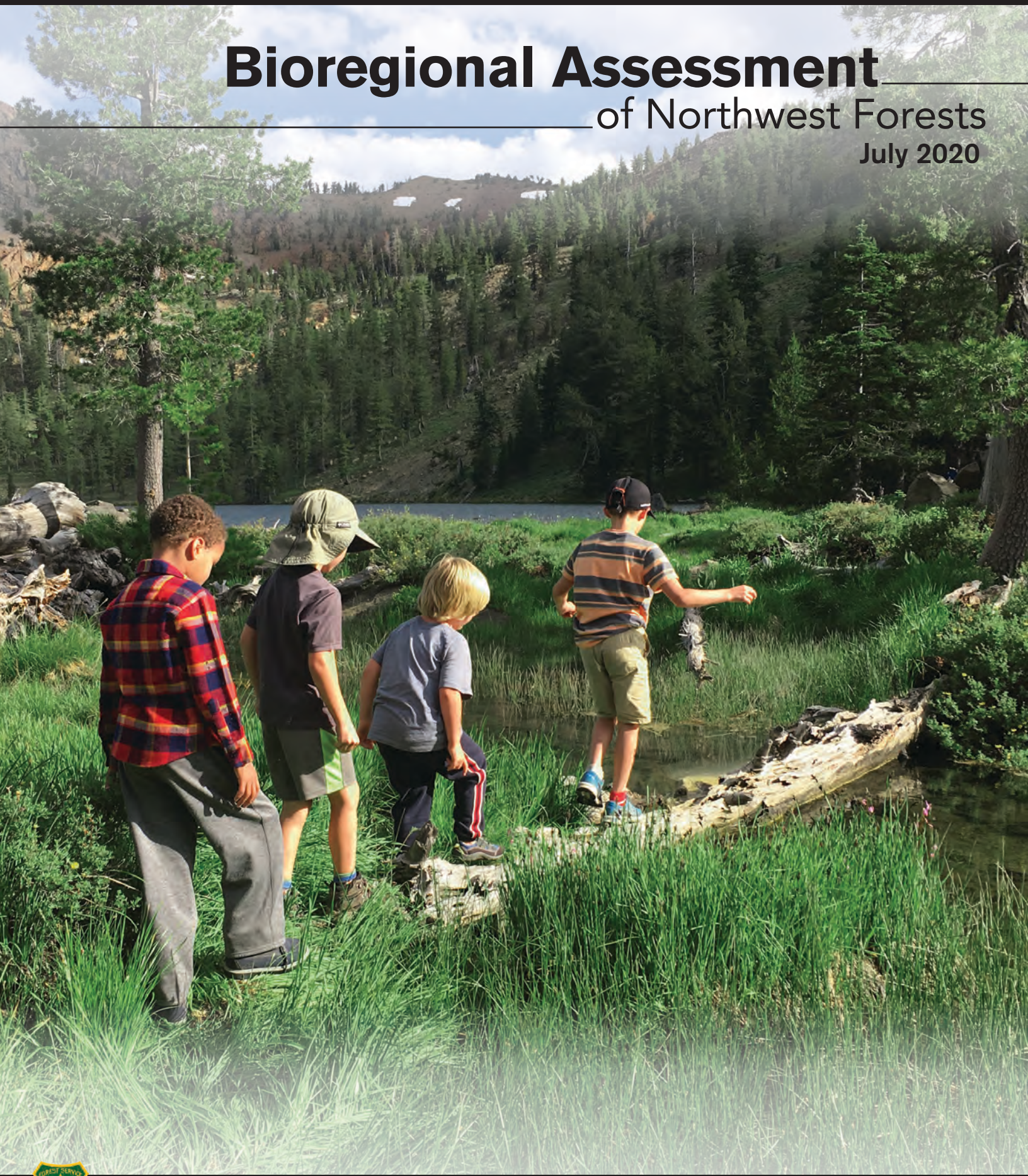
USDA
United States Department of Agriculture

Bioregional Assessment
of Northwest Forests

July 2020



Forest Service

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Dear Reader

The Pacific Northwest and Pacific Southwest Regions land management of the USDA Forest Service are pleased to introduce the Bioregional Assessment of Northwest Forests. For the last several years, in both formal and informal settings, we heard from many stakeholders that our land management plans and the Northwest Forest Plan amendment, covering western Washington, Oregon, and northern California, need updating. Among other issues, we heard that there is an urgent need to address risk to communities and ecosystems from wildfires, insects and disease, and other stressors. We also heard that we need to better balance and disclose the expected tradeoffs between economic and environmental issues.

As land managers, we reviewed monitoring and internal feedback and identified that the 19 land management plans in the Northwest were not fully achieving desired outcomes, partly due to tremendous changes in ecological and socioeconomic conditions in the last two decades. We believe the landscape-scale approach of the 1994 Northwest Forest Plan amendment has served us well across many resource topics. However, we recognize that given the geographic diversity of the 24 million acres in focus, updates to national forests and grasslands plan direction can help us address the unique challenges national forest and grasslands face to more fully achieve ecological, economic, and social desired outcomes across the landscape.

We recognize forest land management updates initiate a complex planning process that can be time intensive for our stakeholders, partners, local governments and the Forest Service. This is especially true when numerous forests are bound together through amendments such as the 1994 Northwest Forest Plan. Given this challenge, we believe this Bioregional Assessment can inform options to efficiently and effectively update plans while maintaining alignment of plan direction where and when applicable to address broad-scale issues.

This Bioregional Assessment is not intended to comprehensively address everything that might warrant a change in our land management plans. Instead, we focus on the most compelling issues that need updating and highlight those that are shared across the broad landscape, such as species habitat and wildland fire. We drew upon the best available science and, working collaboratively with our research stations, we designed this assessment to communicate key issues clearly and concisely. Through assessment of the most important information evaluated, we will identify the need to change existing land management plan direction.

What we give you in this document is only the beginning of the journey toward updating our land management plans. We will work together to develop the specific solutions that fully address recommendations in this assessment. We are putting in place robust opportunities for your engagement and feedback throughout the planning process. We anticipate a challenging task balancing the ecological and socioeconomic tradeoffs present in such a dynamic landscape. We value your ideas and appreciate your willingness to work with us to discover innovative approaches to achieve this goal.

Thank you,

Randy Moore, Regional Forester Pacific Southwest Region
Glenn Casamassa, Regional Forester Pacific Northwest Region

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Introduction

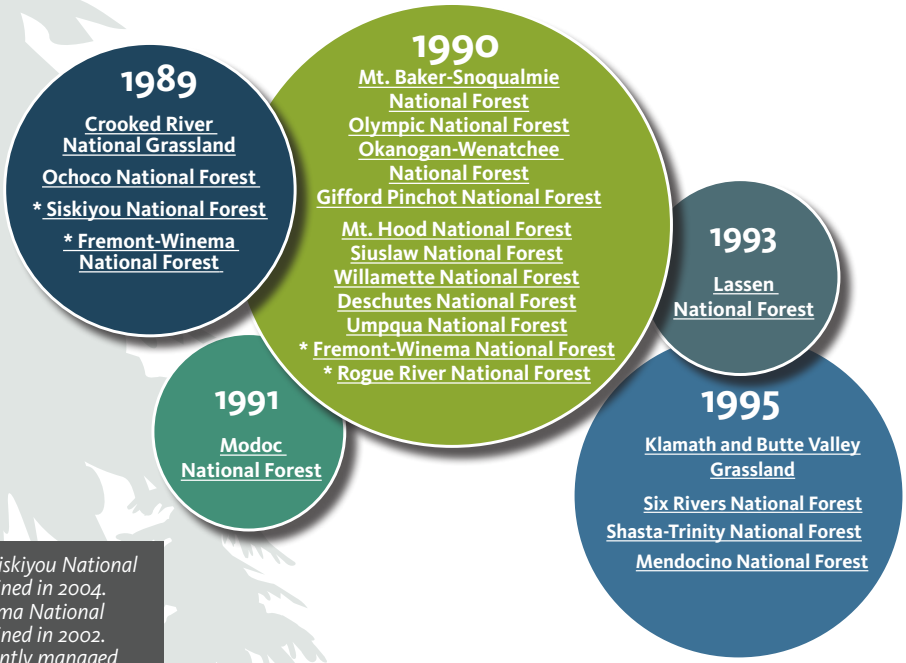
The Forest Service, U.S. Department of Agriculture, is exploring options to modernize 19 land management plans in the Bioregional Assessment (BioA) area (figures Intro-1 and Intro-2). The 19 plans include all those in the Northwest Forest Plan amendment (NWFP) and two other adjacent national forests. The BioA will help us explore innovative planning strategies to more efficiently and effectively manage national forests and grasslands with similar as well as differing issues and potential solutions, while considering community and stakeholder interests. Rather than being confined by administrative boundaries, our regional approach to modernizing land management plans in the BioA area will be an opportunity to understand the individual contributions of each national forest and grassland as well as their collective contributions to community needs and ecological integrity across a broad landscape. The BioA is focused primarily on national forests and grasslands but, to assess ecological and social connections across the landscape, we considered some other federal and non-federal lands. The BioA assesses current conditions and trends across a broad landscape and serves as a foundation for future land management planning.

What the Bioregional Assessment is Not

The BioA does not make land management planning decisions; it is not a decision document. It will not replace development of individual forest or grassland assessments; instead, it will inform those assessments, and is intended to reduce the time it takes to complete them.

This is not a comprehensive document and purposefully lacks details on specific solutions. The BioA does not include specific planning components and is intentionally non-prescriptive. Forest, project, or site-specific topics are not discussed in this document but will be collaboratively developed during public and stakeholder engagements as the planning process continues.

When Land Management Plans in the Bioregion Were Enacted



** Rogue River and Siskiyou National Forests were combined in 2004. Fremont and Winema National Forests were combined in 2002. Each forest is currently managed under a land management plan enacted before merging.*

Figure Intro-1—Land management plans in the BioA area are more than 25 years old. There have been changes in social, ecological, and economic conditions, as well as in resource demands, and new scientific information and policy is available. We need to make sure that land management plans are responsive to current issues and conditions.

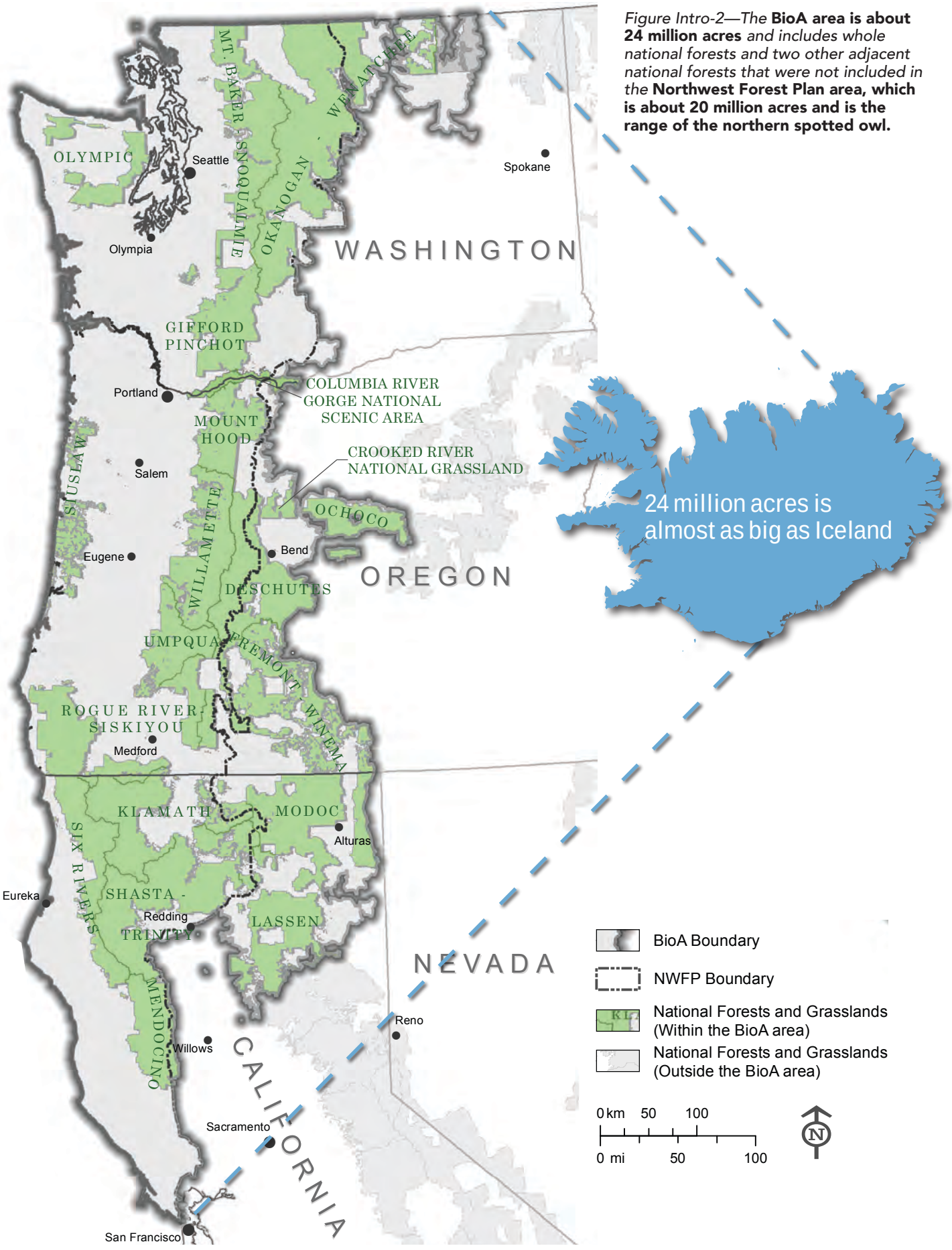


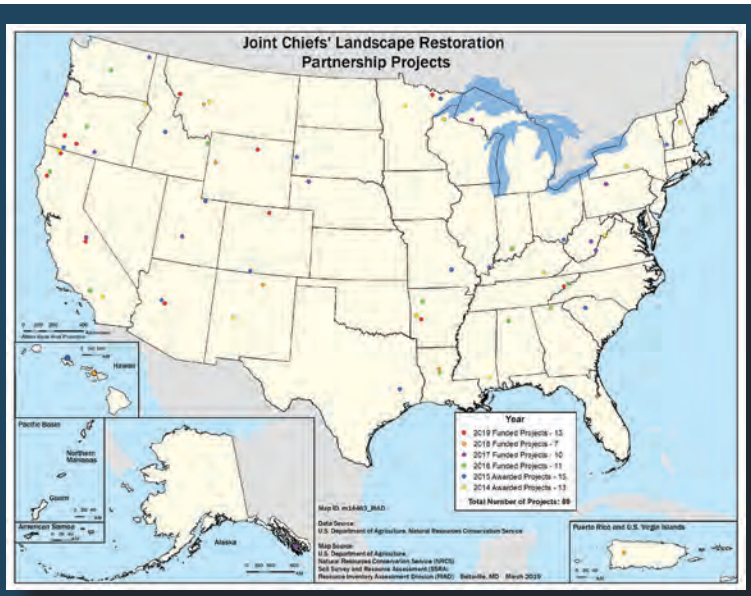
Figure Intro-2—The **BioA area is about 24 million acres** *and includes whole national forests and two other adjacent national forests that were not included in the* **Northwest Forest Plan area, which is about 20 million acres and is the range of the northern spotted owl.**

The BioA is grounded in science, land management experience, and feedback received during community listening sessions. To compile this document, the Forest Service Pacific Northwest and Pacific Southwest development team relied on nearly 25 years of monitoring data[1] and many information sources, including the 2018 *Synthesis of Science to Inform Land Management within the Northwest Forest Plan Area*,[2] other adjacent-area science syntheses,[3] the 2015 public listening sessions, fire-risk assessments, and state action plans.

Shared Stewardship

"Shared Stewardship is about working together in an integrated way to make decisions and take actions on the land." — USDA Forest Service Chief Vicki Christiansen

Today's Forest Service land managers face a range of urgent challenges, including uncharacteristic wildfires, increasing recreation needs, conflicting public needs, degraded watersheds, and insect and disease epidemics. We are committed to a shared stewardship strategy to address these challenges by working collaboratively to identify priorities for landscape-scale treatments and working with a variety of partners to do the right work in the right place and at the right scale. By coordinating at the state level, we will be able to increase the scope and scale of critical forest treatments that support communities and improve forest conditions.



The shared stewardship strategy builds upon a foundation of collaborative work, such as the Joint Chiefs' Landscape Restoration Partnership, the National Cohesive Wildland Fire Management Strategy, and the Collaborative Forest Landscape Restoration Program. The strategy also builds on authorities created or expanded in the 2018 Omnibus Bill and the 2018 Farm Bill, such as the Good Neighbor Authority. The Forest Service will build on the foundation to work more closely with states, Tribes, and other partners to set cross-boundary priorities.

The BioA was informed by 19 public listening sessions held throughout the Northwest in the spring of 2015. During the sessions, we gathered public thoughts and concerns about revising land management plans in the BioA area. We learned that there is a need to balance local values and economic considerations with environmental concerns, more fully consider fire management and risk, work to meet the NWFP timber projections, focus more on recreation, improve road maintenance and safety, protect water quality and watershed health, and avoid single-species management. We also heard that we should keep much of what is working well, like the conservation networks in the NWFP. We value public feedback and are committed to a transparent planning process as we continue to improve trust and build relationships throughout the entire planning process.

19 Public Listening Sessions

In the spring of 2019, the BioA team held meetings with more than 220 Forest Service employees working on the national forests and grasslands in the BioA area. Their feedback helped us better understand the opportunities and challenges these national forests and grasslands face when implementing their land management plans.

Based on what we heard from the public and our employees, we developed five categories to organize the findings and recommendations presented in the BioA—ecological integrity, fire and fuels, sustainable timber, habitat management, and sustainable recreation.

The Forest Service will continue to engage with our publics and stakeholders throughout the entire land management planning modernization effort. A Northwest Forest Plan Modernization webpage provides updates and opportunities for further public engagement.

[1] https://www.fs.fed.us/r6/reo/monitoring/
[2] Spies and others, 2018. https://www.fs.usda.gov/pnw/page/synthesis-science-inform-land-management-within-northwest-forest-plan-area
[3] Long and others, 2014 - Sierra Nevada Science Synthesis (2014); Dumroese and others, 2018 - Northern California Plateaus Science Synthesis in progress; Stine and others, 2014 - Eastside Moist Mixed Conifer Science Synthesis (2014); Quigley and Arbelbide, 1997 - Interior Columbia Basin Assessment (1997).

Forest Service Collaboratives

There are more than 40 local and four nationally chartered Collaborative Forest Landscape Restoration Program[4] collaborative groups across the BioA area. For decades, the Forest Service has been committed to and engaged in collaboration to address local community priorities, build community capacity, leverage resources, meet goals, and increase benefits. Collaboratives have played important roles in bridging rural and urban needs and moving beyond bilateral relationships toward large-scale, integrated collaboration with diverse stakeholders.

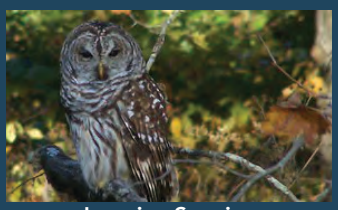
The BioA benefited from reviews by a science synthesis team working with the Forest Service's Pacific Southwest and Pacific Northwest Research Stations. Monitoring efforts to verify whether land management plans were achieving the desired results have been a successful key element of the NWFP. Research results and monitoring reports, which were captured in the 2018 *Synthesis of Science to Inform Land Management Within the Northwest Forest Plan Area*, provided the team with an up-to-date review of scientific literature about the national forests and grasslands within the NWFP area.

Forest Service assessments evaluate readily available information on land management plan topics that are appropriate and relevant. Although new analysis or studies aren't initiated during an assessment process, the assessment can help us identify information gaps that should be addressed as we move forward with the planning process. During our future land management planning efforts, we will conduct further analysis; develop or revise plan components; engage stakeholders, Tribes, and local governments; and conduct an environmental review on the affected environment, as required under the National Environmental Policy Act, regulations, and Forest Service policy.

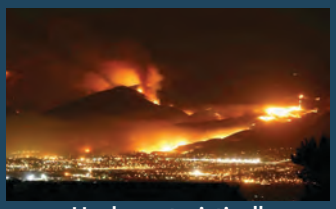
The NWFP and other multi-land management plan amendments have guided Forest Service land managers across Washington, Oregon, and northern California with a landscape-level approach to land management. Some aspects of this approach have been working well. Forests have worked collaboratively toward common objectives across administrative boundaries guided by direction associated with Land Use Allocations (figure Intro-3). Forest Service land managers have shared learning and adaptation under monitoring programs and the survey and manage standards and guidelines. They've leveraged the Aquatic Conservation Strategy as well as Pacific Anadromous Fish Strategy (PACFISH) and Inland Fish Strategy (INFISH) Aquatic Conservation Strategies to restore fisheries and link aquatic and terrestrial habitat, and they've addressed species conservation under the Sierra Nevada Framework[5] (figure Intro-4).

Science Shows Increased Threats and Concerns

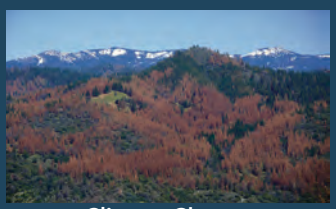
Three significant ecological threats in the Bioregional Assessment area are invasive species, such as the barred owl; wildfire because the area is increasingly likely to experience large, uncharacteristic fires; and climate change, which is affecting rates of tree mortality, temperatures of streams, and frequency and intensity of floods.



Invasive Species



Uncharacteristically Severe Wildfire



Climate Change

[4] https://www.fs.fed.us/restoration/CFLRP/
[5] USDA Forest Service, 2004.

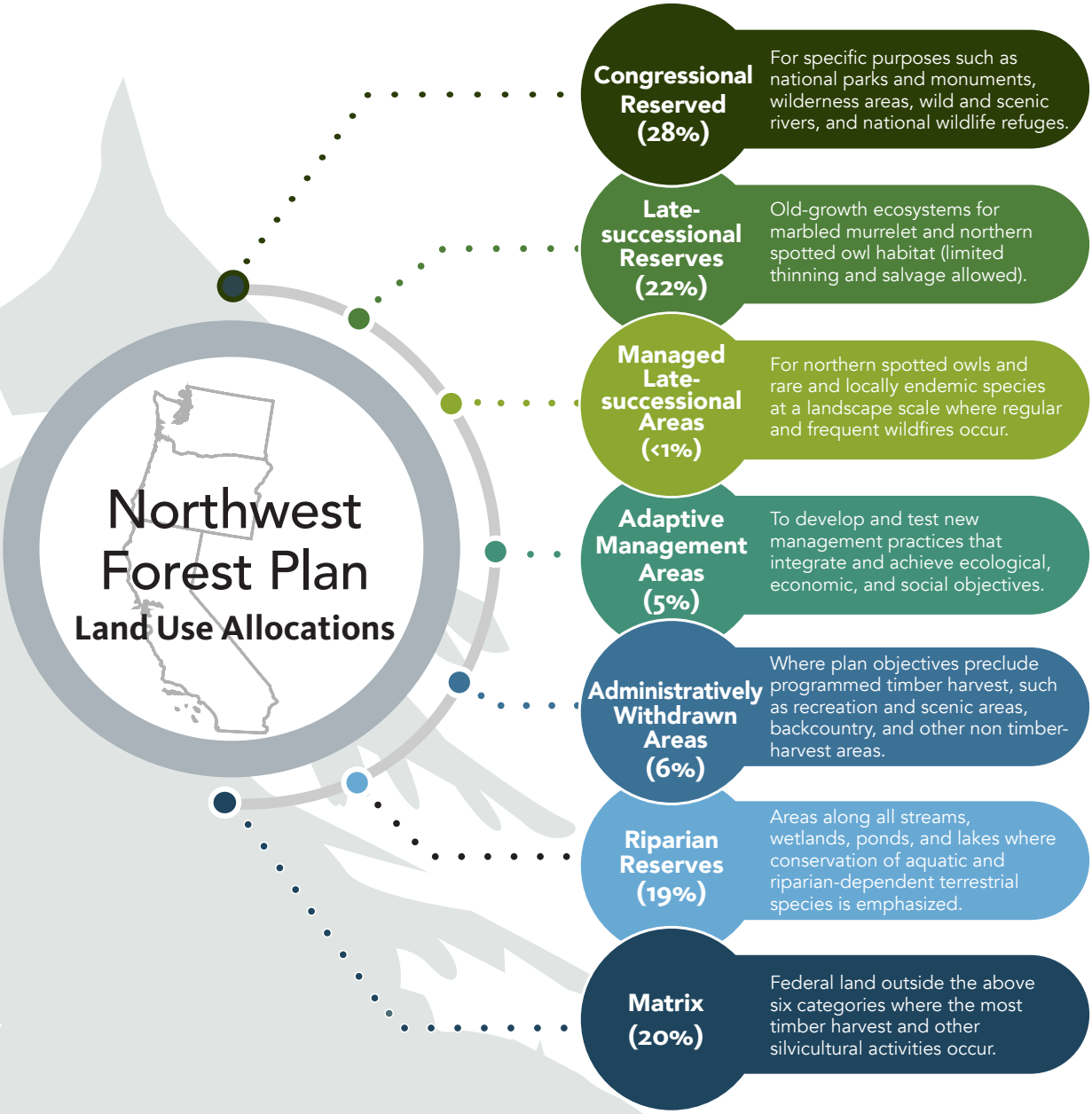


Figure Intro-3—Land use allocations are a central feature of the NWFP. Each allocation has specific direction to help ensure consistent management wherever that allocation occurs.

Northwest Forest Plan Amendment

The 1994 Northwest Forest Plan amended the land management plans on the national forests and grassland in the range of the northern spotted owl. The amendment was developed in response to mounting public concern and legal battles that halted timber harvesting in old forests throughout the owl's range. Approval of the amendment allowed timber management to continue with new operating restrictions, while habitat management for northern spotted owls, marbled murrelets, other species associated with old forests, and aquatic species was achieved. However, neither the goal to maintain a viable timber industry to sustain rural communities and economies nor the goal to recover habitat for the northern spotted owl has been achieved.

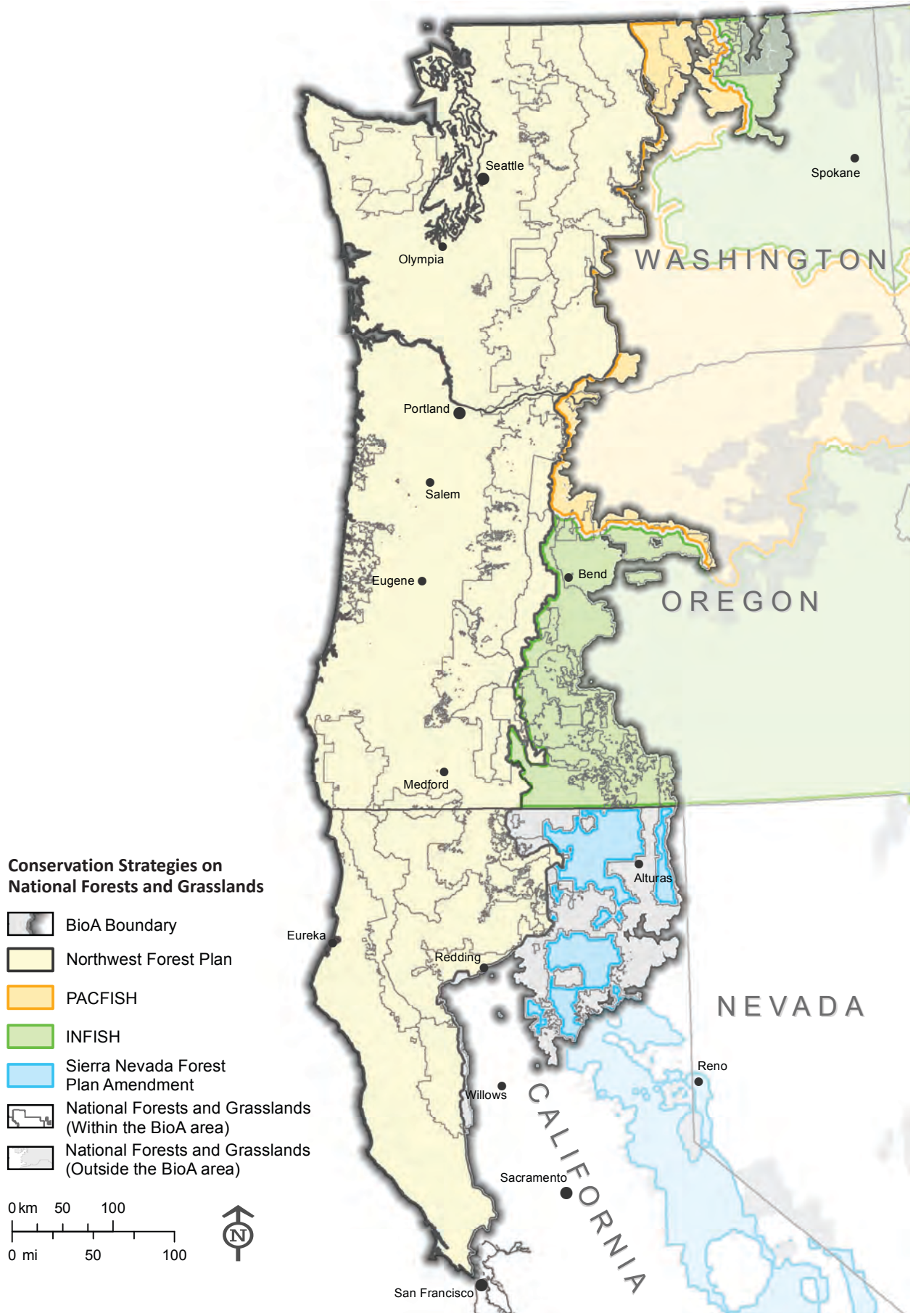


Figure Intro-4—Conservation strategies amending land management plans on national forests and grasslands across the BioA area. Most of the national forests in the BioA area were amended by the NWFP (72 percent) but INFISH (14 percent), PACFISH (3 percent), and the Sierra Nevada Forest Plan Amendment (10 percent) also influence land management plans within the BioA area.

Although there are benefits from consistent land management policy, **land managers struggle with a one size fits all management approach that does not always fit the circumstances.** For example, some plan direction hasn't worked well in distinguishing between the dry and wet forest ecosystems across the national forests and grasslands in the BioA area, especially given the fire adapted ecology of some forests. The landscape-level amendments have focused on protecting and developing habitat for aquatic and old forest-dependent species, and they don't necessarily reflect today's understanding of dynamic landscapes. Some habitat types in the wetter parts of the region, such as vegetation that emerges after forest-replacing disturbances, are becoming scarce across the landscape. And, although the Forest Service is one of the largest suppliers of outdoor recreational opportunities in the area, the NWFP and other land management plans and amendments lack modern direction supporting sustainable recreation.

The BioA offers management recommendations to address some of these challenges. As the modernization effort moves into individual national forest and grassland assessments, analyses, and planning, we will use the BioA as a tool during conversations with diverse stakeholders to more fully address the social aspects surrounding natural resource management.

We acknowledge that land management planning alone won't resolve conflicts in values or tradeoffs. We are committed to learning how and why stakeholders hold different values and to providing transparent public engagement opportunities throughout the entire planning process to increase shared learning and build trusting relationships. We believe that improving and maintaining trust among the Forest Service, Tribes, other agencies, local partners, and communities is essential to developing broadly supported land management plans, which help ensure that we're moving toward the desired conditions on the lands we manage.[6] With public and stakeholder participation, we'll determine what current land management plan direction should be carried forward and what can be improved upon based on new information, today's issues, and what best meets the needs of today's communities and stakeholders.

What are Land Management Plans and Monitoring Plans and why we do them

The National Forest Management Act of 1976 requires that every national forest and grassland develop and maintain a land management plan. Plans set the overall management direction for a forest or grassland, guiding projects and activities on the ground. The process for developing and revising land management plans, along with the required content of plans, is outlined in Forest Service planning regulations, often referred to as the planning rule. The 2012 planning rule created a collaborative and science-based planning process to guide management of national forests and grasslands so that lands are ecologically sustainable and contribute to social and economic sustainability. The planning rule emphasizes public involvement through every step of the planning process and specifies working with Tribal, state, and local governments.

Land management plans have integrated components that guide land management decision-making. **Desired conditions** are a description of specific social, economic and/or ecological characteristics of the plan area towards which progress can be made. **Objectives** are measurable and time-specific statements that, if achieved, would contribute to maintaining or reaching the desired conditions. **Standards** are a mandatory constraint on project and activity decision-making, often expressed as sideboards that are established to help achieve desired conditions. **Guidelines** are like standards, but they allow for departure from the terms, if the purpose of the guideline is met. Specific lands within a plan area are determined to be suitable or not suitable for various uses or activities, such as timber production, grazing, and road construction, based on the desired conditions for those lands. **Suitability of lands** is a required plan component, but need not be identified for every use or activity. A land management plan is also required to have a **plan monitoring program.** A broader-scale monitoring strategy is developed at the regional level for monitoring questions that are best answered at a scale larger than one forest or grassland. We use monitoring information to determine if changes are needed to the plan direction, the management activities, the monitoring program or, if we should reassess the current conditions and trends.

[6] Cerveny and others, 2018.

Most land management plans in the BioA area were written about 30 years ago, and a lot has changed since they were adopted and amended. Communities are better informed and are interested in working with the Forest Service to contribute to land management approaches and planning solutions that tackle complex social, economic, and ecological challenges across multiple boundaries and ecosystems. Today, there's a greater expectation that national forests and grasslands provide a range of ecosystem services, such as clean air and water. These lands also help people and communities build relationships with nature and serve as a repository of cultural and natural treasures for future generations.

Based on the findings in the BioA, the Forest Service may approach individual land management plan modernization by grouping national forests and grasslands based on geography, common issues, or ecosystems, if consistent management approaches are warranted. Or, it might be appropriate to complete region-wide or sub-region-wide plan amendments to modernize plans and ensure that consistent direction is developed and applied at the appropriate scale. The Forest Service might decide to combine some modernization approaches, and we'll consider other options, such as updates to Forest Service policy and regional forester direction. Regardless of the adopted planning strategy, we will sustainability manage national forests and grasslands in the BioA area to deliver long-term benefits and services to the communities and stakeholders that rely on our national forests and grasslands.

Roadmap

The BioA contains five chapters, bookended by an Introduction and Next Steps. There's a glossary at the end of the document to help clarify some words and terms used in the document and a reference section, also at the end, that provides a citation for each of the in-text references. After the Introduction, we focus on the importance of the communities we serve and the many benefits and services that national forests and grasslands can and do provide (chapter 1). Delivering the bottom line up front, we dive right into our 10 key management recommendations in chapter 2, summarizing potential updates to the existing land management plans in the BioA area. In chapter 3, you'll read about what's been working well under the existing plans, suggesting that some guidance and direction should be retained as we move through the modernization process. Chapter 4 acknowledges that there have been management challenges, and we talk about the potential opportunities for change that support the recommendations in chapter 2. Chapter 5 is an overview of key geographic considerations highlighting where similar challenges and opportunities for change are occurring across the landscape. The BioA closes with some initial thoughts on the next steps that we might take together as we move toward modernizing the Forest Service land management plans in the BioA area.

Chapter 1

Serving People

Caring for the land and serving people is the motto of the Forest Service, which means we're thoughtful about balancing the short- and long-term needs of people and nature. We do this by working in collaboration with Tribes, communities, and our partners; providing access to resources and experiences that promote economic, ecological, and social vitality; and connecting people to the land.

National forests and grasslands deliver significant value for all citizens. They provide us with clean air and water, habitat for plants and animals, and natural settings and recreational opportunities. And, they deliver essential commodities for our benefit today and for the benefit of future generations.

Biological diversity is critical to sustaining healthy ecosystems and provides a variety of social and economic values to people. The plants, animals, and fungi within the BioA area support traditional and cultural uses, recreation activities, and connections to nature. Money spent by anglers, hunters, and wildlife watchers on national forests and grasslands within the BioA area contributes considerably to local and regional economies.[7]

The benefits of national forests and grasslands improve the quality of our lives. Some benefits, such as timber, have an easily identifiable monetary value. Others, such as cultural heritage, have tangible forms of value, such as artifacts, buildings, and landscapes, and also intangible forms of value that support value systems, beliefs, traditions and lifestyles. While there has been no one common community experience during the past few decades, small rural communities are generally more susceptible than urban communities to changes in how we sustain and deliver both monetary and non-monetary benefits. As such, changes in federal land management can lead to significant impacts to day-to-day life.

More than 70 federally recognized American Indian Tribes have lands or ancestral territory within the BioA area and maintain a government-to-government relationship with the Forest Service. In this document, we use the term "Tribes" to acknowledge those recognized as sovereign by the U.S. government and also the many tribes that petitioned for but were denied federal recognition when Congress ended federal acknowledgment of Tribal sovereignty in California and Oregon between 1954 and 1964.[8] Ecosystems within the BioA area provide and support a broad range of ecocultural resources important to Tribes including foods, medicine, materials, and non material values. Tribal communities continue to foster longstanding customary relationships with natural resources and are impacted by land management of culturally significant sites and resources.

Based on existing data, in this chapter we examine key forest benefits and highlight their social and economic values. We look at what's been working well for local communities and where communities have struggled to adapt under current land management plans on the national forests and grasslands in the BioA area. We acknowledge limitations and consider what we can do to improve how we serve communities into the future. We will update information related to economic benefits to communities with detailed, site-specific local data during future land management planning. More information about the benefits that national forests and grasslands provide to local communities is in each BioA chapter.

[7] USFWS 2011b, 2016.
[8] Koenig and Stein, 2008.

Supporting Jobs

Jobs are one of the most critical ways that national forests and grasslands support social and economic activities in many communities throughout the Northwest. In 2016, activities on federal lands in the NWFP area supported almost 25,000 jobs, with spending by visitors supporting about 7,800 recreation-based jobs and activities associated with timber harvests supporting about 8,900 jobs, (figure 1-1).[9]

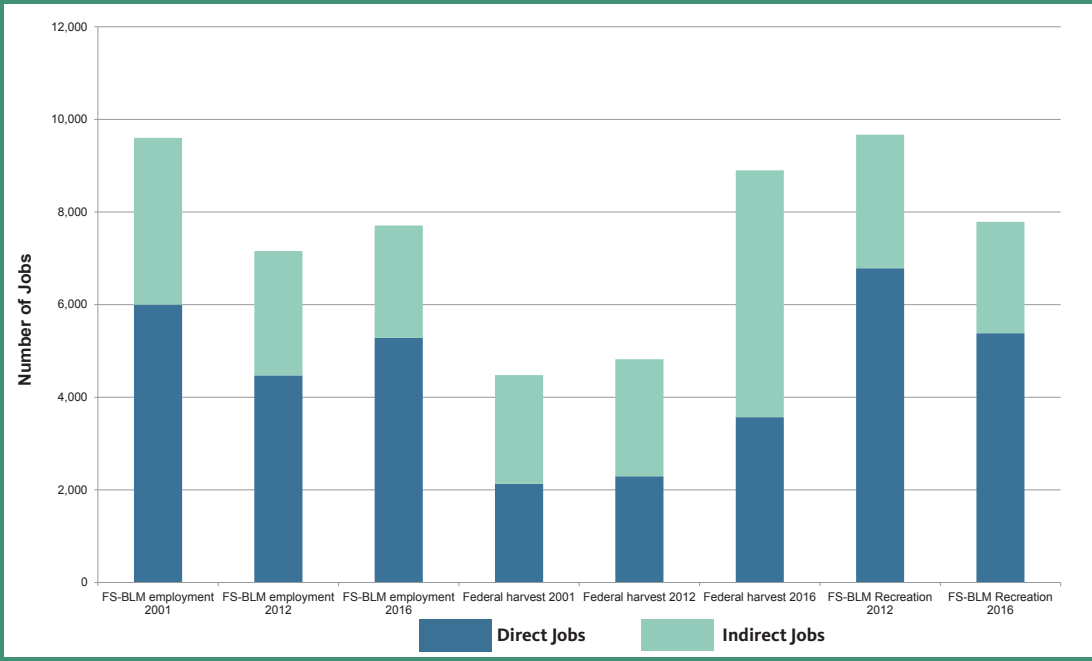


Figure 1-1—Employment supported by Forest Service and Bureau of Land Management programs in the NWFP area in 2001, 2012, and 2016. Forest activities support jobs in key sectors related to federal timber harvests, recreation, and agency employment. Direct jobs are supported by forest activities (e.g., timber harvesting) and indirect jobs are supported by subsequent business-to-business transactions that support these forest activities (e.g., spending on materials, equipment, and fuel for forest work). Source: Adapted from Grinspoon and others.

We have more information about supporting job opportunities in the NWFP area than outside the area due to decades of monitoring. However, we do know that in 2016, the Ochoco National Forest supported almost 800 jobs in local communities—mostly associated with Forest Service employment, grazing, and timber; the Modoc National Forest supported about 1,000 jobs—mainly in grazing and federal employment; and the Lassen National Forest contributed about 1,400 jobs—mostly in federal employment, timber, and recreation.

Sustainable Recreation

Recreation activities provide enjoyment for millions of national forest and grassland visitors. Recreation improves physical and mental health and helps people connect with the outdoors. In the BioA area, national forests and grasslands offer great opportunities for outdoor recreation. As such, tourist spending is a large part of the economic benefits national forests and grasslands provide to communities. On the national forests and grasslands in the BioA area, people enjoy biking, hiking, camping, horseback riding, off-road vehicles, hunting, fishing, skiing, wildlife viewing, and water sports. **In the NWFP area, recreation visitors spend about $613 million annually** on lodging, restaurants, souvenirs, and other trip-related expenses that support businesses in local communities.[10]

[9] Grinspoon and others in progress-Some data and information presented in this chapter are from the *Northwest Forest Plan—The First 25 Years (1994–2018): Socioeconomic Monitoring Results* report. The report is in development as of publication of the Bioregional Assessment.
[10] Charnley and others, 2018.

Forest Products

Forest products, logging, and wood manufacturing support many different types of jobs in local communities. Total employment in forest products industries in the NWFP area has declined in the past 25 years and, even as overall harvest in the area has increased slightly since 2009, there has not been a corresponding increase in jobs (figure 1-2).[11] Timber job losses have more impact on small rural communities, where up to 10 percent of the community could be working in forest products manufacturing, than larger, urban communities. The Forest Service also supports jobs by hiring and training local contractors to work on forest restoration activities.

Forest products in the BioA area are a tremendous benefit for people and communities, and provides a critical resource for economic development in the United States. About 600 million board feet of timber was harvested each year from 2009 through 2018 from national forests in the BioA area—enough to build about 37,000 homes. Timber also generated average annual revenues of about 39 million dollars for forests in the BioA area. Nontimber forest products, such as moss, mushrooms, cones, grasses, and firewood, provide valuable economic and cultural benefits to rural, Tribal, and urban households through their use, harvest, and processing.[12]

Timber-related employment and timber harvest on federal, state, Tribal, and private land in the NWFP area.

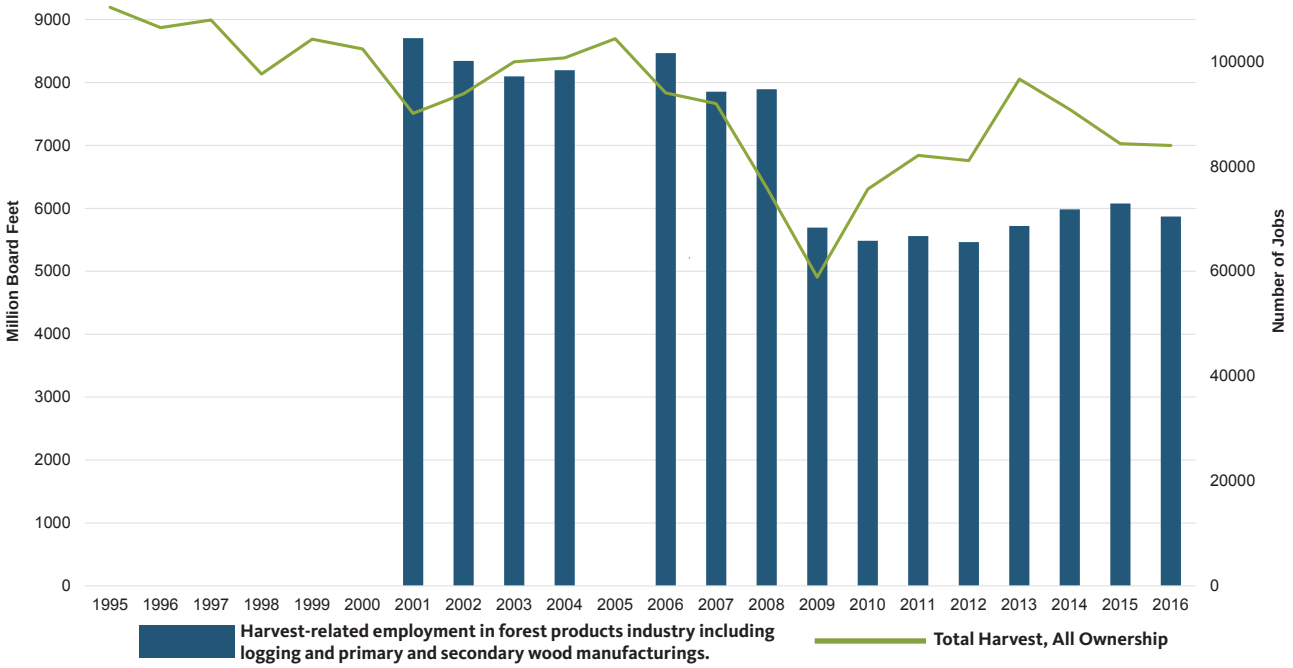


Figure 1-2—Harvest-related employment and timber harvest on all ownerships—federal, state, Tribal, and private—in the NWFP area. The decline in employment from 2006 to 2009 has not improved despite recent increases in harvest, which might be due to changes in industry structure and improvements in mill efficiencies. Employment data was not available pre-2001 or in 2005. Source: Adapted from Grinspoon and others in progress.

Average annual forest products on national forests within the BioA area (2009 - 2018)

[11] Grinspoon and others in progress.
[12] Grinspoon and others in progress.

Bull Run Watershed

Located 26 miles from downtown Portland in the Sandy River basin on the Mt. Hood National Forest, the 102-square-mile Bull Run watershed collects rainwater and snowmelt that flows to the Bull Run River and its tributaries. As the primary drinking water supply for Portland, water from the watershed drains into two reservoirs that store more than 17 billion gallons of water. This water serves nearly a million residents in the Portland metropolitan region, a quarter of Oregon's population.

Water, one of the most important natural resources we receive from our national forests and grasslands, provides valuable ecological benefits, supports terrestrial and aquatic species, and enables us to enjoy many types of recreation activities. Local communities depend on water from national forests for their economic growth as well as to meet their municipal, industrial, and agricultural needs. In fact, **about 49 percent of the water in the western United States comes from national forests and grasslands** (figure 1-3).[13] Water has an annual monetary value of more than $3.7 billion nationally with the highest values in Oregon, Washington, and California.[14]

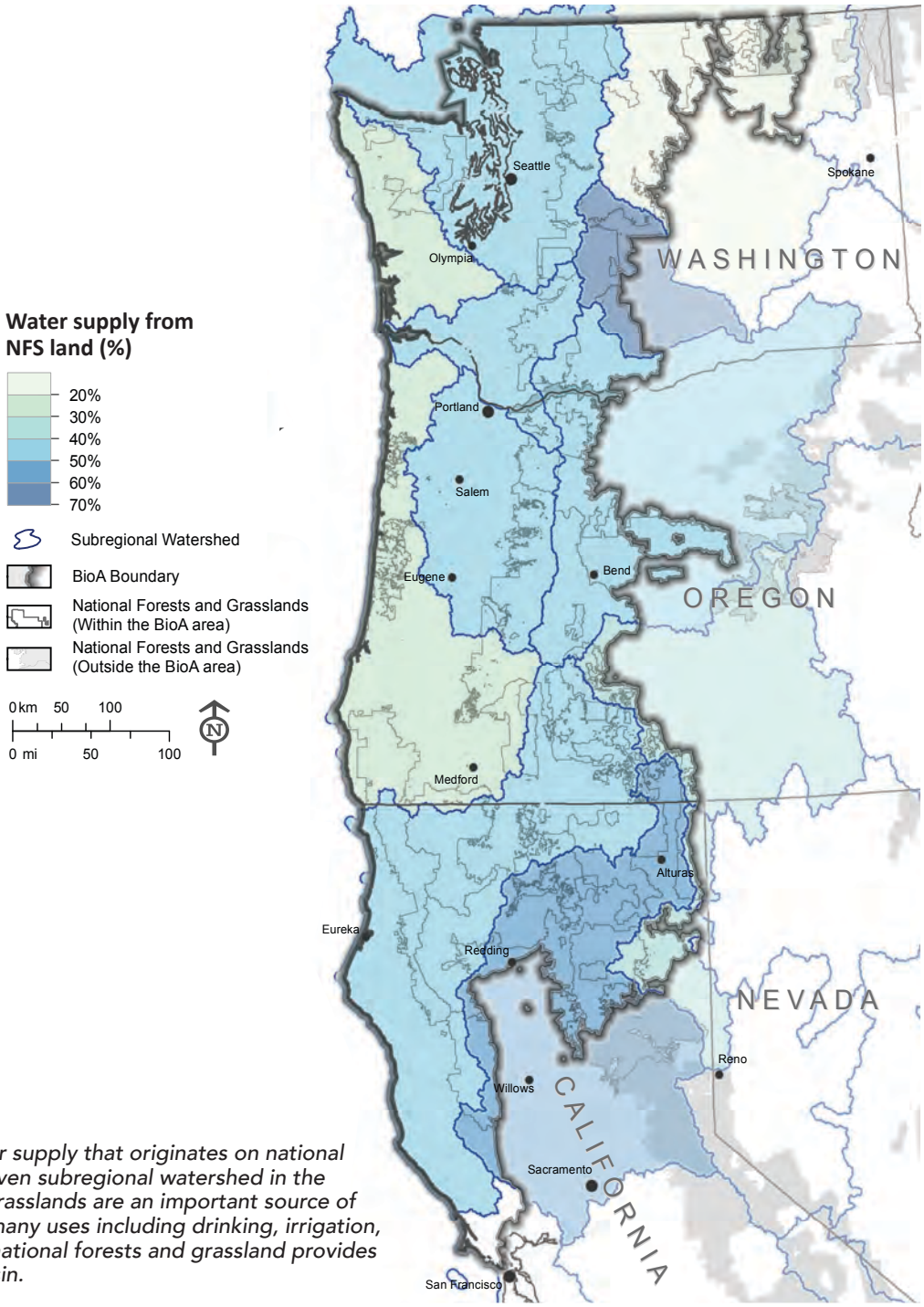


Figure 1-3—Percent of total water supply that originates on national forests and grasslands within a given subregional watershed in the BioA area. National forests and grasslands are an important source of abundant high-quality water for many uses including drinking, irrigation, and aquatic habitat. Water from national forests and grassland provides much of the water for a given basin.

[13] Brown and others, 2016.
[14] Sedell and others, 2000.

Air quality

Forests contribute to improved air quality, making it safer to breathe and easier to see as a result of reduced ozone and less particulate matter. Clean air and good visibility contribute to a sense of wellbeing, enhancing people's desire to recreate on national forests and grasslands and engage in spiritual and cultural activities, which results in positive impacts to area visitation and jobs in local communities. In contrast, smoke from wildfires and some prescribed fires adversely affects air quality and can negatively impact the health and quality of life for visitors and residents. There is an economic effect to the communities that are dependent on recreation when visitors choose to avoid smoke-filled areas.

Economic Impacts of Smoke From Fire

The effects of smoke from fires can be wide reaching. In the summer of 2018, many communities in the BioA area experienced long periods of heavy smoke from wildfires. The Oregon Shakespeare Festival in Ashland canceled or moved more than 26 outdoor performances, resulting in an estimated loss of $2 million to the local community. This loss does not include any additional trickle-down impacts for businesses. Visits to nearby Crater Lake National Park dropped by 22 percent and uses of other area outdoor recreation businesses declined as much as 45 percent. The Ashland Chamber of Commerce noted some members' sales dropped 20 to 60 percent that summer.

Carbon Storage

Most forests and grasslands in the BioA area, especially those in the western part, have much higher carbon densities than the rest of the country (figure 1-4).[15] Carbon storage, or sequestration, is a global benefit that is hard to quantify or put a dollar value on, but it supports ecosystems and local and worldwide communities by addressing one of the main causes of climate change.

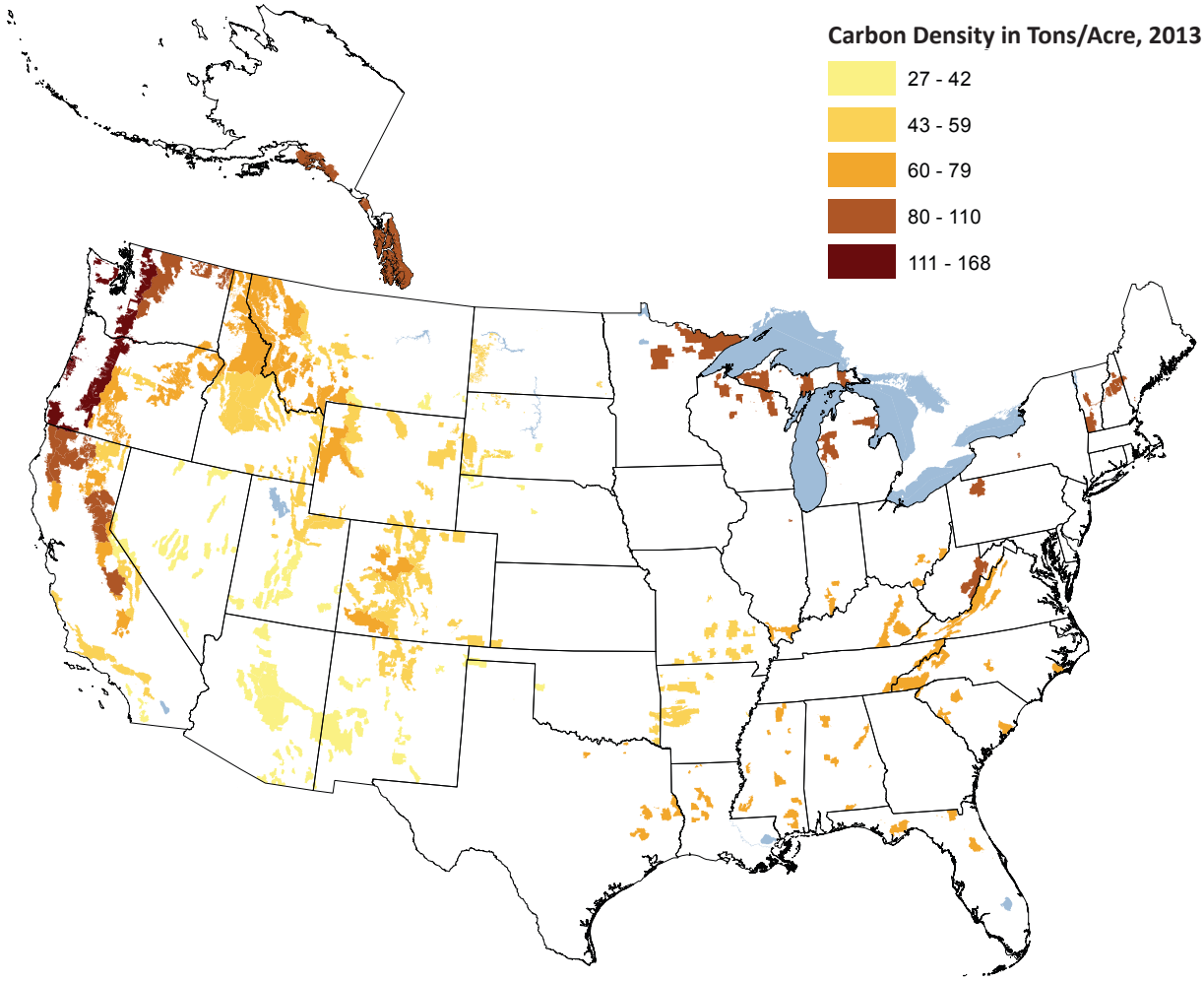


Figure 1-4—Carbon density on national forests and grasslands, as of 2013. Most forests and grasslands within the BioA area, especially those in western part of the BioA, have much higher carbon densities than the rest of the country. Source: USDA Forest Service 2015.

[15] USDA Forest Service, 2015.

Roads and Access

Roads in the National Forest Road System provide essential access to our national forests and grasslands and are built and maintained primarily from timber-sale revenue. We use roads for recreation, specially authorized activities, Forest Service administrative activities, and for traditional and Tribal harvesting of forest products. Local communities depend on maintained forest roads for many of their daily activities. Roads and trails also provide key access for fire suppression and search-and-rescue operations. After 30 years of declining timber sale volumes and revenue, our ability to maintain the road system and its benefits to communities is challenged.

Special Use Services & Energy Infrastructure

The Forest Service receives numerous individual and business applications to use national forests and grasslands. These special uses provide many essential benefits to our nation, including water delivery, agriculture, outfitting and guiding, recreation, telecommunications, research, photography and video productions, and road and utility rights of way. The special use activities that generate the most revenue on national forests and grasslands in the BioA area are recreational residences, winter recreation resorts, powerlines, telecommunications, outfitting and guide services, and marinas. Energy infrastructure, such as transmission and powerlines on national forests and grasslands, contributes to national energy security, improves quality of life, and feeds power to communities. National forests and grasslands in the BioA area support more than 1,700 miles of energy transmission lines that contribute to local communities and regional needs. Hydropower provides important electricity generation capability to meet the needs of people across the region. In 2018, special uses in the BioA area generated about $19 million, and this annual amount has been growing for the past decade.

Livestock Grazing

Grazing provides important benefits and supports both employment and the ranching culture in local communities, particularly on the eastern forests and grasslands of the BioA area (Modoc, Ochoco and Fremont-Winema National Forests and Crooked River National Grassland). Ranchers seasonally graze on national forests and grasslands because the land usually provides high-quality forage, good access, and cooler summer temperatures at higher elevations. However, land managers are required and challenged to provide long-term sustainable grazing, while maintaining habitat for wildlife and healthy streams in the face of changing climatic conditions and the related increase in the frequency, intensity, and scale of wildfires.

Unique Forest Communities

Every forest community is different. Social and economic conditions in some communities are more connected to forest activities than in others. For example, Tribes maintain an interdependent relationship with the national forests whereby Tribal practices nurture ecological systems, and those systems nurture and sustain cultural identity and social continuity. Tribes hold deep connections to ancestral lands managed by the Forest Service and rely on effective forest management of Tribal resources to maintain those connections. The Forest Service has unique legal responsibilities to each American Indian Tribal government through treaties, where Tribes have reserved rights for their Tribal members both on and off reservation lands. The ability of all Tribes to obtain ecocultural resources from public lands in the desired quality and quantity can be reduced by both social and biophysical factors. While some Tribes have treaties, other Tribes have different rights and cultural differences, making each Tribe and its relationship with Forest Service land management unique.

Of those non-Tribal communities with close ties to national forests and grasslands, some have been able to adapt to land management changes. For example, some are "amenity communities" that have taken advantage of natural forest settings to benefit from an increase in the number of residents and visitors. In addition, some communities have been able to successfully develop economic opportunities outside of the timber sector by pursuing energy, agricultural, and tourism possibilities. In contrast, other communities have faced significant challenges as a result of land management changes. The communities that relied on a federal supply of timber to support their workforce and infrastructure (figure 1-5) are more likely to have been directly affected by reductions in federal harvests. These communities might also be aging and young people are moving away. When part of the workforce retires without being replaced by younger people, jobs remain unfilled and businesses leave the community, which leads to more people leaving and perpetuates a cycle of social and economic loss. Rural communities that depend on federal timber face these types of challenges throughout the BioA area.

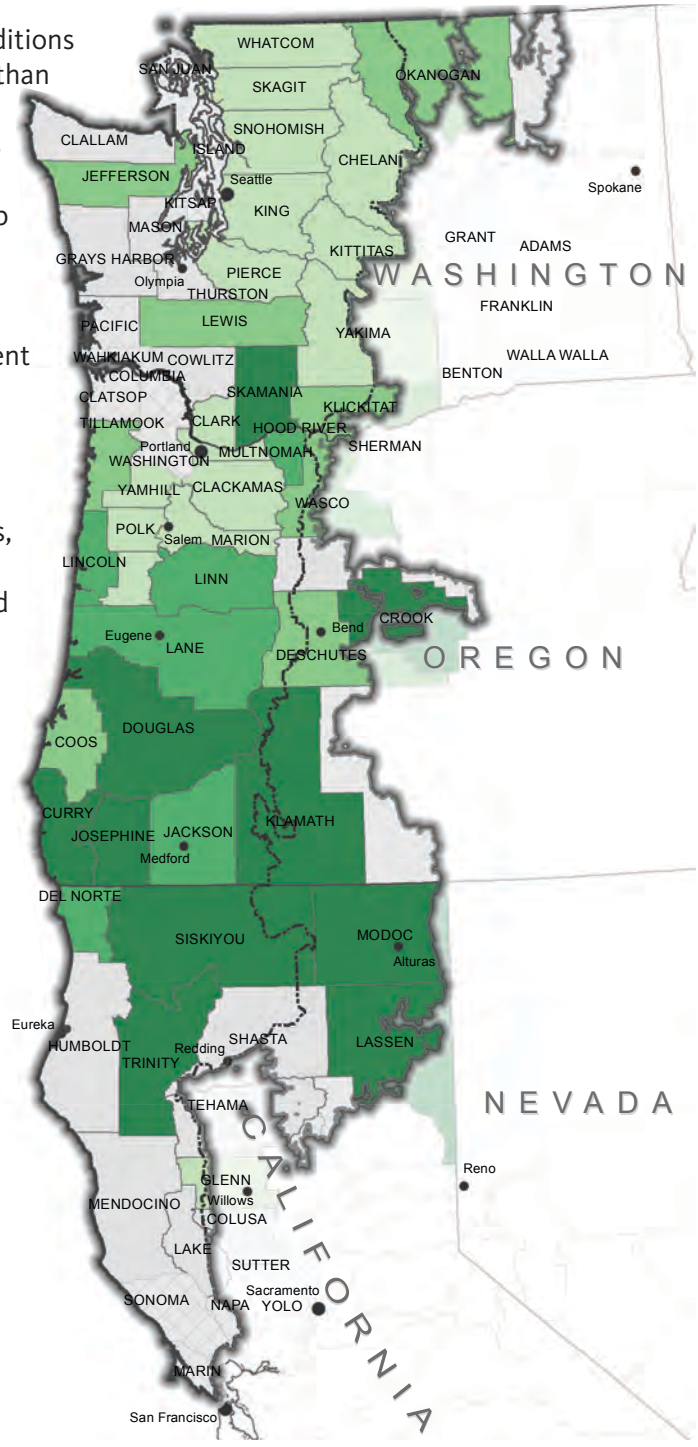


Figure 1-5—Strength of county economic and social ties to federal forest activities in 1990. 1990 is a mid-point between a period of very high harvest activity, as measured by total volume on federal forests in the 1980s, and the adoption of the NWFP in 1994. Counties with stronger links just before the NWFP era might have had a greater likelihood of experiencing challenging economic conditions related to management changes, such as reduced staffing and timber harvest levels, introduced by the plan. Counties in southern Oregon and northern California were more likely to be strongly linked to federal forest land management during this time than counties in other areas of the NWFP region. Individual communities might not have had the same strength of links to federal forest lands management in 1990 as did the county in which they are located, though the proportion of communities within a county that were strongly linked to federal forest lands management is probably higher in strongly linked counties. Some counties to the east and south edges of the BioA area are not represented as they were not part of the NWFP socioeconomic monitoring. Source: Adapted from Adams in progress.

Communities across the BioA area also experienced shifts in demography. Some communities saw an increase in minority populations, while others saw an increase in low-income residents. Demographic shifts bring new social challenges that interact with land management decisions. The Executive Order on Environmental Justice and the Forest Service's 2012 planning rule direct land managers to pay attention to how policy changes or program implementation affect vulnerable populations, such as minority, low income, elderly, and disabled populations, and to consider the unique outreach and communication needs of these populations.

The following community stories are descriptive and show differing experiences in national forest communities in the BioA area. These communities were all historically linked to federal forests and had to adapt to changes introduced by the NWFP. The stories have been adapted from the comprehensive formal analysis of communities that will be presented in the forthcoming 25-year monitoring report.[16]

Happy Camp, California

Happy Camp is a small mountain community surrounded by northern California's Klamath National Forest. The town's timber economy, based almost exclusively on national forest harvests, boomed between the 1950s and 1980s, after which national forest harvests were sharply curtailed. The last sawmill in the area shut down in 1994. Happy Camp and the surrounding area lost 22 percent of their population during the 1990s. This dramatic change created a void in the community as younger working-class families left to pursue other opportunities. A way of life—working in the woods—that had defined the community was lost and has not returned. Today, the town is home to the Klamath-Siskiyou Art Center; Karuk Tribe administrative offices, which provide important services to the community; and the USDA Forest Service's Happy Camp/Oak Knoll Ranger District offices, which have remained open but at lower staffing levels. The community has worked with the Forest Service to expand recreation visitation in the two wilderness areas adjacent to the community and on the Klamath River, which offers excellent opportunities for rafting and fishing. The community persists, but its population, economy, and social structure have changed dramatically during the past 30 years.

Leavenworth, Washington

Leavenworth is a small mountain town surrounded by the Okanogan-Wenatchee National Forest in central Washington. Nearly 6,000 people lived in Leavenworth by 1920, and the town supported a large sawmill. But the timber boom ended when the railroad was rerouted in 1926, and soon afterward the mill closed. Although many locals continued in the timber industry at nearby mills or at the Leavenworth Ranger District, the town population steadily declined until the 1960s. In 1963, community leaders decided to create a Bavarian-themed tourist town to boost the economy. Leavenworth's economy steadily improved during the latter 20th century. Tourism continued to grow as mountain biking, rock climbing, and rafting on the Okanogan-Wenatchee National Forest became popular. In addition, the forest's beautiful scenery and amenities attracted new permanent and part-time residents that spurred burgeoning real estate and vacation rental markets. Although Leavenworth is now prosperous, neither this community nor nearby communities in the Wenatchee Valley are associated with timber-sector work anymore, a fact that some residents lament. The lack of infrastructure in the area makes needed restoration work on the national forest challenging.

[16] Coughlan and others in progress.

Mill City, Oregon

Mill City is at the mouth of the North Santiam Canyon 30 miles east of the city of Salem. Between the late 1950s and the late 1980s, Mill City thrived. High-wage jobs with the town's lumber mills and the Forest Service sustained a variety of local businesses, a community theatre, and a bowling alley. Unlike Happy Camp and Leavenworth, the timber industry did not disappear from Mill City. At least one wood products mill has operated in the North Santiam Canyon area throughout the NWFP era. A few small outdoor recreation businesses are in operation, and the area has attracted some retirees. Yet the town still experienced significant social and economic change starting in the 1990s. Forest Service positions funded by timber were eliminated, many employees and their families left town, and many local logging contractors either folded or moved away.

Houses were left vacant and the number of absentee landlords grew. School enrollment declined substantially, reflecting far fewer families with children in the community. Mill City's population did not decline sharply, unlike many other rural forest towns in the Northwest. In 2017, it had roughly the same number of residents as in 1990, but it is a much different community with fewer services and jobs.

Land Management Plans Help Sustain Community Benefits

Updates to land management plan direction, while unable to resolve all issues, can help to improve social and economic sustainability and better reflect the needs of local communities throughout the BioA area, especially those in hard-hit rural communities across southern Oregon and northern California. While the Forest Service strives to balance the social, economic, and ecological needs of communities and landscapes, there are instances where one resource objective might require more emphasis than others. When updating land management plans, the Forest Service collaborates with Tribes, states, counties, and communities to develop goals and discover potential management approaches that seek the right emphasis on community and ecosystem objectives. For example, plan direction can help increase forest products generated from national forests, which can increase timber available and increase the workforce needed to maintain a stable pace and scale of restoration. In this way, land management direction can, to the extent possible, emphasize the value of social and economic benefits of national forests and grasslands to local communities.

We can help ensure effective stewardship of sustainable, healthy, and fire resilient national forest and grassland landscapes as well as recreation opportunities by developing direction that is compatible with Tribal, state, and local land and action management plans. Additionally, **the Forest Service is committed to sharing the stewardship of federal lands with Tribal, state, and local partners**. By setting priorities together, we can better focus our land management efforts across boundaries.

Local Businesses and the Forest Service Work Together

Businesses and partners in the communities around our national forests and those across the region help us do important work on our forests and grasslands. Local businesses often purchase timber sales and accomplish restoration work. And, businesses and partners located within the region might have needed unique skills and capacities. Ultimately, the amount of local economic activity that results from land management activity on our national forests and grasslands is strongly influenced by who is doing the work and if harvested wood is locally processed. Developing a shared understanding and common expectations with our partners and stakeholders about the link between land management and economic well-being is vital. It's also important to recognize the limits that land management activities have on local communities.

Conclusion

In this chapter, we recognized the significant values that national forests and grasslands deliver to all people, especially to those in communities that directly depend on economic benefits from these lands. Moving forward, we know that balancing complex ecological needs with the growing social and economic needs of communities within the BioA area will take a commitment to ongoing communication, collaboration, and coordination to develop solutions that address these challenges.

Chapter 2

Management Recommendations

Chapter 2 presents 10 key recommendations for improving land management plans to support communities and ecosystems in the BioA area. The recommendations provide a focused snapshot of the most urgent or widespread community needs and ecological issues. We recognize that the social, economic, and ecological challenges across this landscape are complex and will likely require solutions that go beyond what can be achieved by modernizing land management plans. However, these recommendations offer a step forward by identifying what can be influenced by land management planning on national forests and grassland in the BioA area.

The integrated recommendations in this chapter are based on the opportunities, challenges, and geographic considerations that you'll read about in chapters 3 through 5, as well as the contributions to communities discussed in chapter 1. This chapter weaves together key findings, while drawing out connections to people and their communities to present a cohesive, integrated set of recommendations for Forest Service land management planning across the BioA area. The recommendations intentionally don't address the details of exactly how they would be incorporated and implemented into land management plans. We'll engage with our publics and stakeholders as we move along in the planning process and then accomplish that greater level of planning detail. These recommendations don't involve all issues that might be addressed in future planning. Additional findings and recommendations that did not rise to a level of urgency or those that did not affect multiple national forests and grasslands will be considered when individual national forests and grasslands in the BioA area conduct their assessments.

Throughout the rest of this assessment, you'll notice that findings are organized under the following five broad categories. These categories represent the key social, economic, and ecological challenges facing our existing land management plans and illustrate linkages and opportunities for integration across the recommendations. We developed the categories after assessing current conditions and trends using the best available science and monitoring and implementation results as well as what we heard during the public listening sessions held in 2015 and the Forest Service meetings in 2019.

Ecological Integrity. Maintain and enhance the sustainability of our terrestrial and aquatic ecosystems so they continue to deliver important benefits.

Fire and Fuels. Manage fire and fuels for increased compatibility with natural processes, while continuing to prioritize human health and safety.

Sustainable Timber. Provide sustainable timber and forest products to local communities, while contributing to ecological restoration needs.

Habitat Management. Address habitat management to promote the recovery of federally listed species and the persistence of other species at risk.

Sustainable Recreation. Provide recreation opportunities that are sustainable considering increasing demand and the changing nature of recreation patterns.

RECOMMENDATION 1—*MAINTAIN AND RESTORE ECOSYSTEM CHARACTERISTICS AND PROCESSES BY WORKING TOWARD DESIRED CONDITIONS THAT ARE COMPATIBLE WITH THE DIVERSE LANDSCAPES ACROSS THE BIOA AREA.*

For the past few decades, conditions associated with invasive species, wildfire, and climate change have affected the sustainability of our national forests and grasslands in the BioA area, and their ability to provide the numerous benefits described in chapter 1.[17] **The water we drink, the air we breathe, the food we gather and eat, and the places where we recreate and enjoy spiritual renewal, depend on the sustainability and integrity of our national forests and grasslands.**

The ability of ecosystems to persist in the face of stress or pressure and continue providing benefits into the future depends on their ecological integrity (figure 2-1). However, ecological integrity is compromised across much of the BioA area (chapter 4, Ecological Integrity). We need to restore ecosystem processes, such as fire, and characteristics, such as the distribution and extent of major vegetation types, tree species diversity, forest structure, stream connectivity, density and size of dead wood, water quality and quantity, and habitat connectivity. Ecosystems have integrity when these characteristics are resilient to fire and climate change and function at multiple scales.

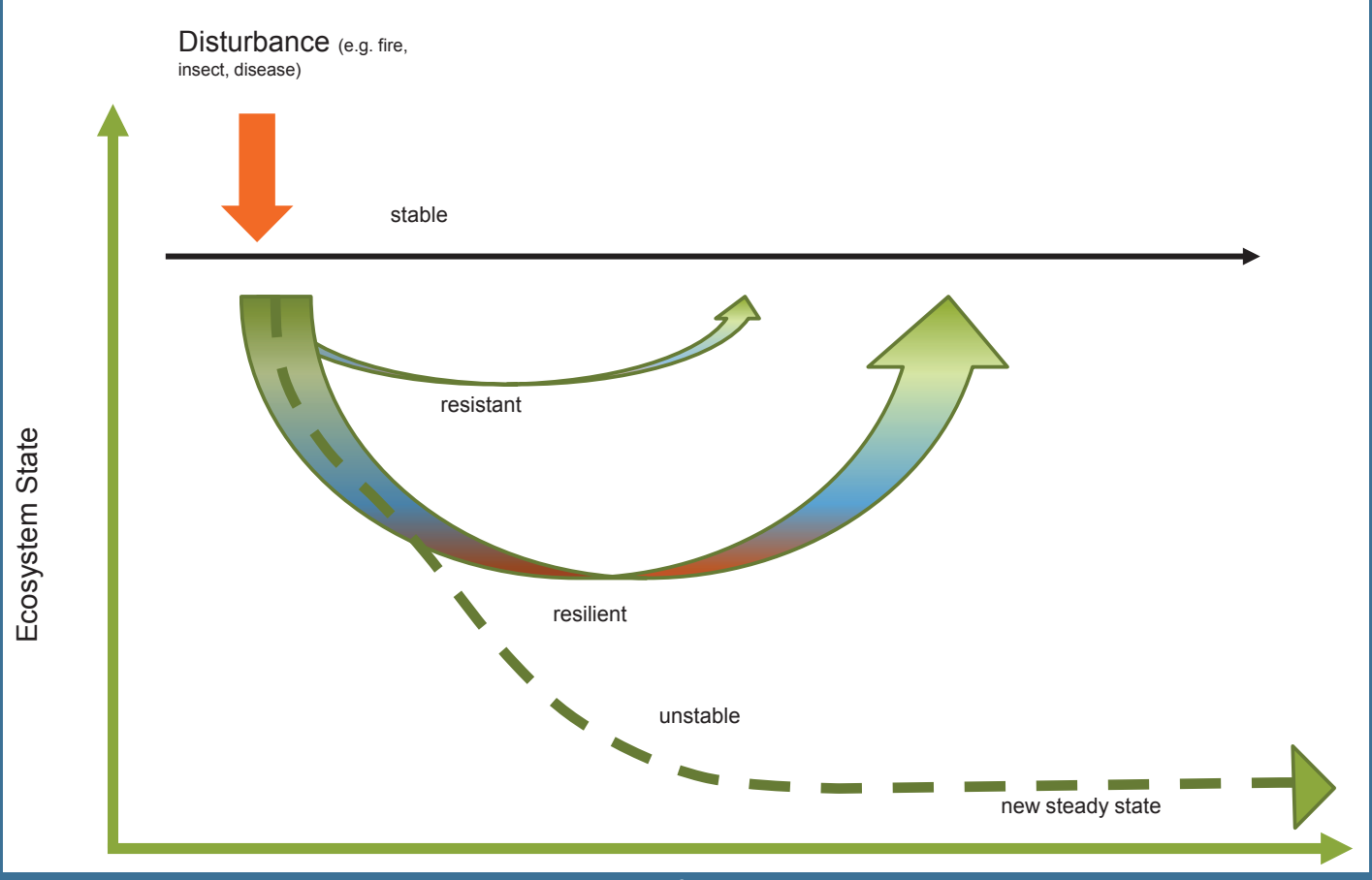


Figure 2-1—When a disturbance occurs, even a natural one like fire, drought, insects, or disease, an ecosystem responds in different ways. The ecosystem can be resistant (very little change occurs, and the system stabilizes quickly), resilient (more change occurs but the ecosystem stabilizes eventually), or unstable (ecosystem changes completely). One example of this is a frequent-fire dependent forest historically dominated by ponderosa pine that now has dense stands of white fir or grand fir. The forest could experience a low-severity ground fire and change very little (resistant), or it could experience a mixed-severity fire and take years to recover, but eventually return to a conditions resembling those before the fire. Finally, a large high-severity fire could burn a large area of forest to the ground with the ecosystem unable to regenerate ponderosa pine, instead transitioning to a fir-dominated forest or a grass or shrubland ecosystem (unstable). This figure does not incorporate climate change, changes in land use, or social factors. Adapted from Franklin and others 2018.

[17] Spies and others, 2018; Long and others, 2014; Dumroese and others, 2018.

One of the factors limiting our ability to maintain and restore ecological integrity is existing plan direction that is not always compatible with the diversity of ecosystems across the BioA area (figure 2-2) (chapter 4, Ecological Integrity and Habitat Management). For example, current direction related to tree age and size in the NWFP and the Eastside Screens[18], which promote old-growth forests, might be appropriate in some instances but can create barriers to implementing appropriate management when applied using a one size fits all approach. While existing plans have been effective at stemming the loss of dense, multi-layered old-growth habitat and providing habitat connectivity (chapter 3, Ecological Integrity and Habitat Management), it has been at the cost of ecological integrity in some areas.[19]

"The science of the NWFP did not adequately deal with substantially different ecology of forests and landscapes of the dry forest zone, which comprises almost half of the NWFP area."

Spies and others 2018

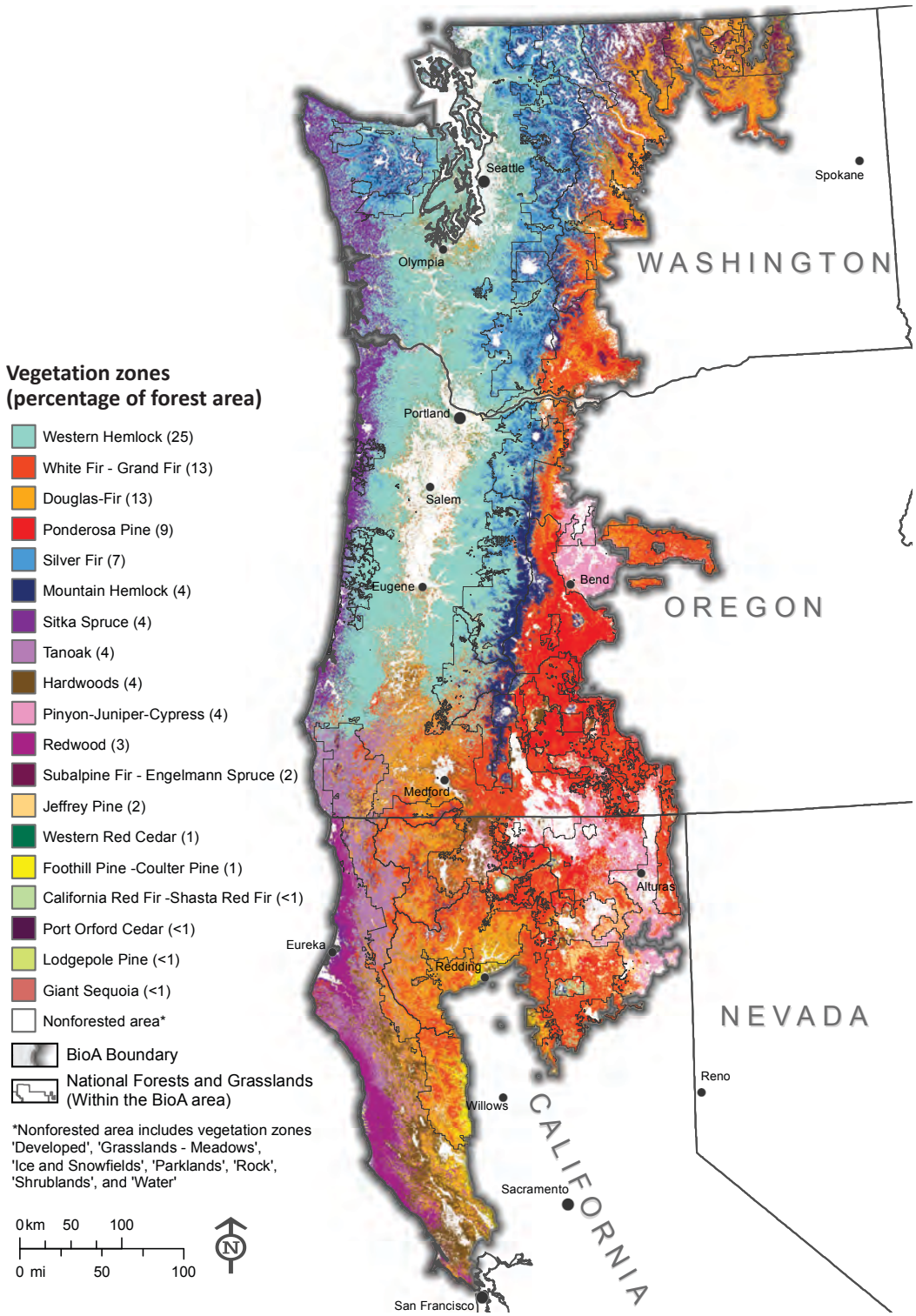


Figure 2-2—There are the broad and diverse vegetation zones within the BioA area. The zones are named for the main tree species and indicate the potential of the land to support ecosystems and produce resources. The categorization is a framework for the intersection of climatic and productivity gradients across the landscape, including disturbance—notably fire.

[18] USDA Forest Service, 1995.
[19] Spies and others, 2018a.

Some incompatibility between plan direction and our goals for achieving ecologically resilient landscapes is found across the BioA area but is particularly acute in the frequent-fire dependent ecosystems of the Klamath Mountains, Southern Coast Range (California) and on the eastern side of the Cascade Mountains (chapter 5, Ecological Integrity and Fire and Fuels). An extensive build-up of flammable vegetation, increasingly dense forests, and changes in tree type and patterns all contribute to uncharacteristic effects from wildfire and insects and disease that can impact local communities as well as important habitat and other resources.

Ecosystem-specific desired conditions that support the natural capabilities of the land will better ensure that we are managing for ecological integrity and the long-term sustainability of habitats, which includes incorporating the natural role that fire, insects, disease, and other processes play. Desired conditions should incorporate the best available scientific information for example, Pacific Southwest Research Station's report, *An Ecosystem Management Strategy for Sierran Mixed-conifer Forests*[20] about the amount, type, size, and arrangement of vegetation in forested and non-forested landscapes.

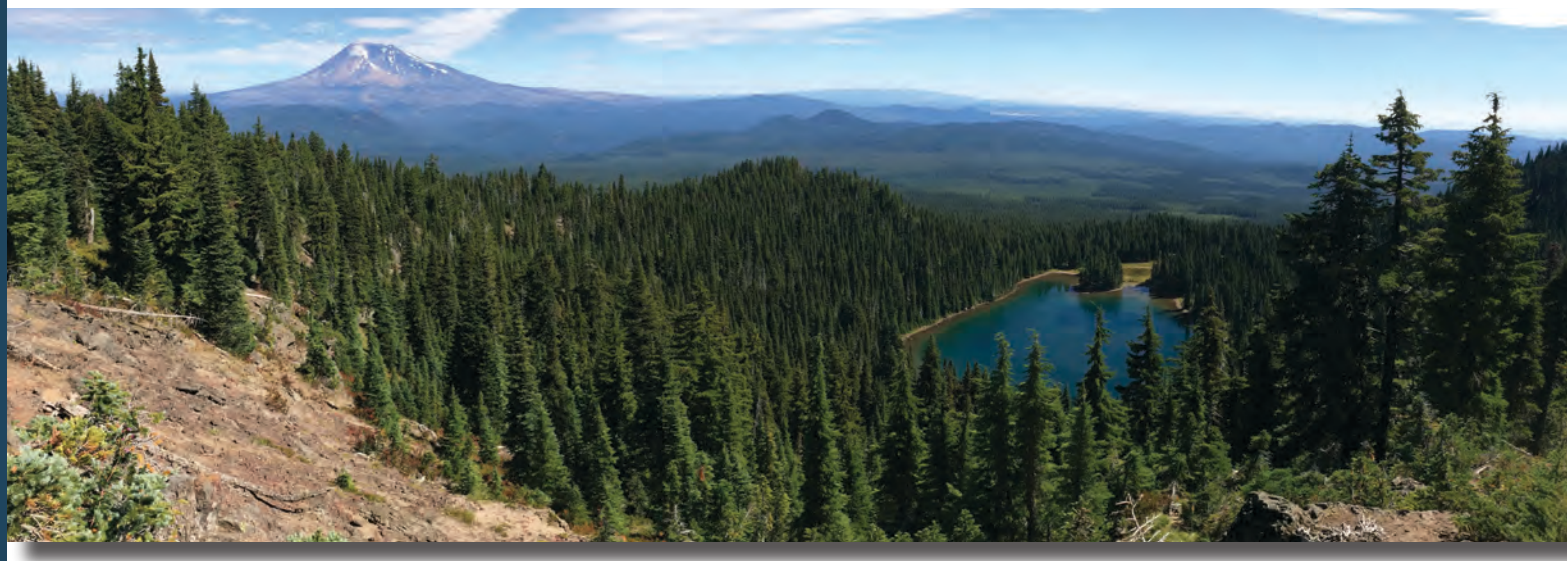
Desired conditions that address the diversity of ecosystems across the BioA area and promote the resilience of those ecosystems will be a strong foundation for land management plan direction that will guide us toward ecologically sustainable landscapes. We can then build other plan direction to support ecological integrity as well as benefits like clean air and water, recreation, forest products, carbon storage, and cultural connections.

Resilient Ecosystems and Ecological Integrity

A resilient ecosystem maintains key functions and processes in the face of stress or pressure, which is a key component of ecological integrity. Less resilient ecosystems are slower or less likely to recover from disturbances. Resilient ecosystems maintain important processes, like fire, which are sources of renewal and function across multiple scales.

One method to estimate if a landscape is resilient to disturbance is by comparing existing forest structure, species composition, and landscape patterns to reference conditions, such as a natural range of variation. Significant differences indicate a loss of resiliency. Understanding reference conditions provides critical insight to help ensure that management practices will lead to increased resiliency and flow of resources. For example, knowing reference conditions could provide percentages for how much old, mid-aged, young, and early-seral forest would be on the landscape if that landscape were resilient to natural stressors, like fire.

However, ecological resilience is not always a desired condition. In fact, ecological resilience might directly conflict with desired conditions. For example, ecologically resilient forests might host wildfire near homes and important infrastructure like telecommunication sites or powerlines. These are cases when a natural process that is part of maintaining ecological integrity is not desired. We can use concepts like ecological integrity and resilience as anchors for management and desired conditions, but they have limitations in the context of communities, changes in climate, and land use.



[20] North and others, 2009.

RECOMMENDATION 2—*ADDRESS THE DYNAMIC NATURE OF ECOSYSTEMS TO BETTER RESPOND TO FUTURE ENVIRONMENTAL UNCERTAINTIES.*

The dynamic nature of ecosystems means that goals for reserves should likely include a range of successional stages and, in some cases, adjustments to reserve boundaries. For example, the needs of some species associated with old forests that experience dynamic disturbance events are not being met by the static boundaries of late-successional reserves.[21] Managing large reserves as dynamic mosaics of vegetation conditions that meet the needs of various wildlife species as well as goals for resilience to climate change and fire might better align with current goals.

Ecosystems naturally change across time; we need plan direction that is tied to the characteristics that define these ecosystems. Such land management direction is more adaptable to the dynamic systems we steward. In addition, our growing knowledge about how to enhance and retain old-growth forest habitats tells us that land management plans must adapt to changing desired forest characteristics like tree age and size. Incorporating climate change refugia into reserve networks and aligning late-successional reserves with late-seral habitat can proactively address habitat management given future uncertainties (figure 2-3).

"In recent years, the frequency and severity of pest and wildfire events are unlike what we have experienced in the past, forcing us to reexamine our land and fire management policies and practices."

California's Forest and Rangelands: 2017 Assessment

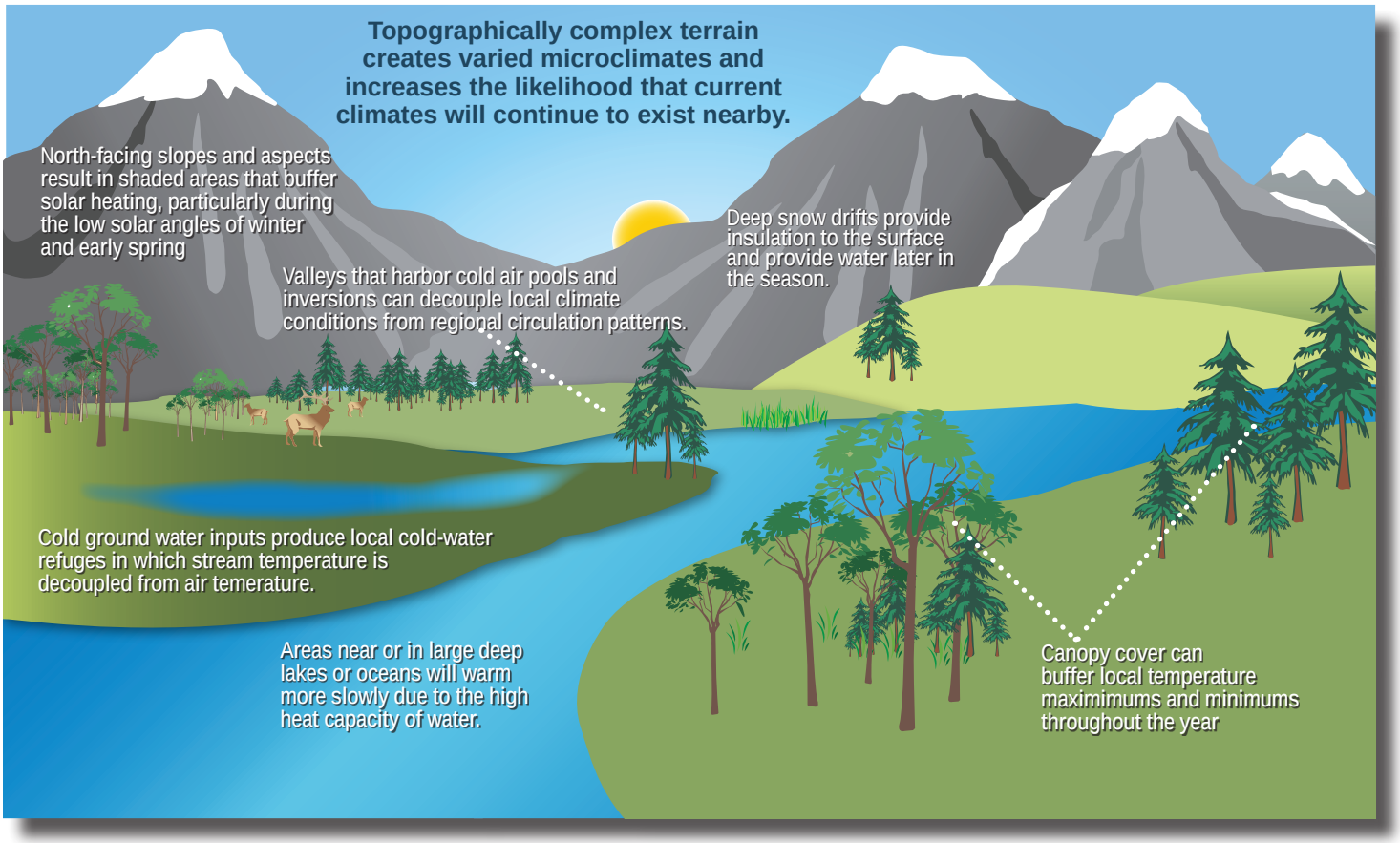


Figure 2-3—Climate change refugia principles and examples of refugia that might experience reduced rates of impact from climate change. Source: Morelli and others. (2016). After Spies and others. 2018.

[21] Marcot and others, 2018.

Climate change adaptation and mitigation strategies are not directly addressed under existing land management plans and maintaining and restoring natural processes is often difficult. A changing climate is expected to impact ecosystems, biodiversity, and the delivery of benefits to people.[22] As we work to modernize the plans, we have an opportunity to include direction[23] (chapter 3, Ecological Integrity) that enables us to meet a changing climate with ecologically resilient landscapes. Within the BioA area, the effects of climate change are anticipated to be the greatest in northern California, southern Oregon, the eastern Cascades, and high-elevation zones (chapter 5, Ecological Integrity).

While our knowledge about national forests and grasslands and the communities that we serve has grown, large uncertainties remain.[24] By improving how we integrate future uncertainty into our land management planning direction, we will be better positioned to manage ecosystems in the face of anticipated change. **Risk management, adaptive management, and monitoring are tools we can use to address complex social and ecological issues given an uncertain future.**[25] Adaptive management areas were designated in the NWFP but are rarely used, so goals associated with learning from adaptive management were not met. It will be important to incorporate and implement adaptive management processes, risk management, and monitoring into future land management plan direction.

"The response of forest and range ecosystems to a changing climate is one of the greatest challenges confronting California"

California's Forest and Rangelands: 2017 Assessment

Testing and evaluating new, highly integrated conservation strategies could help us deal with uncertainties and knowledge gaps related to fire, climate change, invasive species, tradeoffs between ecosystem and species goals, and between ecological and social components.[26] Incorporating contemporary management concepts and tools could help us manage ecosystems to move toward resilient states and reduce risks associated with uncertainty. Creating plan scenarios or processes that are triggered under various circumstances could also help. Using a variety of management approaches and courses of action will likely be the best way to minimize risk and enable future learning.[27]

[22] Reilly and others, 2018.
[23] Reilly and others, 2018.
[24] Spies and others, 2018b.
[25] Spies and others, 2018b.
[26] Spies and others, 2018b.
[27] Reilly and others, 2018.

RECOMMENDATION 3—*UPDATE AND INTEGRATE EXISTING AQUATIC DIRECTION FROM MULTIPLE AQUATIC STRATEGIES.*

Healthy, functioning watersheds and the aquatic and riparian ecosystems within them are critical to providing key benefits to people and ecosystems, as described in chapter 1. The Aquatic Conservation Strategy is working well, is functionally sound, and provides a solid foundation, with opportunity for improvements, to move into future land management planning efforts[28] (chapter 3, Ecological Integrity). National forests and grasslands in the BioA area, including those outside of the NWFP area, also have well-functioning aquatic direction that addresses the need to provide beneficial habitat and water quality.

Designation of riparian management areas—a cornerstone to the Aquatic Conservation Strategy, Sierra Nevada Framework Aquatic Management Strategy, and PACFISH and INFISH strategies—has resulted in a trend toward watershed improvement across the BioA area. Although climate change projections suggest a trend of warmer stream temperatures, which cause water to hold less oxygen, 20 years of monitoring data are showing cooler stream temperatures, which indicates improving stream conditions within the NWFP area.[29] Cooler stream temperatures might be a result of increasing tree cover along streams, which helps to buffer stream temperatures against climate change.

At the same time, managing aquatic and riparian ecosystems in the BioA area under the above strategies has created multiple process and analysis requirements that have increased Forest Service planning costs, while agency budgets and workforce have declined (chapter 4, Habitat Management). For example, in areas where both PACFISH and the NWFP apply, the consultation, reporting, and analysis requirements of both must be met. By developing one consolidated strategy for managing aquatic and riparian systems across the BioA area, we can increase efficiencies while retaining the effective qualities of the current strategies.

Active Management—direct interventions to achieve desired outcomes, which may include harvesting and planting of vegetation and the intentional use of fire, among other activities.

Spies and others 2018

Existing strategies have been successful at addressing aquatic and riparian conservation issues at the appropriate scale, as well as taking an ecological approach to managing habitat to support species viability. It will be important to bring these successful approaches forward and to consider how complementary land allocations—for example, riparian reserves, late-successional reserves, and congressionally-designated areas—work together to protect and restore aquatic habitat and watersheds.

Land management planning direction that considers natural processes and future uncertainties is vital for aquatic and riparian systems. For example, promoting fire regimes that result in fewer large, uncharacteristic wildfires can help maintain the resiliency of aquatic systems.[30] Modernizing the land management plans in the BioA area should also address impaired waters and aquatic invasive species, which have emerged as a threat and are expected to increase as a result of factors such as climate change and human activities.[31]

Riparian areas are generally managed passively using natural process and minimal intervention. However, by clearly defining the desired conditions, we can identify where active management, such as harvesting, planting vegetation, using fire, and other activities,[32] is needed. Sometimes, for example, when dealing with non-native species, passive management might even hinder the restoration of aquatic and riparian ecosystems.[33]

By bringing forward the successful components of existing strategies and plan direction, improving direction based on what we have learned, and developing one consolidated strategy across the BioA, we can ensure effective and efficient management of watersheds, and their aquatic and riparian ecosystems.

[28] Reilly and others, 2018.
[29] Miller and others, 2017.
[30] Hunsaker and others, 2014.
[31] Reeves and others, 2018.
[32] Spies and others, 2018.
[33] Reeves and others, 2018.

RECOMMENDATION 4—*REDUCE THE INTRODUCTION AND SPREAD OF EXOTIC PLANT, ANIMAL, AND OTHER INVASIVE SPECIES.*

The effects of invasive species are one of the primary concerns associated with maintaining ecological integrity across the BioA area (chapter 4, Ecological Integrity). Our understanding of the ecological and economic impacts of invasive species has greatly increased during the past few decades. Invasive species can have widespread social, economic, and ecological impacts, including negative impacts to native species, permanent ecological changes, reductions in water quality, altered fire regimes, degradation of forage quality, adverse effects on human health and well-being, and economic losses.[34]

Existing land management plans are quite limited in addressing potential impacts of invasive species; they focus primarily on invasive plants. However, the term "invasive species" includes terrestrial and aquatic insects, animals, and pathogens that have moved into habitats or areas where they previously did not exist. An example of an invasive species is the barred owl, which has invaded the range of the northern spotted owl and has become one of the major factors affecting the recovery of spotted owls (chapter 4, Habitat Management). Direct management of most animals, including the barred owl, is outside the authority of the Forest Service. However, land management plans should address the need to manage habitats to reduce opportunity for competition between native and invasive species and prevent the introduction of invasive species.

Land management plans in the BioA area should address the need for proactive invasive species management by integrating invasive species ecology and management direction with overarching desired conditions related to forest ecology. In addition, plans need to include approaches for increasing invasive species prevention and control efforts, such as early detection and rapid response, frequent inventories, and increased interagency coordination. Because invasive species are a landscape-level issue that crosses administrative boundaries, creating consistency in plan direction across the BioA area would improve efficiency and effectiveness of treatment strategies by making it easier to coordinate and share resources within the Forest Service. Managing and preventing invasive species is not something that the Forest Service can do on its own. **Having consistent invasive species management direction in the BioA area promotes shared stewardship and enhances the ability to work with other agencies and private landowners to manage invasive species across multiple jurisdictions.**

[34] Long and others, 2014.

RECOMMENDATION 5—*PRIORITIZE COMMUNITY AND FIREFIGHTER SAFETY IN FORESTED AREAS NEAR COMMUNITIES AT RISK FROM WILDFIRES.*

The population of the region continues to grow, and people are increasingly choosing to live within and adjacent to national forests and grasslands. During the past few decades communities have experienced some of the largest and most impactful fire seasons in recent memory. As the amount of wildland-urban interface has increased, so has the risk of wildfire impacts to people and communities (figure 4-5). Wildfire can have significant effects on public health and safety and community economics by impacting air and water quality, the supply of power, recreation opportunities, and travel and transportation. **Although fire plays a key ecological role in national forests and grasslands, wildfire often occurs in places and at times that are not desired.**

The cost of suppressing increasingly complex wildfires continues to climb, consuming valuable time and resources that could otherwise be used to work toward land management objectives for the benefit of local communities and the public. Of the national forests within the BioA area, 10 are in the top 40 that have the highest wildfire risk across the country,[35] and eight are in the top 25 that have the highest wildfire suppression costs.[36] Emphasizing strategic risk management, especially in places on the landscape where it is most needed and effective, might help alleviate some of the imbalance.

"Fire risk' comprises the likelihood of a wildfire, its intensity, and its positive or negative effects."

– Toward Shared Stewardship: Across Landscapes (2018)

Some current land management plan direction emphasizes ecological and wildlife habitat objectives in places where they are incompatible with effective wildfire-risk mitigation (chapter 4, Fire and Fuels Management). Although most ecological and wildlife habitat objectives are compatible with wildfire risk mitigation, incompatibilities that do exist hinder effective hazardous fuels reduction in certain circumstances, particularly in portions of some designated late-successional reserves. Plan direction for late-successional reserves includes provisions for risk reduction activities; however, the risk is narrowly defined as risk of loss for late-successional habitats. The definition of risk needs to include risks posed to communities in addition to ecosystem integrity.

Land management plans need to better address strategic wildfire -risk mitigation in and around communities and in the wildland-urban interface. We need to better align fuels and fire management objectives with land management allocations, including options for active management. This also includes ensuring land use allocations support management activities to reduce the risk around critical infrastructure, such as powerlines and telecommunication sites.

"To better manage fire risk, we will need to step up the use of prescribed fire and managed wildfire in concert with mechanical treatments and timber sales. Working with partners and stakeholders, we can find opportunities in fire-adapted forests to reintroduce the right kind of fire at the right times in the right places."

– Toward Shared Stewardship: Across Landscapes (2018)

Having a risk-based framework in our land management plan direction would allow for management of key ecological and wildlife characteristics, while at the same time emphasizing critical risk mitigation in the places and at the times where it is most needed. A key example of a management challenge is the apparent conflict between the objectives of addressing fire risk and maintaining habitat for northern spotted owl. Wildfire-risk assessments provide a quantitative approach to identifying and prioritizing treatments around communities and infrastructure, to restoring focus areas on the landscape, and to providing appropriate response to wildfires (chapter 5, Fire and Fuels Management).

[35] Dillon and others, 2015; Dillon, 2017; Dillon In Press.
[36] Thompson and others, 2015.

RECOMMENDATION 6—*RECOGNIZE THAT FIRE IS A NATURAL PROCESS AND PLAYS AN IMPORTANT ROLE IN REDUCING THE RISK OF UNCHARACTERISTIC FIRE AND IN PROMOTING ECOSYSTEM HEALTH.*

Dating back nearly a century, the Forest Service has suppressed most wildfires, fearing resource damage and impacts to private property and communities. During the past few decades, we better understand the vital ecological importance of natural disturbance in many of the ecosystems in the BioA area.[37] Today, we know that fire plays a particularly critical role in shaping the ecology of the forest, shrubland, and grassland ecosystems of the Pacific Northwest and northern California.[38]

"To safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and as a Nation, live with wildland fire."
National Cohesive Wildland Fire Management Strategy Vision

To restore ecological balance, as well as to promote community safety and resiliency and ecological integrity, **it is essential that we restore natural fire into ecosystems in the BioA area.** In practice, this might require different approaches based on and tailored to conditions within the diverse ecosystems of the broad BioA area. Existing land management plans focus on wildfire suppression and don't fully acknowledge the important ecological role of fire in fire-adapted ecosystems, nor do they adequately promote the use of unplanned ignitions to meet ecological and resource objectives (chapter 4, Fire and Fuels Management). Across the BioA area, and especially in frequent-fire dependent systems, the amount of "good" fire today is only a small fraction of what historically drove these ecosystems (figure 2-4).

- Ecosystems that experience fire frequently are **frequent-fire dependent.**
- Ecosystems that sometimes experience fire are **fire diverse (mixed-severity).**
- Ecosystems that historically haven't often experienced fire are **fire infrequent.**

For full definitions, see Chapter 4, Fire and Fuels Management.

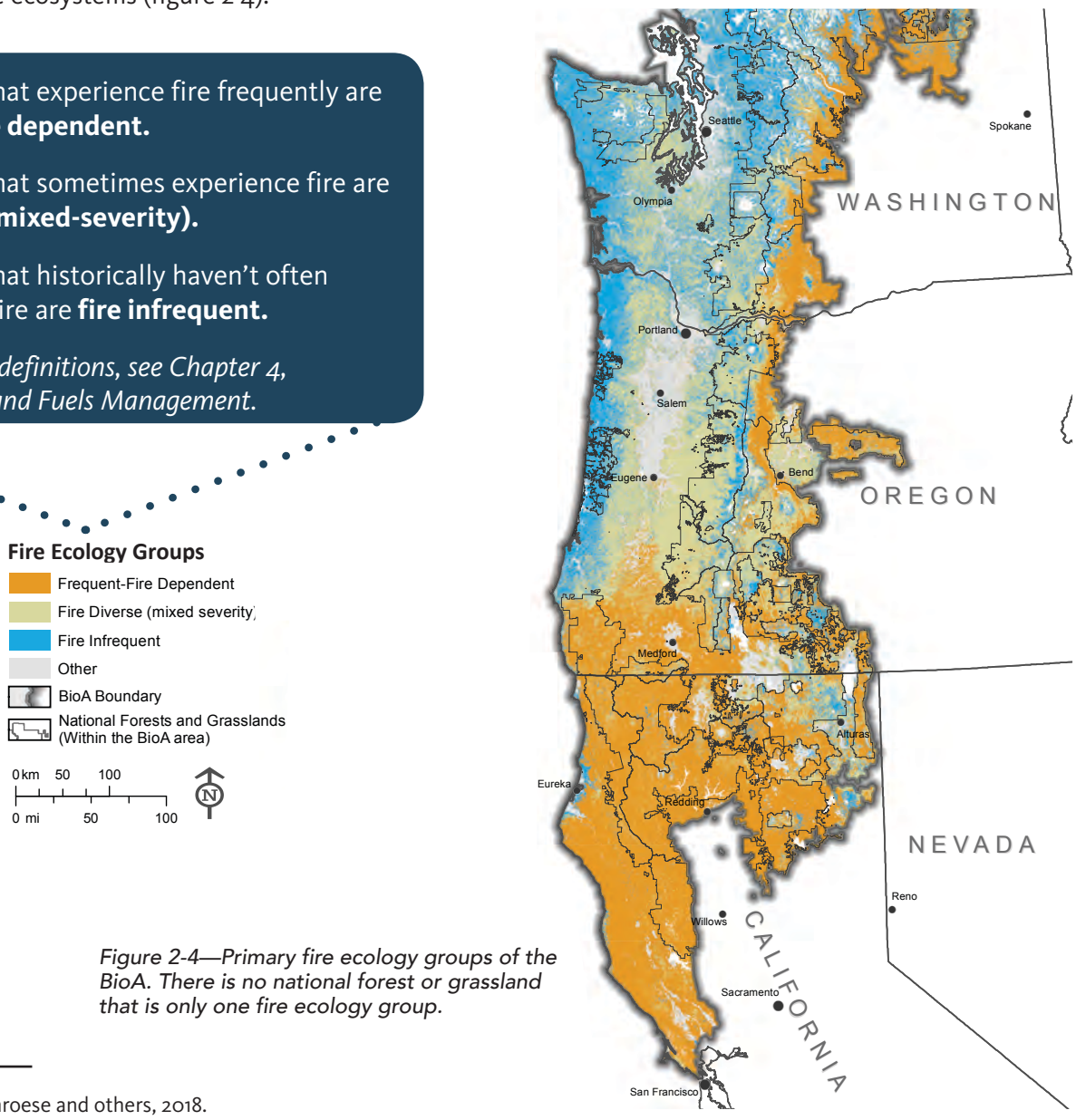


Figure 2-4—Primary fire ecology groups of the BioA. There is no national forest or grassland that is only one fire ecology group.

[37] Spies and others, 2018.
[38] Long and others, 2014; Dumroese and others, 2018.

We acknowledge that fire can pose a significant risk to communities, recreational opportunities, municipal watersheds, important wildlife habitat, private timber lands, and other social values. However, not all fire is bad, and fire is often essential to the long-term function, stability and resilience of ecosystems. These concepts are reflected in the 2014 National Cohesive Wildland Fire Management Strategy, which is the result of a collaborative effort among federal, state, local, governments, Tribes, partners, and stakeholders. The strategy, which aims to comprehensively address wildland fire management across all lands in the United States, is not reflected in existing land management plans in the BioA area.

It is not practical to use only mechanical harvest and prescribed fire to meet landscape resource objectives because of the vast geographic scope of the challenge.[39] Therefore, to help affect landscape-level change and promote broad-scale ecological sustainability, integrity, and resilience, we need to leverage fire, one of nature's own tools, to help restore ecosystems.[40] There are opportunities in our frequent-fire dependent systems to manage wildfires to reduce fuels and improve forest conditions when the fires are safe for firefighters and the public and do not threaten communities or structures. We recognize that conflict can exist between the use of fire and other objectives, like timber production, which we will need address in upcoming planning efforts.

"Use of naturally ignited wildfires to achieve resource objectives is very important because, in most areas, current amounts of prescribed fire are too little to affect a sufficient area"

– Spies and others 2018 (North and others 2012, 2015)

"In the era of megafires that sweep across landscapes in multiple ownerships, no single entity can meet the challenge alone at the scale needed to reduce fire risk across broad landscapes."

– Toward Shared Stewardship: Across Landscapes (2018)

We know that many landscapes that need restoration are so departed from resilient conditions that fires might become uncharacteristically large and of high severity so that even the most fire-resistant trees cannot survive.[41] Such fires could permanently alter forest types or damage ecosystem integrity. To support the natural role of fire in restoring our landscapes, we must ensure that land management plan direction supports the strategic placement of mechanical and prescribed fire treatments. Such treatments will be most successful if they are coordinated and appropriately scaled across all land ownerships including Tribal, state, other public, and private lands.

While the problems and solutions associated with fire vary across the BioA area, the most urgent need to restore natural disturbance and fire is primarily in the frequent-fire dependent ecosystems in the eastern Cascade Mountains, Klamath Mountains of southern Oregon and northern California, and the southern Coastal Mountains (figure 2-5) (chapter 5, Fire and Fuels Management). **Updated land management plans need to support the use of natural fire as an ecological tool and use a risk-based strategy** to identify places on the landscape where fire can safely and effectively be managed to benefit resources. To reflect the National Cohesive Wildland Fire Management Strategy, plans need to emphasize working with partners and neighbors to take an all-lands approach to fire management that supports a spectrum of management options, including prescribed fire, mechanical treatments, suppression, managed wildfires, and working with communities to increase their resilience to fire.

[39] North and others 2012, 2015.
[40] Spies and others, 2018a. p. 172
[41] Spies and others, 2018a.

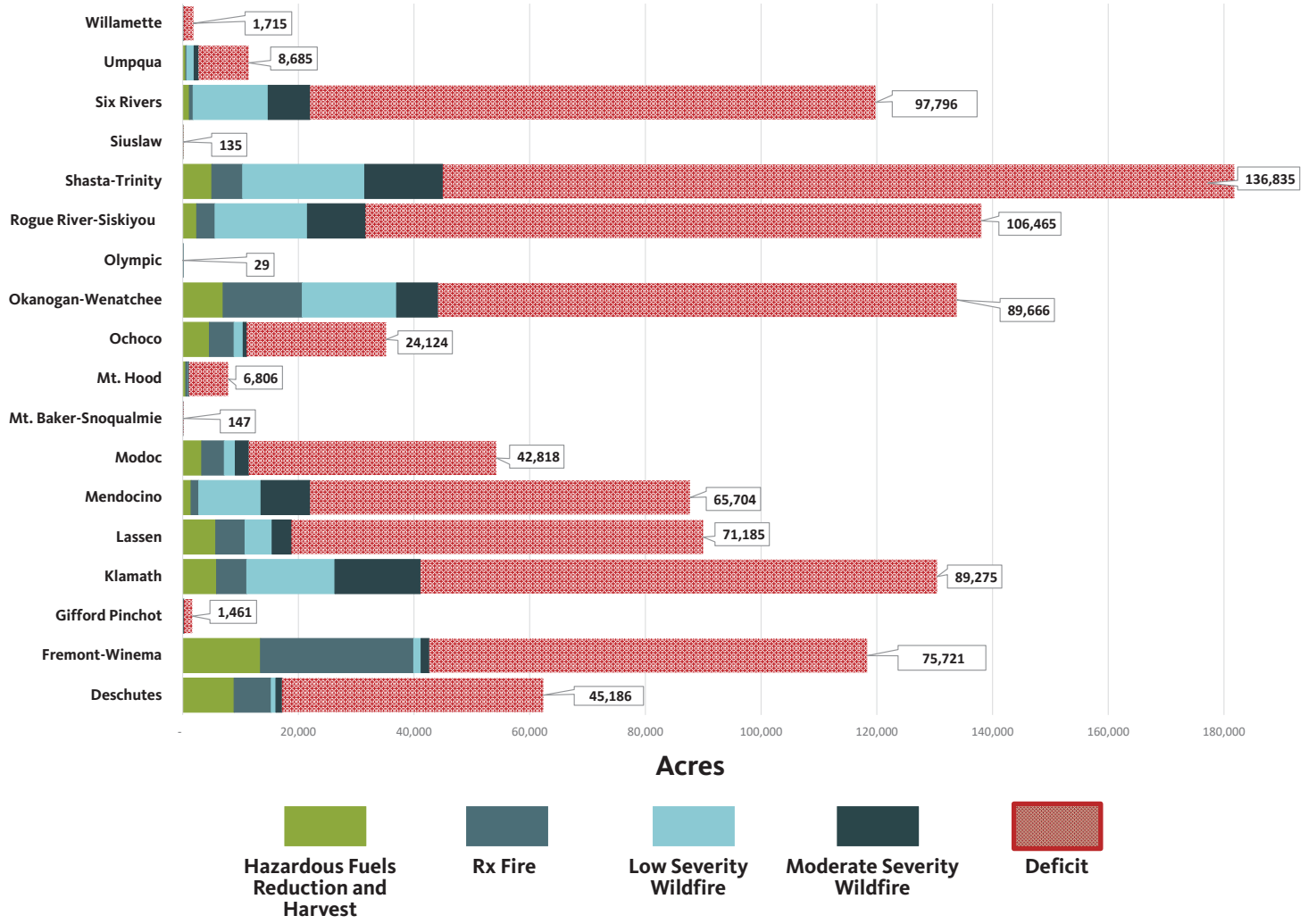


Figure 2-5—Mean annual acres of disturbance for frequent-fire dependent ecosystems on each national forest in the BioA area, in contrast to the amount of fire disturbance expected for these ecosystems. Totals are based on 2008–2018 data. The deficit bar is the difference between the amount of fire that historically, or naturally, was on the landscape and the amount of wildfire, prescribed fire, and hazardous fuels treatment currently on the landscape. Land management plan direction that provides for use of treatments that close the gap will help restore the role of fire.

RECOMMENDATION 7—*EXPAND THE USE OF TIMBER HARVEST AS A RESTORATION TOOL TO PROVIDE ECONOMIC AND SOCIAL BENEFITS TO COMMUNITIES.*

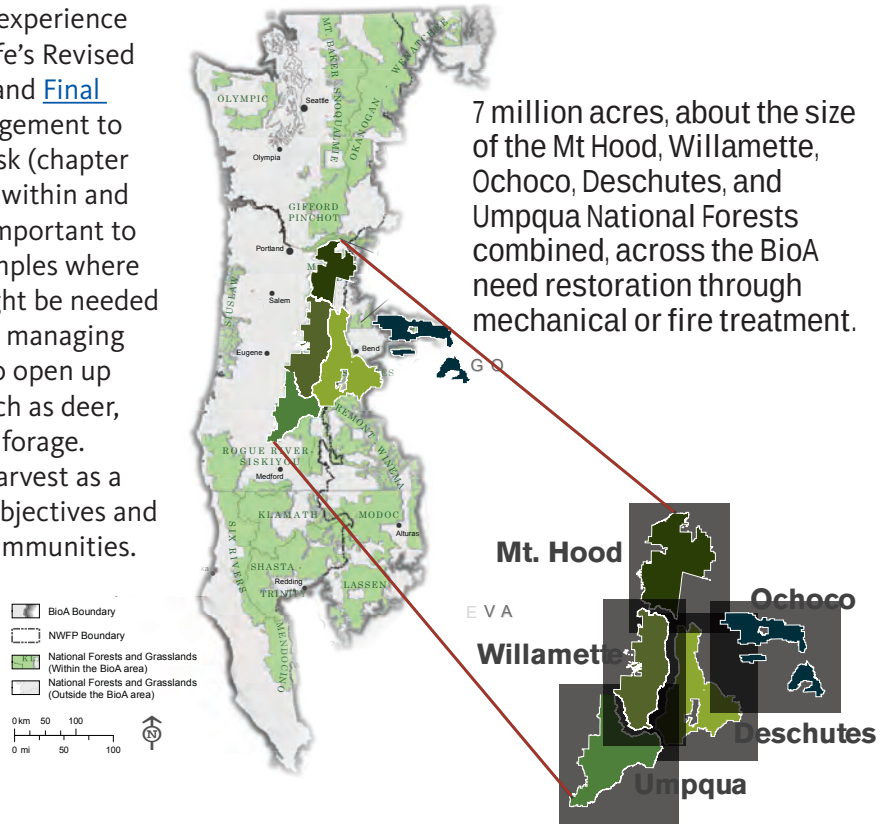
While remaining fairly stable for the past decade (chapter 3, Sustainable Timber), timber harvest levels fall short of what was anticipated under existing land management plans,[42] and they are not expected to significantly increase in the BioA area in the future under current land management direction (chapter 4, Sustainable Timber). Updating existing plans to identify and expand where timber harvest is an appropriate tool to support desired ecological conditions would help to increase the pace and scale of landscape restoration and the resulting timber harvests could support the local or regional economy. Combining an ecological forestry approach (Evolving Timber Harvest Methods; chapter 3, Sustainable Timber) with timber production would help support a more predictable and sustainable supply of timber in the BioA area, where timber processing infrastructure and workforce both play a critical role in meeting restoration needs (chapter 4, Sustainable Timber).

Modernizing land management plan direction, in partnership with Tribes in California, Oregon, and Washington, is key to working toward regional ecological integrity and community sustainability. For example, Tribal strategies, like the Plan for the Klamath Tribes,[43] and state forest assessments and action plans provide insight into areas where timber harvest offers mutual benefits to achieve cross-boundary restoration goals.

"... ecological forestry recognizes that forest are ecosystems with diverse biota, complex structure, and multiple functions, and not simply collections of trees valuable primarily for the production of wood. In doing so it seeks to maintain the fundamental capacities (integrity) of the forest ecosystems to which it is applied."
Franklin and others 2018

We estimate that about **7 million acres across the BioA area need restoration** through mechanical treatments or fire[44] (chapter 4, Ecological Integrity). In the frequent-fire-dependent ecosystems east of the Cascade Range, in the Klamath Mountains, and in the southern coastal ecoregion, restoration to increase resilience is an urgent need (chapter 5, Sustainable Timber).

Harvesting trees to meet restoration goals is often restricted by a combination of planning incompatibilities, such as direction for late-successional reserves and survey and manage standards and guidelines (chapter 4, Ecological Integrity and Sustainable Timber). However, taking a narrowly interpreted or passive approach to management to protect at-risk species and old-growth habitat is not necessarily helpful to ecosystems and habitats in the long-term, especially in dry forest types that historically experience frequent fire.[45] In fact, the U.S. Fish and Wildlife's Revised Recovery Plan for the Northern Spotted Owl and Final Critical Habitat Rule recommend active management to revitalize forest ecosystems and reduce fire risk (chapter 2, Recommendation 9).[46] Active management within and outside the reserve network of the NWFP is important to meet many of our ecological goals.[47] Two examples where active restoration through timber harvest might be needed but is limited under current plan direction are managing scenery resources where trees might be cut to open up views and managing habitat for ungulates, such as deer, where trees might need to be cut to generate forage. Updating plans to expand the use of timber harvest as a restoration tool can help us meet ecological objectives and could support socioeconomic goals in local communities.



[42] Grinspoon and others, 2016.
[43] Hatcher and others, 2017.
[44] Ringo and others, 2019.
[45] Spies and others, 2018a.
[46] Spies and others, 2018a.
[47] Spies and others, 2018a.

RECOMMENDATION 8—*EVOLVE FROM SINGLE-SPECIES FOCUS TO A COMPLEMENTARY ECOSYSTEM AND SPECIES APPROACH TO MAINTAIN DIVERSITY OF PLANT AND ANIMAL COMMUNITIES AND SPECIES PERSISTENCE.*

Maintaining or restoring ecological integrity is expected to provide for the habitat needs of species and the diversity of plant and animal communities (coarse-filter approach). A coarse-filter approach provides for a diversity of habitat types at various scales, such as complex early seral habitat, to account for the complexity of these landscapes and the species that depend on them. Sometimes this approach doesn't adequately consider unique habitat requirements, and then there is a need for species-specific management that focuses directly on one species (like the marbled murrelet) and its specific habitat needs, this is called a fine-filter approach.

The NWFP emphasized fine-filter approaches to conservation for the spotted owl, marbled murrelet, and hundreds of other species, although it recognized that both coarse-filter and fine-filter approaches were needed.[48] The reserve system has been successful in conserving and developing northern spotted owl habitat on federal lands, although the owl population is still declining due to a combination of other factors (chapters 3 and 4, Habitat Management). However, the emphasis in the NWFP on one size fits all dense, multi-layer old-growth habitat is not always ecologically appropriate, especially outside of fire-infrequent forests[49] (chapters 4 and 5, Habitat Management).

Pine Marten

The NWFP survey and manage standards and guidelines are a fine-filter approach that was designed to protect biological diversity. The standards and guidelines have increased our knowledge about species that depend on late-successional and old-forest habitat (chapter 3 Habitat Management). However, they haven't been fully implemented primarily because of the complexity and cost of individually surveying for and managing so many species—currently 298 (chapter 4 Habitat Management). Taking a coarse-filter approach can help us manage for the habitat needs of multiple species, including species that are considered imperiled or vulnerable. The Aquatic Conservation Strategy is a good example of a multi-species, coarse-filter approach that has improved conditions within aquatic and riparian ecosystems that anadromous fish and other organisms depend on.

"Conserving biodiversity is about more than protecting old-growth forests; it is also about maintaining processes, other successional stages, and forest dynamics at multiple scales."

Spies and others 2018

Ecological integrity has been compromised in more frequent-fire dependent ecosystems where loss of old forest from high-severity wildfire has been concentrated in recent years.[50] This can have negative impacts on species habitat and biological diversity. Plan direction to protect species habitat needs to be grounded in ecological principles and acknowledge the differences between ecosystem types to promote resilience to fire, climate change, and other drivers and stressors. We also need to update land allocations to be better aligned with the habitats they are trying to protect, such as critical habitat for northern spotted owl and late-successional reserves (chapter 5, Sustainable Timber).

To more successfully manage species habitat, we need to reassess how we are using ecosystem versus species-specific approaches in our land management plans, and ensure we are managing our ecosystems to be resilient in the face of change. Maintaining or restoring ecological conditions like those under which native species have evolved offers the best assurance against losses of biological diversity and maintenance of habitats for most species in an area.[51] Using a combination of management approaches is necessary to help ensure conservation of both individual species and biodiversity.[52]

[48] Stine and Spies, 2018.
[49] Spies and others, 2018.
[50] Davis and others in progress; subject to peer review, Davis and others, 2015.
[51] 36 CFR Part 219 National Forest System Land Management Planning Preamble.
[52] Marcot and others, 2018.

RECOMMENDATION 9—*PROMOTE ACTIVE MANAGEMENT IN PLANT AND ANIMAL HABITATS TO RESTORE AND ENCOURAGE ECOLOGICAL RESILIENCE.*

As highlighted in previous recommendations, we must manage for species habitat along with other management objectives to ensure our national forests and grasslands can continue to provide social, economic, and ecological benefits. Passive management—allowing nature to take its course to restore ecosystem conditions—can protect habitat and biodiversity. However, current conditions across parts of the BioA area are putting habitats, communities, and resources at risk. In some cases, active intervention is needed to restore ecological integrity and support the long-term sustainability of benefits that national forests and grasslands provide.

We have largely been successful in maintaining intact habitat for species that depend on dense, multi-layered old-growth forest, particularly within the NWFP late-successional reserve network[53] (chapter 3, Ecological Integrity). Similarly, our riparian reserve network created by the Aquatic Conservation Strategy, PACFISH, INFISH and Sierra Nevada Framework has been successful in protecting riparian habitat and water quality with distinct benefits to fish and amphibians (chapter 3, Ecological Integrity).[54] However, management of diverse wildlife habitats involves more than just protecting old-growth forests.[55] Management also requires maintaining a variety of ecological processes and all successional stages on our dynamic landscapes,[56] such as complex early-seral habitat for pollinators and early-seral dependent birds.

Under current land management plans, management direction that protects habitats and tree structural stages and size classes creates barriers to treatments that are needed to restore habitats and increase ecosystem resilience (chapter 4, Ecological Integrity). Monitoring and best available science tells us that to foster ecological integrity across a diversity of habitat components for northern spotted owl, we must allow for active habitat management within and outside of the reserve networks. For example, the Revised Recovery Plan for the Northern Spotted Owl (U.S. Fish and Wildlife Service) recommends protecting the best of the spotted owl's remaining habitat, while also revitalizing forest ecosystems through active management.[57] Active management might include "carefully applied prescriptions such as fuels treatment to reduce the threat of severe fires, thinning to help older trees grow faster, and restoration to enhance habitat and return the natural dynamics of a healthy forest landscape."[58] We know that in frequent-fire dependent ecosystems, forests are currently experiencing uncharacteristic fire. If not actively managed using mechanical treatments and prescribed fire, these forests will be increasingly susceptible to more large and high severity fires that could negatively impact ecological integrity (chapter 4, Fire and Fuels Management and Habitat Management).

"Active rather than passive human participation in the initiation and development of forest ecosystems has probably never been more appropriate than in the 21st century when human kind has altered so many of the fundamental conditions under which forest ecosystems have evolved. We believe forests in this century will often require human participation to assist them in their continued adaption to shifting environments and disturbance regimes..."

Franklin and others 2018

For example, our current reserve network was developed and located on the landscape to protect fire-infrequent forests, but the network also includes fire-diverse and frequent-fire dependent forests. Different fire groups require a variety of management techniques to maintain and restore resilience in the face of wildfire and climate change (chapter 4, Ecological Integrity and Fire and Fuels Management). Static late-successional reserves might not be able to meet the needs of all old growth-dependent species because large disturbance events, combined with changes in fire on the landscape due to climate change, reduce or isolate a reserve[59] (chapter 5, Habitat Management). As discussed in earlier recommendations, the dynamic nature and ecological capabilities of the landscape must be incorporated into the design of the reserve system to ensure that it is a connected system of habitats that meets the needs of its dependent species.

Using a system of reserves has been a critical component of conservation in the BioA area. However, updates to the current reserve system are needed to allow for active management to increase connectivity and support fire and other key natural disturbance processes[60], which is an issue in frequent-fire dependent ecosystems. Active management inside and outside NWFP reserves is needed to promote biodiversity and ecological resilience.[61]

[53] Davis and others, 2015
Davis and others in progress; subject to peer review.
[54] Reeves and others, 2018.
[55] Marcot and others, 2018.
[56] Spies and others, 2018.
[57] US Fish and Wildlife Service, 2011a.
[58] Marcot and others, 2018
[59] Marcot and others, 2018; Spies and others, 2018; Reilly and others, 2018.
[60] Spies and others, 2018b.
[61] Spies and others, 2018.

RECOMMENDATION 10—*RECOGNIZE THE SOCIAL AND ECONOMIC BENEFITS TO COMMUNITIES AND PEOPLE FROM SUSTAINABLE RECREATION OPPORTUNITIES.*

Participation in recreational activities is how most of us experience our national forests and grasslands; however, recreation was not a major focus of the land management plans for the forests and grasslands within the BioA area. In contrast to the NWFP's guidance for natural resource management, there is no overall consistency to recreation management (chapter 4, Sustainable Recreation). The lack of uniform management direction related to recreation inhibits our ability to effectively and efficiently address management concerns for resources that cross multiple administrative boundaries, such as trails and designated wilderness, and can be confusing to the public. **The increasing demands and economic significance of recreation activity as well as the impacts of excessive deferred maintenance and a changing climate was not anticipated in 1994.** These changes and lack of recreation direction undermine our ability to manage recreation resources and ensure their long-term sustainability.

Land management plans in the BioA area should support sustainable recreation by better integrating resource and recreation management objectives (chapter 4, Sustainable Recreation). For example, while the NWFP has helped preserve and improve the outstanding natural qualities that encourage visitation (chapter 3, Sustainable Recreation), options for addressing recreation issues, such as overuse and facilities maintenance, are often limited due to the need to meet species conservation objectives within late-successional reserves and riparian reserves. However, not addressing recreation issues can have negative impacts to aquatic systems, wildlife habitat, and other resources (chapter 4, Ecological Integrity). There are opportunities within land management plans to meet species conservation objectives, while also increasing recreation management options and our ability to maintain, expand, or create new sites. Moving forward we desire to appropriately design and manage recreation facilities to meet both recreation and Aquatic Conservation Strategy objectives. Taking an integrated approach to recreation management and ecological needs can help us more sustainably meet the needs of visitors and support local economies.

Land management planning efforts must continue to consider wide-ranging recreation challenges and develop tools that can be consistently applied, while understanding the unique recreation opportunities and the needs of surrounding communities on individual national forests and grasslands in the BioA area. **Evaluating recreation demands that will complement state outdoor recreation action plans and other management strategies is important to integrate cohesive recreation direction.** Land management planning offers the opportunity to work with the public to identify recreation emphasis areas that can help focus resources on priority maintenance or development needs as well as help respond to changing recreation demands, particularly for national forests and grasslands located near metropolitan areas where the greatest recreation challenges are expected. (chapter 5, Sustainable Recreation).

NWFP area visitors spend about $612 million each year on lodging, restaurants, souvenirs, and other trip-related expenses.[62]

[62] Charnley and others, 2018.

Modernization Options

The integrated recommendations presented in this chapter focus on several major issues impacting multiple national forests and grasslands across the BioA area that can be influenced by land management planning. Using these recommendations as a starting point, the Forest Service will engage the public as we develop a strategy for updating land management plans across the BioA area. We want to keep and enhance management direction that's working well, but make changes where necessary to meet today's social, economic, and ecological conditions and challenges on our dynamic landscapes. Large-scale management challenges, such as climate change, affect all the national forests and grasslands across the BioA area. Other challenges, including maintenance of spotted owl habitat and maintaining the role of wildfire in frequent-fire dependent ecosystems, are unique to or more urgent on individual or several national forests and grasslands. To increase efficiency in land management, it's important for modernization efforts to create consistent direction for universal challenges, but also to develop direction that recognizes and is compatible with diverse ecosystems and communities.

Potential Strategies for Land Management Modernization

Simultaneous Plan Revision

Pros
- Ensures consistency and compatibility among the plans.
- Contributes to standardizing the formats of land management plans.
- Realizes efficiencies if phases of the process are streamlined and expected timelines are met.

Cons
- Presents internal coordination challenges across 19 responsible officials and their staff.
- Changes on one national forest or grassland might impact all 19 national forests and grasslands.
- Would be challenging to conduct meaningful public engagement.

Incremental Plan Revision

Pros
- Focuses on national forests and grasslands with the most urgent needs.
- Supports ability to learn as we go; increases efficiencies.
- Provides lower per year and more sustainable budget and staff.

Cons
- Extends budgeting and staffing needs across a long period.
- Requires at least 12 years to complete revision on all 19 national forests and grasslands.
- Maintains the outdated condition of many plans for a longer time.
- Necessitates close coordination between planning teams as one group of plans is finalized and the next group starts.

Amendment(s)

Pros
- Focuses on the most immediate needs within the BioA area.
- Develops streamlined direction compatible with ecosystems and conditions.
- Provides public engagement focused on specific areas and issues.

Cons
- Doesn't address problems associated with overlapping management direction.
- Would not be a comprehensive modernization of all plans.

Individual Plan Revision

Pros
- Historically, most national forests and grasslands have individually revised or amended their land management plans.

Cons
- Extends budgeting and staffing needs across a long period.
- Requires about 80 years to complete revision on all 19 national forests and grasslands.
- Restricts the ability to accomplish timely work on the ground.
- Delays comprehensive modernization of most plans.

Incremental Plan Revision and Amendment

Pros
- Allows for a broad-scale modernization of plan components.
- Contributes to consistent management of similar issues across the landscape and management compatibility with varied ecosystems.
- Allows for more robust public involvement related to the specific issues.

Cons
- Delays comprehensive modernization of most plans.
- Amending rather than revising would result in overlapping layers of management direction.

Simultaneous Plan Revision—All 19 forests and grasslands in the BioA area would complete plan revision at the same time. This approach, like the landscape-level approach used during the NWFP, would ensure consistency and compatibility among the plans and would contribute to standardizing the formats of land management plans to help develop a common understanding of management direction. Completing simultaneous plan modernization presents significant capacity and coordination challenges across 19 responsible officials and their staff; however, efficiencies might be realized if phases of the process are streamlined and expected timelines are met. If, during simultaneous plan updating, the required analyses are integrated and conditions change significantly on one national forest or grassland requiring different or additional analysis, all 19 units would likely be impacted. Finally, this strategy might present a challenge to meaningful engagement with the public in the planning process because of the amount and complexity of information and the breadth of the geographic scope.

Incremental Plan Revision—We would revise three to six land management plans at the same time based upon similar challenges and geography. As an example, we could start with five units in the southwestern BioA area based on growing departure in desired ecological conditions, vulnerability to fire cost and behavior, and dependency of local communities on benefits from national forests and grasslands. The planning effort on the next group of units would begin approximately 1 year before the process is complete on the first group, and so on until revisions for all 19 units are complete. This option would allow the Forest Service to focus on the units with the most urgent needs for modernization first and would support our ability to learn as we go, which will help us continually improve land management planning efficiencies. Budgeting and staffing needs would be extended across a longer period than under the simultaneous plan revision option but would be lower per year and therefore, potentially more sustainable. Under this approach it would take at least 12 years to complete revision on all 19 units and would maintain the outdated condition of many plans for a longer time. Ensuring consistency and compatibility between plans that are in different groups would require close coordination between planning teams as one group of plans is finalized and updating is started on the next group.

Amendment(s)—Under this option, we would complete a range-wide amendment of all or a subset the land management plans to address one or more of the topic areas identified as needing change in the BioA. For instance, this option could be used to develop up-front, standardized agreements on range-wide management for listed species such as the northern spotted owl. This method could specifically address issues like northern spotted owl habitat connectivity throughout its range and facilitate Engendered Species Act consultation on future plan revisions. Amendments could also be used to better align late-successional reserve boundaries with late-successional habitat. An amendment process, even at a large scale, would be shorter than full plan revisions, and might take only 2 years to complete. This approach would allow the Forest Service to focus on the most immediate needs within the BioA area and might be a more streamlined option for creating direction that is compatible with the various ecosystems and conditions. Opportunities for public engagement would be more focused on specific areas and issues, which might allow for more robust public involvement. A drawback to this approach is that it would not completely address the problems associated with overlapping management direction. In addition, while this approach would focus on the most urgent issues within the BioA area, it would not be a comprehensive modernization of all plans; plans would remain outdated and many important updates would not be completed.

Individual Forest Plan Revision—Historically, land management plans are revised or amended by individual national forests or grasslands. However, many of the ecological and socioeconomic conditions in the BioA area span many forests and grasslands and are therefore, best addressed at a landscape scale. Completing individual land management plan modernizations wouldn't meet the agency's goal of reducing the time and cost to produce efficient, effective, and high-quality land management plans to accomplish more work on the ground and be more responsive to our public.

Incremental Plan Revision and Amendment—We would begin modernization on a prioritized group of units, as in the incremental plan revision option, and simultaneously complete amendments on other units that are facing some of the same urgent issues. For instance, as a group of plans are updated to include refined and improved direction associated with the natural role of fire in frequent-fire dependent ecosystems, all other plans on units with similar ecosystems could be amended to incorporate the same language. This approach would allow for a broad-scale modernization of plan components to meet immediate needs without the complexity of updating many plans at the same time. The approach would contribute to consistent management of similar issues across the landscape as well as management that is compatible with the varied ecosystems. Potentially, this approach would contribute to more robust public involvement related to the specific issues on which amendments were focused. However, comprehensive modernization of most plans would still be delayed and amending plans rather than revising them would still result in overlapping layers of management direction.

Combination approach—An Example

Relevant direction from the US Fish and Wildlife's Conservation Strategy for Grizzly Bear in the Northern Continental Divide Ecosystem 2019 [63] has been incorporated as amendments to the landmanagement plans for the Helena, Kootenai, Lewis and Clark, and Lolo National Forests. The Flathead National Forest incorporated the relevant direction into its land management plan revision.

This combination of revision and amendments ensures that habitat for this wide-ranging species is managed consistently and appropriately across all affected national forests.

Many of the identified opportunities for modernizing the land management plans in the BioA area cross multiple national forest and grassland boundaries. Some management opportunities on some national forests and grasslands are more urgent than others, while other challenges experienced across several national forests and grasslands would benefit from a consistent approach. Some forests have a more urgent need for restoration activities to improve the resiliency of the landscape than others (figure 2-6). The need for management consistency arises when multiple national forests and grasslands face the same management challenge; an example is managing habitat to facilitate the recovery of the northern spotted owl across that species' range (figure 2-7). We gain efficiencies by combining modernization efforts around similar management needs.

[63] NCDE Subcommittee, 2019.

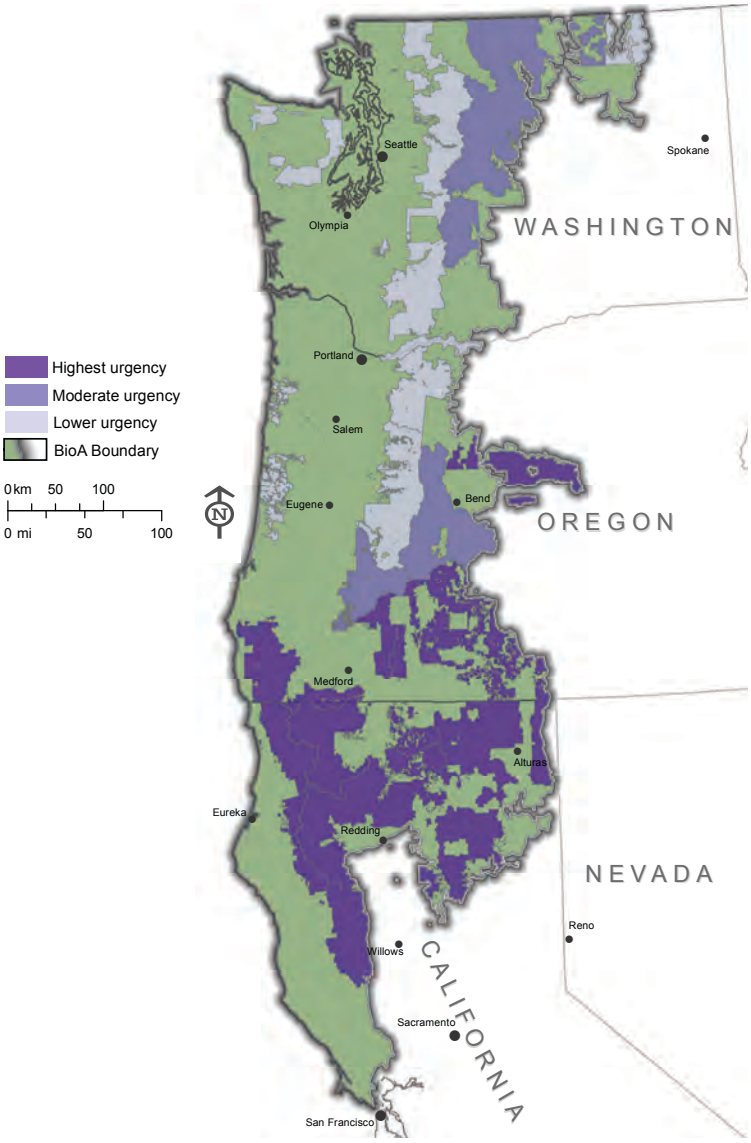


Figure 2-6—National forests and grasslands within the BioA area rated by urgency to address lack of resiliency. High urgency includes the Fremont-Winema, Rogue River-Siskiyou, Six Rivers, Klamath, Modoc, Lassen, Shasta-Trinity, Mendocino, and Ochoco National Forests and Crooked River National Grassland. Moderate urgency includes the Okanogan-Wenatchee, Umpqua and Deschutes National Forests. Map shows logical groupings of national forests and grasslands for incremental plan revision.

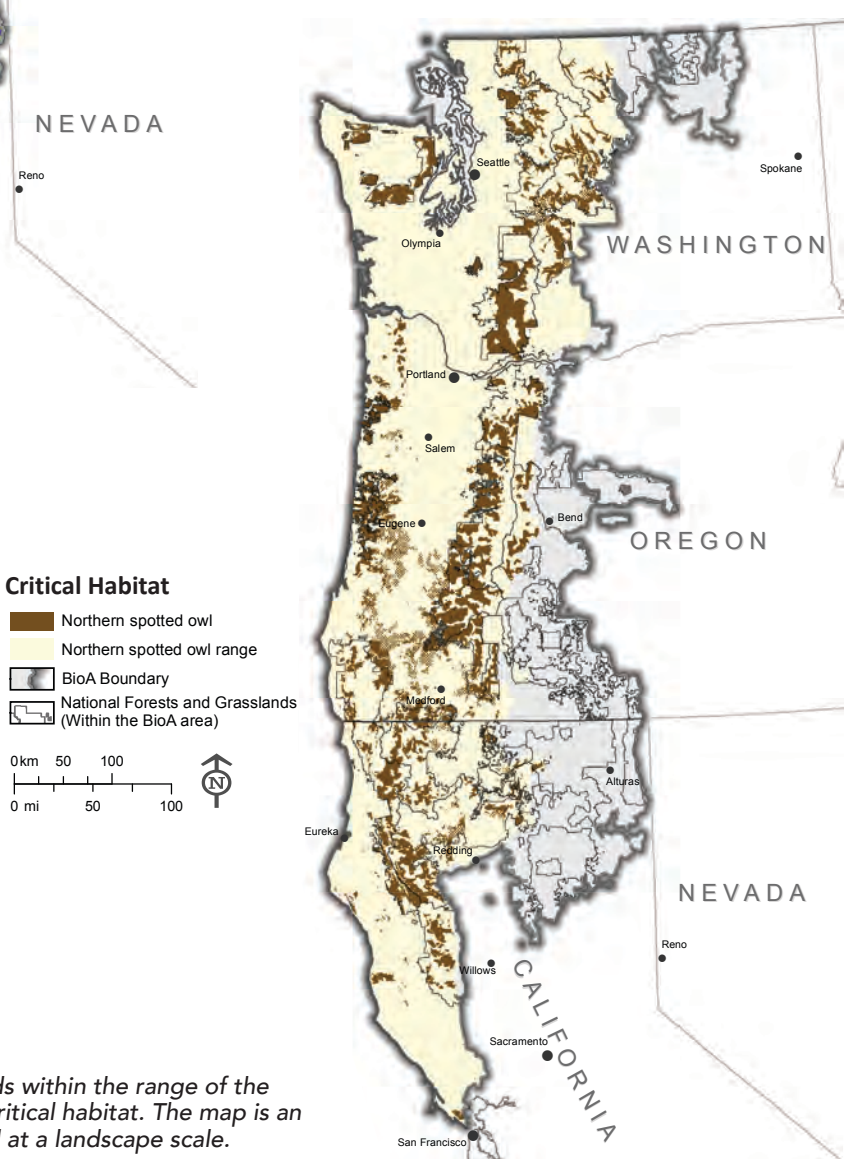


Figure 2-7—National forests and grasslands within the range of the northern spotted owl and its designated critical habitat. The map is an example of an issue that is best addressed at a landscape scale.

Conclusion

In this chapter, we presented key management recommendations aimed at addressing the complex social, economic, and ecological challenges that national forests and grasslands in the BioA area are facing. We recognized the interdependent relationships of these challenges and identified how updates to land management plans could improve the ability of national forests and grasslands to continue to deliver benefits to communities and increase the ability to manage for improved ecological sustainability across the landscape. We presented this information by organizing recommendations under five categories of resource management changes needed across the landscape: (1) ecological integrity, (2) fire and fuels management, (3) sustainable timber, (4) habitat management, and (5) sustainable recreation; these categories continue through the remainder of the BioA. Chapter 3 presents what's working well in the existing land management plans and identifies what should be retained or modified in future planning updates to reflect current knowledge and learning from past experiences.

Chapter 3

What's Working Well?

> *"NWFP monitoring indicates that progress is being made toward meeting several of the original long-term goals, namely maintenance of vegetation conditions that support northern spotted owls and marbled murrelets, protecting dense old-growth forest, providing habitat for aquatic and riparian-associated organisms, and reducing the loss of mature and old forest to logging."* [64]

In chapter 2, we described recommendations for future planning efforts in the BioA area. Throughout this and subsequent chapters, we provide additional context to the recommendations highlighted in chapter 2 and integrate information using the five broad categories.

In many cases, land management plans in the BioA area are delivering effective, landscape-scale management, achieving positive community benefits, and moving us toward or maintaining desired conditions. During the 2015 public listening sessions, we heard that our public and stakeholders want to keep the parts of the NWFP and other land management planning efforts that have been and continue to be effective. This chapter is a broad look at what's working well in existing land management direction across the landscape in terms of sustaining ecological integrity and achieving benefits to communities. We do not touch on every aspect of what is working well; this is a summary. And, we didn't include findings about what's working well for fire and fuels because we learned most of these issues are management challenges and opportunities for change (see chapter 4, Fire and Fuels).

Through monitoring and evaluation, which are continuous learning tools that form the backbone of Forest Service adaptive management, we learn about what's working well on the lands that we manage. This assessment relied heavily on the results of the NWFP's broad-scale monitoring program but did not evaluate the program itself. The information from the monitoring program meets research publication standards, including peer review, and we use it to tell us if changes are needed to plan direction, management activities, or the monitoring program itself, or if we should reassess the current conditions and trends in the plan area. Broad-scale monitoring answers questions about multiple plan areas across a Forest Service region. NWFP monitoring[65], in late-successional and old-growth forests, of northern spotted owls and marbled murrelet habitats, watershed and socio-economic conditions, and Tribal-federal relationship has been successful[66] in helping us determine if we're moving toward the desired conditions. The NWFP monitoring might serve as a model, with some adjustments, for similar efforts across the BioA area in the future.

[64] Spies and others, 2018b. p. 970.
[65] https://www.fs.fed.us/r6/reo/monitoring/.
[66] Spies and others, 2018b.

Reserve Network. Late-successional reserves, riparian reserves, and congressionally reserved lands are part of a landscape-scale approach that has worked well in supporting the integrity of ecosystems, which includes support for aquatic habitat (figure 3-1) and conservation of habitat for wildlife species. The reserve network also ensures that consistent management direction is applied to each type of land use allocation (figure Intro-3). Other plan amendments, like the PACFISH, INFISH, Eastside Screens, and Sierra Nevada Framework, also have been successful in achieving some desired outcomes including connecting and conserving aquatic habitat and dense, multi-layered forest.

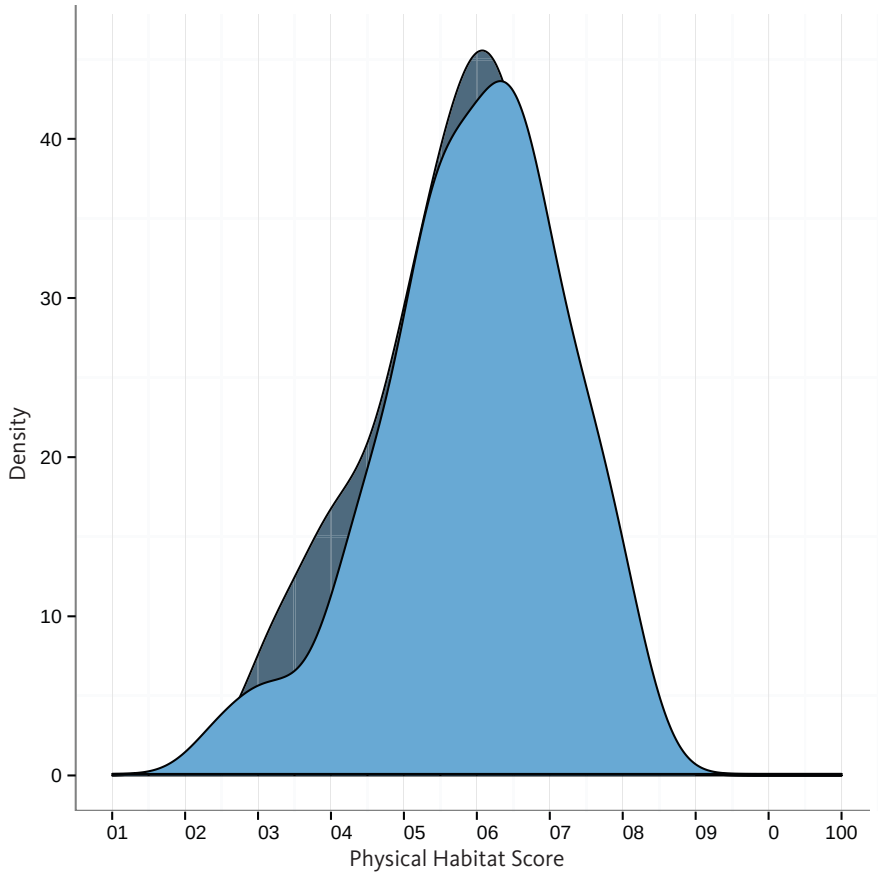


Figure 3-1—This graph highlights a shift to the right (slight improvement) in physical habitat scores determined from stream surveys conducted during 2002–2009 (Rotation 1) and those performed during 2010-2013 (Rotation 2). The physical habitat score is the individual ratings for amounts of fine sediment in channel substrate and presence of large wood. While the amounts of fine sediment in channel substrate and large wood scores were similar between the two rotations, the channel substrate score improved, meaning that less sediment was detected throughout stream channels across the NWFP area. The improvement indicates that changes in land management have been effective at improving aquatic habitat, which benefits federally listed salmon, steelhead, and Bull trout.

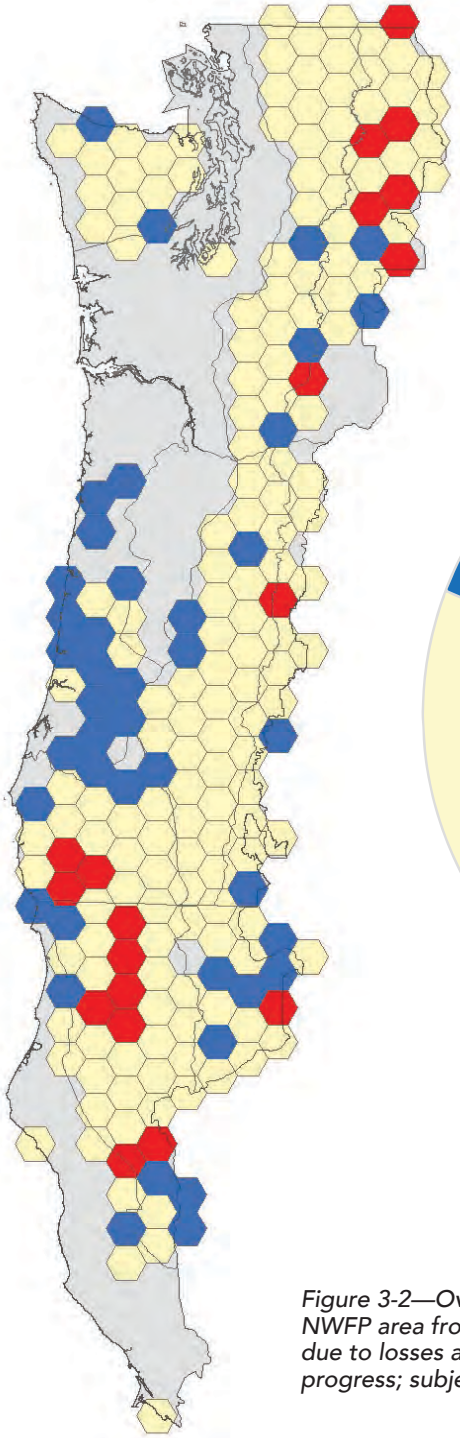
While land use allocations and the reserve network have benefited many resources, some adjustments are needed to create landscape resilience, especially in frequent-fire dependent and fire diverse (mixed severity) ecosystems. A well-connected reserve network that will persist into the future will incorporate climate change refugia and fire refugia.

Conservation of Dense Multi-layered Old-growth Forests. The NWFP conservation strategies and other strategies, including the Eastside Screens and the Sierra Nevada Framework, have effectively stopped the loss of old trees and old-growth forest on federal lands, mainly in dense multi-layered forest.[67] Old-growth forest is generally considered stable on federal lands and has increased slightly since 1993, providing the abundance, diversity, connectivity, and availability needed to support ecosystem functions and specific old-growth-dependent species in the BioA area (figure 3-2).[68] Reversing the loss of old-growth trees and old-growth forest is mainly due to stopping clear cutting practices and allowing trees to mature on federal lands.

While this old-growth forest conservation approach on federal land has been successful in some respects, old-growth forests that were not defined or emphasized in the above planning efforts are increasingly at risk of loss due to fire.[69] These include old-growth forests in frequent-fire dependent and fire diverse (mixed severity) ecosystems. **Loss of old-growth forests from wildfires in California, southern Oregon, and east of the Cascade crest have been masked by gains in old-growth forest on federal lands west of the Cascades** where trees planted after large 20th century fires have grown into the old-forest category.[70] Acres of old-growth forests have declined in frequent-fire dependent ecosystems.

[67] Spies and others, 2018a.
[68] Davis and others, 2015; Davis and others in review.
[69] Spies and others, 2018a.
[70] Davis and others, 2019.

Location of old-forest change



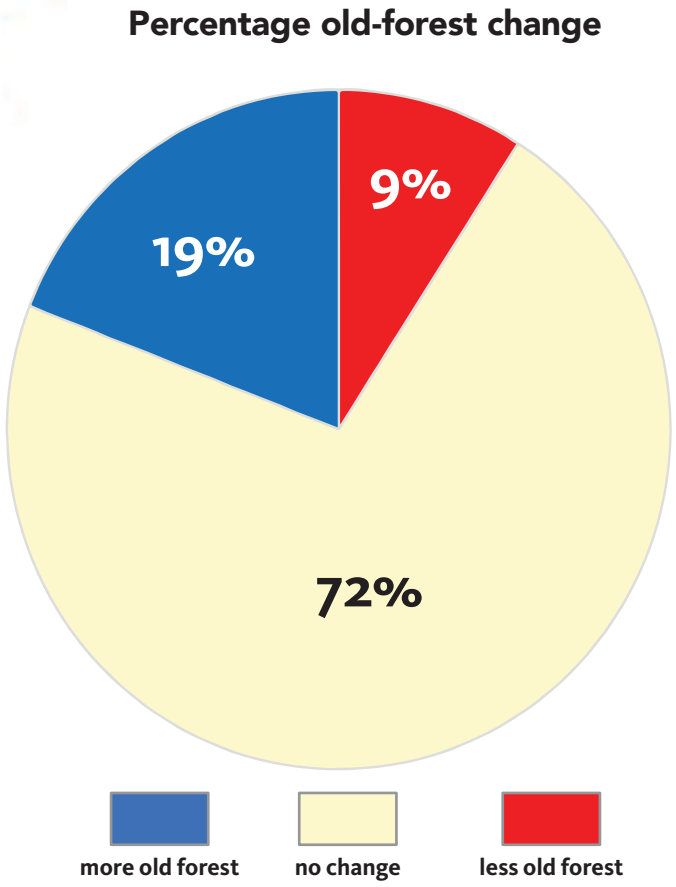


Figure 3-2—Overall, the amount of old-growth habitat remained stable in the NWFP area from 1993-2017. However, where the habitat is located has changed due to losses and additions across time. (Adapted from Davis and others, in progress; subject to peer review).

Conservation of Aquatic Resources. The Aquatic Conservation Strategy is working and provides a solid foundation for upcoming planning efforts, with some opportunity for improvements.[71] Intensive monitoring efforts have revealed improving trends for aquatic habitat (figure 3-1), aquatic macroinvertebrates, and water temperatures. [72] Even with climate change projections indicating warmer stream temperatures, monitoring data are showing cooler (improving) stream temperatures across the last 20 years within the NWFP area,which could be a sign of the effectiveness of climate change refugia principles. Monitoring indicates that upslope and riparian conditions have generally improved across the NWFP area.[73] PACFISH, INFISH,[74] and the Sierra Nevada Framework,[75] like the Aquatic Conservation Strategy, also are successfully protecting and restoring aquatic habitat and watersheds.

[71] Reeves and others, 2018.
[72] Miller and others, 2017.
[73] Miller and others, 2017.
[74] Roper and others, 2019.
[75] Furnish, 2013.

All-lands Aquatic Conservation

Since adoption of the NWFP amendment, many community-based watershed restoration partnerships, including conservation districts, water boards, regional fish enhancement groups, and watershed councils, have formed. Many have adopted an all-lands stewardship approach by conducting assessments and restoration across federal, state, and private borders to improve fish habitat and water quality.

The Willamette National Forest is one of 13 partners forming the McKenzie Watershed Council in Oregon, a group that works together to help restore watershed conditions in the McKenzie River sub basin (figure 3-3). The Forest Service offers unique technical skills and funding for many of the council's projects, such as stream restoration, fish passage restoration, and outreach efforts.

Forest Service staff have acquired a highly useful skill set through the implementation of NWFP, PACFISH, INFISH, and Sierra Nevada Framework aquatic restoration programs, which guide implementation of diverse, active management treatments (for example, stream and fish passage restoration) to efficiently and effectively restore water quality and aquatic ecosystems at watershed scales.

ESA-listed Fish Critical Habitat and Land Ownership in the Mckenzie Subbasin

Willamette National Forest

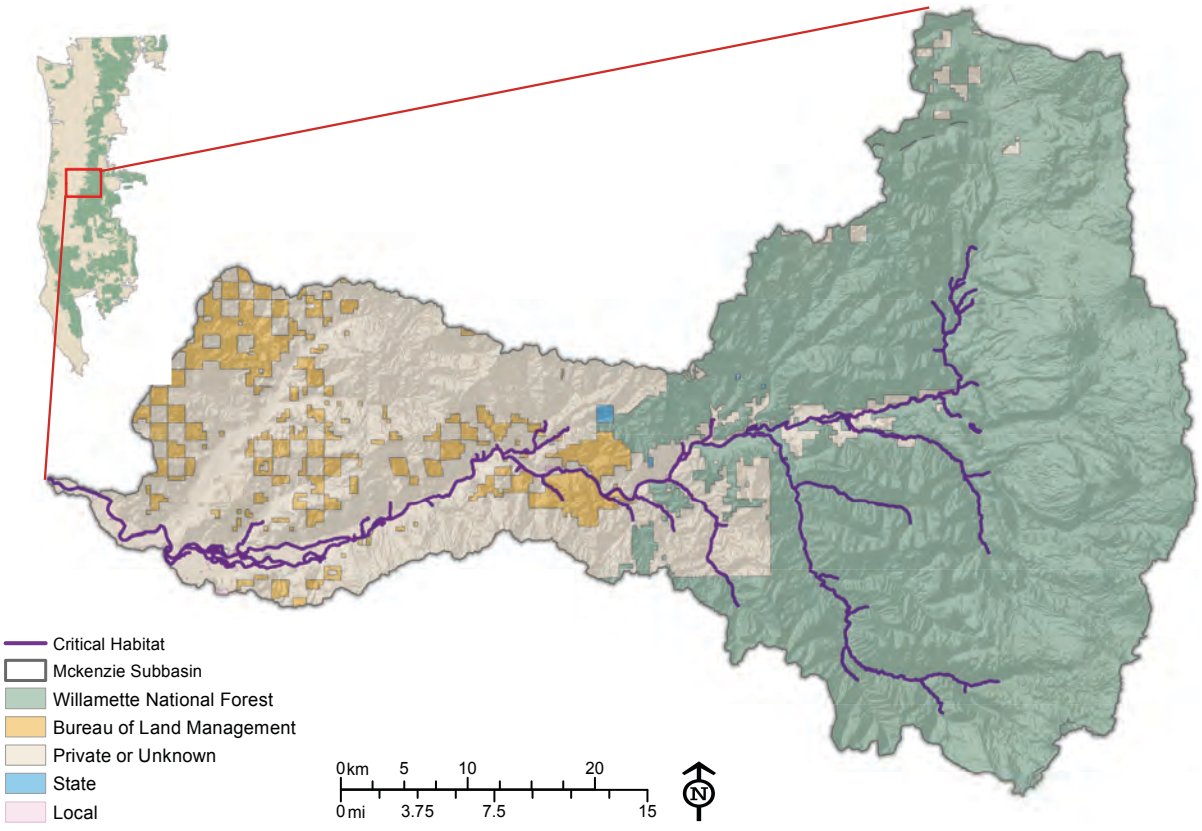


Figure 3-3—The McKenzie River watershed and its critical habitat distribution for fish listed under the Endangered Species Act cross multiple land ownerships. The land ownership mix demonstrates an all-lands restoration approach, where partners work through land boundary and jurisdictional issues to improve watershed conditions for fish, water, wildlife, and local communities.

Riparian Management Zones. These areas, a cornerstone of the NWFP, PACFISH, INFISH, and Sierra Nevada Framework aquatic strategies, have resulted in watershed improvements across the BioA area. Passive restoration—when riparian areas recover naturally without active forest management—has been practiced in riparian management areas and has contributed to watershed improvements. Likewise, large trees in riparian areas that were typically harvested before 1994 are now left to grow and provide stream shade, aquatic and terrestrial habitat, and to create a network of migration corridors for animals throughout and between watersheds.

Additionally, streamflow and water-quality conditions, important for providing clean drinking water and enough water for agriculture, recreation, and environmental needs, have been largely maintained or improved. Monitoring indicates that upslope and riparian conditions have generally improved across the NWFP area.[76] Existing land management direction is successfully protecting and restoring aquatic habitat and watersheds.[77] Restoring watersheds and riparian areas also has resulted in areas of climate refugia for species sensitive to changing temperatures and precipitation patterns.[78]

Carbon Sequestration and Climate Change. Forests and grasslands in the BioA area store large amounts of both above and below ground carbon in live and dead plant and animal material (figure 3-4).[79] At current rates, timber harvest and disturbance will have little impact on carbon sequestration on federal lands in the wetter, western forests of Oregon, and Washington.[80] As stated in the Forest Service's 2018 *Synthesis of Science to Inform Land Management Within the Northwest Forest Plan Area*, "the effects of climate change have become a major concern and focus of research since the NWFP was developed and implemented."[81] Although there is uncertainty associated with the effects of climate change, modernization of land management plans in the BioA area will likely help national forests and grasslands adapt to the effects of climate change and continue to work well at sequestering carbon.

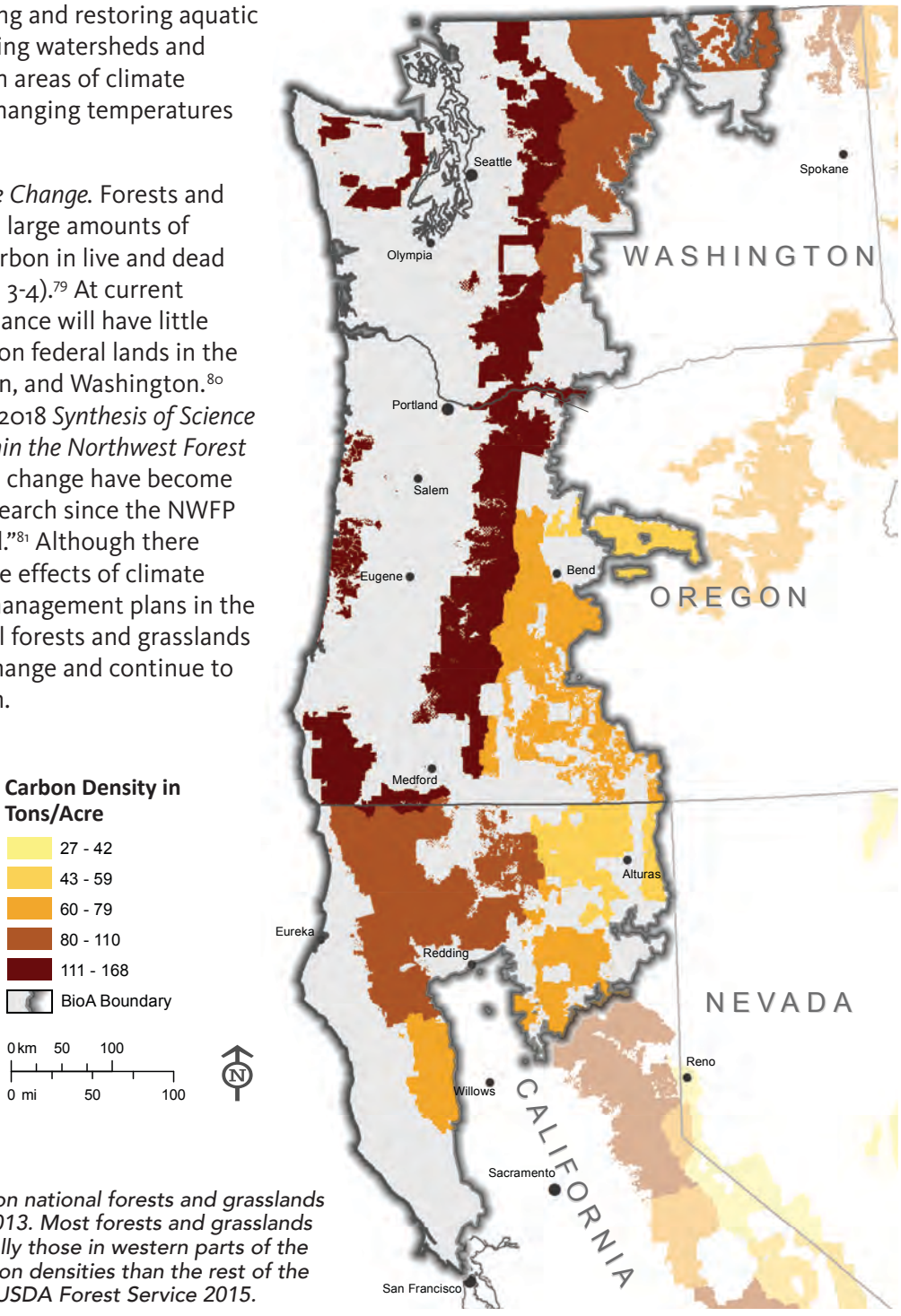
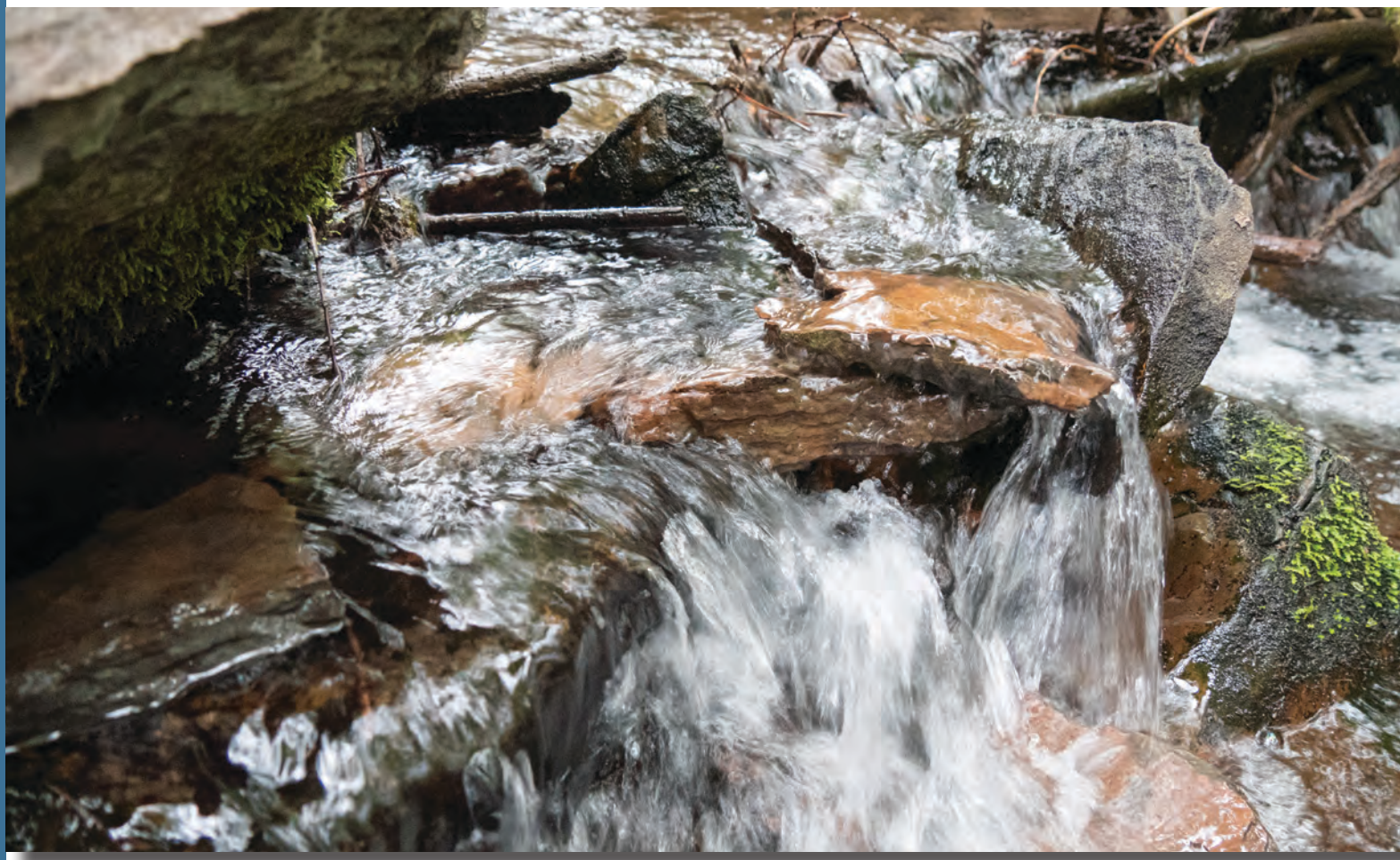


Figure 3-4—Carbon density on national forests and grasslands within the BioA area, as of 2013. Most forests and grasslands within the BioA area, especially those in western parts of the BioA, have much higher carbon densities than the rest of the country (figure 1-4). Source: USDA Forest Service 2015.

[76] Miller and others, 2017.
[77] Roper and others, 2019.
[78] Reeves and others, 2018
[79] USDA Forest Service, 2015. figure 3-4.
[80] Spies and others, 2018a.
[81] Spies and others, 2018b.



Traditional Ecocultural Resources. Ecosystems within the BioA area provide and support a broad range of cultural resources sites, areas, buildings, structures, and objects that are important to American Indian Tribes. New and emerging forest management concepts, including restoring frequent-fire-dependent systems, align with Tribal ecocultural resource perspectives.[82]

Tribal communities contribute to the social and economic benefits of national forests and grasslands through Tribal culture and viewpoints that can help with restoration-related work and interpretive and training programs. The Aquatic Conservation Strategy and its four main components provide long-term resource benefits, such as improved fisheries habitat, which are central to Tribal well-being.[83]

First Foods

First foods are traditional foods that have been and remain significant in some American Indian Tribal diets and cultures (Lynn and others 2013). Culturally significant resources, including water, fish, big game, roots, and berries, are used in ceremonies as well as for sustenance and economic benefit to perpetuate American Indian sovereignty and cultures.

The Forest Service understands the Tribal significance of treaty rights and traditional resources, including first foods. Many Tribal members have longstanding, customary knowledge and relationships with natural resources on national forests and grasslands. The interdependent relationship is one in which Tribal practices nurture ecological systems that in turn nurture and sustain cultural continuity and identities.

The goal of promoting Tribal ecocultural resources, such as first foods, is consistent with emerging direction in forest management and the management options presented in the BioA.

[82] Long and others, 2018.
[83] Long and others, 2018.

Sustainable Timber

Since 2005, timber production levels have remained relatively stable, producing an average of 450 million board feet per year from Forest Service lands within the NWFP area. Recent harvest levels have also been regionally stable at about 72 percent of Forest Service anticipated timber production (figure 3-5). While we view our stable timber production rates as a success, the fact that production levels are consistently below what was anticipated in our land management plans is a concern—**the predicted harvest of about 600 million board feet per year hasn't been realized.** Although commercial harvest of timber is planned to continue, conflicting plan direction and restrictions on tree size or stand age, as well as a lack of social acceptance of planned harvest methods like regeneration, will likely limit future harvest (chapter 4, Sustainable Timber).

"Federal forest management contributes to socioeconomic well-being in rural communities by providing timber and nontimber forest products, recreation opportunities, jobs, other ecosystem services, and backdrops for where people want to live and work."

Charnley and others 2018 p. 661

450 million board feet per year from Forest Service lands within the NWFP area

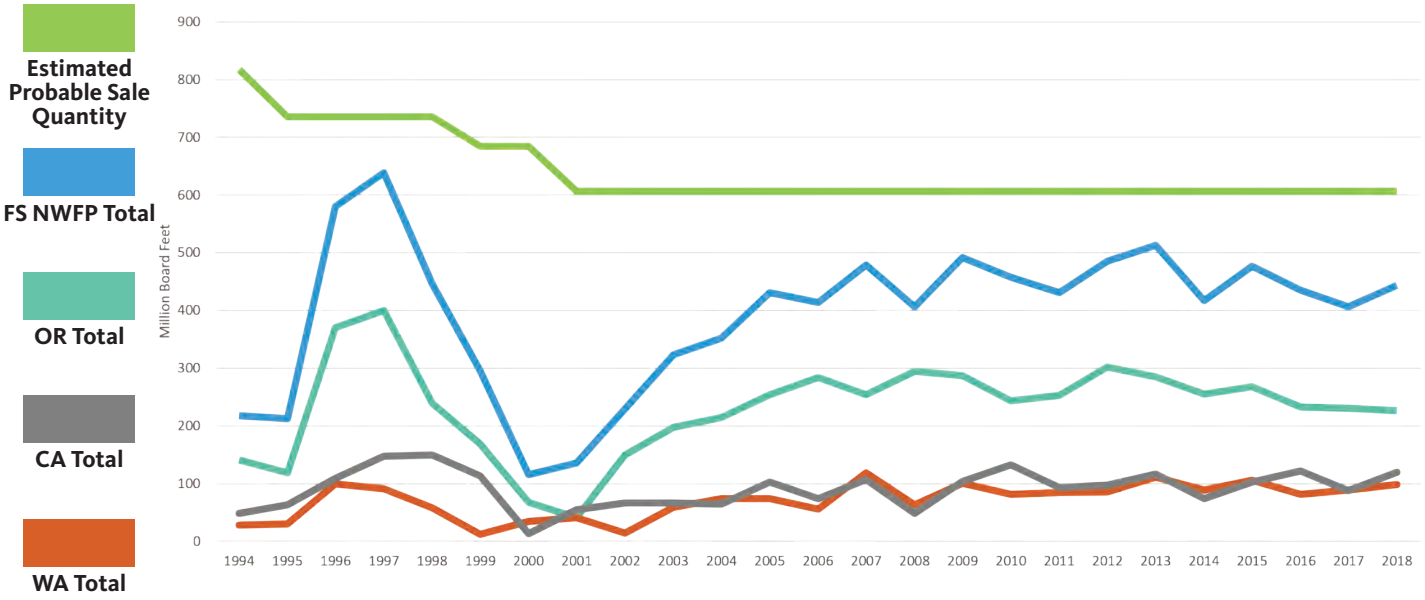


Figure 3-5—Harvest levels have remained stable in the NWFP area for the past decade, although they have been less than projected. The graph shows the amount of timber sold from national forests in the NWFP area between 1994 and 2018 compared to the Forest Service estimated probable sale quantity. Forest Service anticipated timber volume is about 600 million board feet and the agency has produced an average of about 450 million board feet within the NWFP area annually since 2005.

In addition to timber products, national forests and grasslands provide a variety of nontimber forest products such as moss, mushrooms, cones, grasses, and firewood. These products support community and household well-being by providing income and economic opportunities, strengthening community networks and relationships, facilitating intergenerational ecological knowledge transfer, and enabling nontimber forest product gatherers to develop stronger connections with nature and improve their mental and physical health.[84]

Evolving timber harvest methods. Forest Service harvest methods shifted from primarily clear cutting in the 1980s and early 1990s to mainly commercial thinning after 1994 as we implemented more intermediate harvest treatments with multiple objectives.[85] More modern intermediate methods, such as variable density thinning and variable retention harvest, have been studied and implemented in the BioA area during the past decade. Harvests that retain significant structural elements of the pre-harvest stand have largely replaced clearcutting"[86] (figure 3-6). Harvest methods continue to create timber outputs that contribute to local economies, often along with restoration and resilience projects.

[84] Charnley and others, 2018.
[85] Spies and others, 2018b.
[86] Franklin and others, 2018. p.108.

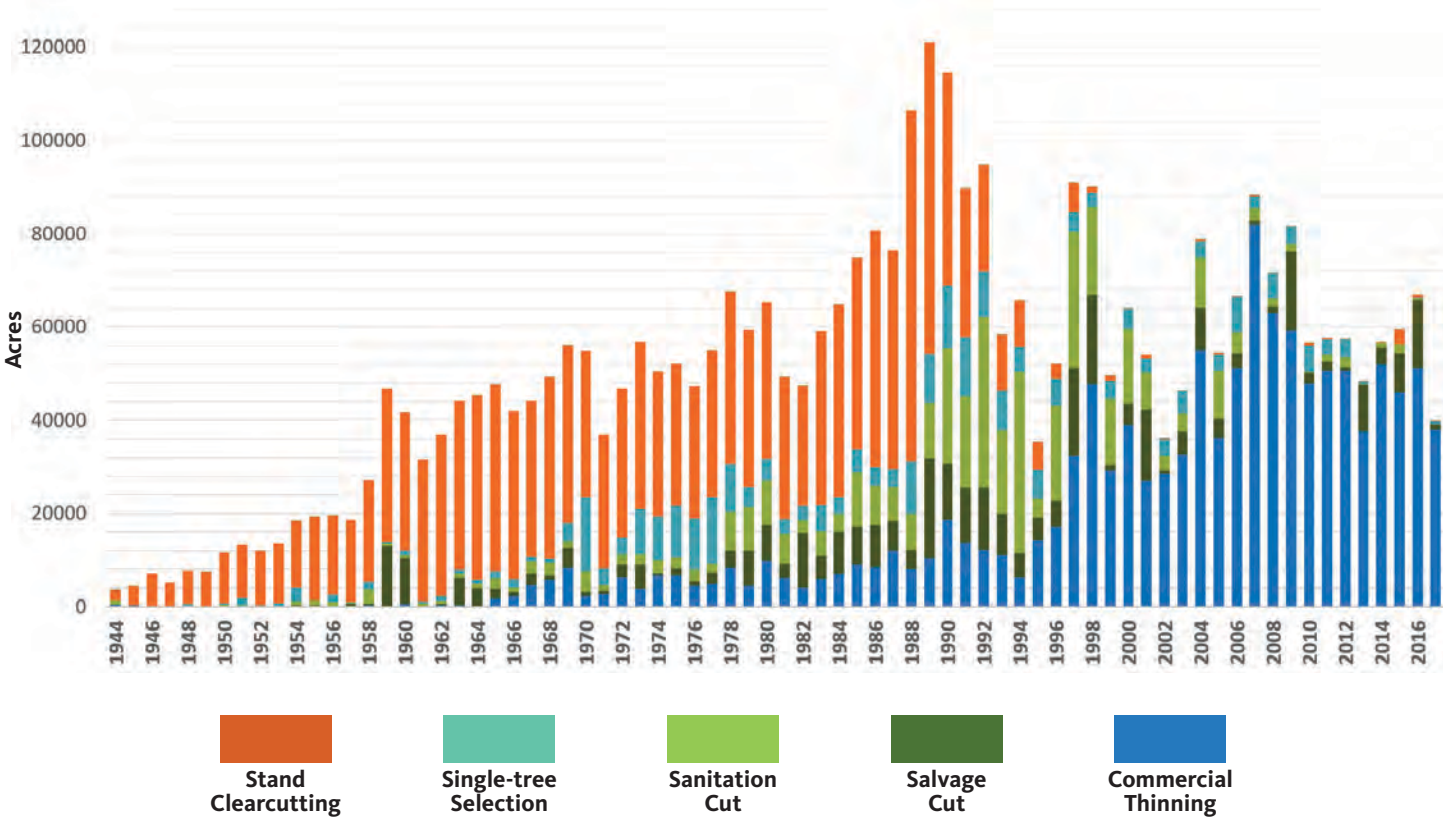


Figure 3-6—Acres of primary harvest types (clearcutting, commercial thinning, salvage, sanitation, and single-tree selection) within the BioA area from 1947 to 2017. There were more than 75,000 acres clear-cut in 1988, while 2007 saw a peak in commercial thinning at just under 82,000 acres. Timber harvest practices have moved to mostly commercial thinning with almost no stand clearcutting.

commercial thin—An intermediate timber harvest with the objective of reducing stand density primarily to improve tree growth and enhance forest resilience. Saw-log size material is a product of this management, although regenerating new trees is not an objective. Commercial thinning can include a wide variety of thinning types including low, free, selection and crown thinning in addition to variable density thinning, "skips and gaps", or the Individuals, clumps, and openings method.

salvage cut—An intermediate treatment that harvests trees that are dead or dying due to injurious agents like insects or disease. A primary objective of this timber harvest is to recover economic value.

sanitation cut—An intermediate harvest removing trees to improve stand vigor by stopping or reducing the actual or anticipated spread of insects and disease.

single-tree selection cut—A regeneration harvest where individual trees of various sizes and ages are removed. The objective of this treatment is to provide space to grow new trees in a multi-age structure in addition to promoting the growth of remaining trees. This is an uneven-aged method. Multiple entries of this activity ultimately result in an uneven-aged stand of three or more age classes or sizes.

stand clear-cut—A regeneration harvest that removes all trees in the stand. The objective of this treatment is to grow new trees that are all the same age. It produces a fully exposed micro climate and one cohort of regeneration in one entry.

In the 21st century, ecological forestry, which includes natural forest ecological models, natural forest development, and concepts related to natural disturbances in project design and harvest methods, has become central to how foresters approach landscape planning. However, the broadly diverse harvest methods of ecological forestry, including a variety of regeneration harvests and multi-aged management, are often controversial and not yet widely accepted or applied. The lack of social acceptance, and therefore application, could prove problematic, especially in the face of climate change and social and ecological uncertainty.

The Forest Service is dedicated to supporting the study and use of more modern and diverse methods to meet today's need for resilient landscapes and multiple land management objectives. We will continue to work to build trust and improve consideration of the benefits of various harvest methods.

Habitat Management

Old-growth habitat. The northern spotted owl, listed as threatened under the Endangered Species Act in 1990, is one of many species that relies on old-growth forest habitat. **The reserve network established by the NWFP has been effective in stemming the loss of old-growth habitat from timber harvest on federal lands;[87] however, the owl population continues to decline** (chapter 4, Habitat Management). The reserve network has also been effective in maintaining and enhancing marbled murrelet habitat on federal lands; however, the birds continue to experience population declines in the northern portion of the BioA area. Since the NWFP was adopted, additional conservation focus has been placed on other species, such as marten, fisher, wolverine, and other mammalian carnivores, who also depend in part on late-successional forest habitats.

Broad-scale habitat conservation. The core principles of broad-scale conservation developed in the NWFP area are implemented through land use allocations. Late-successional reserves, riparian reserves, and other land use allocations that focus on species recovery have provided clear and effective management direction in the context of habitat protection.

Survey and Manage. The survey and manage standards and guidelines in the NWFP require that surveys be conducted before initiating management actions, and actions are limited based on the results of the surveys. Survey and manage standards and guidelines have added much to our knowledge about rare and uncommon late-successional and old-forest-dependent species in the NWFP area.[88] For example, 50 different mollusks have been considered for listing during the past 20 years. And, although none were listed, all the decisions were informed by surveys. Survey and manage standards and guidelines help us focus on certain individual species and contribute to the modernization of forestry practices, such as leaving more dead trees, downed wood, and refugia habitat. However, implementing the survey and manage standards and guidelines has been challenging and improvement and updates are needed.

[87] O'Hara, 2014.
[88] Marcot and others, 2018.

Sustainable Recreation

The Forest Service is one of the largest suppliers of outdoor recreation in the BioA area, providing opportunities for experiences and activities to a broad range of users. Special use permits are issued to people, clubs, and businesses for many recreational purposes including operation and maintenance of picnic areas, campgrounds, ski areas, and boat docks. The permits provide experiences for the recreating public, while addressing public safety and protecting natural resources.

The Pacific Northwest is a showcase of recreation largely due to outstanding natural resources that have been maintained and improved through conservation strategies like the NWFP and the Aquatic Conservation Strategy. Clean water, healthy vegetation, and improved fishery resources enhance recreation experiences on the national forests and grasslands in the BioA area. Wilderness Areas, Wild and Scenic Rivers, and National Scenic and Recreation Areas provide unique recreation opportunities and complement landscape-scale wildlife management objectives by conserving critical habitat.

Forest Service Special Use Permits

The Forest Service's Special Use Permit Program provides a variety of land use opportunities. Each year, thousands of individuals and businesses apply for permits to use national forests and grasslands for such activities as water transmission, agriculture, outfitter guiding, telecommunications, research, video productions, road and utility rights-of-way, and recreation. Special use permits provide economic benefits and value for many rural communities. By offering more ways to experience our national forests and grasslands, the special use permit program helps enrich lives by providing opportunities for lasting memories, personal growth, and a sense of connection with our national forests and grasslands.

The Shasta-Trinity National Recreation Area provides one of the largest, most diverse, and complex uses of the special use program for recreation. The 2014 National Recreation Area Management Guide for the Shasta-Trinity estimated that there were about 970 recreation special use permits in use within the National Recreation Area. This includes permits issued for privately owned houseboats and cabins, resorts, marinas, campgrounds, RV parks, outfitter and guide services, concessionaires, boat docks, recreation events, and shooting ranges. Most commercial recreation use happens at the 13 full-service resorts or marinas, while private permitted recreation use is primarily in cabin and houseboat ownership. On the Shasta-Trinity National Forest, the annual revenue generated from cabins, marinas, and houseboats is nearly $1.5 million.

Conclusion

In this chapter, we summarized what's working well in the existing land management plans across the BioA area. We recognized that NWFP and other planning direction have met many of their social, economic, and ecological goals, and we want to retain aspects of existing plans that provide benefits to communities and ecosystems. We also identified where existing science and decades of monitoring and implementation indicate opportunities to expand upon and further improve the parts of existing land management plans. In chapter 4, we explore where existing direction presents management challenges, and we provide a preliminary identification of the need to change direction to ensure the delivery of essential forest benefits to communities and the sustainability of ecological integrity in the BioA area.

Chapter 4

Management Challenges and Opportunities for Change

What you're about to read is a preliminary identification of opportunities to change existing management direction across the BioA area. While much of the landscape-level direction across the 19 national forests and grasslands is consistent, in many cases it isn't compatible with the unique and dynamic ecological, economic, and social issues faced by local national forests and grasslands.

The BioA area contains about **24 million acres of national forests and grasslands** with a myriad of unique and common management challenges; therefore, this chapter is not is a comprehensive look at all the management challenges in the BioA. During the next steps of the planning process, we'll determine the challenges and opportunities for management change on each forest and grassland in the BioA area to gain insight on how we can better support local economies and sustain ecological integrity.

Ecological Integrity

Land management plan direction for national forest and grassland restoration is needed to improve and maintain ecological function. Improved restoration will better meet the needs of communities now and for future generations.[89] About 18 million acres (65 percent) of the national forests and grasslands in the BioA area lack structural diversity and resilience and do not adequately contribute to ecological integrity. Unless we address this issue, often through active management, ecological integrity could continue to decline and the benefits we receive from the national forests and grasslands today could be diminished for future generations.

About 10 million acres within the BioA area need some type of forest structure restoration to improve and maintain ecological function and resilience (figure 4-1). About 2.2 million acres, primarily in our wettest, most fire-infrequent ecosystems, need restoration to enhance tree growth and snag development. Natural ecosystem processes and active treatments that maintain and enhance old-growth forest are needed to develop and maintain ecosystem function. **An estimated 7 million acres, where there is denser vegetation than would have been naturally supported, would benefit from mechanical treatment, fire treatment, or both** to achieve more natural, sustainable, and resilient densities. This would help these areas be more resilient to drought, insects and disease, as well as fire and climate change. Of the 7 million acres, about 3 million acres lack large trees and need disturbance to alter density and provide time to develop old-forest attributes. Even when the best available science indicates that active management restoration is needed, conflicting management direction makes restoration in riparian areas and upland forests challenging.[90] Desired conditions identified in most land management plans are too general and not linked to landscape-level vegetation restoration or resiliency (figure 4-1).

[89] Spies and other, 2018b.
[90] Reeves and others, 2018.

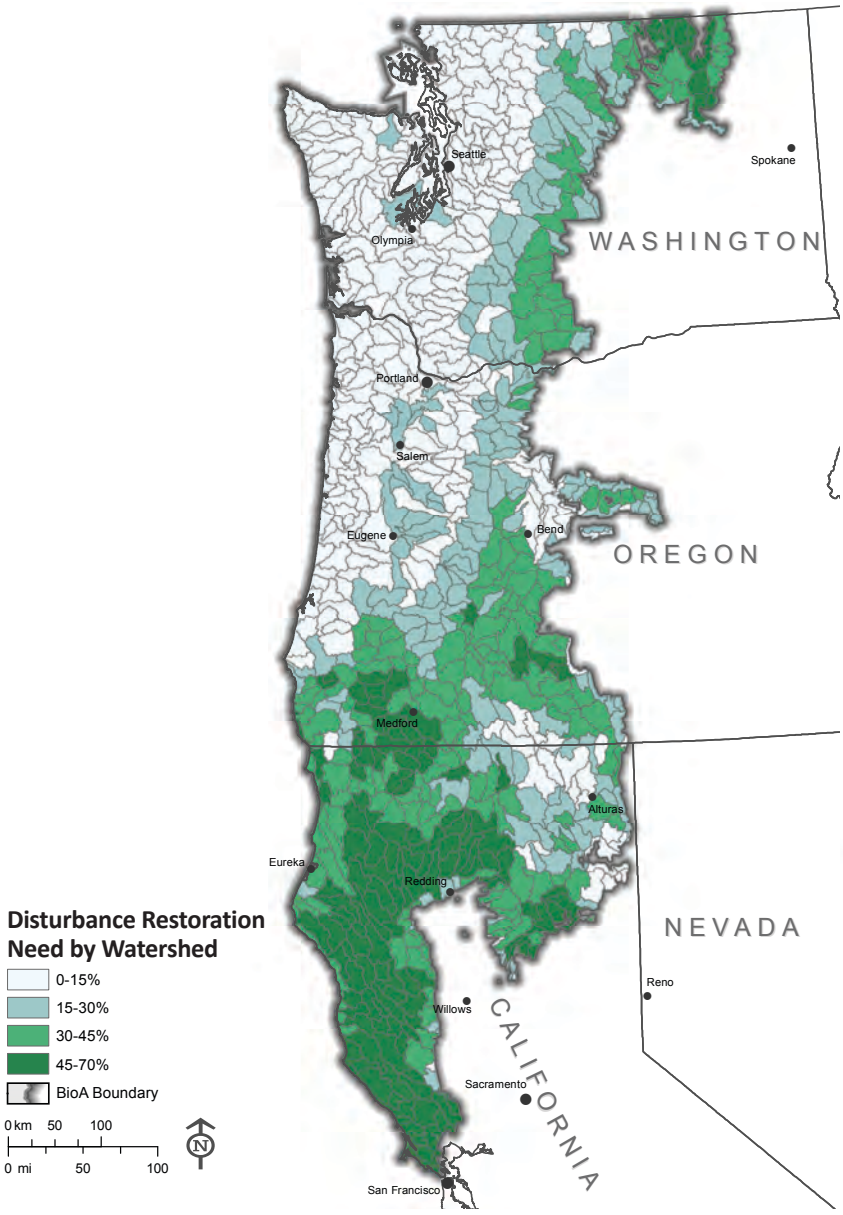


*Figure 4-1 Map A—**7 million acres of national forests and grasslands within the BioA area need disturbance restoration** (for example, mechanical or fire treatments) to reduce density and restore forests (disturbance restoration). If a watershed has a 45 to 70 percent restoration needed, it urgently needs restoration to maintain ecosystem resilience.*

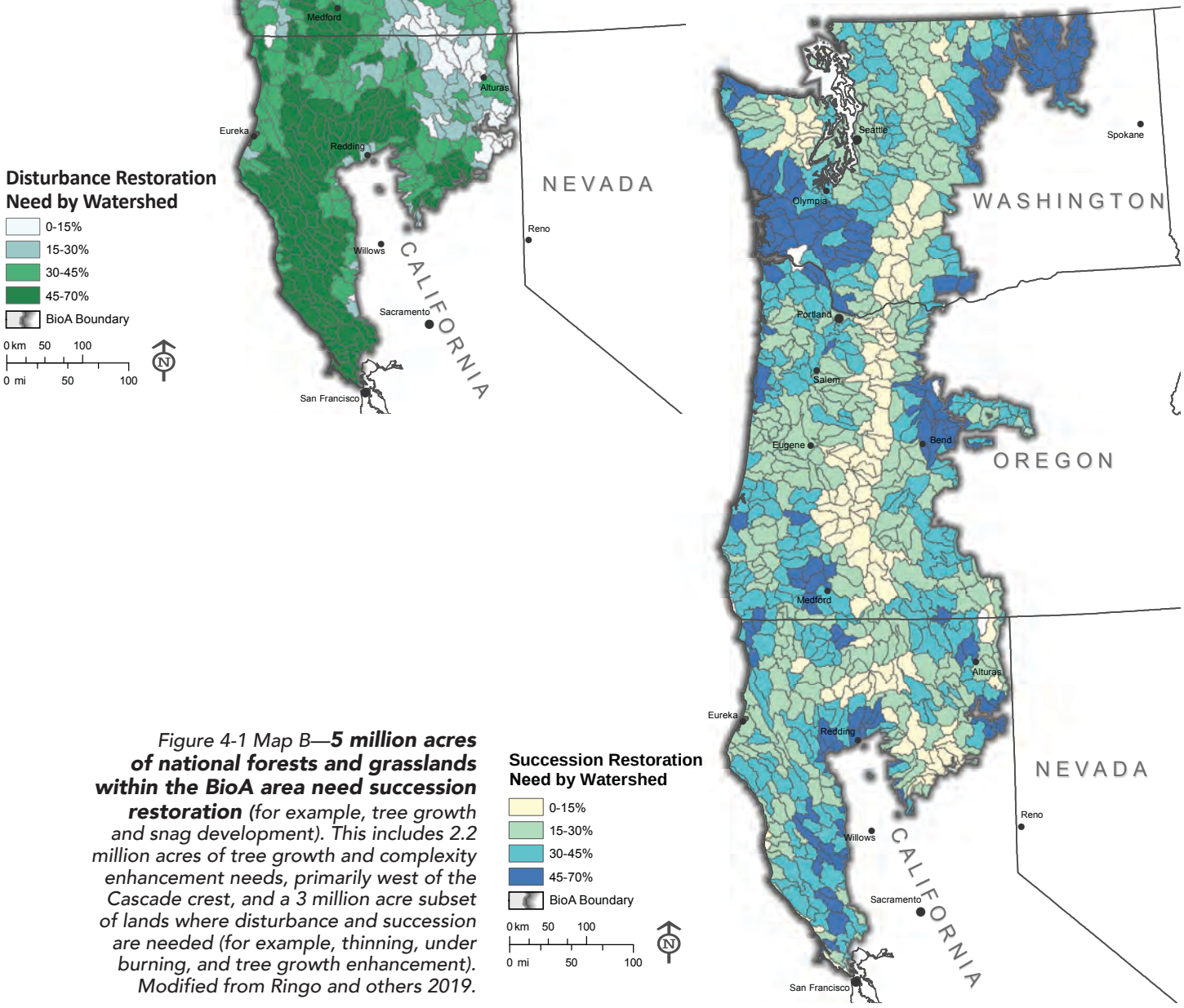


*Figure 4-1 Map B—**5 million acres of national forests and grasslands within the BioA area need succession restoration** (for example, tree growth and snag development). This includes 2.2 million acres of tree growth and complexity enhancement needs, primarily west of the Cascade crest, and a 3 million acre subset of lands where disturbance and succession are needed (for example, thinning, under burning, and tree growth enhancement). Modified from Ringo and others 2019.*

Late-successional reserve direction needs to reflect the dynamic nature of landscapes. The current land management plan direction for late-successional reserves is static both in location of the reserves and goals for ecosystems within the reserve boundaries. The static condition doesn't account for or reflect the increasing patch size of large fires and other disturbances (for example, drought or insect and disease related mortality), habitat fragmentation, and the dynamic nature of the ecosystems within and around the late-successional reserves.[91] Although revising late-successional reserve assessments might be a way to incorporate new science, updated management direction that reflects the dynamic nature of the ecosystems would help provide for connected habitat.

Land management **plan direction needs to be more compatible with the unique ecosystems across the BioA area** to help restore and protect national forests and grasslands. It's necessary to better align management direction with the best available science to achieve desired conditions. For example, fire exclusion is leading to unintended ecological consequences[92] across much of the BioA, but the restoration work needed to address the consequences is difficult to implement because plan direction limits our available options. Additionally, there's a need for plan direction that addresses using timber harvest to achieve ecological desired conditions, but existing plans focus on timber outputs rather than desired landscape conditions.

Harvest restrictions on lands within the NWFP reserve network[93] and other amendments, such as the Eastside Screens, that restrict the size or age of trees available for harvest don't reflect the best available science.[94] The restrictions also limit our ability to capitalize on using timber harvest as a tool to improve ecological integrity. For instance, restriction on harvesting trees that are more than 80 years old in NWFP late-successional reserves is inconsistent with the best available science in many ecosystems.[95] Due to the restriction, land management activities in stands older than 80 years is complicated, takes additional time and resources, and is generally avoided. Furthermore, the Endangered Species Act consultation processes and public controversy are complex.

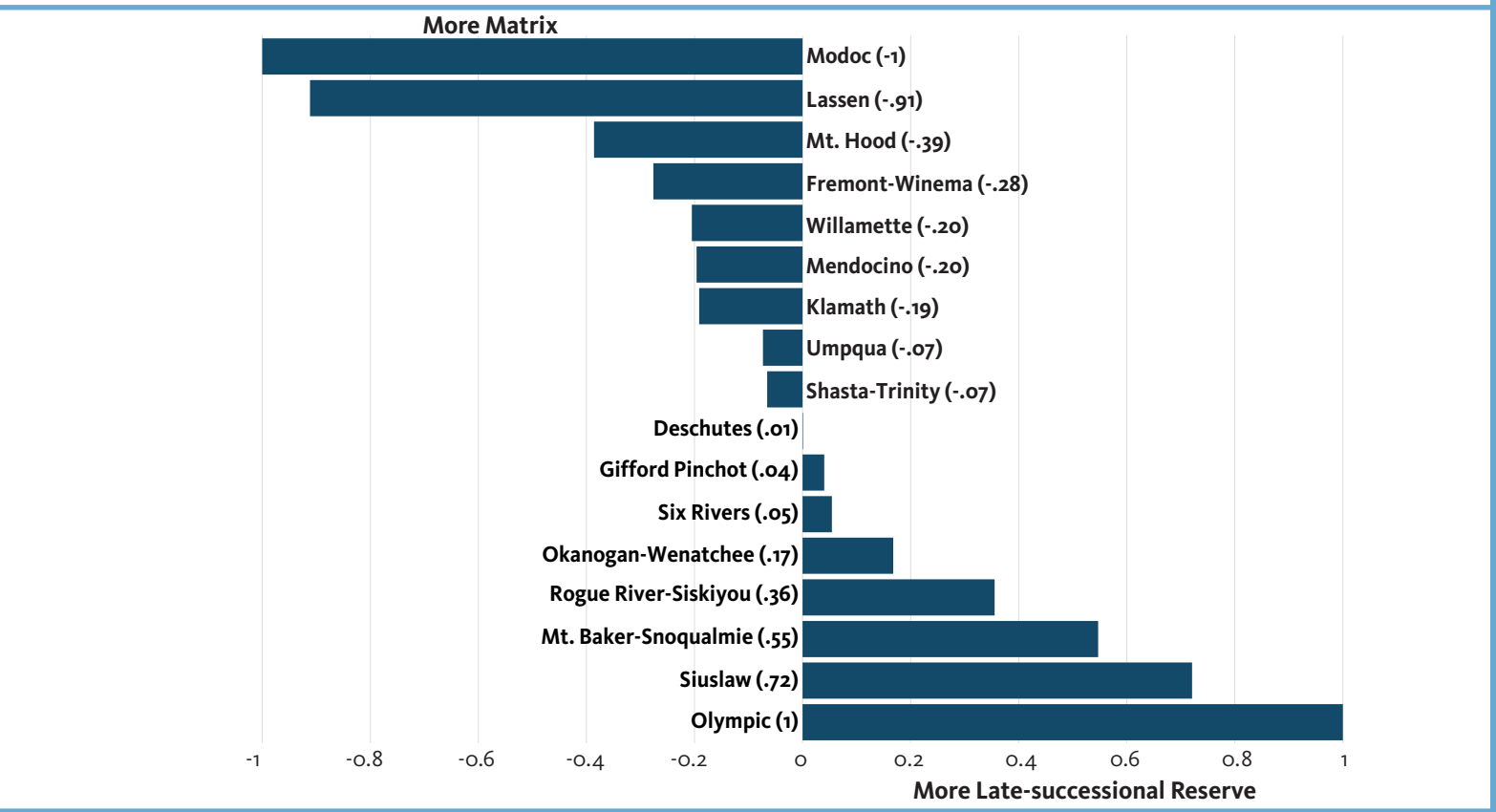


Figure 4-2—Index of late-successional reserve and matrix land by national forest. Forests with an index of 1 have almost all potential active management land in late-successional reserves. Forests with a value of negative 1 have almost all potential active management land in matrix. The Olympic and Siuslaw National Forests have almost all their potential active management in late-successional reserves (value of 1). The Rogue River-Siskiyou National Forest has almost 40% more late-successional reserve land than matrix land. The Mount Hood National Forest has almost 40% more matrix land than land in late-successional reserves. More land in late-successional reserves means that constraints, like the 80-year exemption, will likely make old forest restorative or enhancing treatments more difficult, especially as trees naturally age.

[91] Spies and others, 2018a.
[92] Spies and others, 2018a.
[93] Late-successional reserves, riparian reserves, and congressionally reserved lands.
[94] Stine and others, 2014.
[95] Spies and others, 2018a.

Stand age and tree size are not the only, nor necessarily the best, measures of ecological health. For example, forests more than 80 years old on low productivity sites might be dense and lack understory diversity due to slow growth and development and exclusion of fire. When this happens, land management activities could help move the stand toward a more natural condition. The 21-inch standard associated with the wildlife standard of the Eastside Screens, restricts harvest of trees greater than 21-inches in diameter when old-forest structure is lacking. Due to this constraint, relatively young, shade tolerant trees that should be removed to improve ecological resiliency are overly abundant but cannot be harvested because they have grown beyond 21 inches in diameter.[96] Restrictive management direction in late-successional reserves, ungulate habitat, and scenic corridors, which hinders our ability to reduce the risk of insect and disease mortality (figure 4-3),[97] is another example of the need to update plan direction to reflect the best available science.

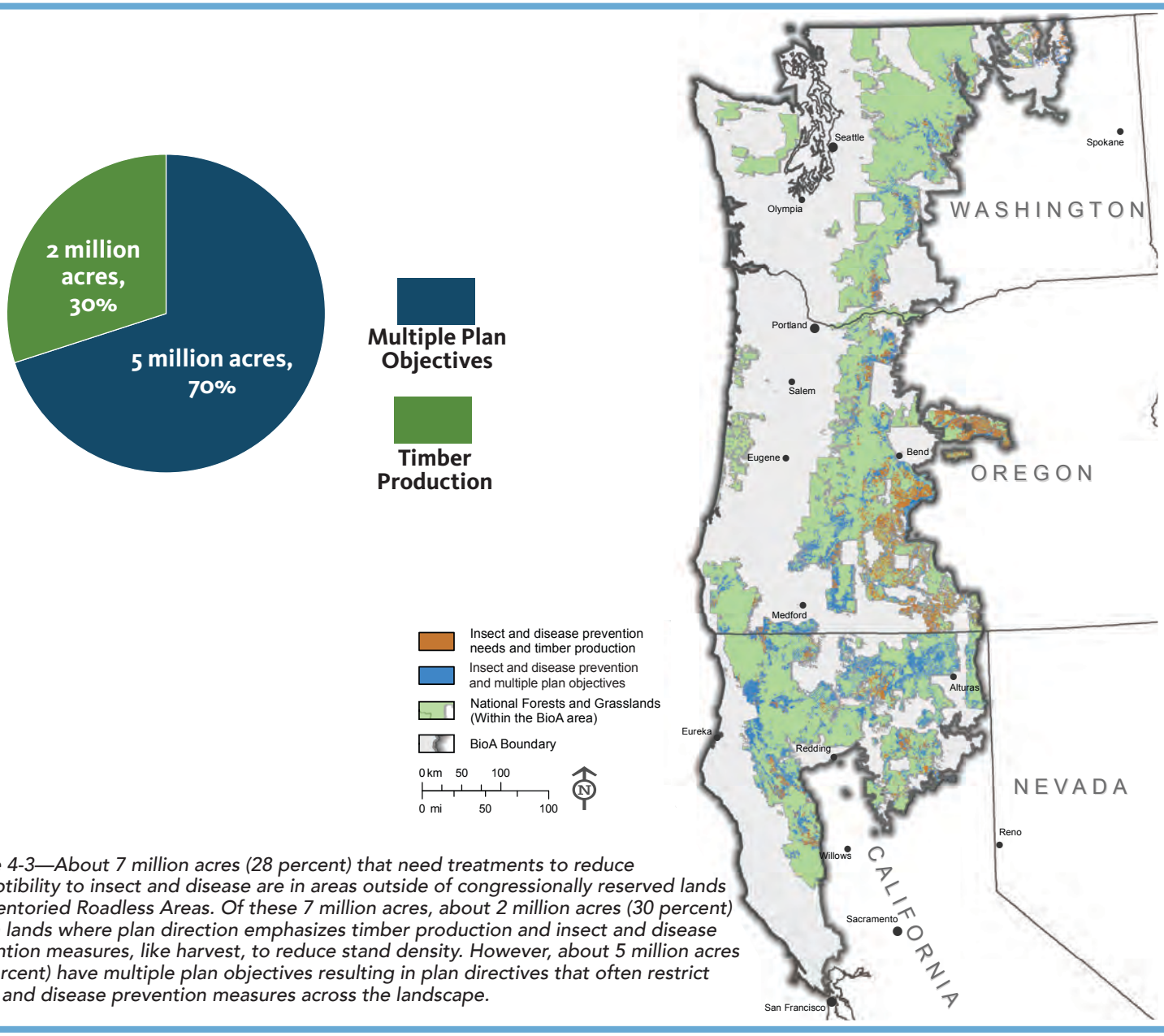


Figure 4-3—About 7 million acres (28 percent) that need treatments to reduce susceptibility to insect and disease are in areas outside of congressionally reserved lands or Inventoried Roadless Areas. Of these 7 million acres, about 2 million acres (30 percent) are on lands where plan direction emphasizes timber production and insect and disease prevention measures, like harvest, to reduce stand density. However, about 5 million acres (70 percent) have multiple plan objectives resulting in plan directives that often restrict insect and disease prevention measures across the landscape.

Land management plan direction needs to better anticipate the extent or degree of invasive species including plants, insects, and animals. Invasive species have changed the nature of forests, grasslands, and aquatic systems, which will negatively affect ecosystem function and processes in the future.[98] Invasive species generally reduce ecosystem resilience, which is of heightened concern in the face of climate change.[99] Invasive species were not considered through a contemporary lens, or often at all, in the existing land management plans in the BioA area. The result is that managing for invasive species is difficult and inefficient due to a lack of consistent guidance within and between forests.

[96] Stine and others, 2014.
[97] Krist and others, 2014.
[98] Spies and others, 2018a.
[99] Spies and others, 2018a.

Invasive Species

Along with climate change, invasive plant and animal species are a significant threat to native biodiversity and ecological integrity. Climate change also will likely influence the expansion of nonnative plant and animal species, while at the same time reducing or even eliminating local occurrences of native species. It's particularly challenging to manage for species biodiversity in the face of both climate change and invasive species. Likewise, invasive species, climate change, and fire exclusion have altered fire regimes and vegetation dynamics.

BioA national forests and grasslands store some of the highest levels of carbon in the United States,[100] and land management plans need to consider carbon management. Areas that store carbon across the landscape, especially in fire-infrequent systems, are important to land management planning and need to be protected from disturbances that can release carbon, such as those that increase soil erosion or decomposition beyond inherent levels. We need to leverage opportunities to mitigate or limit overall carbon emissions in frequent-fire dependent ecosystems where fire-resiliency treatments are needed.

Land management plan direction needs to better address the unintended consequences on aquatic systems, wildlife habitat and distribution, and invasive species from Forest Service roads and recreation infrastructure. Lack of direction affects the ecological integrity of national forests and grasslands.[101]

Work is needed to create more effective processes and to build trust and collaboration that could more successfully integrate adaptive management into land management plans. Adaptive management areas, a land use allocation in the NWFP, were designed to study new or experimental treatments to improve land management practices and incorporate results into future land management plan direction. Unfortunately, adaptive management areas were rarely used, and their goal wasn't fully realized due to risk aversion and lack of acceptance[102] by regulatory agencies, environmental groups, and the public about experimental design implementation, as well as insufficient funding.[103]

"Trust among interested parties is essential for developing adaptive management strategies that can nimbly and effectively respond to changing climate, species, disturbances, human values, and markets."

Spies and others 2018b

Fire and Fuels Management

In the past few decades, we have learned a lot about the benefits of wildfire on the landscape and the critical importance of fire in maintaining ecological integrity in fire-adapted ecosystems.[104] At the same time, we have experienced some of the biggest and most impactful fire seasons in recent memory. Fire can be a destructive and devastating force, and it can also serve important ecological functions. As we have learned more about the effectiveness of fuels treatments and explored the benefits of using prescribed fire and natural wildfire, we better understand that fire helps to restore balance to national forests and grasslands. In the BioA area, ecological systems fall into three groups (figure 4-4) based on fire ecology characteristics.

Frequent-fire dependent ecosystems are those where fire is essential to overall ecosystem function. Before Euro-American settlement, fires were quite frequent and of low or mixed severity and were the primary driver of disturbance. Fire in these systems drives structural and successional dynamics, favoring fire-dependent and fire-adapted species. In these areas, we need to increase disturbance and modify conditions, where appropriate, to prevent uncharacteristically large and severe fires from occurring.

[100] USDA Forest Service, 2015. figure 3-4.
[101] Reeves and others, 2018.
[102] Spies and others, 2018b.
[103] Stankey and others, 2006.
[104] Spies and others, 2018.

Fire diverse (mixed-severity) ecosystems are those where fire can be important to ecosystem function, but it is not the primary driver of successional dynamics, including structure and composition. Historically, fires were moderately frequent and primarily ranged between mixed and high severity in a variety of patch sizes. There is a need on these landscapes to find places where naturally occurring wildfires can and should be managed for long-term resource benefit.

Fire infrequent ecosystems represent a broad range of ecosystem types from high-elevation spruce-fir forests to coastal temperate rainforests where fires were historically infrequent and of mixed to high severity in large areas. In these areas, naturally occurring fires need to be managed for ecological benefit without compromising firefighter or public safety; this can be particularly challenging in more populated coastal areas.

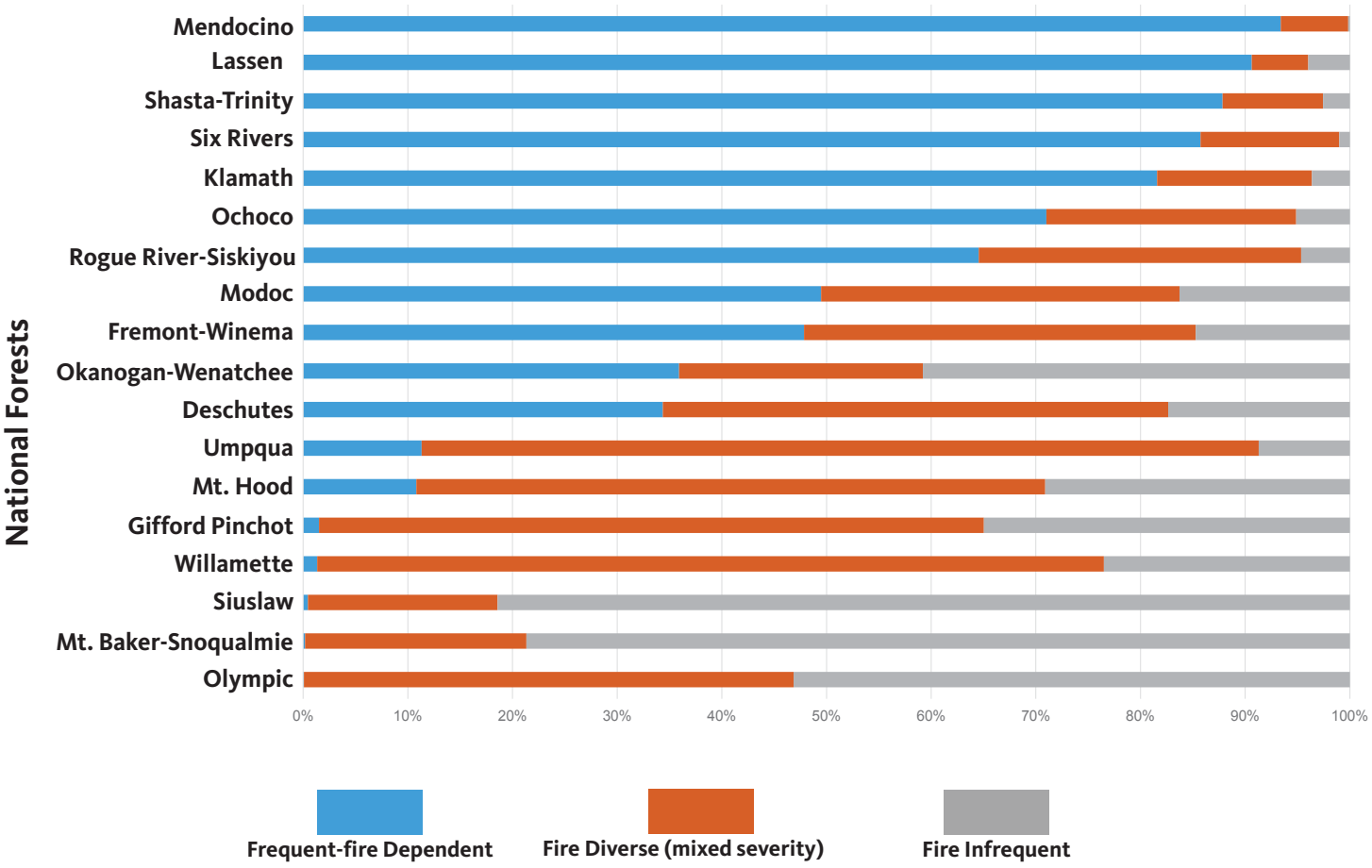


Figure 4-4—Percentage of fire ecological groups, based on historical fire regime, by national forest. No forest is all in one fire ecology group.

Land management plans need to address strategic wildfire-risk mitigation in and around communities in the wildland-urban interface and around infrastructure. There's been a dramatic increase in people living in the wildland-urban interface (figure 4-5).[105] To ensure that fire management needs are supported, plan direction needs to be better aligned with today's understanding of fire management and fire strategies, as well as with land management allocations. In addition to aggressively suppressing fires, modern strategies to protect communities should include reducing fuels through mechanical treatments and prescribed fire. When wildfires occur, they should be managed under specific and limited conditions to achieve risk-reduction objectives.

[105] Charnley and others, 2018.

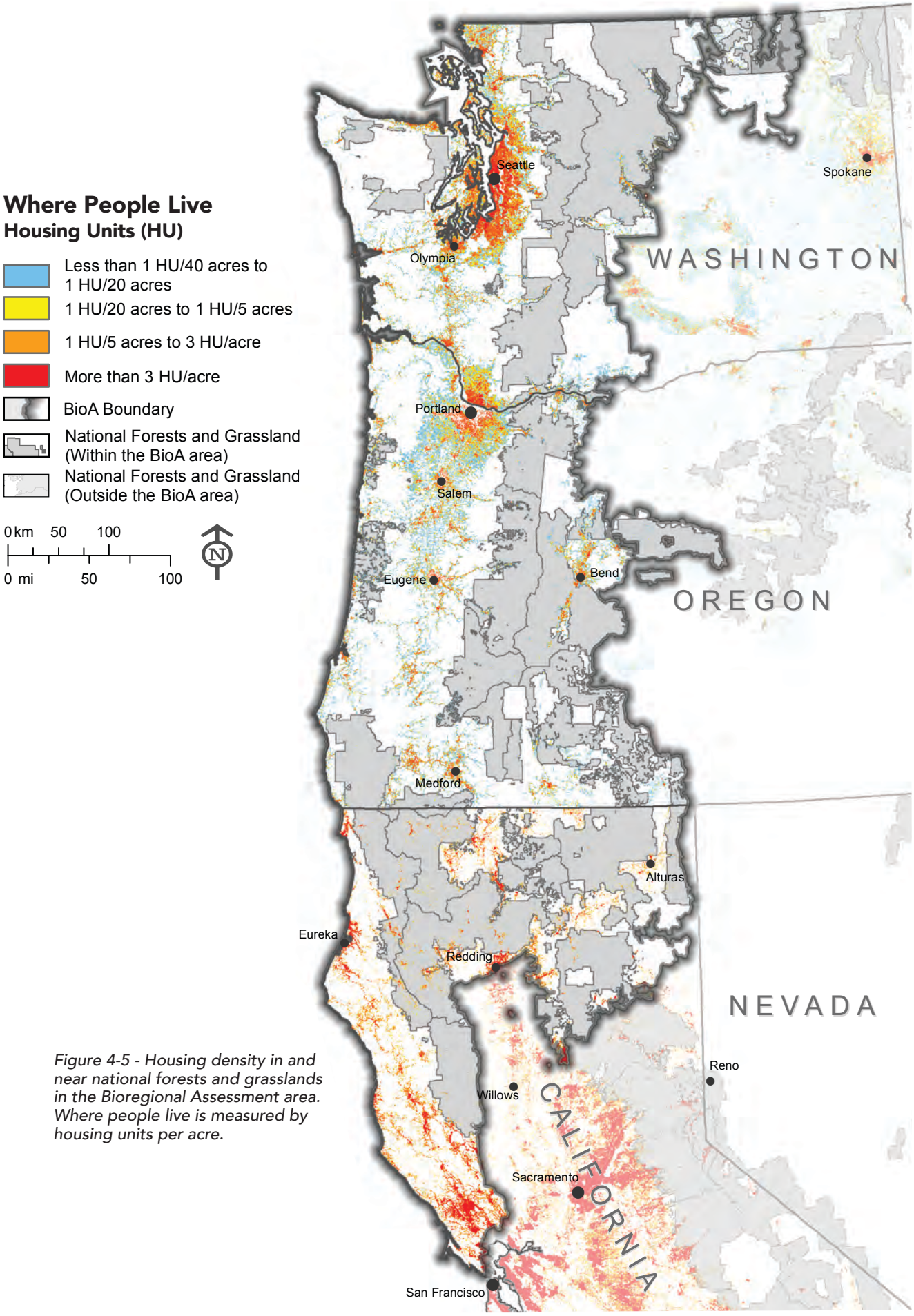


Figure 4-5 - Housing density in and near national forests and grasslands in the Bioregional Assessment area. Where people live is measured by housing units per acre.

Better alignment of fire management objectives includes ensuring that land allocations support management activities that reduce risk around important assets, such as communications and energy infrastructure. There's about 1,700 miles of transmission lines on national forests and grasslands within the BioA area. These facilities often cross multiple national forest and grassland boundaries, as well as other municipal and private boundaries. Improved management consistency across the BioA, as well as alignment of plan direction, can help increase public safety and reduce fire risk concerns by improving agency responses to facility maintenance needs and system upgrade proposals.

A strategic risk-based approach to fire management and loss mitigation is needed to help reduce losses from unwanted wildfire and reduce the high cost of fire suppression in and near communities and other resources and assets.[106] This approach would help ensure we are making progress toward the intent of the *National Cohesive Wildland Fire Management Strategy*. The Strategy is a broad national strategic framework that addresses wildland fire across landscapes as a vitally important natural ecological process. The subsequent report, The National Strategy, provides a path forward to address key issues associated with wildfire; create resilient landscapes by managing vegetation and fuel; create fire-adapted communities by treating hazardous vegetation to protect communities, infrastructure, and other highly valued resources and assets; and provide a safe and effective wildfire response by using a risk-management approach that includes all jurisdictions when developing a response plan.

Land management plans need an improved focus on managing wildfires, acknowledging the important ecological role of fire in fire-adapted ecosystems, and promoting the use of unplanned ignitions to meet ecological and resource objectives. Existing land management plans primarily focus on suppression rather than on fuels management, managing fires, and other tactics to help meet ecological and resource objectives. High-severity fire can alter important habitat, impact water quality, and create dangerous or even lethal conditions for rural communities. There has been an increase in high-severity wildfires in predominantly low-severity fire areas since our land management plans were written (figure 4-6).[107] We need to increase the pace and scale of work in frequent-fire dependent ecosystems to reduce the risk of uncharacteristic effects from large-scale, stand-replacing fire using strategies in addition to aggressive fire suppression (figure 2-4).

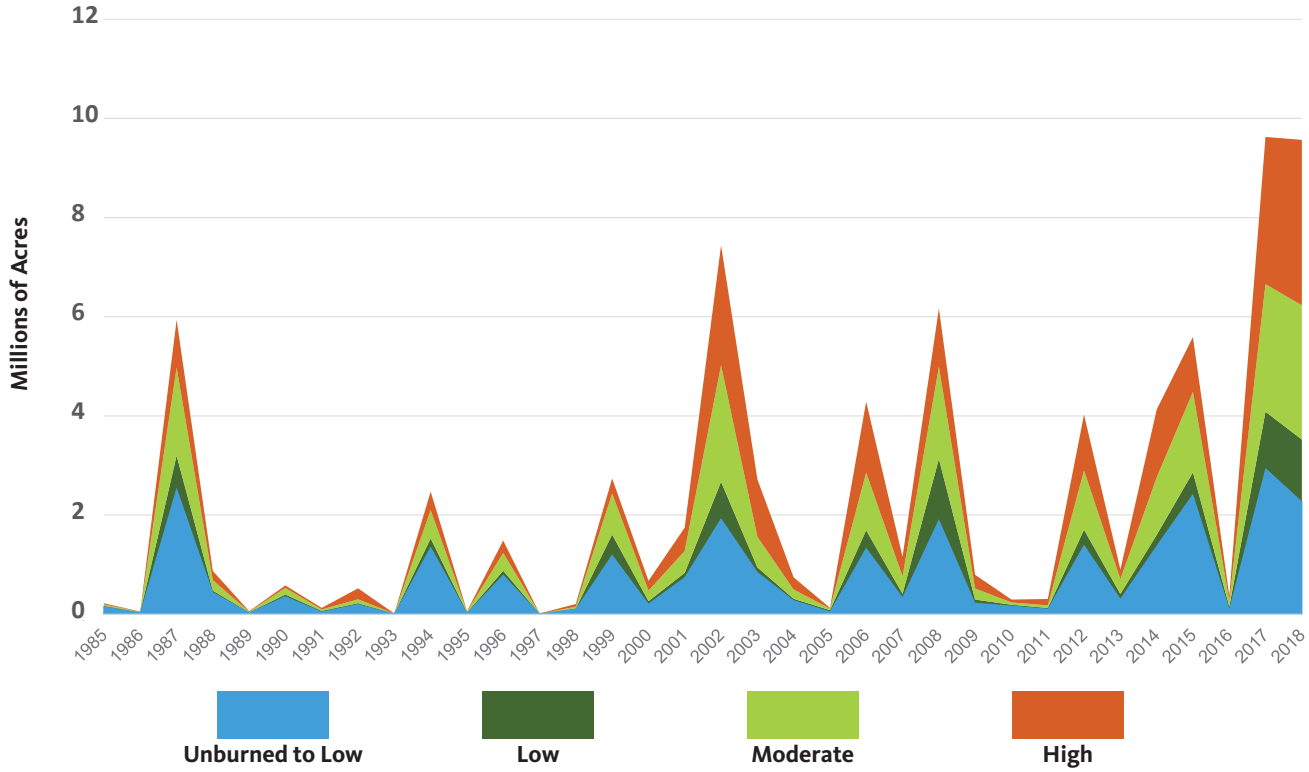


Figure 4-6—Total annual acres burned by severity class on national forests and grasslands in the BioA area from 1985 to 2018. There is a widely variable nature of area burned and an apparent annual increase in burn area and regularity of fire. While the overall area burned each year remains below historic and natural levels, a noticeable increase in high- and moderate-severity fire has occurred since 1985, which helps explain how the perception of fire and fire risk was different when current land management plans were written.

[106] Thompson and others, 2015.
[107] Thompson and others, 2015.

Land management plan direction is needed to facilitate the use of prescribed and natural fire, along with timber harvest and mechanical fuel treatments, to achieve desired conditions in fire-adapted ecosystems. Existing management direction, although consistent, is not compatible with desired conditions or natural disturbance ecology in the variety of ecosystems across the BioA area (figures 2-2 and 2-4). There's a high proportion of densely stocked forests with highly flammable fuel on drier, frequent-fire dependent areas. Fires on these lands are often uncharacteristically severe and can have negative ecological impacts. Additionally, climate change is expected to expand uncharacteristic fire effects across the BioA area, especially in frequent-fire dependent ecosystems. **Combining timber harvest, other mechanical fuel treatments, and prescribed or natural fire can achieve desired conditions** where using only one option would not fully meet the landscape needs.

Sustainable Timber

Timber processing infrastructure and a skilled workforce has declined in the BioA region in recent decades.[108] Many rural communities in and around the BioA area that rely on federal timber and landscape restoration have been socially and economically affected by declines since the 1990s. Economically feasible restoration projects, timber processing infrastructure, and a skilled workforce are needed to support ecological integrity and benefits to communities in the region.

The ability to implement restoration treatments on federal lands is influenced by several factors including the status of markets, sawmill facilities, and a capable workforce (figure 5-5). In turn, the types of restoration treatments implemented and products generated influence the viability of the infrastructure and the presence of a capable workforce. For timber production to function as a tool to meet ecological objectives, purchasers must be able to meet the requirements for minimum acceptable bid prices, use the offered wood material, and perform the required work. Therefore, it is difficult to rely on timber harvest to fund forest management and restoration on all but the most valuable timberlands.

Timber processing infrastructure and a skilled workforce are sparse in some locations, especially east of the Cascades. The number of mills has decreased regionally but those that remain have modernized and total wood processing capacity has increased.[109] However, the average distance between large mills has grown to about 100 miles, resulting in an increased cost to transport logs to mills throughout much of the BioA area.

[108] Charnley and others, 2018.
[109] Charnley and others, 2018.

Timber harvest anticipated under the land management plans has never been met[110] *primarily because management direction restricts active management.* As with limited timber processing infrastructure, timber harvest below projected levels restricts our ability to achieve restoration objectives and support communities. Harvest levels are unlikely to increase under current plans because the objectives for **timber production and restoration often conflict with habitat protection objectives.** For example, timber production is no longer emphasized on much of the NWFP matrix land because large areas of matrix have been designated as critical habitat for the northern spotted owl (figures 4-7 and 4-8).

Similar management conflicts exist in BioA forests outside the NWFP area. For example the Eastside Screens, which restrict commercial timber sale activities in late- and old-structural stages, restricts the diameter of trees harvested to less than 21 inches diameter at breast height. Another example is the requirement for 40 to 70 percent ungulate canopy cover in frequent-fire dependent forests that naturally have a more open canopy.

Commercial thinning to restore historic plantations is generally only commercially viable every 30 to 50 years on the most productive sites; growth is slower in drier areas. So, restrictions on harvesting trees that are more than 80 years old mean that sustainable timber production will be more difficult for the next couple of decades. The challenge arises because areas available for restoration and commercial timber production will be thinned or have already been thinned within the last 30 years. This progression through time results in stands that are too old and trees that are too large to be commercially harvested under the restrictions in the land management plans.

Northern Spotted Owl Critical Habitat

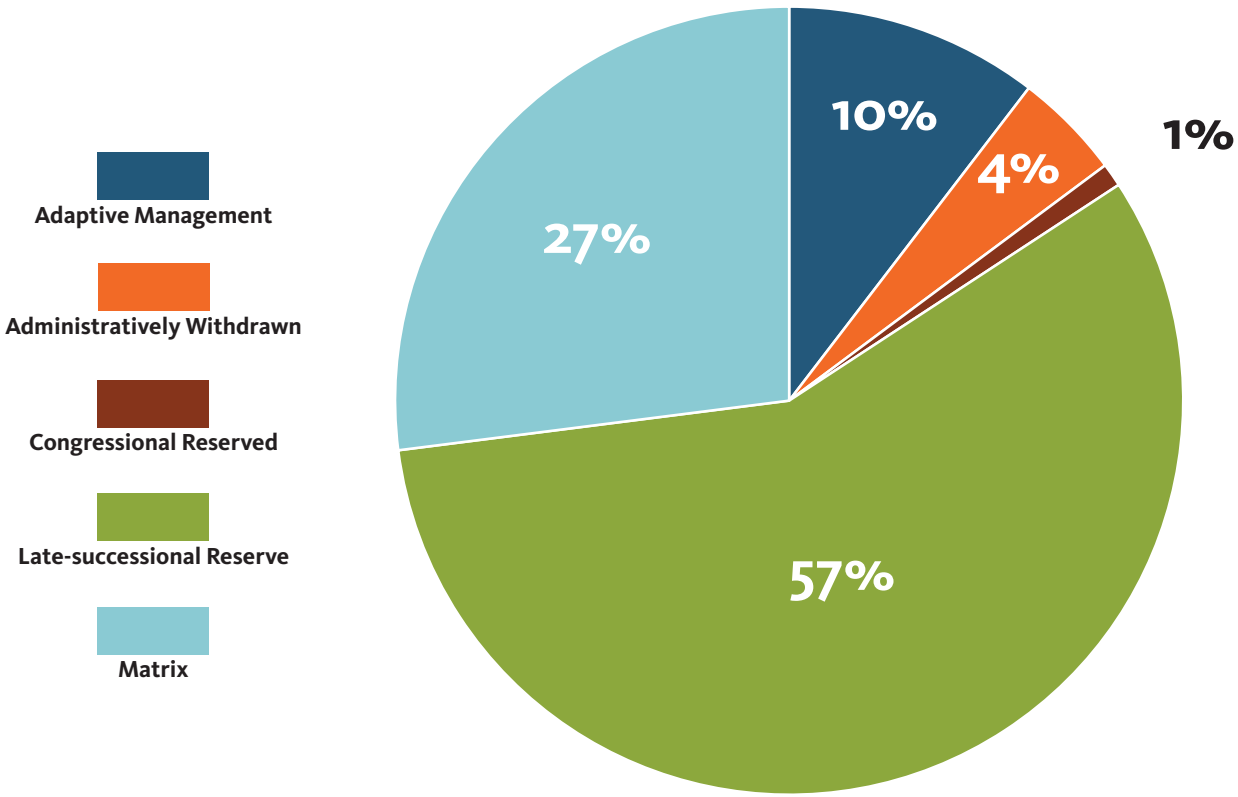
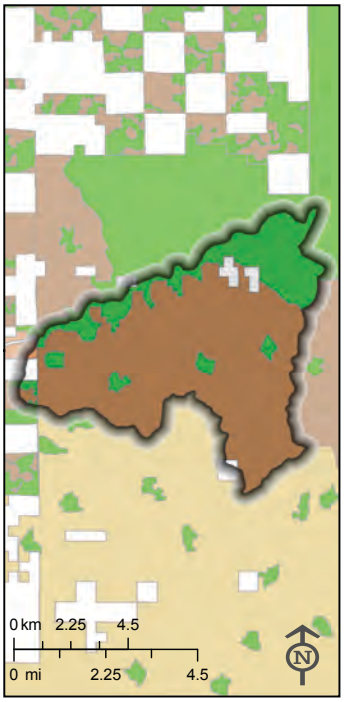
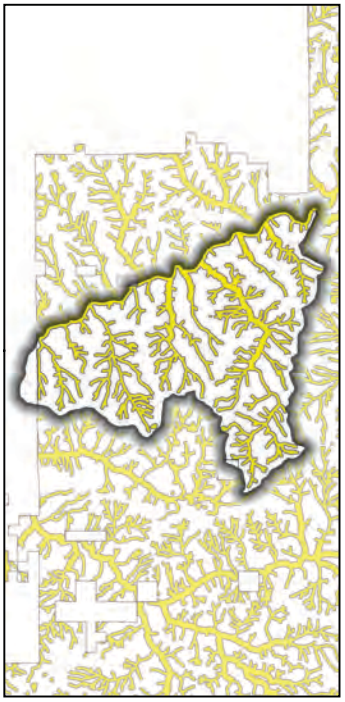


Figure 4-7. Designated critical habitat for northern spotted owl is most aligned with late-successional reserve, congressional reserves, and administratively withdrawn land allocations.

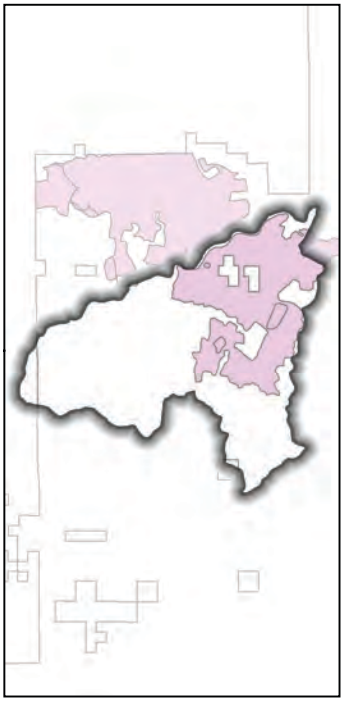
[110] Charnley and others, 2018.



NWFP Land Use Allocations



Riparian Management Areas



Inventoried Roadless Areas

Northern Spotted Owl Critical Habitat

- Adaptive Management Areas
- Late Successional Reserve
- Not Designated
- Matrix
- Riparian Management Areas
- Inventoried Roadless Areas
- NSO Critical Habitat

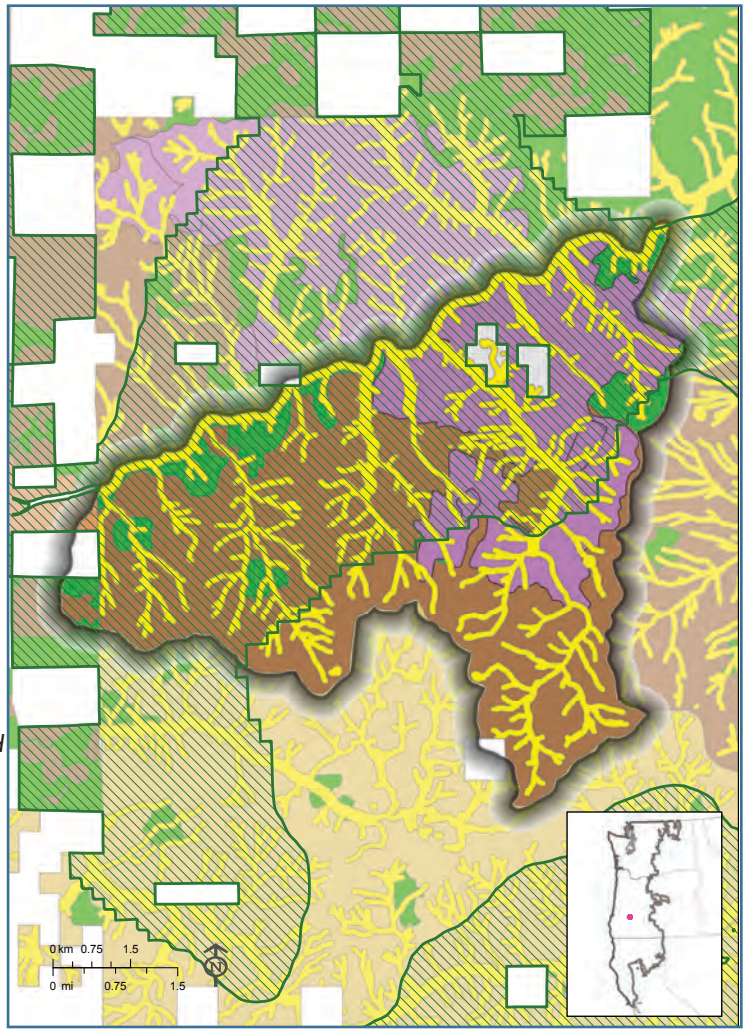


Figure 4-8—The land available for timber production under the NWFP is much less than what was left undesignated in NWFP matrix land. Plan direction and Inventoried Roadless Area designation often conflict with assumptions about timber production. Matrix was assumed to emphasize timber production, but timber production goals in matrix are superseded by more restrictive stipulations, such as minimum canopy cover requirements for ungulates and requirements for tree retention or limited tree stumps. Inventoried Roadless Areas limit timber harvest. Unmapped riparian reserve, survey and manage standards and guidelines, and northern spotted owl critical habitat designations create further complexity and unpredictability for timber production. And, northern spotted owl critical habitat designation has reduced the land base available for primary timber production.

Projects that produce timber do not closely adhere to planned harvest methods like regeneration harvest of old forest in matrix lands. Existing land management plans don't incorporate today's harvest methods and technology, like variable density thinning and modern logging methods, or consider the mutual benefits of timber harvest and ecological resilience and integrity. Existing plans focus more on setting standards and guidelines for timber harvest than on working toward desired conditions. Such a focus can prevent leveraging a new technology that, for example, can harvest on steep slopes with little impact to soils. Timber outputs from our highly productive fire-infrequent and fire-diverse (mixed severity) lands have been particularly curtailed. However, social values related to land management have begun to shift toward recognition of the broad benefits associated with our natural resources and the importance of balancing resource protection with timber production.[111]

NWFP late-successional reserves and matrix are similar in their current need for disturbance restoration, which involves mechanical treatments, including timber harvest, in combination with fire treatments (figure 4-9).

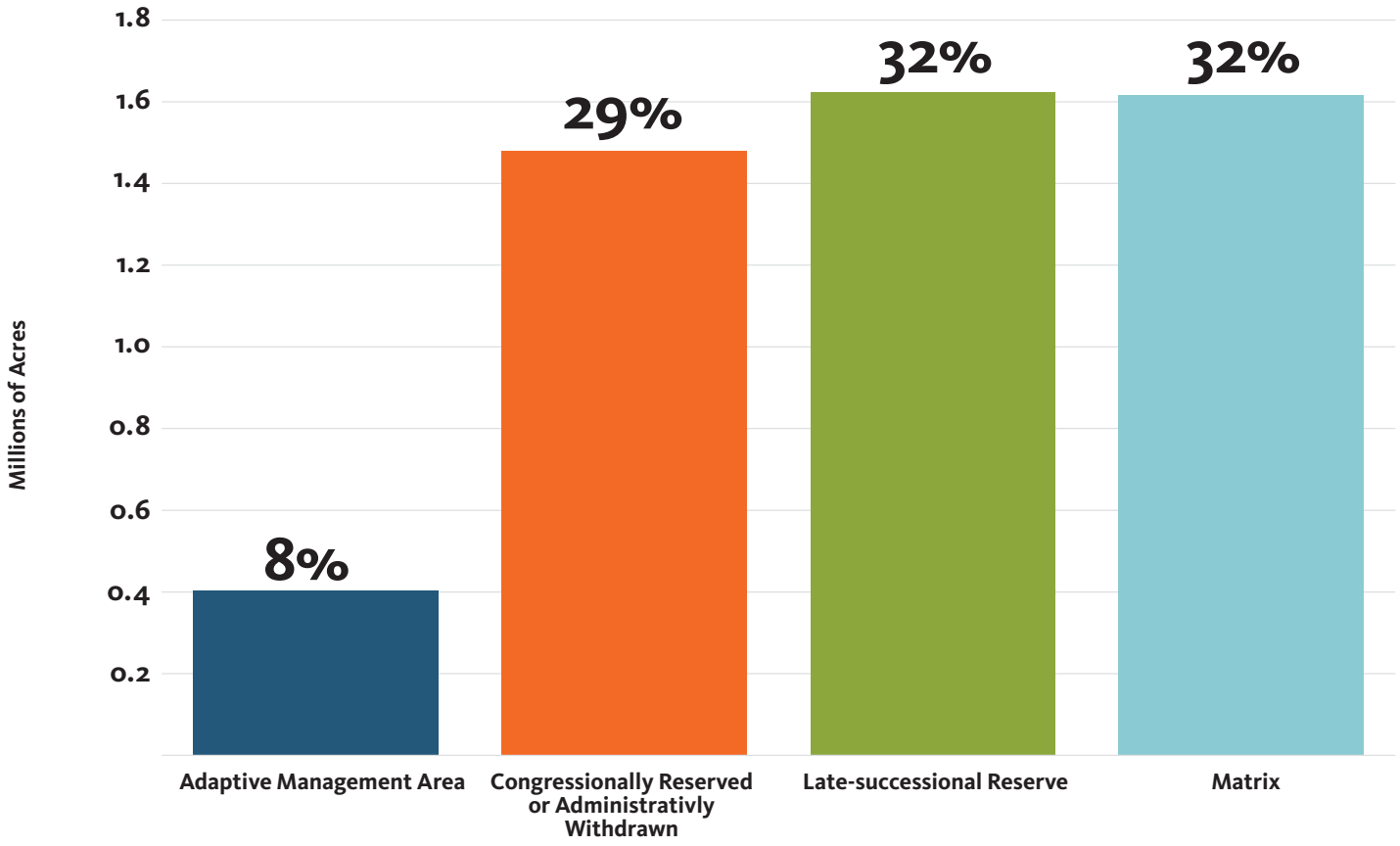


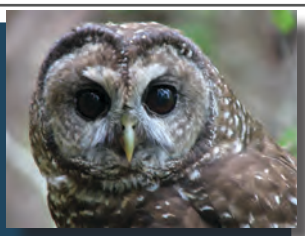
Figure 4-9—Millions of acres need some combination of mechanical or fire treatment to reduce density and restore forests (disturbance restoration need) in land use allocations including matrix, late-successional reserve, congressionally reserved and administratively withdrawn, and adaptive management areas. Percent of land use allocation needing disturbance restoration is indicated above each colored bar. Mechanical treatments to achieve restoration goals can often produce commercial timber as a co-product of improving ecological resilience. (Modified from Ringo and others 2019)

[111] Charnley and others, 2018.

There is a need for land management plan direction that better aligns with the U.S. Fish and Wildlife Service's northern spotted owl recovery plan[112] (figure 2-7) and critical habitat final rule.[113] Better alignment is needed between designated critical habitat for spotted owls and the late-successional old-growth portion of the late-successional reserve network; this could help simplify management direction and better protect high-quality habitat for owls and other old growth-dependent species, such as marbled murrelet. In addition to protecting these habitats, management direction that allows active management to restore and improve ecosystem resilience could help conserve and develop northern spotted owl habitat in the long term (chapter 4, Ecological Integrity).

Modification of land management plan desired conditions associated with old-forest management in drier, frequent-fire dependent ecosystems is needed. Loss of old forest from high-severity wildfire has been concentrated in frequent-fire dependent ecosystems (figure 3-2).[114] It will be important to update land management plans to reflect ecological resilience and expected ecosystems in these areas.[115]

Northern Spotted Owl



The historic range of the northern spotted owl stretches from southwest British Columbia through the Cascade Mountains and coastal ranges in Washington, Oregon, and northern California. A key component of northern spotted owl habitat is structurally complex old-growth forests, especially for nesting and roosting. Early seral habitat (for example, openings) is also important, especially in the drier portions of the northern spotted owl's range.

The Northwest Forest Plan and the Endangered Species Act have helped protect and enhance spotted owl habitat on federal lands, but habitat protection will not be enough to ensure long-term viability of the species (Lesmeister and others 2018).

Despite current protections, the species' population continues to decline each year throughout its range. These declines are thought to be driven by continued reduction of nesting and roosting habitat, particularly on nonfederal lands, increasing habitat loss from wildfires, and competition with expanding populations of barred owls. Climate change projections indicate that suitable habitat for spotted owls will shift northward and to higher elevations.

Despite the protections afforded by the NWFP, old-growth dependent species, such as the northern spotted owl, continue to decline due to factors that weren't anticipated.[116] One of these factors is the barred owl, an invasive species in the BioA area, which has expanded its range in the past 25 years and become a more significant threat to northern spotted owls. The expansion of the barred owl's range, in combination with disturbances outside of federal lands, have led scientists to conclude that the protections in the NWFP alone are not enough for spotted owl recovery.

Barred Owl Invasion

A threat to the northern spotted owl that was not anticipated by the NWFP is the invasion and establishment of a non-native competitor. The barred owl, once confined to eastern North America, now co-occupies habitat and outnumbers spotted owls throughout much of their range and continues to increase in population density.[117] Barred owls have higher annual survival, produce more offspring, and inhabit smaller home ranges than spotted owls.

> *"It appears unlikely that spotted owls can persist without significant reductions in barred owl polulations."*
> *Spies and others 2018- NWFP Science Synthesis*

They compete for resources that would otherwise be available to spotted owls, including nest sites. They are slightly larger, and are strongly aggressive toward their native counterparts, usually quickly excluding spotted owls from territories and habitat. The competitive relationship between the two owl species has become a key limiting factor to spotted owl recovery (figure 4-10).

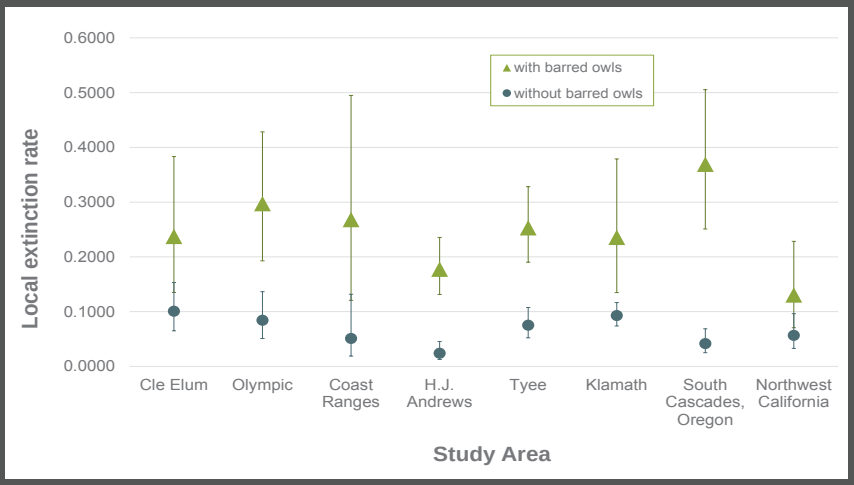


Figure 4-10—Mean annual local extinction rates for northern spotted owl on 11 study areas relative to presence of barred owls.[118] *Northern spotted owls are more at risk of extinction when barred owls are living in the area. After Dugger and others 2016*

[112] US Fish and Wildlife Service, 2011a.
[113] Spies and others, 2018b.
[114] Spies and others, 2018a.
[115] Spies and others, 2018a.
[116] Lesmeister and others, 2018.
[117] Lesmeister and others, 2018. p. 259.
[118] Dugger and others, 2016.

Conservation of qualifying survey and manage species should be screened to determine if they should be transitioned to at-risk species of conservation concern. The survey and manage standards and guidelines need modernization to be consistent with and complement the 2012 planning rule and a coarse filter species conservation approach. Complexity of direction has made it difficult to conduct the annual species review, which is required as part of adaptive management under the survey and manage standards and guidelines. Therefore, changing the status of species has not occurred since 2003. Complex and lengthy survey protocols and requirements for managing known sites have been obstacles to some land management and restoration objectives. Additionally, the survey and manage standards and guidelines require region-wide periodic strategic surveys to update the program's species list and make changes to management recommendations. These survey protocols are costly and have not been conducted as intended.

Managing aquatic and riparian ecosystems in the BioA area under the Aquatic Conservation Strategy, Sierra Nevada Framework Aquatic Management Strategy, and PACFISH and INFISH strategies needs to be integrated under a single management approach. Management under these strategies has created conflicts and increased Forest Service planning costs. For example, in some planning areas both PACFISH and the NWFP apply; therefore, it's necessary to meet consultation, reporting, and analysis requirements for both sets of management direction.

Land management plan direction is needed that improves management of riparian areas by consolidating existing information to better describe desired conditions. Some direction under the NWFP Aquatic Conservation Strategy, Sierra Nevada Framework, and PACFISH and INFISH strategies, while consistent, does not adequately describe the diversity of riparian area in the BioA area.

Adjust key watershed locations to consider science since 1994. Information to consider includes designated critical habitat for ESA-listed fish, high-intrinsic potential assessments, bull trout core areas, climate change vulnerability assessments, presence of vulnerable non ESA-listed aquatic species, and refuge areas for ESA-listed aquatic species identified in federal recovery plans.

Land management plan direction needs to consider the requirements of complex early-seral habitats, meadows, and other types of habitat. Oversimplification of the landscape, often through management practices such as fire suppression, historic clear cutting, or focus on old-forest development, has resulted in reduced habitat diversity in the BioA area.[119] Additionally, the habitat needs of broad-ranging species, such as marten, fisher, wolverine and other mammalian carnivores, are not adequately addressed within land management plan objectives.

[119] Spies and others, 2018a.

Sustainable Recreation

There is a need for land management plan direction that sustains recreation opportunities considering increasing use and the need to maintain existing developed recreation sites. The 2012 planning rule specifies that land management plans include direction for sustainable recreation defined as the set of recreation settings and opportunities on national forests and grasslands that are ecologically, economically, and socially sustainable for present and future generations.[120] Existing land management plans did not anticipate the significant increase in recreation demand from a growing population[121] nor the advances in recreation technology that have occurred in the past few decades.

Land management plans need proactive direction to address the potential effects of climate change and other landscape-altering events on recreation and its infrastructure. Sustainable recreation depends on availability of activities and facilities. A changing climate might result in less snow at lower elevations, which would reduce the geographical extent and length of the winter-sport season. Increased flooding could affect trails, roads, campgrounds, boat launches, and other infrastructure that supports recreation-related services and benefits. Uncharacteristically severe fires, insects and disease impact recreation through direct damage or destruction of infrastructure, reduced air, water, and visual quality, and decreased safety. Land management plan direction needs to address the connection between resilient landscapes and sustainable recreation and prioritize when and how management activities apply to desired conditions related to recreation.

Recreation management direction needs overall cohesion and consistency within and across the 19 national forests and grasslands in the BioA area to effectively and efficiently sustain recreation opportunities. Updated plans need to address inconsistencies between current direction and objectives for sustainable recreation; this is particularly needed within NWFP riparian settings where recreational use conflicts with Aquatic Conservation Strategy objectives. Many national forests and grasslands in the BioA area have outdated recreation opportunity spectrum and scenery management system inventories that don't reflect current recreation uses and patterns of use. Updated mapping techniques combined with findings from monitoring and other methods to determine existing and desired recreation opportunities would help planners identify desired conditions and develop consistent recreation direction where uses cross administrative boundaries.

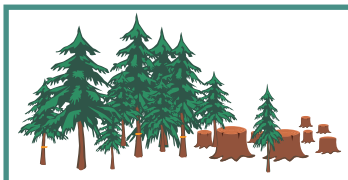
[120] 36 CFR 219.19.
[121] Charnley and others, 2018.

Conclusion

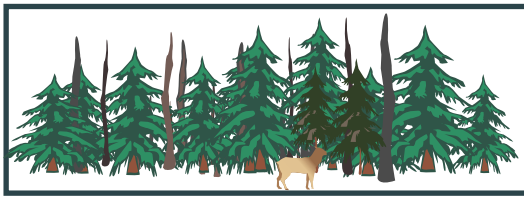
This chapter supports the 10 key recommendations presented in chapter 2. In this chapter, we acknowledged that there have been management challenges, and we talked about the potential opportunities for change. In chapter 5, we'll show you where urgent management challenges exist across multiple national forests and grasslands in the BioA area and discuss how the opportunities for change vary across the landscape. Chapter 5 geographically shows where consistent management direction has been working well and highlights where different management direction would be appropriate.

At a Glance

BioA area Treatment Needs

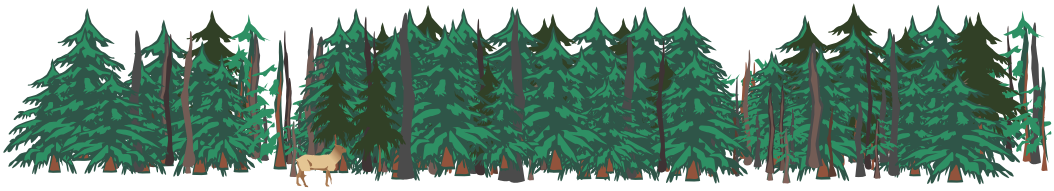


2 million acres
have plan direction that emphasizes timber production and these acres need active management to reduce susceptibility to insects and disease.

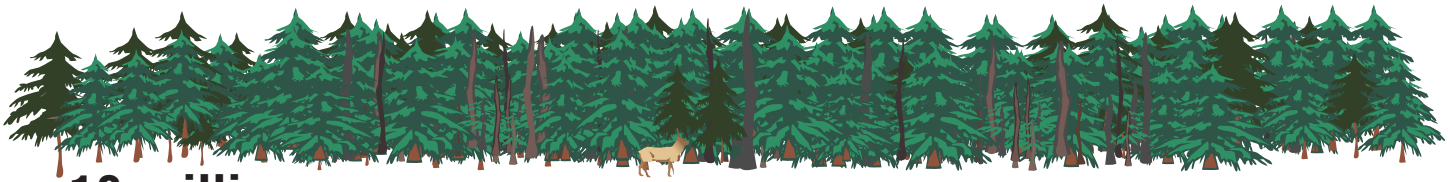


5 million acres
in old-growth forest, ungulate cover, wildlife habitat, and scenic corridors have multiple plan objectives that inhibit active management to reduce susceptibility to insects and disease.

7 million acres
need disturbance restoration



10 million acres
need some type of restoration treatment



18 million acres
lack structural diversity and resilience and do not adequately contribute to ecological integrity

Above graphic totals more than the 24 million acres that compromise the BioA area because some areas have multiple treatment needs, while others have no treatment needs.

Chapter 5

Geographic Considerations

The NWFP, PACFISH, INFISH and Sierra Nevada Framework all address challenges at the landscape scale by providing consistent management direction across multiple national forests and grasslands. As the BioA shows, we've learned that we need to refine and better align management direction so that it's compatible with unique ecosystems, while still being consistent at the appropriate scale. Chapter 5, like chapters 3 and 4, provides context to the 10 key recommendations highlighted in chapter 2.

Across the 19 national forests and grasslands in the BioA area, there are ecological and social similarities as well as differences and many unique opportunities to modernize the existing land management plans. We've learned that some land management plans are working better in some locations than in others, and some areas have a more critical need for modernization than others.

In chapter 5, we geographically illustrate patterns and trends across the BioA landscape. Some of the patterns and trends have a shared urgency, while others have a need for consistent management. The patterns and trends vary in scale, but they are all larger than one or two national forests or grasslands.

Table 5-1 is a snapshot—an innovative look and an attempt to be as transparent as possible right from the get-go—of broad-scale generalizations about management challenges and opportunities across each of the 19 national forests and grasslands in the BioA area. Keep in mind that the table is not an in-depth quantitative analysis; such analysis will come during future planning phases. Instead, table 5-1 is a qualitative appraisal that reveals some interesting patterns and trends, which we discuss in more detail in the chapter. We hope that table 5-1 will open a door and provide a starting place for future engagement with our communities and stakeholders as we move toward modernization of the land management plans in the BioA area.

Snapshot of Urgent Management Challenges and Opportunities

"Urgent," as used in this table and chapter, means that the issue might be critical on a particular forest or grassland and there might be a risk of loss if action is not taken in a timely manner.

1. National forests that depend on frequent fire have a greater need for **disturbance restoration** (such as mechanical and fire treatments) because fire has been excluded for much longer than what they historically experienced. These forests are overly dense and lack resiliency (pages 69-70).

2. Due to decades of fire exclusion and ongoing climate change, national forests and grasslands that rarely experienced **large, high severity fires** in the past might now have large fires on a regular basis, which could negatively impact late-successional habitat (pages 71-72 and 76 and figure 5-8).

3. **Climate change** will impact all national forests and grasslands in the BioA area but those with greater extremes and drier climates will likely experience greater effects (pages 70-71).

4. Some national forests in the BioA area have more potential to retain stored carbon because of their climate, vegetation, and fire frequency and intensity. Forests and grasslands with wetter year-around climates that infrequently experience fire have more potential to keep **stored carbon.** Seasonally dry areas that depend on frequent fires lose carbon more often (page 47, 70).

5. The land management plans signed in the 1980s and amended by the NWFP, PACFISH, INFISH, and Sierra Nevada Framework include projected **timber volume** outputs. Some national forests have met the projected outputs while others haven't. Although these volume projections are now more than 25 years old, its important to show the gap between projected and actual outputs (pages 73-74).

6. On some national forests the need for restoration is greater due to the type of vegetation, fire frequency and intensity, past disturbances, and past management actions. When there's also **less access to sawmills** to produce the product and markets to buy the product, these forests experience additional challenges to meeting their restoration needs (page 73).

7. Recreation is common on national forests and grasslands in the BioA area. Areas close to population centers generally experience high levels of **recreation use** and visitation and have more associated management challenges that will need to be addressed in the land management plans (page 77).

Table 5-1—A snapshot of broad-scale generalizations about critical management challenges and opportunities to change planning direction on the 19 national forests and grasslands in the BioA area. The table indicates where an issue has less, mid, or more urgency on a specific national forest or grassland and, in doing so, the table displays multi-unit landscape patterns that require management attention in a timely manner.

Ecological Integrity

Frequent-fire dependent ecosystems—those that are farthest from resilient conditions—occur throughout the BioA area but are most prevalent on east Cascades slopes and foothills and in the Klamath Mountains/California High North Coast Range ecoregions.[122] We determined the areas of less resilient conditions by comparing current forest structure with what was found historically[123] (figure 4-1). And, we identified two broad groups of restoration types that would be beneficial throughout the BioA area: disturbance restoration, such as mechanical and fire treatments (figure 4-1A), and succession restoration, such as enhanced tree growth and snag development (figure 4-1B). Both types of restoration are needed (figure 5-1). The Okanogan-Wenatchee, Shasta-Trinity, and Fremont-Winema National Forests are examples of where this complex restoration is more urgently needed.

There is a heightened risk of loss in forests needing disturbance restoration in comparison to those needing primarily succession restoration; therefore, disturbance restoration is an urgent need. Forests that need mechanical and fire treatments tend to be overly dense and are places where past fire exclusion deprived these systems of multiple important disturbance cycles (figure 2-5). If these forests are not restored, the next fire, or some other disturbance event, might move the ecosystem toward an undesirable, and potentially unstable condition (figure 2-1). Disturbance restoration is evenly needed throughout the NWFP land use allocations (figure 4-9), yet the urgency of the need varies by national forest or grassland (table 5-1 and figure 5-1) and limiting the overall carbon emissions through fire resiliency treatments in frequent-fire dependent and fire diverse (mixed-severity) ecosystem.[124]

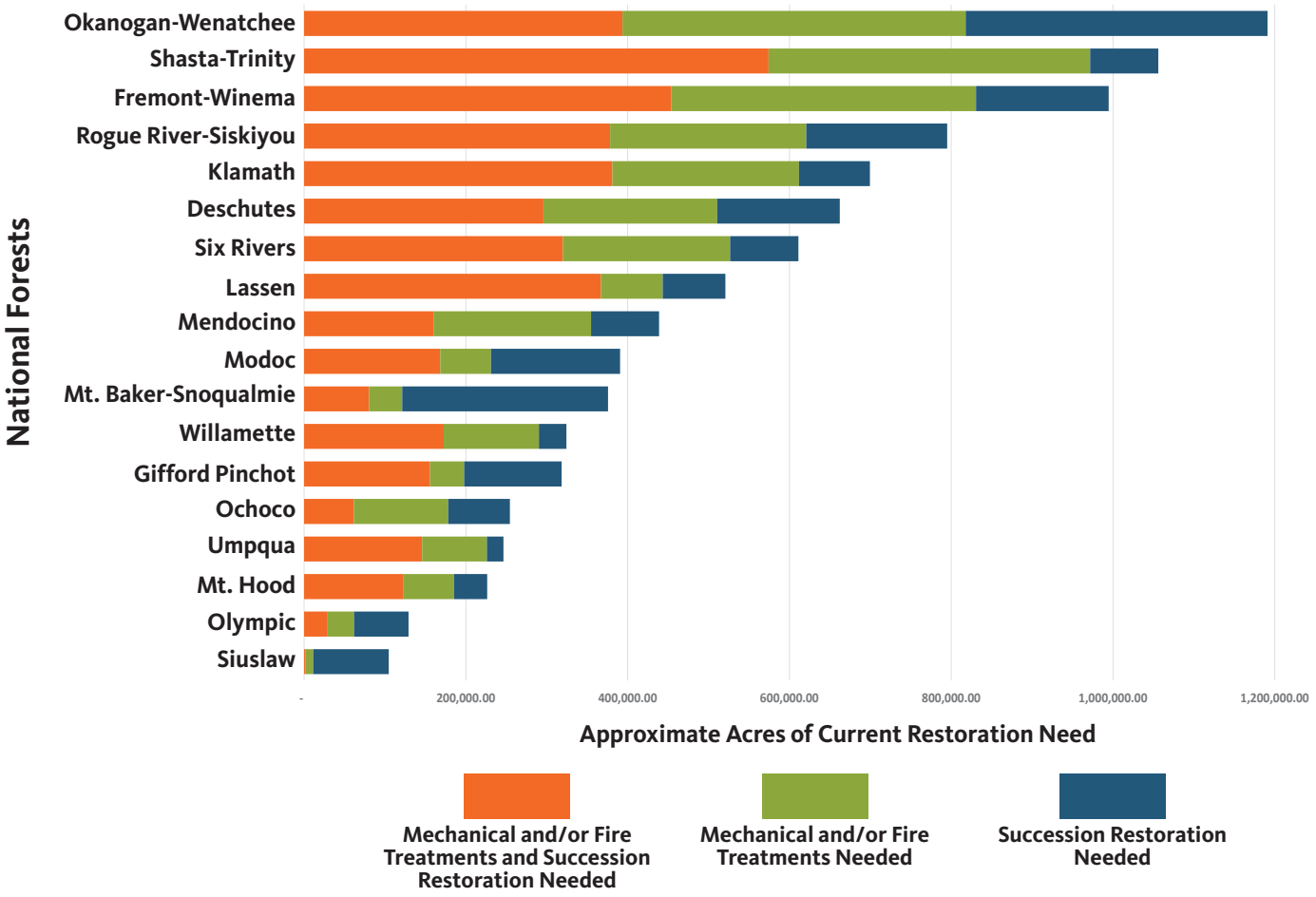


Figure 5-1—Total acres of restoration need by national forest.[125] All land designations including congressionally reserved areas, late-successional reserves, riparian reserves, matrix, and lands outside the NWFP area. Forests that depend on frequent fire have more restoration need.

[122] Level III ecoregions of the continental United States: https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states.
[123] Ringo and others, 2019.
[124] Spies and others, 2018.
[125] Ringo and others, 2019.

Late-successional reserves need management that is compatible with the diverse landscapes across the BioA area (chapter 2, Recommendation 1), while also being managed consistently for planning efficiency and implementation effectiveness. One of the key components of diverse landscapes is fire ecology.[126] Using the fire ecology groups—frequent-fire dependent, fire diverse (mixed severity), and fire infrequent—described in chapter 4 would provide a consistent management approach for future late-successional reserve (figure 5-2).

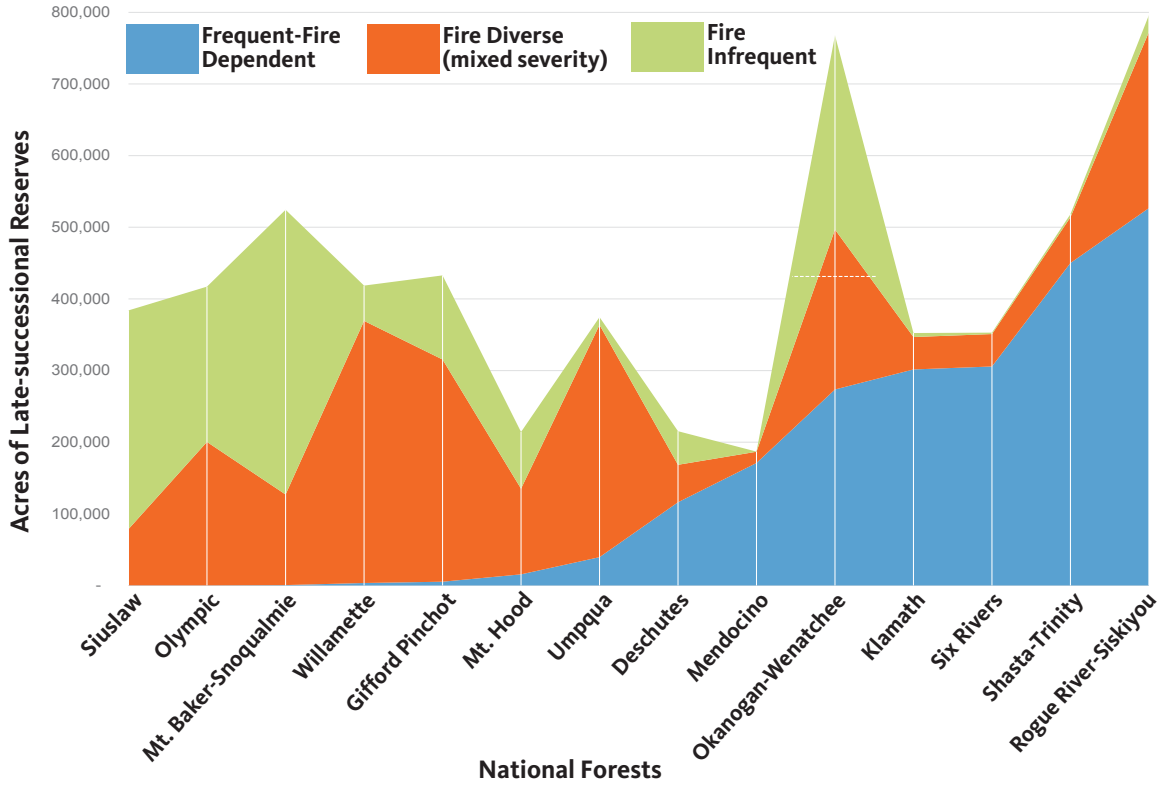


Figure 5-2—Acres of late-successional reserve in each fire ecology group (frequent-fire dependent, fire diverse (mixed severity), and fire infrequent) by national forests in the BioA area. Only forests with more than 100,000 acres of late-successional reserves are displayed. Consistent management of late-successional reserves is needed in forests with similar fire ecology. The Rogue River-Siskiyou, Shasta-Trinity, Six Rivers, Klamath, Okanogan-Wenatchee, Mendocino, and Deschutes National Forests all have more than 100,000 acres of late-successional reserves in the frequent-fire dependent ecosystem group. Source: Morelli and others (2016). After Spies and others 2018.

Carbon storage is an ecosystem service provided by healthy forests. The potential for carbon sequestration in the BioA area is greatest in coast-range forests, such as the Siuslaw, Mt. Baker-Snoqualmie, and Olympic National Forests, due to their high productivity and low fire frequency. The greatest potential for mitigating emissions and limiting the overall losses through fire resiliency treatments is in frequent-fire dependent and fire diverse (mixed-severity) ecosystems (figure 5-2).

The effects of climate change, such as increased temperatures, drier summers, and wetter winter storms, will likely be most pronounced in the southern portion of the BioA area (northern California and southern Oregon) and in the drier forested and non-forested types (eastern Cascades) (figure 5-3).[127] Climate change effects will also be pronounced in high-elevation forests where effects, such as loss of snow pack and warming, can change ecosystems.

[126] Spies and others, 2018.
[127] Reilly and others, 2018.

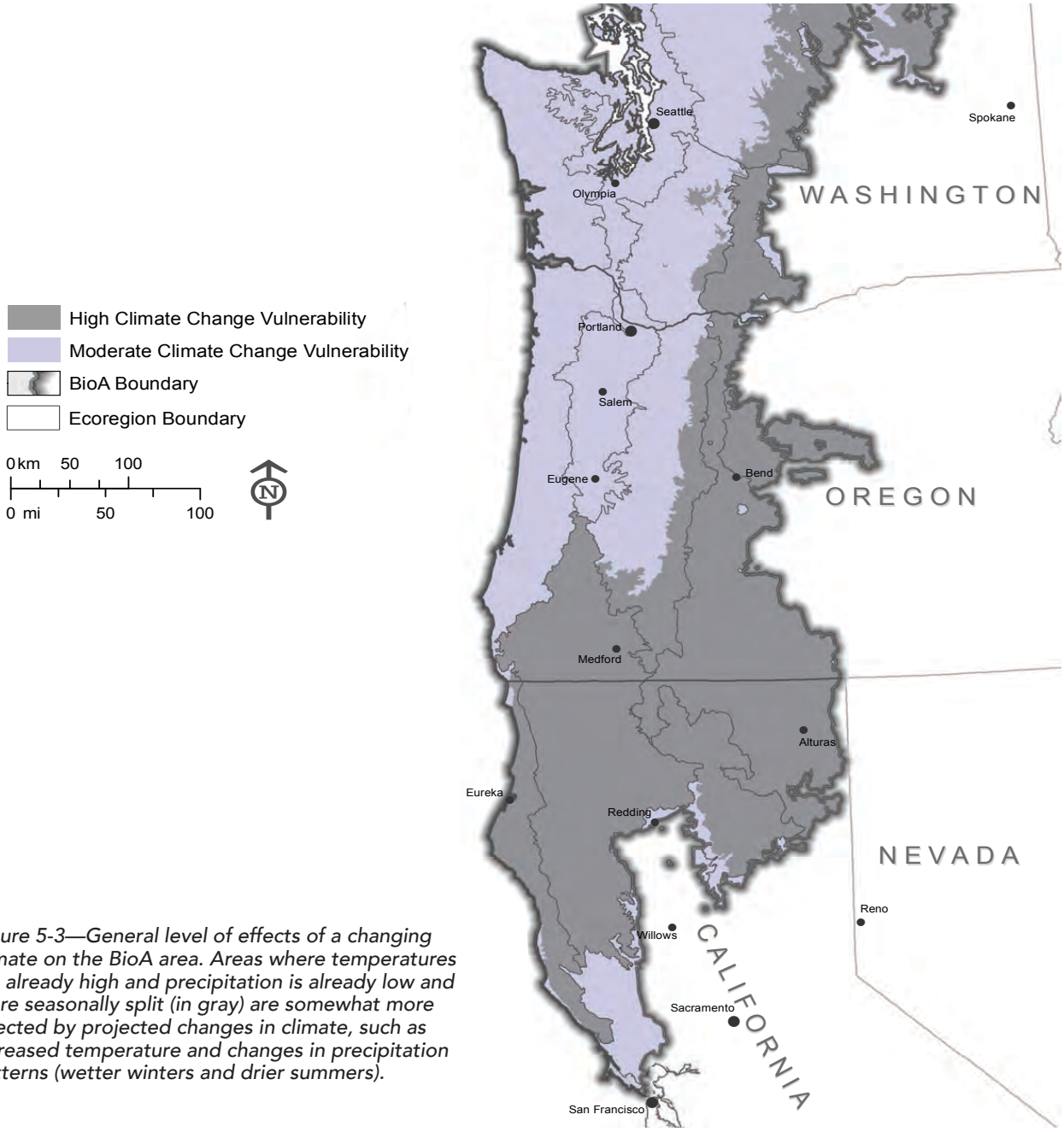


Figure 5-3—General level of effects of a changing climate on the BioA area. Areas where temperatures are already high and precipitation is already low and more seasonally split (in gray) are somewhat more affected by projected changes in climate, such as increased temperature and changes in precipitation patterns (wetter winters and drier summers).

Fire and Fuels

There is an urgency to address ecological conditions in frequent-fire dependent ecosystems that are outside of what would be expected for such an ecosystem. Identification of fire ecology groups provides a framework where consistent management approaches would be most effective for national forests and grasslands in the BioA area. The drier forest types (frequent-fire dependent) of northern California, southern Oregon, and the eastern Cascades[128] (figures 2-4 and 4-4) have the greatest increases in burn area; this trend is expected to continue. Most studies project little increase in fire activity in the moist maritime forests (fire infrequent); for example, Sitka spruce, redwood, and western hemlock forests[129] (figure 2-4).

Forests with many frequent-fire dependent ecosystems would benefit the most from adjustment to prescribed fire and wildfire management direction. All forests would benefit, to some degree, from direction to address the lack of fire on the landscape.

There is a lack of fire on the landscape even with current prescribed fire management activities (figure 2-5). Forests with the greatest gap have the greatest lack of fire and are most in need of updated land management plan direction to better enable fuel treatments for landscape ecological restoration.

[128] Reilly and others, 2018.
[129] Reilly and others, 2018.

Using quantitative wildfire-risk assessments (figure 5-4) addresses fire-risk management around communities and helps focus on the areas of greatest urgency. Assessments, when complete for California, can be used to evaluate overall priorities and urgency to focus management direction on community risk.[130]

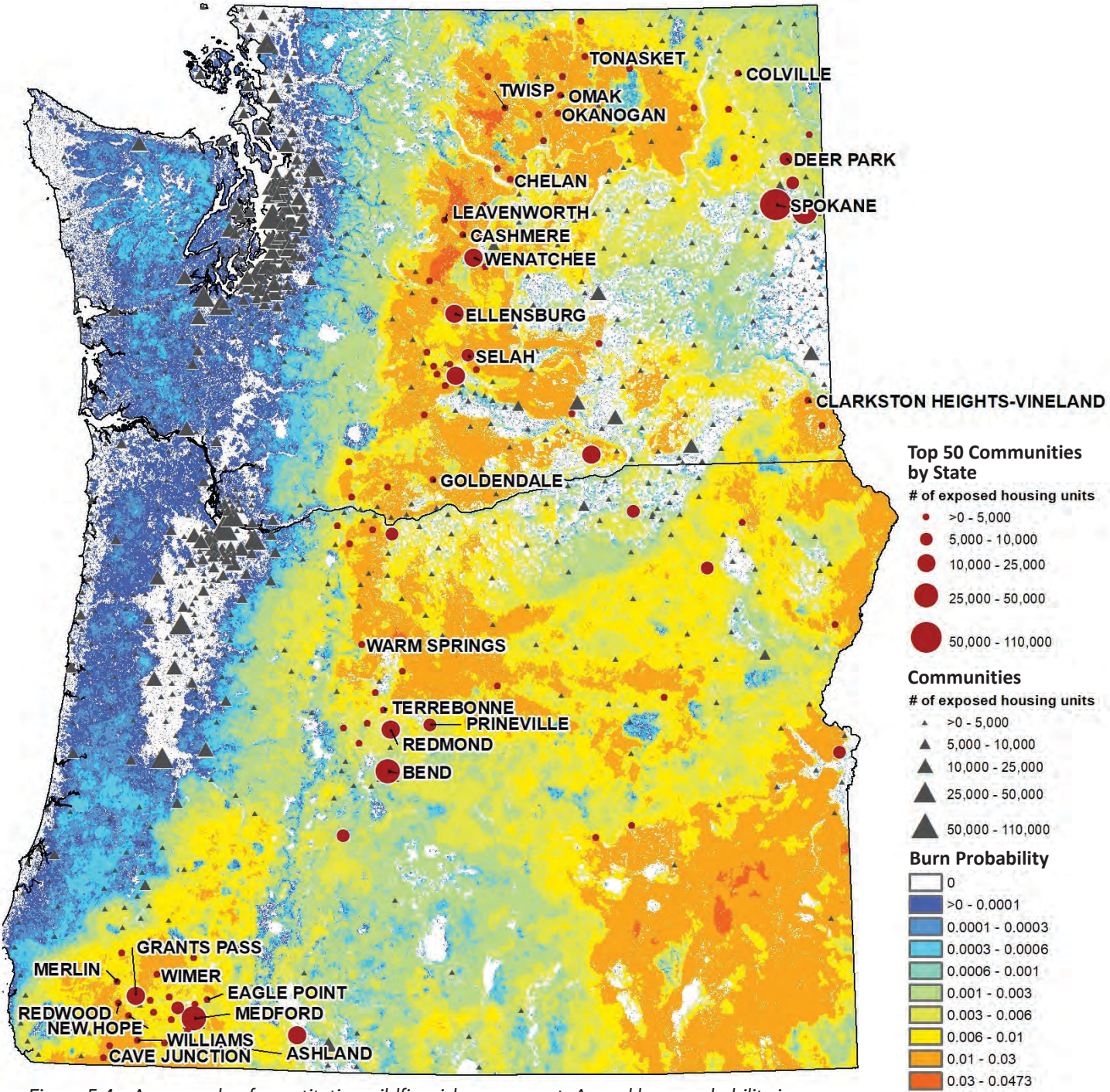


Figure 5-4—An example of quantitative wildfire-risk assessment. Annual burn probability in Washington and Oregon and exposed human communities in each state. The 50 most exposed communities in Oregon and Washington, based on annual burn probability, are in dark red.[131] A similar assessment is being drafted for California and will display similar data to highlight risks to communities and to conduct large-scale risk assessments. Source: Scott and others 2018

[130] Gilbertson-Day and others, 2018.
[131] Gilbertson-Day and others, 2018.

Sustainable Timber

Providing a predictable and sustainable timber supply is a core component of the Forest Service mission. Today, much of our timber volume is a product of restoration and resiliency projects, which are urgently needed (figure 4-1). Most of the current restoration need is in forests dominated by frequent-fire dependent ecosystems (figure 5-1, figure 4-4).

How timber is harvested and where it comes from today is very different from how and where is was projected to come from when the NWFP was signed. The land management plans on the Gifford Pinchot, Mt. Hood, Willamette, and Umpqua National Forests projected the highest timber outputs under the NWFP. Today, these forests have the biggest gap between timber actually produced and what was projected in the NWFP. The actual timber output doesn't accurately reflect potential productivity because we know that these are highly productive timber forests.

The number of local timber processing facilities has decreased in Washington, Oregon, and northern California. Although total processing capacity has increased in Washington and remains constant in Oregon,[132] the cost of transporting harvested timber to mills has increased in areas with limited remaining infrastructure.[133] This is particularly true east of the Cascade Range and in the southern Coast range (figure 5-5) where restoration needs in frequent-fire dependent ecosystems are critical.

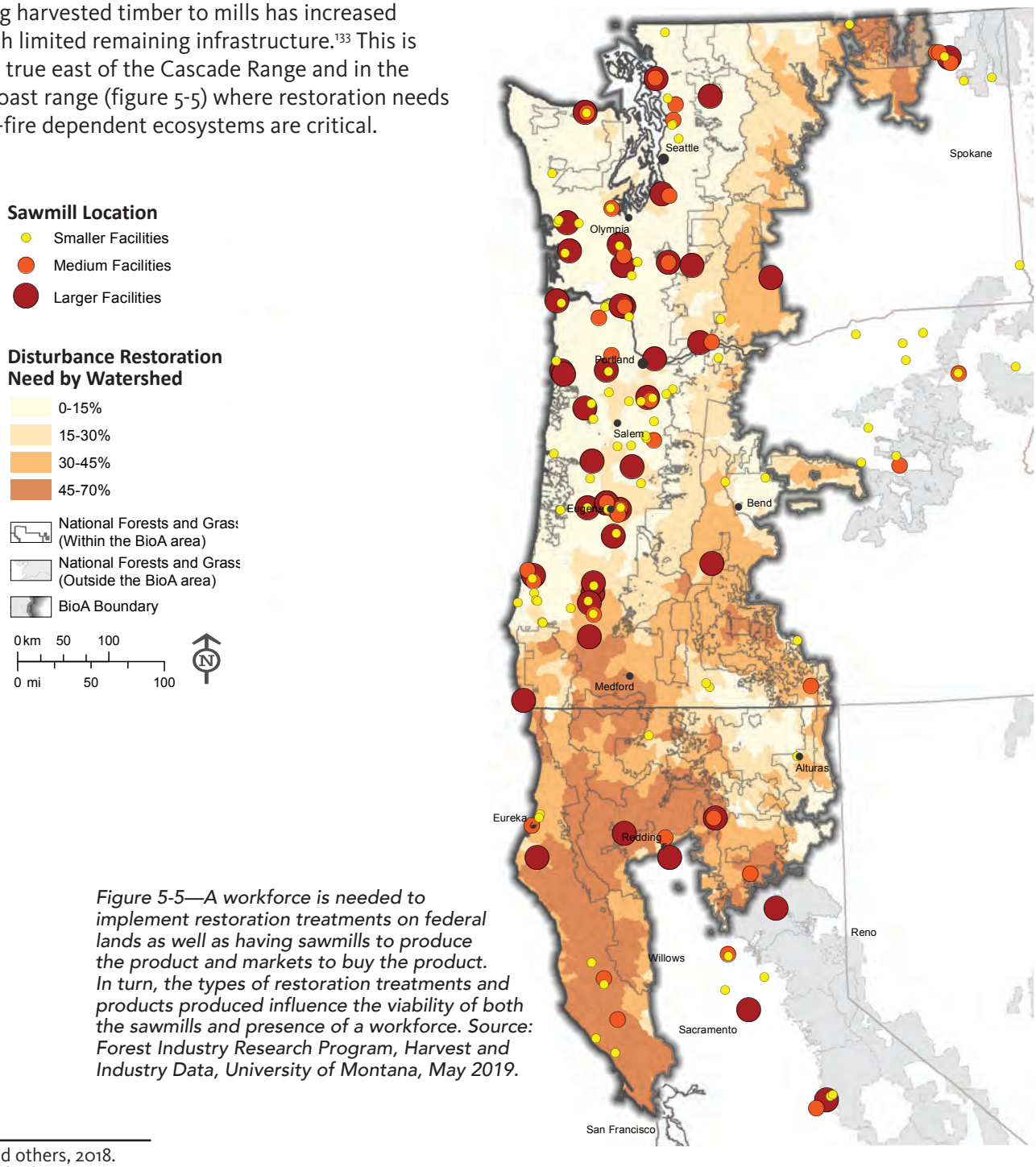


Figure 5-5—A workforce is needed to implement restoration treatments on federal lands as well as having sawmills to produce the product and markets to buy the product. In turn, the types of restoration treatments and products produced influence the viability of both the sawmills and presence of a workforce. Source: Forest Industry Research Program, Harvest and Industry Data, University of Montana, May 2019.

[132] Charnley and others, 2018.
[133] Charnley and others, 2018.

Conflicting management direction related to northern spotted owl designated critical habitat affects anticipated timber harvest. The overlap of critical habitat designation (chapter 4, Sustainable Timber) is least aligned with late-successional reserves on the Mt. Hood, Umpqua, Six Rivers, Willamette, Klamath, Okanogan-Wenatchee, Shasta-Trinity, Gifford Pinchot, and Rogue River-Siskiyou National Forests (figure 5-6). These forests have the greatest urgency to modernize land management plan direction to better align designated critical habitat with late-successional reserves. Better realignment of the late-successional reserve network with critical habitat could adjust the matrix lands available for ecological treatments, which might provide additional timber outputs.

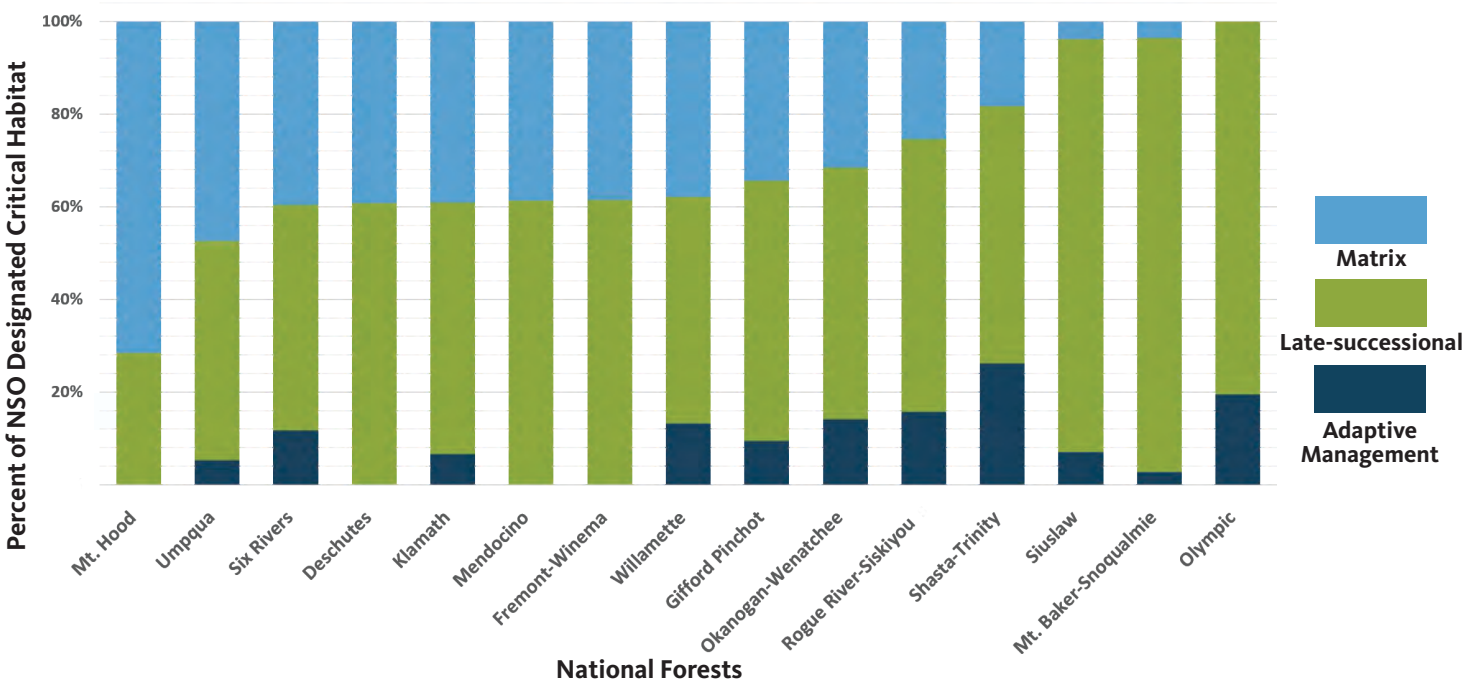


Figure 5-6—Northern spotted owl designated critical habitat overlaps with plan management direction differently on each national forest. On some forests there is a more urgent need to align critical habitat with late-successional reserves. Consistency in critical habitat management is needed between adjacent forests, especially when fire ecology is similar. Critical habitat designations are least aligned with late-successional reserves on the Mt. Hood, Umpqua, Six Rivers, Willamette, Klamath, Okanogan-Wenatchee, Shasta-Trinity, Gifford Pinchot, and Rouge River-Siskiyou National Forests, where there is less than 60 percent alignment for critical habitat in non-Wilderness reserves.

Habitat Management

Addressing old-forest habitat management for the northern spotted owl across the BioA area requires considering different ecological conditions, while working toward a level of consistency to help ensure planning effectiveness and implementation efficiency. Consistency would relate to the fire ecology of the landscape. For example, drier frequent-fire dependent ecosystems would benefit from habitat direction different from fire diverse (mixed severity) and fire infrequent ecosystems. However, planning efficiencies would still be gained through consistent direction within each fire ecology group (figures 4-4 and 5-7). Consistent habitat direction, appropriate for the ecosystem, could help national forests and grasslands meet the recovery actions highlighted in the northern spotted owl and marbled murrelet recovery plans (for example, northern spotted owl recovery action 10 and 32).[134] Similarly, consistent management direction for aquatic and riparian conservation is recommended across the BioA area to meet the needs of broad ranging aquatic species and to increase planning efficiency and implementation effectiveness.

[134] US Fish and Wildlife Service, 2011a.

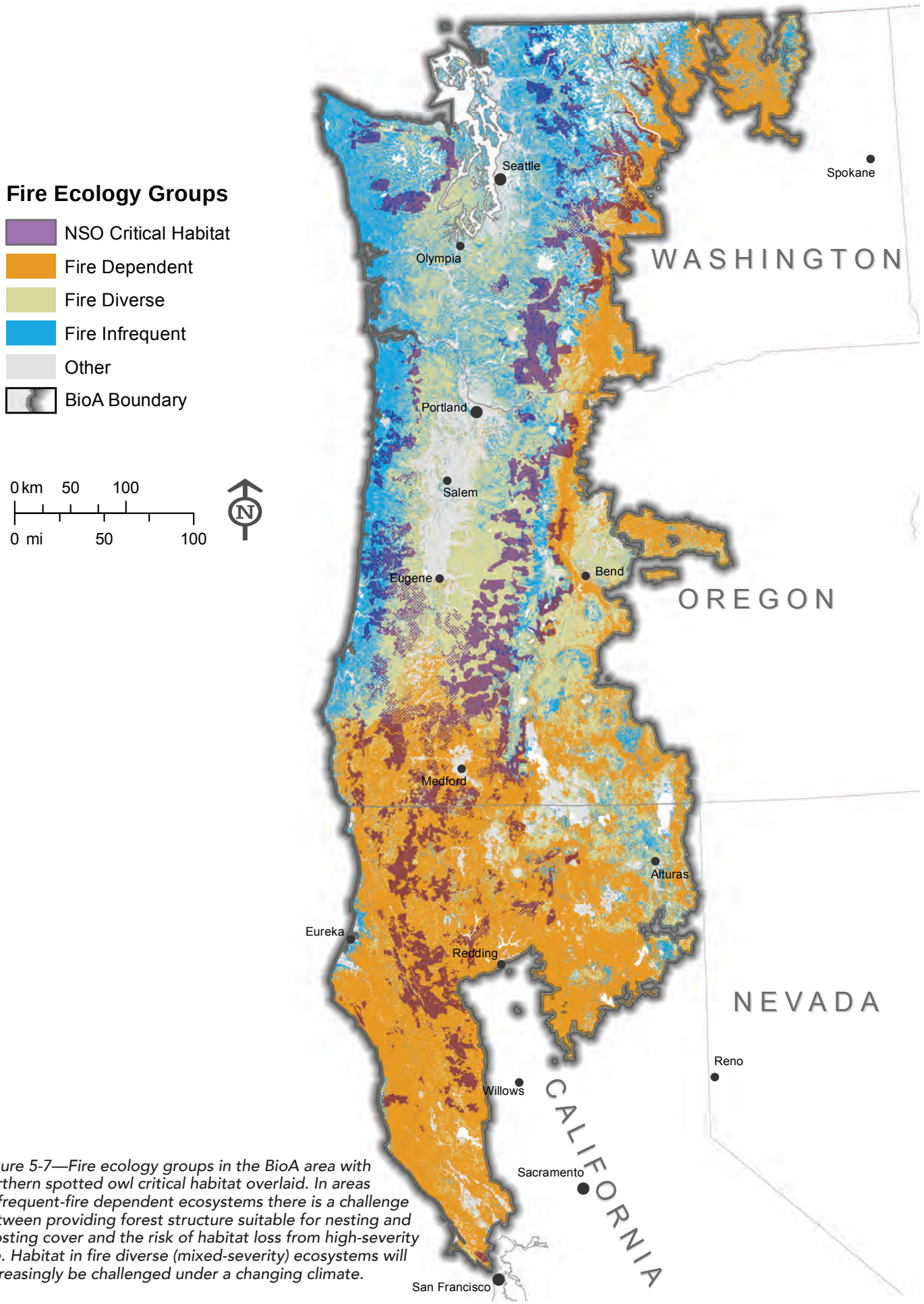


Figure 5-7—Fire ecology groups in the BioA area with northern spotted owl critical habitat overlaid. In areas of frequent-fire dependent ecosystems there is a challenge between providing forest structure suitable for nesting and roosting cover and the risk of habitat loss from high-severity fire. Habitat in fire diverse (mixed-severity) ecosystems will increasingly be challenged under a changing climate.

Active management is urgently needed to manage ecological integrity and wildlife habitat, as highlighted by the large fire potential in late-successional reserves and congressionally reserved land allocations (chapter 5, Fire and Fuels, figure 5-8). Some areas in northern California and eastern Oregon experience wildfires that are uncharacteristically large. It is projected that more fire diverse (mixed severity) areas will experience large fires in the future, which could have negative impacts on late-successional habitat (figure 5-8).

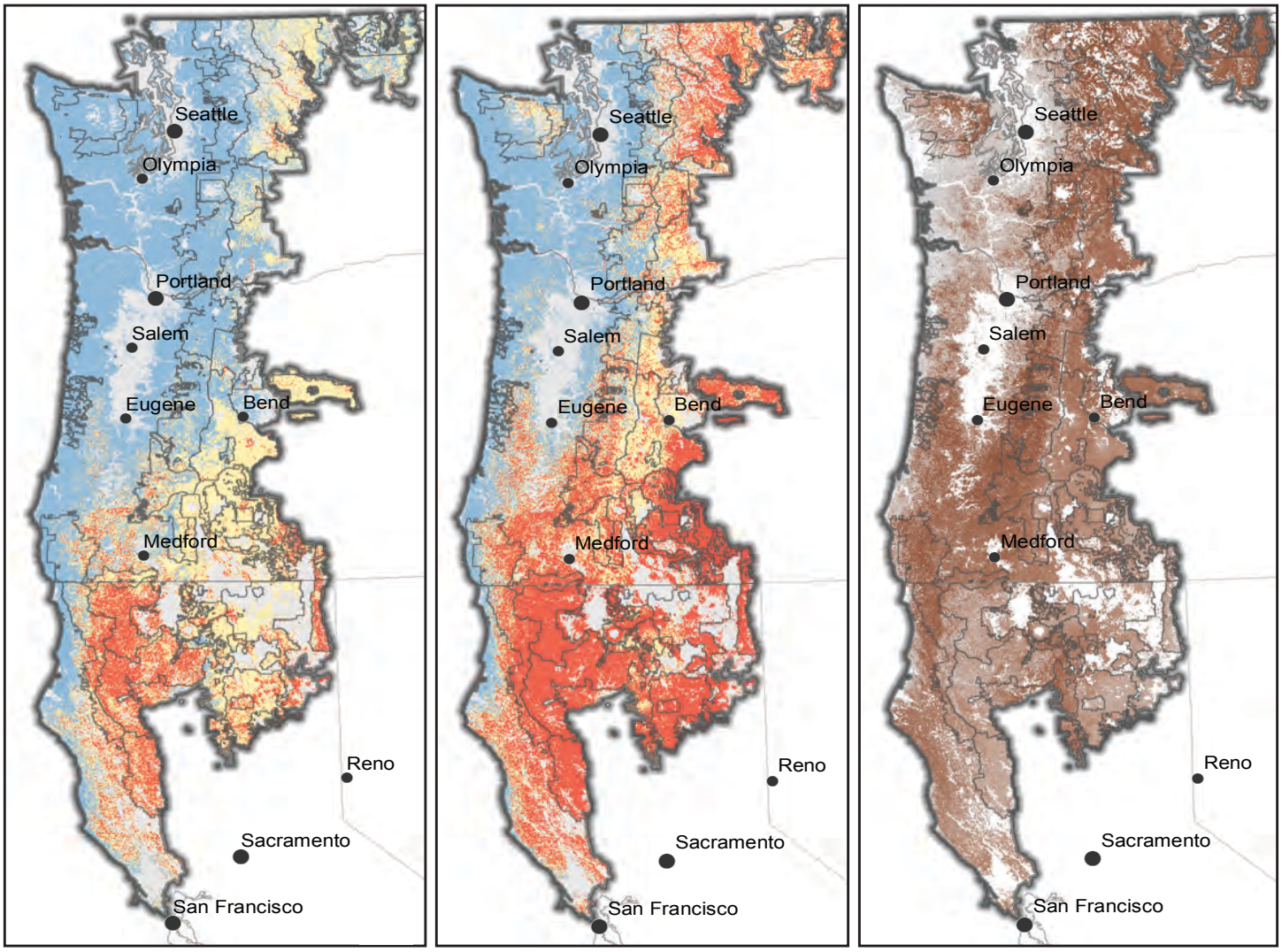


Figure 5-8—With a changing climate some forests will become increasingly prone to large fires. This shift will put reserve areas and associated habitat at risk of large stand-replacing fire. Developing vegetation management direction and desired conditions that are informed by climate change to sustain higher levels of ecological function, reduce risk, and create options for resilient ecological pathways will be important for these forests.[135]

[135] Adapted from Davis and others, 2017.

Sustainable Recreation

Providing consistent land management plan direction for recreation will help avoid confusion and frustration related to conflicting direction. The amount and type of visitor use varies across the BioA area, with high levels around metropolitan areas (figure 5-9). Additional assessment of how people use the national forests and grasslands will help to highlight where there is a need for consistency in land management plan direction. The data can be used to develop land management plan direction and monitoring strategies that consider the need for consistency, where appropriate, as well as the unique characteristics of recreation landscapes across the BioA area.

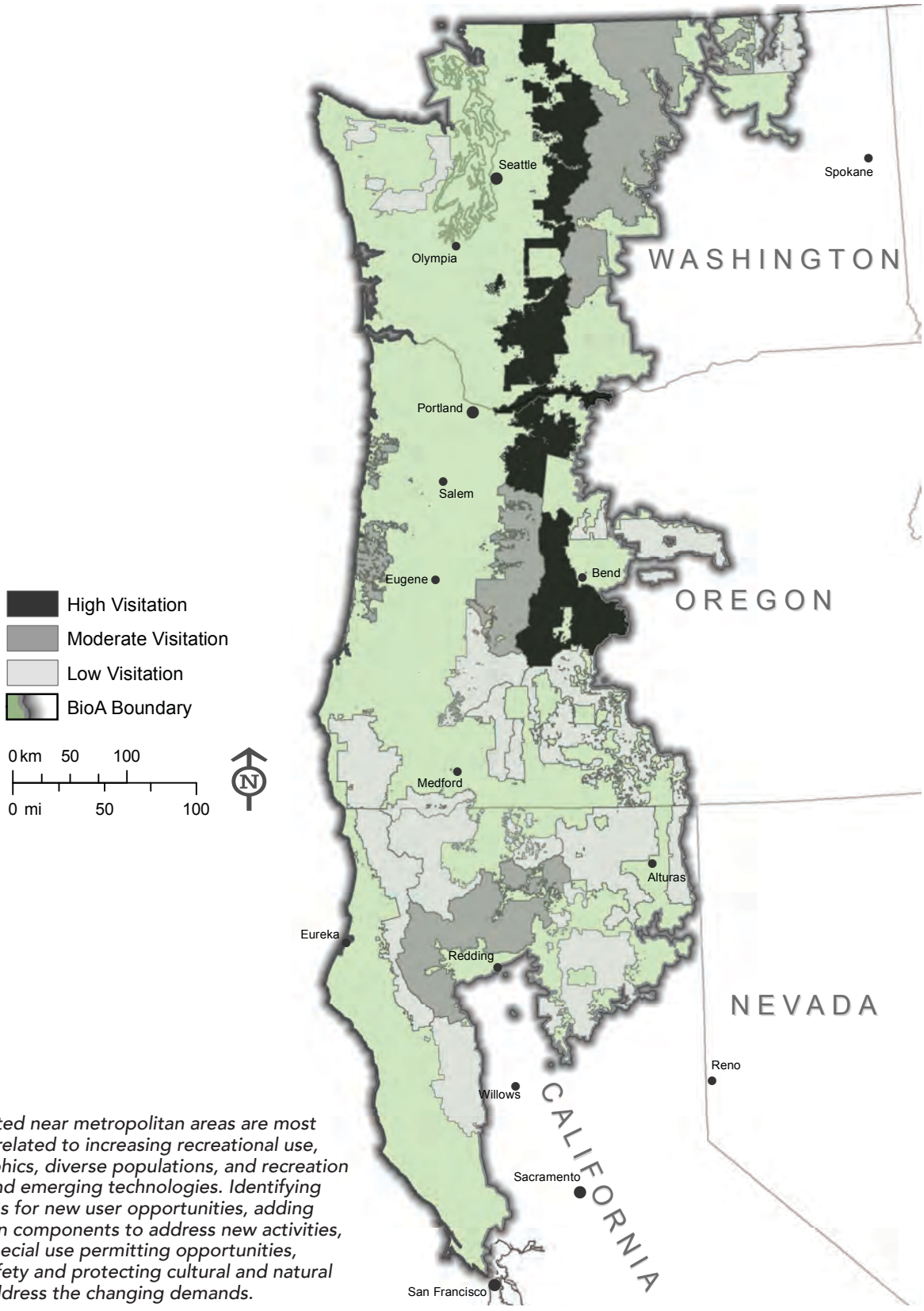


Figure 5-9—Forests located near metropolitan areas are most likely to face challenges related to increasing recreational use, changing user demographics, diverse populations, and recreation activity related to new and emerging technologies. Identifying recreation emphasis areas for new user opportunities, adding consistent recreation plan components to address new activities, and adding recreation special use permitting opportunities, while addressing user safety and protecting cultural and natural resources, can help to address the changing demands.

Roads and trails across national forests and grasslands are an important aspect of recreation and provide the Forest Service with access to conduct work on the ground, including fire and fuels management. The National Forest Road System varies by national forest and grassland (figure 5-10), as does its impacts on ecological integrity and terrestrial and aquatic wildlife and plants. Because existing Forest Service direction adequately addresses most road-related concerns, road management is not a primary driver in the need to modernize land management direction. However, when a road crosses from one national forest or grassland to another, consistent management direction is needed to efficiently serve communities and conduct management.

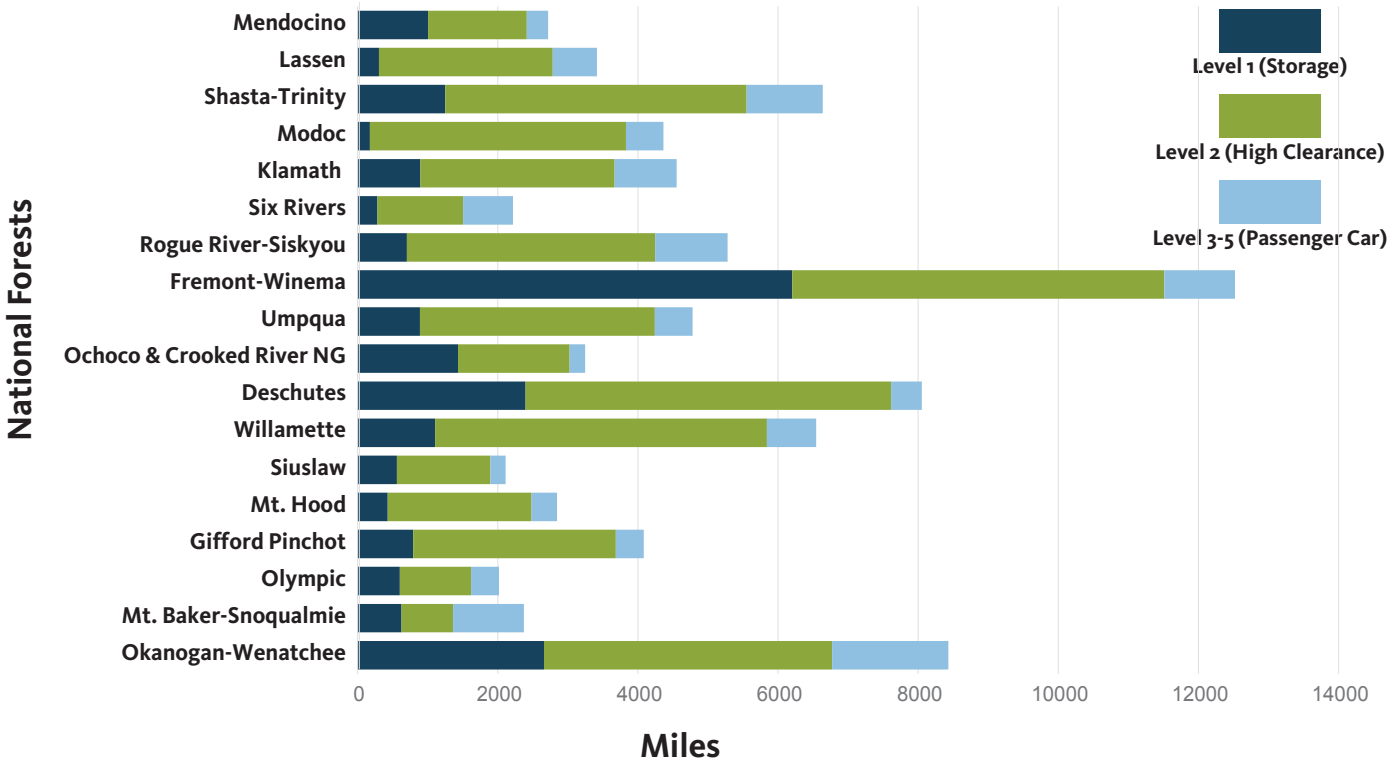
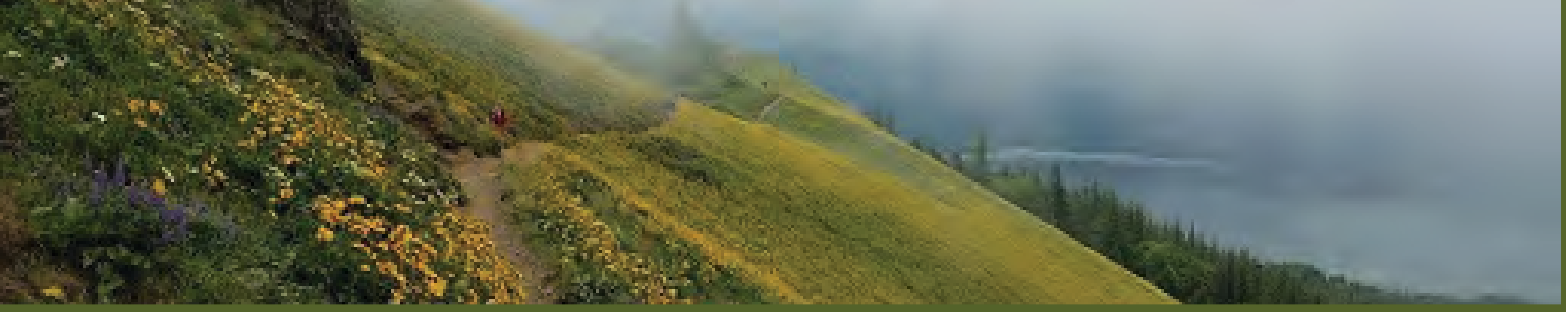


Figure 5-10—Road density and maintenance levels vary widely and, while not directly correlated, provide an indication of the maintenance backlog and needs along with access to a given area. Stored roads are not open to the public and receive no regular maintenance; high-clearance roads are open yet receive minimal maintenance, typically only to address road failures and resource concerns (for example, drainage and erosion control); and passenger car roads are open, can be gravel to pavement, and are intended to receive regular scheduled maintenance.

The impacts of climate change on recreation and Forest Service roads and trails exist across the entire BioA area, from increased flooding in more northern areas and to tree fall from increased wildfires in northern California, southwest Oregon, and the eastern Cascades (figure 5-3). Climate change has impacted and will continue to impact the delivery of abundant and safe recreational opportunities on national forests and grasslands in the BioA area.

Conclusion

In this chapter, we weighed the geographic urgency of various management challenges and opportunities for change and discussed the value of management consistency across the BioA area. We identified some management issues that would benefit from consistent direction across the BioA area and some management challenges and opportunities for change that aren't equal in geographic scope or urgency. To best address and improve how we meet the needs of the socially, economically, and ecologically diverse BioA landscape, the Forest Service will consider the full spectrum of policy and regulatory options available to make management decisions as we engage with Tribes, states, local governments, stakeholders, and the public. Next, you'll read about how your participation will help guide the Forest Service to develop land management plans that improve how we meet public needs while maintaining ecological sustainability on our national forests and grasslands in the BioA area.



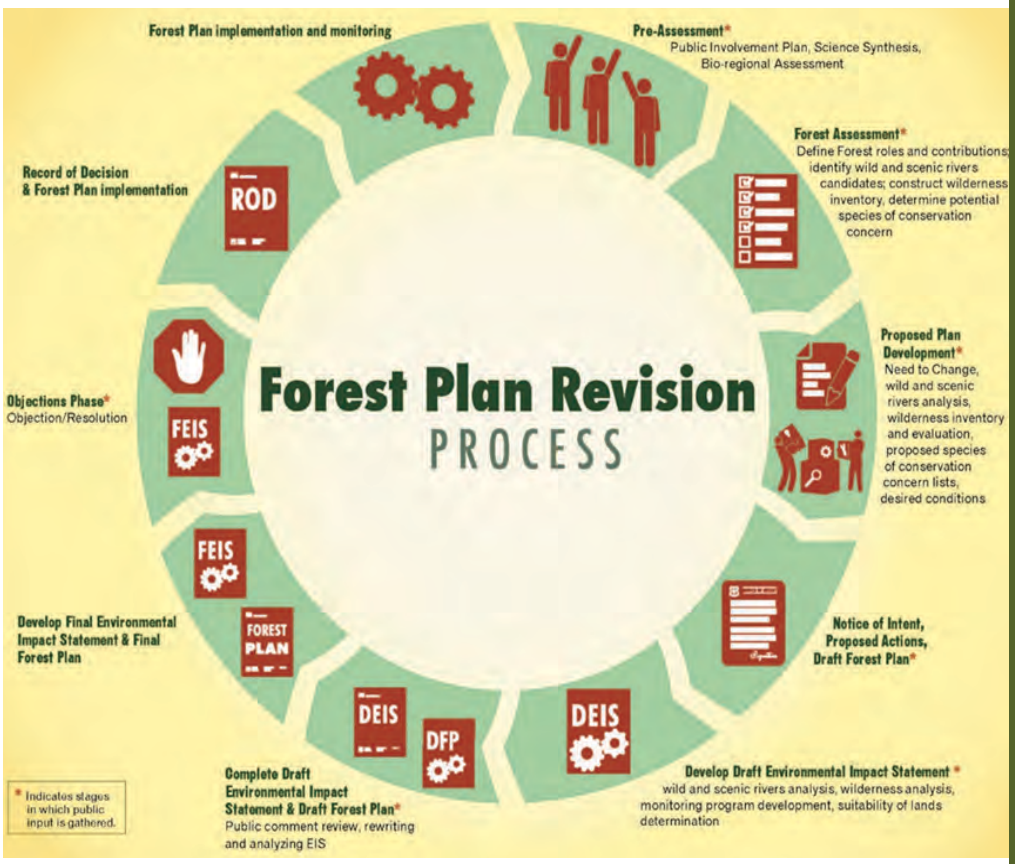
Next Steps

How to Stay Involved

The BioA will guide the Forest Service in making strategic decisions about what needs to change in existing land management plans as well as the sequence and timing for modernizing them through amendments or revisions. Using the five broad management categories that we developed in the BioA—ecological integrity, fire and fuels, sustainable timber, habitat management, and sustainable recreation—the Forest Service will move into the next phase of the land management planning process for the 19 national forests and grasslands in the BioA area. We know that effective public engagement depends on meeting people where they are, talking with them about what they care about, and making connections to how their public lands provide the multiple benefits that society and their communities seek.

Following the release of the BioA, we'll begin Tribal and public engagement in Washington, Oregon, and California to ensure that we identify and understand issues and opportunities important to the communities that we serve before any formal plan revision or amendment efforts. We'll share information about the public engagement opportunities on the NWFP web page, and go to GovDelivery to sign up to receive email updates about how to stay involved and join the conversation.

Our 2012 planning rule supports and encourages productive working relationships between the Forest Service and diverse communities, including youth, low-income, and minority populations, and stakeholders, Tribes, and other governments by providing ". . . for a transparent, collaborative process that allows for effective participation" throughout the entire land management planning process. For several years after finalization of the current planning rule, a small committee[136] of public, state- and local-elected officials, Tribes, and youth provided advice and recommendation on implementation of the planning rule. This same committee developed the Citizens Guide to National Forest Planning. In this spirit, we are committed to a participatory collaborative process to accomplish modernization of the existing land management plans. The collaborative effort will bring diverse interests together to explore critical issues and provide meaningful input to our decision process.



In an open, inclusive, and receptive environment, we'll address challenging complex issues on a broad scale, create shared responsibility and understanding, and build working relationships, trust, and capacity. With your participation, we'll develop land management plans that meet public needs and protect natural resources now and into the future.

[136] National Advisory Committee for Implementation of the National Forest System Land Management Planning Rule. (https://www.fs.usda.gov/main/planningrule/committee)

Glossary

This glossary is adapted from the *Synthesis of Science to Inform Land Management Within the Northwest Forest Plan Area* (Science Synthesis) to ensure consistency of language between the Science Synthesis and the Bioregional Assessment and help readers understand various terms used in this document.

Sources include the Forest Service Handbook (FSH), the Code of Federal Regulations (CFR), executive orders, the Federal Register (FR), and various scientific publications. The authors have added working definitions of terms used in the synthesis and its source materials, especially when formal definitions might be lacking or when they differ across sources.

active management—Direct interventions to achieve desired outcomes, which may include harvesting and planting of vegetation and the intentional use of fire, among other activities.

adaptive management—A structured, cyclical process for planning and decision-making in the face of uncertainty and changing conditions with feedback from monitoring, which includes using the planning process to actively test assumptions, track relevant conditions over time, and measure management effectiveness (FSH 1909.12.5). Additionally, adaptive management includes iterative decision-making, through which results are evaluated and actions are adjusted based on what has been learned.

adaptive management area (AMA)—A portion of the federal land area within the NWFP area that was specifically allocated for scientific monitoring and research to explore new forestry methods and other activities related to meeting the goals and objectives of the Plan. Ten AMAs were established in the NWFP area, covering about 1.5 million ac (600,000 ha), or 6 percent of the planning area (Stankey and others 2003).

ancestral lands (of American Indian Tribes)—Lands that historically were inhabited by the ancestors of American Indian tribes.

annual species review—A procedure established under the NWFP in which panels of managers and biologists evaluate new scientific and monitoring information on species to potentially support the recommendation of changes in their conservation status.

Aquatic Conservation Strategy (ACS)— A regional strategy that uses an ecosystem approach to manage and protect riparian and aquatic habitats across the broad landscapes of lands in the Northwest Forest Plan area.

biodiversity—In general, the variety of life forms and their processes and ecological functions, at all levels of biological organization from genes to populations, species, assemblages, communities, and ecosystems.

bull trout core areas—Areas where bull trout populations have been delineated for conservation purposes.

climate adaptation—Management actions to reduce vulnerabilities to climate change and related disturbances.

climate change—Changes in average weather conditions (including temperature, precipitation, and risk of certain types of severe weather events) that persist over multiple decades or longer, and that result from both natural factors and human activities such as increased emissions of green- house gases (U.S. Global Change Research Program 2017).

climate change refugia—Areas that remain relatively buffered from contemporary climate change across time and enable persistence of valued physical, ecological, and socio-cultural resources.

collaboration or collaborative process—A structured way a collection of people with diverse interests share knowledge, ideas, and resources, while working together in an inclusive and cooperative manner toward a common purpose (FSH 1909.12.05).

commercial thin—An intermediate harvest with the objective of reducing stand density primarily to improve growth, enhance forest health, and other resources objectives. Treatment can recover potential mortality while producing merchantable material. Thinning includes the following: chemical (killing of unwanted trees by herbicide application); crown (removal of trees from dominant and co-dominant strata); free (no consideration to crown position); low (removal of trees from lower crown classes); mechanical or row (removal of trees either in row, strips by using a fixed spacing interval); selection (removal of the crown class to favor those in the lower crown classes) (Forest Service Activity Tracking System Appendix B).

community (plant and animal)—A naturally occurring assemblage of plant and animal species living within a defined area or habitat (36 CFR 219.19).

community resilience—The capacity of a community to return to its initial function and structure when initially altered under disturbance.

community resistance—The capacity of a community to withstand a disturbance without changing its function and structure.

composition—The biological elements within the various levels of biological organization, from genes and species to communities and ecosystems (FSM 2020).

congressionally reserved land—Lands reserved by the U.S. Congress such as wilderness areas, wild and scenic rivers, and national parks and monuments.

connectivity (of habitats)—Environmental conditions that exist at several spatial and temporal scales that provide landscape linkages that permit (a) the exchange of flow, sediments, and nutrients; (b) genetic interchange of genes among individuals between populations; and (c) the long-distance range shifts of species, such as in response to climate change (36 CFR 219.19).

desired conditions—A description of specific social, economic, or ecological characteristics toward which management of the land and resources should be directed.

disturbance regime—A description of the characteristic types of disturbance on a given landscape; the frequency, severity, and size distribution of these characteristic disturbance types and their interactions (36 CFR 219.19).

disturbance restoration need—The area departed from the Natural Range of Variability (NRV) where a disruption is needed to move existing conditions closer to NRV. These disruption processes include fire, wind, and insects and disease. Disturbance can also be achieved through management tools of thinning and/or prescribed burning (Haugo and others 2015, DeMeo and others 2018).

disturbance—Any relatively discrete event in time that disrupts ecosystem, watershed, community, or species population structure or function, and that changes resources, substrate availability, or the physical environment (36 CFR 219.19).

dynamic reserves—A conservation approach in which protected areas are relocated following changes in environmental conditions, especially owing to disturbance.

early-seral vegetation—Forest conditions in the early stages of succession following an event that removes the forest canopy (e.g., timber harvest, wildfire, windstorm), on sites that are capable of developing a closed canopy (Swanson and others 2014). A non-forest or "pre-forest" condition occurs first, followed by an "early-seral forest" as young shade-intolerant trees form a closed canopy.

"complex" early-seral forest—A forest comprised of early-seral vegetation that differs from more simplified early seral forest in a few key ways. First complex early seral forest is often naturally occurring. It has high species diversity and is made up of survivors and legacies including organic structures like live and dead trees that provide habitat for surviving and colonizing organisms. Traditional forestry practices like clearcutting, salvage logging, and tree planting can reduce species richness and key ecological processes associated with complex early seral habitat (Swanson and others 2011).

eastside screens—Interim management direction establishing riparian, ecosystem and wildlife standards for timber sales on National Forest System lands in eastern Oregon and Washington under regional forester's amendment 2. Consistency with Eastside Screens and National Forest Managment Act. https://www.fs.usda.gov/nfs/11558/www/nepa/52637_FSPLT2_116557.pdf

ecocultural resources—Valued elements of the biophysical environment, including plants, fungi, wildlife, water, and places, and the social and cultural relationships of people with those elements.

ecological conditions—The biological and physical environment that can affect the diversity of plant and animal communities, the persistence of native species, invasibility, and productive capacity of ecological systems. Ecological conditions include habitat and other influences on species and the environment. Examples of ecological conditions include the abundance and distribution of aquatic and terrestrial habitats, connectivity, roads and other structural developments, human uses, and occurrence of other species (36 CFR 219.19).

ecological forestry—An ecosystem management approach designed to achieve multiple objectives that may include conservation goals and sustainable forest management and which emphasizes disturbance-based management and retention of "legacy" elements such as old trees and dead wood (Franklin and others 2007).

ecological integrity—The quality or condition of an ecosystem when its dominant ecological characteristics (e.g., composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence (36 CFR 219.19).

ecological sustainability—The capability of ecosystems to maintain ecological integrity (36 CFR 219.19).

economic sustainability—The capability of society to produce and consume or otherwise benefit from goods and services, including contributions to jobs and market and nonmarket benefits (36 CFR 219.19).

ecoregion—A geographic area containing distinctive ecological assemblages, topographic and climatic gradients, and historical land uses.

ecosystem—A spatially explicit, relatively homogeneous unit of the Earth that includes all interacting organisms and elements of the abiotic environment within its boundaries (36 CFR 219.19).

ecosystem diversity—The variety and relative extent of ecosystems (36 CFR 219.19).

ecosystem integrity—See "ecological integrity."

ecosystem services—Benefits that people obtain from ecosystems.

endangered species—Any species or subspecies that the Secretary of the Interior or the Secretary of Commerce has deemed in danger of extinction throughout all or a significant portion of its range (16 U.S.C. Section 1532).

environmental justice populations—Groups of people who have low incomes or who identify themselves as African American, Asian or Pacific Islander, American Indian or Alaskan Native, or of Hispanic origin.

environmental justice—An executive order requiring that federal land managers identify any disproportionately high and adverse human health and environmental effects of agency programs, policies, and actions on minority and low income populations. (Grinspoon and others 2014). An environmental justice population is a group of people that meets the criteria for low-income or minority status under E.O. 12898. An environmental justice population may be low income and/or minority.

environmental suitability—Environmental suitability is the conditions (here predicted by fire season precipitation, maximum temperature, slope and elevation) where large wildfires have manifested in the past and therefore could reasonably be predicted to occur in the future.

federally recognized Indian Tribe—An Indian Tribe or Alaska Native Corporation, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian Tribe under the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. 479a (36 CFR 219.19).

fire diverse ecosystems (mixed severity) (fire ecology group)—Fire can be important to ecosystem function, but it is not the primary driver of successional dynamics, including structure and composition. Fires were historically moderately frequent, ranging primarily between mixed and high severity in a variety of patch sizes.

fire exclusion—Curtailment of wildland fire because of deliberate suppression of ignitions, as well as unintentional effects of human activities such as intensive grazing that removes grasses and other fuels that carry fire (Keane and others 2002).

fire infrequent ecosystems (fire ecology group)—Fire is not necessarily a part of most ecosystem functions, although when fires do occur, they can be highly impactful. Fires were historically rare or infrequent, of mixed to high severity, in large patches, and were a rare disturbance within these systems.

fire regime—A characterization of long-term patterns of fire in an ecosystem across a specified and relatively long period of time, based on multiple attributes, including frequency, severity, extent, spatial complexity, and seasonality of fire occurrence.

fire refugia—Landscape elements that remain unburned or minimally affected by fire, thereby supporting postfire ecosystem function, biodiversity, and resilience to disturbances.

fire severity—The magnitude of the effects of fire on ecosystem components, in this document specifically effects of fire on vegetation.

fire suitability—The environmental conditions as measured by fire season precipitation, maximum temperature, slope and elevation that, based on past fire occurrence and size, would potentially host a similar fire in the future. In the BioA we discuss suitability for large wildfires.

fire suppression—The human act of extinguishing wild- fires (Keane and others 2002).

forest assessment—A report available to the public that must be completed for the development of a new plan or for a plan revision. An assessment is the identification and evaluation of existing information to support land management planning. Assessments are not decision-making documents, but provide current information on select topics relevant to the plan area, in the context of the broader landscape. (36 CFR 219.19).

frequent-fire dependent ecosystems (fire ecology group)—Fire is essential to overall ecosystem functions. Before Euro-American settlement, fires were quite frequent, of low or mixed severity, and were the primary driver of disturbance. Fire in these systems drives structural and successional dynamics, favoring fire-dependent and fire-adapted species.

fuels (wildland)—Combustible material in wildland areas, including live and dead plant biomass such as trees, shrub, grass, leaves, litter, snags, and logs.

fuels management—Manipulation of wildland fuels through mechanical, chemical, biological, or manual means, or by fire, in support of land management objectives to control or mitigate the effects of future wildland fire.

function (ecological)—Ecological processes, such as energy flow; nutrient cycling and retention; soil development and retention; predation and herbivory; and natural disturbances such as wind, fire, and floods that sustain composition and structure (FSM 2020). See also "key ecological function."

goals (in land management plans)—Broad statements of intent, other than desired conditions, that do not include expected completion dates (36 CFR part 219.7(e)(2)).

habitat—An area with the environmental conditions and resources that are necessary for occupancy by a species and for individuals of that species to survive and reproduce.

High-intrinsic potential assessment—An assessment conducted to determine a streams capacity to provide high-quality habitat for a given fish species.

invasive species—An alien species (or subspecies) whose deliberate, accidental, or self-introduction is likely to cause economic or environmental harm or harm to human health (Executive Order 13112).

key watersheds—Watersheds that are expected to serve as refugia for aquatic organisms, particularly in the short term, for at-risk fish populations that have the greatest potential for restoration, or to provide sources of high-quality water.

land management direction—Guides and directs management through a combination of aspirations and projections (desired conditions and objectives) and constraints (standards and guidelines). Land management direction also specifies what activities are acceptable or suitable on what parts of a National Forest.

land management plan (Forest Service)—A document or set of documents that provides management direction for an administrative unit of the National Forest System (FSH 1909.12.5).

land use allocation—A process of allocating different activities or uses to specific units of area within a geospatial context, to maximize a spectrum of social, economic, and ecological benefits.

landscape—A defined area irrespective of ownership or other artificial boundaries, such as a spatial mosaic of terrestrial and aquatic ecosystems, landforms, and plant communities, repeated in similar form throughout such a defined area (36 CFR 219.19).

late-successional forest—Forests that have developed after long periods of time (typically at least 100 to 200 years) following major disturbances, and that contain a major component of shade-tolerant tree species that can regenerate beneath a canopy and eventually grow into the canopy in which small canopy gaps occur. Note that FEMAT (1993) and the NWFP also applied this term to older (at least 80 years) forest types, including both old-growth and mature forests, regardless of the shade tolerance of the dominant tree species (e.g., 90 year-old forests dominated by Douglas-fir were termed late-successional).

late-successional reserve—Lands reserved for the protection and restoration of late-successional and old-growth forest ecosystems and habitat for associated species.

managing wildfire for resource objectives—Managing wildfires to promote multiple objectives such as reducing fire danger or restoring forest health and ecological processes rather than attempting full suppression. The terms "managed wildfire" or "resource objective wildfire" have also been used to describe such events (Long et al. 2017). However, fire managers note that many unplanned ignitions are managed using a combination of tactics, including direct suppression, indirect containment, monitoring of fire spread, and even accelerating fire spread, across their perimeters and over their full duration. Therefore, terms that separate "managed" wildfires from fully "suppressed" wildfires do not convey that complexity. (See "Use of wildland fire," which also includes prescribed burning).

matrix—Federal and other lands outside of specifically designated reserve areas, particularly the late-successional reserves under the NWFP, that are managed for timber production and other objectives.

minority population—A readily identifiable group of people living in geographic proximity with a population that is at least 50 percent minority; or, an identifiable group that has a meaningfully greater minority population than the adjacent geographic areas, or may also be a geographically dispersed/transient set of individuals such as migrant workers or Americans Indians (CEQ 1997).

mitigation (climate change)—Efforts to reduce anthropogenic alteration of climate, in particular by increasing carbon sequestration.

monitoring—A systematic process of collecting information to track implementation (implementation monitoring), to evaluate effects of actions or changes in conditions or relationships (effectiveness monitoring), or to test underlying assumptions (validation monitoring) (see 36 CFR 219.19).

native species—A species historically or currently present in a particular ecosystem as a result of natural migratory or evolutionary processes and not as a result of an accidental or deliberate introduction or invasion into that ecosystem (see 36 CFR 219.19).

natural range of variation (NRV)—The variation of ecological characteristics and processes over specified scales of time and space that are appropriate for a given management application (FSH 1909.12.5).

nontimber forest products (special forest products)—Various products from forests that do not include logs from trees but do include bark, berries, boughs, bryophytes, bulbs, burls, Christmas trees, cones, ferns, fire- wood, forbs, fungi (including mushrooms), grasses, mosses, nuts, pine straw, roots, sedges, seeds, transplants, tree sap, wildflowers, fence material, mine props, posts and poles, shingle and shake bolts, and rails (36 CFR part 223 Subpart G).

old-growth forest—A forest distinguished by old trees (>200 years) and related structural attributes that often (but not always) include large trees, high biomass of dead wood (i.e., snags, down coarse wood), multiple canopy layers, distinctive species composition and functions, and vertical and horizontal diversity in the tree canopy. In dry, fire-frequent forests, old growth is characterized by large, old fire-resistant trees and relatively open stands with- out canopy layering.

passive management—A management approach in which natural processes are allowed to occur without human intervention to reach desired outcomes.

patch—A relatively small area with similar environmental conditions, such as vegetative structure and composition. Sometimes used interchangeably with vegetation or forest stand.

prescribed fire—A wildland fire originating from a planned ignition to meet specific objectives identified in a written and approved prescribed fire plan for which National Environmental Policy Act requirements (where applicable) have been met prior to ignition (synonymous with controlled burn).

probable sale quantity—An estimate of the average amount of timber likely to be awarded for sale for a given area (such as the NWFP area) during a specified period.

recreation opportunity—An opportunity to participate in a specific recreation activity in a particular recreation setting to enjoy desired recreation experiences and other benefits that accrue. Recreation opportunities include non- motorized, motorized, developed, and dispersed recreation on land, water, and in the air (36 CFR 219.19).

reference conditions—Vegetation or forest metrics that represent resilient conditions. For the BioA, either natural range of variation, historic range of variation, or conditions that incorporate future environmental change. Historic range of variation is often based on pre-European settlement conditions.

refugia—An area that remains less altered by climatic and environmental change (including disturbances such as wind and fire) affecting surrounding regions and that therefore forms a haven for plants and wildlife.

regeneration harvest—A cutting procedure by which a stand is established or renewed and a new age class is created. Each method of regeneration harvest consists of the removal of the old stand, the establishment of a new one, and any treatments that are applied to create and maintain conditions favorable to the start and early growth of reproduction.

reserve—An area of land designated and managed for a special purpose, often to conserve or protect ecosystems, species, or other natural and cultural resources from particular human activities that are detrimental to achieving the goals of the area.

resilience—The ability of an ecosystem and its component parts to absorb, or recover from the effects of disturbances through preservation, restoration, or improvement of its essential structures and functions and redundancy of ecological patterns across the landscape.

restoration need—The difference between existing conditions and Natural Range of Variability (NRV). In terms of forest structure, this is the area departed from the natural range of variation. It can be in need of treatment (thinning and/or prescribed fire) to change or maintain structure, or in need of succession to develop into older structural conditions. See disturbance and succession restoration need (Haugo and others 2015, DeMeo and others 2018).

riparian areas—Three-dimensional ecotones (the transition zone between two adjoining communities) of inter- action that include terrestrial and aquatic ecosystems that extend down into the groundwater, up above the canopy, outward across the floodplain, up the near slopes that drain to the water, laterally into the terrestrial ecosystem, and along the water course at variable widths (36 CFR 219.19).

riparian reserves—Reserves established along streams and rivers to protect riparian ecological functions and processes necessary to create and maintain habitat for aquatic and riparian-dependent organisms over time and ensure connectivity within and between watersheds. The Aquatic Conservation Strategy in the NWFP record of decision included standards and guidelines that delineated riparian reserves.

risk—A combination of the probability that a negative out- come will occur and the severity of the subsequent negative consequences (36 CFR 219.19).

salvage cut—An intermediate harvest removing trees which are dead or dying because of injurious agents other than competition, to recover economic value that would otherwise be lost (Forest Service Activity Tracking System Appendix B).

sanitation cut—An intermediate harvest removing trees to improve stand health by stopping or reducing the actual or anticipated spread of insects and disease (Forest Service Activity Tracking System Appendix B).

scale—In ecological terms, the extent and resolution in spatial and temporal terms of a phenomenon or analysis, which differs from the definition in cartography regarding the ratio of map distance to Earth surface distance (Jenerette and Wu 2000).

science synthesis—A narrative review of scientific information from a defined pool of sources that compiles and integrates and interprets findings and describes uncertainty, including the boundaries of what is known and what is not known.

sensitive species—Plant or animal species that receive special conservation attention because of threats to their populations or habitats, but which do not have special status as listed or candidates for listing under the Endangered Species Act.

Sierra Nevada Framework—Plan amendment that amended land management plans of forests in the Sierra Nevada Mountains including the Lassen and Modoc National Forests. https://www.sierraforestlegacy.org/FC_LawsPolicyRegulations/KFSP_SierraNevadaFramework.php

special forest products—See "nontimber forest products."

species of conservation concern—A species, other than federally recognized as a threatened, endangered, proposed, or candidate species, that is known to occur in the NWFP area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long term in the Plan area (36 CFR 219.9(c)).

stand—A descriptor of a land management unit consisting of a contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit.

stand clear-cut—An even-aged regeneration or harvest method that removes all trees in the stand producing a fully exposed microclimate for the development of a new age class in one entry (Forest Service Activity Tracking System Appendix B).

standard—A mandatory constraint on project and activity decision-making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

single-tree selection cut—An uneven-aged regeneration method where individual trees of all size classes are removed more or less uniformly throughout the stand creating or maintaining a multiage structure to promote growth of remaining trees and to provide space for regeneration. Multiple entries of this activity ultimately results in an uneven-aged stand of 3 or more age classes (Forest Service Activity Tracking System Appendix B).

strategic surveys—One type of field survey, specified under the NWFP, designed to fill key information gaps on species distributions and ecologies by which to determine if species should be included under the Plan's Survey and Manage species list.

stressors—Factors that may directly or indirectly degrade or impair ecosystem composition, structure, or ecological process in a manner that may impair its ecological integrity, such as an invasive species, loss of connectivity, or the disruption of a natural disturbance regime (36 CFR 219.19).

structure (ecosystem)—The organization and physical arrangement of biological elements such as snags and down woody debris, vertical and horizontal distribution of vegetation, stream habitat complexity, landscape pattern, and connectivity (FSM 2020).

succession restoration need—The area departed from the Natural Range of Variability (NRV) where natural ecological processes are needed to move existing conditions closer to NRV. Succession processes inherently require time and include plant growth, decomposition, and regeneration (Haugo and others 2015, DeMeo and others 2018).

survey and manage standards and guidelines—A formal part of the NWFP that established protocols for conducting various types of species surveys, identified old-forest-associated species warranting additional consideration for monitoring and protection (see "Survey and Manage species"), and instituted an annual species review procedure that evaluated new scientific and monitoring information on species for potentially recommending changes in their conservation status, including potential removal from the Survey and Manage species list.

survey and manage species—A list of species, compiled under the survey and manage standards and guidelines of the NWFP, that were deemed to warrant particular attention for monitoring and protection beyond the guidelines for establishing late-successional forest reserves.

sustainability—The capability to meet the needs of the present generation without compromising the ability of future generations to meet their needs (36 CFR 219.19).

sustainable recreation—The set of recreation settings and opportunities in the National Forest System that is ecologically, economically, and socially sustainable for present and future generations (36 CFR 219.19).

threatened species—Any species that the Secretary of the Interior or the Secretary of Commerce has determined is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are listed at 50 CFR sections 17.11, 17.12, and 223.102.

timber harvest—The removal of trees for wood fiber use and other multiple-use purposes (36 CFR 219.19).

timber production—The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use (36 CFR 219.19).

use of wildland fire—Management of either wildfire or prescribed fire to meet resource objectives specified in land or resource management plans (see "Managing wildfire for resource objectives" and "Prescribed fire").

watershed—A region or land area drained by a single stream, river, or drainage network; a drainage basin (36 CFR 219.19).

watershed analysis—An analytical process that characterizes watersheds and identifies potential actions for addressing problems and concerns, along with possible management options. It assembles information necessary to determine the ecological characteristics and behavior of the watershed and to develop options to guide management in the watershed, including adjusting riparian reserve boundaries.

watershed condition—The state of a watershed based on physical and biogeochemical characteristics and processes (36 CFR 219.19).

watershed restoration—Restoration activities that focus on restoring the key ecological processes required to create and maintain favorable environmental conditions for aquatic and riparian-dependent organisms.

wilderness—Any area of land designated by Congress as part of the National Wilderness Preservation System that was established by the Wilderness Act of 1964 (16 U.S.C. 1131–1136) (36 CFR 219.19).

wildfire—Unplanned ignition of a wildland fire (such as a fire caused by lightning, volcanoes, unauthorized and accidental human-caused fires), and escaped prescribed fires.

wildland-urban interface (WUI)—The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetation fuels.

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