 25. Energy Release Component percentile and fires greater than 1000 acres from 1963-2016

Time Range in years	90th percentile	97 percentile	Fires greater than 1,000 acres
1963-1986	59	67	19
1987-2016	75	81	103

Social, political, and policy changes have influenced how these wildfires have been managed on the Salmon-Challis. During the last three decades an estimated 3,000 fires have burned approximately 1.7 million acres across the forest. Seventy-two percent of those acres burned in the 2000, 2007 and 2012 fire season. All fires outside designated wilderness have been managed using suppression strategies, with public and firefighter safety as the utmost priorities. Weather, topography, availability of local and national resources, and cost effectiveness have driven the majority of fire suppression and management decisions.

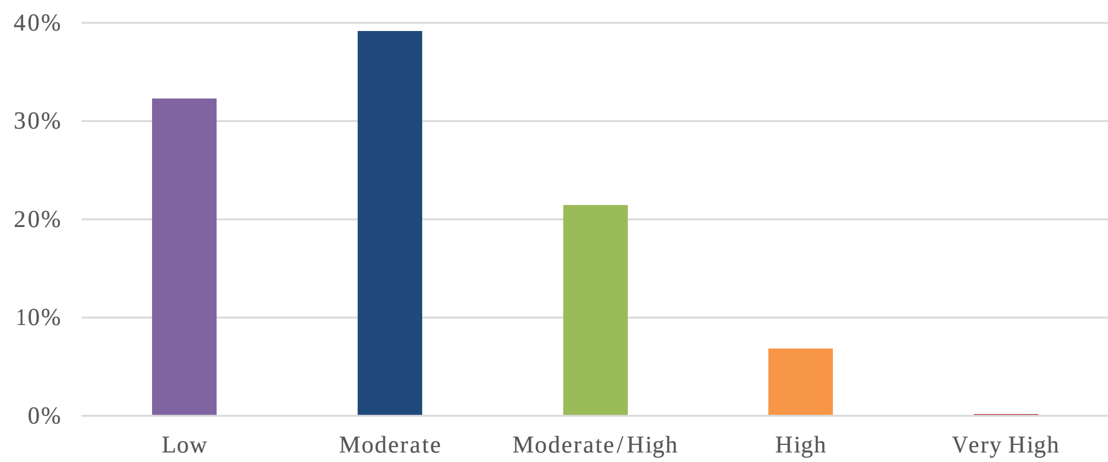
In 2005, two fires, covering approximately 18,000 acres within the wilderness, were managed strictly for resource objectives. Since then other fires or parts of fires within the wilderness have allowed fire to play its natural role as directed by the current land management plans. Exceptions to this have been when actions were taken to protect values at risk, such as protecting fire fighter safety, the Middle Fork river corridor and private property. This accounts for approximately 400,000 acres burned within designated wilderness over the last 20 years. No fires have been managed for resource benefit outside of designated wilderness.

Wildfires are an important aspect of functioning ecosystems across the Salmon-Challis. However, these fires also have the potential to threaten human lives and property, degrade air and water quality, and damage natural and cultural resources. These potential threats to values are summarized as wildfire risk. Historical fire start data, current vegetation data, and modeled fire behavior characteristics were analyzed to identify where uncharacteristic wildfire is anticipated to occur and its proximity to values at risk, such as infrastructure and private property. Fire behavior modeling is used to estimate a number of fire behavior characteristics. There are three main categories of inputs to fire behavior modeling: weather, fuels and topography.

Historic weather information is used as an input to estimate live and dead fuel moistures under 90th percentile energy release component conditions. Energy release component is a widely-used index that tracks seasonal dryness. Historically, an energy release component percentile greater than 90 percent provides live and dead fuel moistures that correlate to the potential for large, high-intensity fires. Fuels are classified as surface fuels and crown fuels. The topography input related to fire behavior is percent slope, aspect and elevation. Fires generally burn with more intensity and faster spread rates when burning on steeper slopes, drier aspects and lower elevations.

There are several outputs available with fire behavior modeling. Our analysis focused on flame length and type of fire, which can be either surface or crown fire. Fire behavior characteristics are used to estimate how successful suppression efforts would likely be. This, in turn, is used to calculate risk to identified values.

Figure 57. Salmon-Challis National Forest Overall Wildland Fire Risk Rating Percentage



The wildfire risk analysis concluded that conditions in many locations on the Salmon-Challis are at moderate- to very high-risk of losses to infrastructure, private property and key ecosystem characteristics due to uncharacteristically large and severe fires, as shown in Figure 57. This wildland fire risk rating reflects the measured increased in vegetative density, shifts in forested species composition, modified landscape patterns and impacts of large scale insect and disease epidemics. The largest scale drivers for these conditions on the Salmon-Challis have been the compounding effects of over 80 years of fire suppression and changing climate. These extreme fire events are increasingly outside the ability of managers to control and threaten the safety of firefighting personnel.

Figure 58. The lightning caused Ibex Fire was detected on July 24, 2017, eleven miles west of Twin Peaks Lookout.

Source: USDA photo provided by inciweb.nwcg.gov.

Insect and Disease

Insects and diseases are an integral part of forested ecosystems and are natural drivers of vegetative patterns. Current ecological theories propose that there is a healthy amount of insect and disease activity to be found in properly functioning forested ecosystems (Castello and Teale 2012). However, epidemic levels of insects and disease infections can reduce the capability of forests to provide ecological and societal benefits.

Suitable forest stand structures and sufficient amounts of preferred host vegetation must be available in a forested ecosystem to accommodate epidemics. As forests change through natural or human-induced influences, so do their associated insect and disease communities and the subsequent risk of undesirable impacts.

Large mortality events in forests are normally associated with the occurrence of several stressors (Allen and others 2010; McDowell and others 2016). For instance, interactions between disturbances, such as the combination of bark beetle outbreaks and wildfires, can result in apparent, rapid, and persistent changes in vegetation composition and structure.

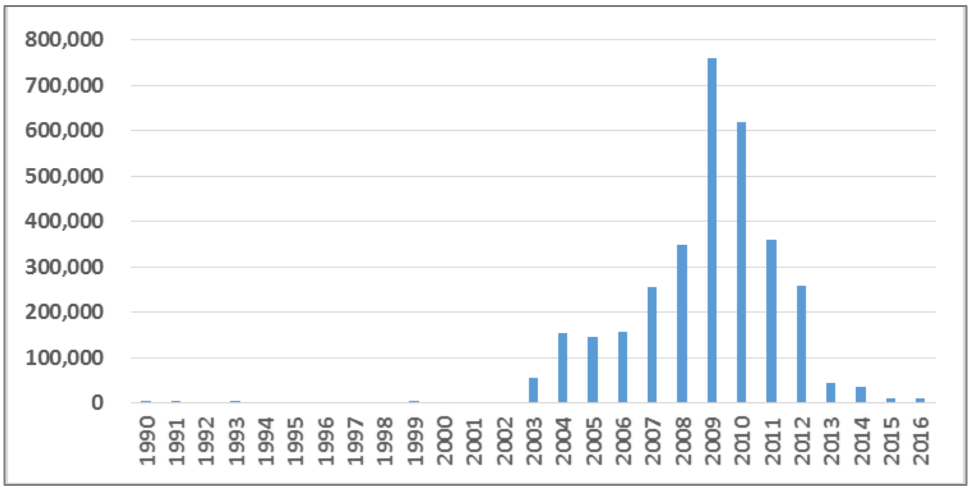
The most prominent insects and diseases on the Salmon-Challis for conifer species are discussed in the following sections. For each agent, we address past disturbance, existing conditions, and future trends. Many of these agents have overlapped in occurrence during the assessment and mortality severity will be greater in those places.

Mountain Pine Beetle

Mountain pine beetle, the most destructive bark beetle on the Salmon-Challis, has caused significant mortality in whitebark, lodgepole, ponderosa and limber pine forests since 1999, as seen in Figure 59.

During the height of the last outbreak, beetle populations grew exponentially in a matter of a few years from barely noticeable to landscape-level mortality. Up to 90 percent mortality occurred throughout the lodgepole pine forest type. Green-infested and fading lodgepole pine trees contributed to the erratic, severe fire behavior in the Mustang Complex and Halstead wildfires of 2012.

Figure 59. Total Acres of Mountain Pine Beetle Damage Recorded Each Year from Aerial Detection Survey 1990-2016 on the Salmon-Challis



The mortality level was higher than expected in ponderosa pine and whitebark pine (K. Gibson and others 2008; Halofsky 2018; Kegley and others 2011; Lazarus and McGill 2014). Mortality in ponderosa pine forests, in particular, measured 90 percent for the first time in recorded history on this Forest (Lazarus and McGill 2014). The landscape-level loss of large fire-resistant ponderosa pine will have impacts for this ecosystem as fires become more frequent and intense (Intermountain Adaptation Partnership 2016).

Whitebark pine were also killed at high levels up to 90 percent in some areas (Fins and Hoppus 2013; K. Gibson and others 2008; Schotzko and others 2013). This loss is a resource concern because the natural return of mature whitebark pine-dominated communities may require hundreds of years. Approximately 20 percent of regenerated whitebark pine is infected by white pine blister rust, further reducing the likelihood that new trees will reach maturity.

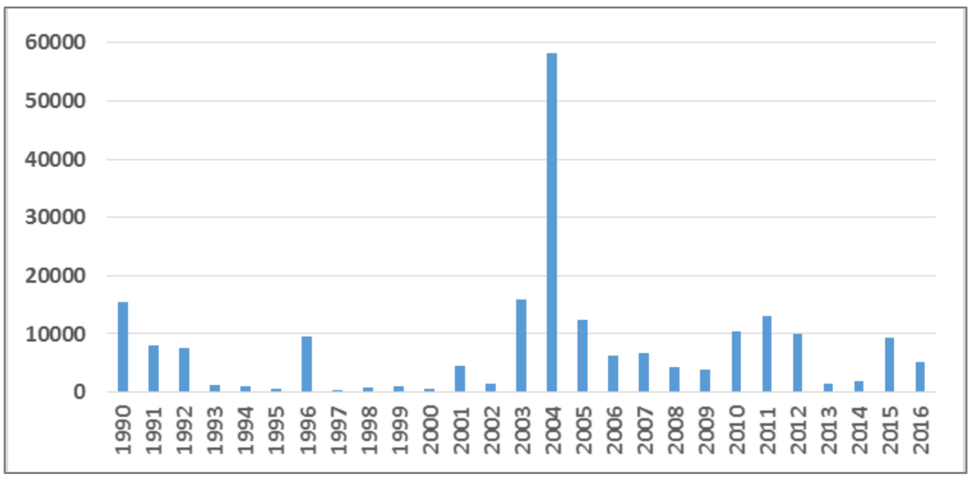
Douglas-fir Beetle

Douglas-fir is the exclusive host for the Douglas-fir beetle, the primary boring bark beetle on the Salmon-Challis. Figure 60 shows the total acres of Douglas-fir beetle damage recorded annually 1990-2016. Most of the Douglas-fir beetle-caused mortality over the last 25 years has been associated with large wildfires and drought conditions in areas with abundant suitable host. Mortality ranging up to 60 percent of host within impacted stands was common (K. Gibson 2003; Negron and others 1999).

Although Douglas-fir beetle populations have occurred historically, the spatial and temporal scales of outbreaks may have been elevated compared to prior assessment periods due to interaction of fire, defoliation and drought. Populations of Douglas-fir beetle peaked 3-4 years following drought conditions and wildfires in 2000, 2007, 2012 and 2013. The outbreak following the 2000 and 2012 fires on the North Fork Ranger District resulted in cumulative mortality of over 30 trees per acre.

While large diameter Douglas-fir is still represented across the Forest, current size class distribution may be skewed to the smaller sizes, which represents a departure from historic conditions. The departure may worsen for Douglas-fir in the future as wildfires and drought increase in frequency and as Douglas-fir beetle populations continue to respond to the abundance of host trees.

Figure 60. Total Acres of Douglas-Fir Beetle Damage Recorded Each Year from Aerial Detection Survey 1990-2016 on the Salmon-Challis



Western spruce budworm

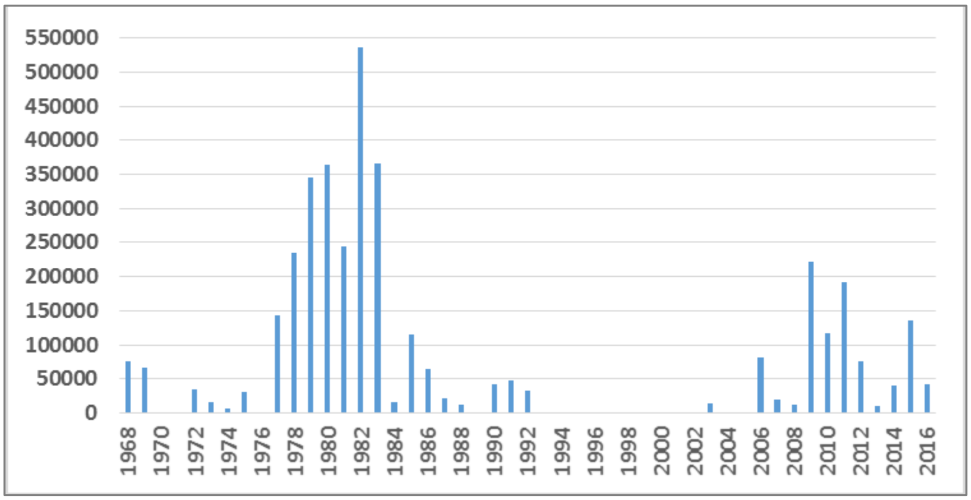
Western spruce budworm is the most widespread and destructive defoliator on the Salmon-Challis, particularly where Douglas-fir and true firs are the primary tree species in a stand. Figure 61 shows western spruce budworm damage in subalpine fir and Douglas-fir mapped by aerial detection survey between 1968 and 2016.

Western spruce budworm activity has been continuous since the early 2000s. Defoliation has been fluctuating from year to year, likely due to winter survival, timing of budbreak with emergence, and lack of interaction with natural enemies (Halofsky 2018).

Western spruce budworm damage occurred across all Ranger Districts during the assessment period. Over the past decade the western spruce budworm activity has been high, ranging up to 200,000 acres defoliated per year across the Forest. Regeneration of Douglas-fir and subalpine fir have been most affected so far, with exceptions of large size Douglas-fir mortality on drier sites and additional mortality due to Douglas-fir beetle (Laura Lowrey 2017).

The outbreak is not expected to subside until the drivers of this system, natural enemies and untimely or unseasonable climate events, occur. Exactly when that will be is unknown. Realistically, defoliation could continue for another 20 years or until stand conditions become less suitable. Mature trees are expected to continue to die on drier sites just from western spruce budworm defoliation alone. The cumulative effects of over a decade of defoliation has resulted in Douglas-fir beetle population expansions into chronically-defoliated areas. Bark beetle attack in these areas will be worse in years of drought.

Figure 61. Total Acres of Western Spruce Budworm Damage in Subalpine Fir and Douglas-Fir Mapped By Aerial Detection Survey from 1968 through 2016



Subalpine fir mortality complex

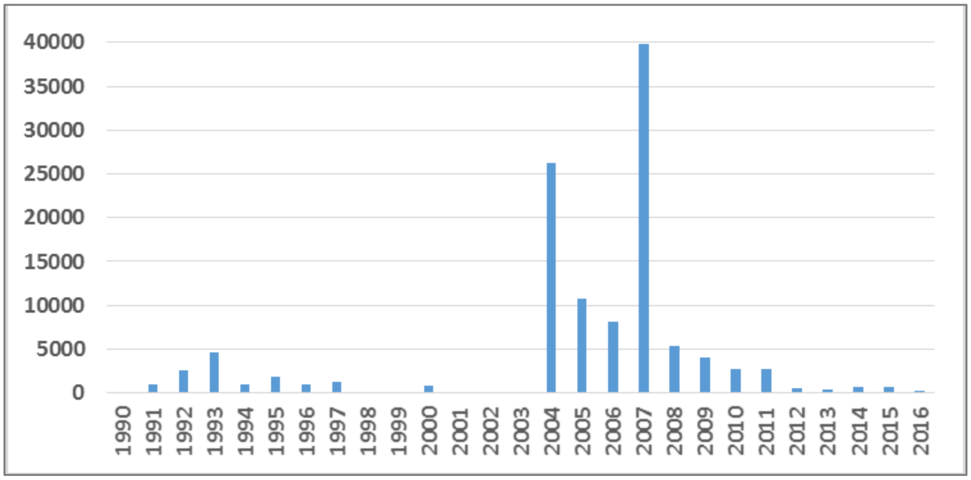
The relationship between the factors contributing to subalpine fir mortality complex is the subject of some controversy. The agents involved in this complex are varied and tend to be a complex of root disease, canker diseases, broom rust and secondary twig beetles (Beckman and others 1992; Munson 1995).

Figure 62 shows the total acres of subalpine fir mortality complex damage in subalpine fir and grand fir on the Salmon-Challis mapped by aerial detection survey from 1990 through 2016.

Subalpine fir dieback and decline has been noted since the 1950s, but recent widespread mortality in drought years has led to increasing interest in the status of subalpine forests. Increasing dieback and decline was reported across the Intermountain West following a drought from 2001-2004.

Mortality rates peaked from 2004 to 2007 and have since returned to pre-drought levels. Damage from subalpine fir mortality complex was noted across the entire Forest. However, cumulative mortality was most severe on the Leadore and Challis-Yankee Fork Ranger Districts. Forest types with a component of true fir may be at risk in the future because of combined impacts of subalpine fir mortality complex, western spruce budworm, and balsam wooly adelgid.

Figure 62. Total Acres of Subalpine Fir Mortality Complex Damage in Subalpine Fir and Grand Fir by Aerial Detection Survey from 1990-2016



Dwarf mistletoes

Dwarf Mistletoes are a group of parasitic seed plants that are widespread across the Salmon-Challis National Forest, and mainly cause reduced tree growth and forest structural changes, but in some cases also cause tree mortality. The Salmon-Challis covers a range of forested ecosystems, and consequently is home to several dwarf mistletoes, listed on primary host:

- *A. americanum* on lodgepole pine;
- *A. campylopodum* on ponderosa pine;
- *A. cyanocarpum* on limber pine;
- *A. douglasii* on Douglas-fir; and
- *A. abietinum* on true firs

The distribution of dwarf mistletoes are closely related to the frequency and intensity of wildland fire in many Intermountain forest types (Geils and others 2002). Stand-replacing fires tend to eliminate dwarf mistletoes, and, historically, fire has been the single most important factor governing the distribution and abundance of dwarf mistletoes.

Past management also plays an important role, and any management practices that promote interfaces between infected overstory trees and susceptible regeneration promote the spread and intensification of dwarf mistletoes.

Data from Forest Inventory and Analysis plots were used to create Table 26 and are believed to be representative for the forest types on the Salmon-Challis.

Table 26. Percentage of Host Infected with Dwarf Mistletoes from Intermountain Region Forest Inventory Analysis Data

Community	Percentage Infected
Engelmann spruce subalpine fir	16.2
Engelmann spruce	4.7
Douglas-fir	30.8
Whitebark pine	10.0
Lodgepole pine	33.6
Ponderosa pine	15.3
Limber pine	12.7
Other forest types	1.9
All Forest Types	15.1

White Pine Blister Rust

White pine blister rust is a non-native fungus that was inadvertently introduced to western North America from Europe around 1910 (Bingham 1983; Tomback and Achuff 2010). The white pine blister rust fungus infects only five-needle pine species, which includes whitebark pine and limber pine.

Pine blister rust-caused tree mortality greatly affects stand structure and species composition, but the most serious impact of white pine blister rust on the Salmon-Challis is long-term effects on whitebark and limber pine regeneration capacity.

White pine blister rust infection levels have been tracked through ground-based surveys across the Intermountain Region. Current Forest Inventory Analysis data reports white pine blister rust infections across national forests ranging from 5.6 to 83.7 percent based on data collected over the last 15 years. More mesic forests have experienced significant mortality since 2005. Potential new introductions of white pine blister rust with limited seed source availability and unknown genetic diversity suggests trends of continued increasing mortality for these climax stands.

Climate predictions of warmer and changed moisture patterns may enhance white pine blister rust infection because environmental conditions for initial and ongoing infection would be more favorable. Since rust diseases tend to have wave years of relatively high infection levels during warm-moist years in the dry Intermountain climate, these wave years may become more frequent (Kliejunas 2011; Kliejunas and others 2009).

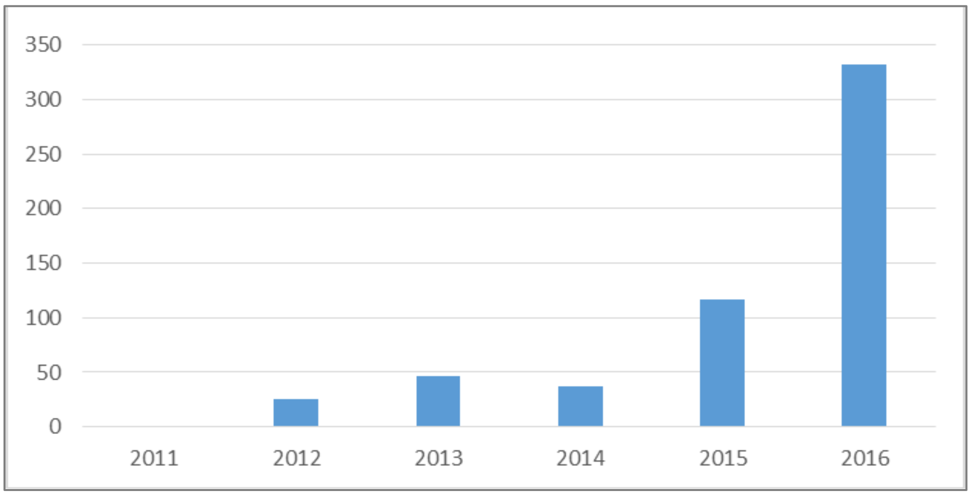
Balsam woolly adelgid

Balsam wooly adelgid is a non-native insect. During the 2000s, balsam wooly adelgid expanded its range across the Middle Rockies and into the Southern Greater Yellowstone area of the Intermountain Region (L.L. Lowrey 2015). Subalpine fir is the most susceptible true fir species with up to 90 percent mortality killed in 5 years (Mitchell 1966).

At present, many areas of the Salmon-Challis dip below the cold temperature threshold during winter that kills balsam wooly adelgid populations, reducing impacts and subsequent mortality in those locations for now (L.L. Lowrey 2015). Limited ground surveying has been completed on the Forest, but permanent plots established in 2008 on the Salmon-Challis showed 6 percent loss of subalpine fir after 5 years at elevations over 6500ft (2008). Aerial detection surveys are beginning to document more balsam wooly adelgid mortality each year, as seen in Figure 63. Continued losses are expected as balsam wooly adelgid expands and temperatures trend warmer.

Since it is not a native insect and has no known predators or methods to control impacts, balsam wooly adelgid will continue to passively spread across the Salmon-Challis by wind, animals and humans. Impacts will likely continue to worsen over time. Forest types with a component of sub-alpine fir are projected to lose a large percentage of sub-alpine fir over the next 25-year assessment period. Increased surface fuel loading from dead trees will affect fire behavior on this terrain.

Figure 63. Total Acres of Balsam Wooly Adelgid Damage in Sub-Alpine Fir and Grand Fir by Aerial Detection Survey from 2011-2016



Summary

The insects and diseases discussed here have a component of ecological urgency. Current vegetative trends or status elevate concerns associated with future tree mortality and management may be warranted to mitigate impacts. Other endemic insects and diseases occur at endemic levels. However, they pose a low risk to important ecosystem services and do not require intensive management.

Invasive Plant Species

Invasive plants, which are stressors to ecosystems, are non-native plants whose introduction causes economic or environmental harm. Invasive plants have been identified as a major threat to the biological diversity and ecological integrity within and around the Salmon-Challis.

Invasive plants create many adverse environmental effects, including:

- displacement of native plants;
- slow or prevent natural succession in native plant communities;

- reduction in functionality of habitat and forage for wildlife and livestock;
- reductions in water holding capacity and water yield;
- threats to populations of threatened, endangered and sensitive species;
- alteration of physical and biological properties of soil, including productivity;
- changes to the intensity and frequency of fires; and
- loss of recreational opportunities.

The Weeds Record of Decision, which was signed in July 2016, identified approximately 49,000 acres as being infested with 23 known species of State- and County-listed invasive species outside of wilderness acres on the Salmon-Challis National Forest. These infestations are most often tied to initial introduction from human activities, including:

- use and maintenance of roads,
- recreational uses of the Salmon-Challis,
- airstrips in the Frank Church – River of No Return Wilderness Area,
- soil disturbance resulting from mining activities,
- timber harvest, and
- livestock grazing.

Figure 64. Cheatgrass and knapweed are two invasive species of concern to land managers.

Untreated invasive plant infestations have the potential to expand at an average rate of 1.3 to 25 percent each year (Duncan and Clark 2005). Increases are due to growth of existing plants, the seeds of which then spread by wind, water, animals, and humans. The additional threat of potential invasive plants that have not been found on the Forest but are known to occur in adjacent lands, counties, or states, also exists.

Many of these invasive plants use late fall and early spring soil moisture, when native plant communities have gone dormant. This head start in establishment results in a competitive advantage on either a wet or dry spring. Examples can be seen where spotted knapweed is starting to invade relatively intact middle elevation shrublands. It is these changing conditions that make a flexible and adaptive noxious weed management program necessary to address new threats quickly.

Cheatgrass, an invasive plant species of particular concern to land managers and citizens, is an annual grass that uses fall moisture to germinate and develop root structures prior to winter dormancy. It is more tolerant of cold soil temperatures, giving it a competitive advantage when native grasses are dormant. While there are known infestations of cheatgrass on the Salmon-Challis, it is not listed by the State of Idaho in any of the four categories of invasive species. For this reason, until recently, we have not tracked the locations and to what extent it exists in our database.

With the September 2015 release of the Greater Sage-grouse Record of Decision, the Forest has tried to determine the risk of cheatgrass invasion on lands it manages. Assessments of possible risk from invasive plants, wildfire and conifer encroachment on greater sage-grouse habitats were completed in February 2016 and provided an estimate of the possible extent of cheatgrass establishment. This assessment estimated 106,955 acres, or 23 percent, of greater sage-grouse habitat on the Salmon-Challis is probably infested or at risk of invasion with cheatgrass.

Infrastructure

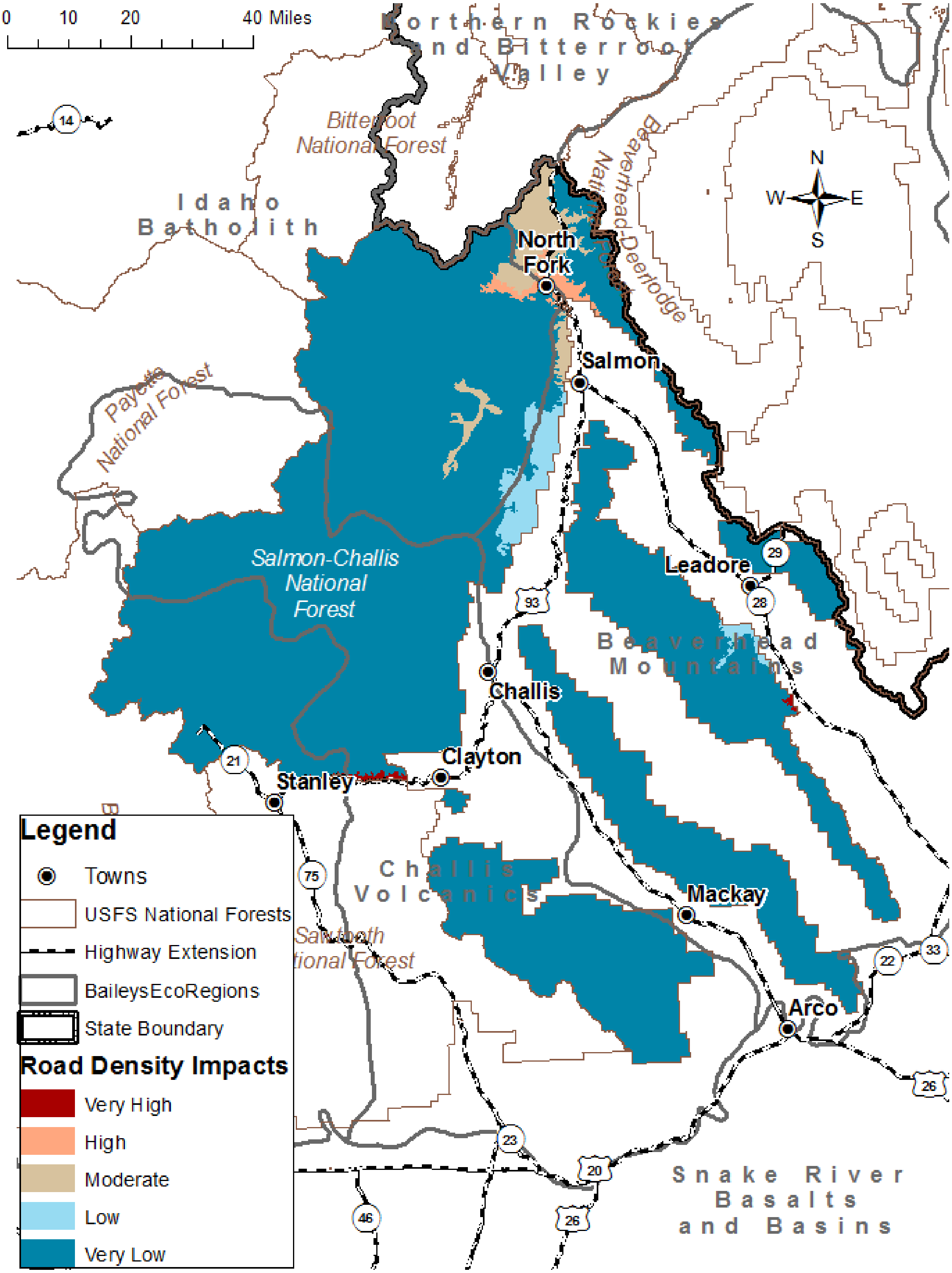
Man-made developments, such as roads, fences, dams, diversions and stream crossings, are also stressors because they can negatively impact connectivity on the Forest.

Roads constructed to support timber harvest activities, even temporary ones, may have impacts on forest integrity and its effectiveness as wildlife habitat. A review of 91 species in the Columbia River Basin found more than 70 percent are affected negatively by one or more factors associated with roads (Wisdom and others 2000).

The most recent U.S. Forest Service National Terrestrial Condition Assessment modeled habitat quality for wildlife based on road density across all National Forests, including the Salmon-Challis (Cleland and others 2017). Figure 65 is the result of this modeling, which was based on a review of road effects on multiple wildlife species.

The map shows 96 percent of the Salmon-Challis has very low- to low-impacted wildlife habitat due to roads. However, four of the six Salmon-Challis Ranger Districts have moderately to very highly impacted landscapes. The North Fork Ranger District, with its logging roads and non-highway class paved roads, has the greatest extent of these impacted landscapes. The Salmon-Cobalt Ranger District has moderate to high impacts along Panther Creek and front-country lands south of North Fork and north of Salmon.

Figure 65. Wildlife Habitat Quality Based on Road Density



Source: U.S. Forest Service National Terrestrial Condition Assessment

Livestock and Wildlife Grazing

Grazing is an ecosystem driver. Grazing of forage species by wildlife is a natural part of the succession of plant communities on the Salmon-Challis National Forest but can also be a stressor where wildlife populations rise above the carrying capacity of the land.

With European settlement of southeastern Idaho, livestock began to use additional forage. This addition of grazers resulted in some shift in vegetation communities based on the type of livestock, the intensity of grazing, and the duration of use. Changes in composition occur when fine fuels are removed and shrublands and conifer species expand due to a lack of natural disturbance. An example of this on the Salmon-Challis is the conversion of areas used historically as sheep bedding sites to mule's ear or other forblands. This phenomenon has been exacerbated by fire suppression policies of the 1950s through 1990s, when livestock operations shifted to more intensively managed grazing in response to concerns over riparian grazing and distribution of grazing effects across landscapes.

Livestock grazing is discussed in further detail in the Multiple Uses section of this assessment.

Timber Harvest

Timber harvest, thinning, and prescribed fire have been implemented on less than two percent of the Salmon-Challis National Forest since 1987. Impacts of these activities to the ecological composition, structure, function and connectivity on forested stands varies based on their intensity, the type of harvest or treatment used, recurrence, forest type, and whether these activities were done in conjunction with each other. Intensive selective cutting of certain species and size classes prior to the 1990s are likely still affecting stand structure, composition and function of the forest where it occurred.

Since the early 1990s, timber harvest objectives have largely been met through forest ecosystem restoration goals, where silvicultural prescriptions have attempted to more closely mimic natural disturbance regimes.

WATER, AIR, & SOILS

Watersheds and water resources on the Forest, in conjunction with air and soil resources, are part of a foundation of ecosystem functions that provide a full suite of multiple uses and ecosystem services. These services go on to support recreation, the resistance and resilience of aquatic and terrestrial habitats, and water for human consumptive and non-consumptive uses.

Information Sources & Needs

The following sources of information were used to summarize the condition and trend of watersheds, water quality, and quantity for this assessment:

- the National Hydrography Dataset, with edits made by forest personnel;
- data from monitored sites on the Salmon-Challis;
- twenty-two watershed analysis reports completed by forest personnel;
- a water rights inventory, which documents water uses and rights on the Salmon-Challis; and
- precipitation and hydrologic data from the Natural Resources Conservation Service's Snow Telemetry sites.

Current and history data related to air quality in or near the Salmon-Challis National Forest was used for this assessment, including:

baseline emission inventories,

ambient air quality measurements,

visibility, and

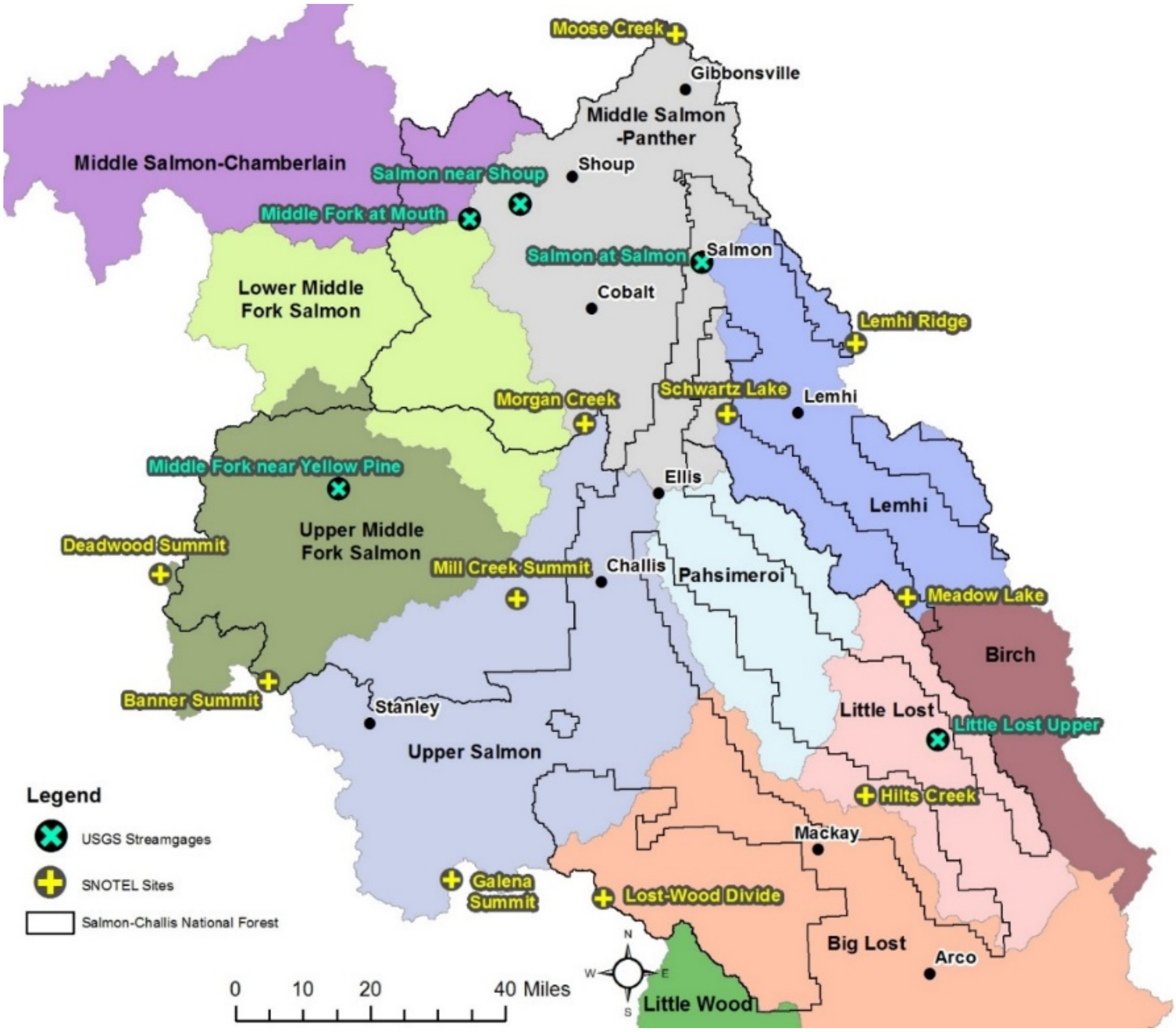
deposition measurements.

Existing Plan Direction

The Salmon and Challis Forest Plans both address air, soil, and water resources in a similar manner. For soil and water resources, direction related to sedimentation, flows, or disturbance is redundant with direction in PACFISH and INFISH. Meeting PACFISH and INFISH direction in most cases meets related water and soil direction in the existing plans. Existing plan direction for soils and water also require following best management practices and the Intermountain Region technical guide for erosion control on timber sale areas. Existing plan direction for air resources is identical to Forest Service Policy to comply with State and Federal Air Quality Standards. The Challis plan also requires day-to-day notification to the State air quality agency.

Existing plan direction does provide guidance on air, soil, and water resource. However, for water and soil resources, there are redundancies with other direction or law, regulation, or policy. The soil and water direction is redundant with PACFISH, INFISH, and best management practices that are already included in Forest Service Policy. In addition, meeting air quality standards is a requirement regardless of whether it is restated in the forest plans. The direction to coordinate with state air quality agencies is helpful to keep relevant state and local agencies informed.

Figure 66. The Subbasins, Snow Telemetry Sites and Gauging Stations Used for the Water and Watershed Analysis



Scale of Assessment

The discussion of watersheds and water resources in this Assessment is bound by the 11 subbasins shown in Figure 66. The Subbasins, Snow Telemetry Sites and Gauging Stations Used for the Water and Watershed Analysis but focuses on conditions and trends within the Salmon-Challis National Forest at the subwatershed scale.

Evaluation of soils is limited to the administrative boundaries of the Salmon-Challis National Forest. Management activities on Forest lands do not directly impact soils on adjacent ownerships. However, indirect impacts may be linked to some large disturbances that cross Forest boundaries, such as wildfire and debris flows.

The scale of analysis for Air resources includes all of counties in Idaho that contain part of the Salmon-Challis National Forest. These counties are: Blaine, Boise, Butte, Clark, Custer, Idaho, Lemhi, and Valley.

Conditions & Trends

Water and Watersheds

The Salmon-Challis National Forest straddles the divide between the Salmon and Upper Snake River drainages, both of which are major tributaries to the Columbia River. The eastern Forest boundary is the Continental Divide, with the headwaters of the Missouri River directly adjacent. The Salmon-Challis National Forest lies within two basins, Salmon and Snake, and 11 subbasins.

Within these 11 subbasins there are 75 watersheds. Watersheds generally range from 40,000 to 320,000 acres in size. Within these watersheds, there are 323 subwatersheds. Subwatersheds generally range from 10,000 to 60,000 acres in size; however, the Forest has two subwatersheds over 150,000 acres. An interactive map of watershed boundaries within and surrounding the forest is available here online in our Open Data Gallery.

State Integrated Reports

The State of Idaho 2012 Integrated Water Quality Monitoring and Assessment Report describes the water quality status of all Idaho waters (Idaho Department of Environmental Quality 2017). The 2012 Integrated Report presents information about the status of Idaho's waters based on the department's data and other readily available data and information.

In total, there are 638 miles of streams on the Salmon-Challis that do not meet water quality standards. The most common cause is combined biota and habitat bio-assessments that indicate aquatic life use is impaired. Additional analysis is needed to determine if nutrients or sediment is causing the impairment. Other causes for impairment include excessive temperature and sediment levels.

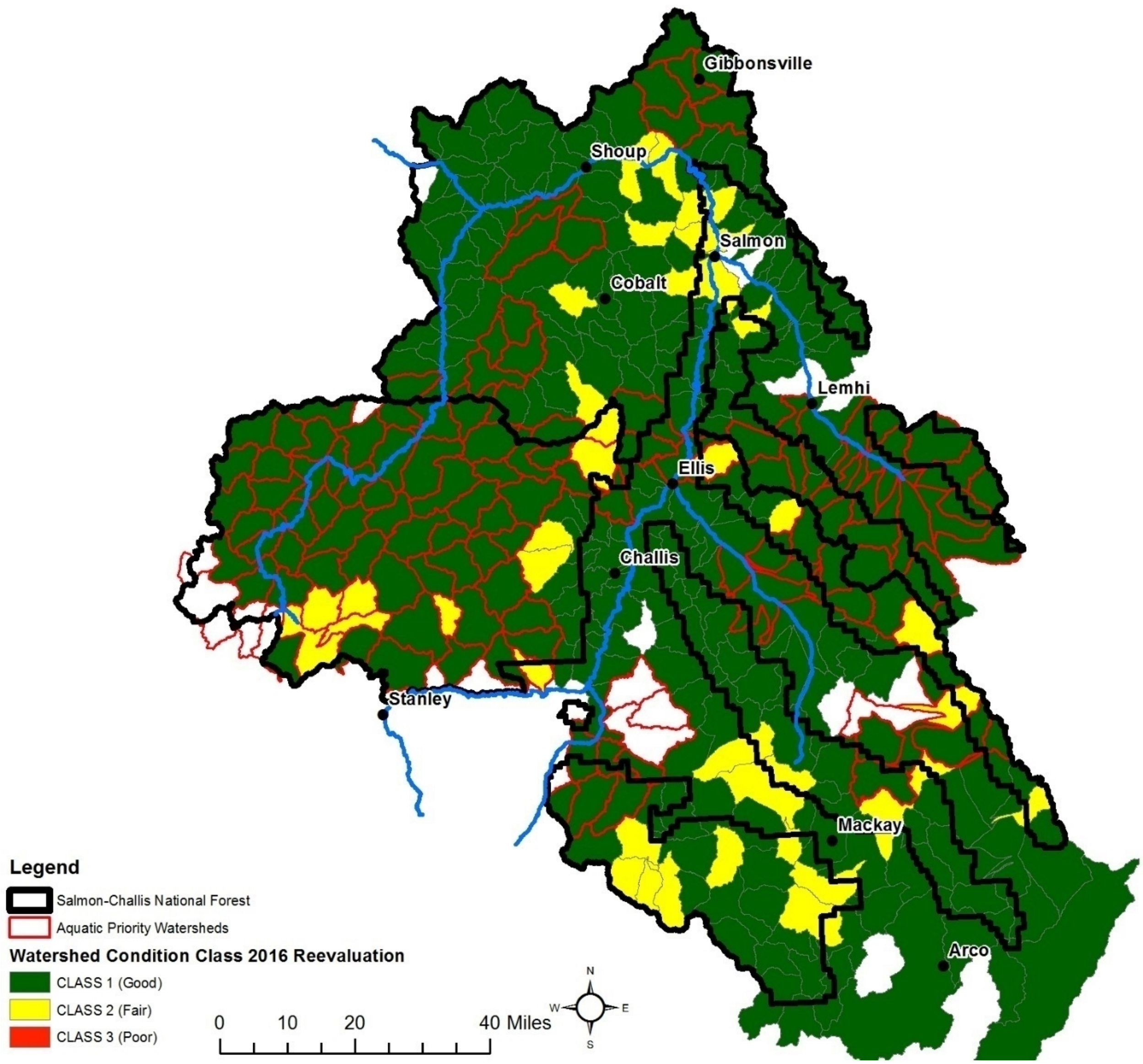
Table 27. Miles of Impaired Streams on the Forest by Subbasin

Cause	Big Lost	Lemhi	Little Lost	Middle Salmon-Panther	Pahsimeroi	Upper Middle Fork Salmon	Upper Salmon	Total
Cause Unknown	14	0	0	8	0	0	0	22
Combined Biota and Habitat Bio-assessments	87	60	3	63	61	0	32	307
Copper	0	0	0	15	0	0	0	15
Fecal Coliform	5	0	0	0	15	0	0	20
Fish Bio-assessments	0	0	27	0	0	0	0	27
Sedimentation/Siltation	0	1	21	7	0	0	25	54
Water Temperature	6	25	98	0	0	2	61	193
Grand Total	112	86	150	94	76	2	117	638

Watershed Condition Framework

The Watershed Condition Framework is the Forest Service's comprehensive approach for classifying and prioritizing watersheds on national forests and grasslands for restoration (U.S. Department of Agriculture, Forest Service 2011). The first step of the framework characterizes the health and condition of watersheds. The most recent characterization for the Salmon-Challis was completed in 2016, when 310 of the 365 subwatersheds were examined and classified, as shown in Figure 67. Our online Aquatics Ecosystems Story Map further explores the watershed condition framework and aquatics data layers.

Figure 67. Watershed Condition Scores



Overall Watershed Condition and Process Categories

In accordance with the Watershed Condition Framework, an interdisciplinary team evaluated the 310 watersheds on the Salmon-Challis based on 12 indicators, which are detailed in Figure 68.

Figure 68. Four Process Categories and 12 Indicators Used to Assess Watershed Condition

Aquatic Physical Properties	Aquatic Biological Properties	Terrestrial Physical Properties	Terrestrial Biological Properties
•Water Quality •Water Quantity •Conditions of Aquatic Habitat	•Life Form Presence •Presence of Native Species •Presence & Extent of Exotic or Invasive Species •Conditions of Vegetation	•Road & Trail Density, Condition and Proximity •Soil Conditions	•Effects of Fire •Amount of Forest Cover •Condition of Vegetation •Presence & Extent of Terrestrial Invasive Species

Overall, 274 of the 310 watersheds are functioning properly, 36 are functioning at-risk, and there are no watersheds with impaired function, as shown in Table 28. A majority of the 310 watersheds are functioning properly relative to three of the four process categories: aquatic physical, aquatic biological, and terrestrial physical. Relative to the fourth process category, terrestrial biological processes, a majority of the watersheds are functioning at risk, also in Table 28.

Table 28. Overall Watershed Condition by Process Categories

Condition	Watershed Condition Class	Watershed Condition Process Categories			
	forestwide	Aquatic Physical	Aquatic Biological	Terrestrial Physical	Terrestrial Biological
Good, or Functioning Properly	274, or 88 percent	285, or 92 percent	255, or 82 percent	260, or 84 percent	107, or 35 percent
Fair, or Functioning At Risk	36, or 12 percent	24, or 8 percent	55, or 18 percent	49, or 16 percent	203, or 65 percent
Poor, or Impaired Function	0, or 0 percent	1, or 0 percent	0, or 0 percent	1, or 0 percent	0, or 0 percent

There are no watersheds with impaired aquatic biological and terrestrial biological function. There is one watershed, Lower Squaw Creek, with impaired aquatic physical function. The concerns in this watershed are water quantity and aquatic habitat. There is one watershed, Owl Creek, with impaired terrestrial physical function. The concerns in this watershed are lack of road and trail maintenance, proximity of roads and trails to water, loss of soil productivity, and erosion.

Process Categories and Indicators Summary

Most watersheds are functioning properly relative to aquatic physical indicators: water quality, water quantity, and aquatic habitat, as shown in Table 29. Less than 20 percent of the watersheds are listed as either functioning at-risk or impaired function relative to the water quality indicator due to un-listed and listed water quality segments. Roughly 10 percent of the watersheds are functioning at-risk or impaired function relative to the water quantity indicator due to altered flow characteristics.

Table 29. Aquatic Physical Indicator Class

Condition	Aquatic Physical Process Category	Aquatic Physical Indicators		
	Forestwide	Water Quality	Water Quantity	Aquatic Habitat
Good	285, or 92 percent	259, or 84 percent	274, or 88 percent	303, or 98 percent
Fair	24, or 8 percent	43, or 14 percent	23, or 7 percent	4, or 1 percent
Poor	1, or 0 percent	8, or 3 percent	13, or 4 percent	3, or 1 percent

The majority of watersheds across the Forest are functioning properly with regard to the aquatic biota indicators, as shown in Table 30. In the 20 percent of these watersheds that are functioning at-risk relative to that indicator, the lack of native aquatic species and presence of exotic and aquatic invasive species are the driving concerns. More than half of the watersheds are functioning at-risk relative to the riparian and wetland vegetation indicator, with vegetation condition being the main concern.

Table 30. Aquatic Biological Indicators

Condition	Aquatic Biological Process Category	Aquatic Biological Indicators	
	Forestwide	Aquatic Biota	Riparian or Wetland
Good	255, or 82 percent	245, or 79 percent	124, or 40 percent
Fair	55, or 18 percent	65 , or 21 percent	186, or 60 percent
Poor	0, or 0 percent	0, or 0 percent	0, or 0 percent

The majority of watersheds are functioning at-risk relative to the roads and trails indicator, as shown in Table 31. Open road density, lack of road and trail maintenance, and road proximity to water are the key drivers. Most watersheds are functioning properly relative to the soils indicator with chemical contamination being the main concern.

Table 31. Terrestrial Physical Indicators

Condition	Terrestrial Physical Process Category	Terrestrial Physical Indicators	
	Forestwide	Roads and Trails	Soils
Good	260, or 84 percent	43, or 14 percent	308, or 99 percent
Fair	49, or 16 percent	257, or 83 percent	2, or 1 percent
Poor	1, or 0 percent	10, or 3 percent	0, or 0 percent

Most watersheds are at impaired function relative to the fire regime or wildfire indicators with six watersheds listed due to the effects of wildfire, as seen in Table 32. Similarly, a majority of watersheds are functioning at-risk relative to the forest health indicator with insects and disease being the key drivers. More than half of watersheds are functioning at-risk due to rangeland vegetation condition concerns. The majority of watersheds are functioning properly relative to the forest cover and invasive species terrestrial biological indicators.

Table 32. Terrestrial Biological Indicators

Condition	Terrestrial Biological Process Category	Terrestrial Biological Indicators				
	Forestwide	Fire Regime or Wildfire	Forest Cover	Rangeland Vegetation	Terrestrial Invasive Species	Forest Health
Good	107, or 35 percent	0, or 0 percent	296, or 95 percent	109, or 35 percent	280, or 90 percent	13, or 4 percent
Fair	203, or 65 percent	47, or 15 percent	3, or 1 percent	201, or 65 percent	27, or 9 percent	297, or 96 percent
Poor	0, or 0 percent	257, or 83 percent	11, or 4 percent	0 , or 0 percent	3, or 1 percent	0, or 0 percent

Watershed Condition Framework Summary

Across the Salmon-Challis National Forest, 88 percent of the 310 watersheds evaluated in 2016 are functioning properly, 12 percent are functioning at-risk, and no watersheds have impaired function. Attribute and indicator ratings for three of the four process categories—Aquatic Physical, Aquatic Biological and Terrestrial Physical—are the driving influences behind the overall condition ratings and scores. Attribute and indicator ratings for the remaining process category Terrestrial Biological are less influential.

Further examination shows eight of the twelve indicators are influencing watershed condition across the Forest most significantly. These indicators are:

- Water Quality,
- Water Quantity,
- Aquatic Biota,
- Riparian or Wetland Vegetation,
- Roads and Trails,
- Fire Regime or Wildfire,
- Rangeland Vegetation, and
- Forest Health.

Land use and activities that are likely influencing these attributes the most are:

- domestic water supply,
- irrigation,
- stock water development,
- livestock grazing in both uplands and riparian areas or wetlands,
- road, trail, and off-road motorized recreation and
- lack of road and trail maintenance,
- introduction of exotic and invasive aquatic and terrestrial species,
- historical mining, and
- natural range of variability issues relative to fire regimes and insect and disease activity.

Landscape-scale Disturbances

Ecosystems across the Forest experience periodic, but essential, natural disturbances. The most recognized landscape-scale disturbances are floods, weeds, drought, insect epidemics, wildfire and climate change.

Bark Beetles

Watershed studies indicate that declines in live tree densities due to bark beetle-caused mortality can increase runoff due to decreased transpiration and less interception of snow and water by foliage. Stand-level mortality rates of 20 percent or greater are typically required before additional water yields are measurable (Samman and Logan 2000). Modeling efforts of bark beetle infestation indicate there may be a 5–10 percent increase in runoff; although watershed studies suggest that an increase of at least 15 percent is necessary to be able to detect the change at the subwatershed scale (MacDonald and Stednick 2003). Increased runoff can increase rates of soil erosion and streambank instability due to greater instream flows and post outbreak wildfires can affect water quality as subsequent erosion deposits ash and soot into streams, changing water chemistry (Samman and Logan 2000).

Wildfire

Wildfire can change the biotic and abiotic characteristics of a watershed such that the subsequent hydrologic response to the normal precipitation regime is often a sudden and dramatic increase in water discharge (Moody and Martin 2001). High severity fire consumes ground cover exposing previously protected soil and alters the soil surface creating water repellency, which reduces infiltration rates and results in erosion and overland flow to channels (Johansen and others 2001).

Wildfire can also change the response to short-duration, high-intensity summer thunderstorms, resulting in considerable soil erosion, sediment delivery, flash floods, higher peak flows, and down cutting of stream channels (Carlson 2008). These responses are typically a part of the ecosystem but can result in issues and concerns for: infrastructure, like roads, culverts, bridges, and campgrounds; sensitive resources, such as anadromous fish; and for downstream private land and municipal water sources. Such responses and associated effects are usually short-term three to five years and dissipate as vegetation recovers.

Floods

Post-fire flood events and debris flows that occur during late summer thunderstorms can wreak havoc on Forest roads and there is a need to balance engineering requirements with dynamic stream behavior. Occasional floods also occur as a result of snowmelt runoff.

The valleys in the vicinity of Salmon and Challis often experience strong inversions during the winter when high pressure systems cause cold air to be trapped in the valleys. Extended inversions often result in excessive river ice and eventually ice jams that cause flooding of low lying areas in the floodplain. The most significant event happened in 1984 when ice jams and associated flooding caused 325 people to evacuate their homes (Idaho Office of Emergency Management 2017). Ice jams and floods have been common in recent winters between Salmon and North Fork along the Salmon River.

Soils

The soil resource on the Salmon-Challis National Forest, in conjunction with air, water and watershed resources, is part of the foundation for providing for the full suite of multiple uses available from national forests. Productive and stable soils are the building blocks for most all uses, products, and services the Forest provides.

The general results of the monitoring and soil quality assessments indicated no unanticipated short-term or long-term alteration of water or soil productivity and that current best management practices are effective at eliminating or minimizing adverse effects.

Several areas of natural soil instability are present throughout the Salmon-Challis National Forest. Incidences of natural debris flows have been recorded and photographed. Landslide prone areas have been identified on topographic maps indicating where historical landslide-prone soils are located.

Soil disturbance and accelerated erosion from off-road vehicles is a concern on the Forest. The use of off-road vehicles both on and off roads and trails has increased over the last 10 years. User created roads and trails have the potential to alter soil productivity, increase erosion, and alter hydrologic functioning of the soil.

Other factors that can influence soils include:

- road, trail, and landing construction in support of vegetation management;
- dispersed recreation activities impacting riparian areas;
- heavy concentration use areas;
- cattle and sheep use, especially along riparian corridors and at concentrated use areas, such as bedding grounds, watering troughs and stock driveways;
- wildfire and severely burned areas;
- reconstruction and obliteration of old timber harvest and other unauthorized routes during present day projects;
- prescribed burning and large pile burning; and
- impacts to mesic, wet meadow and other ground-water dependent resources.

Air

Clean air is a valuable resource managed by the Salmon-Challis National Forest. Recreational experiences on the Forest can be impacted by air quality and on-Forest activities have the potential to impact air quality outside Forest boundaries. The public values the clean air and sweeping vistas that national forests can provide.

Air pollutants, whether internal to a forest or transported across the forest boundary, can affect forest resources such as forest health, visibility, water quality, aquatic organisms, or heritage resources. By identifying national forest components that are impacted by air pollution and by measuring the effect of air pollution on these sensitive elements, the degree to which air pollution is affecting the Forest can be measured. This information can be used by air regulators, land managers and concerned citizens to promote improvements in air quality that will benefit national forest areas.

The Salmon-Challis includes airsheds 16, 17, 19, and 21A of the Montana/Idaho smoke management program.

Other than the Salmon area, air quality within and near the Salmon-Challis National Forest area is good to excellent as the area is minimally developed and has limited local emissions sources. The forest is currently in conformance with current National Ambient Air Quality Standards but is likely to soon be a non-attainment area within Lemhi County due to the amount of fine inhalable particles, which have diameters that are generally 2.5 micrometers and smaller.

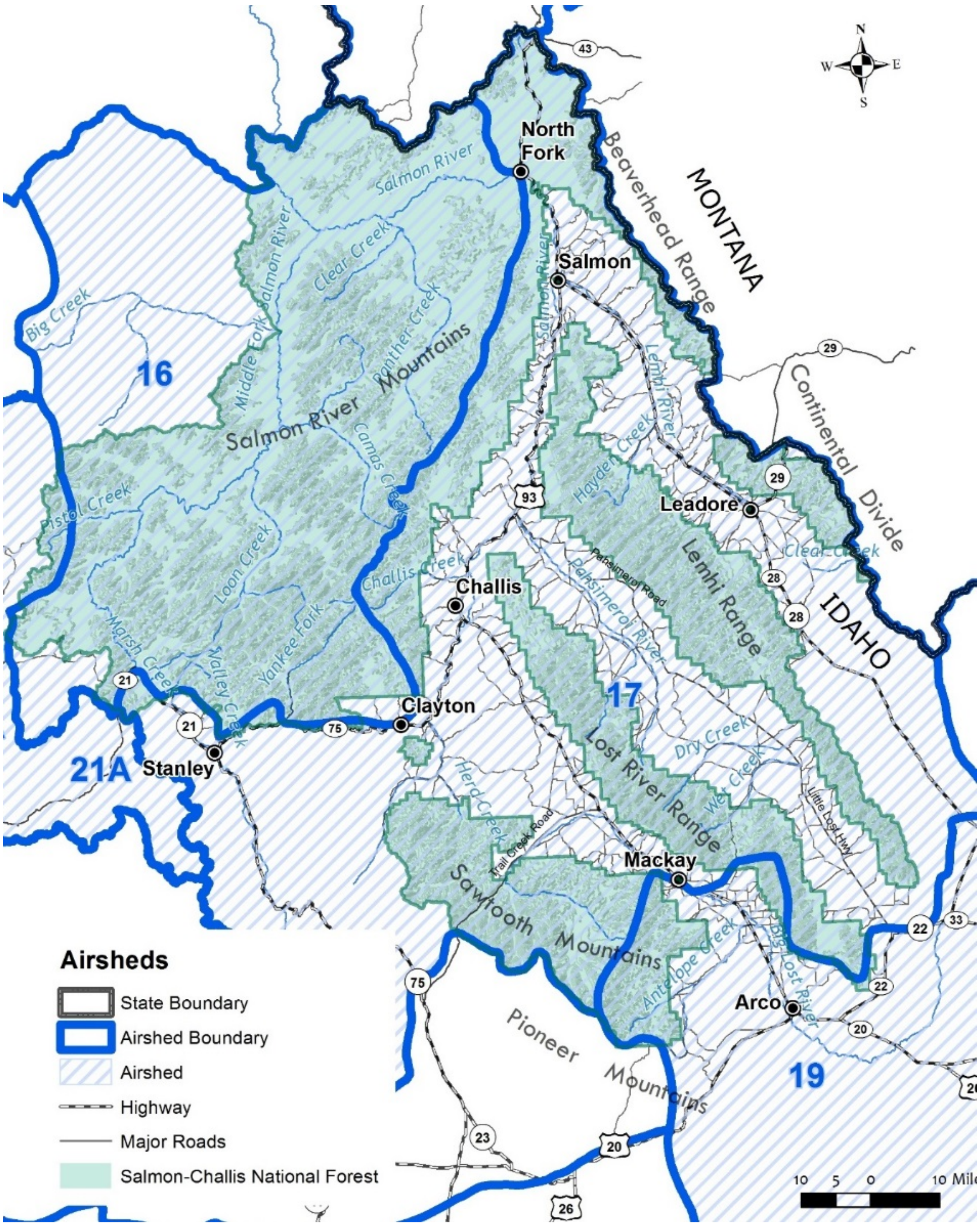
Smoke from wildfires across the west can be a significant source of pollution for the Forest and its neighboring communities. The smoke can fill local and downwind communities with dangerously high levels of particulate. Smoke from wildfires is becoming increasingly difficult to manage due to excessive fuel loads, history of fire exclusion, drought, and increasing temperatures.

These emissions are not controllable by management except through fire suppression. Depending on the effects of climate change, under a warming climate there will likely be an increase in burned areas, so wildfire smoke emissions could increase (Intermountain Adaptation Partnership 2016). Prescribed-fire emissions in the area do occur and are regulated by permit from the State of Idaho through the smoke management program.

Summary

Because of the likelihood of Lemhi County being classified as a non-attainment zone, it will be in the interest of forest managers to consider a monitoring program to document the Salmon-Challis's role in air quality.

Figure 69. Map of the Montana/Idaho Smoke Management Program



TERRESTRIAL ECOSYSTEMS

Terrestrial, or land-based, ecosystems on the Salmon-Challis include forest, rangelands and alpine ecosystems. These are typically the upland areas away from the influence of lakes, streams, and other wet areas.

Information Sources & Needs

For this assessment, we used products developed by the Landscape Fire and Resource Management Planning Tools geospatial program, also known as LANDFIRE. This suite of national datasets includes landscape-scale information on species composition, structural stage, canopy closure and fuel loadings for both historic and existing vegetation. It also uses both measured and modeled information on historic disturbance cycles.

Because this assessment is meant to be a snapshot of the overall condition and general trends related to land management across the forest, we used LANDFIRE's Vegetation Condition Class data layer to quantify forestwide-scale ecological departure. This dataset is a composite of key ecosystem characteristics, habitat types, disturbance cycles and management actions that allows us to show in a general way the condition of vegetation on the Salmon-Challis.

For the fuel hazard analysis, the national fire behavior modeling and mapping system called FlamMap was used with 90th percentile weather information from the National Oceanic and Atmospheric Administration to quantify fire behavior characteristics and mechanisms to control a wildfire. Forest Inventory Analysis plot data was used to quantify old forest structure, snags and downed wood distribution. A combination of annual aerial detection surveys was used to describe insect and disease conditions and trends (Laura Lowrey 2017). These surveys detect new activity, monitor ongoing activity, and rate levels of defoliation and mortality.

In order to determine which areas are at risk of losing key ecosystem components and where management actions may be needed to maintain or restore ecological integrity, more in-depth analysis will be completed in the next stages of plan development.

Information needs to inform plan direction include detailed analysis of current conditions and historic range of variation for each vegetation group specific to structure, function, landscape patterns, and distribution of successional stages. This information will help build a more complete picture of current conditions of ecological integrity and plan direction that would maintain and restore key ecosystem components. Further investigations will be conducted into the use of existing datasets and models to estimate the amount and distribution of old forest, snags and downed wood, and invasive annual grasses at sub-forest scales. Indicators of these conditions may also be considered.

Existing Plan Direction

Currently, plan direction within both the Salmon and Challis plans is to provide fire suppression action on all wildfires that is cost effective and protects life and property, with an appropriate response relative to their respective fire management plans. Lightning-caused fires are permitted to play, as nearly as possible, their natural ecological role within wilderness. Prescribed fire is to be used to improve range and wildlife habitat as long as riparian and aquatic values are also protected. Vegetation treatments are to be used to reduce fire potential in high-hazard, high-value areas and to modify activity fuels in order to permit fire suppression forces to meet fire protection objectives. Insects and disease epidemics are to be prevented or suppressed through forestry and timber management, with specific but differing direction between the two plans on how best to accomplish these goals. Specific plan direction also exists regarding acres of old growth, snags per acres and downed wood per acre. However, each plan has different criteria on what those should be.

One of the biggest changes since the current plans were signed is the documented recognition that a century of purposeful fire exclusion from many fire-adapted ecosystems has caused unanticipated and unprecedented changes in these systems (Swetnam and others 2016). In addition, studies and advances in ecology have expanded our understanding of natural fire regimes, which is defined as the pattern, frequency and intensity of successive fire events in a given vegetation community.

As our understanding of the importance of fire as a natural disturbance across the landscape has expanded, national policy for fire management has also evolved. National wildland fire policies have been updated several times in the last three decades. Most recently, the National Cohesive Wildland Fire Management Strategy established a national vision for fire management in order to better understand the risks and consequences of using fire in the wildland to restore and maintain our landscapes (U.S. Department of Agriculture, Forest Service and Department of Interior 2014a).

This strategy focuses on the integration of fire management into other resource functions and emphasizes working collaboratively to prepare for and respond to wildland fire in order to build fire-adapted communities. It also emphasizes managing wildland fire for resources objectives and ecological purposes to restore and maintain fire-adapted ecosystems, thereby working towards the goal of achieving fire-resilient landscapes. Lastly, it promotes the expansion of using mechanical, biological, and chemical methods to treat hazardous fuels where economically feasible and sustainable and where these methods align with landowner objectives.

The current wildland fire risk to social and ecological values across the western United States has influenced the fire management tools used today and will likely affect all future options. For example, exclusion of fire has caused dramatic changes in vegetation structure and fuels compared to conditions in the 19th century. These changes contribute to larger and more extreme fire events, which are increasingly outside the ability of managers to control and threaten the safety of fire fighter personnel (Finney and Cohen 2003; Hardy 2005). A revised forest plan that incorporates the National Cohesive Wildland Fire Management Strategy is needed to address these risks to social and ecological values.

Other significant changes since the current plans were implemented include nearly four decades of advances in science, technology and available data.

For example, the latest science and information regarding landscape connectivity and forest structure needs to be incorporated into forest plan direction. The importance of connectivity to ecosystem integrity was not considered in either current plan since this is a relatively new concept.

Additionally, recent research encompassing the central Idaho Batholith ecological section indicates that, while old growth characteristics were not extensive on the historic landscape (Penelope Morgan and Parsons 2000), the large tree component was common (Penelope Morgan and Parsons 2000; Wisdom and others 2000). Further consideration of the inherent capability of the landscape to meet the current forest plan's direction on old growth amount, minimum stand size, and distribution is needed.

Current forest plan direction for retention of snags and downed wood lacks detail on within-stand distribution. They also lack emphasis on larger size classes that are important for some species and have been adopted by forests surrounding the Salmon-Challis. In addition, consideration of current standards and guidelines are needed to better meet the current and future demand for personal use fuelwood without damaging important resources for terrestrial and aquatic resources.

Finally, many changes have occurred in national policy and regional direction, including but not limited to the Idaho Roadless Rule, the Sage Grouse Record of Decision and riparian habitat management objectives. A new land management plan that does not conflict with those changes and is consistent across the Salmon-Challis National Forest will improve the ability of land managers to meet restoration goals through fire management, vegetation treatments, timber harvest, and habitat improvement projects.

Scale of Analysis

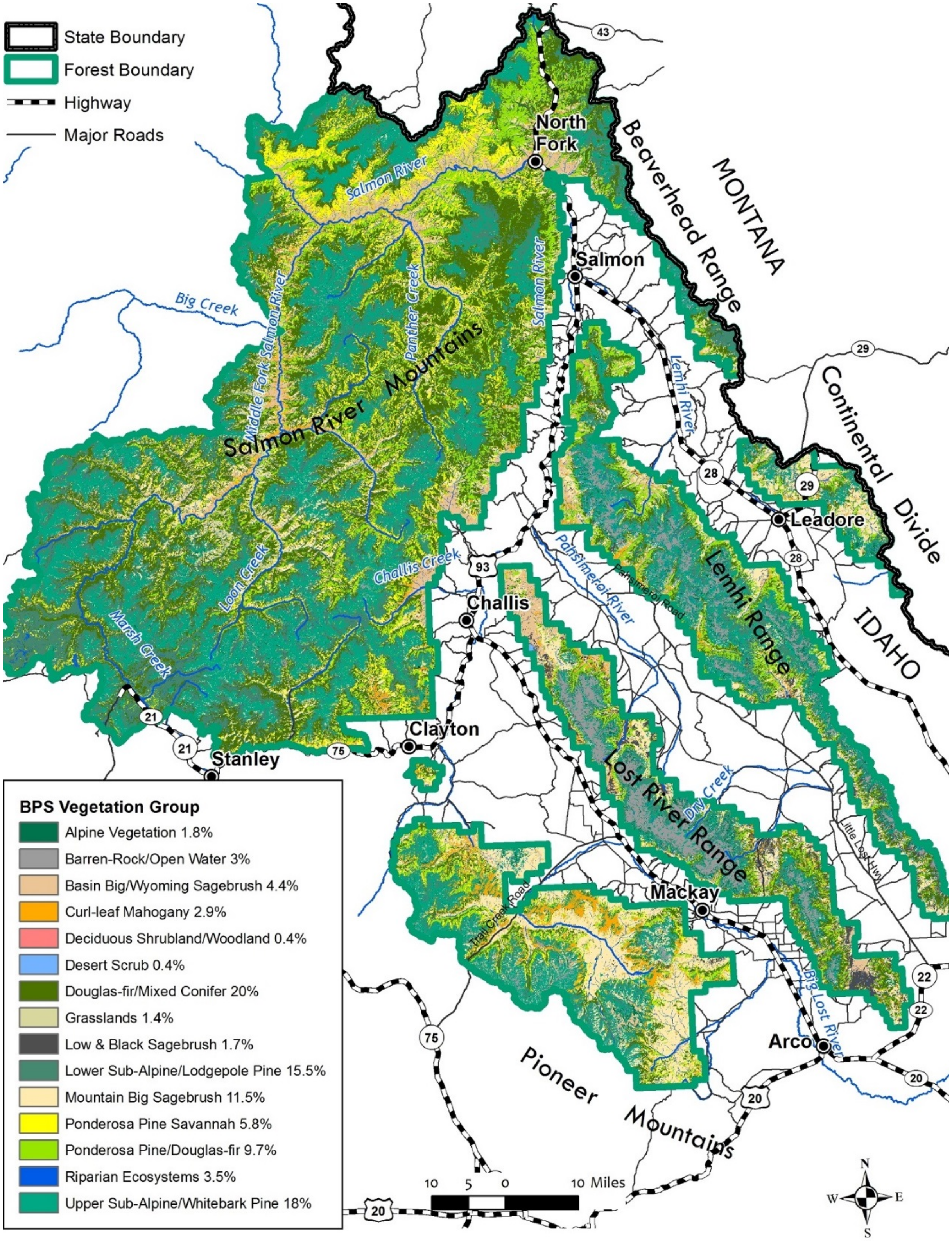
Our scale of analysis is forestwide.

Conditions & Trends

We used LANDFIRE's biophysical setting data layer to describe vegetation community types historically present on the Forest (LANDFIRE 2014). This data layer divides the landscape according to what vegetation communities it can potentially support and depicts baseline conditions for key ecosystem characteristics. It is based on both the existing environment, including elevation, soil type, and topography, and an approximation of how these vegetation types would be arranged on the landscape if the disturbance regimes were functioning as historically measured (Robert E. Keane and others 2009). For our analysis, we summarized these vegetation types into 15 general groups, which are based on habitat type and its interactions with disturbance cycles (Crane and Fischer 1986; LANDFIRE 2007, 2014, 2018 (latest update in draft form)). Figure 70 shows the distribution of those vegetation groups across the Salmon-Challis.

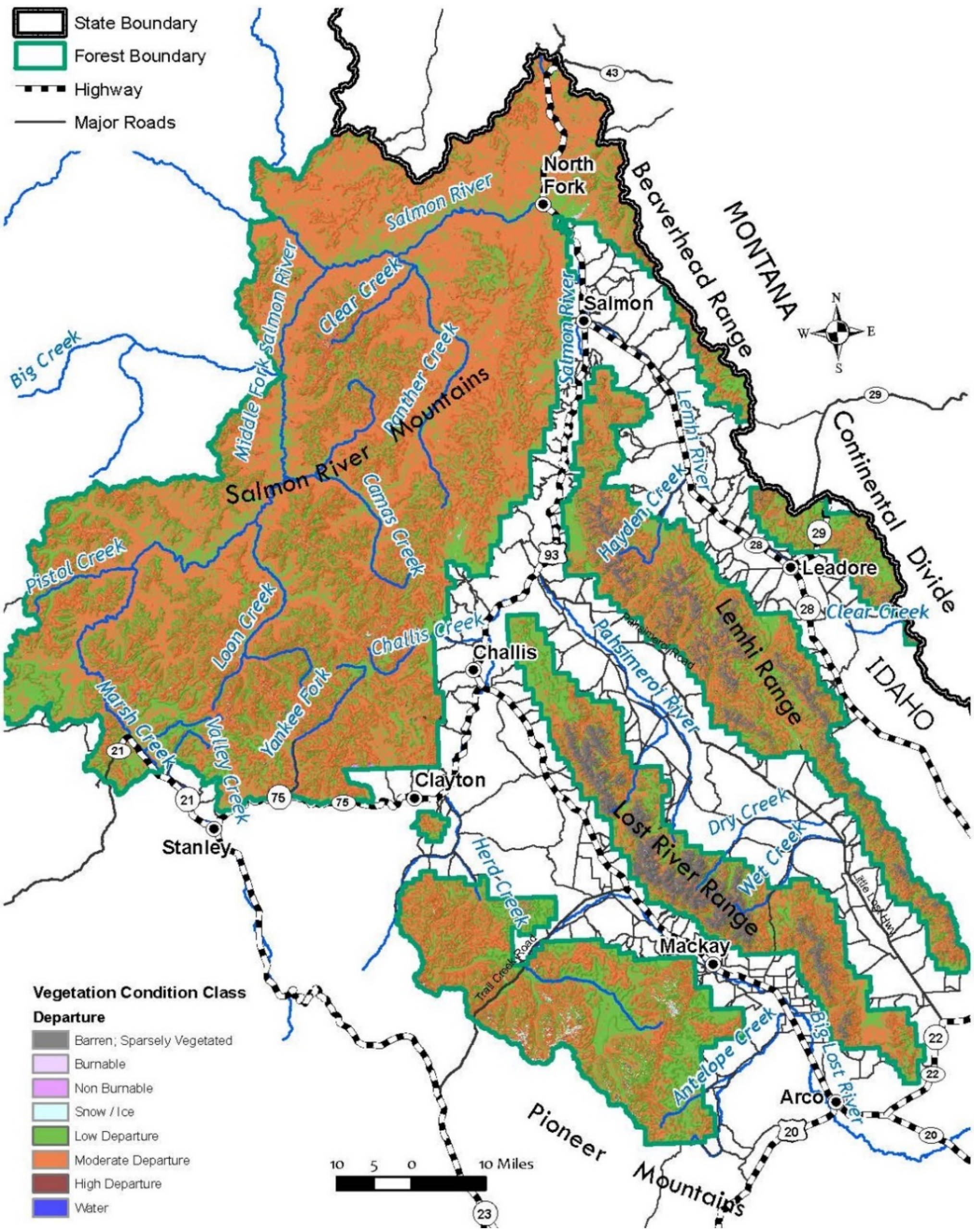
Our evaluation of ecological integrity on the Salmon-Challis is based on how far our vegetation communities have departed from disturbance cycles historically present on the Forest.

Figure 70. Distribution of Vegetation Groups Historically Present on the Salmon-Challis National Forest



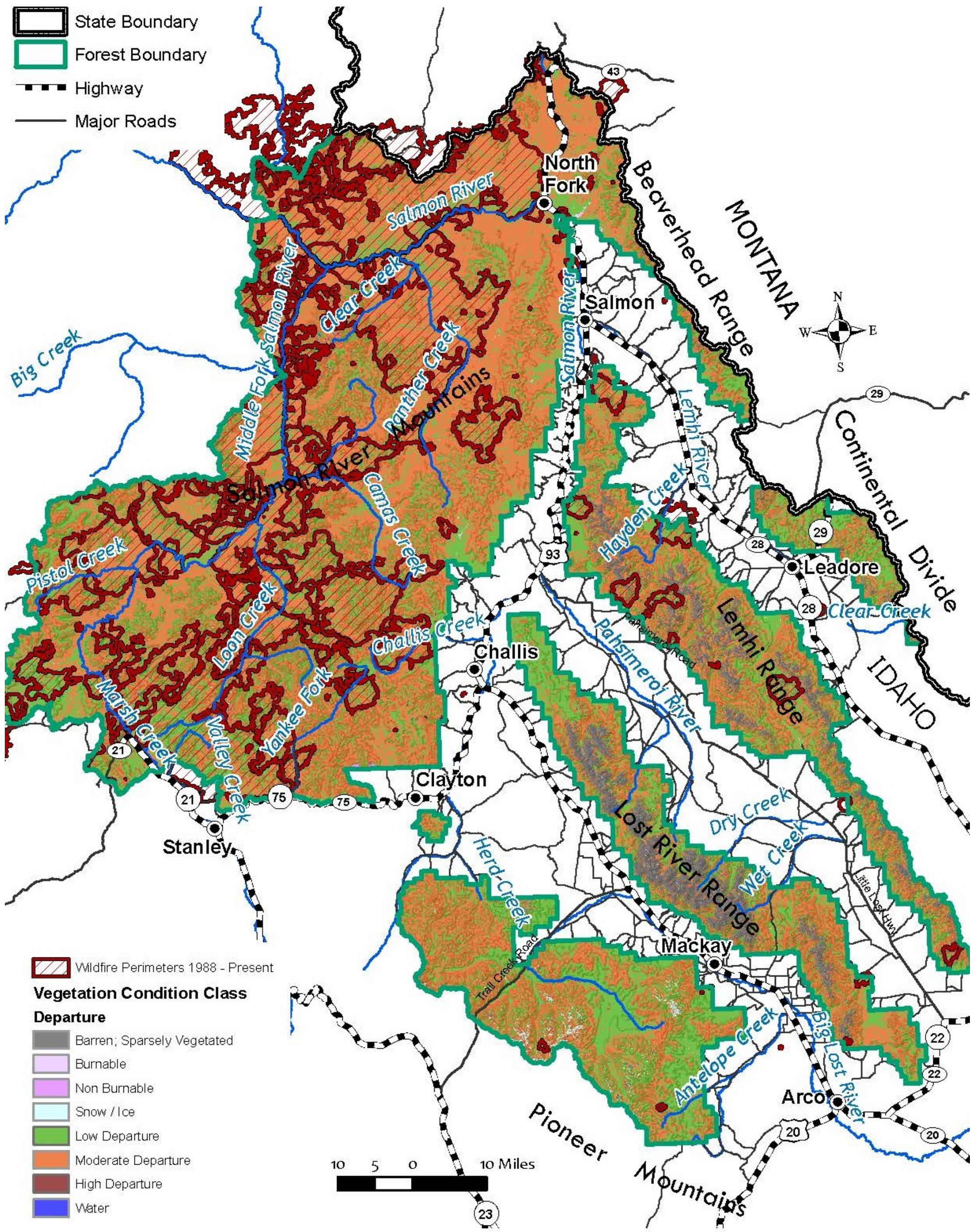
We used LANDFIRE's Vegetation Condition Class data layer to quantify ecological departure. This determination is a combination of species composition, structural stage, stand age, canopy closure and fuel loadings currently on the ground compared to what was present prior to land management activities. This analysis represents the most current landscape-scale vegetation data for the Salmon-Challis and offers a composite of conditions and responses to drivers and stressors that affect vegetation. The combined effects of fire occurrence, fire suppression, timber harvest, livestock grazing, invasive plant species occurrence, insects, diseases, and other management activities are reflected in this display of overall departure, shown in Figure 71 (National Interagency Fuels Fire and Technology Transfer System 2010).

Figure 71. Amount of Departure from Historic Conditions on the Salmon-Challis.



At a forestwide scale, 62 percent of our vegetation communities have a moderate or higher amounts of departure from historic conditions. When we compare the Vegetation Condition Class analysis to the fire perimeters for acres burned in the last thirty years, we see the highly variable and complex mosaic pattern shown in Figure 72.

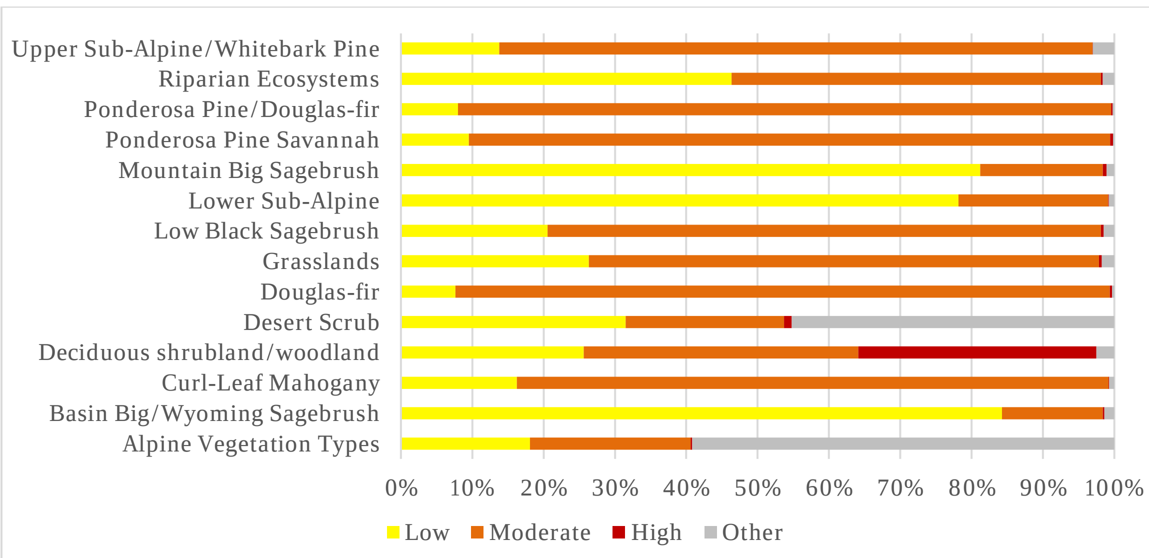
Figure 72. Departure from Historic Conditions and Wildfire Perimeters 1988 to present on the Salmon-Challis



This mosaic is also reflected in the fire severity classifications measured for fires over 1,000 acres from 1996 2015, obtained from Monitoring Trends in Burn Severity data (U.S. Geological Survey). This dataset measures potential fire effects that pertain to soil heating, consumption of fuels and degree of change to vegetation cover measured from the overstory. According to this dataset, these fires burned in a mosaic pattern with 25 percent categorized as high severity, 17 percent as moderate, 22 percent as low and 28 percent as very low or unburned. This also likely reflects where fires burned into previous fire scars. This distribution of fire severities are a result of the variations in topography and fluctuations in fuel conditions and weather that occurred when these fires burned.

Further analysis within each vegetation group reflects the degree to which different forest and non-forested plant communities have responded to changes in fire cycles, insect and disease epidemics, invasive plant species, management actions and a changing climate. Each Vegetation Group and its responses to these changes are described below.

Figure 73. Amount of Departure from Historical Conditions on the Salmon-Challis by Vegetation Group



Vegetation Communities

Grasslands

The Grassland vegetation group is highly variable and makes up 2 percent of vegetation on the Salmon-Challis. Idaho fescue and bluebunch wheatgrass are the predominant grasses on our Forest, but a variety of cool-season herbaceous, grass-like plants may also be present. This vegetation type may have increased in cover by as much as threefold from pre-European settlement. This is likely a result of stand-replacing wildland fires on the Forest.

Bighorn sheep use grasslands to graze on preferred grasses and forbs, but may seasonally shift to subsist on shrubs. Grassland and shrubland habitats provide nesting, brood-rearing, and foraging sites for greater sage-grouse, short-eared owl, burrowing owl, and long-billed curlew (Idaho Department of Fish and Game 2017b). Open slopes of intermountain valleys are used by black rosy-finch during winter storms or while higher country is covered in snow (Johnson 2002). The wide variety of grasses, forbs, and shrubs in this vegetation group also provide abundant nectar and pollen resources for a diverse assemblage of pollinator species.

Perennial forbs, such as spotted knapweed, and annual grasses, such as cheatgrass, have colonized some areas of native grasslands and pose a threat to this important habitat. Site disturbances, such as high-intensity fire or improper livestock grazing, can reduce native plant vigor. This problem is exacerbated in areas of lower precipitation where nonnative cheatgrass is able to outcompete native grasses by using late fall and early spring moisture while native grasses remain dormant. Stressors, such as prolonged drought, longer growing seasons and uncharacteristic fire frequency, may elevate the risk of a change in species composition and function in grassland types.

Most species in this type are fire adapted, with a majority of areas historically responding favorably to replacement fire types generally every 10-30 years in frequency. Where this group existed within forested ecosystems, fire frequency will be strongly influenced by the adjacent forest's fire regime. According to LANDFIRES's Vegetation Condition Class analysis, 72 percent of this vegetation type has experienced moderate or higher departure from historic conditions (LANDFIRE 2014). This is largely due to missed or changed fire cycles and invasive species.

Under a warming climate scenario, warm-season grasses are favored by higher temperatures, providing an opportunity for spread into mountain grasslands from lower-elevation and more southern locations. Increased wildfire frequency will facilitate an increase of invasive species, thereby decreasing the dominance and vigor of native grasses (Halofsky 2018).

Desert Scrub

This vegetation group makes up less than 1 percent of the Forest. Desert Scrub communities are usually dominated by a mix of several shrubs or dwarf shrubs. Dominant shrubs may include fourwing saltbush, shadscale saltbush, bud sagebrush, spiny hopsage, and winterfat. The herbaceous layer is often sparse and dominated by perennial grasses, especially Indian ricegrass and sand dropseed. The forb layer can be diverse but forms sparse cover. These unique inclusions are valuable in providing structural and compositional diversity to the sagebrush-steppe landscape and provide important winter forage for wildlife, such as pronghorn antelope and mule deer.

Historical disturbance cycles that occurred in this group are primarily drought, insects and flooding. Wildfire occurrence was rare, such as during moist periods that resulted in a more dense representation of grasses, and burned with highly variable severities. The Vegetation Condition Class analysis indicates that 24 percent of this vegetation type has experienced moderate or higher departure from historic conditions (LANDFIRE 2014). This is likely due to the changes in native and invasive plant species and losses due to drought. Forty-five percent of this vegetation type was classified as “Other,” which includes bare ground. This is largely due to the sparse arrangement of this group which is difficult to measure with satellite imagery.

These shrublands have low to moderate vulnerability to the effects of a changing climate, depending on their location relative to soil moisture availability. Many of these shrublands have relatively high species diversity. Some are well-adapted to periodic drought, and some may be able to migrate to higher elevations. Salt desert communities at lower elevations may be vulnerable to drought and are intolerant of wildfire (Halofsky 2018).

Basin & Wyoming Sagebrush

This group makes up 4 percent of the vegetation on the Salmon-Challis. Basin & Wyoming Sagebrush are found between 3,000 and 7,000 feet in elevation on deep, well-drained, non-saline, alluvial soils. Basin big sagebrush generally dominates in lower elevations with deepest soils, and Wyoming big sagebrush generally dominates alluvial fans at mid-elevations. Understory grasses include bluebunch wheatgrass, Thurber needlegrass, needle and thread, basin wildrye, squirreltail and western wheatgrass. Forbs include hawksbeard, bird's beak, blue bell, Rocky mountain aster, phlox species, lupine and buckwheat. These species are important forage for wildlife, such as elk, mule deer, pronghorn antelope, greater sage-grouse and others. These types generally represent both winter and spring habitats for wildlife.

Fire, climate, and insects all played a role in the disturbance history of this group. The dry nature and inherently low productivity of these plant communities limits fire occurrence. Deliberate use of fire by Native Americans were a significant source of ignitions and shaped sagebrush community structure, potentially limiting the sizes and burn patterns of lightning fires. The combination of human and lightning-caused fires likely created a highly variable fire return interval. Fires may have occurred as frequently as every 50 years to as infrequently as every 150 years (LANDFIRE 2018 (latest update in draft form)).

Much of this vegetation type, 84 percent, has experienced little to no departure from historic disturbance cycles (LANDFIRE 2014). However, this vegetation community is highly vulnerable to the establishment of and spread of invasive species, such as cheatgrass.

This group is also prone to multi-year droughts instead of single-year droughts. Periodic drought may have reduced the density and cover of sagebrush by reducing canopy size and killing individual plants (LANDFIRE 2018 (latest update in draft form)). Increased frequency and duration of drought are expected to drive direct changes to soil moisture. Conditions suitable for seedling establishment are infrequent under current climatic conditions and are likely to become less frequent in a warmer climate (Halofsky 2018).

Mountain Big Sagebrush

This group makes up 12 percent of the vegetation on the Salmon-Challis. Mountain Big Sagebrush is found between 4,500 and 10,500 feet in elevation on well-developed, dark organic surface horizons in moderately-deep to deep, well-drained soil of loam, sandy loam, clay loam or gravelly loam textural classes. It may also occur on more shallow, coarse textured soils at higher elevations. The small amount of juniper woodlands represented on the Forest are also part of this group (LANDFIRE 2014).

This sagebrush community represents the transition from low-elevation sagebrush steppe and desert scrub to forested community types. This vegetation community is quite diverse, supporting many grass, grass-like and forb species that provide important habitat and forage to wildlife. This ecological system is critical summer habitat for greater sage-grouse, and resprouting bitterbrush in mountain big sagebrush types is potentially important to wildlife during early stand development.

This group historically experienced stand-replacing wildfires every 10 to 40 years. The resulting burn pattern was generally patchy. At least 5 percent of a given watershed needs to burn each decade to prevent conifer expansion. Burning practices and escaped campfires of various Native American tribes shaped sagebrush community structure and potentially limited the sizes and burn patterns of lightning fires. Although fire ignition and spread in big sagebrush is considered to be largely a function of understory plants, live fuel moisture in shrubs appears to be an important local control on the resulting burn pattern (LANDFIRE 2018 (latest update in draft form)).

Recovery rates for shrub canopy cover vary widely in this type, depending on post-fire weather conditions, abundance of resprouting shrubs, and size and severity of the burn. Mountain big sagebrush does not resprout following fire and recolonization of burned areas must come from either a short-lived seed bank or seed dispersed by plants in unburned patches or adjacent stands. Montane sagebrush communities are also subject to periodic mortality due to drought, insects, freeze kill, snow mold, and vole outbreaks. These disturbances, in combination with fire, likely reduced the ability of this sagebrush species to develop into very dense stands over large areas (LANDFIRE 2018 (latest update in draft form)).

Much of this vegetation type, 80 percent, has experienced little to no departure from historic disturbance cycles (LANDFIRE 2014). However livestock grazing, the encroachment of conifer species, altered wildfire regimes, and invasive species are significant stressors to this group. These factors may be exacerbated by a warmer climate, especially in drier habitats (Halofsky 2018).

Low & Black Sagebrush

This group makes up 2 percent of the vegetation on the Salmon-Challis. Low & Black Sagebrush generally occur at elevations between 3,500 and 10,000 feet on shallow soils or convex slopes. Low sage tends to grow where there is a claypan layer, and black sage tends to grow where there is a root-limiting layer in the soil. These species often grow in association with spiny hopsage, rabbitbrush, shadscale, scattered bunchgrasses and cushion forbs. This group represents important winter and spring browse for wildlife species, such as mule deer, pronghorn antelope and to a lesser degree, elk.

Stand-replacing wildfires historically occurred in this group when successive years of above-average precipitation were followed by dry conditions, high winds and dry lightning. This generally resulted in wind-driven fires that only burned small areas or patches. Seventy-eight percent of this vegetation type has experienced moderate or higher departure from historic conditions (LANDFIRE 2014).

All low-growing sagebrush species are likely to be negatively affected by higher temperatures and increased periods of drought. Seed viability is short and their dependence on spring soil moisture will make them susceptible to prolonged droughts and to altered timing and amount of spring moisture. Increased wildfire frequency, coupled with drought, could inhibit regeneration on drier sites (Halofsky 2018).

Ponderosa Pine Savannah

This group makes up roughly 6 percent of the vegetation on the Forest. These stands typically occur on hot, dry, south and west-facing slopes at lower elevations with well drained soils and gentle to moderately-steep slopes. Frequent natural fires historically promoted a grass-dominated understory with sparse shrubs and a ponderosa pine overstory. Douglas-fir and Rocky Mountain juniper may occur as minor individuals. Common snowberry, antelope bitterbrush and chokecherry are important shrubs, and mountain mahogany may also occur on rocky outcrops. Grasses may include Idaho and rough fescue. More mesic shrubs may be present if it is a wetter habitat type that historically maintained an open stand through frequent fire.

Frequent, non-lethal surface fires were historically the dominant disturbance factor, occurring every 15-30 years on average. Mixed-severity fires also likely occurred about every 50 years while stand replacement fires likely occurred in small patches up to a few hundred acres every 300-700 years. This resulted in a mosaic of uneven-aged stands across the landscape (LANDFIRE 2007).

LANDFIRE data indicates 90 percent of this vegetation type has experienced moderate departure from historic conditions (LANDFIRE 2014). This is largely due altered fire cycles, invasive species and insect infestations. A significant increase in cheatgrass has reduced the native plant diversity and increased the flammability of the understory, which can lead to more frequent fire cycles than that with which this system evolved.

Ponderosa pine forest types are drought and fire tolerant. Under a warming climate scenario this group will likely persist but may grow more slowly. The Western pine beetle also affects this group and can attack large ponderosa pine trees in any canopy density. If insect outbreaks are more prevalent in a warmer climate, they could increase stress in pine species, especially during drought (Halofsky 2018).

Ponderosa Pine and Douglas-fir Mix

This group makes up 10 percent of vegetation present on the Salmon-Challis. Generally found in the montane zone on well-drained, thin soils, and relatively warm sites that can range from nearly-flat to steep slopes on all aspects. Ponderosa pine is generally the dominant species on southerly aspects and drier sites, whereas Douglas-fir dominates on northerly aspects. Southerly aspects support relatively open stands while northerly aspects support more closed stands.

Historically both surface and mixed-severity fires occurred at varying intervals ranging from 10 to 80 years, with occasional stand replacement fires. Resulting fire effects depended on elevation and site conditions. Insects and disease also play an important role, especially in the absence of fire (LANDFIRE 2018 (latest update in draft form)).

Ninety-two percent of this vegetation type has experienced moderate departure from historic conditions (LANDFIRE 2014) due to altered fire cycles and recent impacts of insect and disease infestation.

Most species in this dry forest type are expected to be resilient during long periods of drought. However, fire, insect, and climate interactions could be a stressor on this group and result in a change in species arrangement and composition (Halofsky 2018).

Douglas-fir

This group makes up 20 percent of vegetation present on the Salmon-Challis. The Douglas-fir group generally ranges from the lower foothills immediately above grasslands and shrublands, with upper elevation bordering dry subalpine fir. Stands are typically open and dominated by Douglas-fir. Limber pine may be present at warmer sites, whereas lodgepole pine can co-dominate on cool sites.

Douglas-fir increases in canopy density in the absence of fire disturbance. Much of this landscape today has canopy cover denser than the historic range of variability. Since this type is dominated by mixed fires, patches tend to be smaller in size and fire sizes are generally variable. Fires likely burned thousands of acres at a time. Evidence of naturally occurring fires in pure Douglas-fir stands in the Salmon Mountains and the Frank Church – River of No Return Wilderness suggest that at least 15 to 20 percent of fires in this group historically burned under low severity (LANDFIRE 2018 (latest update in draft form)).

Ninety-two percent of this vegetation type has experienced moderate departure from historic conditions (LANDFIRE 2014) due to missed fire cycles, overcrowded stands and interactions from several different insect and disease epidemics.

Douglas-fir have high fire tolerance and may become more common in a warmer climate scenario. Growth rates, however, will likely decrease and stress from insects and pathogens will likely increase (Halofsky 2018).

Lower Sub-Alpine

This group makes up 15 percent of vegetation present on the Salmon-Challis. Lodgepole pine, subalpine fir and Engelmann spruce are historically the dominate tree species. Lodgepole pine comprises a greater component on dryer sites typical of many areas on the Salmon-Challis, and can exist in even-aged stands on poor, harsh sites. At high elevations and southerly aspects, whitebark pine may occur while aspen and Douglas-fir may be early-seral components at lower elevations. High-severity or stand-replacing fires favor lodgepole pine regeneration if serotinous cones are present. Some large, thick-barked Douglas-fir trees often survive fires severe enough to kill the lodgepole pine, ensuring its presence in future stands. Spruce or subalpine fir will dominate the site in the absence of fire.

This group historically experienced mixed and stand replacement fires at intervals of 100 to 400 years. Lightning strikes were frequent but most often resulted in small, patchy spot fires. Fire behavior in this group is strongly related to climatic cycles. Long-term changes in climate, as well as short term seasonal changes, affect the frequency of fire in this system. These also interact with elevation and site conditions, resulting in a large-scale mosaic of patchy stand replacing fires over a period of hundreds of years (LANDFIRE 2018 (latest update in draft form)).

Insects and disease epidemics are likely the largest reason why 21 percent of this vegetation type has experienced moderate departure from historic conditions

(LANDFIRE 2014). The remaining 78 percent of this group's departure is categorized as low primarily due to the long intervals for fire occurrence in this group.

Spruce beetle and mountain pine beetle can also influence stand structure, species composition, and stand density. Spruce beetle and mountain pine beetle often promote more shade-tolerant species. Large-scale insect infestations may create large patches of early-seral conditions or create conditions that lead to large, stand replacement fires (LANDFIRE 2018 (latest update in draft form)).

Under a warming climate scenario, the subalpine fir and Engelmann spruce in this group may experience increased growth during a longer growing season. Bark beetles may also become a stressor for Engelmann spruce. Crown fires also have the potential to eliminate mature trees across the landscape (Halofsky 2018).

Upper Sub-Alpine and Whitebark Pine

This group makes up 15 percent of vegetation present on the Salmon-Challis. These vegetation communities range from nearly-uniform stands of five-needled pines on harshest highest elevation sites to mixed species stands that include shade tolerant firs. Vegetation is stunted with short, dwarfed trees, including krumholz vegetation on the harshest sites. Historically, whitebark pine dominated on southerly aspects, while northerly aspects were dominated by alpine larch or subalpine fir and Engelmann spruce. Lodgepole pine may be present as an early-succession species. Whitebark pine is listed as a Candidate Species under the Endangered Species Act. More information about whitebark pine can be found in the At Risk Species section.

Historically fires were long-interval, burning every 100-200 years or more with both mixed and stand- replacing severities. Ignitions are frequent due to lightning, though fires seldom carry due to lack of fuel from the slow-growing vegetation. Individual tree torching is more common. Nonlethal surface fires may dominate where continuous light fuel loading, such as grasses, exist, but they would typically be small. Fires could range in size from individual trees to hundreds of acres. Topography and continuity of fuel beds influence fire spread (LANDFIRE 2007).

Infestations occur periodically and are another natural agent of disturbance in this group. The mountain pine beetle is an important disturbance agent in whitebark pine and lodgepole pine forests, and past outbreaks have caused widespread morality in these forest types. Spruce budworm may be present on higher density spruce sites. Snow, wind, and other weather events may also cause damage and initiate transitions between successional stages of forest development (LANDFIRE 2007).

LANDFIRE data indicates that 83 percent of this vegetation type has experienced moderate departure from historic conditions (LANDFIRE 2014). Fire suppression and climate change have likely altered natural fire frequency. Dendroecological data collected in whitebark pine forests near Missoula, Montana, implicated large-scale climate variability, such as occurred during the Little Ice Age, as a driver of temporal changes in the fire regimes of these forest systems (LANDFIRE 2007).

Most subalpine tree species will be moderately affected by a warmer climate. If wildfire extent and severity increases, crown fires may eliminate mature trees across the landscape (Halofsky 2018).

Alpine communities

Alpine communities occur above timberlines at elevations greater than 9,500 feet and include dwarf-shrublands, fell-field, alpine turf and sparsely vegetated plant communities. This group makes up roughly one percent of the vegetation on the Salmon-Challis.

While alpine habitats represent less than 1 percent of land area within the state of Idaho, this plant community association is well represented on the Salmon-Challis and is considered unique and of significant conservation value (Idaho Department of Fish and Game 2017b). These habitats support species, such as black rosy-finch, hoary marmot, mountain goat, and wolverine species, which are uniquely adapted to harsh climatic conditions. Snowpack from alpine catchments is critically important to maintaining favorable flow regimes in the rivers and streams of the Salmon-Challis.

Vegetation in this group is controlled by snow retention, wind desiccation, permafrost, and a short growing season. Dry summers associated with major drought years favor grasses over forbs, whereas wet summers can result in a more diverse mixture of forbs and grasses. Avalanches on steeper slopes where soil accumulated can cause infrequent soil-slips, which exposes bare ground. Very rare instances of replacement fires historically burned in very small patches in this group (LANDFIRE 2007).

Approximately 23 percent of this vegetation type has experienced moderate departure from historic conditions (LANDFIRE 2014). Alpine communities are considered to exhibit good ecological integrity because this habitat type exists primarily in wilderness, roadless, and otherwise remote areas. Fifty-nine percent of this vegetation type was classified as “Other,” which includes bare ground. This is largely due to the sparse arrangement of this group, which is difficult to measure with satellite imagery.

The greatest risk to this plant community is its low-adaptive capacity to stressors associated with shifts in climate (Idaho Department of Fish and Game 2017b). Under a warming climate scenario, the composition and distribution of alpine ecosystems will be affected by decreasing snowpack, which will alter plant vigor and regeneration. Specific effects will depend on vulnerability thresholds of diverse species and the rate and magnitude of changes over time. Some species may be able to persist or migrate to suitable habitat, but the lower extent of some communities will be compromised by tree establishment (Halofsky 2018).

Barren-Rock & Open Water

This group makes up roughly 2 percent of the vegetation on the Salmon-Challis. Barren-Rock & Open Water represent areas not thought to support vegetation. However, these environments have the potential to support highly-specialized and often native plant and animal species.

The edges of mountain lakes and associated hanging valleys have the potential to support species of plants that are unique to these high alpine or sub-alpine systems. These plant species have evolved through the expansion and contraction of glaciers, and the lakes themselves can serve as refugia for sensitive amphibian species. LANDFIRE data indicates that approximately 11 percent of this vegetation type has experienced moderate departure from historic conditions (LANDFIRE 2014), indicating either a shift in species presence or land use.

Although these cover types are relatively protected from human impacts due to their remoteness, it is still unclear what impacts shifts from our usual weather patterns may have on these cover types.

Curl-leaf mahogany

This group makes up 3 percent of vegetation present on the Salmon-Challis. Curl-leaf mahogany is a unique habitat type usually found on upper slopes and ridges between 5,000 and 10,500 feet in elevation on relatively shallow soils with fractured bedrock below. Codominant species can include rabbitbrush, antelope bitterbrush, mountain big sagebrush, or black sagebrush.

The Idaho State Wildlife Action Plan identifies curl-leaf mahogany as highly palatable to bighorn sheep, moose, elk, and mule deer and an important winter cover for Mountain Goat, Bighorn Sheep, and other wild ungulates (Idaho Department of Fish and Game 2017b). The same plan identifies curl-leaf mahogany on the Salmon-Challis National Forest as in fair condition.

Eighty-three percent of this vegetation type has experienced moderate or higher departure from historic conditions (LANDFIRE 2014). Altered fire cycles pose the greatest risk to this important habitat component. Historically, a mix of fire severities influenced this group in irregular scales and over long timeframes, typically 100-200 years. Curl-leaf mahogany is fire intolerant, however, excluding fire completely results in over-decadent and unhealthy stands. Dry conifer types expanding into curl-leaf mahogany can cause uncharacteristic fires, from which the stand would be slow to recover. Invasive annual grasses also threaten this rare and highly-valuable habitat (LANDFIRE 2007).

These woodlands are expected to be moderately vulnerable under a warming climate scenario. Although regeneration on disturbed sites may be slow, curl-leaf mahogany is also capable of growing on low-fertility soils so it will likely continue to be competitive with other species (Halofsky 2018).

Deciduous Shrublands and Woodlands

Although LANDFIRE analysis shows that this group represents less than 1 percent of the vegetation historically present on the Salmon-Challis, this group, which includes aspen stands, is important habitat for wildlife.

Quaking or trembling aspen was historically a relatively minor component of the forested landscape on the Salmon-Challis National Forest, covering approximately 48,000 acres (LANDFIRE 2014). The current distribution and condition reflects its tolerance for a wide range of environmental conditions and the influence of land management policies, such as wildland fire suppression, grazing, and state wildlife objectives. On the Salmon-Challis, aspen tends to occur in small, isolated stands as a seral tree species with conifers or along water courses.

Aspen communities harbor high biodiversity, maintain water storage capacity for watersheds, and offer recreation and scenic value to visitors. Other than riparian habitats, aspen forests support the highest biodiversity in the Intermountain West (Kay 1997). Aspen also produce an abundance of livestock forage. Cattle grazing the aspen understory has been a primary consumptive use on the Salmon-Challis.

LANDFIRE data indicates that 71 percent of the Deciduous Shrublands and Woodlands vegetation group has experienced moderate or higher departure from historic conditions (LANDFIRE 2014). Generally, the condition of deciduous stands across the Salmon-Challis is one of reduced vigor due, primarily, to the lack of landscape-level fire.

Increased wildfire frequency and extent will likely determine future composition and structure of this forest type. Under a warming climate scenario, aspen may attain increasing dominance because of their ability to sprout vigorously after fire and outcompete other species that are susceptible to drought and fire (Halofsky 2018).

Aspen is not considered a commercial tree species and is not targeted for harvest on the Salmon-Challis. However, incidental amounts of dead aspen continue to be removed from the forest along travel corridors by personal-use firewood gatherers.

Riparian

Riparian Ecosystems are described in the Riparian & Groundwater-Dependent Ecosystems section.

Other Vegetation and Cover Types

Developed and Agricultural zones on the Forest are represented by administrative sites and their associated administrative pastures. Many of these pastures were once managed for forage production and cut for hay. Currently, they are used for pasturing agency horses and mules. Private inholdings, mining claim sites with structures, and similar developments may also fall into this cover type.

These cover types are important to note, as guidelines may be needed to address management of these areas that would not otherwise fit within standards identified for native plant communities.

Other Considerations

In addition to the system drivers and stressors discussed in the introduction of the Ecosystems Assessment, there are other important considerations specific to Terrestrial Ecosystems.

Old Forest Structure

Old forests provide valuable ecological functions. They promote water quality, soil stability, and biological diversity. They are also valued for timber. The structure that develops in the later stages of forest succession, such as snags and downed logs, are used by animals for breeding, foraging, and thermal cover. Some plants and animals are highly dependent on these structural features.

The Salmon and Challis forest plans designate reserves of old forest growth reserves, termed old-growth in the plans. However, there has been no comprehensive ground-based validation of them to date. While a small number of projects on the North Zone of the Forest have required old-growth validations since 2009, finding stands that meet the Hamilton (1993) definitions for canopy tree size, age, and density has been difficult because of the low productivity of the sites. The existing Salmon forest plan standard for old forest stand size, which is at least 80 acres, is also difficult to meet.

We used the Forest Inventory and Analysis data to estimate the amount of old forest on the Salmon-Challis. Old forest characteristics of tree size, density, and age as defined by Hamilton (1993) were used, and the resulting estimates are provided in Table 33.

Table 33. Acres and percentage of old forest by type

Forest Type	67% Confidence Interval	
	Acres	Percent
All Forest Types	171,046 – 238,694	7-10
Douglas Fir	97,966 – 150,710	8-12
Ponderosa Pine	3,589 – 21,107	6-27
Engelmann Spruce and Engelmann Spruce/ Subalpine Fir	20,872 – 50,206	10-23
Subalpine Fir	7,028 – 27,015	3-10
Lodgepole Pine	6,281 – 24,975	2-9

High-severity fire over the past 20 years has likely reduced the amount of old forest, although we do not know by how much. The Halstead and Mustang fires of 2012 and the Clear Creek fire of 2000 each burned hundreds of thousands of acres. Timber harvesting has also contributed to the reduction of old-growth forest. However, much of this activity has been through selective harvest, which better retains stand structure and returns to pre-cut conditions more quickly.

But the entire picture may be more complex. There is evidence that the dominant fire regimes of the Intermountain West do not promote large stands of old-growth. Recent research encompassing the central Idaho Batholith ecological section indicates that, while old growth late-successional stage characteristics were not extensive on the historic landscape (Penelope Morgan and Parsons 2000), the large tree component was common (Penelope Morgan and Parsons 2000; Wisdom and others 2000). An important consideration is that the Salmon-Challis is dominated by the moderate-severity fire regime, which is characterized by fires that burn with mixed severity at fine scales and result in small patches of forest that vary in age.

If, as shifting weather patterns suggests, the Salmon-Challis continues to experience larger, more severe and frequent wildland fire, we can expect continued changes in forest structure and a reduction in the amount of old growth on our forest(Behrens and others 2018).

Snags and Downed Wood

Dead and dying trees are a natural occurrence in forest stands and are essential for preserving both the living and nonliving components of forested ecosystems. Downed logs aid nutrient recycling, build soils, retain soil moisture, reduce erosion, and maintaining water quality.

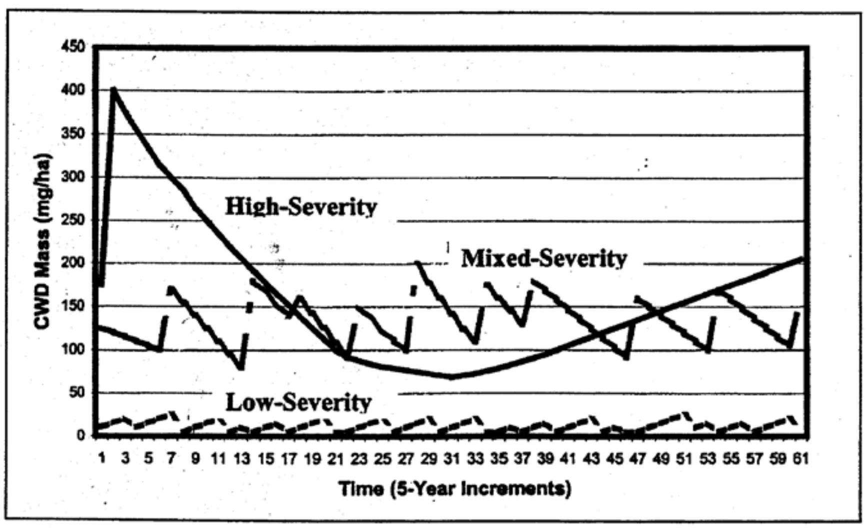
Snags and downed wood also provide wildlife habitat for nesting, denning, and foraging and provide shelter and thermal cover from extreme heat and cold. In Idaho, roughly 50 species of birds and 25 mammals use snags for nesting or shelter, as do amphibians, reptiles, and invertebrates. Snags and downed logs are additionally used for communication by birds, such as woodpeckers and ruffed grouse, and snags provide perches from which birds can conspicuously proclaim their territories, attract mates, and forage.

The most important characteristics of snags and downed wood for wildlife are their size, decay stage, amount, and distribution. Generally speaking, larger and harder snags and downed logs persist longer on the landscape and serve more species (Robin Lee Lambert Graham 1981; Morrison and Raphael 1993). Foraging occurs on all sizes of snags and dead wood, but larger snags and dead wood can support more invertebrates. This rule of thumb also applies to the benefits to the ecosystem as a whole (Idaho Department of Fish and Game 1997). Guidance provided by the Washington State Department of Natural Resources (Bottorff 2005) for land owners indicates snags greater than 20 inches in diameter and 60 feet tall can accommodate all snag-dependent species. The exception is bears, which require three feet or more diameter hollow trees or stumps for denning. Foraging occurs on all sizes of snags and dead wood, but the larger they are the more invertebrates they can support.

Washington State University research indicates downed logs must be 10 inches in diameter and 12 feet long to be useful, and snags at least 20 inches in diameter at breast height and 60 feet tall provide the most wildlife value (Bottorff 2005).

Downed wood and snags vary by fire regime as illustrated in Figure 74. In low severity fire regimes, frequent, low-intensity fires limit coarse woody debris and results in very low biomass and very little fluctuation in biomass. Agee (James K Agee 2002) estimated that this fire regime supports 100 snags per 20 acres and that snag decomposition is accelerated by frequent fires. He estimates downed log biomass would be less than 5 metric ton per hectacre and would break down quickly due to recurrent surface fires.

Figure 74. Coarse woody debris mass over time under high, mixed, and low severity fire regimes.



Source: (James K Agee 2002)

In moderate- or mixed-severity fire regimes, fires both consume and created coarse woody debris several times a century. Dynamics of coarse woody material in this regime are very complex, but the mixed fire regime supports a relative abundance of dead wood, but with more fluctuations than seen in the low-severity regime (James K Agee 2002).

High-severity regimes create a boom and bust dynamic with substantial dead wood created after a stand replacing fire followed by a century or more without further substantial input. Insects and disease occurring in older stands can contribute dead wood within this fire regime. In general, moderate and high severity fires compensate for fire consumption of debris on the forest floor by creating patches of snags (James K Agee 2002).

The Forest Inventory and Analysis dataset was used to estimate snag and downed wood densities across the Forest, and the results are presented in Table 34. Based on this information, minimum snag and downed wood densities defined in the Salmon and Challis forest plans are being exceeded, although the results are inconclusive for ponderosa pine because of low sample size.

Table 34. Salmon and Challis Forest Plan standards for snag retention and current density estimates forestwide by forest type.

Forest Type	Forest Plan Minimum Number of Hard Snags per 10 Acres		Number of Hard Snags per 10 Acres, excluding non-stocked stands	
	Salmon	Challis*	Estimate	67% Confidence Interval
10 Inch Diameter at Breast Height				
Douglas-fir	20-30	10	104	92- 115
Ponderosa Pine	20-30	10	20	5-34
8 Inch Diameter at Breast Height				
Lodgepole Pine	20-30	10	305	265- 347
Aspen	20-30	30	187	107-198

Note: *No size is specified in the Challis Forest Plan

Table 35. Salmon forest plan standards for downed wood retention and current density estimates forestwide by forest type.

Forest Type	Salmon Forest Plan Minimum Feet of Downed Wood per Acre	Feet of Downed Wood per Acres, excluding non-stocked stands	
		Estimate	Lower Confidence Limit-Upper Confidence Limit
12 Inch Diameter			
Douglas-fir	50	265	241-290
Ponderosa Pine	50	396	247-544
Engelmann Spruce	50	386	206-565
Subalpine Fir	50	524	443-604
Engelmann Spruce and Spruce-Fir	50	889	724-1053
10 Inch Diameter			
Lodgepole Pine	33	489	419-558
Aspen	33	477	342-613

The snag size classes used by other the Sawtooth, Payette, and Boise national forests are 10 to 19.99 inches diameter at breast height and 20 inches or greater. Washington State University indicates snags at least 20 inch diameter at breast height and 60 feet tall provide the most wildlife value (Bottorff 2005). We include estimates for these size classes across the Salmon-Challis in Table 36, which indicates the density of snags that provide a lot of wildlife value because of their size across the Salmon-Challis is high. However, once we break this out into forest type the precision of the estimates declines. In addition, the 60-foot class is not attainable for some forest classes, like whitebark pine.

Table 36. Estimates of snag densities by forest type and size class. DBH is diameter at breast height.

Forest Type	Number of Snags per 10 Acres*			
	10>x<20 DBH	X=>20 DBH	X=>20 DBH	
	No Height Requirement		=> 30 Ft Tall	=> 60 Ft Tall
Douglas-fir	106 (94-117)	25 (22-28)	23 (20-26)	18 (15-121)
Ponderosa Pine	24 (14-35)	1 (0-10)	5 (0-10)	5 (2-10)
Engelmann Spruce	182 (144-220)	-	-	-
Engelmann Spruce/Subalpine Fir	223 (188-257)	18 (9-27)	16 (7-25)	12 (5-18)
Subalpine Fir	305 (271-339)	29 (23-36)	25 (19-32)	10 (7-15)
Lodgepole Pine	163 (138-188)	61 (39-84)	5 (3-6)	4 (3-6)
Limber Pine	212 (147-276)	44 (28-60)	23 (9-36)	1 (2-24)
Whitebark Pine	271 (226-316)	20 (13-26)	15 (9-21)	2 (0-4)
Aspen	111 (72-151)	23 (14-33)	18 (9-27)	12 (4-20)
Nonstocked	21 (11-30)	37 (29-45)	30 (24-36)	22 (16-28)
Total	167 (157-176)	20 (21-25)	19 (18-21)	14 (12-16)

Note: * 67 Percent Confidence Interval

Further analysis is needed to separate out these results by age class and disturbance agent. This will better identify the extent that large stand-killing fires and insect epidemics are contributing to snag and downed wood densities. There is no shortage of large snags and downed wood across the Salmon-Challis, but the extent these are occurring in green stands is not known. We do know that high densities of dead wood, due to fire suppression, are accumulating in green stands across the Forest and contributing to unhealthy conditions. Dead wood provides important habitat for wildlife, but some wildlife do not benefit from cluttered forests. Fire suppression on the Salmon-Challis has likely been detrimental to these species but beneficial to others.

Threats to Shrublands

Shrublands present on the Salmon-Challis include vegetation from the Desert Scrub, Basin & Wyoming Sagebrush, Mountain Big Sagebrush and Low & Black Sagebrush communities.

The Idaho State Wildlife Action Plan identifies these sagebrush habitats on the Salmon-Challis as having high ecological integrity relative to other Idaho Sections based on their large spatial extent, contiguous distribution, and comparatively low human footprint (Idaho Department of Fish and Game 2017b). These habitats are important when managing for greater sage-grouse and can also provide important habitat for sagebrush-dependent species, such as pygmy rabbit, pronghorn antelope, sage thrasher, and other associated bird species. These vegetation communities also represent the highest percentage of primary rangeland for livestock grazing.

Threats to shrublands include both natural and human-induced disturbance, an increase in invasive species, and the slow-growing nature of sagebrush species. This group, especially the Wyoming and mountain big sagebrush communities, may also be experiencing encroachment by conifer species, such as juniper, lodgepole pine, Douglas-fir and limber pine.

At low and middle elevations, this group is highly susceptible to invasive plant establishment in openings in native plant communities or inclusions of desert scrub within sagebrush steppe. This increases fine fuel, risk to loss from large wildfire, and a slight shift to an annual grass-dominated fire cycle. Drought and increases in mean annual temperatures exacerbate this issue by increasing the competitive advantage of invasive plants species, such as cheatgrass. These characteristics result in a positive feedback loop where fire occurrence interacts with drought and results in a type conversion from native vegetation to cheatgrass, particularly in high-intensity fires. This affects grasslands, shrublands and forest types with grass understories, such as ponderosa pine. Examples of type conversion can be seen within severely-burned areas in the Salmon River Canyon from the 2012 Mustang Fire and in the lower Panther Creek Canyon from the 2000 Clear Creek Fire, where cheatgrass and tumble mustard are now the dominant vegetation. In lower Panther Creek, many sites show no sign of recovery.

Importance of Pollinators

Pollinators are indicator species for ecosystem diversity, connectivity and function. Simultaneous declines in native and managed pollinator populations globally, with highly visible decreases in honey bees, bumble bees, and monarch butterflies, have brought into focus the importance of pollinator conservation (Cameron and others 2011; Engelsdorp and others 2010; National Research Council 2007; Pettis and Delaplane 2010). These species maintain native plant communities, which, in turn, provide a variety of invaluable ecosystem services, including carbon sequestration, water filtration, and erosion control (National Research Council 2007). Changing climate, introduction of invasive species, habitat degradation and fragmentation, altered fire regimes, disease, and incorrect use of pesticides have all contributed directly and indirectly to the decline of our native pollinators across North America and continue to pose significant threats (Halofsky 2018). On the Salmon-Challis National Forest, the most apparent and seemingly influential threats are changing climate, the introduction of invasive species, wildfire in altered fire regimes and in some areas conifer encroachment.

Climate change impacts pollinators both directly and indirectly. Direct impacts are associated with differential effects of climate change on the pollinators themselves and the plant communities on which they depend (Settele and others 2016). This is of particular concern with specialist pollinators that emerge at a time – usually too early – that no longer coincides with the flowering of its specific host plant. This process is called decoupling. Generalist species that are less prone to the effects of decoupling instead see changes in range, generally moving northward and up in elevation. The effect is an overall decrease in range size (Settele and others 2016). Changing climate also alters precipitation and temperature patterns that impact important plant communities, often resulting in unreliable food resources and conditions more favorable to higher intensity wildfires. Warming and drought patterns seen across the Salmon-Challis render some plant communities unable to provide pollinators with food throughout the growing season as lack of water cuts flowering periods short.

Invasive plants species negatively affect pollinators by restricting the timing of food availability for pollinators or by outcompeting flowering plants altogether. Some pollinators complete lifecycles in the spring, others in the summer, and some throughout the season. When a single plant becomes dominant, the necessary diversity of flowering time to support a wide variety of pollinators is lost. Likewise diverse pollinators require diverse floral shapes. In the case of invasive grasses, such as cheatgrass, these plants do not produce flowers that support pollinators. Invasion of any sort degrades the quality of habitat for pollinators. On the Salmon-Challis, spotted knapweed, a late summer flowering species, is a concern even though some pollinators love it as it outcompetes native forbs that flower throughout the season.

Altered fire regimes play a big role in the overall health of pollinator populations on the Salmon-Challis National Forest. Native plant communities struggle to recover from high-intensity wildfires over large areas, which create a positive feedback relationship with invasive species, especially invasive annual grasses. Cheatgrass, in particular, invades disturbed soil after a fire then promotes more frequent fire, which further prevents flowering plant communities from recovering. The result is often ecosystem type conversion from diverse shrub- and grasslands to an annual grassland cover that doesn't support pollinators. Lack of occasional fire in essential habitat due to fire suppression is also a threat to pollinators. In higher elevation meadow complexes, which are important pollinator habitat on the Salmon-Challis, lack of fire results in the encroachment of conifer species that shade the understory, leading to a decrease in the flowering plant component of the vegetation community.

Summary & Conclusions

Terrestrial ecosystems are based on a variety of environmental conditions that exist across the Salmon-Challis. Fire is a system driver for many of these ecosystems yet management activities, the largest in extent and acreage being fire suppression, have resulted in 62 percent of the Salmon-Challis having moderate to high departures from historic conditions. As observed and measured in recent decades, wildfires that burn with greater frequency, extent, and severity than the vegetation evolved with diminish the ecological integrity of the ecosystem as a whole. Interactions of insects and disease, invasive plants, and drought exacerbate this situation by increasing the likelihood for uncharacteristic and large-scale fire effects. This further degrades the structure and function of terrestrial ecosystems and will result in further changes in species composition and distribution.

As part of the forest plan revision current direction for old growth, snags, and downed wood retention will be reviewed in the context of best available scientific information. Our direction for snags and downed wood is not consistent with the literature, other area National Forests, and lacks detail needed for consistent and meaningful implementation. Alternate approaches to maintaining old growth have emerged since the 1980s. Advancements in understanding ecology should be considered within the context of the dominant disturbance agent on the forest, which is wildland fire. Information on historic or natural range of variation in old forests, including amount, patch size, and distribution for the forested ecosystems of the Salmon-Challis, would greatly aid this effort. This should be informed by biophysical setting group definitions and their fire regimes.

Connectivity is a key ecosystem characteristic for which there is no direction in either forest plan. Consideration of connectivity in the forest plan revision will be important as we build plan components for restoring and maintaining ecosystem integrity, ecosystem diversity, and conserving and contributing to the recovery of native species. Several efforts are underway or have been completed to model species and ecological connectivity in the area of the Salmon-Challis and beyond. These are beyond the scope of this assessment but will be considered as we move into the next phase of the forest plan revision.

Functioning terrestrial ecosystems are not only important to protect in and of themselves, they also provide critical ecosystem services. The distribution, arrangement, and variety of vegetation communities present on the Salmon-Challis influence water quality, fish health, sediment and runoff, erosion, water holding capacity, and drought resiliency, and directly affect wildlife species presence. Advances have been made in our understanding of these ecosystems as well as available technology by which to quantify ecological integrity. Management actions, informed by these advances, are needed to restore and maintain resiliency in these systems.

Under the current forest plans, departures from historical conditions, as well as the risk of significant losses due to wildfire occurrence, will continue to increase. A revised forest plan that allows for the use of wildland fire as a tool to restore and maintain these fire-adapted ecosystems is needed for land managers to address risks to both social and ecological values disclosed in this assessment and to work towards achieving fire-resilient landscapes.

RIPARIAN & GROUNDWATER-DEPENDENT ECOSYSTEMS

Riparian ecosystems occur at the interface of aquatic and terrestrial zones and are influenced by dynamics of surface water and groundwater (Gregory and others 1991). Physical, chemical, and biotic interactions between terrestrial and aquatic systems shape riparian areas across three dimensions:

- from the headwaters of a stream to its mouth,
- from the groundwater zone to the canopy of vegetation, and
- from the stream bed to the outer extent of the floodplain (JA Stanford and Ward 1988; Jack A Stanford and Ward 1993; Vannote and others 1980).

Information Sources & Needs

We used peer-reviewed literature, data from the forest and other partners, and site visits to evaluate the status of riparian composition, structure, function and connectivity. The primary sources we used for analysis include:

- the National Hydrography Dataset;
- the U.S. Forest Service Valley Confinement Algorithm, clipped to the administrative boundary;
- 50-year floodplain map (Abood and others 2012);
- the biophysical settings and existing vegetation type layers from the Landscape Fire and Resource Management Planning Tools geospatial program, also known as LANDFIRE;
- output from the Riparian Condition Assessment Tool;
- the National Wetlands Inventory;
- fen mapping for the Salmon-Challis completed by the Colorado Natural Heritage Program;
- the Spring Stewardship Institute database;
- proper functioning condition reports from on-site visits;
- data collected by the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program;
- Idaho Department of Environmental Quality assessments completed for subbasins;
- Land Type Association classifications
- Terrestrial Condition Assessment data
- Watershed Condition Framework data
- Salmon-Challis Watershed Monitoring Program data
- Salmon-Challis Best Management Practices monitoring program data

To provide a more complete picture of riparian conditions on the Salmon-Challis, we need the following information:

- Detailed remote sensing investigations and additional groundwater dependent ecosystems inventories are necessary for a more thorough assessment of spring and wetland resources.
- Monitoring is needed to determine if livestock effects on surface pools, runout channels, fens, other groundwater dependent ecosystem features are carried over from one grazing season to another.
- Beaver activity is a driver of water quality, water fluctuations, and channel and floodplain dynamics. More information is needed to determine the location of current beaver populations and whether or not these populations are comparable in size and distribution to historic levels.
- Information on the distribution and extent of aquatic invasive species would improve our assessment of channel dynamics and will be important in planning efforts.
- While the locations and impacts of large surface mining operations are likely known, a geographic information systems layer would improve our assessment of channel dynamics and water fluctuations and help identify smaller areas that may need restoration.
- Multiple indicator monitoring data can provide information on annual grazing use and long term trends that would be valuable for ecosystem assessments and planning efforts, but the data is not yet in an accessible format.

Scale of Assessment

We assessed riparian ecosystems at two spatial scales. We evaluated riparian systems, wetlands, and groundwater-dependent ecosystems at the scale of land type associations, or collections of land areas distinguished by processes of geology, geomorphology, soils, climate, and vegetation. We then summarized results for the entire plan area.

Existing Plan Direction

Both the Salmon and Challis forest plans contain direction for management of riparian ecosystems. As previously discussed in the Rangelands and Grazing section, riparian management practices were modified by the listing of four fish species. Desired conditions are broadly described in the PACFISH/INFISH implementation direction (U.S. Department of Agriculture, Forest Service 1995).

The Salmon-Challis' 2008 Riparian Strategy (Gamett and others 2008) parallels implementing direction for PACFISH and INFISH. While not formally incorporated into the forest plans, this strategy has guided management for healthy riparian communities.

A revised forest plan could provide the opportunity for developing riparian management flexibility and accountability in meeting the intent of requirements as defined by the Endangered Species Act as well as meeting the habitat needs for other fish species.

Conditions & Trends

To determine whether riparian, wetland, and groundwater dependent ecosystems are within their natural range of variation, we evaluated the following characteristics of ecosystem integrity and sustainability:

- distribution of riparian and groundwater dependent ecosystems,
- surface and groundwater fluctuations,
- water quality,
- channel and floodplain dynamics,
- spring runout channel dynamics,
- composition and condition of riparian, and
- composition and condition of groundwater-dependent ecosystems.

We reviewed scientific literature and agency reports to develop a list of drivers and stressors that influence the ecosystem characteristics listed above. We also selected indicators of characteristic status that could be evaluated with available data. These are shown in Table 37. These ecosystem characteristics include measures of composition, structure, function, and connectivity.

Table 37. Drivers, Stressors, and Indicators Measured for Assessment of Riparian and Groundwater Dependent Ecosystems

Ecosystem Characteristic	Drivers	Stressors	Indicators
Distribution of riparian ecosystems	Surface flows, groundwater availability, groundwater discharge	Conifer encroachment, upland vegetation encroachment, fire suppression, diversions, dams, agriculture, development	Riparian vegetation departure, human-caused riparian conversion types
Distribution of groundwater dependent ecosystems	Geologic setting, extent of glaciation & glacial history, temperature, precipitation	Roads, Diversions, Dams, Mining, Climate Change	Relative density of groundwater dependent ecosystems, current condition & characteristics of groundwater dependent ecosystems
Surface and groundwater fluctuations	Temperature, Precipitation, Geologic setting, Beaver activity	Roads, Diversions, Dams, Mining, Timber Harvest, High Severity Fire, Insects & Disease, Grazing, Climate Change	Conifer and Upland Encroachment, Deviation in Winter Temperatures, Deviation in Winter Precipitation

Ecosystem Characteristic	Drivers	Stressors	Indicators
Water quality	Geologic Setting, Chemistry of Precipitation, Hydrologic Regime, Dissolution of organic and mineral substances	Wildfire, Agriculture, Diversions, Mining, Grazing, Roads, Recreation, Loss of wetlands and riparian cover	Community Tolerance Quotient for Macroinvertebrates, Stream Temperature, Median Substrate Size, Impaired Freshwater systems
Channel and floodplain dynamics	Geologic Setting, Terrain, Hydrologic Regime, Large Woody Debris, Beaver Activity, Stabilizing Vegetation	Grazing, Dams, Diversions, Timber Harvest, Invasive Species, Climate Change	Floodplain Acres per Stream Mile, Sinuosity, Bank Stability, Bank Angle, Frequency of Large Wood, Volume of Large Wood, Wildfire Disturbance, Wetland Rating
Spring runout channel dynamics	Hydrologic regime, precipitation regime, geologic setting	Grazing, Roads, Diversions, Spring Development, Recreation	Condition of bank morphology, condition of channel morphology
Composition of riparian ecosystems	surface water dynamics, groundwater availability, geologic setting	Wildfire, insects and disease, introduced vegetation, livestock use, wild ungulate use, development	Conifer encroachment upland encroachment, introduced vegetation tree mortality and defoliation, native cover, alien cover, greenline cover, effective ground cover.
Composition of groundwater dependent ecosystems	Water availability, geomorphic setting, sediment dynamics, thermal activity	Spring development, livestock use, wild ungulate use, recreational use, ditching, channelization, droughts, earthquakes	Disturbance to riparian and wetland vegetation, soil disturbance

Distribution of Riparian Ecosystems

We define riparian ecosystems as areas of transition from aquatic to terrestrial habitats that are influenced by surface and groundwater dynamics. Under natural conditions, riparian ecosystems support plant species that differ from upland areas.

The unique vegetation communities of riparian ecosystems provide physical, hydrological, and biotic services across forest landscapes. Soil stabilization is an essential physical function that helps to maintain conditions required for persistence of resident and anadromous fishes (Horan and others 2000; Hubert 2004; J.L. Kershner and Roper 2010).

Riparian vegetation is also a key component of terrestrial wildlife habitat, providing food, cover, and nesting sites for numerous species of high conservation priority (Atamian and others 2010; Collins 1977; Russell T Graham and others 1999). At larger scales, riparian corridors are critical in connecting habitats and wildlife populations (Hauer and others 2016).

Physical and biotic processes influence the distribution and connectivity of riparian ecosystems in western landscapes. The riparian ecosystems assessed in this report occur along perennial and intermittent streams that remain connected to groundwater when surface flows subside (U.S. Department of Interior, Bureau of Land Management 1993). Riparian vegetation can occur across unconfined valley bottoms if connectivity of floodplains and stream channels are maintained (Brierley and Fryirs 2013). At some streams, beaver dams and instream wood slow the movement of water and trap sediment to maintain late-season surface flows, floodplain connectivity, and substrate for riparian vegetation (Pollock and others 2014; Roni and others 2002).

Significant changes to surface flows and vegetation communities have occurred throughout the Western States, altering the distribution and connectivity of riparian ecosystems (Webb and others 2007). Dams and diversions alter the volume and timing of surface flows, thereby reducing the extent of riparian vegetation (DeWine and Cooper 2007). Reservoirs inundate valley bottoms, disconnecting riparian corridors. Dams are relatively rare within the boundary of the Salmon-Challis, but portions of some streams are diverted for irrigation.

Figure 75. The riparian vegetation along Morse Creek contrasts sharply with the surrounding uplands.

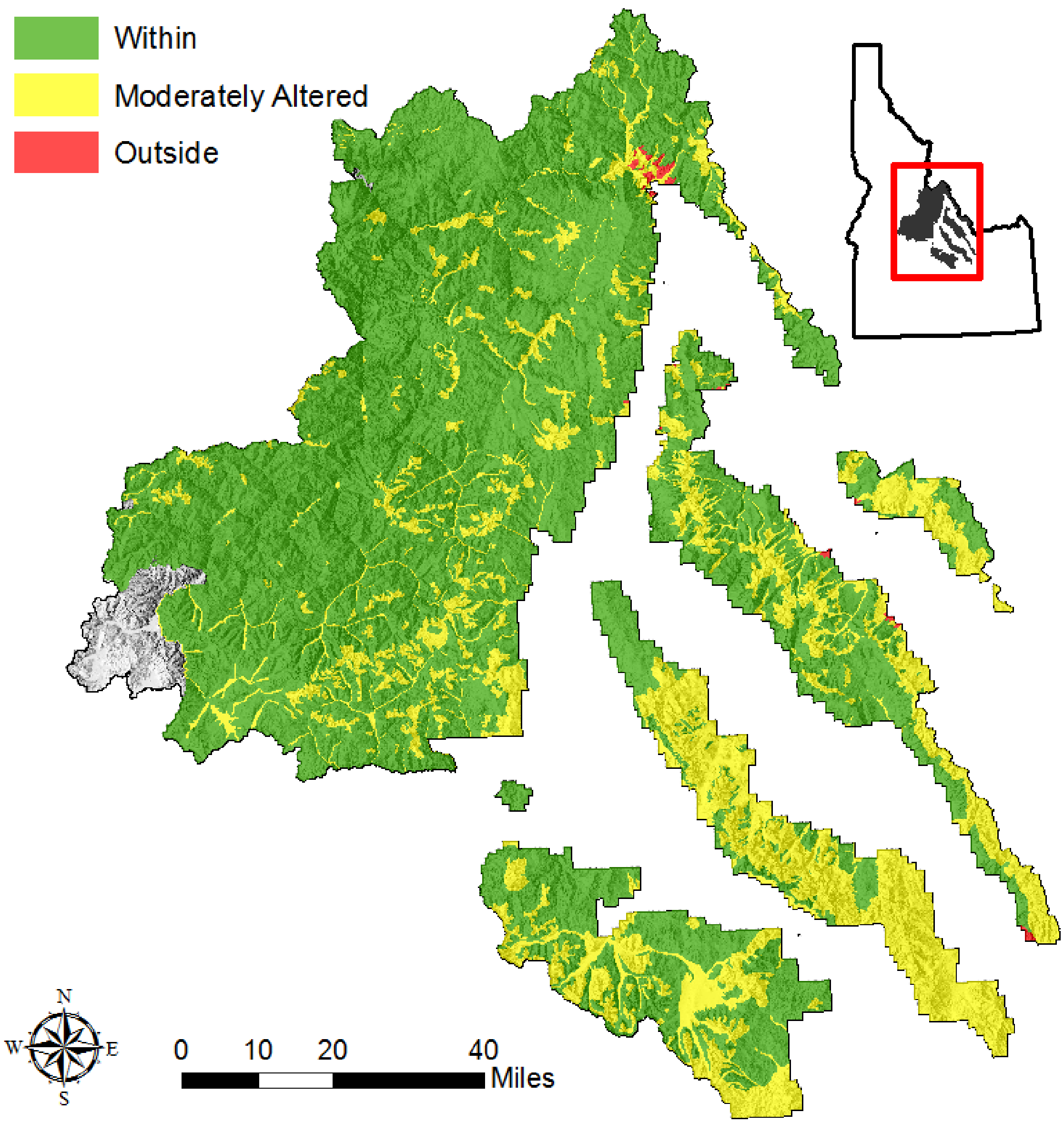
Photo by D.M. Smith, USFS.

Stressors of greater importance include development of valley bottoms for municipal areas, agriculture, and industry (K Bruce Jones and others 2010; Macfarlane and others

2016). Other forms of development, including roads and mines, have the potential to decrease extent and connectivity as well. In many areas, removal of beaver has resulted in loss of surface flows and stream incision, fragmenting riparian corridors in the process (Pollock and others 2014).

Overall, distribution and connectivity was very high in much of the Salmon-Challis National Forest. We determined that 75 percent of the Forest was within the natural range of variation, 25 percent was moderately altered, and less than 1 percent was outside its natural range, as seen in Figure 76. Dissected foothills in quartzite, located entirely in managed areas, was the only land type association considered outside the natural range of variation.

Figure 76. Natural Range of Variation Status of Riparian Ecosystem Distribution on the Salmon-Challis



The land type associations of the Forest contain a total of 6,367 miles of perennial streams and 7,813 miles of intermittent streams. Approximately 22 percent of perennial stream miles had increases in riparian vegetation or negligible departure, and 72 percent had significant or large departure.

At intermittent streams, 13 percent of miles had increases or negligible departure and 83 percent of miles had significant to large departure. Potentially natural forms of departure were conifer encroachment, upland encroachment, and replacement by barren land. Human-caused forms of departure involved conversions to crops and hay, developed land, and introduced vegetation.

Distribution of groundwater-dependent ecosystems

Knowledge of the location, extent, and arrangement of spring and wetland groundwater-dependent ecosystems across the landscape is necessary for conservation and management of these systems.

The 2012 Planning Rule recognizes that groundwater, groundwater dependent ecosystems, and their associated water resources are vital to forest health, sustainability, and biodiversity. Still, most national forests, including the Salmon-Challis, have limited knowledge of the landscape-scale distribution of groundwater dependent ecosystems, their species compositions, and their ecosystem processes. Groundwater-dependent ecosystems distribution is included to emphasize the need for improved information on the location and characteristics of groundwater dependent ecosystems across the Forest so they can be more readily acknowledged in forest planning activities.

Groundwater dependent ecosystem distribution is stressed by natural and anthropogenic activities and forces that alter hydrologic connectivity, deplete groundwater sources, or increase nutrient loads (Chadde and others 1998). On the Salmon-Challis, the most common stressors impacting distribution were roads, diversions, and mining. Roads are unnatural sources of fine sediment that can obstruct natural flow paths between surface and groundwater systems (Forman and Alexander 1998; Reid and Dunne 1984). Diversions alter the amount and distribution of water received by aquatic systems (Winter and others 1998). The distribution of water within aquatic ecosystems can be altered by certain mining practices, occasionally resulting in disappearance or movement of springs (Waddell and others 1981). Peatlands, in particular, are sensitive to pollutants from mining or increased nutrient loads from other activities, like grazing or agriculture (Chadde and others 1998).

Changing climate may be the greatest stressor influencing the distribution of springs and groundwater dependent wetlands on the Salmon-Challis. Seasonal temperatures across the Forest have increased in all four seasons, causing temperature exposure of nearly the whole forest to be classified as very poor. Precipitation has decreased during winter and spring and increased during summer and fall. Only the northern half of the forest is considered in good or very good condition in terms of precipitation exposure (Cleland and others 2017).

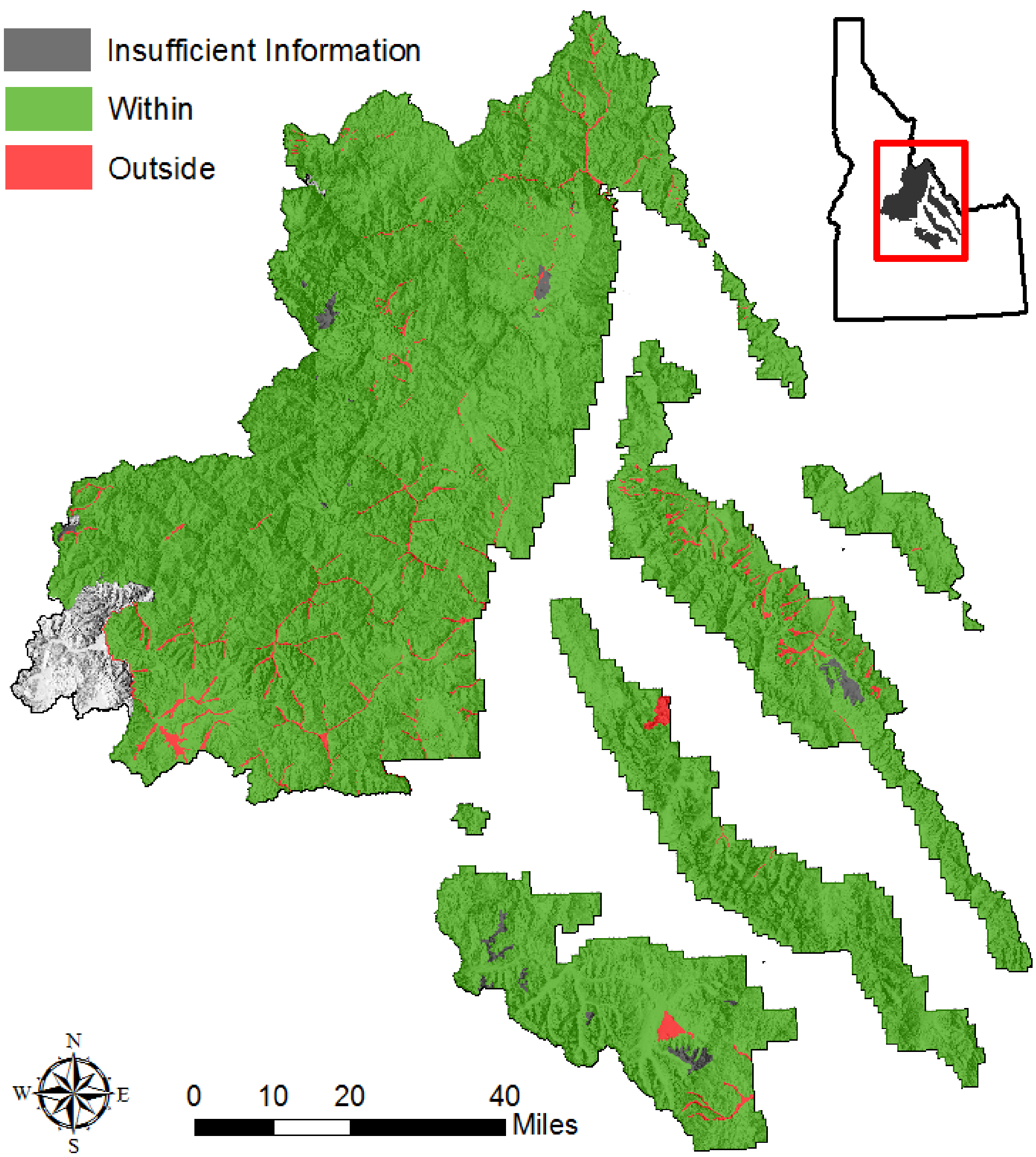
Spring Distribution on the Salmon-Challis

The Spring Stewardship Institute has documented 669 springs and seeps on the Salmon-Challis. However, additional springs and seeps are likely present on the Forest.

Natural forces were generally the strongest drivers of spring distribution, and 97 percent of the Forest is considered within the natural range of variation, as seen in Figure 77. For the majority of the forest, distributions of springs within reference areas was comparable to managed portions of the Forest. There was insufficient information to evaluate the natural range of variation status for less than 1 percent of the Salmon-Challis.

Some land type associations, particularly those in the southern half of the Forest have experienced larger deviations in winter precipitation and temperature during the last 30 years when compared to the previous century (Cleland and others 2017). Land type associations that are experiencing large climate deviations are likely more vulnerable to cumulative effects of additional stressors, including roads, mining, and diversions.

Figure 77. Natural Range of Variation Status of Spring Distribution on the Salmon-Challis



Fen Distribution on the Salmon-Challis

Fens are wetlands supported primarily by groundwater with a minimum depth of usually 40 centimeters of accumulated peat (Bedford and Godwin 2003; Chadde and others 1998). The National Wetlands Inventory database documented 2754 palustrine emergent wetlands, which are the most common wetland types supported by groundwater that occur in mountainous environments. A fen mapping report by the Colorado Natural Heritage Program identified 3,401 potential fens covering 5,749 acres, including 385 likely fens (G. Smith and others 2017).

The Colorado Natural Heritage Program showed the highest densities of potential fens in the southwestern part of the Forest, particularly in Upper Elk Creek, Swamp Creek-Marsh Creek, and Cape Horn Creek watersheds (G. Smith and others 2017). A large spring and fen complex was identified in the Crane Meadow area. The largest fen on the forest, Blind Summit Fen, is located in the Swamp Creek-Marsh Creek watershed and measures 140 acres within the Salmon-Challis boundary (G. Smith and others 2017). This site, shown in Figure 78, is nearly two-miles long and one-third-mile wide and is composed of quaking mats that are sub-irrigated by numerous springs (Chadde and others 1998). The report also identified three possible iron fens in the Iron Bog Creek watershed.

Figure 78. Blind Summit Fen near Marsh Creek is part of a large wetland complex subirrigated by numerous springs.

Due to the discrepancies in the datasets and the lack of ground-verified observations, we concluded there was insufficient information to evaluate groundwater-dependent wetlands distribution in any land type association.

Surface Water and Groundwater Fluctuations

Fluctuations in surface and groundwater levels influence the structure, function, and composition of all riparian and aquatic systems. A stream's natural flow regime includes the timing, frequency, magnitude, rate of change, and duration of flooding events (Poff and others 1997).

High flows are critical disturbances (Resh and others, 1988) that maintain diverse aquatic and terrestrial habitats, allow for the exchange of material and energy between a stream and its floodplain, and recharge the areas along stream beds and groundwater systems (Junk and others 1989; Poff and others 1997; Jack A Stanford and others 2005).

During low flows, succession occurs as riparian plants establish and grow on recently scoured or deposited alluvium (Stromberg and others 1991; Whited and others 2007). Discharge from groundwater resources that are maintained by infiltration from rainfall and snowmelt support base flows (Poff and others 1997).

Flow regimes of groundwater dependent ecosystems are distinct from surface water systems dominated by runoff. The range of discharge from spring and groundwater dependent wetlands is narrower than the extremes observed in hydrographs that include snowmelt (Whiting and Stamm 1995). The timing, reliability, and reduced extremism of groundwater dependent ecosystem discharge is important for species that are associated with groundwater dependent ecosystems. Timing, reliability and reduced extremism of discharge also has implications for the base flows observed in surface water systems during late summer.

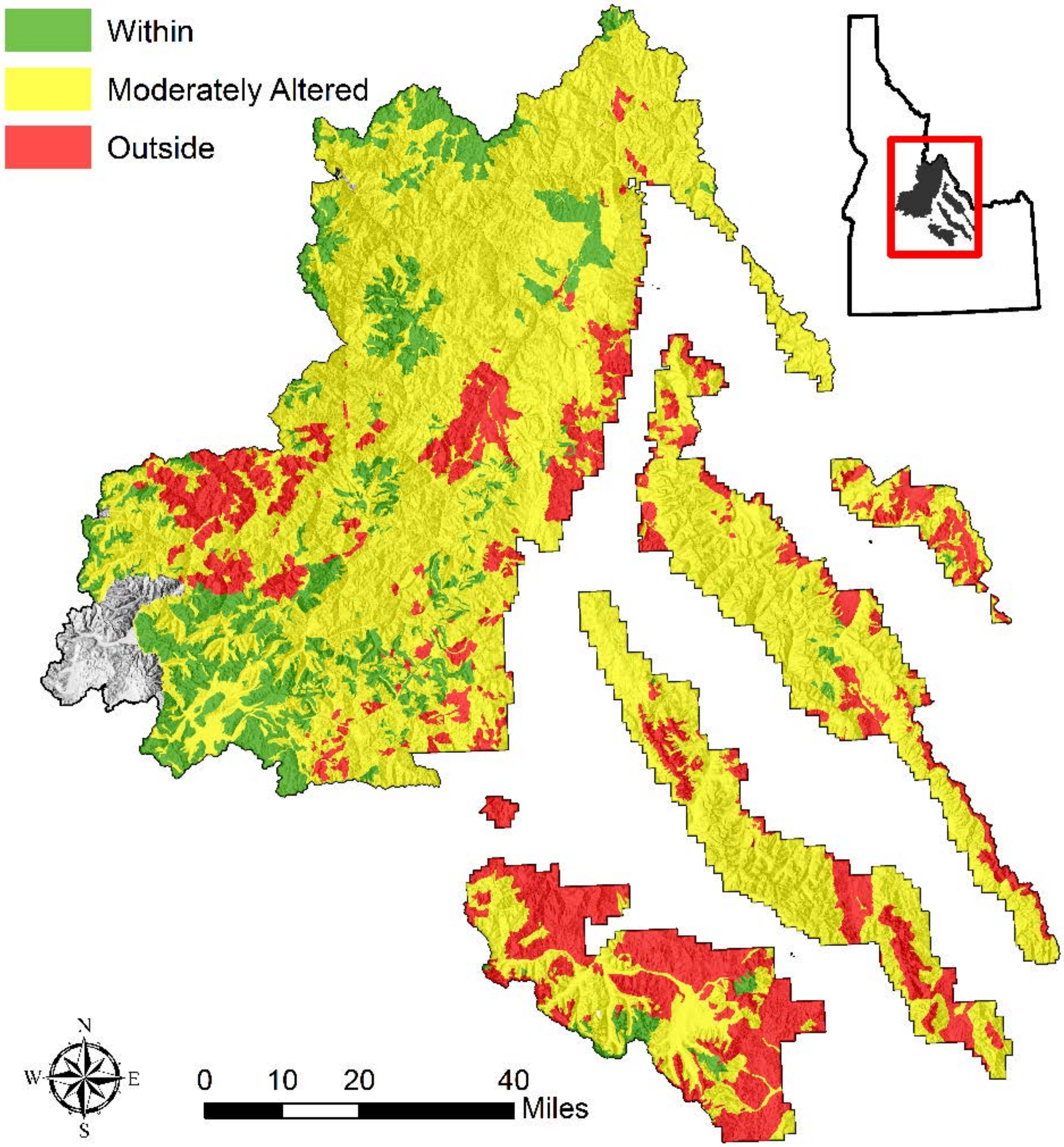
The natural flow regimes of groundwater and surface water systems on the Salmon-Challis are driven by climate, geology, and beaver activity. Fluctuations in ground and surface water levels are also influenced by the degree of connectivity between a channel and its floodplain (Junk and others 1989), as well as vegetation that slows runoff and consumes water throughout the drainage.

Stressors to water fluctuations include any activity or force that alters the timing, frequency, magnitude, duration, or rate of change of natural flows. Anything that impacts the hydrologic connectivity between ground and surface water systems also serves as a stressor. These forces can be natural or human-caused.

The stressors on the Salmon-Challis include mining, grazing, vegetation mortality, diversions, roads, drought, trails, timber harvest, fire, and altered temperature and precipitation. Altered temperature and precipitation are potentially the most important stressors to water fluctuations on the forest, particularly on the South Zone. Fires also have a long history of impacts to water fluctuations on the Forest (Elizabeth Smith 1969). Water fluctuations in surface water systems on the Salmon-Challis have been strongly impacted by multiple interacting stressors.

Based on analysis of conifer encroachment and deviations in winter precipitation and temperature, 10 percent of the Forest is within the natural range of variation, 79 percent is moderately altered, and 11 percent is outside the natural range of variation, as shown in Figure 79.

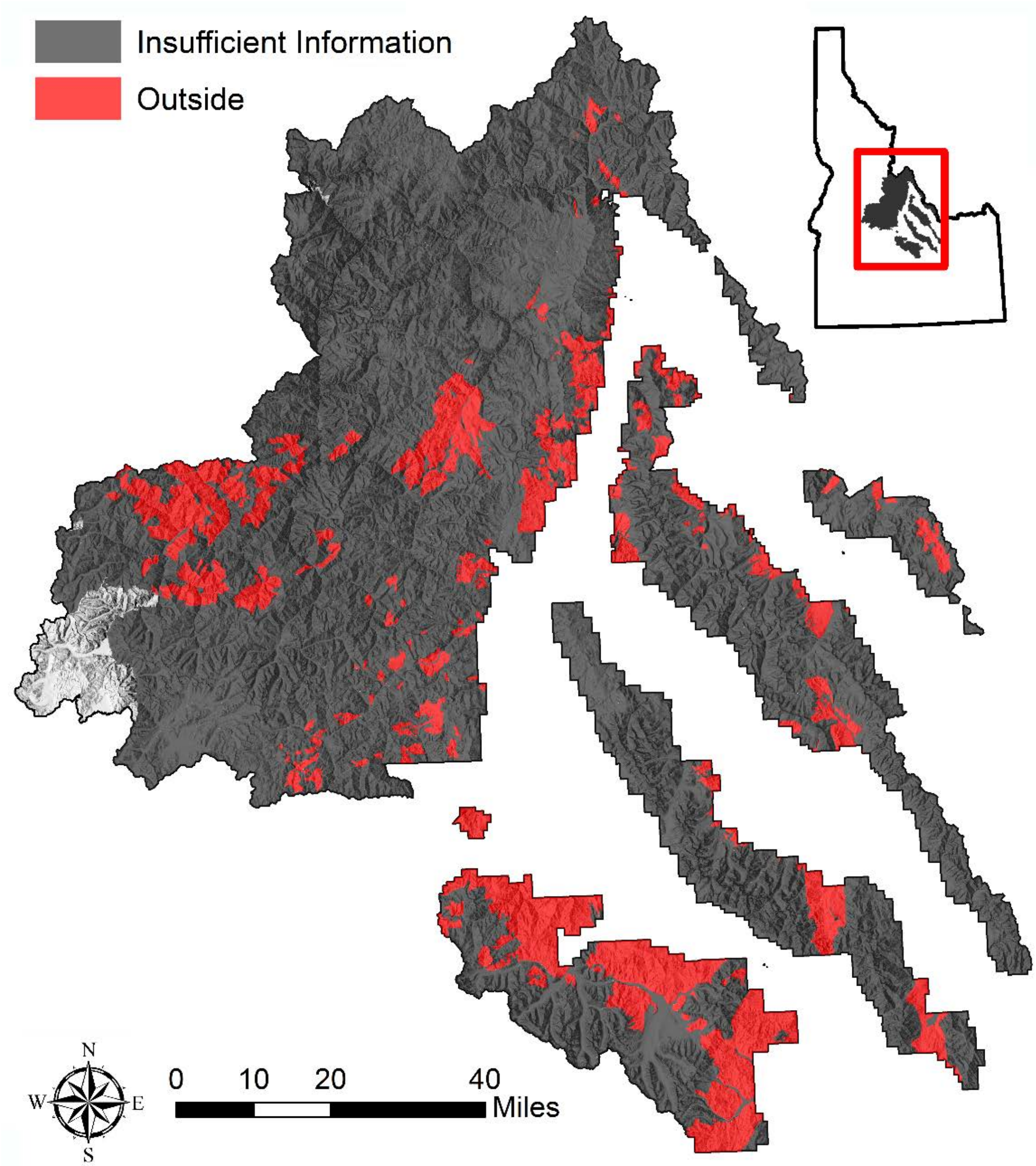
Figure 79. Natural range of variation status of water fluctuations in surface water systems on the Salmon-Challis.



Volcanic and granitic geologies with broad, gently sloping ridgetops and mountain slopes or with historically glaciated lands tend to be the most resistant and resilient to stressors. Surface water systems in sedimentary geologies with mountain slopelands and dissected foothills are most vulnerable to alterations in the natural flow regime.

Like surface water systems, water fluctuations at groundwater dependent ecosystems also appear to be impacted by stressors on the Forest. There was insufficient information to evaluate the natural range of variation status for 84 percent of the Forest, as seen in Figure 80. We were able to assess two land type associations and both are outside the natural range of variation. It appears that water fluctuations of groundwater dependent ecosystems located in volcanic dissected foothills or mountain slopelands are especially vulnerable to stressors.

Figure 80. Natural Range of Variation status of water fluctuations at GDEs on the SCNF



Overall, roads in the floodplain, diversions, mining, recreation sites in the floodplain, grazing, and altered temperature and precipitation regimes may have influenced surface and groundwater fluctuations. There were weak correlations between upland conifer encroachment along intermittent streams and floodplain road density, diversion density, mine density, and percent of floodplain impacted by recreation sites. We also observed weak associations between upland conifer encroachment along perennial streams and floodplain road density, winter temperature deviation, winter precipitation deviation, and percent of floodplain impacted by recreation sites. Timber harvest and vegetation mortality due to insects and disease appear to not have major impacts to water fluctuations on the Salmon-Challis. Nevertheless, they may interact with other stressors, such as roads and grazing.

Stressors can have cumulative effects on natural flow regimes. For example, livestock grazing is a stressor in all land type associations considered outside their natural range of variation. In addition to grazing, winter precipitation has decreased by at least 9 percent and winter temperatures have increased by at least 2.9˚F in all land type associations considered outside the natural range of variation. Grazing was identified as a stressor in two land type associations considered within the natural range of variation, however, these associations have experienced no reduction in winter precipitation. These results imply that cumulative stressors should be considered during planning and that certain actions, such as using a rest period to limit grazing impacts, may be more successful in certain land type associations.

Our results align with many studies that have concluded that there has been a marked decline in annual streamflows in the region and throughout the western United States (Charles H Luce and Holden 2009; Safeeq and others 2015). This trend is likely to continue as modeling for the Salmon River basin predicts the gradual advancement in the timing of peak flow associated with snowmelt by about 10 days. Expected diminished snow-water equivalent, reduced soil moisture, and increased evapotranspiration imply the potential to trigger drought in the basin (Sridhar and others 2013). The transitional precipitation zones at mid-elevations will likely be extremely vulnerable to climate change as areas where snow accumulates near 0˚C are most sensitive to warming (Safeeq and others 2015).

Water Quality

Water quality describes the complex biogeochemical interactions that occur within aquatic and riparian systems. The ecology of freshwater systems depends on inputs of sediment, nutrients, temperature, dissolved oxygen, and pH (Bilotta and Brazier 2008; Dauer and others 2000; Johnston 1991; Sánchez and others 2007). These characteristics impact the structure and function of streams, lakes, and groundwater dependent ecosystems in various ways. Aquatic systems, particularly aquifers and the regions beneath and alongside stream beds, provide the fundamental ecosystem service of nutrient transformation and biological filtration that results in drinking water for numerous communities (Boulton 2005). As surface waters become more polluted, sources of good water quality, especially groundwater resources, will be important refugia for considerable biodiversity and water sources for human consumption.

The biogeochemistry of aquatic systems is driven by geology, chemistry of precipitation, the length of time water is in contact with certain soil and rock types, mixing of cold and thermal water sources, and the dissolution of organic and mineral substances from vegetation, soil, and rocks (Yee and W.R. 1987). These factors all influence the concentrations of dissolved substances in ground and surface water systems.

Stressors to water quality include forces that alter temperature, suspended sediments, and the concentrations of nutrients, minerals, or pollutants (Bilotta and Brazier 2008; Dauer and others 2000; Johnston 1991; Sánchez and others 2007). Stressors to water quality can be generated by natural and human-caused forces. Wildfires are an example of a natural stressor that can temporarily increase nutrient and sediment inputs and remove riparian vegetation (Shakesby and Doerr 2006; Spencer and others 2003).

Human activities that influence water quality include burning of fossil fuels, agriculture, diversions, mining, roads, recreation, and loss of riparian zones. Fossil fuel combustion and high intensity agriculture have increased nitrogen deposited from the atmosphere (Carpenter and others 1998). Runoff from fertilized fields or grazed areas can increase nutrient inputs to aquatic systems (Carpenter and others 1998; Yee and W.R. 1987). Diversions and pumping remove water from the system and can increase the concentration of dissolved minerals and solutes (Liu and others 2003). Mining can introduce trace metallic elements as well as increase phosphorus loading (Yee and W.R. 1987).

Roads, particularly those located within floodplains, are unnatural sources of sediment and are linked to altered levels of heavy metals, salinity, turbidity, and dissolved oxygen (Forman and Alexander 1998). Recreation areas, including trails and campsites can increase sediment inputs and affect water quality through refuse disposal. Lastly, wetlands and riparian zones are very effective at trapping sediments and nutrients. In fact, Gilliam (Gilliam 1994) identified these areas as the most important factor influencing nonpoint-source pollutants and essential for surface water quality protection. Globally, riparian areas are shrinking, with potentially harmful effects to water quality.

We used the following indicators to determine the natural range of variation status of surface water quality of each land type association:

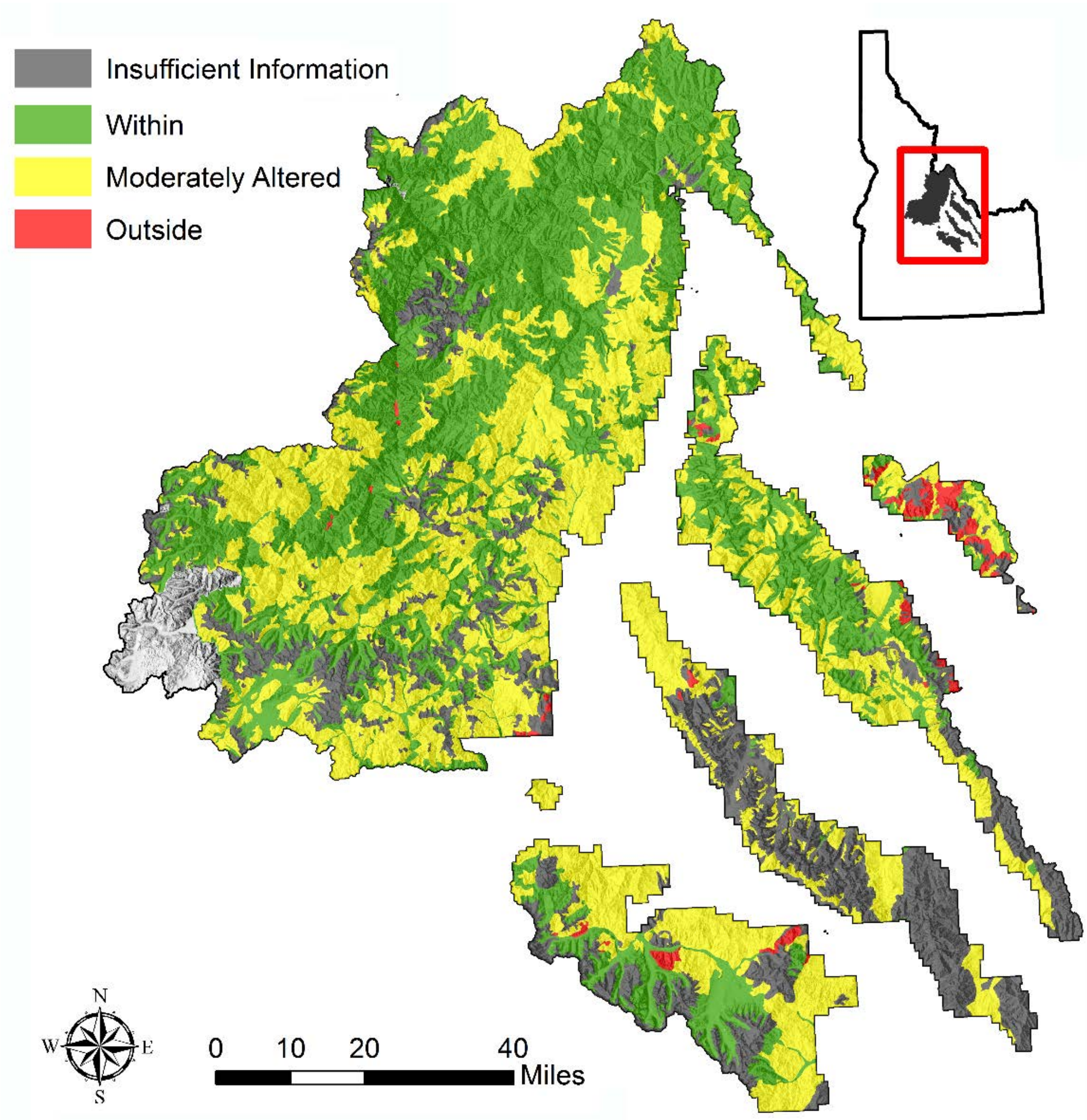
- Community Tolerance Quotient for macroinvertebrates,
- average hourly stream temperature from July 15-August 31,
- median substrate size, and
- the percentages of streams and waterbodies classified as impaired by the Idaho Department of Environmental Quality.

We used data for Community Tolerance Quotient, average hourly temperature and median substrate size from the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program. We used Idaho Department of Environmental Quality spatial data to determine the percentage of stream miles and waterbodies classified as impaired within each land type association.

To evaluate the water quality status of groundwater dependent ecosystems, we used proper functioning condition reports completed by Salmon-Challis staff. These assessments include information on the stressors present at each groundwater dependent ecosystem. Each report also notes if changes in water quality are affecting the groundwater dependent ecosystem.

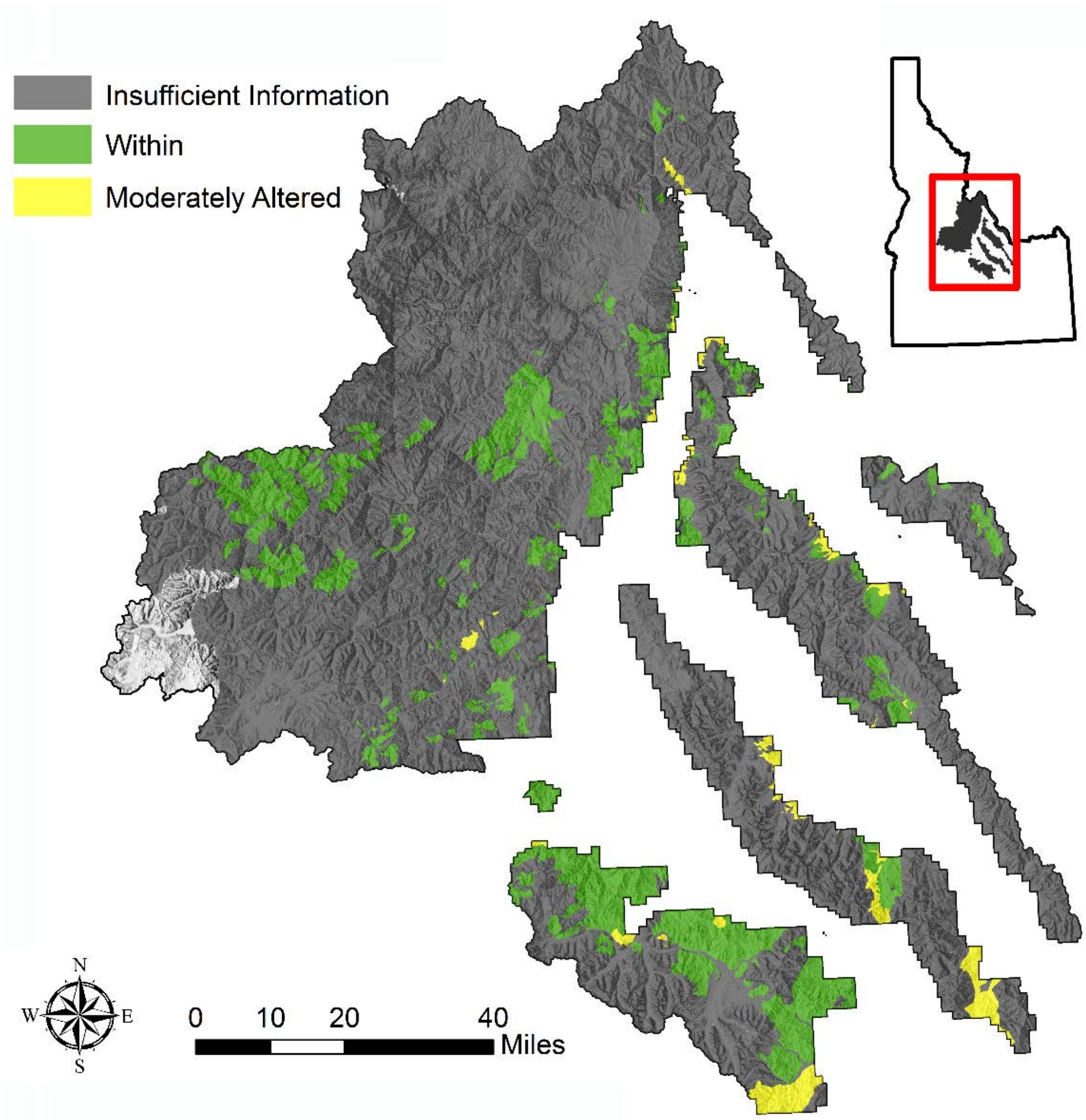
Stressors have impacted water quality on a limited portion of the Forest. Based on indicators for surface water systems, 41 percent of the Forest is within the natural range of variation, 40 percent is moderately altered, and 1 percent is outside the natural range of variation, as seen in Figure 81. There was insufficient information to evaluate surface water quality on 18 percent of the forest.

Figure 81. Natural Range of Variation Status of Surface Water Quality on the Salmon-Challis



Groundwater dependent ecosystems show less impact to water quality with 14 percent of the Forest within the natural range of variation and 2 percent moderately altered, as seen in Figure 82. However, there was insufficient information to evaluate groundwater dependent ecosystem water quality on 84 percent of the Salmon-Challis.

Figure 82. Natural Range of Variation Status of Groundwater Dependent Ecosystem Water Quality on the Salmon-Challis



Geologic settings and landforms have some influence on water quality and the resistance or resilience of streams to stressors. Sedimentary land types are expected to be more productive than granitic, quartzite, or volcanic (Salmon-Challis National Forest 2004, 2017). Our results show they may also be more vulnerable to changes in water quality. However, there was insufficient information to evaluate the majority of sedimentary land type associations. Quartzite and granitic settings appear fairly resistant and resilient to water quality stressors, and volcanics are more sensitive.

Our results are consistent with several Idaho Department of Environmental Quality assessments completed for subbasins on the Forest, including the Middle Salmon River -Panther Creek Subbasin (Idaho Department of Environmental Quality 2001; Salmon-Challis National Forest 2017), the Upper and Lower Middle Fork Salmon River Subbasin (Idaho Department of Environmental Quality 2008), the Lemhi River Subbasin (Idaho Department of Environmental Quality 2012), the Pahsimeroi River Subbasin (Idaho Department of Environmental Quality 2013), the Little Lost River Subbasin(Idaho Department of Environmental Quality 2015), and the Upper Salmon River Subbasin (Idaho Department of Environmental Quality 2016). These reports consistently document reduced water quality due to thermal loading and sediment deposition. Additionally, reports for the Upper Salmon, Lemhi, and Pahsimeroi rivers include E. coli and fecal coliform bacteria as concerns.

The assessments indicate alteration of streambanks and loss of riparian vegetative cover due to grazing as major contributors to high stream temperatures and large sediment loads. The reports conclude that these systems are responsive to restoration and management practices, with improvements observed in the Middle Salmon River-Panther Creek, Upper Salmon River, and Upper and Lower Middle Fork of the Salmon River subbasins. These conclusions are supported by our analysis that shows many land type associations moderately altered from the natural range of variation.

Channel and Floodplain Dynamics

Riparian areas include aquatic and terrestrial habitats distributed across a geomorphological template that is formed by the movement of sediment and water within the channel and between the channel and the floodplain (Junk and others 1989; Jack A Stanford and others 2005). The distribution of habitats across this template is driven by various patterns and processes operating at many spatial and temporal scales including flooding, channel avulsion, cut and fill alluviation, recruitment of large woody debris, and regeneration of vegetation (JA Stanford and Ward 1988).

Streamflow, in particular, is a master variable that strongly influences channel and floodplain structure. High flows connect the stream to its floodplain, enabling the exchange of organic matter and energy (Junk and others 1989; Poff and others 1997). They also play an important role in the life cycle of many riparian vegetation species by dispersing seeds and scouring the channel, resulting in bare substrate needed by seedlings. Low flows allow for the establishment and growth of vegetation and successional rebuilding (Salo and others 1986; Jack A Stanford and others 2005; Thomaz and others 2007).

Complex floodplains with diverse and constantly changing aquatic and terrestrial habitats are more productive (Junk and others 1989; Thoms 2003), have higher biodiversity (Hauer and others 2016; Ward and others 1999), and are more resistant and resilient to disturbance (McCluney and others 2014).

A major driver of channel and floodplain dynamics is the underlying geology and surrounding terrain. In the Columbia River basin, catchment geology explains a significant amount of variation in channel substrates and bank attributes. Channels draining igneous catchments tend to support more undercut and steeper banks and larger amounts of fine sediment than those in sedimentary settings (Al-Chokhachy and others 2010).

Floodplain structure is further influenced by topography. Very steep gradients and narrow canyons limit floodplain development in many parts of the Salmon-Challis. Due to the steep slopes in these areas, debris slides and avalanches are common natural disturbances to channels and floodplains (Salmon-Challis National Forest 2004). These events alter channel structure by depositing large amounts of wood or sediment within channels (Benda and others 2005; Fetherston and others 1995). In topographies with shallower gradients or large meadows, wide valley bottoms with streams meandering through depositional material are common (Salmon-Challis National Forest 2004).

Lastly, the vegetative communities of the surrounding terrain influence the frequency and volume of wood within the channel. Debris creates complex floodplains by altering water velocity, creating locations of scour and deposition, stabilizing streambanks, and creating pool habitats (AM Gurnell and others 2002). Drainages on the Forest range from forested to grassland and shrubland, naturally creating differing amounts of large wood expected within channels. The size and condition of forests near the channel account for variability in the frequency and volume of large woody debris, as well as stream substrate and channel shape (Al-Chokhachy and others 2010).

In addition to geology and terrain, flooding is a driver of channel and floodplain dynamics on the Salmon-Challis. Natural flow regimes include the timing, frequency, duration, rate of change, and magnitude of flood pulses within a stream (Poff and others 1997). These characteristics influence the extent and condition of riparian zones associated with aquatic habitats. Most of the hydrographs of streams on the Forest are dominated by a strong snowmelt signature in early summer, with the exception of some low elevation streams that are highly influenced by summer thunderstorms (Tennant and Crosby 2009). Approximately 55 percent of streams on the Salmon-Challis are intermittent or ephemeral, limiting the development of their associated floodplains.

A final driver of channel and floodplain dynamics is beaver activity. Beavers modify streams by cutting wood and building dams that effectively trap sediment, create and maintain wetlands, alter the structure and dynamics of the riparian zone, and lead to the formation of wide, low gradient, alluvial plains as the associated ponds fill with sediment (Angela M Gurnell 1998; Naiman and others 1988). These meadows also contribute to a step pattern along the stream's longitudinal profile. Beaver dams also slow water velocity and create variable substrates throughout the channel. Structures built by beavers increase the diversity of channel widths, depths, and morphological features. Overall, beaver dams encourage stable channels with more complex floodplains (Angela M Gurnell 1998; Pringle and others 1988).

Compared to other salmon-bearing basins in the northern Pacific, the complexity of floodplains and the quality of stream habitats of the Columbia River basin are degraded (Luck and others 2010). Alterations in the structure and function of aquatic and riparian systems within this large basin have frequently been attributed to stressors from certain land management practices, including livestock grazing, road construction, agriculture, timber harvest, and mining (Al-Chokhachy and others 2010; J.L. Kershner and Roper 2010; Jeffrey L Kershner and others 2004). In addition to these stressors, channel and floodplain dynamics on the Salmon-Challis are also likely impacted by diversions, recreation, invasive species, and climate change.

Livestock grazing can cause numerous impacts to floodplains, including trampling banks, over-widening streams, a decrease in stabilizing vegetation, and unnatural sediment from trailing (George and others 2002; Thibault and others 1999). With European settlement of the west came overgrazing and the removal of vegetation from landscapes. As protective vegetation was destroyed, runoff became more sporadic and large amounts of sediment were introduced to channels. Systems became out of balance between the supplies of water and sediment and streams were not able to clear depositional material. Larger peak flows that result from the loss of vegetation cause channels to become incised and the water table to be lowered. Riparian plants are left in drier soils and are ultimately replaced by upland species, leading to an overall reduction in the size of the floodplain (Belsky and others 1999). Overgrazing did occur on the Salmon-Challis, primarily due to trespass stock during the very early days of the Forest. Today, approximately 50 percent of the forest has active grazing allotments and the steep terrain of many land type associations tends to concentrate livestock and wildlife to valley bottoms (Salmon-Challis National Forest 2004).

Stressors such as road construction, recreation, mining, and wildfire can impact channel and floodplain dynamics by altering sediment inputs or disrupting the connection between the channel and its floodplain (Bellmore and others 2012; Benda and others 2005; Forman and Alexander 1998; Julia A Jones and others 2000; Trombulak and Frissell 2000). In addition to providing an unnatural source of fine sediment, roads disrupt floodplain development by confining or crossing the stream, as seen in Figure 83.

Figure 83. A road paralleling Colson Creek erodes into the channel, disrupting natural channel migration and contributing sediment to the channel.

Photo by D.M. Smith, USFS

Roads that parallel streams often limit movement of the channel and road crossings cause streams to become wider and shallower with flattened banks (Forman and Alexander 1998; Julia A Jones and others 2000; Trombulak and Frissell 2000). Trails and campgrounds can have similar effects by increasing sediment inputs and causing trampling of stream banks. Artificial banks built to protect roads and recreation structures disconnect the stream from its floodplain and simplify the structure of the system (Forman and Alexander 1998; Julia A Jones and others 2000; Trombulak and Frissell 2000).

Similarly, mining, especially in-stream placer mining, can impact channel and floodplain dynamics. Disturbances, such as dredging and other mining activities, often reduce streams to a single channel and limit channel migration and cut and fill alluviation (Bellmore and others 2012). While restoration and collaborative efforts have addressed these disturbances within many reaches, impacts from mining, like the extreme examples in parts of the Yankee Fork drainage, are still visible across the Forest. High-severity wildfires increase sediment input into streams and remove riparian vegetation, further altering channel and floodplain dynamics.

Activities that alter the natural flow regimes and the distribution of floodplain habitats include timber harvest, diversions, invasive species, and climate change. Depending on how timber harvest is managed, it may affect floodplain structure (Bosch and Hewlett 1982). The frequency of landslides can increase following harvest, in turn leading to more debris flows that alter channel morphology and the amount of wood (Benda and others 2005).

Dams and diversions decrease the magnitude of floods that reshape the channels, can disconnect a stream to its floodplain, and transport sediment downstream (Winter and others 1998). Dams can starve systems of sediment, resulting in channel incision and coarser substrate (Kondolf 1997). Furthermore, regulated reaches have 79 percent less active floodplain areas and 3.6 times more inactive floodplain area than comparable unregulated reaches (Graf 2006). Regulation reduces floodplain complexity by 37 percent and interior western rivers are most susceptible to these changes (Graf 2006).

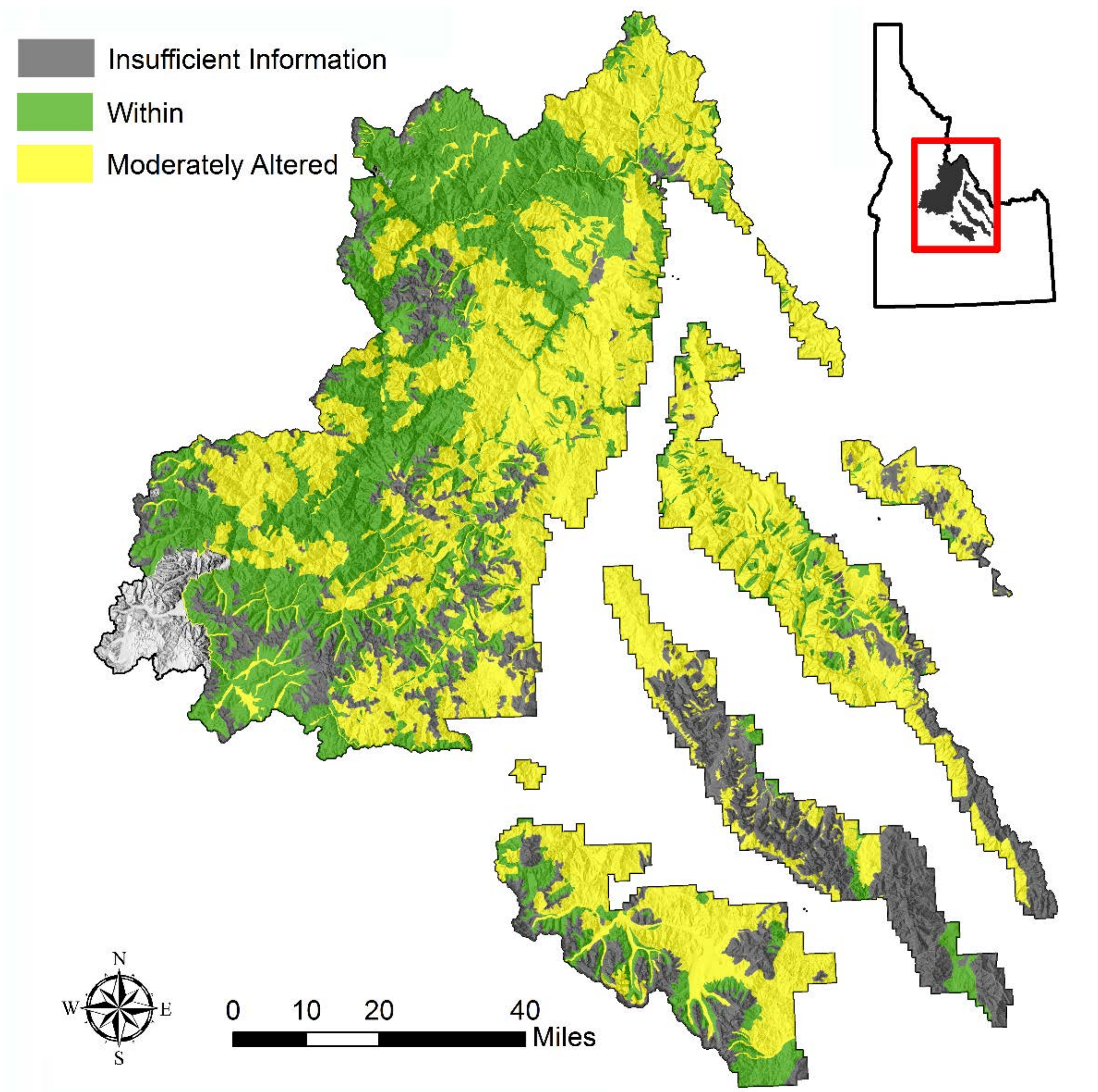
Certain types of invasive species withdraw more groundwater than native riparian vegetation, causing the water table to lower and conditions to become drier. These invasions can kick off a positive feedback loop, eventually leading to an incised channel with no connection to its floodplain and a loss in riparian cover. Lastly, warmer and drier conditions associated with climate change can alter flow regimes and reduce inundation that drives floodplain dynamics (Dukes and Mooney 2004; Stromberg and others 2007).We used eight indicators of channel and floodplain dynamics to determine the natural range of variation status for each land type association:

- a ratio of floodplain acres per stream mile,
- sinuosity,
- bank stability,
- bank angle,
- frequency of large wood within the channel,
- volume of large wood within the channel,
- area within floodplains of perennial streams that has been burned with moderate to high severity between 1984 and 2014, and
- a cross section wetland rating.

Floodplain acres per stream mile were calculated using a map of the 50-year floodplain and the National Hydrography Dataset flowline GIS layer. The PACFISH/INFISH Biological Opinion effectiveness monitoring program provided the data for sinuosity, bank stability, bank angle, frequency and volume of large wood, and the cross section wetland rating. The area within floodplains burned with moderate to high severity was calculated using data from the Terrestrial Condition Assessment.

Stressors have moderately impacted channel and floodplain dynamics on a large portion of the Forest. Based on indicators of floodplain complexity, 33 percent of the Salmon-Challis is within the natural range of variation and 49 percent was moderately altered, as seen in Figure 84.

Figure 84. Natural Range of Variation Status of Channel and Floodplain Dynamics on the Salmon-Challis



There was insufficient information to evaluate the natural range of variation status for 18 percent of the Forest. It appears that some geologies and landforms are more resistant and resilient to stressors. Channels and floodplains in granitic geologies, steep canyonlands, and glacial troughlands were generally in the best condition on the Forest. Volcanic and sedimentary geologies, mountain slopelands and cryic uplands appear more vulnerable to stressors that alter channel and floodplain dynamics.

The primary stressors to channel and floodplain dynamics on the Salmon-Challis were grazing and roads. We observed weak negative correlations between the percentage of the land type association with active grazing and bank stability. When compared with the PACFISH/INFISH Biological Opinion monitoring program's index of physical habitat integrity, we found the index decreased with increased grazing pressure. Active grazing is common and extensive across the forest, with a median of 98.5 percent of land type association acreage located within active allotments (Forest 2017). Roads, particularly those located within floodplains, have also impacted channel and floodplain dynamics. Our results show a correlation between large floodplain road densities and the loss of riparian cover as indicated by upland encroachment at perennial and intermittent streams. Roads in floodplains are also associated with reduced frequency of large wood and a more degraded PACFISH/INFISH Biological Opinion physical habitat index. We also observed reduced physical habitat integrity was associated with more recreation sites within the floodplain.

The conditions of stream channels and their floodplains on the Salmon-Challis are monitored by the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (Archer and Ojala 2015). This program assigns an index of physical habitat integrity that is calculated using residual pool depth, percent pools, median substrate size, percent of pool tail fines less than 6mm in diameter, large wood frequency, and average bank angle. Our results are consistent with analysis completed by this program that shows the overall physical habitat index for managed sites is slightly degraded compared to reference sites on the forest, within the ecoregion, and throughout the entire Columbia River basin. The components of the index that are especially skewed from reference conditions on the Salmon-Challis are median substrate size, wood frequency, and bank angle. PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program uses repeated measures to assess the trend of the physical habitat index and all its components. On the Salmon-Challis, there is a significant downward trend in the physical habitat integrity index since 2001 (Archer and Ojala 2015).

The PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program report further identifies patterns and trends for the following subbasins:

- Middle Salmon-Panther Creek,
- Lemhi, Little Lost,
- Big Lost,
- Upper Salmon,
- Lower Middle Fork Salmon, and
- the Upper Middle Fork Salmon (Archer and Ojala 2015).

There are significant downward trends in the overall index of streams in the Middle Fork-Panther Creek, Little Lost, Big Lost, and Upper Middle Fork subbasins. The most common concerns throughout the basin are reduced frequency of large wood, smaller median substrate size, and larger percentage of fine sediment in pool tails. Wood frequency significantly differs from reference conditions in the Middle Fork-Panther Creek, Lemhi, Big Lost, and Upper Salmon subbasins. The median substrate size significantly differs from reference conditions in the Lemhi, Little Lost, and Upper Salmon subbasins. The percentage of pool tail fines less than 6mm significantly differs from reference conditions in the Lemhi, Upper Salmon, and Upper Middle Fork subbasins. These conclusions are somewhat limited, however, by small sample sizes within the subbasins.

In addition to the PACFISH/INFISH Biological Opinion monitoring program, streams and their floodplains on the Salmon-Challis also are monitored by the Forest's Watershed Program. Like PACFISH/INFISH Biological Opinion's physical habitat index, the watershed monitoring program records an aquatic zone analysis rating that is based on quality of vegetative stream cover, vegetative bank cover, dominant vegetative type, bank rock content, dominant bank rock size, bank cutting, instream sediment deposition, and ungulate bank damage. Our results are consistent with analysis completed by the watershed program, which has identified 50 monitoring sites of concern. Sites were identified if the percentage of fines was greater than 30 percent, bank stability was less than 80 percent, or the aquatic zone analysis rating was less than 70 percent based on the average of sampling done between 2012 and 2016. Of these, 1 site was located in the Middle Salmon-Chamberlain; 15 were in the Middle Salmon-Panther; 10 were in the Upper Salmon; 2 were in the Lower Middle Fork; 1 was in the Upper Middle Fork; 6 were in the Lemhi; 9 were in the Big Lost; and 6 were in the Little Lost. Overall, the Watershed Monitoring Report (Salmon-Challis National Forest 2017), shows no relationship between lower aquatic zone analysis rating scores and:

- the percentage of watershed grazed,
- the percentage of watershed burned, or
- road density within the watershed.

These conclusions, however, are somewhat limited as the dataset lacks reference sites and the monitoring is limited to streams with anadromous and/or resident fish and locations easily accessible by foot or vehicle.

Condition of Spring Runout Channel

Runout channels are "groundwater-fed streams that emerge from springs or within groundwater-fed wetlands" (U.S. Department of Agriculture, Forest Service 2012). Groundwater runout channels can be distinguished from those dominated by runoff by their flow regimes and sediment inputs (Griffiths and others 2008). Assessing the condition of these unique downstream portions of springs or wetlands is important because they can support unusual aquatic and wetland biota and these features are especially vulnerable to spring development.

The primary drivers of spring runout channel dynamics are flow regimes and sediment inputs (Griffiths and others 2008; Whiting and Stamm 1995). The hydrographs of spring dominated channels tend to be less variable than runoff channels (Whiting and Moog 2001). Sediments in spring channels tend to be variable in size, with cobbles and boulders generally only present at the head of springs. Typically, spring-dominated channels lack fine sediments or algae, indicating that sediments are regularly flushed from the system (Whiting and Moog 2001; Whiting and Stamm 1995). The muted hydrograph and the limited sediment inputs that are characteristic of springs lead to channels with steep banks and dense vegetative cover, armored beds, greater sinuosity, weakly developed bars, and lower width-to-depth ratios (Griffiths and others 2008; Whiting and Moog 2001; Whiting and Stamm 1995).

Stressors to the spring runout channel dynamics include forces or activities that alter spring flow regimes, sediment inputs, or channel structure (U.S. Department of Agriculture, Forest Service 2012). Diversions, regulation, and spring development can alter the amount of flow in the channel as well as the timing or magnitude of pulses. Road construction, recreation, and livestock grazing can increase the sediment load and overwhelm the system with sediment that cannot be cleared. These activities can also lead to trampling channel banks and shallower channels. Runout channels affected by trampling, erosion, entrenchment, ditching, or redirection of flow can lead to extreme degradation or the complete absence or elimination of a runout channel.

To evaluate the dynamics of spring runout channels, we used proper functioning condition reports completed by Salmon-Challis staff. These assessments include information regarding the geomorphology and soils at each groundwater dependent ecosystem, including:

- if human-caused mass movement or other disturbances affect the site stability,
- if the runout channel is functioning naturally and not entrenched or otherwise altered, and
- whether soils are intact and functional without excessive erosion or deposition.

Stressors have impacted the dynamics of spring runout channels on some parts of the Forest. Based on proper functioning condition reports, approximately 16 percent is outside the natural range of variation, as seen in Figure 85. There was insufficient information to evaluate the condition of spring runout channels on 84 percent of the Forest.

We were able to evaluate two land type associations for spring runout channel dynamics. Both are primarily composed of volcanic geologies, which appear fairly vulnerable to forces that alter runout channels. Proper function condition reports cited trailing, trampling, and shearing and the subsequent erosion and channelization of spring runout channels as the grazing impacts on spring channels, as shown in Figure 86. More information across the Forest is needed to understand the extent of impacts to spring runout channels.

Figure 85. Natural Range of Variation Status of Spring Runout Channel Condition on the Salmon-Challis

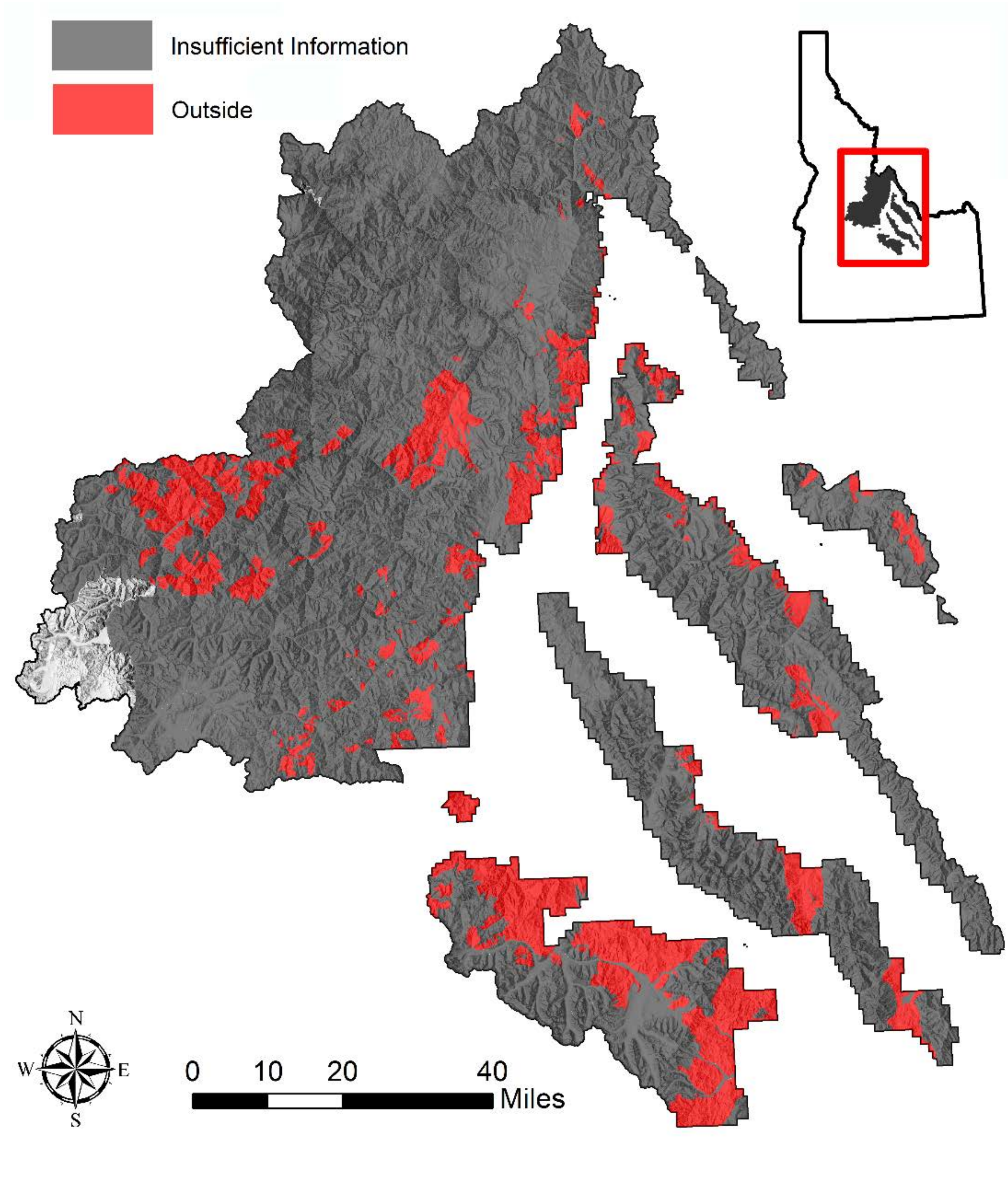


Figure 86. Example of Impacts, Including Trailing, Trampling, and Shearing Imposed by Cattle on a Spring Runout Channel on the Salmon-Challis.

Photo by K.P. Driscoll, USFS.

Composition and Condition of Riparian Ecosystems

Characteristics of riparian communities exert a disproportionately large influence on forest resources, given the small percentage of the landscape they cover. Herbaceous and woody riparian plants enhance salmonid habitat by stabilizing soil, creating overhanging banks, and shading streams (Beschta 1997; Winward 2000). Cottonwoods and other riparian trees are favored roosts, nest sites, and foraging substrates for terrestrial wildlife (DM Smith and Finch 2014; D Max Smith and Finch 2016). Human-caused changes to composition and condition of riparian communities have been linked to reduction in quality of aquatic and terrestrial habitat and alteration of stream dynamics (Krueper 1993; Pollock and others 2014; Williams and others 1999).

Composition of riparian ecosystems varies among settings in the Salmon-Challis, with physical processes acting at multiple scales to determine the riparian community types that are present. Elevation, climate, and other features of the landscape place constraints on which vegetation communities can establish along a given stream segment (Hough-Snee and others 2015).

Riparian and wetland ecosystems are shaped by surface water and groundwater dynamics. Growth and survival of deep rooted plants, such as cottonwoods and willows, is dependent on stable groundwater connections (Bilyeu and others 2008). These connections are maintained by numerous factors, including occasional flooding, springs, beaver dams, and instream wood (Montgomery and others 2003; Pollock and others 2014; Stromberg 2001). Where present, karst systems influence surface flows through storage and transport of groundwater (Godfrey 1985; Mills 1989). By raising water tables, beaver dams encourage the establishment of willow- and herbaceous-dominated community types (Polly P Gibson and Olden 2014; Marshall and others 2013).

Figure 87. This section of Lake Creek is located in a strongly glaciated, unconfined valley bottom. Surface flows and vegetation are influenced by several beaver dams.

Photo by PACFISH/INFISH Biological Opinion, USFS.

A variety of natural disturbances influence composition of riparian communities. Reproduction of cottonwoods, willows, and other pioneering species occurs in response to valley bottom scour and sediment deposition during years with heavy precipitation and spring runoff (Baker 1990; Dykaar and Wigington 2000). High-severity wildfire results in above-ground mortality of trees and shrubs, but can encourage establishment of deciduous species through sprouting or germination (Dwire and Kauffman 2003; D Max Smith and others 2009; Wolf and others 2007). Clonal sprouting of willows and cottonwoods is also triggered by flooding, beaver activity, and other disturbances (Wilding and others 2014).

Due to their dynamic nature and high productivity relative to upland ecosystems, riparian areas are especially vulnerable to colonization by introduced plants (Richardson and others 2007). Introduced species with potential to spread into the Salmon-Challis National Forest riparian areas include cheatgrass, thistles, and other invasive species, forage grasses, and landscaped woody species such as Russian olive.

In coniferous-dominated landscapes, fire helps to maintain natural riparian vegetation by preventing encroachment of upland species and dominance by late-successional species (Kleindl and others 2015). Widespread suppression of wildfire has led to changes in riparian composition in landscapes adapted to frequent wildfires. Changes to composition of riparian ecosystems include encroachment of conifers and other upland vegetation types. Potential causes of conifer encroachment include loss of soil moisture, fire suppression, and reduction in stream channel dynamism (G. Smith and others 2017).

Figure 88. The riparian zone along this confined section of Colson Creek contains coniferous and low deciduous tree dominance groups. Stream and vegetation dynamics are influenced by instream wood and wildfire.

Photo by D.M. Smith, USFS.

Livestock grazing and wild ungulate herbivory have large impacts on vegetation and soil in riparian ecosystems. There are numerous effects from cattle grazing including decreases in woody and herbaceous vegetation, reduction in bank stability, and soil exposure from trailing (George and others 2002; Thibault and others 1999). Growth is also affected by wild ungulate browsing, beaver herbivory, and flooding behind beaver dams. Removal of beaver from watersheds has resulted in stream incision and lowering of water tables (Pollock and others 2014). These changes prompt the loss of willow and herbaceous communities and the encroachment of conifers and upland plants into valley bottoms (Marshall and others 2013). Additional human-induced stressors in the Forest include direct damage to vegetation and introduction of invasive species resulting from recreational use of riparian areas.

Riparian and wetland communities are highly vulnerable to changing climate, especially those at lower elevations where soil conditions are already affected by periodic drought. Reduced summer streamflow and groundwater will create significant stress for some dominant plant species, although high species diversity in many locations ensures some long-term persistence, perhaps with lower functionality (Halofsky 2018).

Climate change vulnerability of mid-elevation riparian and wetland communities is rated as moderate to high because these communities have moderate to high sensitivity and moderate adaptive capacity to the effects of climate change. Mid-elevation riparian plant species may have the ability to move upward in elevation, but where resilience has been compromised by human uses, these systems may not be able to easily adjust to changes in their environment. Invasive species that already dominate many mid-elevation sites are likely to expand their dominance. As riparian areas become drier, upland species will continue to expand into these sites (Halofsky 2018).

High-elevation riparian and wetland communities have a high vulnerability to climate change because of moderate to high sensitivity and low to moderate adaptive capacity. Mid-elevation riparian and wetlands communities are likely to move higher in elevation with warming climate. Systems currently in place are in danger of losing their water source, and soil moisture is likely to be reduced as snowpack amount and duration decrease (Halofsky 2018).

We used nine indicators of composition and condition to determine the natural range of variation status for each land type association. Spatial indicators were:

- conifer encroachment,
- upland encroachment,
- replacement of nonnative vegetation from the Riparian Condition Assessment Tool, and
- watershed-scale condition of riparian and wetland vegetation from the Watershed Condition Framework.

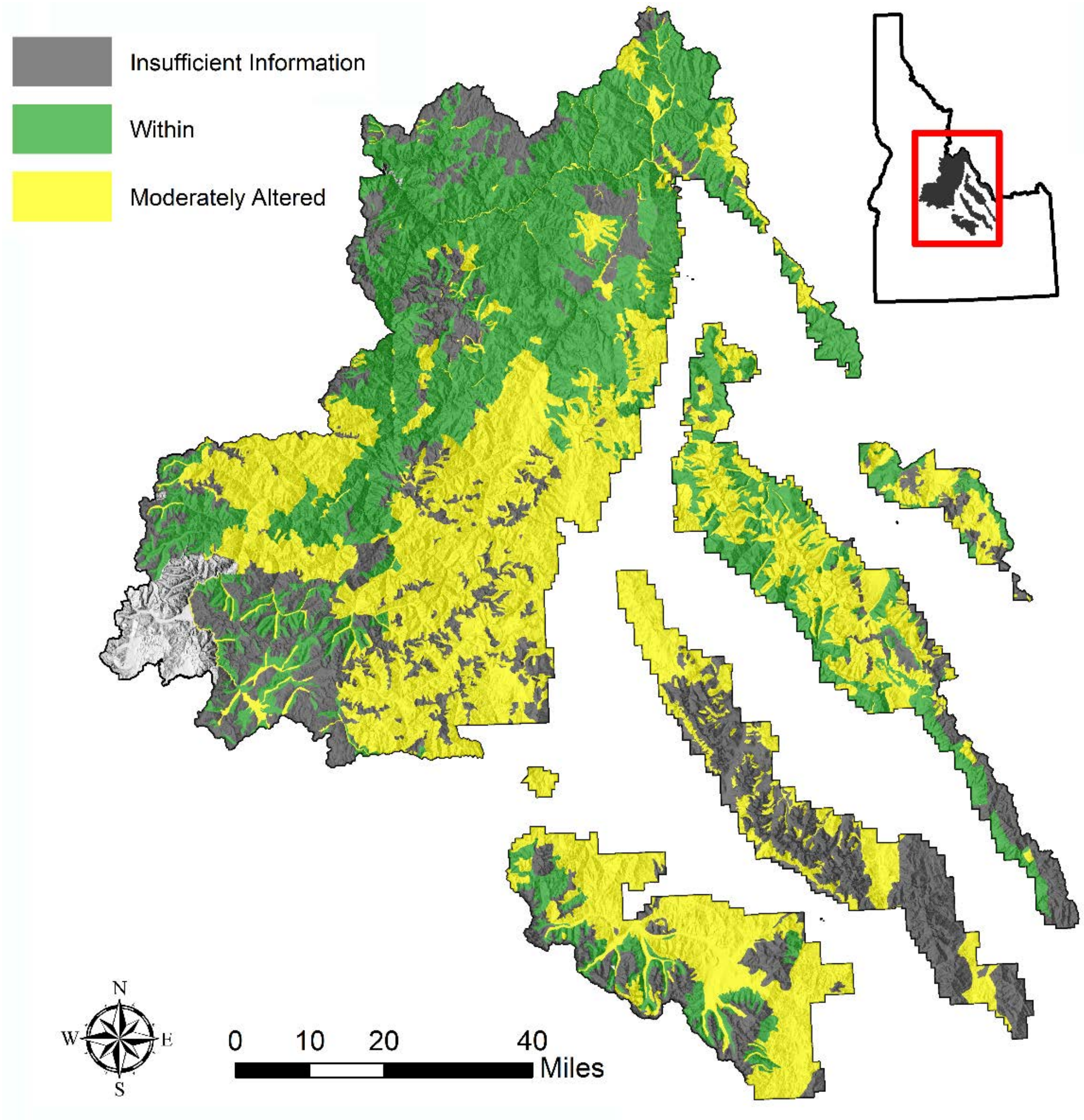
The set of field-sampled indicators consisted of five variables:

- greenline cover, or total plant relative cover where the first perennial vegetation is found on or near the water's edge;
- the percent of the riparian area with effective ground cover, not including the greenline;
- the measure of the abundance of wetland species in the riparian area;
- native species relative cover, or measure of native species cover at the greenline and at a cross-section of the riparian area; and
- non-native species relative cover, or measure of non-native species cover at the greenline and at a cross-section of the riparian area.

To obtain indicators of composition and condition from spatial data, we applied the Riparian Condition Assessment Tool to LANDFIRE data at perennial streams in the Salmon-Challis (Macfarlane and others 2016). With this approach, we compared existing vegetation with expected vegetation to estimate changes in riparian cover along streams and in valley bottoms. We also examined data from the Watershed Condition Framework, which combines qualitative and quantitative assessments of variables including riparian and wetland conditions (Potyondy and Geier 2011).

Composition and condition of riparian ecosystems had been moderately altered in much of the Salmon-Challis National Forest. We determined that 35 percent of the forest was within the natural range of variation, 41 percent was moderately altered, and there was insufficient information to evaluate 24 percent of the forest, as seen in Figure 89.

Figure 89. Natural Range of Variation Status of Riparian Composition and Condition on the Salmon-Challis



The composition and condition index derived from spatial data was high at ten land type associations with granitic, volcanic, and mixed geologies. This index was low at seven land type associations, most of which were in sedimentary or volcanic geologies. Overall, estimates of conifer encroachment and upland encroachment were greater in managed portions of the forest.

We observed a weak positive association between the percentage of the land type associations with active grazing and upland encroachment. There was also a weak positive association between upland encroachment and recreation sites in the floodplain. Estimates of replacement by introduced species were similar in reference and managed areas. Land type associations with high percentages of replacement were near the Main Salmon River and Middle Fork of the Salmon River.

We observed a weak negative correlation between grazing and replacement by introduced vegetation. Percentage of the land type associations with high fire hazard had a weak positive association with introduced vegetation. Grazing had a positive association with percentage of land type associations in good riparian and wetland condition, whereas fire hazard had a weak negative association.

The PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program collected riparian vegetation measurements on multiple occasions at most sites, and the number of occasions varied among sites. To address this inconsistency, we report results from the first and most recent measurements.

Composition and condition indices derived from field data were high at five land type associations with granitic or quartzite geologies. Indices were low at seven land type associations with sedimentary, quartzite, or volcanic geologies. Reach native cover and greenline cover were greater at reference sites than at managed sites. Reach alien cover was greater in managed sites. Effective ground cover and wetland index were similar between managed and reference sites.

Percentage of land type associations grazed had a weak negative association with native cover, a weak positive association with alien cover, and a weak negative association with greenline cover during the first sampling occasion. Percentage of land type associations with high fire hazard had a weak positive association with native cover during the first sampling occasion and a weak positive association with greenline cover during the first and most recent sampling occasions. Density of recreation sites had a weak negative association with effective ground cover during the most recent sampling occasion. Recreation had weak positive associations with wetland rating during the first and most recent sampling periods.

A variety of riparian vegetation dominance groups were present in most land type associations. Some communities in these groups had been moderately altered, with livestock grazing as a primary stressor. To determine which community types were most impacted, analysis of multiple indicator monitoring and greenline data is needed, along with a reach-scale understanding of current and historical beaver presence, departure from historical fire regimes, and intensity of use by livestock and wildlife.

Composition and Condition of Groundwater-Dependent Ecosystems

The composition and condition of communities associated with groundwater-dependent ecosystems reflect environmental conditions and management activities, with different types promoting regional biodiversity (Springer and Stevens 2009). The surface pools of springs and groundwater-dependent wetlands provide still-water habitat for plants, vertebrates, and other biota. Spring runout channels provide unique free-flowing aquatic habitats due to relatively uniform water temperatures and low oxygen concentrations (Springer and Stevens 2009). These channels also increase connectivity across the landscape for organisms associated with surface water systems. Runout channels may connect with streams or may terminate to subsurface flow while still supporting aquatic and riparian species. Spring mounds, composed of calcareous minerals, peat, and other substrates, provide specialized habitat features as well. Karst systems, which facilitate movement and discharge of groundwater in many parts of the forest, also host unique floras and faunas (Humphreys 2006).

Groundwater-dependent wetlands, particularly those with accumulated peat, create distinct plant communities with many species limited to these specialized environments (Bedford and Godwin 2003; Chadde and others 1998; U.S. Department of Agriculture, Forest Service 2007b, 2012). Whether groundwater-dependent ecosystems are connected to streams and riparian areas or isolated and surrounded by upland vegetation, they provide critical habitat and ecosystem services (Cohen and others 2016). The current composition of plants, animals, and other biota must be evaluated to inform management decisions (Kreamer and others 2015), and the condition of vegetation and soils influence the composition and function of groundwater-dependent ecosystems.

Water availability and geomorphic setting are the primary bottom-up drivers of groundwater-dependent ecosystem composition (Cooper and others 1999; Magee and Kentula 2005; Stevens and Meretsky 2008). Geology and hydrology interact to shape water chemistry, which is a determinant of plant community composition of fens (Rod A Chimner and others 2010). Other drivers influencing composition of Forest groundwater dependent ecosystems include sediment dynamics and thermal activity (Brock 1994).

Springs are among the ecosystems most threatened by human activities in the western U.S. (Stevens and Meretsky 2008). Spring developments for irrigation and livestock include installation of headboxes, diversion of flows to troughs and other structures, and construction of ponds within groundwater dependent ecosystems. These activities can have adverse effects on composition and condition of groundwater dependent ecosystems, but in some situations, spring-dependent flora and fauna can persist following development (Unmack and Minckley 2008).

Wildlife and livestock directly affect spring ecosystems through grazing and browsing of vegetation. Grazing and browsing can also cause soil compaction, hummocking, and headcutting. Thermal springs are popular recreation sites on the Forest, and there are numerous human impacts to these unique ecosystems. These include vegetation trampling, soil compaction, and alteration of the natural runout channels for the creation of soaking pools.

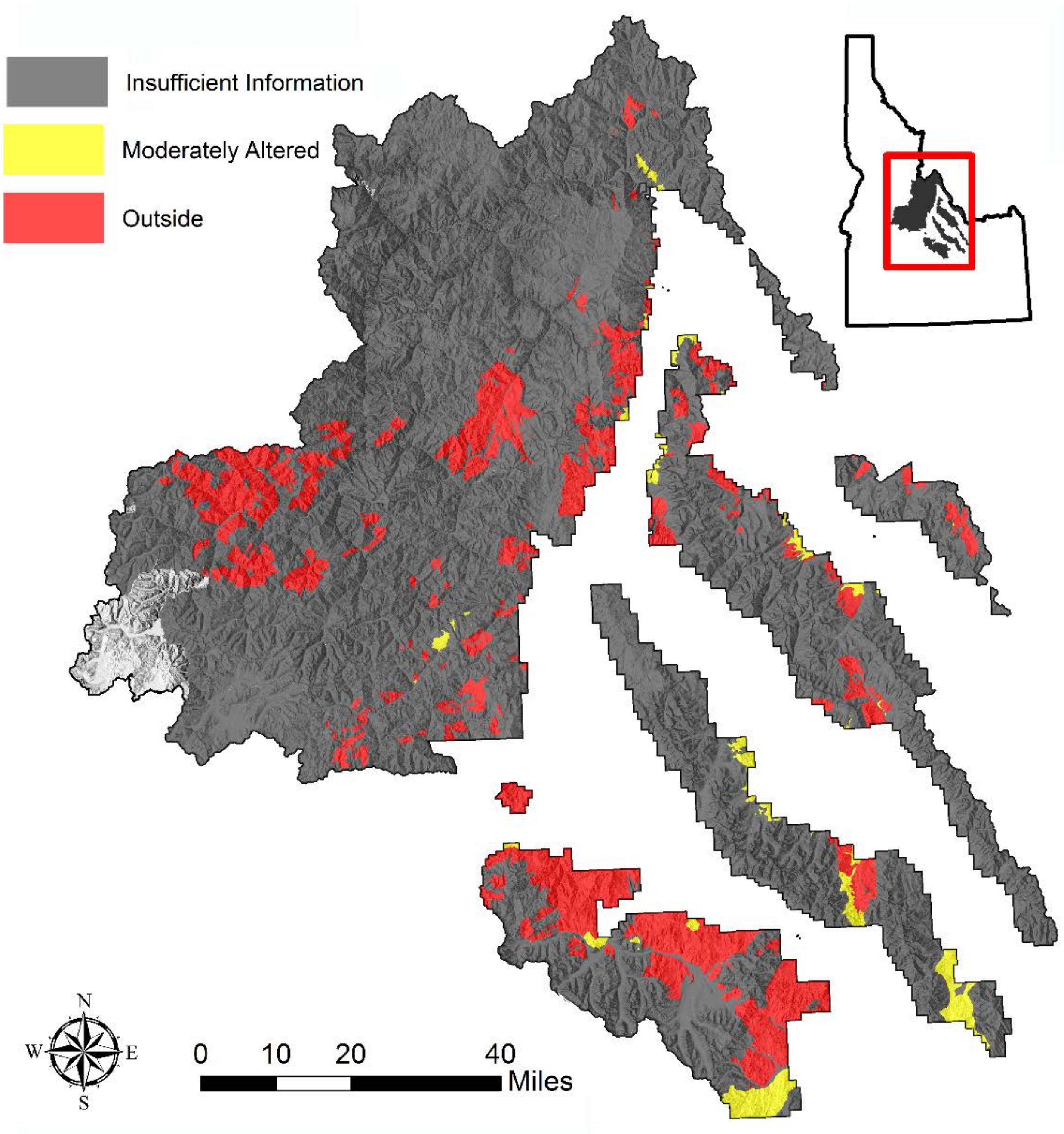
Natural stressors to spring ecosystems include wildfire, which directly impacts plant and animal communities, drought cycles, and geological events, such as the 1983 Borah Peak earthquake (Wood and others 1985).

In fens and other wetlands, disturbance to soils by ditching, trailing, and stream incision can cause drying, resulting in oxidation and degradation of peat (Rodney A. Chimner and Cooper 2003). Wetland vegetation and soil are also vulnerable to grazing, browsing, and trampling.

To evaluate the composition and condition groundwater dependent ecosystems, we used proper functioning condition reports completed by Forest staff. These assessments include information regarding the vegetation and soils at each groundwater dependent ecosystem, including disturbances affecting site stability. We summarized these reports to describe the vegetation type groupings and dominant plant species that are present.

We used best professional judgement to determine the composition and condition of groundwater dependent ecosystems in land type associations where information was available.

Figure 90. Natural Range of Variation Status of the Composition and Condition Groundwater Dependent Ecosystems



Data is too limited to describe differences in composition among the many types of groundwater dependent ecosystems in the Salmon-Challis. Review of reports and photographs indicate, however, that many groundwater dependent ecosystems on the

Forest contain willow-dominated vegetation communities. Fens support additional shrubs species (Chadde and others 1998; Jankovsky-Jones and others 1999). Herbaceous-dominated community types are frequent in groundwater dependent ecosystems as well. Introduced vegetation is present at several of the groundwater dependent ecosystems that were surveyed. Nonnative species include Kentucky bluegrass, Timothy-grass, and other forage grasses.

Damage to vegetation and soil from livestock and wild ungulates has been documented at spring pools, along channels, and in wetlands. This damage includes excessive grazing, browsing of trees and shrubs, and soil disturbance. Fences can protect vegetation and soil from livestock, but must be maintained. Channelization, diversion, and ditching has resulted in replacement of wetlands by upland vegetation at several groundwater dependent ecosystems.

We were able to evaluate two land type associations for composition and condition of groundwater-dependent ecosystems. Both are primarily composed of volcanic geologies. We determined that composition and condition was outside of the natural range of variation at one land type association because 15 of 25 groundwater-dependent ecosystems were determined to be functioning at risk due to livestock impacts, upland encroachment, and other stressors.

Composition and condition was moderately altered at one other land type association, where 10 of 17 groundwater dependent ecosystem were in properly functioning condition. More information across the Forest is needed to understand the extent of impacts to groundwater dependent ecosystem condition and composition.

Summary

Livestock grazing and roads appear to be the primary stressors to riparian ecosystems, wetlands, and groundwater-dependent ecosystems on the Forest. We observed impacts from these stressors on many of the ecosystem characteristics we evaluated, including:

- surface and groundwater fluctuations,
- water quality,
- channel and floodplain dynamics,
- condition of spring runout channels
- composition and condition of riparian ecosystems, and
- composition and condition of groundwater dependent ecosystems.

We found little evidence that livestock grazing has shifted composition and condition outside of the natural range of variation at perennial streams. Long-term impacts of grazing may be greater, however, at intermittent stream and groundwater dependent wetlands.

The secondary stressors present on the Forest include diversions, mining, and recreation. We observed impacts to groundwater and surface water fluctuations from diversions and mining, but not to other ecosystem characteristics. Recreation sites within floodplains are also associated with alterations to water fluctuations and channel and floodplain dynamics. We assessed timber harvest, high severity burns, and vegetation mortality as potential stressors to aquatic, riparian, and groundwater-dependent ecosystems and did not find them to be having substantial impacts on their own.

In addition to stressors caused by management, patterns in temperature and precipitation from 1985 to 2015 have been altered from the patterns of the previous century (Cleland and others 2017). These changes in climate can have major impacts on riparian systems and groundwater-dependent ecosystems by shifting the flow regime.

The direct effects of reduced flows and changes in timing and duration of spring runoff because of climate change will reduce resilience in low-elevation riparian and wetland communities, so their vulnerability to climate change is rated as high to very high. These systems have also been affected by upstream diversions of water and wetland drainage, and by livestock grazing, development, road construction, and concentrated recreational uses. Additional pressures on these already vulnerable ecosystems could have significant effects in the future (Halofsky 2018).

We found that changes in temperature and precipitation were slightly more substantial on the southern half of the forest. All other stressors were acting in addition to altered temperature and precipitation (Intermountain Adaptation Partnership 2016), and there was some correlation between stressors caused by management and changing temperature and precipitation regimes. Land type associations that had experienced larger increases in winter temperature tended to have a larger percentage of land within active grazing allotments, and land type associations with large reductions in winter precipitation were also impacted by vegetation mortality, high fire hazard, mining, and timber harvest.

Stressors to riparian ecosystems, wetlands, and groundwater-dependent ecosystems tended to act cumulatively (Intermountain Adaptation Partnership 2016). This is of concern for the Salmon-Challis as many land type associations had multiple stressors. We have identified livestock grazing, mining, diversions, roads and recreation sites within the floodplain as the major factors linked to degraded riparian areas and groundwater-dependent ecosystems. Many of these stressors were correlated, meaning a land type association with impacts from one stressor was more likely to be affected by multiple stressors. Land type associations with a high percentage within active grazing allotments also had greater road density, more unimproved roads, and impacts from vegetation mortality. Land type associations with high road densities also tended to have more trail miles per acre, higher diversion density, more recreation sites within floodplains, more mines, and a larger percentage of land harvested for timber. Land type associations with high mine density also tended to have more diversions.

AQUATIC ECOSYSTEMS

The Salmon-Challis National Forest covers nearly 4.4 million acres in east central Idaho and includes portions of the Salmon River, Wood River, Big Lost River, Little Lost River, and Birch Creek basins, as seen in Figure 91. The area covered by the forest contains an incredible diversity of aquatic habitats. This includes:

- thousands of miles of rivers and streams;
- hundreds of lakes;
- thousands of acres of wetlands, including fens, bogs, and marshes;
- numerous springs; and
- many man-made reservoirs, ponds, and ditches.

Figure 91. Major river basins on the Salmon-Challis National Forest.

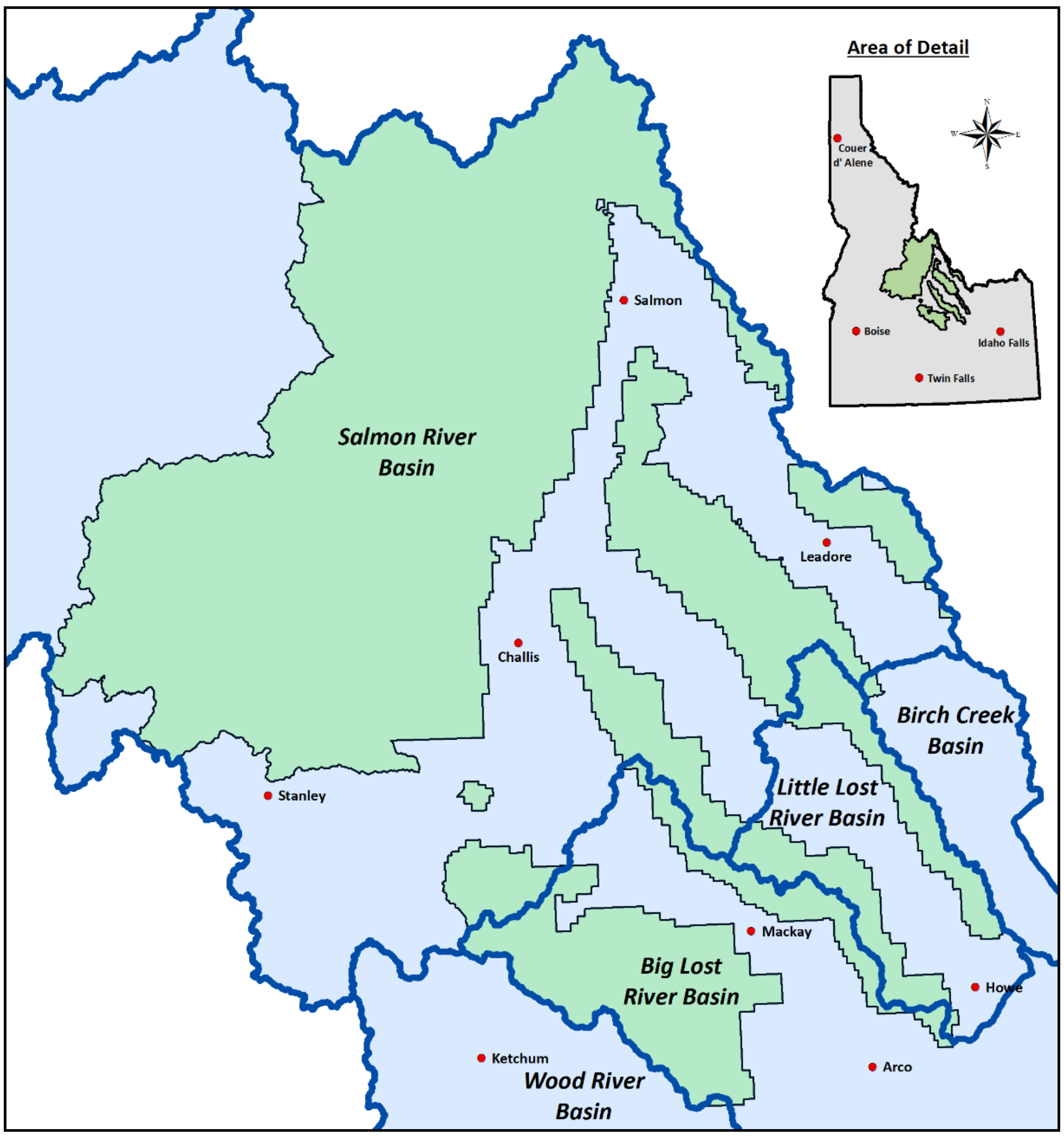


Figure 92. Examples of the Different Aquatic Habitats Found on the Salmon-Challis: top left, Fen in the Jesse Creek Watershed; top right, Freighter Springs; middle left, Willow Creek; middle right, a Beaver Pond on an Unnamed Tributary to the North Fork Big Lost River; bottom left, North Fork Salmon River; and bottom right, Camas Creek.

The aquatic habitat found on the Salmon-Challis supports a wide variety of aquatic organisms including fishes, amphibians, and aquatic invertebrates. These aquatic organisms provide important ecological functions, cultural benefits, and opportunities for recreating, viewing, education, and research.

Information Sources & Needs

Sources used for this section include:

- the Idaho Department of Fish and Game's Idaho Species website;
- the Idaho Department of Environmental Quality Beneficial Use Reconnaissance Program data;
- the Idaho Department of Environmental Quality Integrated Report;
- PACFISH/INFISH Biological Opinion Monitoring Program data;
- the California Academy of Sciences Invertebrate Zoology Collection Database; and
- Columbia Habitat Monitoring Program data.

Existing Plan Direction

Four documents contain important Forest Service direction for the management of aquatic organisms, primarily fishes, on the Salmon-Challis National Forest:

- the Challis National Forest Land Resource Management Plan;
- the Land and Resource Management Plan for the Salmon National Forest;
- the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California, also known as PACFISH; and
- the Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada.

Challis National Forest Plan

The Challis forest plan provided general direction that applied to the entire forest as well as site-specific direction that applied to specific management areas. Additional direction was later provided through numerous forest plan amendments.

The Challis forest plan included some management direction relative to fish. Some of this direction applied to the entire forest. For example, the plan provided forestwide direction to "Emphasize habitat improvement for Threatened and Endangered Species, Forest Service Sensitive, and economically and socially important species" and to "Protect anadromous fish spawning areas from disturbance by livestock and other activities." Some of the direction applied only to specific management areas. For example, in the Marsh Creek drainage, the plan directed the forest staff to improve fish habitat, where possible, through coordination with range, and, in the Lost River Range, the plan directed the forest staff to improve stream quality.

The strengths of the Challis forest plan as related to the management of aquatic organism are that it:

- emphasized habitat improvement for endangered, threatened, sensitive, and economically- and socially-important organisms;
- established sediment, stream shade, and bank stability standards;

- provided direction on managing habitat quality and quantity;
- provided direction on protecting stream flows;
- provided direction on cooperating with partners; and
- provided area-specific direction.

The Challis forest plan also had weaknesses. It lacked a comprehensive forestwide watershed management strategy that protects and, where necessary, restores natural watershed processes that develop and maintain habitat quality, quantity, and connectivity.

The Challis plan provided little direction for:

- managing habitat connectivity;
- managing for aquatic organisms other than fishes that are endangered, threatened, sensitive, or economically and socially important; and
- developing and maintaining fishing opportunities and fishing access, including opportunities and access for those with limited mobility.

It provided no direction for:

- managing activities that directly impact aquatic organisms, particularly fish, such as redd trampling by livestock grazing and fish entrainment by diversions; and
- preventing, monitoring, and controlling the spread of aquatic invasive species.

The Challis plan does not address emerging issues, such as a lack of wildfire on the landscape, aquatic invasive species, and livestock trampling fish redds. The plan does not reflect current science nor changes in public attitudes and views.

Salmon National Forest Plan

The Salmon forest plan provided direction that applied to the entire forest as well as area-specific direction that applied to a 328,545 acre portion of the Salmon National Forest where management emphasis was on anadromous fish habitat. Additional direction was later provided through numerous forest plan amendments.

The Salmon forest plan included some management direction relative to fish. Some of this direction applied to the entire forest. For example, the plan provided forestwide direction to “Manage waters capable of supporting self-sustaining trout populations to provide for those populations” and “Manage anadromous fish habitat to supply and maintain 90 percent or more of its inherent smolt production capability.”

The plan also provided direction that applied to the area where emphasis would be on aquatic habitat management for anadromous fish species. Direction for this area included “Plan habitat improvement projects with the assistance of State wildlife agency” and “Maintain instream flow in cooperation with State agencies to support production goals for anadromous fish.”

The strengths of the Salmon forest plan, as related to the management of aquatic organisms, are that it:

- emphasized management of anadromous fishes and trout;

- established a 328,545 acre portion of the Salmon National Forest where management emphasis was on anadromous fish habitat;
- provided direction to limit the impact of livestock grazing on fish habitat; and
- provided direction on cooperating with partners.

The Salmon forest plan also had weaknesses. Like the Challis plan, it lacked a comprehensive forestwide watershed management strategy that protects and, where necessary, restores natural watershed processes that develop and maintain habitat quality, quantity, and connectivity.

The plan provided little direction for:

- managing habitat connectivity;
- managing for aquatic organisms other than fishes that are endangered, threatened, sensitive, or economically and socially important; and
- developing and maintaining fishing opportunities and access, including opportunities and access for those with limited mobility.

The Salmon plan provided no direction for:

- managing of activities that directly impact aquatic organisms, particularly fish, such as redd trampling by livestock grazing and fish entrainment by diversions;
- preventing, monitoring, and controlling the spread of aquatic invasive species; or

The Salmon plan does not address emerging issues, such as a lack of wildfire on the landscape, aquatic invasive species, and livestock trampling fish redds. The plan also does not reflect current science or changes in public attitudes and views.

PACFISH

The Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California, commonly known as PACFISH, was implemented by the Forest Service and Bureau of Land Management in 1995. The purpose of the interim strategies was to ensure that actions carried out by the agencies did not further endanger anadromous fishes within the target area for a period of 18 months while long-term management strategies were developed and implemented. PACFISH sought to accomplish this goal by establishing riparian management objectives, standards and guidelines, and monitoring direction that the agencies were required to follow. Additional requirements were also provided in the Endangered Species Act consultation that was associated with PACFISH.

PACFISH applies to that portion of the Salmon-Challis National Forest within the Salmon River basin and does not apply to that portion within the Big Lost River, Little Lost River, Birch Creek, or Wood River basins. While PACFISH was implemented in 1995 and was intended to last just 18 months, the long-term strategies that were intended to replace PACFISH were never completed, and the Salmon-Challis continues to be bound by PACFISH direction 22 years after it was implemented.

The strengths of PACFISH are that its direction:

- provided additional emphasis on the management of fish and fish habitat;
- provided significant protection to anadromous fish;
- clearly defined desired conditions, also referred to as riparian management objectives;
- clearly defined riparian habitat conservation areas; and
- provided additional protection for priority watersheds.

The weaknesses of PACFISH are that the direction:

- applied only to anadromous fishes and does not provide direction for other aquatic organisms;
- generally focused on streams and provides little direction for other types of aquatic habitat;
- complicated direction that is scattered in numerous documents that encompass hundreds of pages;
- included some riparian management objectives that are unattainable, even in natural conditions; and
- provided little management flexibility for many activities.

The strategy was implemented in 1995 and was intended to be interim direction that would be in place for not more than 18 months.

INFISH

The Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada, commonly known as INFISH, was implemented by the Forest Service in 1995. The purpose of the interim strategies was to provide interim direction to protect habitat and populations of resident native fish within the target area for a period of 18 months while long-term management strategies were developed and implemented. INFISH sought to accomplish this goal by establishing riparian management objectives, standards and guidelines, and monitoring direction that the agencies were required to follow. Additional requirements were also provided in the Endangered Species Act consultation that was associated with INFISH.

INFISH applies to that portion of the Salmon-Challis National Forest within the Big Lost River, Little Lost River, Birch Creek, and Wood River basins and does not apply within the Salmon River basin. While INFISH was implemented in 1995 and was intended to last just 18 months, the long-term strategies that were intended to replace INFISH were never completed, and the Salmon-Challis continues to be bound by INFISH direction 22 years after it was implemented.

The strengths of INFISH are that its direction:

- provided additional emphasis on the management of fish and fish habitat;
- provided significant protection to all resident native fishes;
- clearly defined desired conditions, also referred to as riparian management objectives;

- clearly defined riparian habitat conservation areas; and
- provided additional protection for priority watersheds.

The weaknesses of INFISH are that the direction:

- applied only to native fishes and does not provide direction for other aquatic organisms;
- generally focused on streams and provides little direction for other types of aquatic habitat;
- complicated direction that is scattered in numerous documents encompassing hundreds of pages;
- provided the same level of protection to all native fishes, regardless of their conservation status;
- included some riparian management objectives that are unattainable even in natural conditions; and
- provided little management flexibility for many activities.

The strategy was implemented in 1995 and was intended to be interim direction that would be in place for not more than 18 months.

Scale of Analysis

Our scale of analysis is forestwide.

Conditions & Trends

Aquatic Species

Fishes

There are numerous fishes that occur on the forest. As part of the forest plan revision effort, the Salmon-Challis National Forest completed a comprehensive review of these fish species. The Salmon-Challis is home to 35 fish species, including:

- four fishes listed under the Endangered Species Act,
- two fishes listed as sensitive by the Forest Service, and
- four species designated as Species of Greatest Conservation Need by the Idaho Department of Fish and Game.

Additionally, 16 of the fishes found on the Salmon-Challis are designated by the Idaho Department of Fish and Game as game fish.

Amphibians

There are several species of amphibian that occur on the forest. These include Columbia spotted frog (Idaho Department of Fish and Game 2018a), Rocky Mountain tailed frog(Idaho Department of Fish and Game 2018d), Western toad (Idaho Department of Fish and Game 2018i), Sierran treefrog (Idaho Department of Fish and Game 2018e), and Long-toed Salamander (Idaho Department of Fish and Game 2018c). While amphibian data, including trend data for Columbia spotted frogs, have been collected from parts of the Salmon-Challis, a comprehensive review and summary of this data has not been completed. Such a review would help managers more effectively manage amphibians on the Salmon-Challis.

Invertebrates

There are a numerous aquatic invertebrates that occur on the Salmon-Challis. Sampling has occurred for many aquatic invertebrates, such as arthropods and annelids, at hundreds of locations. This includes sampling completed by the Idaho Department of Environmental Quality at hundreds of stream sites (Idaho Department of Environmental Quality 2017, 2018), sampling completed by the PACFISH/INFISH Biological Opinion Monitoring Program at over one hundred stream sites (U.S. Department of Agriculture, Forest Service 2018a), and sampling completed by the Forest Service and University of Idaho at numerous high elevation lakes and streams (Rabe 2001), While data has been collected for many types of invertebrates from many parts of the Salmon-Challis, a comprehensive review and summary of this data has not been completed. Such a review would help managers more effectively manage invertebrates.

While considerable data are available for many aquatic invertebrates on the Salmon-Challis, this is not the case with mollusks. There are several mollusks that have been observed on the forest, including western pearlshell (Idaho Department of Fish and Game 2018g; Vannote and Minshall 1982), western ridged mussel (Idaho Department of Fish and Game 2018h; Vannote and Minshall 1982), tadpole physa (California Academy of Sciences 2018; Idaho Department of Fish and Game 2018f), Green River pebblesnail (Idaho Department of Fish and Game 2018b), and clams (Rabe 2001).

While several species of mollusks have been observed on the Salmon-Challis, there is surprisingly very little mollusk data that has been collected here. Additionally, a comprehensive review and summary of the limited data that is available has not been completed. Additional data and a comprehensive review and summary of all available data would help managers more effectively manage mollusks.

Aquatic Habitat

Habitat is critical to the persistence of organisms, and there are three habitat characteristics that are essential to maintaining the long-term viability of aquatic organisms. These are habitat quality, habitat quantity, and habitat connectivity. Given that these three habitat attributes are essential to successful aquatic organism management, they are being designated as the ecosystem characteristics necessary for managing aquatic organism habitat and each of them should be addressed in detail in forest plan revision.

Habitat Quality

Habitat quality is the condition of the habitat. Habitat quality is critical to aquatic organisms because it affects the number of organisms that a specific habitat can support. Aquatic habitat quality can be evaluated using features such as riparian seral status, bank stability, woody recruitment, residual pool depth, sediment, large woody debris, stream temperature, chemical characteristics, or the presence of certain aquatic organisms. Aquatic habitat quality has been evaluated on many parts of the Salmon-Challis using a wide variety of protocols. Some examples of these efforts are:

- the PACFISH/INFISH Biological Opinion Monitoring Program, which has collected physical habitat, stream temperature, riparian vegetation, and macroinvertebrate data from many locations on the Forest (U.S. Department of Agriculture, Forest Service 2018a);
- the Idaho Department of Environmental Quality's Beneficial Use Reconnaissance Program, which has collected physical habitat, riparian vegetation, and macroinvertebrate data from numerous locations on the Forest (Idaho Department of Environmental Quality 2018);
- the Salmon-Challis National Forest watershed program, which has collected sediment and bank stability data from many locations;
- the Salmon-Challis National Forest fish program, which has collected stream temperature data and physical habitat data from numerous locations;
- the Salmon-Challis National Forest range program, which has collected physical habitat and riparian data from many locations on the Salmon-Challis; and
- the Columbia Habitat Monitoring Program, which has collected physical habitat data from some locations on the Salmon-Challis.

While the status of aquatic habitat quality has been evaluated on parts of the Salmon-Challis, a single comprehensive evaluation of aquatic habitat quality has not been completed. We should consider completing such an evaluation to help guide the management process.

Many human activities can alter aquatic habitat quality and affect the long-term viability of aquatic organisms. As part of this assessment, staff conducted a cursory review of the status of aquatic habitat quality across the forest. This qualitative evaluation, which was based on available data and personal observations made across the Salmon-Challis, compared existing habitat quality to what might be expected under natural conditions, or conditions as they would exist in the absence of the influence of European man. This evaluation found that the condition of aquatic habitat quality varied considerably across the Salmon-Challis.

In some areas, aquatic habitat quality appeared to be at or near natural conditions. This included aquatic habitat in most of the designated wilderness, portions of roadless areas, and some other parts of the Salmon-Challis, where the watershed processes that create and maintain quality habitat have been allowed to function in a natural manner.

Conversely, in other areas, habitat quality was significantly different from natural conditions due to impacts from human activities, as seen in Figure 94. Some of the most significant human activities that have affected aquatic habitat quality on the Salmon-Challis are livestock grazing, roads, trails, diversions, mining, timber harvest, a loss of beaver, and a lack of wildfire. It is also likely that changing climate has begun to impact aquatic habitat quality and will likely continue to do so in the future.

Figure 93. Some of the man-made aquatic habitats on the Salmon-Challis National Forest. From top left: Mosquito Flat Reservoir, a dredge pond in the Pond Series 1 complex in the Yankee Fork watershed, a cow pond in the Pass Creek watershed, a cow pond in the Antelope Creek watershed, a canal originating from a diversion in the Morgan Creek watershed, and a canal originating from a diversion in the Big Lost River watershed.

Figure 94. Examples of aquatic habitat on the Salmon-Challis National Forest where habitat quality was determined to be significantly less than natural conditions due to human activities: top left, a stream segment where livestock grazing has impacted riparian vegetation, habitat complexity, and width-to-depth ratio; top right, a stream segment where motorized vehicles have impacted riparian vegetation, width-to-depth ratio, and sediment; bottom left, a stream segment where a road has impacted riparian vegetation, habitat complexity, and floodplain quantity; and, bottom right, a stream segment where dredge mining has impacted riparian vegetation, habitat complexity, and floodplain quantity.

Note: Bottom right photo courtesy of the Bureau of Reclamation

Habitat Quantity

Habitat quantity is the amount of habitat. Habitat quantity is critical to aquatic organisms because it influences the number of aquatic organisms that can be supported across the landscape. Aquatic habitat quantity can be evaluated using features such as length of stream; volume of a water body; number of springs; or surface area of streams, lakes, wetlands, and reservoirs.

Some data on aquatic habitat quantity are available for the Salmon-Challis. This includes data such as miles of perennial stream and acres of lakes. However, a single comprehensive evaluation of aquatic habitat quantity has not been completed, and there has been no attempts to describe changes in habitat quantity. We should consider completing such an evaluation to help guide the management process.

Several human activities can alter aquatic habitat quantity and affect the long-term viability of aquatic organisms. As part of this assessment, staff conducted a simple review of the status of aquatic habitat quantity across the Salmon-Challis. This qualitative evaluation, which was based on personal observations made across the forest, compared existing habitat quantity to what might be expected under natural conditions. This evaluation found that there has been a loss of aquatic habitat in some areas.

Some of the most significant human activities that have affected aquatic habitat quantity on the Salmon-Challis are:

- diversions, which reduce streamflow and, in some cases, completely dewater streams;
- dams, which inundate stream habitat and reduce stream flows; and
- roads, which can encroach onto floodplains and into stream channels.

It is also possible that a lack of wildfire caused by fire suppression, which has resulted in an expansion of conifers and subsequent increase in water use by vegetation, has also led to a reduction in the amount of aquatic habitat. The extent to which conifer encroachment has impacted aquatic habitat quantity is not known. It is also likely that changing climate has begun to impact habitat quantity on the Salmon-Challis and will likely continue to do so in the future.

Habitat Connectivity

Habitat connectivity is the extent that habitats are connected to each other. Habitat connectivity is critical to aquatic organisms because it:

- allows migratory aquatic organisms to complete their life history cycle;
- enables populations that have disappeared to be naturally reestablished; and
- provides for the movement of water, energy, and nutrients that are essential to aquatic organisms.

Aquatic habitat connectivity can be evaluated using features such as length of connected stream, length of disconnected stream, or number of barriers. Aquatic habitat connectivity has been evaluated on some parts of the forest. This work has generally involved culvert and diversion assessments that have been conducted by the Salmon-Challis National Forest. However, a single comprehensive evaluation of aquatic habitat connectivity has not been completed for the entire forest. The Salmon-Challis should consider completing such an evaluation to help guide the management process.

Many human activities can alter aquatic habitat connectivity and affect the long-term viability of aquatic organisms. This can include both actions that physically interfere with passage or actions that degrade habitat conditions to the point that passage is restricted. As part of this assessment, staff conducted a simple review of the status of aquatic habitat connectivity across the Salmon-Challis. This qualitative evaluation, which was based on available data and personal observations made across the Salmon-Challis, compared existing habitat connectivity to what might be expected under natural conditions. This evaluation found that the condition of aquatic habitat connectivity varied considerably across the forest.

In some areas, aquatic habitat quality appeared to be at or near natural conditions. This included aquatic habitat in most of the designated wilderness, portions of roadless areas, and some other parts of the Salmon-Challis. Conversely, in other areas, habitat connectivity was significantly different from natural conditions due to impacts from human activities.

Some of the most significant human activities that have affected aquatic habitat connectivity on the Salmon-Challis are culverts, dams, and diversions. It is also possible that increases in stream temperature associated with human activities has led to degraded habitat conditions that restrict the movement of aquatic organisms. However, the extent to which this has occurred remains unknown. It is also likely that changing climate has begun to impact habitat connectivity on the Salmon-Challis and will likely continue to do so in the future.

Additionally, impacts to aquatic habitat connectivity downstream of the Salmon-Challis have also impacted aquatic organisms on the forest. For example, many of the streams on national forest lands in the Pahsimeroi River basin that contain fish have reduced connectivity downstream of the forest boundary, which prevents fish from the Pahsimeroi River from accessing streams on the national forest. There are also numerous factors impacting the ability of anadromous fish to move between the Salmon-Challis and the Pacific Ocean and these factors ultimately impact anadromous fish populations on the Salmon-Challis National Forest.

Direct Mortality of Aquatic Organisms

While management efforts generally focus on habitat management, there are some management actions that can cause direct mortality of aquatic organisms. These include actions such as:

- issuing permits for diversions, which can trap fish in canals where the fish then die;
- permitting livestock to wade in streams, where they may crush and kill fish eggs,
- motorized vehicles moving through streams fords, where they may crush and kill fish eggs and fish; and
- boats striking redds, potentially crushing and killing fish eggs.

Forest managers should also ensure that mortality associated with management actions does not affect the long-term viability of aquatic organisms. This does not mean that management actions could not cause the mortality of individual organisms but that the cumulative results of that mortality would not compromise the long-term viability of the species.

Summary & Conclusions

The development and implementation of effective management direction helps ensure the attainment of the aquatic organism management goal. Such direction protects and, where necessary, restores habitat quality, quantity, and connectivity and ensures that direct mortality associated with management actions does not affect the long-term viability of aquatic organisms. The forest plan is one important source of this management direction.

A critical element of this assessment is identifying aquatic resource management direction that should be included in the forest plan revision. In developing recommended forest plan management direction, forest staff considered the strengths and weaknesses of existing management direction, solicited input from other aquatic management professionals inside and outside of the Forest Service, reviewed data, and called upon their professional training and experience on the Salmon-Challis.

Accordingly, forest staff recommend future direction for the management of aquatic organisms should:

- ensure that there is sufficient habitat quality, quantity, and connectivity to provide for the long-term viability of native aquatic organisms and socially-important introduced organisms;
- emphasize, support, and focus on the role of natural processes in developing and maintaining aquatic habitat quality, habitat quantity, and connectivity;
- encompass all aquatic habitat including rivers, streams, lakes, wetlands, fens, bogs, and marshes, springs, man-made reservoirs, ponds, and ditches;
- define desired future conditions for aquatic habitat quality, quantity, and connectivity;
- regulate the impact of management actions that may prevent achieving desired future conditions;
- provide broad direction on implementation monitoring that will determine if management actions are implemented correctly;
- provide broad direction on effectiveness monitoring that will evaluate the status of desired future conditions;
- provide adaptive management mechanisms that evaluate implementation and effectiveness monitoring data and allow for revision of management accordingly;
- provide a process for identifying, prioritizing, and restoring areas that are not meeting or moving towards desired future conditions; and
- allow advancements in science, changes in monitoring procedures, and new data that become available during the life of the strategy to easily be incorporated.

Desired future conditions should be consistent with what is achievable on the landscape and the natural range of variability across space and time. For example, desired conditions for habitat quality, quantity, and connectivity might be more rigorous in areas occupied by species listed under the Endangered Species Act. The desired conditions should also allow for the use human-made barriers, where appropriate, to control the movement of introduced or invasive species.

The strategy should also include direction to ensure that management actions that cause the direct mortality of aquatic organisms do not compromise the long-term viability of native aquatic organisms and socially important introduced aquatic organisms. This does not mean that management actions could not result in mortality of individual organisms but that the cumulative impact of that mortality would not compromise the long-term viability of any species.

These management actions include, but are not limited to:

- livestock grazing;
- floating, wading, and other water-based recreational activities;
- fording of stream by motorized vehicles, stock, and foot traffic;
- operating dams and diversions;
- removing water from water bodies for fire suppression, road maintenance, and other activities;
- using of herbicides, pesticides, fire retardant, and other chemicals
- operating hatcheries on the Salmon-Challis; and
- monitoring

Additional direction in the comprehensive management strategy should:

- require aggressive prevention, monitoring, and control of the spread of aquatic invasive species;
- encourage development and maintenance of a wide diversity of fishing opportunities across the Salmon-Challis;
- encourage forest staff to share information about aquatic resources with the public and other resource management professionals;
- encourage forest staff to cooperate with partners on aquatic organisms management efforts; and
- include measures that would simplify the process for forest partners to carry out management efforts related to aquatic organisms, such as monitoring and habitat restoration on National Forest System lands.

Priority for fishing opportunities would be focused on native fishes but would also include socially-important introduced fishes, where appropriate. Developing and maintaining fishing access opportunities should be consistent with the requirements of the Americans with Disabilities Act. It should also include some fishing opportunities that can be accessed by each of the following methods:

- Roads
- Motorized trails
- Non-motorized trails
- Cross-country routes
- Floating

The Salmon-Challis should closely coordinate this effort with the Idaho Department of Fish and Game.

AT-RISK SPECIES

At-risk species include threatened, endangered, candidate, and proposed species under the Endangered Species Act and U.S. Forest Service species of conservation concern. These are all species for which special consideration in future management direction is necessary.

Specifically, the 2012 Planning Rule states that forest plans will provide, within the control and capability of the plan area, the ecological conditions necessary to:

- contribute to the recovery of federally listed threatened and endangered species,
- conserve proposed and candidate species, and
- maintain a viable population of each species of conservation concern.

A viable population is defined as "a population of a species that continues to persist over the long term with sufficient distribution to be resilient and adaptable to stressors and likely future environments" (2012).

Information Sources & Needs

Information sources for this section are varied and lengthy. They generally include, but are not limited to:

- geographic information system datasets compiled by the Salmon-Challis, LANDFIRE, and the Idaho Department of Fish and Game;
- species risk assessments conducted by organizations, such as NatureServe and the Xerces Society;
- peer-reviewed scientific literature; and
- gray literature, such as the Idaho State Wildlife Action Plan and species management plans.

Our picture of at-risk species would be more complete if we had more complete data, including:

- Salmon-Challis distribution surveys for little known species that existing conservation assessments indicate are potentially at risk, including several invertebrate species and species in hard to reach places;
- information on the location and quality of important landscape linkages for broad ranging and dispersing at-risk species;
- spatial habitat models for key at-risk species;
- more complete maps that better identify ecologically important, but low abundance habitat, such as riparian zones, aspen, wetlands, and meadows; and
- more complete information on species life histories and demographics; and
- the mechanisms by which threats act on populations.

Although standard abundance and trends surveys exist for some birds, these are intended for regional-scale estimates or require long time periods of collection to develop smaller scale estimates. Increasing survey effort of these existing programs could yield more robust estimates for the Salmon-Challis, although whether this could be done within budgets is of concern.

Existing Plan Direction

Most at-risk species considered during development of the existing forest plans in the 1980s are different than those that will be considered during plan revision. For example, the Canada lynx was not listed as threatened in Idaho under the Endangered Species Act in the 1980s but is now.

Several terrestrial animal species that were listed in the 1980s have since been delisted, including the bald eagle, American peregrine falcon, cougar, and gray wolf. Delisting does not necessarily indicate conservation efforts are not needed for the species. The Endangered Species Act requires monitoring of species populations 5 years post delisting. However, all former listed species on the Salmon-Challis were delisted more than 5 years ago. Because this critical time period has passed and these species have remained recovered, there is less concern. Still, critical habitat features may be under threat without habitat management direction. Further review is needed.

The current Challis Forest Plan includes direction for regional forester’s sensitive species, but the Salmon Forest Plan does not. Regional forester’s sensitive species are being phased out by the 2012 Planning Rule and are being replaced by species of conservation concern. These will be specific to the Salmon-Challis and used in developing the revised forest plan direction. This direction will adopt modern approaches to species conservation in the 2012 Planning Rule.

Approaches to species conservation in the 1980s tended to be species centric, and the concept of minimum viable populations was coming into practice. A minimum viable population is an estimated threshold population size below which extinction risks are deemed unacceptably high and for which a population is resilient to changes in its environment. This concept appears in the Salmon Forest Plan direction for wildlife. However, today it is recognized that this concept in practice has limited utility because estimating a minimum viable population require onerous amounts of data that, when analyzed, still provides highly imprecise and inaccurate results (Flather and others 2011).

Modern conservation has turned to landscape and ecosystem approaches along with considering the mechanisms behind population declines (Flather and others 2011). The revised forest plan will use complimentary ecosystems-based and species-specific components, where necessary, to contribute to species conservation within the Salmon-Challis.

The Northern Rockies Lynx Management Direction Record of Decision (U.S. Department of Agriculture, Forest Service 2007a) provides forest plan direction for managing Canada lynx habitat on national forests in Montana, and parts of Wyoming, Utah, and Idaho. Because the Salmon-Challis is unoccupied by Canada lynx (U.S. Department of Interior 2005) employing the Canada lynx direction is optional. The Salmon-Challis currently considers impacts to Canada lynx for projects planned in officially-designated Canada lynx analysis units. The Canada lynx direction should be considered during forest plan revision.

The Salmon and Challis forest plans currently have no direction regarding conservation of North American wolverines. Forest Service policy requires forest supervisors to ensure that legal and biological requirements for the conservation of endangered, threatened and proposed species are met in forest planning. In addition, forests must establish, through the forest planning process, objectives for habitat management or recovery of populations in cooperation with state and Federal partners.

The current forest plans, along with 10 others in Idaho, Nevada, Utah, and southwestern Montana, were amended in 2015 to add conservation strategies for the greater sage-grouse (U.S. Department of Agriculture, Forest Service 2015a). This was part of a larger effort between the Bureau of Land Management and Forest Service. They were responding to the U.S. Fish and Wildlife Service's decision that listing of the species under the Endangered Species Act was warranted due to loss of habitat and adequate regulatory mechanisms, but was precluded by other priorities (U.S. Department of Interior 2010).

The Intermountain Region is currently considering amending the greater sage-grouse conservation strategies. The current or amended strategy, whichever is in effect for the Salmon-Challis, will be considered as part of the forest plan revision. The greater sage-grouse is also proposed to be a potential species of conservation concern for the Salmon-Challis.

Scale of Analysis

Our scale of analysis is forestwide.

Conditions & Trends

Threatened and Endangered Species

The U.S. Fish and Wildlife Service and National Marine Fisheries Service are responsible for administering the Endangered Species Act. These agencies determine which species of animals and plants require Federal protection.

The following species are threatened, candidate, or proposed species known to occur on the Salmon-Challis National Forest.

Whitebark pine

Whitebark pine occupies approximately 325,000 acres within the Salmon-Challis National Forest (LANDFIRE 2014) on high-elevation sites, which are characterized by rocky, poorly developed soils, cold temperatures, and snowy, windswept exposures.

Whitebark pine is considered an important species for promoting forest biodiversity and stability. It is often the first conifer to colonize high-elevation sites following ecosystem disturbances, such as wildfire, and the species facilitates establishment of other conifers and vegetation by improving harsh environmental conditions (Perkins 2016).

The primary means of managing for whitebark pine success is reducing the number of competing conifers adjacent to individual trees. Most of this work coincides with timber harvest activities nearby.

Current threats to the overall health of whitebark pine forests on the Salmon-Challis include:

- white pine blister rust disease;
- mountain pine beetle outbreaks;
- altered frequency and intensity of fire; and
- effects from changes in climate.

These combined threats have led to the recent listing of whitebark pine as a Candidate Species under the Endangered Species Act across its range (Federal Register 2011).

Mountain pine beetle, the most destructive bark beetle on the Salmon-Challis, has caused significant mortality in whitebark pine forests since 1999. During the height of the last outbreak, beetle populations grew exponentially in a matter of a few years from barely noticeable to landscape-level mortality. The mortality level, which reached up to 90 percent in some areas (Fins and Hoppus 2013; K. Gibson and others 2008; Schotzko and others 2013), was higher than expected in whitebark pine (K. Gibson and others 2008; Halofsky 2018; Kegley and others 2011; Lazarus and McGill 2014). This loss is a resource concern because the natural return of mature whitebark pine-dominated communities may require hundreds of years. Approximately 20 percent of regenerated whitebark pine on the forest is infected by white pine blister rust, further reducing the likelihood that new trees will reach maturity.

Whitebark pine is particularly vulnerable to a warmer climate because it is already stressed. If wildfires increase in frequency, severity and size as predicted then crown fires may quickly eliminate mature trees from the landscape (Halofsky 2018).

Yellow-billed Cuckoo

The yellow-billed cuckoo is fairly large, long, and slim bird with warm brown upper parts and white underparts, long banded tail and a long slender downward-curved yellow bill. This species winters in the Neotropics and breeds from southern Canada south to the Greater Antilles and Mexico. The western distinct population segment was listed as threatened under the Endangered Species Act in 2014.

In Idaho, breeding yellow-billed cuckoo nest almost exclusively in low to moderate elevation riparian woodland at least 100 acres in size and dominated by native broadleaf trees and shrubs. The amount of cottonwood-willow dominated forest and the width of riparian habitat is a good predictor of yellow-billed cuckoo breeding distribution at the landscape level (Idaho Department of Fish and Game 2017b).

Biologists estimate that more than 90 percent of the yellow-billed cuckoo's riparian habitat in the West has been lost or degraded as a result of conversion to agriculture, dams and river flow management, bank protection, overgrazing, and exotic plants, such as tamarisk (U.S. Department of Interior 2014).

The South Fork and main-stem of the Snake River comprise stronghold habitat this threatened bird (Reynolds and Hinckley 2005). But the species is extremely rare there.

Surveys in Eastern Idaho from 2010-2012 and 2015 documented 18 observations at 10 sites during the breeding season (Idaho Department of Fish and Game 2017a). In addition, there is no population trend data for Idaho since the populations are too low to make a valid statistical estimate (Idaho Department of Fish and Game 2005b).

There are no records of yellow-billed cuckoo on the Salmon-Challis and it is likely due to limited habitat as large cottonwood gallery forests are rare on the forest. Deciduous shrublands and woodlands, which include cottonwoods, cover less than a half percent of the Salmon-Challis. The U.S. Fish and Wildlife Service has not proposed critical habitat for the yellow-billed cuckoo on the Salmon-Challis (U.S. Department of Interior 2014). Large blocks of cottonwood forest are more prevalent on Bureau of Land Management and private lands in the valley bottoms adjacent to the forest. Here there are three unverified records for yellow-billed cuckoo; one near Salmon, ID and the others near Challis, ID (Idaho Department of Fish and Game 2017a).

The valley bottom land type association likely contains the best habitat for the yellow-billed cuckoo on the Salmon-Challis. This land type association has experienced moderate loss of riparian habitat and moderate alteration of riparian vegetation condition and composition (U.S. Department of Agriculture, Forest Service 2017c).

Canada Lynx

The Canada lynx, hereafter, lynx, is a medium-sized cat that is strongly associated with its primary prey, the snowshoe hare. Both are highly adapted to survive in moist conifer forests in cold, snowy climates (Koehler and Aubry 1994). In Idaho, lynx also prey upon white and black-tailed jackrabbits, beaver, and porcupines (Lewis and Wenger 1998) as well as red squirrels, small mammals, and grouse (Koehler and Aubry 1994).

The contiguous United States lynx population was listed as threatened under the Endangered Species Act in 2000. The primary factor that caused the listing was inadequate guidance for the conservation of lynx and snowshoe hare habitat in plans for federally managed lands (U.S. Department of Interior, Fish and Wildlife Service 2018a).

In response, the U.S. Forest Service developed lynx conservation strategies for national forests in Montana, and parts of Wyoming, Utah, and Idaho, including the Salmon and Challis National Forests (U.S. Department of Agriculture, Forest Service 2007a). This has greatly reduced the risk of future population scale habitat deterioration on these lands and the U.S. Fish and Wildlife Service concluded in the most recent 5-year review that the lynx population in the contiguous United States no longer meets the definition of a threatened species (U.S. Department of Interior, Fish and Wildlife Service 2017a). Still, the species has not been delisted.

Maintaining and restoring landscape connectivity between lynx populations and habitats in Canada and the contiguous United States is the greatest conservation need for this species (U.S. Department of Interior, Fish and Wildlife Service 2018a). High road traffic bisecting suitable lynx habitat may hinder movements and can result in high mortalities, such as in the southern Rockies. Land uses such as timber harvest, recreation, and their related activities can affect lynx denning and foraging habitat and connectivity. Natural disturbances, such as wildfires and outbreaks of insects and disease, can as well.

Snowmobile and ski trails may reduce the lynx's competitive edge with other predators like coyote, bobcat, and mountain lion. For example, ecologists hypothesize that lynx and coyotes naturally occupy separate snow niches. The large feet of the lynx are adapted to travel in deep snow and so they occur in higher elevation deep snow environments. In contrast, coyote feet easily punch through dry and light snow and so they primarily occur at lower elevations with more supportive snow. Snow compaction created by winter recreation may facilitate competitors, such as coyotes, access to lynx habitat that would otherwise be unavailable. In the intermountain west, coyotes have been documented doing just that (Bunnell and others 2006; Gese and others 2013).

However, Montana Kolbe and others (2007) found contrary evidence. Gese and others (2013) hypothesize this was due to differing snow conditions between the studies as verified by snow telemetry data. Still, Dowd and Gese (2012) found very little dietary overlap between lynx and coyotes in winter. They caution that coyotes are known to switch their prey and so future competition for resources cannot be ruled out. In addition, studies are needed to determine if lynx avoid coyotes and compete with them spatially or temporally.

The U.S. Fish and Wildlife Service categorizes lynx habitat in the lower 48 states as core, secondary or peripheral, based on historic and current occupation. The Salmon-Challis National Forest is considered unoccupied, secondary lynx habitat based on the Forest having the following:

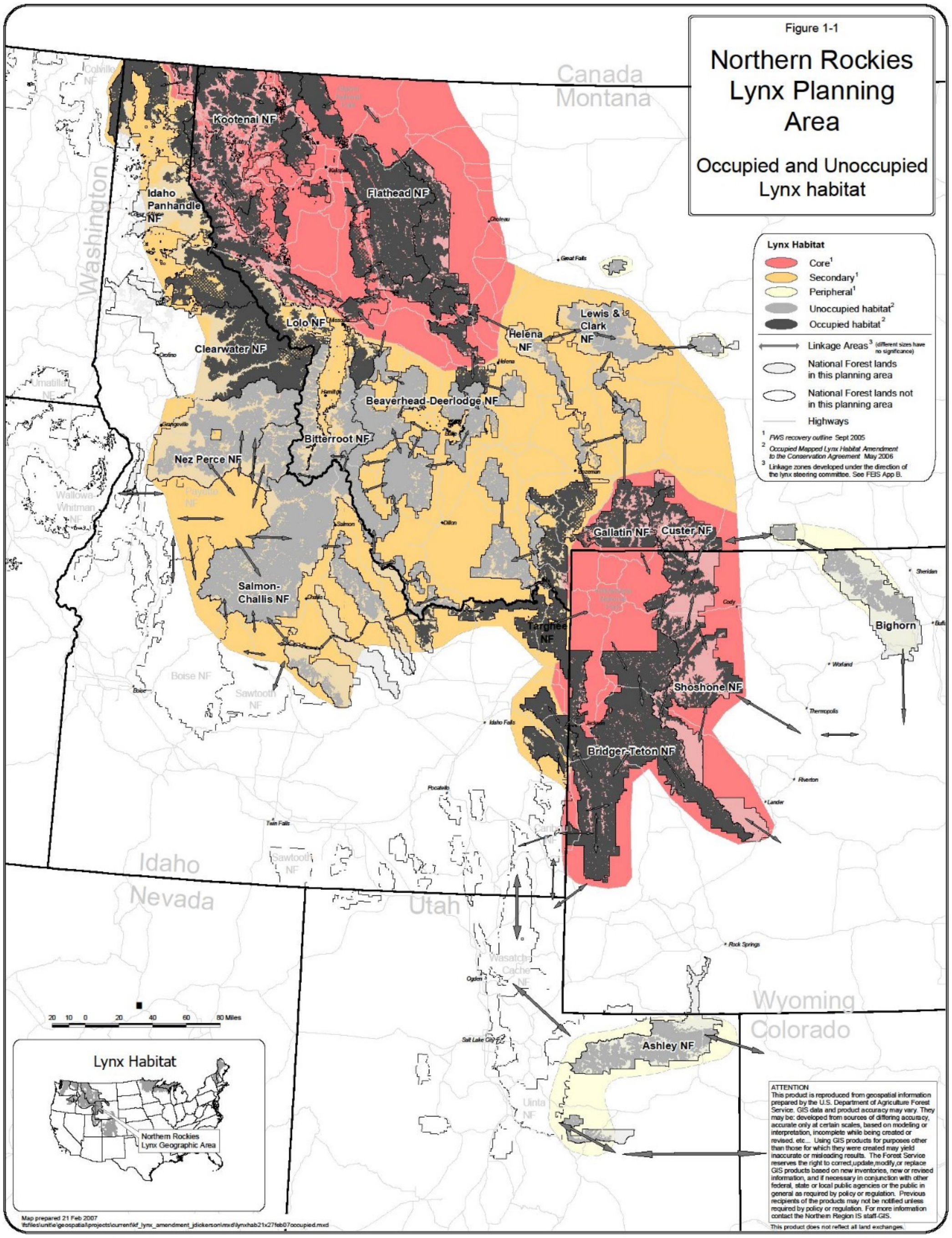
- a lack of verified non-transient observations within the last decade;
- few and more sporadic current and historical records of lynx, resulting in low historical abundance; and
- no evidence of reproduction (U.S. Department of Interior 2005).

Although there are lynx occurrence records for all Salmon-Challis ranger districts, the majority are on the North Zone of the Salmon-Challis where conditions are most favorable for the species. Observations go back to 1916 and the most recent verified and documented siting was in January 2012, when the Idaho Department of Fish and Game confirmed a wild male lynx was caught in a bobcat trap on the Salmon-Cobalt Ranger District. It is possible the individual was responding to low prey abundance to the north. There continues to be no evidence of a breeding population on the Salmon-Challis.

The recovery objective for unoccupied, secondary areas for lynx is to ensure that habitat remains available for occupancy and sufficient habitat is available to accommodate the long-term persistence of immigration and emigration between core areas and adjacent population in Canada or secondary areas in the United States (U.S. Department of Interior 2005).

The role of secondary habitat, such as that on the Salmon-Challis, in lynx recovery is unclear. Lynx populations may not be sustained by secondary habitat or it may be that populations in secondary habitat are more susceptible to ill-effects of management actions. However, secondary habitat may enable successful dispersal of lynx between populations or sub-populations (U.S. Department of Interior 2005). Core areas of occupied habitat lay to the southeast and northeast of the Salmon-Challis in Idaho, Montana, and Wyoming, as seen in Figure 95. Managing forest stands for snowshoe hare in secondary habitat may be beneficial to lynx.

Figure 95. Occupied and unoccupied lynx habitat as mapped for the Northern Rockies Lynx Management Decision Record of Decision

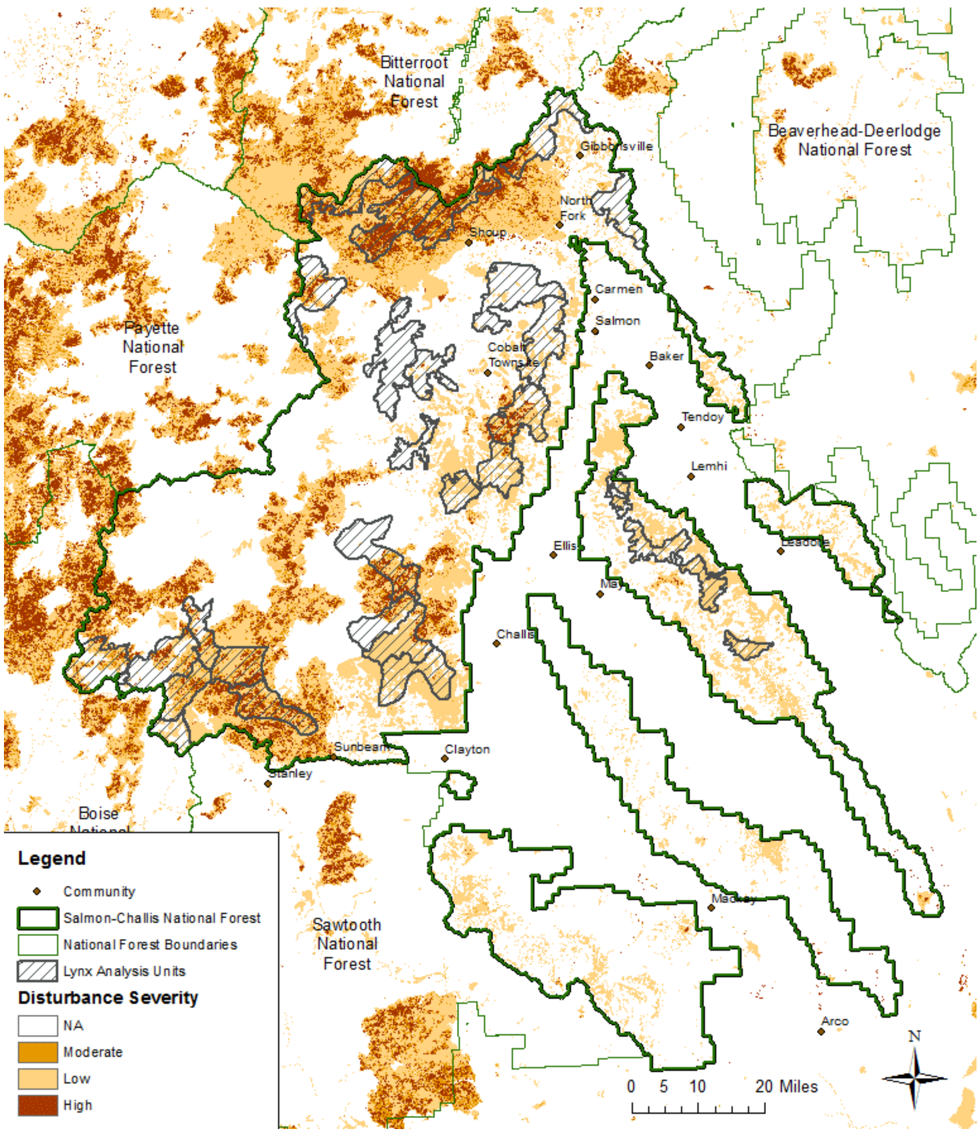


Source: (U.S. Department of Agriculture, Forest Service 2007a)

Potential lynx habitat has been mapped on the Salmon-Challis based on potential natural vegetation, precipitation, topography, snowmobile recreation areas, and lynx observations. In addition, the Salmon-Challis has identified 28 lynx analysis areas, which are mapped in Figure 96. Disturbance by severity between 1999 and 2014 and Lynx Analysis Units on the Salmon-Challis.. These areas are the size of a female lynx home range.

Changes to forests within the lynx analysis areas on the Salmon-Challis have been due to wildland fire, prescribed fire, insects, and disease. In addition, some timber harvest has occurred, but fires have largely burned after harvest was complete. The unprecedentedly large and severe Mustang and Halstead Fires of 2012 where each hundreds of thousands of acres and burned through whole lynx analysis areas on the North Fork, Challis Yankee Fork and Middle Fork Ranger Districts. Small scale stand killing fires can be beneficial to lynx by creating stands of seedlings and saplings that are good quality snowshoe hare habitat. But expansive stand replacing fires are detrimental because they remove the forest cover needed by both lynx and their prey. However, the Salmon-Challis is a fire adapted landscape and habitat for the lynx may have been limited there historically. Figure 96 provides a map of disturbance severity on the Salmon-Challis in relation to the lynx analysis units.

Figure 96. Disturbance by severity between 1999 and 2014 and Lynx Analysis Units on the Salmon-Challis.



Source: (LANDFIRE 2014)

Insects and disease kill has also been extensive in lynx analysis units on the Leadore, Challis Yankee Fork, and the Salmon-Cobalt Ranger District. Low severity insect kills creates quality denning habitat as trees eventually fall to the ground, but live tree cover remains. Extensive stand replacing infestation can be detrimental because they remove the forest cover needed for denning and foraging and are not as suitable as travel routes.

Determining the actual changes in the amount of quality lynx habitat due to these disturbance will require complex analyses that are beyond the scope of this assessment. Although lynx foraging habitat has been created by small-scale stand replacing fires and insect and disease occurrences, it is likely that, the scale of stand-killing disturbances on the Salmon-Challis have reduced habitat connectivity for the lynx. In addition, as these forests transition into the stem-exclusion phase of forest succession, the habitat for snowshoe hare will be reduced. At this phase, these forests no longer provide the cover snowshoe hair require.

Grizzly Bear

With the westward expansion of pioneers and settlers in the 1800s, grizzly bear populations, their numbers, and range drastically declined. In 1975, the U.S. Fish and Wildlife Service listed the grizzly bear as a threatened species in the lower 48 states.

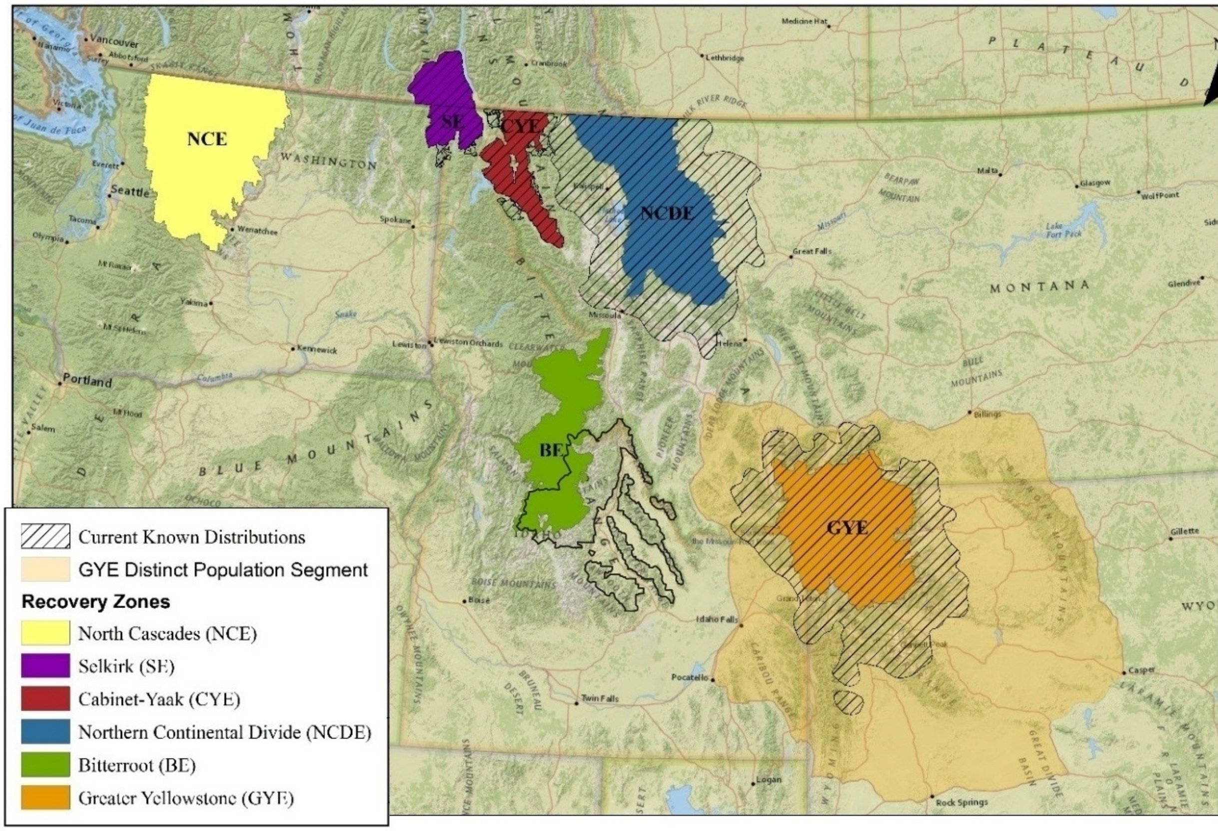
Grizzlies remain today in the five ecosystems mapped in Figure 97 that support 1,400-1,700 bears. The Greater Yellowstone distinct population segment of grizzlies, was delisted in June 2017 due to recovery.

Grizzlies were eliminated from the Bitterroot Ecosystem Recovery Zone, which includes the Selway-Bitterroot and the Frank Church River of No Return wildernesses in the 1940s. There had been no verified sightings of grizzlies in this recover zone for over 60 years until a black bear hunter mistakenly killed a grizzly in 2007 (U.S. Department of Interior, Fish and Wildlife Service 2017b).

The Bitterroot Ecosystem Recovery Zone is designated a nonessential experimental population by the U.S. Fish and Wildlife Service. Nonessential experimental populations are those for which the best available information indicates the population is not essential for the continued existence of the species, but have been reintroduced back into their historic range. In this case, the reintroduction has not occurred and the State of Idaho Yellowstone Grizzly Bear Management Plan (Idaho 2002) stipulates relocated bears will only be placed in the Yellowstone Primary Conservation Area, in areas where grizzly already occur, or in appropriate locations outside the State.

The grizzly exists in low densities across the Continental Divide from the Salmon-Challis. This remote and undeveloped area, along with the relatively roadless Centennial Mountains, provides a potential link between the Yellowstone population and the Bitterroot Ecosystem. Grizzly from the North Continental Divide recovery zone have also expanded around Missoula.

Figure 97. Grizzly Bear Recovery Zones in Relation to the Salmon-Challis



Over time, connection of these three ecosystem populations is possible if landscapes remain habitable for dispersal. Research has shown that bears avoid areas with high open road densities (Lloyd and Fleck 1977; Schallenberger and Jonkel 1980). Managing the landscape to reduce grizzly bear mortality risk requires that motorized roads and trails be considered when evaluating and maintaining secure habitat. State grizzly bear management plans for Idaho, Montana, and Wyoming recognize this and encourage land management agencies to maintain or improve habitats important to grizzly bears outside the Greater Yellowstone Ecosystem. For example, the Montana and Wyoming plans recommend limiting average road densities to one mile per square mile or less in these areas (Dood and others 2006; Wyoming Game and Fish Department 2016). The Idaho State plan focuses management of motorized access outside the Greater Yellowstone Primary Conservation Area where road densities are already one mile per square mile or less (State of Idaho 2002).

The Terrestrial Ecosystems section includes results of the U.S. Forest Service National Terrestrial Condition Assessment, which modeled habitat quality for wildlife based on road density effects to wildlife, including grizzlies, as reported in the scientific literature. The majority of the Salmon-Challis has very low impacts to wildlife habitat due to road density. Areas of the North Fork Ranger District due west of potential source populations in the Big Hole area of Montana have moderate to high impacts due to roads with road densities ranging from 1 to 2.6 miles per square mile.

North American Wolverine

The North American wolverine is a bear-like mustelid that requires near-arctic conditions. The lower-48 population of the wolverine is proposed to be listed as threatened under the Endangered Species Act. The primary threats to this population are habitat and range loss due to changing climate (U.S. Department of Interior, Fish and Wildlife Service 2013).

The current range of the lower-48 population of wolverine is restricted to high-elevation areas of the west that maintain deep, persistent, and reliable snow cover well into spring (Aubry and others 2007; JP Copeland and others 2010). Suitable habitat tends to occur as high-elevation sky islands surrounded by intervening valleys of unsuitable habitat (U.S. Department of Interior, Fish and Wildlife Service 2013). This fragmented distribution of habitat makes these wolverine populations very vulnerable to local extinction (Schwartz and others 2009).Population strongholds are restricted to the northern Cascades in Washington and northern Rockies of Idaho, Wyoming, and Washington.

The wolverine is a year-round resident of the Salmon-Challis. It occurs on all ranger districts, but population densities are low, which is natural for them. Four western states Idaho, Montana, Wyoming, and Washington are attempting to get a handle on just how many wolverines they have and where. Known as the Western States Wolverine Conservation Program, this partnership between state and federal agencies, tribes, and universities set out 185 bait and scent stations during the winters of 2015-2016 and 2016-2017.

Fifty-eight stations were placed in Idaho. Each station was equipped with cameras and hair traps. Photos and DNA in hair collected will be used to identify individuals. In addition, results of the surveys should provide information about core habitats and areas important to conserve to allow movement of wolverines between core areas (Evans Mack and Long 2016). Not all the results are available yet, but, so far, wolverine have been detected at 5 of the 16 camera stations on the Salmon-Cahllis. Across the entire study area, wolverines were detected at 59 stations and preliminary results indicate that roughly 27-40 percent of the study area was occupied by wolverines (Evans Mack and others 2018).

Wolverine habitat has been mapped on the forest based on work by Copeland and other (2007) in central Idaho, which showed the animal used whitebark pine, Douglas fir, and lodgepole pine forests at elevations between 7,218 and 8,530 feet. Birthing dens tend to be located in subalpine cirque basins above 8,200 feet. Modeled habitat on the Salmon-Challis also includes limber pine and spruce or fir in the same elevation range.

High-elevation habitat islands are predicted to shrink under continued changing climate. Within the next 75 years, wolverine habitat and range are predicted to decline by 63 percent. By 2045, human intervention will be required to maintain populations in currently occupied areas because sky island populations will be isolated to the point that natural dispersal won’t maintain them (U.S. Department of Interior, Fish and Wildlife Service 2018b).

Wolverine reproduction is dependent on snowpack (U.S. Department of Interior, Fish and Wildlife Service 2013). Although uncertainty exists about the magnitude and rate of changes in climate (Behrens and others 2018) over the next 100 years, snowpack depth and persistence on the Salmon-Challis is projected to be reduced, although impacts may be markedly less compared to other areas of the Intermountain Region (Muir and others 2018). The Salmon-Challis has the highest mountain ranges in Idaho and so may be an important landscape for wolverines.

Secondary stressors to wolverines include land management, recreation, infrastructure, development, and transportation corridors. The U.S. Fish and Wildlife Service concluded based on the best available scientific information that these secondary threats in themselves do not pose a threat to the lower-48 population (U.S. Department of Interior, Fish and Wildlife Service 2013). However, when acting in concert with changes in climate, they could be a significant threat.

Several studies that combined maps of land cover and tracked locations of wolverines have found wolverines tend to avoid infrastructure development including roads (Heim and others 2017; Krebs and others 2007; May and others 2006; Rowland and others 2003). However, Copeland and others (2007) found wolverine presence in high-elevation habitat in central Idaho was a function of habitat preference rather than avoidance of development. Studies have found wolverine avoidance of development varied by scale (May and others 2006; Rowland and others 2003), and this may explain conflicting results between studies.

It has been speculated that the reason wolverines avoid human-modified landscapes is because they perceive or experience them as risky. To investigate this, Stewart and others (2016) used camera traps at bait stations to document wolverine behavior. This research found wolverines spent significantly less time lingering at bait stations and climbing to access bait, if at all, in developed compared to undeveloped landscapes. The authors admit there are several competing theories to explain this behavior and provide arguments for why risk avoidance is a plausible explanation.

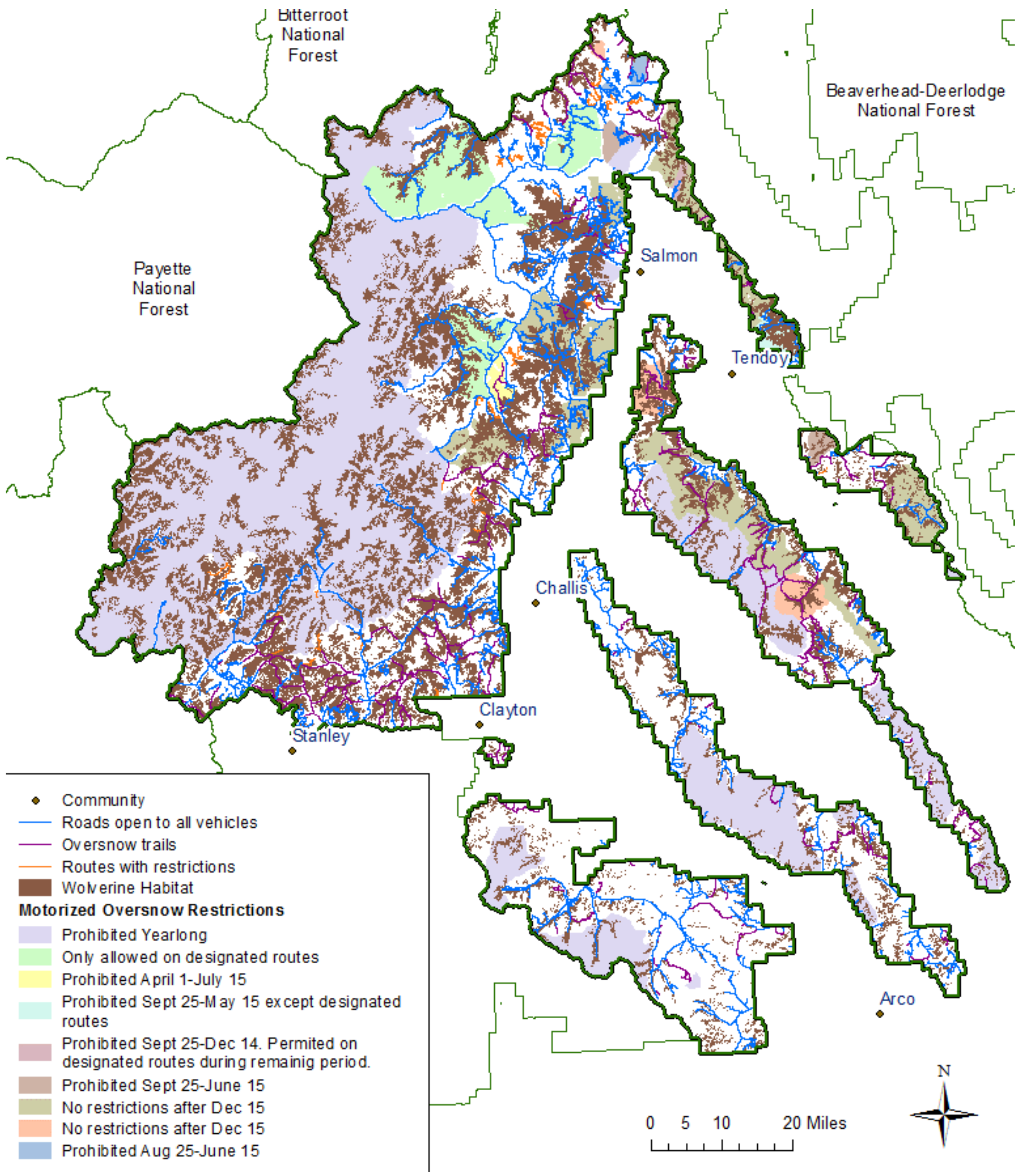
Indeed, female wolverines have a reputation of being shy of humans. Reports of maternal wolverines abandoning natal dens apparently due to disturbance from foot and snowmobile traffic go back to at least the 1960s (U.S. Department of Interior, Fish and Wildlife Service 2013). However, cause and effect have not been established and abandonment may be rare, even under intense disturbances like capture of family groups at dens (Persson and others 2006).

There is a high potential for overlap and interactions between backcountry winter recreationists and wolverines because both occupy similar areas at the same time. Kits are born from mid-February through March and these are peak times for snow recreation (Heinemeyer and others 2017). There is potential for reproductive impacts.

Krebs and others (2007) found female wolverine habitat use decreased with increased percentage of the landscape designated for backcountry recreation use, but actual intensity of use was not measured. Heinemeyer and others (2017) did measure recreation intensity and documented a functional relationship with wolverine landscape use where displacement of wolverines increased with increased intensity of backcountry winter recreation. Reproducing and non-reproducing female wolverines strongly avoided off-road motorized recreation and experienced more indirect habitat loss due to backcountry recreation than males. Both sexes also avoided areas with non-motorized recreation, although any effect of intensity could not be tested. Wolverine avoidance of backcountry winter recreationist resulted in the indirect loss of 2 to 28 percent of habitat within home ranges. This study provides some evidence that wolverines may be less sensitive to predictable patterns of human use as areas of linear recreation access were not as strongly avoided.

Oversnow motorized use is allowed across the Salmon-Challis except where explicitly restricted. Figure 98 shows large areas of mapped potential wolverine habitat lay within areas where oversnow motorized use is prohibited year-round, such as in wilderness. The opposite is true as well. Large areas of potential habitat within areas where oversnow motorized use has no restrictions or restrictions are lifted after December 15 (U.S. Department of Agriculture, Forest Service 2010a).

Figure 98. Potential North American Wolverine Habitat on the Salmon-Challis



Generally speaking, the Salmon-Challis has a low human footprint. Wilderness accounts for one-third of the forest, road densities are generally low, and the Salmon-Challis is one of the least visited national forests. Based on estimates in 2016, the Salmon-Challis ranks 108 out of 114 national forests in terms of numbers of forest visitors. Although the Salmon-Challis provides a bounty of winter recreation opportunities, the travel distance from population centers to the Salmon-Challis are longer compared to other forests providing similar experiences and this affects visitation. Also, although areas of concentrated winter recreation activities occur on the Salmon-Challis, much of the landscape, especially potential wolverine habitat, is rugged and access is difficult for both motorized and non-motorized winter recreation. For more information, see the Recreation section under Multiple Uses.

Mining and timber harvest are potential secondary stressors for wolverines as well, but neither are widespread at this time. Future markets could increase either, but, while cobalt prices are currently rising, this is not predictable. For more information see the Timber Resources and Minerals & Energy Resources sections under Multiple Uses.

While trapping is another secondary threat to wolverines, the State of Idaho does not have a trapping season for wolverines and would not open one unless the population recovered (Idaho Department of Fish and Game 2014). Wolverines are known to be caught in traps set for other species, however. Incidental trapping of wolverines in Idaho is apparently low, with 14 reported since 1965 (Idaho Department of Fish and Game 2014). Of these, eight were released alive and six died. The 2013-2014 trapping season accounted for four of these, but it is not known whether this reflects an increasing rate of incidental trapping or if it is an anomaly.

Bull Trout

Bull Trout occur in many areas on the Salmon-Challis National Forest. Bull Trout are native to the Salmon River basin and occur in many waters within this drainage. Bull Trout also occur on the forest in some portions of the Little Lost River basin. While it was originally believed that Bull Trout were native to the Little Lost River basin, recent research indicates that these fish may have been introduced. Bull Trout do not occur on the forest within the Big Lost River, Birch Creek, or Wood River basins. This species has a global status of G4 and a state status of S4, and is listed as threatened under the Endangered Species Act. Bull Trout populations appear stable in some areas of the Salmon-Challis, but they have declined in some areas and have been completely eliminated in other areas. The primary threats to Bull Trout are: a reduction in habitat quality; habitat fragmentation; and hybridization, competition, and predation from introduced Brook Trout.

Figure 99. Bull Trout

Sockeye Salmon

Sockeye Salmon typically occur in one river reach on the Salmon-Challis. Sockeye Salmon are native to the Salmon River Basin and use the Main Salmon River to move between the Pacific Ocean and lakes in the Sawtooth Valley. They occur in the Salmon River when they are making this migration. Except for incidental excursions into the lower ends of tributaries along the Salmon River, they do not occur on the Salmon-Challis in other locations within the Salmon River Basin and do not occur on National Forest System lands in the Big Lost River, Little Lost River, Birch Creek, or Wood River basins.

Sockeye Salmon are native to the Salmon-Challis, have a global status of G5 and a state status of S1, and are listed as endangered under the Endangered Species Act. Sockeye Salmon have experienced substantial declines, and these declines have reduced the number of fish that migrate across the forest. The primary threats to Sockeye Salmon are: a reduction in habitat quality; habitat fragmentation; and predation from introduced fishes. Some of the most significant threats to Sockeye Salmon occur off the forest in migratory corridors and ocean habitats.

Figure 100. Sockeye Salmon

Chinook Salmon

Chinook Salmon are native to the Salmon River basin and occur on the Salmon-Challis in some waters within this drainage. Chinook Salmon do not occur on the Salmon-Challis within the Big Lost River, Little Lost River, Birch Creek, or Wood River basins. This species is native to the forest, has a global status of G5 and a state status of S1, and is listed as threatened under the Endangered Species Act. The Chinook Salmon in the Middle Fork Salmon River basin are one of the few remaining populations in the continental United States that have not been significantly altered by hatchery introductions.

Figure 101. Chinook Salmon

The Chinook salmon found on the Salmon-Challis outside of the Middle Fork Salmon River Basin have been heavily influenced by hatchery introductions. Chinook salmon populations on the Salmon-Challis have experienced substantial declines in both distribution and abundance. The primary threats to Chinook salmon are: a reduction in habitat quality; habitat fragmentation; and competition with introduced Brook Trout. Some of the most significant threats to Chinook salmon occur off the forest in migratory corridors and ocean habitats.

Steelhead

Steelhead are native to the Salmon River Basin and occur in many waters within this drainage on the Salmon-Challis. Steelhead do not occur on the forest within the Big Lost River, Little Lost River, Birch Creek, or Wood River basins. Steelhead are native to the Salmon-Challis, have a global status of G5 and a state status of S2S3, and are listed as threatened under the Endangered Species Act. The steelhead in the Middle Fork Salmon River Basin are one of the few remaining populations in the continental United States that have not been significantly altered by hatchery introductions.

The steelhead found outside of the Middle Fork Salmon River Basin have been heavily influenced by hatchery introductions. Steelhead populations on the Salmon-Challis have experienced substantial declines in both distribution and abundance. The primary threats to steelhead are: a reduction in habitat quality; habitat fragmentation; and competition and predation from introduced Brook Trout. Some of the most significant threats to steelhead occur off the forest in migratory corridors and ocean habitats. Steelhead are one of the most imperiled fish on the Salmon-Challis and should be a high priority for protection and restoration efforts.

Figure 102. Steelhead

Species of Conservation Concern

Forest Service regulations prior to the 2012 Planning Rule required each regional forester to identify sensitive species of plants and animals for which viability was a concern. Sensitive species could be native or non-native species of interest.

Species of conservation concern is a new designation introduced with the 2012 Planning rule. Species of conservation concern are native plants or animals, other than those already federally-recognized, that are known to occur within the Salmon-Challis and for which the regional forester has substantial concern about the species' capability to persist over the long-term in the Forest. Like regional forester's sensitive species under the 1982 Planning Rule, forest plans under the 2012 Planning Rule must provide for ecological conditions necessary to maintain viable populations of species of conservation concern. The exceptions are where it is beyond the inherent capability of the land to support a viable population or where maintaining viability is beyond the control of the forest. An example of the former would be a species whose range is largely outside the forest and so the population naturally is too small to be viable on the forest. Threats such as wind energy facilities or dams off the Salmon-Challis are examples of the latter.

The Salmon-Challis is currently reviewing all plant and animal species that occur within the administrative boundaries of the Forest and for which existing conservation assessments indicate the species may be at risk. Methods for this review, along with the species risk assessment, which include population and habitat status and trends, can be found on the Salmon-Challis Forest Plan Revision website. Through this review, along with input from the U.S. Forest Service Intermountain Regional Office, Shoshone-Bannock Tribes, Nez-Perce Tribe, Regions Six and Seven of the Idaho Department of Fish and Game, U.S. Fish and Wildlife, and the public, the forest supervisor has identified a list of species he recommends be potential species of conservation concern for the Salmon-Challis. The regional forester makes the final identification of species that will receive the new designation.

Potential Plant Species of Conservation Concern

The Salmon-Challis considered 76 plants as potential species of conservation concern. Further review of records identified 14 of these species do not occur on the Forest. Forest staff conducted risk assessments for 62 plant species.

As a result of these assessments, the forest supervisor is preliminarily recommending 55 plant species be potential species of conservation concern for the Salmon-Challis. Species are listed alphabetically by community type. An asterisk next to a species common name indicates that an argument could be made for either recommending or not recommending this species, but the plant working group came to a consensus to keep these species as recommended.

Alpine and High Elevation

Potential species of conservation concern in this community type include:

- Apetalous Catchfly
- Arctic Buttercup
- Austrian Draba*
- Beautiful (Showy) Indian Paintbrush
- Douglass' Wavewing*
- Four-Parted Gentian*
- Ibapah Spring-Parsley*
- Kotzebue's Grass-Of-Parnassus*
- Kruckeberg's Sword-Fern*
- Low Fleabane*
- Lyall's Phacelia
- Maritime Sedge
- Marsh's Bluegrass*
- Mingan Moonwort
- Nodding Saxifrage*
- Pygmy Buttercup
- Sacajawea's Bitter-Root
- Slender Gentian*
- Wedge-Leaf Saxifrage*

While alpine and high-elevation habitats are often isolated on the Salmon-Challis and often considered stable, they are exceptionally vulnerable to impacts from changing climate. Generalized impacts include:

- warmer temperatures;
- changes in surface water flow and timing;
- reductions in summer precipitation;
- competition with other species that may establish in the alpine zone, including invasives;
- asynchronistic relationships with pollinators; and
- alterations in snowpack abundance and distribution.

Alterations in snowpack abundance and distribution is of particular concern because the limited habitat of many of these species is directly tied to snowmelt. A number of occurrences are near high elevation roads and trails, so many of these species may be threatened by increased recreational activity or development. Repeated site visits and monitoring for climate-related impacts in the alpine zone may be the best management strategy for these species.

One alpine and high elevation plant species for which risk assessments was completed but that is currently not being recommended is whiteworm lichen.

Riparian Areas and Wetlands

Potential species of conservation concern in this community type include:

- Farr's Willow~
- Giant Helleborine
- Hall's Rush
- Idaho Sedge
- Least Grapefern
- Long-Stalked Thread Moss~
- Moonwort
- Park Milkvetch
- Sageleaf Willow~
- Simple Kobresia~
- Vanilla Grass
- Western Sedge

These species are found in riparian and wetland habitats including fens and riparian-transition zones. Many of these species have specific habitat requirements that further limits distribution. In fact, a tilde next to a name indicates that the species requires the unique conditions offered by fens to grow.

Though each of these species face differing combinations of threats at differing intensities, general threats include:

- grazing that occurs outside the terms and conditions of a permit,
- hydrologic alterations,
- invasive species,
- recreation, and
- changing climate.

In many cases, few, small populations exist on the Salmon-Challis and are at risk of potential loss due to natural disturbances.

Riparian and wetland plant species for which risk assessments were completed but that are currently not being recommended are the Mount Shasta sedge, Blandow's helodium, and Hapeman's sullivantia.

Cliff and Rocky Outcrops

Potential plant species of conservation concern in this community type include:

- Reindeer (Lemon Pixie) Lichen
- Borsch's Stonecrop
- Davis' Stickseed*
- Flexible Alpine Collomia
- Hall's Orthotrichum Moss*
- Railroad Canyon Wild Buckwheat
- Salmon River Fleabane
- Wavy-Leaf Thelypody
- Welsh's Buckwheat

Some of these species are extremely limited in distribution due to specific soil requirements that are limited within the Planning Area.

Many of these species have been impacted by or are potentially at risk due to recreational activities and developments, such as roads and trails. Some are facing additional threats from invasive species, grazing that occurs outside the terms and conditions of a permit, and changing climate.

Scrub Steppe and Grasslands

Potential plant species of conservation concern in this community type include:

- Broad-Fruit Mariposa Lily
- Challis Crazyweed
- Challis Milkvetch
- Elusive Jacob's Ladder
- Lavender Dwarf Standing-Cypress
- Lemhi Milkvetch
- Lemhi Penstemon
- Lost River Milkvetch
- Salmon River Penstemon
- Salmon Twin Bladderpod
- Stanley Thlaspi
- Threeleaf Milkvetch

Within the sagebrush steppe, species are typically limited to small distributions or microhabitats with specific soils or environmental conditions. Many of these species occur only within the planning area and a limited area adjacent to the planning area.

Populations are frequently small and susceptible to natural disturbances, which could eliminate occurrences. Although specific combinations of threats and intensity of them varies between species, threats generally include grazing that occurs outside the terms and conditions of a permit, invasive species, and recreational activity and development.

Scrub steppe ecosystems are projected to not be well-adapted to future changing climate conditions which may exacerbate current threats and pose a substantial long-term threat to species persistence.

Scrub steppe and grasslands species for which a risk assessment was completed but that are currently not recommended as potential species of conservation concern are Blue Mountain catchfly and Bitterroot milkvetch.

Forested

A risk assessment was conducted for one forest species, white spruce. It is not currently being recommended as a Potential Species of Conservation Concern.

Potential Aquatic Species of Conservation Concern

The Salmon-Challis considered 16 aquatic animals as potential species of conservation concern. Three of these were dropped from further consideration because records are few and old, and evidence does not support that these species remain on the forest. The Salmon-Challis conducted risk assessments for 13 aquatic animal species, and these are listed in Table 38 along with their residency status, habitat on the forest, and conservation stressors. The eight species the forest supervisor preliminarily recommends for potential species of conservation concern for the Salmon-Challis are bolded.

Table 38. Aquatic species for which risk assessments were completed. Potential Aquatic Species of Conservation Concern are bolded.

Common Name / Residency	Habitat on Salmon-Challis	Stressors
Invertebrates		
Green River Pebblesnail Year-round	Cold, clear spring-fed streams.[3]	The primary threat on the forest is a reduction in habitat quality.[3]
Idaho Amphipod Year-round	Subterranean habitats in streams	The primary threat on the forest is a reduction in habitat quality and quantity associated with management actions and changing climate.
A Mayfly Year-round	Streams that are high elevation with a moderate velocity	The primary threats on the forest are disturbances, both natural and human-caused, and changing climate.
Lolo Mayfly Year-round	Larvae occupy steep, forested headwater streams while adults occupy surrounding areas.[1]	The primary threat on the forest is a reduction in habitat quality.[1]
Lolo Sallfly Year-round	Small mountain streams	The primary threat on the forest is a reduction in habitat quality and quantity associated with management actions and changing climate.

Common Name/ Residency	Habitat on Salmon-Challis	Stressors
Northern Rocky Mountain Refugium Caddisfly Year-round	Larvae occupy cold, fast flowing streams while adults occupy surrounding areas.[1]	The primary threat on the forest is a reduction in habitat quality.[1]
A Riffle Beetle Year-round	Larvae occupy streams and springs while adults occupy surrounding areas.[2]	The primary threat on the forest is a reduction in habitat quality.
Western Pearlshell Year-round	Cold streams that contain salmonids (host fish).[1]	The primary threats on the forest are a reduction in habitat quality and aquatic invasive species.[1]
Western Ridged Mussel Year-round	Bottoms of shallow permanent streams, rivers, and lakes	The primary threat on the Forest is a reduction in habitat quality and quantity associated with management actions and changing climate.
Fishes		
Big Lost River Mountain Whitefish Year-round	Medium and large streams within the Big Lost River basin.	The primary threats on the forest are a reduction in habitat quality associated with livestock grazing, roads, and dispersed recreation; disease; and competition from introduced fishes. Additional threats occur outside the forest.
Pacific Lamprey Anadromous/ Year-round	Salmon River and Middle Fork Salmon River	The primary threat on the forest is a reduction in habitat quality associated with recreation and roads. The most significant threats occur off the Forest in migratory corridors and the Pacific Ocean.
Westslope Cutthroat Trout Year-round	Rivers, streams, lakes, and reservoirs	The primary threats on the forest are a reduction in habitat quality associated with livestock grazing, diversions and dams, roads and trails, vegetation treatments, dispersed recreation, and a lack of wildfire; a reduction in habitat quantity associated with diversions and a lack of wildfire; a reduction in habitat connectivity associated with culverts, diversions, dams, and habitat degradation; direct mortality associated with diversions; aquatic invasive species; and competition and predation from introduced fishes.
White Sturgeon Year-round	Salmon River and Middle Fork Salmon River	The primary threat on the forest is a reduction in habitat quality associated with recreation and roads.

Sources: [1] (Mazzacano 2017), [2] (Barr 2011), [3] (Idaho Department of Fish and Game 2005a)

Potential Terrestrial Species of Conservation Concern

The Salmon-Challis considered 61 terrestrial animals as potential species of conservation concern. Of these, five were dropped from further consideration because our review indicates they are not established on the forest.

Risk assessments were conducted for the remaining 48 terrestrial animal species and these are listed in Table 39 along with their residency status, habitat on the forest, and identified conservation threats. The 20 species the forest supervisor preliminarily recommends be potential species of conservation concern for the Salmon-Challis are bolded.

Table 39. Potential Terrestrial Species of Conservation Concern

Common Name / Residency	Habitat on Salmon-Challis	Stressors*
Amphibians		
Columbia Spotted Frog Year-round	Breeding in shallow quiet waters. Foraging in wetland and riparian habitat associated with water features.	Disease (see western toad), introduction of non-native predators, trampling by livestock. Loss and degradation of habitat due to invasive plants, development including rangeland use, climate change caused reduced water availability and conifer encroachment.
Rocky Mountain Tailed Frog Year-round	Breeding in cold, clear, swift, mid-elevation streams. Foraging and overwintering in cool, moist forested riparian habitat.	Loss and degradation of habitat due to timber harvest, unrestricted livestock grazing, severe fires, fire suppression, and changes in climate.
Western Toad Year-round	Breeding in quiet waters. Foraging in broad range of terrestrial habitats close to water.	Environmental stressors, in combination with inherent cold body temperature, may be lowering specie's immune system and ability to fight off disease and parasites, trampling by livestock, habitat loss/degradation.
Birds		
American Three-Toed Woodpecker Year-round	Generally associated with spruce forest. Old or disturbed forests with high bark beetle larvae density, especially recent low intensity burns. Snags for nesting.	Impacts to habitat from fire suppression, logging, and forest fragmentation.
Bald Eagle Year-round	Mature or old growth trees near water with fish as a food source.	Habitat loss from urban development and logging, death from poisoning and illegal shooting, low breeding success from exposure to environmental contaminants, and decreasing food supply.

Common Name / Residency	**Habitat on Salmon-Challis**	**Stressors***
Black Rosy-Finch Year-round	Nest exclusively in alpine cliffs and rock slides within flying distance of tundra, fellfields, rock slides, snowfields, and glaciers.	Long–term changes in habitat, including alpine snowfields and tundra, as a result of a warming climate.
Black-backed Woodpecker Year-round	Montane conifer forest, especially with standing dead trees such as burned areas.	Habitat loss: reduction of early post-fire habitat due to fire suppression and logging of those sites; logging insect killed stands, reduction of mature and old forest through logging.
Boreal Owl Year-round	Mature and old spruce-fir stands near openings for foraging. Less so in Douglas-fir and lodgepole stands. In Idaho, typically breed above 4,000 ft.	Large scale timber harvest (Hayward 1997) and forest fires reducing nesting sites, prey, and foraging sites. Habitat loss due to increased fire severity and size and stand killing insect outbreaks due to climate change. (IAP 2017).
Brewer's Sparrow Breeding	Sagebrush	Widespread decline on breeding grounds is uncertain, but possibly linked to widespread degradation, loss, and fragmentation of sagebrush habitat due to urbanization, agriculture, grazing, invasive annual grasses, and fire.
Cassin's Finch Year-round	Open conifer forest	Unknown (allaboutbirds.org)
Clark's Nutcracker Year-round	Open montane to subalpine conifer forest	Decline in whitebark pine forests (a major food source) from white pine blister rust, mountain pine beetle infestations, and increased fire severity, frequency, and size due to fire suppression. Exacerbation of these conditions expected with warmer climate (USDI BLM 2016 Whitebark pine pub).
Evening Grosbeak Year-round	Breeding: Spruce-fir forest Wintering: Forest generalist	Loss of forest habitat due to logging and other development, disease, reductions in forest insects due in part to aerial spraying in U.S. and Canada (allaboutbirds.org). Climate change may exacerbate loss of forest.
Flammulated Owl Breeding	Open coniferous forest ponderosa pine	Decline of open forest conditions due to fire suppression.

Common Name / Residency	Habitat on Salmon-Challis	Stressors*
Golden Eagle Year-round	Open and semi-open shrublands, grasslands, and conifer forests primarily in canyon and rimrock terrain.	Loss of shrubs and jackrabbit habitat due to fires; mortality due to illegal shooting, wind turbine collisions, and car strikes; and declines in nesting and nest success due to disturbance from off road vehicles.
Gray Jay Year-round	Conifer forest primarily spruce	Shift of habitat north due to climate change (allaboutbirds.org).
Great Gray Owl Year-round	Multilayered pine and spruce forests near mountain meadows, bogs, and openings. In Idaho, strongly associated with lodgepole, Douglas-fir, aspen forests.	Degradation and destruction of habitat by logging large trees for nesting and near foraging sites (meadows and bogs). Fire suppression, which may decrease open sites for hunting. Ultimate population effects of climate warming impacts on habitat are not clear.
Greater Sage-Grouse Year-round	Sagebrush steppe associated with riparian and meadow habitats.	Loss, degradation, and fragmentation of sagebrush habitat due to agriculture, grazing, urbanization, and infrastructure and energy development. Direct mortality due to increased predation and strikes with structures. Degradation of habitat by invasive annual grasses causing increased frequency and size of fires.
Green-tailed Towhee Breeding	Shrub habitat primarily in mountains, especially sagebrush steppe and mountain mahogany.	Habitat loss, degradation, and fragmentation due to agriculture, conversion to non-native grasses, and high intensity grazing.
Lewis's Woodpecker Breeding	Breeding: ponderosa pine, cottonwood, and aspen forests with well-decayed large diameter snags in open forest with well-developed understory. Foraging: perches near openings with abundant insects.	Habitat loss and degradation due to timber harvest and fire suppression.
Long-Billed Curlew Breeding	Large, open, flat to rolling grasslands with areas of emergent wetland. Irrigated hay and pasture fields.	Loss, degradation, and fragmentation of habitat due to conversion to croplands, residential development; conversion of flood irrigation to center pivot; loss of wetlands and wet meadows.

Common Name / Residency	**Habitat on Salmon-Challis**	**Stressors***
Long-eared Owl Year-round	Riparian woodlands and dense deciduous or coniferous tree groves isolated within grassland. Roost in willow thicket bordering streams in open landscapes.	Vulnerable to loss of forest habitat, especially in arid west (allaboutbirds.org)
Northern Goshawk Year-round	Mature and old-growth forest dominated by large trees and a dense canopy and open understory. Also, lodgepole and aspen.	Habitat loss and degradation due to logging, altered fire cycles, size, and intensity resulting in higher susceptibility to stand killing insects and disease outbreaks and stand-replacing fires.
Olive-sided Flycatcher Breeding	Mid- to high-elevation mixed conifer forests along forest edges and openings. Tall trees and snags used for singing and forage perches.	Unknown; perhaps foraging habitat degradation due to fire suppression, which increases tree canopy closure and density of understory; timber harvest; reductions in prey due to chemical control of insects. Direct poisoning by same chemicals.
Peregrine Falcon Breeding	Open areas associated with mountains, major rivers, reservoirs, lakes, canyons. Nests on ledge or hole on face of rocky cliff or crag.	DDT exposure in countries where it is not banned. Countries where DDT is banned; consuming prey with bio-accumulated DDT (e.g. within Great Lakes ecosystem). Consuming prey with bio-accumulated flame retardant chemicals (Newsome et al. 2010).
Rufous Hummingbird Breeding	Thickets and mid-seral (age) conifer forest and openings with adjacent scrub and meadows for foraging.	Unknown. Human-created environments that attract the species with elevated food resources may be “ecological traps” that do not provide other needs. Reduction in nectar sources by grazing.
Sage Thrasher Breeding	Wyoming big and three-tip sagebrush	Habitat loss, degradation, and fragmentation due to agriculture, development, removal of sagebrush for livestock range, conifer encroachment, and fires and resulting conversion to non-native grasses. Climate change.
Insects		
Monarch Butterfly Breeding	Breeding: Milkweed and its habitat; grasslands, meadows, fields, roadsides.	Loss and degradation of habitat from urbanization and intensive management of roadsides. Broad-scale use of post-emergent insecticides.

Common Name/ Residency	Habitat on Salmon-Challis	Stressors*
Suckley's Cuckoo Bumblebee Unknown	Host western bumble bee.	Decline of host.
Western Bumble Bee Year-round	Grasslands and shrublands with abundant and diverse native flowers for nectar and pollen.	Habitat loss and fragmentation, range shifts due to climate change, pesticides, competition with honey bees, and nonnative pathogens.
Mammal		
American Pika Year-round	Alpine rock outcrops and talus slopes at high elevation. Typically adjoining a meadow in a cool moist microclimate.	Loss and degradation of habitat and heat stress due to changing climate.
Big Brown Bat Year-round	Roosts in buildings, mines, and bridges, caves, crevices in cliff faces, relatively open forests with large diameter snags. Forest, riparian zones, and water courses for foraging.	The disease, white-nose syndrome, is the greatest threat. Also disturbance and destruction of roosting sites, including removal of important roost trees due to timber harvesting, loss of hibernation and maternity sites due to mine closures or opening of mining operations. Loss/degradation of foraging habitat due to increased urbanization, livestock grazing, invasive non-native plants, dewatering, logging.
Rocky Mountain Bighorn Sheep Year-round	Canyons, foothills, and mountains with steep and rugged terrain to escape predators and low grasses and forbs as forage.	Disease transferred from domestic sheep and goats. Forage habitat degradation by invasive annual grasses, noxious weeds, and conifer encroachment. Combined effects of climate change are unclear.
California Myotis Year-round	Habitat generalist.	Locally, reduction of roosting sites by blocking bat access to abandoned mines, reductions in snags and cavity containing trees.
Fisher Year-round	Mature and old conifer forests, especially riparian, with abundant large diameter trees, snags, and logs wand abundant prey.	Fire suppression and climate warming causing large, stand replacing, fires and insect infestation; timber harvest.

Common Name / Residency	Habitat on Salmon-Challis	Stressors*
Fringed Myotis Year-round	Habitat generalist. Roosts in buildings, mines, old trees and snags, under bridges, and crevices of rock faces. Hibernate in caves, mines, and buildings.	Primary threat is human disturbance of roost sites, especially maternity colonies, through recreational caving and mine exploration. Also, abandoned mine closures and reopening for mining, associated toxic materials, pesticides, livestock grazing, timber harvest, destruction of building and bridge roost sites.
Gray Wolf Year-round	Habitat generalist. Occurs where prey is prevalent and human persecution is low.	Unsustainable trapping and hunting facilitated by high road density.
Hoary Bat Breeding	Habitat generalist. Roosts in trees and rock crevice, usually at edge of clearing.	Primary threat is mortality due to striking wind energy turbines, especially during migration. Also, timber harvest and pesticide use.
Hoary Marmot Breeding	Alpine and subalpine rockslides, boulder piles, and talus slopes near meadows.	Reductions in snowpack and early spring snowmelt cause by climate warming may impact survival. Higher summer temperatures may reduce foraging.
Little Brown Myotis Year-round	Habitat generalist roosting human structures (especially maternity colonies), hollow trees, rock crevices. Caves used less often and for day roost.	The primary threat is the disease white-nose syndrome. Pest control.
Long-eared Myotis Year-round	Primarily associated with coniferous forest, but also sagebrush. Primarily roost under exfoliating tree bark, tree hollows, caves, mines, cliff crevices, sinkholes, rocky outcrops.	Abandoned mine closure, recreational caving, and loss of forest and developments that impact cliff roosts such as highway construction.
Long-legged Myotis Year-round	Habitat generalist: summer day roosting in abandoned buildings, cracks in the ground, cliff crevices, exfoliating tree bark, snag hollows; hibernates in caves and abandoned mines. Forages at forest canopy.	Abandoned mine closures, forest loss, and pesticides.

Common Name / Residency	Habitat on Salmon-Challis	Stressors*
Mountain Goat Year-round	Rugged alpine and subalpine areas with terrain to escape from predators. Summer; forage in high elevation meadows. Winter forage on grasses at lower elevation on south and west aspect where snow is less prevalent.	Human encroachment into habitat from road development, backcountry recreation, and aircraft. Disease may be impacting populations. Loss of habitat due to climate warming.
Pygmy Rabbit Year-round	Sagebrush; may locally prefer on mima mounds. Mountain big sagebrush key forage.	Habitat loss, degradation, and fragmentation due to agriculture, development, removal of sagebrush for livestock range, conifer encroachment, and fires and resulting conversion to non-native grasses. Climate change.
Silver-haired Bat Year-round	Conifer and conifer/hardwood forest with large dimeter trees. Roost and hibernate in tree cavities and under loose bark of large snags. Also hibernate in rock crevices, wood piles, leaf litter, building, mines, and caves. Uses water features, forest canopy, and open meadows for foraging.	Primary threat is mortality due to striking wind energy turbines, especially during migration. Also, timber harvest and human persecution. Fungus causing white-nose syndrome disease detected on species in Washington state, but no disease has been observed.
Spotted Bat Year-round	Xeric and riparian habitats in deep, narrow canyons dominated by massive cliffs. Dominant associated vegetation: sagebrush, juniper, mountain mahogany, and cottonwood.	Unknown. May include destruction of roost sites by reservoir impoundments and disturbance by rock climbers.
Townsend's Big-eared Bat Year-round	Primarily a cave abandoned mine dweller, but also buildings and bridges. No strong association with vegetation type.	Primary threats are disturbance and loss of roost sites by recreational caving, abandoned mine closures, and renewed mining. Also, reduction of prey by pesticides and habitat degradation by cheatgrass. Fungus causing white-nose syndrome disease detected on eastern sub-species, but no disease has been observed.

Common Name / Residency	Habitat on Salmon-Challis	Stressors*
Western Small-footed Myotis Year-round	Roost in cliff and rock crevices, caves, and mines within semiarid and coniferous forest habitats.	Primary threats are disturbance and loss of roost sites by recreational caving, abandoned mine closures, and renewed mining. The disease, white-nose syndrome, is also a threat. Although not documented in the species, is affecting eastern small-footed bat, *Myotis leibii*.
Yuma Myotis Year-round	Habitat generalist roosting in bridges, buildings, cliff crevices, caves, mines, and trees. Forages at water features.	Primary threats are disturbance and loss of roost sites by recreational caving, abandoned mine closures, and renewed mining, and forest loss. Also human persecution and degradation and loss of foraging habitat.

Note: * (Game) 2017; NatureServe 2016; Rosenberg and others 2016)

Summary & Conclusions

Several changes to the list of at-risk species have occurred since the 1980s, when the Salmon and Challis forest plans were developed. Many new species will need to be considered using concepts and direction in the 2012 Planning Rule and best available science. Direction should reflect the 2012 Planning Rule intent for ecosystems-based management complimented with species specific plan components, where they are necessary for:

- contributing to the recovery of federally-listed threatened and endangered species,
- conserving proposed and candidate species, and
- maintaining a viable population of each species of conservation concern within the plan area.

The revised plan components will not include the regional forester's sensitive species as they are replaced by species of conservation concern in plans developed under the 2012 Planning Rule.

Considering important landscape linkages within and beyond the Salmon-Challis that will facilitate dispersal and range expansion of at-risk species, including the grizzly, wolverine and lynx, will be important for understanding the potential for and planning for the conservation and recovery of these species. Maintaining species populations, habitat, and connectivity will require consideration of potential impacts from changes in climate and options for adapting to those changes.

Looking for ways to balance winter recreation with wolverine and lynx habitat requirements that contribute to the conservation of these species will be an important part of the forest plan revision process. Although motor vehicle use mapping is not part of the revision process, motor vehicle use decisions and maps must be in compliance with their forest plans. The revision process is an opportunity to provide direction that will guide future decisions in this regard.

Although the Salmon-Challis is unoccupied, secondary habitat for the lynx, optional direction in the Northern Rockies Lynx Management Direction Record of Decision should be reviewed and considered for its value and relevance in the revised forest plan. The most current greater sage-grouse conservation strategy for the Salmon-Challis should also be considered.

Species risk assessments conducted for potential species of conservation concern are based on the best available science information and will inform the revision process. This includes the development of forest plan direction and the analysis under the National Environmental Policy Act.

CARBON STOCKS

The 2012 planning rule requires this Assessment Report include baseline estimates of carbon stocks on the Salmon-Challis [see 36 CFR 219.6(b)(4)]. Carbon sequestration helps mitigate greenhouse gas emissions by offsetting losses through removal and storage of carbon. Estimating carbon stocks helps determine the magnitude of carbon sequestration on the forest.

Baseline Estimates for Forested Lands

The Salmon-Challis National Forest stores the largest amount of carbon in the Intermountain Region, approximately 164 terragrams in 2005 and 166 terragrams in 2013 (U.S. Department of Agriculture, Forest Service, 2015e).

Baseline Estimates for Non-Forested Land

Above-ground carbon within shrubs has been measured for all of the non-forested lands in the Intermountain Region, using vegetation structure, composition, height, and type data. Carbon density of shrubs is highly varied in the region, with the average across three height ranges ranging from 1.19 to 12.45 megagrams per hectare. The average on the Salmon-Challis is 2.1 megagrams per hectare (U.S. Department of Agriculture, Forest Service 2017a).

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