United States Department of Agriculture

Biennial Monitoring Evaluation Report

Mt. Hood National Forest

Forest Service – September 2023

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Summary of Findings and Results

The information presented in this monitoring report is summarized in Table 1 below. Monitoring suggests that forest management activities overall are being conducted in a manner that meets the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) desired conditions, goals, objectives, and standards and guidelines for most areas. Monitoring also suggests recommendations for changes to some forest management activities and some Forest Plan components.

Recommendations for changes to management activities include:

- Increasing pace and scale of timber harvest and associated NEPA procedures to ensure beneficial growth and mortality patterns across the forest, including increasing the quantity of projects where timber harvest is the driving objective;
- Enhancing coordination between soil specialists and contract administrators, as well as the inclusion of soil restoration opportunities into inventory and planning; and,
- Additional monitoring of the Oregon spotted frog, along with a possible site management plan.

Recommendations for changes to the Forest Plan include:

- Updating areas designated for timber harvest to reflect the land base available more accurately for production of timber, and concurrently updating the Probable Sale Quantity (PSQ) considering Forest outputs are trending to be about half of what the Forest Plan indicates; and,
- Updating standard FW-420 for defining criteria that would allow the Forest to focus its maintenance activities on passenger car-suitable roads and reduce operational maintenance levels on other, less passenger-car-utilized road systems.

Table 1. Summary of monitoring findings.

Monitoring Item	Do monitoring results demonstrate intended progress or trend toward Forest Plan targets?[1]	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed?
Have Best Management Practices (BMPs) been implemented and are they effective at managing water quality consistent with the Clean Water Act?	Yes	No	N/A
Are Standards and Guidelines effective in maintaining or enhancing fish habitat capability?	Yes	No	N/A
Are habitat improvement projects contributing to the persistence of Survey and Manage species?	Yes: Aquatic Species Yes: Wildlife Species	No: Aquatic Species No: Wildlife Species	N/A: Aquatic Species N/A: Wildlife Species
Are known populations of invasive species continuing to spread? Are new infestations occurring?	Yes	No	N/A
Are projects designed to prevent reactivation or acceleration of landslides, debris slides, debris flows, and earthflow areas?	Yes	No	N/A

Monitoring Item	Do monitoring results demonstrate intended progress or trend toward Forest Plan targets?[1]	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed?
What is the trend for mature and late-successional habitat needed for pileated woodpecker persistence?	Yes	No	N/A
What is the trend for mature and late-successional habitat above 3500 feet needed for American marten persistence?	Yes	No	N/A
What is the trend for oak pine habitat needed for gray squirrel persistence?	Yes	No	N/A
What is the trend for early-seral habitat needed for deer and elk persistence?	No	Yes	Additional forest management activities may be needed to progress towards Forest Plan objectives for early-seral habitat needed for deer and elk persistence.
Are Standards and Guidelines effective in maintaining or enhancing aquatic habitat complexity?	Yes	No	N/A
What is the trend for mature and late-successional habitat needed for northern spotted owl recovery?	Yes	No	N/A
What is the trend for Oregon spotted frog populations at Camas Prairie?	Uncertain	No	Additional monitoring is needed to determine if developing a site management plan for the Oregon spotted frog at Camas Prairie is needed.
Are significant (National Register eligible) historic properties being maintained, stabilized, and repaired according to historic preservation standards?	Yes	No	N/A
Are the physical/biological, managerial, and social settings of each Wilderness Resource Spectrum (WRS) maintained consistent with the standards for wilderness management?	Yes	No	N/A
Has the Off-Highway Vehicle Record of Decision (2010) been implemented?	Yes	No	N/A

Monitoring Item	Do monitoring results demonstrate intended progress or trend toward Forest Plan targets?[1]	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed?
Are people having a high level of satisfaction during their visit to Mt. Hood National Forest?	Yes	No	N/A
Is the production of pure, clear, raw, potable water being sustained for municipal use?	Yes	No	N/A
What are the current tree mortality rates and patterns across the forest?	Yes	Yes	A change is recommended to forest management activities regarding the pace and scale of stand-level treatments.
Is total growth and productivity exceeding mortality over all forest disturbances? Every five to ten years?	Yes	Yes	A change is recommended to forest planning processes implementing NEPA.
What is the rate of harvest of stands available for timber management?	Yes	Yes	A change to forest management activities is recommended to increase the quantity of projects specific to timber harvesting.
How much timber is being awarded?	Yes	Yes	A change may be warranted to the Forest Plan's PSQ based on annual awarded volume accounting for about half of what is defined in the Forest Plan.
Are there any changes in the land base available for producing timber?	Yes	Yes	A change to the Forest Plan may be warranted in regard to the designation of acres classified as suitable for timber harvest.
Are we meeting the 5-year regeneration period required by the National Forest Management Act?	Yes	No	N/A
How many miles are suitable for passenger cars and high clearance vehicles?	No	Yes	A change to the Forest Plan may be warranted for FW-420 as it may make more sense to maintain roads for passenger cars based on different criteria. This may allow us to focus maintenance for passenger cars on certain roads and reduce operational maintenance levels on other roads.

Monitoring Item	Do monitoring results demonstrate intended progress or trend toward Forest Plan targets?	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed?
Are road management activities being implemented in accordance with the latest access and travel management direction?	Yes	No	N/A
Are management activities being implemented so that they do not substantially and permanently impair the productive capacity of the land?	Yes	No	Forest management activities could benefit from enhanced coordination between soil specialists and contract administrators, as well as the inclusion of soil restoration opportunities into inventory and planning.

Introduction

Purpose

Monitoring and evaluation are continuous learning tools that form the backbone of adaptive management. Therefore, the purpose of the biennial monitoring evaluation report is to help the responsible official determine whether a change is needed in Forest Plan direction, such as components or other content that guide management of resources in the Forest Plan area. The biennial monitoring evaluation report represents one part of the Forest Service's overall monitoring program for the Mt. Hood National Forest (the Forest). The biennial monitoring evaluation report is not a decision document. It evaluates monitoring questions and indicators presented in the Forest's monitoring program. The monitoring program was updated in response to the 2012 National Forest System Land Management Planning Rule (Planning Rule). The Planning Rule stated, "Where a [forest] plan's monitoring program has been developed under the provisions of a prior planning regulation and the unit has not initiated plan revision under this part, the responsible official shall modify the monitoring program within 4 years of the effective date of this part (May 9, 2012), or as soon as practicable, to meet the requirement of this section." The Forest completed the updates to the monitoring program in May of 2016. This new approach encourages the use of existing and relevant monitoring questions and indicators that are consistent with the new rule requirements. It also encourages that any required changes to unit monitoring plans will tie to on-going broad-scale monitoring to the extent practical.

How to Use this Report

This report is a tool and a resource for the Forest Service to assess the condition of forest resources in relation to Forest Plan direction and management actions. It is also a tool and a resource for the public to learn more about how the Forest Service is managing forest resources.

A part of implementing the Forest Plan involves a commitment to monitor and evaluate how well the Forest is doing. Based on review of information collected, adjustments in management actions or anticipated results can be identified. This adaptive management process allows the Forest Plan to remain an active, relevant, usable document. Monitoring provides the decision-makers and the public information on the progress and results of implementing the Forest Plan. As the Forest continued into the third decade under the Forest Plan, the Forest began to switch the focus from short-term implementation monitoring to monitoring long-term outcomes of management with respect to key social, economic, and ecological systems.

The biennial monitoring evaluation report is designed to help the public, as well as Federal, State, local government, and Tribal entities anticipate key steps in the program. These steps include opportunities for public participation and how the public will be informed of those opportunities, and how public input will be used as the monitoring program progresses. The biennial monitoring evaluation report is also intended to help people better understand reported results in relation to past monitoring reports, future monitoring reports, and the broader-scale monitoring strategy that is issued at the Forest Service regional level.

Roles and Responsibilities

The monitoring program requires a coordinated effort of many people, from the people who collect the data, to the people outside the Forest Service who provide feedback and assistance, to the decision maker. Meta Loftsgaarden, Forest Supervisor, is the responsible official to whom the recommendations from the report are provided. This biennial monitoring report was respectfully prepared by an interdisciplinary team of the following Forest Program Managers and resource specialists: Chad Atwood, Forest Silviculturist & Terrestrial Program Manager; Bruce Zoellick, Fisheries Program Manager; Josh Marxen, Forest Transportation Planner; Phil Monsanto, Timber Program Manager; Todd Reinwald, Forest Watershed Program Manager; Michelle Lombardo, Environmental Coordinator; Kate Kornder, Cultural Resources; Jody Matz, Wilderness & Wild and Scenic Rivers Planner; and Steven Beri, Forest Recreation & Lands Program Manager. The Wildlife Program Manager and Forest Transportation Manager positions were vacant during the time of this report. Therefore, some sections have not been updated from the previous report.

The Importance of Public Participation

A draft monitoring program was shared with the public in July 2015 for a 30-day comment period. In response, we received two letters, which prompted changes to be made to the draft monitoring program. The final monitoring program and responses to the comments received on the draft are available on the Forest website[1]. The Forest informed the public that the first monitoring report under the new program would begin in 2016. That report was posted to the Forest's planning website in 2018, and a notification email was sent to a list of interested parties. The second report under the new program was completed in 2020, which was also posted to the Forest's planning website and interested parties were notified via email. These monitoring reports are available to the public on the Forest website. The Forest welcomes feedback regarding this monitoring report. Feedback will help ensure the effectiveness of the new monitoring program and the resulting information. The same notification method is applied for this report; posting to the Forest website and emailing notification of its availability to interested parties.

How the Forest Plan Monitoring Program Works

Providing timely, accurate monitoring information to the responsible official and the public is a key requirement of the monitoring program. The Forest's biennial monitoring evaluation report is the vehicle for disseminating this information.

In the context of forest planning there are three main monitoring goals:

- Implementation monitoring: Are we implementing the Forest Plan properly? Are we meeting our management targets and project guidelines?
- Effectiveness monitoring: Are we achieving our Forest Plan management goals and desired outcomes?
- Validation monitoring: Does our hypothesis testing indicate we may need to change the Forest Plan?

Implementation monitoring is important for tracking progress and accomplishments. However, it is effectiveness and validation monitoring that drive and support the adaptive management process. Effectiveness monitoring evaluates condition and trend relative to desired conditions. Validation monitoring tests hypotheses and provides information that might necessitate changes to desired conditions in the Forest Plan.

Monitoring Activities

Monitoring questions focus on providing necessary information to evaluate effectiveness of plan components and management activities in maintaining or achieving progress towards desired conditions and objectives of the Forest Plan area. Indicators are like performance measures used in answering the respective monitoring question. Indicators should be practical, measurable, and relevant to answering monitoring questions for the Forest Plan area. They should also help to test relevant assumptions or track relevant changes. The Forest's monitoring program contains monitoring questions and identifies associated indicators that address each of the following:

1) The status of select watershed conditions.
2) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.
3) The status of focal species to assess the ecological conditions required under 36 CFR §219.9.
4) The status of a select set of ecological conditions required under 36 CFR §219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.
5) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.
6) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.
7) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.

[1] https://www.fs.usda.gov/main/mthood/landmanagement/planning

8) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land (16 U.S.C. §1604(g)(3)(C)).

See Appendix A: Monitoring Program Matrix to review the monitoring program questions and indicators based on the 2012 Planning Rule.

This biennial monitoring report will address the same monitoring program questions as the 2020 report. It will consider the 2020 report findings, which were based on data collected in 2017, 2018 and 2019, and provide additional information where necessary if changes have occurred. Subsequent biennial monitoring reports would focus only on just those monitoring items for which data has changed, or conditions have changed from this reporting period.

The following sections present the most current information (data and evaluations) for all monitoring questions contained within the Forest Plan. All monitoring questions were addressed during the current evaluation period (2020, 2021, and 2022). Each section describes the details that would support the recommendation(s). This report displays the results compiled for each monitoring item. Each monitoring item includes: 1) the monitoring question and its indicator(s); 2) an evaluation of the monitoring results; and 3) a finding on whether the recommendation(s) could be considered for future changes or not. The monitoring program is meant to "enable the responsible official to determine if a change in plan components or other plan content that guide management of resources on the plan area may be needed" (36 CFR §219.12).

Status of Select Watershed Conditions

Best Management Practices

Have best management practices (BMPs) been implemented and are they effective at managing water quality consistent with the Clean Water Act?

- This monitoring question refers to Forest Plan Standards and Guidelines: FW-054, FW-056, FW-060, FW-068 to FW-070, and FW-072.
- Monitoring Indicators: USDA Forest Service National BMP annual monitoring protocols.
- Background Information: 2022 marked the tenth year the Forest has performed monitoring using protocols set forth by the National BMP Monitoring Program. The Forest uses BMP monitoring to serve as a principle means for applying adaptive management measures aimed at protecting water quality from ground disturbing activities.

Monitoring Results

The Forest monitored BMPs at 16 activity sites over the three-year period of 2020 to 2022 to evaluate their implementation and effectiveness. Eight different activity categories were monitored across all four ranger districts on the Forest. At 11 of the 16 monitoring sites (69 percent), BMPs were either "mostly" or "fully" implemented as prescribed. At 14 (88 percent) of those sites, BMPs were either mostly or fully effective at protecting water quality. Or as was the case at one site, there was no post-activity risk despite a lack of prescribed BMPs. Table 2 summarizes the results of the monitoring.

Data

Monitoring is aimed at evaluating the level of effectiveness of implementing BMPs at the project scale. Implementation is rated as either fully implemented, mostly implemented, marginally implemented, or not implemented. Effectiveness ratings are either effective, mostly effective, marginally effective, or not effective.

Evaluations are typically conducted by select members of an interdisciplinary team, or specialists connected with the activity being monitored. Together they collect specifically defined information and observations (i.e., protocols) at the project site. Data are recorded in the field and entered into a national database for tracking.

Table 2. BMP monitoring results.

Monitoring Item	Year Monitored	Implementation Rating	Effectiveness Rating
Aquatic Restoration: Fish Creek Dispersed Sites	2020	Fully Implemented	Effective
Chemical Herbicide: Gordon Creek BPA Corridor	2020	Mostly Implemented	Effective
Roads: Still Creek Tributary C Aquatic Organism Passage (AOP)	2020	Mostly Implemented	Mostly Effective
Aquatic Restoration: Upper West Fork Hood River In-stream Large Wood Debris (LWD)	2021	Marginally Implemented	Marginally Effective
Facilities: Kiwanis Camp Septic	2021	Mostly Implemented	Effective

Monitoring Item	Year Monitored	Implementation Rating	Effectiveness Rating
Recreation: Rock Creek Off-highway Vehicle (OHV)	2021	Marginally Implemented	Not Effective
Recreation: Skibowl Snowmaking	2021	Fully Implemented	Effective
Roads: Threemile Creek AOP	2021	Marginally Implemented	Mostly Effective
Vegetation Management: Buck Unit 94A, ground-based	2021	Fully Implemented	Effective
Vegetation Management: Buck Unit 94B, cable yarding	2021	Fully Implemented	Effective
Vegetation Management: Badger Unit 44, mastication and slash piling	2021	Marginally Implemented	Mostly Effective
Chemical Herbicides: Road 63	2022	Fully Implemented	Effective
Fire: North Rock Prescribed Burn	2022	Fully Implemented	Effective
Roads: Road 18 Maintenance	2022	No BMPs	Not Effective
Vegetation Management: Ashes-Caldera Unit 12	2022	Fully Implemented	Effective
Water Uses: Timberline Springs Impoundment	2022	Mostly Implemented	Mostly Effective

Monitoring Discussion, Findings, and Adaptive Management Considerations

Results of the BMP monitoring conducted from 2020 to 2022 reveal that there were four cases in which BMPs were not implemented as intended, and one case where they were never prescribed. Of these five sites, it was determined that water quality was somewhat compromised for a brief time at two of them. At the remaining three sites, the deficiency of implementation did not result in an effect to water quality because the activity was less impactful than anticipated, so the less-than-ideal implementation was inconsequential.

At the first of the two sites where water quality had been compromised occurred where streambank soils were exposed during instream aquatic restoration activities. The effects should be short-lived however, because the amount of area was quite small (approximately 200 square feet). Also, natural revegetation along the effected streambank is expected to recover quickly. At the second site a minor degree of rill erosion was observed on a short segment (approximately 60 feet) of an OHV trail within the Aquatic Management Zone (AMZ). But there was no evidence of sediment deposition directly into the small intermittent stream channel the trail crossed. Repair is needed on this trail segment to capture and redirect runoff to halt further erosion. Monitoring and maintenance at the site should be more frequent.

Lastly, the case in which no BMPs were prescribed involved the routine operation and maintenance of a primary forest road. Maintenance and improvement needs have been identified to address drainage, surface runoff, and sedimentation issues with the road. Some of those remain deferred due in-part to competing priorities and funding shortfall. The maintenance activities that have occurred however, were executed by the services of a third-party contractor that was solicited using a task order under a blanket purchase agreement.

In review it was discovered that BMPs for road maintenance activities are not implicit in the task order itself. They are considered to apply, however, because they are defined in the Routine Actions and Maintenance Biological Opinion (known as RAMBO), which was issued by the National Marine Fisheries Service in 2018 to ensure these types of activities are compliant with the Endangered Species Act for protecting salmonids. The incorporation of these BMPs directly into the task order by reference has sometimes been assumed, but in practice the direct link has not always been plainly evident or spelled out. In this circumstance, the disconnect had not compromised water quality. Yet, it demonstrated an opportunity to improve the translation of BMPs defined in consultation documents into binding contractual language, or to at least reaffirm the need to double check and make sure they have been incorporated into task orders and are clear.

Status of Select Ecological Conditions

Fish Habitat Capability

Are Forest Plan Standards and Guidelines effective in maintaining or enhancing fish habitat capability?

- This monitoring question refers to Forest Plan Standard and Guideline FW-137, and the Northwest Forest Plan (NWFP) Standards and Guidelines for Riparian Reserves and the Aquatic Conservation Strategy (ACS).
- Monitoring Indicators:
    1. Stream habitat conditions from Forest Plan effectiveness monitoring;
    2. Abundance estimates of representative fish species (i.e., winter steelhead, coho salmon, and bull trout); and,
    3. The number of stream miles currently occupied by representative fish species (i.e., Pacific lamprey and bull trout).

Monitoring Results

The Aquatic and Riparian Effectiveness Monitoring Program (AREMP) is a multi-federal agency program developed to assess the effectiveness of the ACS of the NWFP. The objective of the ACS is to maintain or restore the condition of watersheds in the NWFP area. Watershed condition is assessed by AREMP every five years for every sixth-field watershed based on upslope and riparian data derived from geographic information system (GIS) layers and satellite imagery. In-channel attributes are measured each year in a subset of watersheds to supplement the watershed condition assessments and validate the models used to assess stream condition. AREMP tracks changes in watershed condition over time; and reports on the NWFP's effectiveness across the region. Between 2020 and 2022 the AREMP program sampled 84 (22 in 2020, 28 in 2021, and 34 in 2022) random sixth-field watersheds across Washington, Oregon, California, with four of the watersheds (South Fork Bull Run River, Upper Badger Creek, Cub Creek, and Shellrock Creek) on the Forest.

The AREMP data, which is analyzed every five years, was examined in the 20-year report covering the years 1993-2013, and the 25-year report covering 1993-2018. Key results for stream conditions across the NWFP area from the 20-year report include:

- Improvements in streambed sediment and macro-invertebrates suggest that improvements in roads and vegetation are having the desired effects in the streams. Improving trends were detected for macroinvertebrate diversity (+0.03/1.0).
- Individual components of the physical habitat index varied; substrate showed a positive trend, while in wood and pool tail fines had no significant change.

Indicators of upper trend in stream conditions from the 25-year report include:

- Between 1993 and 2017, mean canopy cover in Riparian Management Areas (RMAs; managed to maintain streamside forest stands) increased slightly (70-72%) over the NWFP area. The variation in canopy cover in specific sub-watersheds ranged from 0 to 94% where large losses in canopy cover were mostly associated with wildfire.
- Measures in old growth structure index at 80 years (OGSI80) in RMAs increased from 57% in 1993 to 61% in 2017, although fires since that time may have reduced the current amount of OGSI80 in RMAs.
- Road decommissioning across the NWFP area reduced the connected road length on Federal lands by 1,608 km (6.6% reduction), estimated sediment delivery by 4.0%, and landslide risk associated with roads by 11%. Trends in instream fine sediment amounts showed improvements and were generally negative across years. Overall, these data indicate similar to the 20-year report that improvements in roads and vegetation management appear to be having the desired effects of decreasing instream fine sediment concentrations.

- Observed to expected ratios of macroinvertebrates were increasing for the majority of AREMP watersheds demonstrating a positive trend over time.
- Fine sediments in stream channels decreased through time, and when examined by land use allocation (LUA), Congressional Reserves had less fine sediment in streams than other LUAs.

Results of all AREMP monitoring can be found on the Regional Ecosystems Office (REO) website[2].

Fish abundance and distribution information is used to better understand habitat use and capability for individual fish species as well as to focus recovery efforts for Endangered Species Act (ESA) listed or sensitive fish species habitat. Forest personnel, in collaboration with government, non-government, and Tribal partners, monitor fish production in several basins across the Forest. A subset of that monitoring is briefly summarized here: 1) Hood River bull trout spawning surveys, 2) the Clackamas River bull trout re-introduction: spawning surveys and monitoring distribution in the upper Clackamas River basin, 3) smolt production monitoring in the Sandy River Basin for long-term population estimates, and 4) Pacific lamprey recolonization post Powerdale Dam removal in the Hood River Basin.

Hood River Bull Trout

The Forest's Hood River Ranger District in collaboration with the Oregon Department of Fish and Wildlife, Middle Fork Irrigation District, and the Confederated Tribes of the Warm Springs Reservation of Oregon, conducts annual spawning surveys for bull trout in the Upper Middle Fork Hood River sixth-field watershed[3]. Although bull trout use areas downstream of the Forest, the only known spawning habitat is located on the Forest, within the Middle Fork of the Hood River, primarily in Clear Branch Creek and Pinnacle Creeks. The size of the Hood River bull trout spawning population remains small but relatively stable (Figure 1). The low numbers are a concern due to the potential for inbreeding and loss of genetic fitness.

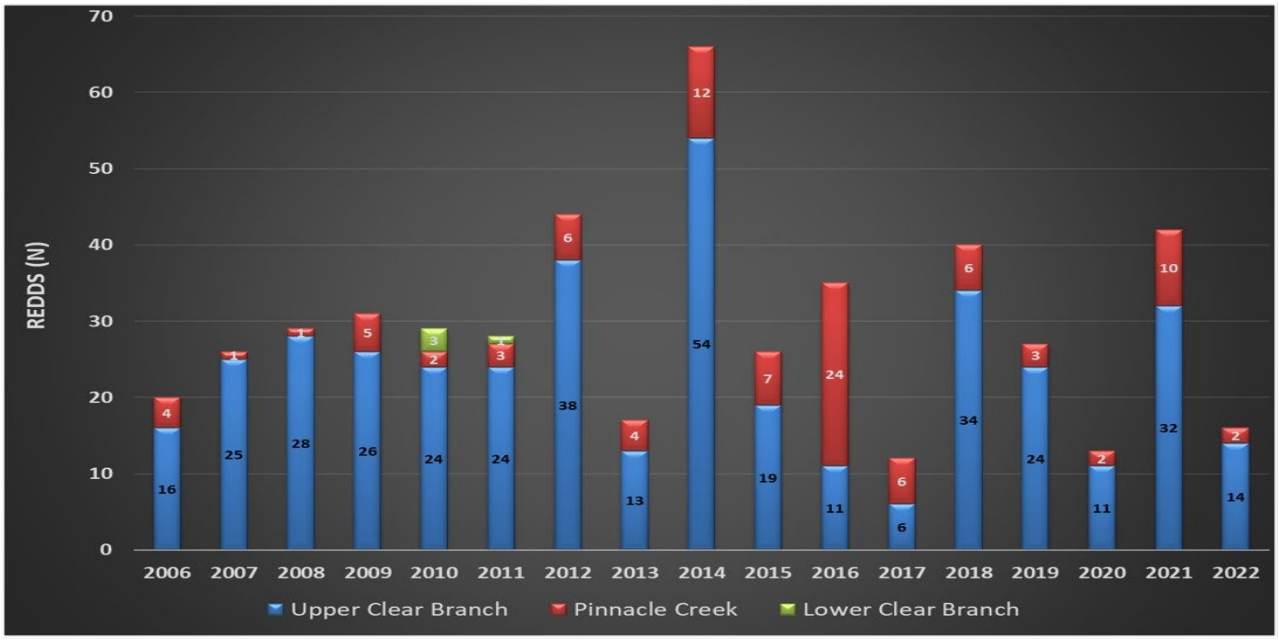

Figure 1. Total number of bull trout redds counted in Clear Branch above and below the dam and in Pinnacle Creek each year from 2006 – 2019. Lower Clear Branch was never surveyed over the entire spawning season and was not surveyed at all in 2006, 2007, and 2009.

Clackamas River Bull Trout

Bull trout were once abundant in the Clackamas River basin but were extirpated around the 1970's due to

[2] https://www.fs.usda.gov/r6/reo/monitoring/watersheds.php

[3] Saiget, Darcy. Hood River Bull Trout Spawning Survey Report 2006-2017, USDA Forest Service, Mt. Hood National Forest, Hood River Ranger District. Parkdale, Oregon. June 2018.

human actions. With the goal to expand the distribution of this federally-listed threatened fish species, an interagency working group, including the Forest, U.S. Fish and Wildlife Service, Portland General Electric, and Oregon Fish and Wildlife Department, developed a feasibility assessment (2007) and implementation plan (2011) to reintroduce bull trout to a portion of its historic habitat. From 2011-2016, 2,836 bull trout were translocated from the Metolius River basin to the Clackamas River basin. Since then, monitoring including redd surveys, use of passive integrated transponder (PIT) tag technology, and eDNA (environmental DNA) surveys, have documented bull trout are successfully spawning and rearing in the upper Clackamas River, with key spawning and rearing areas located on the Forest.

Bull trout are currently widely distributed in the upper Clackamas River basin using Pinhead Creek, Last Creek, Oak Grove Fork, Roaring River (eDNA detection in 2017 and 2019, although spawning is not yet confirmed in either Oak Grove Fork or Roaring River), Berry Creek (spawning confirmed for the first time in 2019), and the upper Clackamas River upstream of Cub Creek. Pinhead Creek is the primary stream used by spawning bull trout and has been monitored annually for bull trout redds from the initial release in 2011 through 2022. The number of bull trout redds increased rapidly from 5 to 80 during 2011 through 2018, as translocated juvenile fish reached spawning age. However, the number of redds has decreased since 2019, with 77 redds in 2018 and 38 redds in 2021.

As relocated bull trout have begun to die of old age, few unmarked adults (offspring of the relocated fish) have been recruited into the population to replace them, resulting in the decline in spawning-aged fish (and redd numbers). U.S. Fish and Wildlife and Oregon Department of Fish and Wildlife staff are evaluating if habitat capacity is limiting survival of bull trout fry (1 to 2 months of age), or if some other factor is impacting survival of juvenile bull trout. Monitoring has confirmed good survival of translocated fish from 1 to 2 years of age to adulthood. Bull trout fry emerge earlier in Pinhead Creek than in streams in the Metolius basin where the translocated fish came from, which might be affecting their survival. The Clackamas re-introduction is unique in being the only known range-wide attempt to return bull trout to a historically occupied watershed.

Sandy River Basin Smolt Monitoring Program

In 2009, the Zigzag Ranger District Fisheries Program in collaboration with the Portland Water Bureau and the Oregon Department of Fish and Wildlife began a multi-year steelhead trout and coho salmon smolt monitoring study on streams in the Upper Sandy River Basin. The sampling design involves monitoring different sets of tributaries every year. Some tributaries like Still Creek are monitored every year; others are monitored on an irregularly rotating basis. The study is intended to provide basin-scale trends after 20 years to better understand fish use, abundance and distribution throughout the Sandy River basin, and support efforts to evaluate the effects of the removal of Marmot Dam in 2007 and the Little Sandy Dam in 2008.

Smolt production was monitored in Clear Fork of the Sandy, Clear Creek, Boulder Creek, Cedar Creek, Little Sandy River, Bull Run River, Gordon Creek, and Beaver Creek in 2021. Monitored smolt production was moderate to relatively high for steelhead and coho in 2021. The Bull Run River had the highest number of steelhead smolts and Cedar Creek had the highest number of coho smolts of streams monitored. Little Sandy produced more steelhead smolts than in any previous monitored year. Cedar Creek produced more coho smolts than in any previous monitored year. Beaver Creek had a relatively low coho smolt estimate in 2021. All other streams produced moderate numbers of steelhead and coho smolts.

Recolonization of the Little Sandy River by steelhead after the removal of Little Sandy Dam in 2008 was immediate, with a significant increase in steelhead smolts through 2021. By 2011 steelhead smolt population for the Little Sandy River was comparable in terms of smolts per unit length and area of stream to other streams of similar size where access by steelhead was never blocked, like Gordon Creek and Still Creek. Coho recolonization of the Little Sandy River was initially slower than that of steelhead, with few smolts produced during 2009 to 2012, but has also increased significantly through 2021.

Steelhead smolt population estimates for the entire Sandy Basin have increased significantly ($P = 0.005$) since 2009. Coho smolt production has increased but is not statistically significant ($P = 0.13$). Steelhead smolt production increased significantly in the Salmon River, Zigzag River, Bull Run River, and Little Sandy River from 2009 through 2021 ($P < 0.05$). Coho smolt production increased significantly in Still Creek, Little Sandy, Cedar Creek, and Lost Creek from 2009 to 2021. The significant increases in steelhead or coho smolt

production in the Salmon River, Bull Run River, Still Creek, and Lost Creek are likely related to dam removal and large-scale fish habitat restoration projects[4]. More detailed information can be referenced in the Sandy River Basin Smolt Monitoring Report (Appendix F) of the Bull Run Habitat Conservation Plan report[5].

Pacific Lamprey Distribution Expansion in the Hood River

The three primary tributaries to the Hood River (West Fork, Middle Fork, and East Fork) all originate on the Forest before joining and entering the Columbia River in the Bonneville pool between Bonneville Dam and The Dalles Dam. Pacific lamprey had been blocked from the upper Hood River on the Forest since 1923 when the Powerdale Dam was completed at approximately river-mile 4 on the Hood River. In October 2010, the Powerdale Dam was decommissioned, and all in-channel structures were removed.

In 2012, the Confederated Tribes of Warm Springs staff documented Pacific lamprey had recolonized 11 miles of river upstream of the dam. By 2017, Pacific lamprey were in the East Fork Hood River more than 20 miles upstream of the Powerdale Dam. In 2020, Pacific lamprey were distributed similarly to that in 2017, up to the Dog River confluence on the East Fork Hood River, 1 to 2 miles downstream of the Forest boundary on the Dog River and East Fork Hood River, with no barriers to prevent their use of high-quality habitat on-Forest. Although Pacific Lamprey rapidly increased their distribution in the East Fork Hood River, there is no evidence of colonization of Middle or West Forks of the Hood River, although suitable habitat is available[6].

The Forest is currently planning, and applying for funding and continuing partnerships, to monitor Pacific lamprey distribution on the Forest using a non-invasive technique of sampling for eDNA (environmental DNA) to detect Pacific lamprey occurrence. Our goal is to identify recolonization rate, as well as to prioritize habitat restoration projects to benefit lamprey in concert with salmonid populations.

Effects of 2020 and 2021 Wildfires on Fish Habitat Capability

In 2020-2021, watersheds containing 139 miles of stream supporting fish populations on the Forest were burned by the Riverside, Lionshead, White River, and Bull Complex fires. In watersheds with high fire intensity, all or most of the riparian canopy was removed by fire. Streams with large losses in riparian canopy include: South Fork Clackamas River, Fish Creek, Roaring River, lower Cub Creek, and portions of the Clackamas River. This is similar to monitoring results from the AREMP program that showed increases in mean canopy cover in Riparian Management Areas over the NWFP area, but large losses in canopy cover in some watersheds due to wildfires.

Recent research of impacts of fire on stream habitat by Coble et al. (2023) that included watersheds burned by the Riverside fire found one-year post-fire that stream temperature increases associated with riparian canopy loss were greater in severely burned watersheds, but increases were lower in watersheds with older pre-fire stand ages. Fish density and fish biomass density decreased in watersheds that burned at higher severity primarily due to lethal water temperatures during the fire and increased temperatures post-fire due to canopy cover loss. Fish populations are resilient to fire effects on stream temperatures and these populations are expected to recover quickly (see citations in Coble et al. 2023).

Coble et al. (2023) expected increases in large wood delivery from fire-killed trees and increased sediment delivery in more severely burned watersheds, but their results revealed large wood diameter was smaller and sediment in streams did not increase in more severely burned watersheds one year after the fires. This is likely because during the first winter/spring post-fire, these watersheds received less precipitation than average, and events were characterized by low-intensity rainfall. The lack of high-intensity events likely limited transport of large wood and sediment and thus short-term impacts of the fires were small, even in severely burned watersheds.

Longer-term, fish habitat capability of streams burned in 2020-2021 will likely be substantially impacted, depending on timing of large wood delivery and of landslides and debris flows. Fish Creek and several other watersheds in the area burned by the Riverside Fire contain large areas of landslide prone geology. About

[4] https://sandyriver.org/wp-content/uploads/2017/10/State-of-the-Sandy-.pdf
[5] https://www.portland.gov/water/documents/hcp-compliance-report-2021/download
[6] Lamprey recolonization in the Hood River: Baker, C., A. Wildbill, J. Santos. 2015. Evaluate status and limiting factors of Pacific Lamprey in the lower Deschutes River, Fifteenmile Creek, and Hood River. Confederated Tribes of Warm Springs, Branch of Natural Resources, Fisheries Research. 48 pp.

five years post-fire, when roots of fire-killed trees begin to fail, large amounts of large wood are expected to be delivered to tributaries to the Clackamas River and then potentially to the Clackamas River. With the loss of tree cover, increased landslides are also expected. If the large wood is delivered prior to landslides or debris flows, then stream channels and floodplains will likely improve long term with the increased habitat complexity provided by the large wood, and by large wood and bedload sediments interacting to reduce channel incision and restore floodplain connectivity. However, landslides and debris flows prior to significant large wood delivery, or in amounts that remove the large wood may result in severe degradation of fish habitat capability due to channel scour and incision, and excess sedimentation.

Monitoring Discussion, Findings, and Adaptive Management Considerations

Abundance and distribution monitoring by the Forest and other agencies indicate Pacific lamprey, steelhead trout, Chinook salmon, and bull trout populations on Forest are stable to increasing, with the likely exception of the re-introduced bull trout population in the Clackamas River. The USFWS and ODFW have not determined if habitat capacity or some other factor is contributing to low recruitment of reintroduced bull trout in the Clackamas River. However, Spring Chinook and coho salmon numbers are increasing in the Clackamas basin indicating the factors impacting bull trout fry survival are not negatively impacting salmon recruitment.

The population and distribution data combined with AREMP stream and watershed monitoring results show that aquatic habitat conditions are being maintained or improved across the Forest since the implementation of the NWFP. The 2020-2021 wildfires are expected to have long-term impacts to fish habitat capability, depending how large wood delivery from fire-killed trees interacts with landslides and debris flows resulting from fire removal of tree cover on valley slopes. Habitat conditions in the Fish Creek watershed in the Clackamas basin are particularly at risk because the watershed has extensive areas of geologically unstable (landslide prone) slopes, and 90% of the watershed burned, much of it at high severity.

Continued aquatic restoration projects, implemented in collaboration with partners and stakeholders, will further improve conditions and ensure an abundance of quality habitat on the Forest for conservation and recovery of many fish species. One adaptive management change that is suggested by the monitoring results is to examine potential causes for the apparent low survival of bull trout fry (less than 3 months old) in the reintroduced population in the Clackamas River basin. USFWS and ODFW have recently implemented several studies to examine bull trout fry habitat use and survival.

Survey and Manage Species

Are habitat improvement projects contributing to the persistence of survey and manage species?

- This monitoring question refers to NWFP standards and guidelines for survey and manage species.
- Monitoring Indicator: Acres of habitat enhanced for survey and manage species.

Monitoring Results and Data

The NWFP outlined additional protection for rare species closely associated with late-successional old-growth habitat. The NWFP survey and manage guidelines are intended to mitigate potential effects from agency actions to approximately 300 flora and fauna species including mosses, liverworts, fungi, lichens, vascular plants, slugs, snails, salamanders, great gray owl, and red tree voles.

Since the NWFP, projects on the Forest have generally been planned to avoid potential habitat (stands >80 years old and spring-fed systems), if possible. In cases where treatment was desired in mature stands, required surveys were completed and known sites protected from ground disturbing activities.

From 2017-2019, a total of 12,142 project acres were surveyed to locate and buffer all potential survey and manage sites.

The Forest provides potential habitat for 11 species of NWFP fauna survey and manage species, including:

1. Larch Mountain salamander (*Plethodon larselli*)
2. Great gray owl (*Strix nebulosa*)
3. Red tree vole (*Arborimus longicaudis*)
4. Columbia Oregonian (*Cryptomastix hendersoni*)

5. Crater Lake tightcoil (*Pristiloma arcticum crateris*)
6. Dalles sideband (*Monadenia fidelis minor*)
7. Evening fieldslug (*Deroceras hesperium*)
8. Panther jumping slug (*Hemphillia pantherina*)
9. Puget Oregonian (*Cryptomastix devia*)
10. Basalt Juga (*Juga O. sp. 2*)
11. Columbia Duskysnail (*Colligyrus greggi*)

Monitoring Discussion, Findings, and Adaptive Management Considerations

Obligate aquatic species (Basalt Juga and Columbia duskysnail) were surveyed and known sites evaluated for potential project impacts. In almost all cases stream/spring habitat are already delineated and protected by NWFP riparian protection buffers. With these conservation measures in place, the Forest is contributing to the persistence of survey and manage species as described in the NWFP.

Terrestrial survey and manage species include the larch salamander, great grey owl, red tree vole, and seven terrestrial mollusks identified above. These species were surveyed and known sites evaluated for potential impacts for all projects occurring in potential habitat. Successful conservation measures developed during project analysis, and put in place during implementation, indicate that there are no recommended changes. The Forest continues to contribute in a positive way to the persistence of survey and manage species.

Invasive Species

Are known populations of invasive species continuing to spread? Are new infestations occurring?

- This monitoring question refers to Forest Plan Standards and Guidelines: FW-375 to FW-377, FW-384, and Forest Plan amendments 13 and 15.
- Monitoring Indicators: Acres of surveyed lands with new and active invasive species infestations, and acres treated.

Monitoring Results

The monitoring results indicate that populations of invasive species are continuing to spread and new infestations are being recorded on the Forest. This is reflected as an increase in acres infested with weeds over the past several years. However, the existing database inventory does not accurately represent all invasive plant infestations on the Forest. Annual treatments are recorded, but it is difficult to prove that sites have been eradicated. Many weeds have seeds which will persist in the soil and remain viable for several years or more. Treatment of an infestation does not necessarily result in the immediate elimination of the infestation, particularly when multiple treatments are required to affect a change in the target infestation.

Treatments can include actions within any of the four general categories of integrated pest management techniques: biological treatments, cultural treatments, physical/mechanical treatments, or chemical treatments. Awareness, treatment capacity, and funding have increased which contributes to a rise in the number of acres identified.

Botanists continue to map infestations that have not been previously mapped. These sites are not necessarily “new” sites, rather they simply may not have been mapped before. For this reason, there is no true baseline in which to analyze from. A recent increase in staffing, as well as seasonal crews, and partnerships, has allowed the Forest to conduct additional mapping efforts within the last three years. Systematic annual surveys and data entry have been prioritized to develop an accurate baseline. Revisiting older infestations allows us to accurately re-measure infestations to document any increase or decrease in size. These changes in the “Edited Inventory Acres” (Table 3) reflect the work being done to improve data and reporting for the Forest. Larger numbers may refer to adjustments made to reduce polygon size and more accurately pin-point locations of infestations.

In 2011, the Forest moved all the inventory data into a spatial natural resource management database called the Threatened, Endangered and Sensitive Plant – Invasive Plant database (TESP-IS). The data in Table 3 are query results for new and edited inventory records by calendar year beginning in 2012.

Table 3. Invasive species acres inventoried over time.

Calendar Year	New Inventory Acres	Edited Inventory Acres
2012	1148	453
2013	311	942
2014	369	332
2015	68	1060
2016	72	47
2017	89	290
2018	697	336
2019	426	2,672
2020	1,947	21,466
2021	1,750	7,122
2022	604	13,963

Monitoring Discussion, Findings, and Adaptive Management Considerations

The desired future condition (amended to Forest Plan in 2005) states, "In National Forest lands across Region Six, healthy native plant communities remain diverse and resilient, and damaged ecosystems are being restored. High quality habitat is provided for native organisms throughout the region. Invasive plants do not jeopardize the ability of the National Forests to provide goods and services communities expect. The need for invasive plant treatment is reduced due to the effectiveness and habitual nature of preventative actions, and the success of restoration efforts."

The Forest Plan monitoring results indicate that the Forest is making progress reducing invasive species. The Forest is also realizing an increasing trend in our ability to prevent and document new infestations. Management continues for invasive species and there is no need to reduce treatments.

Forest management activities as modified by the Region 6 FEIS[7] have positively influenced invasive plant management, and monitoring results. There is support from other resource and business areas to adhere to the invasive species management and prevention standards and to assist with treatment efforts. Several management activities have influenced the monitoring results:

- Treatments of populations with herbicides and hand removal have reduced the density and spread of high priority infestations on the Forest;
- All ground-disturbing projects utilize a risk assessment to determine the risk of weed introduction and spread. Projects also identify mitigations to reduce this risk;
- All projects follow Region 6 standards and guidelines to prevent invasive species;
- We have increased our partnerships and volunteer groups to survey and/or treat more acres of weeds each year; and,
- Education events and phone-based apps for early detection and rapid response to weeds of concern has increased the number of reports for new populations on the Forest.

Monitoring results suggest that changes in management activities within the Forest Plan area may be warranted. To reduce invasive weed populations to manageable or declining levels, the treatments and follow-up restoration actions need to be increased. All programs must adhere to BMPs and regional direction to reduce the risk of new infestations. Education and outreach must also be prioritized to increase awareness, early detection, and rapid response among our forest visitors. No changes to the monitoring program are recommended.

Landslides, Debris Slides, Debris Flows and Earthflow

Are projects designed to prevent reactivation or acceleration of landslides, debris slides, debris flows, and earthflows?

- This monitoring question refers to Forest Plan Standards and Guidelines: FW-001 to FW-021, and B8-

[7] USDA Forest Service, Record of Decision, Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants, 2005, fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5302164.pdf

001 to B8-055.

- Monitoring Indicator: Description of projects that are near landslides, debris slides, debris flows, and earthflow areas, and how the projects affect stability.

Monitoring Results

Whenever activities are proposed in terrain where slope stability may be an issue, specialists in geology, soils, and/or engineering are consulted. However, due to the wildfire damage from 2020, which put many prior projects on indefinite hold, there were few opportunities for monitoring. There was one post-fire planning effort that was monitored where potentially unstable terrain was evaluated. The Clackamas Fires Roadside Danger Tree Environmental Assessment proposed abating some of the risk to users and infrastructure related to fire-killed trees and post-fire conditions along burned over roadways.

Data

Data is anecdotal and based upon known planning efforts. For the 2020 to 2022 period, one project was sampled to provide a basis for monitoring consistency with Forest Plan elements that address landslides.

Monitoring Discussion, Findings, and Adaptive Management Considerations

Planning for the Clackamas Fires Roadside Danger Tree project occurred in 2021 and a decision was signed in 2022. Implementation began in 2023. The EA identified roads within the Bull Complex, Lionshead, and Riverside fire scars for treatment. Some of the road segments identified for treatment are in areas prone to various types of landslides.

The initial planning effort included the compilation of local landslide information and geologic mapping of those areas. A wealth of empirical spatial data and observational inventories was also acquired. It was used to aid and support ongoing field reconnaissance and validation of landslide risk in relation to potential roadside treatments. Sampling along roads considered for treatment took place during the 2021 and 2022 field season to identify and determine if any unstable or potentially unstable terrain is present and needs to be safe guarded from proposed activities. Final design of the project has incorporated potential landslide risk into its configuration.

Roadside treatments would be modified or avoided where the potential for landslides is a notable risk. Riparian reserve buffers have been customized to incorporate unstable and potentially unstable zones. BMPs and project design criteria have been developed to avoid further effects of proposed activities to landslide prone terrain. Existing roads to be used during implementation of project activities would be maintained so that their effect on potentially unstable slopes would be minimized.

It is worth mentioning that there have been research and monitoring efforts of post-fire erosion and landslides that have been ongoing since 2020. A variety of State and Federal agencies, including academia, have been conducting studies to examine and assess the effects of wildfire on runoff, erosion, and landslides within the burn scars. This work is particularly focused on the Clackamas River corridor, where an increase in landslide occurrence has been observed. To date, there is no recommended changes to the monitoring program, however, as more data becomes available, then it will aid in informing future management actions.

[12] USDA Forest Service, Record of Decision, Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants, 2005, fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5302164.pdf

Status of Focal Species[13]

Pileated Woodpecker[14]

What is the trend of mature and late-successional habitat needed for pileated woodpecker persistence?

- This monitoring question refers to the Forest Plan desired condition that habitat is managed for the pileated woodpecker.
- Monitoring Indicator: Acres of late-successional and old growth habitat on the Forest tracked over time. These are acres that contain 10 or more trees per acre that are greater than 20 inches in diameter at breast height (DBH).

Monitoring Results

The pileated woodpecker is one of the Forest's Management Indicator Species (MIS) and is associated with mature and old growth forests (coniferous and mixed deciduous-coniferous forest types) that typically contain large snags and down wood. They also utilize younger forests if there are scattered large trees and down wood present. Overall, this metric has been steadily increasing since the Forest Plan was written in 1990. Evidence of the 2017 Eagle Creek Fire exists in the dip between 2017 and 2018.

Data

As technology advances, data analysis tools also evolve. The data for the graph below are based on a new annual time series of maps that supersedes previous versions used to compile graphs in previous reports. Data for the 2018 and 2019 forest analysis are currently being developed by the Oregon State University's Landscape Ecology, Modeling, Mapping, and Analysis (LEMMA) team using the vegetation structure; Gradient Nearest Neighbor (GNN).

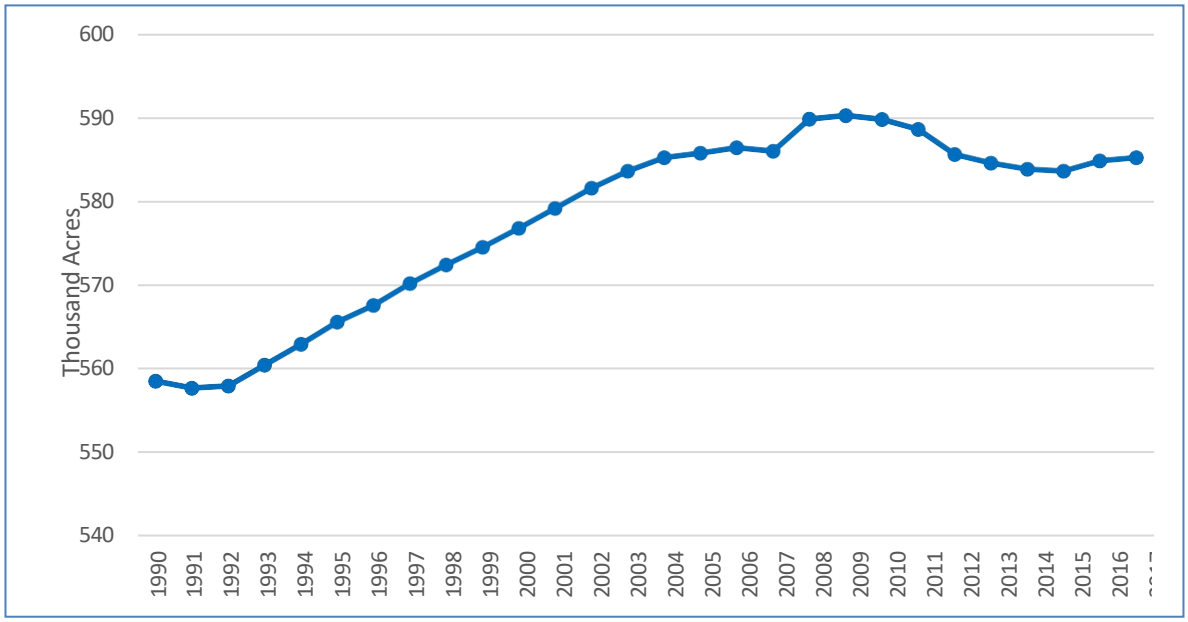

Figure 2. Acres of pileated woodpecker habitat over time.

[13] The 2018 and 2019 areal analysis that supports this the wildlife findings in this report is currently being developed by the LEMMA group in conjunction with the Northwest Forest Plan 25 year Report.

[14] Data for the pileated woodpecker, American marten, Western gray squirrel, Deer and Elk, and the Northern Spotted Owl was provided by Oregon State University's LEMMA vegetation structure GNN dataset https://lemma.forestry.oregonstate.edu/about.

Monitoring Discussion, Findings, and Adaptive Management Considerations

Range-wide within Canada and the United States, the pileated woodpecker population has steadily increased from 1966 to 2015, according to the North American Breeding Bird Survey (Sauer et al., 2017). As shown in Figure 2, the trend for the pileated woodpecker is increasing at the Forest and range-wide scale. The increasing trend does not compel a recommendation for changes in the Forest's management strategy for this focal species.

American Marten

What is the trend for mature and late-successional habitat above 3,500 feet needed for American marten persistence?

- The monitoring question is tracking the Forest Plan desired condition that habitat is managed for the American pine marten.
- Monitoring Indicator: Acres of late-successional and old growth habitat above 3,500 feet elevation on the Forest tracked over time that is currently in mature or late-successional stage, with greater than 50 percent canopy cover were used in this evaluation.
- Background: The American marten is one of the Forest's MIS and is associated with mature and old growth coniferous Forests, generally above 3,500 feet in elevation. Optimal habitat would contain greater than 50 percent canopy cover, with complex cover components (i.e., down trees, rock piles, shrubs/brush).

Monitoring Results

Overall, American marten habitat has been increasing since the development of the Forest Plan, but as shown in Figure 3, these acres plateaued between 2002 and 2005. From 2006 to 2011, mature and late-successional forests (above 3,500 feet elevation) acreage declined largely due to multiple large fires in or adjacent to the Mt. Hood Wilderness and Bull of the Woods Wilderness. Since 2011, marten habitat acreage leveled out as almost all fires were at lower elevations, coupled with several years of low fire activity on-Forest. From 2012 to 2017, the trend for forest stands that meet this metric stayed relatively constant with a slight decline (152,975 to 152,312 acres).

Data

As technology advances, data analysis tools also evolve. The data for the graph below are based on a new annual time series of maps that supersedes previous versions used to compile graphs in previous reports. Data for the 2018 and 2019 forest analysis are currently being developed by the Oregon State University's LEMMA team using the vegetation structure GNN.

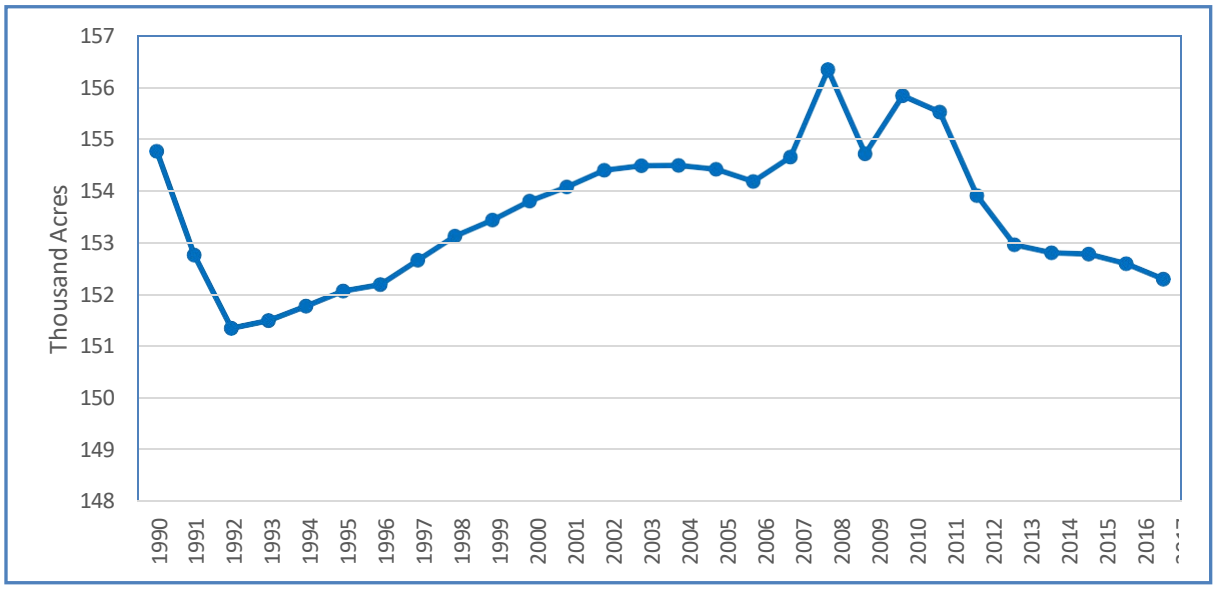

Figure 3. Acres of American marten habitat over time.

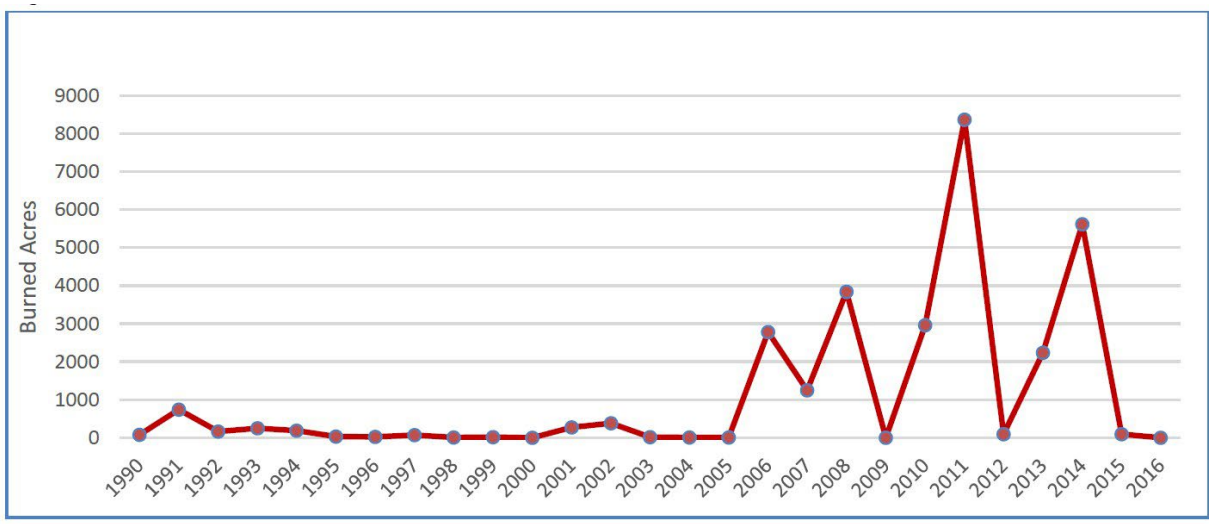

Figure 4. Burned acres on the Forest between 1990 and 2016.

Monitoring Discussion, Findings, and Adaptive Management Considerations

The fires that caused the decrease in habitat shown in Figure 3 resulted from naturally occurring lightning strikes. The habitat fluctuations between 2007 and 2012 mirror fire activity on-the-ground. The aerial imagery used for this analysis may be impacted by the ground conditions (i.e., large amounts of soot) potentially skewing some analysis.

There are no recommendations for changes because the Forest has been maintaining and continues to maintain habitat for this species. Acknowledging that there will be natural fluctuations in available habitat due to wildfire activity, the American marten's habitat on the Forest is on a trend that is consistent with the Forest Plan.

Western Gray Squirrel

What is the trend for oak pine habitat needed for the Western gray squirrel persistence?

- The monitoring question is tracking the Forest Plan desired condition that habitat is managed for other wildlife species represented by the named MIS.
- Monitoring Indicator: Acres of oak pine habitat tracked over time that contain greater than or equal to 80 percent ponderosa pine and/or Oregon White Oak basalarea.
- Background: The Western gray squirrel is one of the Forest's MIS that is strongly associated with forested stands with high ponderosa pine and Oregon white oak components. Studies in south central Washington and north central Oregon, and in areas both within the Forest boundary or immediately adjacent, show that the nest and core areas are in coniferous stands that contain approximately 80 to 95 percent ponderosa pine and/or Oregon white oak, mixed with Douglas-fir (Foster, 1992; Linders and Stinson, 2007).

Monitoring Results

As technology advances, data analysis tools also evolve. The data for the graph below are based on a new annual time series of maps that supersedes previous versions used to compile graphs in previous reports. The data in Figure 5 shows a steady decline from 1990 (32,896 acres) to a low in 2004 (27,777 acres). Habitat has steadily increased since 2008 to approximately 29,431 in 2017. This timing is coincident with the Forest's priority to restore fire-adapted stands to a more natural range of vegetative conditions using fuel reductions projects.

Data

Data for the 2018 and 2019 forest analysis are currently being developed by the Oregon State University's LEMMA team using the vegetation structure GNN. All data below supersedes previous graphs in earlier reports.

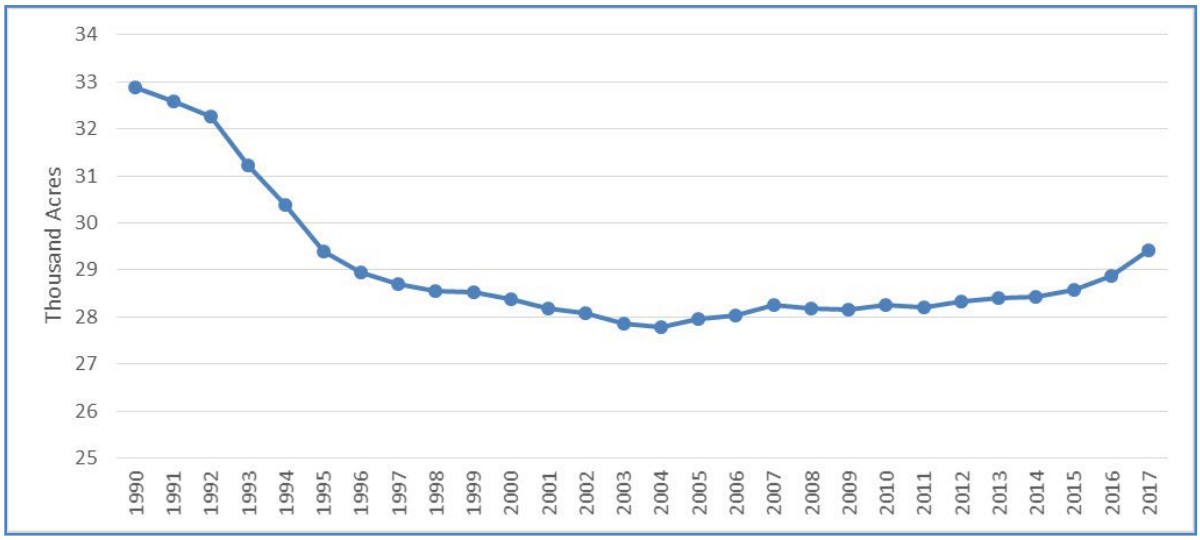

Figure 5. Acres of Western gray squirrel habitat over time.

Monitoring Discussion, Findings, and Adaptive Management Considerations

The goal of fuel reduction projects included silvicultural prescriptions to favor ponderosa pine, oak, and other fire-resistant species, which remove thick understory that resulted from decades of active wildfire suppression. These fuel reduction projects are currently being planned and implemented, and thus will continue to improve pine/oak habitat required by the Western gray squirrel. Therefore, changes to management strategies for the Western gray squirrel are not recommended at this time.

Deer and Elk

What is the trend for early seral habitat needed for deer and elk persistence?

- The monitoring question is tracking the Forest Plan desired condition that habitat is managed for other wildlife species represented by the named MIS.
- Monitoring Indicator: Acres of early seral habitat tracked over time. The Forest used acres of habitat with less than 40 percent canopy cover to measure deer and elk habitat.

Monitoring Results

From 2012 to 2017, early seral habitat slightly decreased from 91,371 to 86,514 acres. Overall, this habitat has steadily decreased since 1990 (high of 155,880 acres) to present day as illustrated in Figure 6. This decreasing trend is consistent with the sharp decline in federal timber harvest starting in the early 1990's, and the reduction of clear cut (regeneration harvest) methods that would have maintained early seral forage preferred by deer and elk. The slight increase in 2012 is likely due to high-severity large fires that created early seral habitat.

Data

The data in Figure 6 are based on a new annual time series of maps that supersedes previous versions used to compile graphs in previous reports. Data for the 2018 and 2019 forest analysis are currently being developed by the Oregon State University's LEMMA team using the vegetation structure GNN.

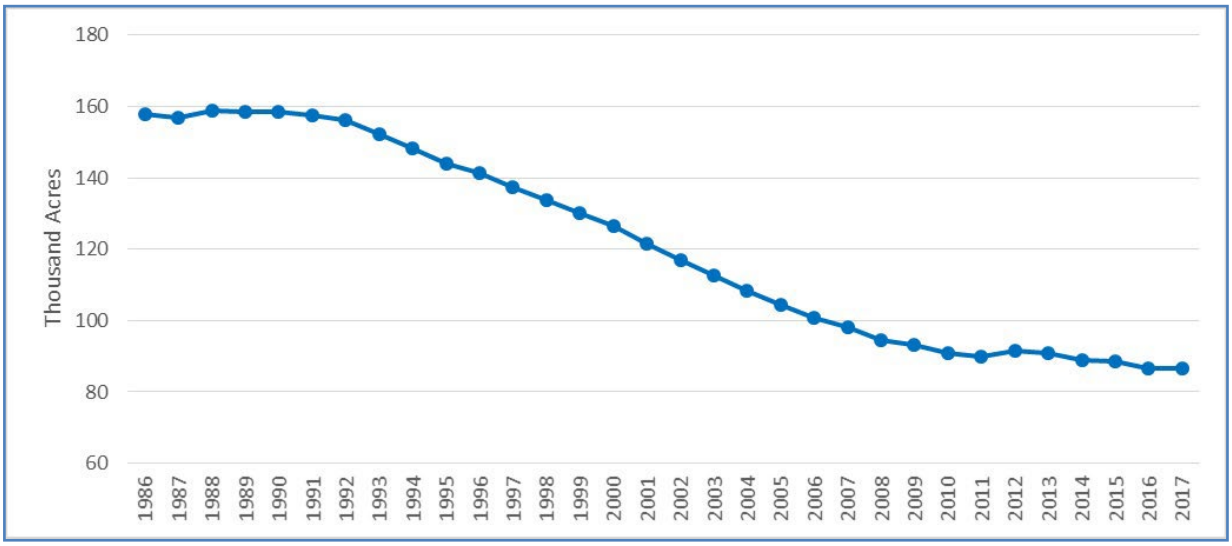

Figure 6. Acres of early seral habitat for deer and elk forage.

Monitoring Discussion, Findings, and Adaptive Management Considerations

Overall, the Forest is in a declining trend for this habitat type even though most vegetation management projects include the creation and enhancement of forage at a small scale. A change in management strategy at the project and landscape level is recommended. In an effort to see a positive trend for deer and elk habitat, future projects should incorporate big game forage enhancement opportunities to a much greater extent.

Starting in 2010/2011, the habitat decline starts to flatten. This trend continues into 2017. Based on current management strategies we expect this trend to continue (with potential for a slight increase) into 2018 and 2019.

Status of Ecological Conditions for Threatened, Endangered, and Proposed Candidate Species

Aquatic Habitat Complexity

Are standards and guidelines effective in maintaining or enhancing aquatic habitat complexity?

- The monitoring question is tracking FW-139 to FW-147 and NWFP Standards and Guidelines for Riparian Reserves and the Aquatic Conservation Strategy
- Monitoring Indicator: Number of stream miles restored for ESA and sensitive listed fish species (i.e., steelhead, Chinook, coho, Pacific lamprey, bull trout, rainbow trout, and cutthroat trout).
- Background: The Forest Plan goals for the fisheries program are to maintain aquatic habitat quality, as well as diverse and sustainable fish populations. Aquatic resource monitoring is the starting point to track the status of populations of concern, such as ESA-listed fish; develop long-term data sets on population trends; and conduct effectiveness monitoring for restoration projects designed for habitat recovery and long-term sustainability of fish populations. Federally-listed fish species on the Forest include steelhead, coho, Chinook, and bull trout.

Monitoring Results

In 2010, the Forest Service initiated a Watershed Condition Framework[8] methodology nationwide as an approach for evaluating and strategically focusing resources and funds in implementing watershed restoration. The Forest has since used this methodology to rank, prioritize, and target watershed restoration projects at both channel and upland sites to best benefit local fish and watershed resources.

The Watershed Condition Framework initiative has now resulted in the completion of all restoration projects listed in Watershed Restoration Action Plans for two watersheds on the Forest: Still Creek and Upper West Fork Hood River.

The Forest is currently implementing restoration actions in the Watershed Restoration Action Plans for the Upper Sandy and Cub Creek watersheds. The Forest began implementing the Fifteenmile Creek Watershed Restoration Action Plan in 2022.

Still Creek

During 2012-2017, the Zigzag Ranger District and its partners restored 8 miles of main channel habitat on Still Creek and 3.2 miles of tributary stream habitat for ESA-listed spring Chinook salmon, coho salmon, and winter steelhead. Restoration was guided by the 2011 Still Creek Watershed Restoration Action Plan, which identified 19 essential projects to be completed in- stream, within the riparian zone, and at the watershed scale, including:

- Placement of 2,300 pieces of instream and floodplain large wood for habitat creation/cover;
- Reconnection of 6.5 miles of side channel habitat, replacement of 5 (culverts) passage barriers, restoration of riparian vegetation; and,
- Installation of 30 road-related sediment control structures.

Total investments in the watershed amounted to nearly $2.2 million dollars that includes contributions from partners such as The Freshwater Trust, Clackamas County, Columbia Land Trust, METRO, Multnomah County, National Marine Fisheries Service, The Nature Conservancy, Northwest Steelheaders, Oregon Department of Fish and Wildlife, Portland Water Bureau, Sandy River Basin Watershed Council, Bureau of Land Management, and Western Rivers Conservancy.

[8] https://www.fs.usda.gov/naturalresources/watershed/condition_framework.shtml

West Fork Hood River

Similarly, from 2013 to 2020, the Hood River Ranger District and its partners, restored 3.7 miles of habitat for ESA-listed spring Chinook salmon, coho salmon, and winter steelhead, and restored fish access to another 3.8 miles of habitat. Restoration was guided by the 2012 Upper West Fork Watershed Restoration Action Plan, which identified 12 essential projects to be completed in-stream, within the riparian zone, and at the watershed scale. Projects included instream/floodplain large wood placement, riparian thinning, invasive plant control/eradication, stream passage remediation, and road stormproofing/decommissioning.

Investments in the watershed totaled to $2.61 million dollars. Key partners include the Confederated Tribes of the Warm Springs Reservation of Oregon, Bonneville Power Administration, The Oregon Watershed Enhancement Board, Ecotrust Forest Management, and the Hood River Watershed Group.

Upper Sandy River

In 2020-2022, the Forest, and partners The Freshwater Trust, and Bureau of Land Management, restored 8.7 miles of ESA-listed fish habitat in the Clear Fork of the Sandy, Zigzag, and Salmon rivers, and Cast, Boulder, Lost, and Lady Creeks through the addition of large trees and logs and reconnecting channels to floodplains. In 2021, another 0.5 mile of ESA-listed fish habitat in the Salmon River was improved by restoring areas disturbed by dispersed recreation use, and in 2022, the Forest improved an additional 0.9 mile of fish habitat in the Zigzag River and Lost Creek through restoration of areas previously impacted by recreation use.

The Forest began implementing the Upper Sandy Watershed Restoration Action Plan in 2018. The 10.1 miles of ESA-listed fish habitat restored in 2020-2022 is in addition to 8.3 miles of stream restored during 2018-2019 on Lost and Cast creeks, and Clear Fork of the Sandy, Zigzag, and South Fork Sandy rivers.

Cub Creek

Implementation of essential projects for the Cub Creek Watershed Restoration Action Plan began in 2022. Logs and trees were flown by helicopter into upper Cub and Berry Creeks to restore 2.6 miles of ESA-listed fish habitat. Working with partners, the Forest will invest over 2 million dollars in the Cub Creek watershed over the next five years to complete an additional 10 essential projects restoring in-stream and floodplain habitats and restoring fish access to habitats blocked by road crossings.

Other Restoration Projects

Other restoration projects to restore aquatic habitat quality from 2020-2022 include:

- Spawning-sized gravel (430 cubic yards) was placed annually below reservoir dams on the Bull Run River and Oak Grove Fork of the Clackamas River to improve 9 miles of stream for anadromous salmon and steelhead below Bull Run Dam 2 and Lake Harriet Dam. Dams, and their intended reservoirs, trap spawning-sized gravel from naturally moving downstream, resulting in reaches below dams unnaturally lacking in suitable sized substrate (typically around 0.75-3” diameter gravel). Additionally, gravel was added downstream of Timothy Lake dam and Stone Creek Dam on the Oak Grove Fork to restore 2 miles of spawning habitat for resident cutthroat trout. Suitable-sized gravel were placed in the channel margins or on point bars as much as possible to allow for gradual transport downstream with periodic high-water events over the following winter and spring. Key partners include Portland General Electric, Oregon Department of Fish and Wildlife, and City of Portland Water Bureau.
- In 2020, 0.5 mile of the lower Clackamas River was improved with the addition of 12 large wood habitat structures constructed of about 275 logs and trees. The habitat structures provide cover for adult coho and Chinook salmon and rearing areas for juvenile salmon in the reach of the river just upstream of the North Fork Reservoir.

- In 2020, aquatic organism passage projects were completed at five road crossings on Kansas and Stump Creeks, and three tributaries to the Clear Fork Sandy River. Undersized culverts were replaced with new culverts that facilitate the passage of fish and other aquatic organisms. These projects restored fish access to 2.2 miles of ESA-listed fish habitat.
- In 2021, aquatic organism passage projects were completed at five road crossings on two tributaries to the Bull Run River, and three tributaries to the Clear Fork Sandy River. These projects restored fish access to 0.3 miles of ESA-listed fish habitat.
- In 2022, aquatic organism passage projects were completed at four road crossings on Camp Creek and three tributaries to the Bull Run River. Additionally, a dam on Lady Creek that was a barrier to fish and aquatic organism movement was removed. These projects restored fish access to 2.8 miles of ESA-listed fish habitat.

Monitoring Discussion, Findings, and Adaptive Management Considerations

The Forest maintains habitat capable of supporting fish, and the Forest annually implements a robust aquatic restoration program that continues to improve habitat for ESA-listed and sensitive fish species of concern. In 2020-2022, 27.5 miles of ESA-listed fish habitat were improved on the Forest. Aquatic habitat complexity varies naturally across watersheds and individual streams, but all stream habitat complexity has been maintained or improved over the reporting period.

Northern Spotted Owl

What is the trend for mature and late-successional habitat needed for northern spotted owl recovery?

- The monitoring question is tracking NWFP Standards and Guidelines for Late-Successional Reserves (LSRs).
- Monitoring Indicator: Acres of late-successional and old growth habitat on the Forest tracked over time. The Forest used acres of nesting and roosting habitat that are rated as suitable or highly suitable (Davis et al., 2016) as the metric to measure mature and late-successional habitat for the northern spotted owl.
- Background: The northern spotted owl is a federally listed threatened species.

Monitoring Results

Habitat for the northern spotted owl has increased steadily over time from 1990 to present. There were several years where this increasing trend slowed somewhat due to large individual forest fires (i.e., 2011 and 2014) and high fire frequency/acreage years (i.e., 2014 and 2015).

The 2017 Eagle Creek Fire is evident in the dip between 2017 and 2018. This dip may also be impacted by the change in the habitat analysis methodology used for the pre-2018 data. Overall, it seems that processes of forest succession have compensated for most of the losses due to fires. It is likely this increasing trend will continue due to reduction of regeneration harvest methods and increased focus on thinning methods.

Data

As technology advances, data analysis tools also evolve. The data for the graph below are based on a new annual time series of maps that supersedes previous versions used to compile graphs in previous reports. The years 2018 and 2019 use a different analysis called “normalized burn ratio” which is related to living or dead vegetation.

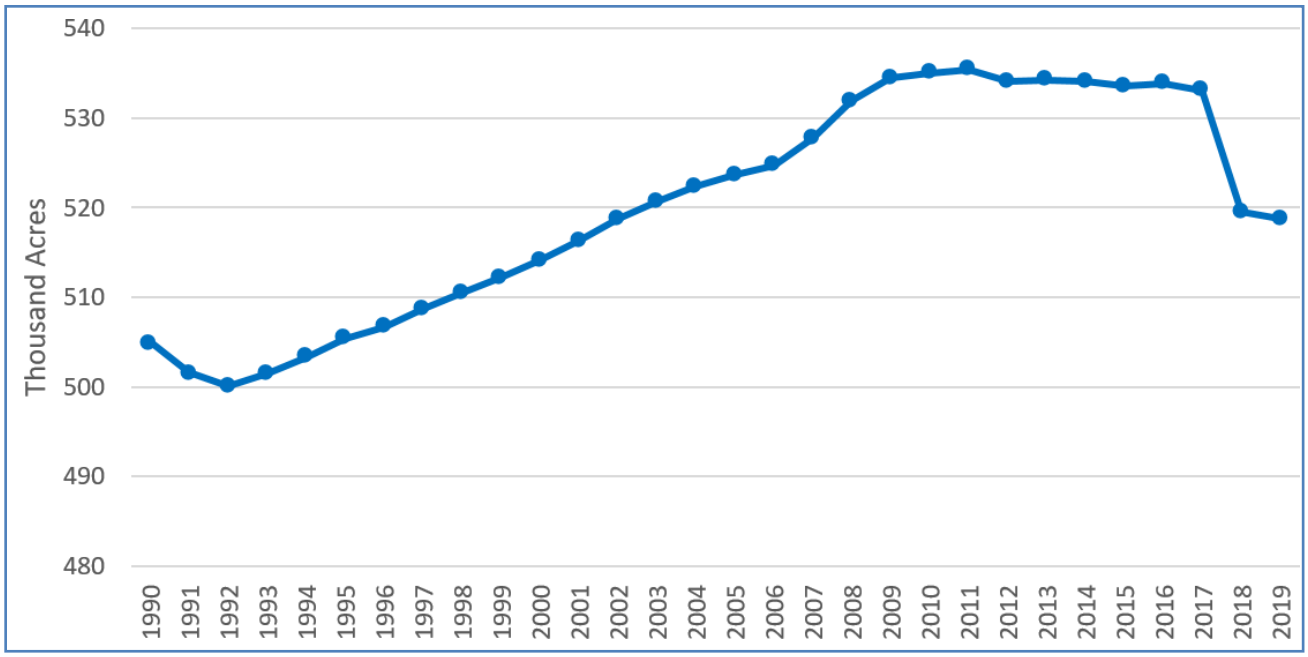

Figure 7. Acres of northern spotted owl suitable nesting and roosting habitat over time.

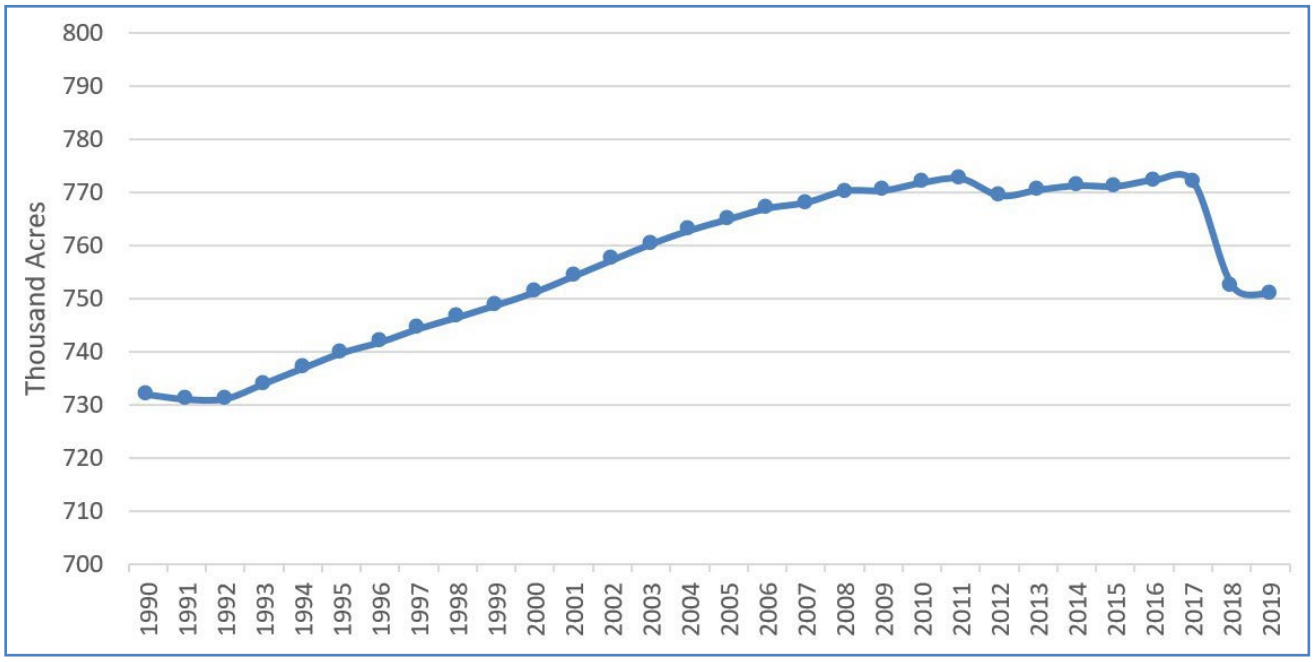

Figure 8. Acres of northern spotted owl dispersal habitat over time.

Monitoring Discussion, Findings, and Adaptive Management Considerations

Northern spotted owl suitable habitat on the Forest has increased over the years (as shown in Figure 7) while populations of owls have continued to decline[9]. Threats to this species include climate change, wildfire, and invasive species, particularly the barred owl (Strix varia) whose range is expanding rapidly.

[9] Spies, T.A., J.W. Long, S. Charnley, P.F. Hessburg, B.G. Marcot, G.H. Reeves, D.B. Lesmeister, M.J. Reilly, LK. Cerveny, P.A. Stine, and M.G. Rapheal. 2019. Tewnty-five years of the Northwest Forest Plan: What Have We Learned? Frontiers in Ecology and Environment. Lesmeister, D.M., R.J. Davis, P.H. Singleton, and J.D. Wiens. 2018. Chapter 4: Northern Spotted Owl Habitat and Populations: Status and Trends. Synthesis of the Science to Inform Land Management Within the Northwest Forest Plan Area; Volume 1. Gen. Tech. Rep. PNW-GTR-966. Portland, OR: USDA, Forest Service, Pacific Northwest Research Station.

A twenty-year report (1994-2013) describing the trend of federal late-successional habitat managed under the NWFP shows a small decrease (2.8-2.9% decrease) in older forests[10]. Wildfire-related losses, including the large areas of the NWFP lands burned annually, has increased in frequency compared to recent decades preceding the NWFP. This increase in fire frequency and size is also reflected on the Forest, but the increase in older, suitable habitat is still on an upward trend for the forest due to on-going forest succession.

It is apparent that the northern spotted habitat trend is the direct inverse of the early-seral habitat trend that provides for forage habitat for deer and elk. You can compare those trends by viewing Figure 7 and Figure 8 and comparing those with Figure 6.

Oregon Spotted Frog

What is the trend for Oregon Spotted Frog populations at Camas Prairie?

- The monitoring question is tracking Forest Plan Standard and Guideline FW-175.
- Monitoring Indicator: Tracking visual encounter surveys of egg masses over time.
- Background: Due to range-wide population declines, the Oregon spotted frog was listed as a threatened species under the ESA in 2014. This is the only extant population on the Forest, and it is completely isolated from other Oregon spotted frog populations.

Monitoring Results

The frogs at Camas Prairie appear to be the only remaining representatives of a major genetic group that is now almost extinct. Egg mass counts have been conducted annually since 2004. Annual egg mass counts from 2005 to 2019 fluctuated from year to year, with a low of 15 (2019) to a high of 82 (2011) as shown in Figure 9.

Data

Data is currently being collected on an annual basis with support from the Wetland Wildlife Watch. The information displayed in Figure 9 was retrieved from Wetland Wildlife Watch. Egg mass production is used as an indicator to measure population health.

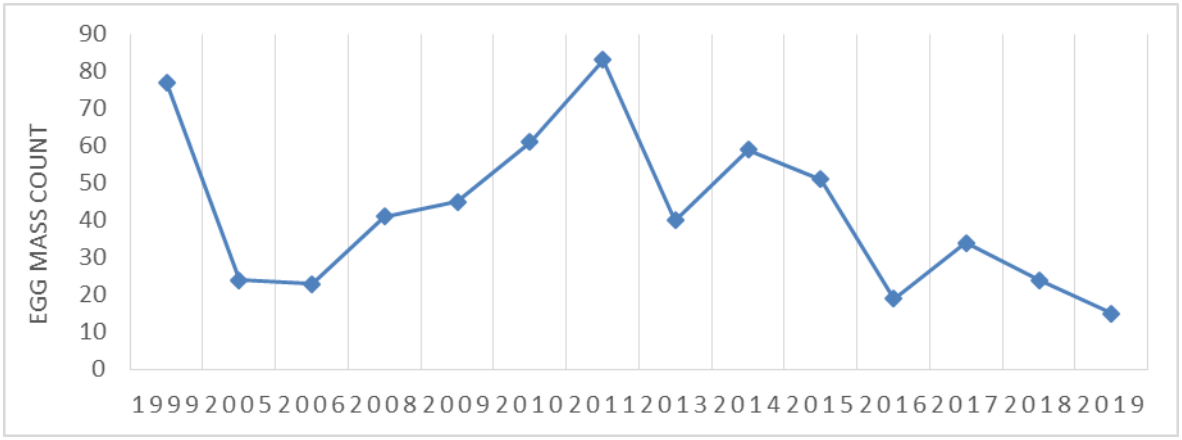

Figure 9. Camas Prairie Oregon spotted frog egg mass counts over time.

Monitoring Discussion, Findings, and Adaptive Management Considerations

Between 2004 and 2012, the population trend was positive. Egg mass counts after 2012 have declined. In 2018, between 20 and 24 egg masses were located within Camas Prairie. In 2019, 15 egg masses were found

[10] Davis, R.J., J.L. Ohmann, R.E. Kennedy, W.B. Cohen, M.J. Gregory, Z. Yang, H.M. Roberts, A.N. Gray, and T.A. Spies. 2015. Northwest Forest Plan–the first 20 years (1994-2013): status and trends of late-successional and old-growth forests. Gen. Tech. Rep. PNW-GTR-911. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 112 p. At the time of the development of this biennial monitoring report this is the current NWFP 20-year report. The next 20- year report is currently being developed. U.S. Fish and Wildlife (USFWS). 2019. Oregon Spotted Frog (Rana pretiosa) 2019 Species Biological Report.

and stranding of at least a subset of the masses was observed in May; this count represents the new lowest count for this site since 2004.

It is suspected that the egg mass counts are highly correlated to cyclical water year fluctuations. More investigation is needed to ensure accuracy of the suspected correlation. Current efforts are underway to better understand the hydrology of Camas Prairie to assess if habitat is becoming less suitable for Oregon spotted frogs and to determine if developing a site management plan is necessary.

Status of Visitor Use and Satisfaction

Historic Properties

Are significant (National Register Historic Places (NRHP) eligible) historic properties being maintained, stabilized, and repaired according to historic preservation standards?

- The monitoring question is tracking Forest Plan Standards and Guidelines FW-622 and FW-624.
- Monitoring Indicator: Monitoring data/site condition assessments.

Monitoring Results

The Forest contains 1,548 historic properties. 77 of these properties are eligible for the National Register and 28 are listed, for a total of 105 eligible or listed historic properties. The remaining 1,443 properties are unevaluated, though they are treated as eligible historic properties until they can be evaluated. In the Forest, historic properties are divided into two broad categories: structures or buildings, and archaeological resources. There are approximately 108 historic buildings or structures on the Forest, and 1,440 archaeological sites.

Of the 105 eligible or listed historic properties, 29 of are Priority Heritage Assets (PHAs). 12 PHAs are archaeological resources, and 17 are buildings or structures (see the table below). In addition, the Forest currently has three cultural resource collections, which are also considered PHAs per Forest Service Manual 2366.03, for a total of 32 PHAs. The Forest completes monitoring and condition assessments on PHAs at least once every five years.

From 2020 to 2022, the Forest completed monitoring and condition assessments at 15 of the 32 PHAs. Of these PHAs, eight were in good condition and seven were in fair condition. Of the 32 PHAs, ten are overdue for a condition assessment. These will be monitored and assessed in 2023. Prior to 2020, the Forest had 33 PHAs, which included another cultural resource collection which was destroyed from wildfire in 2020. In addition, four of the PHAs received investment that maintained, stabilized, or repaired them according to preservation standards. These include: the American Legion Amphitheater (bench and step rehabilitation), Fish Creek (site stabilization), Olallie Meadow Cabin (new roof), and Timberline Lodge (new boiler system and other improvements). For many resources that are in fair condition, planning is underway for their rehabilitation in the next two years. This includes curation improvements for the three cultural resource collections.

Data

Table 4. Priority Heritage Asset Buildings or Structures.[11]

Priority Heritage Asset Name	Resource Type	Last Condition Assessment	Condition
American Legion Amphitheater	Amphitheater	2022	Good
Bagby Guard Station	Building	2021	Fair
Cloud Cap Inn	Building	2022	Good
Cooper Spur Warming Shelter	Building	2017	Fair
Clackamas Lake Ranger Station	Building	2019	Fair
Olallie Meadow Cabin	Building	2021	Good
Sahalie Falls Bridge	Bridge	Unknown	Unknown
Silcox Hut	Building	2022	Good

[11] Due to their sensitive nature, the names of the archaeological sites are not listed.

Priority Heritage Asset Name	Resource Type	Last Condition Assessment	Condition
Tilly Jane A Frame Warming Hut	Building	2022	Good
Timberline Lodge	Building	2022	Good
Upper Sandy River Guard Station	Building	2017	Unknown
Devil's Peak Lookout	Lookout	2017	Fair
Hickman Butte Lookout	Lookout	2023	Good
Flag Point Lookout	Lookout	2022	Good
Elk Meadows Shelter	Building	2021	Fair
McNeil Point Shelter	Building	2017	Fair
East Zone Cultural Resource Collection	Collection	2022	Fair
West Zone Cultural Resource Collection	Collection	2022	Fair
Supervisor's Office Arch Collection	Collection	2022	Fair

Monitoring Discussion, Findings, and Adaptive Management Considerations

A primary objective of the Forest's Heritage Program is the preservation of historic properties. The Forest actively plans for investment in historic properties that are buildings or structures, pursuant to Forest Plan Standard FW-264, which states that "National Register or eligible historic buildings shall be maintained Executive Order 11595 and 36 CFR 68.4." Typically, all historic buildings or structures that are not PHAs are managed actively by engineering or recreation. Many administrative structures used daily for agency operations fall into this category and are routinely maintained according to preservation standards. These include buildings at the Zigzag, Barlow, Summit, and Hood River Ranger Stations, among others. PHA buildings or structures are either maintained by engineering or recreation and are also highly significant structures, such as Timberline Lodge, or are buildings primarily managed by Heritage, such as Olallie Meadows Cabin.

To meet Forest Plan Standard FW-622, which states that "Project activities occurring within the vicinity of a National Register eligible or unevaluated cultural resource should be monitored during project operation to assure unprojected impacts to the cultural resource do not occur," the Forest reviews all activities on Forest land for compliance with 36 CFR 800, which includes implementation monitoring. All archaeological sites are avoided during all project implementation if possible. Where necessary, the Forest also stabilizes archaeological sites for their preservation.

Monitoring is necessary to ensure historic properties area being maintained, stabilized, and repaired according to the Standards. Monitoring evaluates the existing physical condition of historic properties. Individual historic properties, districts, and the National Historic Landmark each have a preservation plan. Preservation plans outline maintenance, stabilization, and repair requirements for the property. The physical condition assessments completed during monitoring inform on the status of individual preservation plans. Existing physical conditions of historic properties are categorized as either good, fair, or poor.

A historic property is evaluated as *Good* when:

- Elements are intact, structurally sound and performing its intended purpose
- There are few or no cosmetic imperfections
- No element needs repair other than minor/routine maintenance (paint touch up, overgrown vegetation, cleaning)

A historic property is evaluated as *Fair* when:

- There are early signs of wear, failure, or deterioration (building cracks, paint), though the element is generally structurally sound and performing its intended purpose
- There is failure of a subcomponent of the property
- Up to 25% of the property is in need of repair and/or replacement

A historic property is evaluated as *Poor* when:

- The property or elements are no longer performing their intended purpose

- Elements are missing
- Deterioration or damage affects more than 25% of the property
- The property shows signs of imminent failure or breakdown
- The property requires major repair/replacement.

Physical/Biological, Managerial, and Social Settings

Are the physical/biological, managerial, and social settings of each Wilderness Resource Spectrum (WRS) maintained consistent with the standards for wilderness management?

- The monitoring question is tracking Forest Plan Desired Condition: there are eight wilderness areas on the Forest that will provide primitive recreation opportunities along with scenic, historical and ecological experiences; and Forest Plan Standards and Guidelines A2-005 through A2-035, and A2-048 through A2-050.
- Monitoring Indicator: Wilderness Stewardship Performance scorecard's ten elements associated with wilderness stewardship.

Monitoring Results

From 2014-2015 the national standards for monitoring wilderness character were measured using the "10-Year Wilderness Stewardship Challenge" (10-YWSC). The performance measure "wilderness managed to a minimum stewardship level" is commonly referred to as the 10-YWSC. The 50th anniversary of the Wilderness Act marked the end of the 10-YWSC. The goal of the 10-YWSC was to bring all wildernesses under the Forest Service's care to a minimum stewardship level by 2014. Under this framework, a stewardship score of 60 or greater met this minimum stewardship level. Under the Omnibus Public Land Management Act of 2009 (the Omnibus Act), five existing wilderness areas were expanded (Badger Creek, Bull of the Woods, Mark O. Hatfield, Mt. Hood, and Salmon-Huckleberry), and three new wilderness areas were created (Clackamas, Roaring River and Lower White River). The new wilderness areas were not part of the 10-YWSC, although baseline information was gathered.

Table 5 shows that in 2014, all five of the wilderness areas on the Forest which were part of this challenge scored over 60 and were considered as managed to a minimum stewardship level under all criteria of the 10-YWSC.

Data

Table 5. 10-year Wilderness Stewardship Challenge (10-YWSC) Data (2014) and Wilderness Stewardship Performance (WSP) Scores (2022).

Wilderness Name	Designation Year	10-YWSC Score (FY14)	WSP Score (FY22)
Mark O. Hatfield Wilderness	1984	66	30
Mt. Hood Wilderness	1964	69	42
Salmon-Huckleberry Wilderness	1984	68	0*
Badger Creek Wilderness	1984	60	28
Bull of the Woods Wilderness	1984	62	14
Clackamas Wilderness	2009	32	20
Lower White River Wilderness	2009	32	16
Roaring River Wilderness	2009	40	22

*Likely reporting error

Monitoring Discussion, Findings, and Adaptive Management Considerations

The direction for 2015 was to follow the new Wilderness Stewardship Performance (WSP) plan to develop new performance measures for each wilderness area. In 2016, the only standard met for all wilderness areas

was air quality monitoring. The agency expected scores to drop initially in the first few years as many of the elements are new or revised. WSP scores rose predictably from 2016 to 2019, but then began a steady decline from 2019 through 2022. This decline may be due in part to the onset of the COVID pandemic, the 2020 and 2021 wildfires that rendered some wildernesses inaccessible, reporting errors, and staff turnover. Currently, none of the eight wilderness areas meet the minimum stewardship level as outlined in WSP. More information on the WSP framework can be found in the WSP Guidebook or here in the WSP brochure[12]. The Omnibus Act wilderness designations continue to lag behind 1984 and 1964 designated wilderness areas, while Bull of the Woods Wilderness has largely been inaccessible due to fire area closures in 2021 and 2022.

Off Highway Vehicles (OHVs)

Has the OHV Record of Decision of 2010 been implemented?

- The monitoring question is tracking Forest Plan Desired Condition: activities such as hunting, sightseeing, off-road vehicle use, dispersed camping, cross-country skiing, and fishing are typical.
- Monitoring Indicator: Development and designation of designated trails in the Forest Service Infrastructure application (INFRA) database for roads and trails.
- Background: The Forest manages three areas specifically designated for OHV recreation use. La Dee Flats, located on the Clackamas River Ranger District, has been the main focus for the beginning phases of implementation of the 2010 OHV decision. The other two designated OHV areas are McCubbins Gulch and Rock Creek, which are both located on the Barlow Ranger District. No work has been completed in either of these areas under the 2010 OHV decision.

Data

The data shown in Table 6 are the same as what was displayed in the previous monitoring report. There have been no changes in the data. The table does not capture data on trails that were existing and already in use and did not have any changes in the 2010 OHV decision. Other trail monitoring is captured through the Trail Assessment and Condition Surveys (TRACS) program. TRACS is the required methodology for conducting trail inventory, condition assessment, and prescriptions for NFS trails.

Table 6. OHV Record of Decision implementation status.[13]

NFS Road Number	OHV Route Designation	OHV Class	Route Status	OHV Trail Number	Approx. Miles
4611	Closed to All Traffic	CL	Closed	-	1.0
4610000	Mixed-Use Route (MU)	MU-I, II, III	MU	-	4.4
4610011	Closed to All Traffic	CL	Decommissioned	-	0.7
4610011	Convert to Trail	I, II, III	Converted	802	0.17
4610011	Convert to Trail	I, II, III	Converted	800	0.1
4610012	Closed to All Traffic	CL	Decommissioned	-	0.3
4610013	Convert to Trail	I, II, III	Converted	802	0.2

[12] https://winapps.umt.edu/winapps/media2/wilderness/NWPS/documents/FS/WSP-Guidebook_v2020.1.pdf

[13] Miles shown are approximate. Where routes are closed, OHV Class is listed as CL, for Closed. For designation there are three types of OHV class vehicles. Class I (quads, 3-wheelers) are vehicles that are 50-inches wide or less and have a dry weight of 800 pounds or less with a saddle or seat and travels on 3 or more tires. Class II (jeeps, sand rails, SUVs, etc.) are vehicles wider than 50 inches and have a dry weight more than 800 pounds. Class III (motorcycles) are vehicles on two tires that have a dry weight less than 600 pounds.

NFS Road Number	OHV Route Designation	OHV Class	Route Status	OHV Trail Number	Approx. Miles
4610014	Convert to Trail	I, II, III	Converted	803	0.7
4610015	Convert to Trail	I, II, III	Converted	802	0.3
4610016	Convert to Trail	I, III	Converted	801	1.2
4610017	Closed to All Traffic	CL	Decommissioned	-	0.3
4610018	Closed to All Traffic	CL	Decommissioned	-	0.1
4610018	Convert to Trail		Decommissioned	-	
4610018		I,III	Decommissioned	-	0.1
4610019	Closed to All Traffic	CL	Decommissioned	-	0.3
4610020	Closed to All Traffic	CL	Closed	-	0.1
4610024	MU	MU-I, II, III	MU	-	0.2
4610112	Convert to Trail	I, II, III	Converted	800	0.9
4610113	Convert to Trail	I, II, III	In the process of being converted	802	1.7
4610115	Closed to All Traffic	CL	Decommissioned	-	1.2
4610115	Convert to Trail	I, III	Converted	804	1.2
4610120	MU	MU-I, III	MU	804	0.1
4610120	Closed	CL	Closed	-	0.7
4611000	MU	MU-I, II, III	MU	-	1.5
4611012	Closed to All Traffic	CL	Decommissioned	-	0.2
4611014	Closed to All Traffic	CL	Decommissioned	-	0.2
4611120	Closed to All Traffic	CL	Decommissioned	-	0.4
4611120	Convert to Trail	I, III	Converted	804	0.5
4611121	Convert to Trail	I, III	Converted	806	1.6
4611125	Convert to Trail	I, III,	Converted	805	0.2
4611130	Convert to Trail	I, III	Converted	805	3
4611135	Closed to All Traffic	CL	Decommissioned	-	0.5

Monitoring Discussion, Findings, and Adaptive Management Considerations

The OHV Record of Decision continues to be implemented. As such, there are no recommendations for changes to the Forest Plan or to OHV-associated management activities.

Level of Satisfaction

Are people having a high level of satisfaction during their visit to the Mt. Hood National Forest?

- The monitoring question is tracking Forest Plan Desired Condition: Outdoor recreation opportunities on the Forest are available in a variety of settings. Opportunities for dispersed recreation in a roaded setting are plentiful. Activities such as hunting, sightseeing, off-road vehicle use, dispersed camping, cross-country skiing, and fishing are typical. Opportunities for dispersed recreation in unroaded areas are less plentiful.
- Monitoring Indicator: The percent visitor satisfaction for developed sites, general forest areas, and designated wilderness.

Monitoring Discussion, Findings, and Adaptive Management Considerations

The report and results for the FY2021 National Visitor Use Monitoring (NVUM) have not been released, though some preliminary data is available. The NVUM data is collected through visitor surveys every five years. The NVUM program provides science-based estimates of the volume and characteristics of recreation visitation to the National Forest System, as well as the benefits recreation brings to the American public. Information about the quantity and quality of recreation visits is required for the Forest Plans, Executive Order 12862 (Setting Customer Service Standards), and implementation of the National Recreation Agenda. The NVUM program ensures that all visitor statistics for National Forests and grasslands produced by the Forest Service use a standardized measure. These standards were established by the Forest Service in the 1970s; however, their application is now stricter than in the past. For example, visitors must be physically recreating on Forest Service managed lands for a visit to count. They cannot be passing through, viewing from a non-Forest Service managed road, or just using restroom facilities.

An important element of outdoor recreation program delivery is evaluating customer satisfaction with the recreation setting, facilities, and services provided. Satisfaction information helps managers decide where to invest in resources and to allocate resources more efficiently toward improving customer satisfaction. Satisfaction is a core piece of data for national- and forest-level performance measures. To describe customer satisfaction, several different measures are used. Recreation visitors were asked to provide an overall rating of their visit to the Forest, on a 5-point Likert scale[14]. About one-third of visitors interviewed on the Forest rated their satisfaction with fourteen elements related to recreation facilities and services, and the importance of those elements to their recreation experience. Visitors were asked to rate the specific site or area at which they were interviewed. They rated both the importance and performance of these elements using a 5-point scale. Although the satisfaction ratings specifically referenced the area where the visitor was interviewed, the survey design does not usually have enough responses for any individual site or area on the forest to present information at a site level. The information is generalized to understand overall satisfaction within the three site types: day-use-developed, overnight-use-developed, general forest areas, and on the Forest as a whole (including designated wilderness).

About 85 percent of the visits to the Forest are very satisfied with their recreation experience. Another 13 percent are somewhat satisfied. Satisfaction index scores for perception of safety were 99 percent across developed recreation sites, 88 percent across dispersed areas, and 86 percent across designated wilderness. In day use developed settings, 69 percent of visitors were very satisfied with facility conditions, while 31 percent were somewhat satisfied.

[14] The scale for importance ranged from “not important” to “very important”. The scale for performance ranged from “very dissatisfied” to “very satisfied.”

Measurable Changes Related to Climate and Other Stressors

Water for Municipal Use

Is the production of pure, clean, raw potable water being sustained for municipal use?

- The monitoring question is tracking Forest Plan Desired Condition: The Bull Run continues to be managed for high quality water; and Forest Plan Standards and Guidelines: FW-084, FW-130, and D-001 to D-021.
- Monitoring Indicator: Changes on the quality and quantity of sustainable municipal waters supply.
- Background: For decades, more than a dozen communities have relied upon surface waters originating from the Forest for municipal use, including large sectors of the Portland metro area. Six watersheds on the Forest have been designated special status by the Forest Plan, as amended by the NWFP, and the 2009 Omnibus Act (see Table 7 for a listing of these watersheds). A primary management goal for these watersheds is to serve as a municipal water source. Activities that are planned and implemented within must be consistent with specific standards and guidelines intended to protect the quantity and quality of water.

Table 7. Special Status Watersheds.

Special Status Watersheds	Municipality
Bull Run Watershed	City of Portland
The Dalles Watershed (Includes Dog River and Mill Creek)	City of The Dalles
Alder Creek	City of Sandy
Fifteenmile Creek	City of Dufur
Gordon Creek	City of Corbett
Crystal Springs	Hood River Valley rural residents

Monitoring Results

No forest management activities occurred within any of the Special Emphasis Watersheds between 2020 and 2022, but there were several large-scale disturbances that influenced the quantity and quality of waters originating from the Forest and used for municipal purposes. They were not scheduled actions, but rather unexpected events closely related to climate anomalies. Variations in the quantity and quality of waters originating from the Forest over that timeframe were attributed to wildfire and drought.

Although none of the Special Emphasis Watersheds were directly affected, the Labor Day fires of 2020 heavily impacted source waters in the Clackamas and North Santiam River Basins. Both provide water downstream for several of the most densely populated municipalities of the state as well as smaller rural communities. Municipal suppliers impacted by the 2020 wildfires had to enact measures to adapt to changing water quality by adjusting treatment operations. Also, there were several instances where emergency measures were implemented to temporarily tap into back-up water reserves until standard operations could be restored.

Drought and record-setting heat also affected water supplies. Prolonged periods of uncharacteristically hot weather and lack of rainfall occurred each summer in the monitoring period. Snowpack accumulation and melt off also were factors, as annual snow-water equivalency to supplement supply was less than average. In response, streamflow reached near-record lows during the late summer months. Water management practices were adjusted to plan for potential supply shortages during high-use periods.

One notable change relative to Special Emphasis Watersheds is the designation of Fifteenmile Creek as a Wild and Scenic River. Fifteenmile Creek was included, along with eight other river segments on the Forest, in a new comprehensive river management plan that compliments existing water conservation and protection objectives. Also, the City of Dufur has converted completely to groundwater for their municipal use. They no longer rely on source waters from Fifteenmile Creek to supply their needs.

Data

All work scheduled within or planned to occur within Special Status Watersheds was evaluated. Sampling and observations were mostly anecdotal and included review of environmental assessments and decision notices, and in-house implementation schedules.

Individual municipalities and media were checked or queried for occurrences of aberrant treatment needs or special water management measures. Announcements from municipalities of curtailment restrictions, reports of boiling and flushing notices as per Oregon Health Authority (OHA) and Department of Environmental Quality (DEQ) requirements were evaluated.

Monitoring Discussion, Findings, and Adaptive Management Considerations

Post-fire effects to water quality became a heightened concern to affected municipalities after the 2020 wildfires. To address this concern, partnerships were established between federal, state, and local agencies to provide enhanced monitoring capability so that water treatment facilities and operators could forecast the need to adjust to changing conditions. New gaging stations capable of measuring specified water quality parameters were installed on certain river reaches. These stations are telemetered so that conditions can be monitored in real-time. This gives water providers the capacity to anticipate the need for adjusting and modifying their operations so they can mitigate potential post-fire threats to water quality.

Publication of a climate change vulnerability assessment (CCVA) that included the Forest was completed and released in 2022. One of the principal resources it addressed was water supply sourced from the Forest for municipal use. In the face of a changing climate, the hydrologic regime is expected to be affected. Also, demand is expected to increase concurrently due to population growth.

Altered hydrology could affect water supplies and quality by changing the amount, timing, and availability of surface water and groundwater necessary to meet human uses and support ecosystem functions. The CCVA highlighted the need for strategies and tactics to be developed to meet these challenges.

If water supplies become increasingly limited as forecasted, managers will likely need to expand their efforts and work across boundaries with other agencies, irrigators, stakeholders, and industry partners to align water-use practices to increase water conservation and protections for source water catchments. The Bull Run watershed management unit is specifically highlighted in the CCVA as an example of such efforts. The Forest is also identified as a Designated Management Agency collaborating with ODEQ to develop water quality management plans where water quality as been determined to be impaired. These plans include practices for restoring and maintaining conditions to further protect water quality.

Tree Mortality

What are the current tree mortality rates and patterns across the Forest?

- The monitoring question is tracking Forest Plan Standards and Guidelines: FW-381 through FW-383.
- Monitoring Indicator: Detectable acres of high tree mortality (i.e., insect and drought stress).

Monitoring Results

Historic fire suppression reduced the size and intensity of fires across the forest thereby reducing tree mortality related to fire. For a period, these activities increase tree growth rates, vigor, resistance to pests and resilience to fire, and reduce mortality rates within stands, thereby leading to growth rates exceeding mortality rates. Also, by reforesting after disturbances, growth rates increase quickly; stands are fully stocked sooner, and trees are free to grow and occupy sites. Fire suppression had kept the number of acres burned to a relatively small number. However, other mortality factors remained present and above background levels across the forest. Stand densities remained high and stands are susceptible to above baseline levels of mortality from insects and disease.

Data

This analysis quantifies tree mortality due to fire, insect, and disease related disturbances. Causes of tree mortality can vary depending on the type of insect or disease, geographic distribution of the affected area(s), and the types of plant species affected. Annual estimates of forested acres damaged by insect and disease are

carried out by the Pacific Northwest Region Aerial Detection Survey (ADS) program using observations from aircraft and other remote sensing technologies. ADS data have been collected annually for the Mt. Hood National Forest since 1947. More information can be found on the R6 Aerial Survey website[15].

Table 8. Fire information considered in tree mortality review.

Year	Number of Fires	Acres Burned
2013	71	2,573
2014	124	5,591
2015	96	109
2016	61	9
2017	74	23,312
2018	56	87
2019	69	16
2020	94	112,721
2021	41	22,043
2022	41	5
TOTAL	**727**	**166,467**
MEDIAN	**70**	**1,341**
AVERAGE	**72.7**	**16,647**

Table 9. Approximate acres affected by the top seven insect and disease disturbances from 2017-2022.[16]

Damage Causing Agent	2017	2018	2019	2021	2022	Annual mean acres
Fir Engraver	4,521	4,707	6,280	4,235	5,531	5,055
Balsam Woolly Adelgid	6,615	7,279	1,344	347	2,834	3,684
Western Pine Beetle	141	510	822	2,001	9,508	2,596
Winter Injury	4,380		30			2,205
Douglas-fir Beetle	319	2,040	753	755	642	902
IPS Engraver Beetles	916	373	959	751		750
Cytospora Canker	412	458	166			345
TOTAL	**17,304**	**15,366**	**10,353**	**8,089**	**18,516**	**15,536**

Monitoring Discussion, Findings, and Adaptive Management Considerations

The top seven agents damaged an average of 15,536 acres per year (approximately 1.5% of the total forest area) in a five-year reporting period. Fir engraver damaged the most acres per year on average across the previous five years of ADS data. Estimates of trees per acre affected by a disturbance were found to be unreliable and the ADS protocols were modified to replace trees per acre measurements with categorical severity levels. For this reason, tree count estimates of mortality are not included in the table as they have been in previous monitoring reports. ADS data is not collected for two years after a fire to avoid

[15] https://www.fs.usda.gov/detail/r6/forest-grasslandhealth/insects-diseases/?cid=stelprdb5286951

[16] The year 2020 is excluded from the table since the 2020 aerial survey was reduced due to the Covid-19 pandemic.

confounding delayed fire mortality with other damages so fire mortality is addressed separately in Table 8.

Forest pests caused overstory mortality events during the last five years which may have caused localized patches above the average observed pattern of growth and loss. The data shown in the table above are cited from the Annual Forest Insect and Disease Aerial Detection Survey (2019). The random placement of data plots across the forest should capture some of those site-specific differences. The rest of the Forest has incurred about 1-2 dead trees per acre, if that, over the last five years. Overall, 55,000 trees were killed on about 6,000 acres between 2014 and 2019.

Fires are another large contributor to tree mortality across the Forest. Within fire burned areas, tree mortality and the rate of mortality varies among different burned areas. Overall, the forest has had a median of 1,341 acres burned annually from 2013-2022. Note the large increase in acres burned in 2020. The results of this one fire year tripled the median acres burned from the previous reporting cycle (403 acres). Based on this information, active management could be focused on stand density reduction to reduce inter-tree competition, increase forest resilience to climate stressors and fire, increase resistance to pests, and reduce the size and intensity of wildfire.

Meeting the Desired Conditions and Objectives in the Plan

Growth and Productivity over Mortality

Is total growth and productivity exceeding mortality over all forest disturbances? Every five to ten years?

- The monitoring question is tracking the Forest Plan objective of long term sustained yield capability and timber growth since previous decade.
- Monitoring Indicators: Track growth, harvest, stocking, and mortality by land use allocation over time.

Data

The following growth and mortality averages were calculated from Forest Inventory and Analysis (FIA) data collected in non-wilderness areas on the Forest. The averages are for 2001-2009 and 2011-2019. FIA is a lagging indicator due to the ten-year remeasurement cycle. Significant mortality from 2020 wildfires will be captured in the FIA sample but will take time to fully be captured in monitoring data. Plot data were used to estimate growth and mortality for trees greater than four inches in diameter-at-breast-height (DBH). There were 199 forested plots with data and ten plots which were missing data. Data were simulated for the ten plots that were missing data. On average, in forested non-wilderness areas:

- Growth is measured at approximately 122 cubic feet per acre per year; and,
- Mortality is measured at approximately 52 cubic feet per acre per year.

Monitoring Discussion, Findings, and Adaptive Management Considerations

Forest health improvement projects increase tree growth rates, vigor, resistance to pests, resilience to fire, and reduce mortality rates within stands thereby leading to growth rates exceeding mortality rates. Reforestation allows growth rates to increase more quickly and realize a “fully stocked” stand. Vegetation project outcomes generally have reduced fuel loads, increased tree growth and vigor, reduced stand susceptibility to insect and disease outbreaks. Reforestation activities have increased stocking and growth within stands.

A change in management activities may be warranted to increase the pace and scale of vegetation management projects (i.e., thinning) so that tree growth rates can increase, and mortality rates decrease. A change may also be warranted for the Forest Plan to allow for projects to more easily comply with some standards and guidelines which routinely have exceptions or project-level amendments.

Rate of Harvest

What is the rate of harvest of stands available for timber management?

- The monitoring question is tracking the Forest Plan objective to produce a continuing supply of wood products, maintain an even flow of harvest, and provide a positive economic return to the government.
- Monitoring Indicator: Timber harvested by land allocation.

Monitoring Results

Harvest rates have fluctuated over time, and during the last decade the Forest has consistently awarded between 90% and over 100% of its annual volume target. The Forest was on its way to meeting its target in FY20 when, on September 8, 2020, the Labor Day Fires, including Riverside, Lionshead, and Beachie Creek Fires, burned onto the Forest. The final planned sale of 2020, Rail, was postponed because the Riverside Fire perimeter burned onto it. In FY21, the sale area was assessed and is now planned for sale in FY24.

Since then, a changed condition analysis (per Forest Service Handbook 1909.15, Chapter 30, Section 18) occurred for NEPA that covered active timber sales within these fire footprints in the Goat, North Clack Integrated, Hunter Integrated, Grove and Lemiti EAs. Of all active timber sales, including Goat Stewardship, Nanny Timber Sale and Gruff Timber Sale (all within the Goat EA), and Lake Timber Sale (within the Grove EA), were the most affected, with some of the units in North Clack EA receiving enough affects to make changes. Goat Stewardship's viable harvestable acres was reduced, whereas Nanny and Gruff were so severely burned that they were closed. Lake's remaining viable acres were also reduced, and although no timber sales have been awarded yet within the North Clack Integrated EA, there were a few units that were minorly affected, with one unit dropped.

Another factor contributing to the reduction in timber harvesting on the Forest over the past few years was the litigation of the Crystal Clear Restoration Project. Located on the east side of the Forest, the Decision Notice was signed in June 2018. The project would have contributed timber products over the next few years after it was signed, however, upon the ruling in the Ninth Circuit Court of Appeals in April 2020, this decision was withdrawn.

Monitoring Discussion, Findings, and Adaptive Management Considerations

In the past, the Clackamas River District has been relied upon to contribute much of the Forest's target. However, from mid-September 2020 to approximately mid-August 2022 most of the District was closed to the public, which put a halt to logging operations temporarily while planning focused on fire recovery, including the clean-up of roads and recreation sites affected by the Labor Day Fires.

With much of the timber land base on the Clackamas River District affected by fire, some with 100% mortality loss, coupled with land bases off limits to harvesting timber, such as Wilderness, the Forest will need to reconsider its strategy for identifying planning areas especially on the west side of the Forest because the current model of rotating from one planning area to the next may not be sustainable. Landscape-level analysis, which could include available land base, ecological considerations, road network, and concerns with wildfire are currently being discussed amongst program managers which may assist with identifying new planning areas.

Awarded Timber

How much timber is being awarded?

- The monitoring question is tracking the Forest Plan objective of producing a continuing supply of wood products, maintain an even flow of harvest and provide a positive economic return to the government.
- Monitoring Indicator: Awarded timber each fiscal year.

Monitoring Results

The Forest Plan identified an allowable sale quantity (ASQ) of 189 million board feet (MMBF) per year. The NWFP, which amended the Forest Plan, predicted a Probable Sale Quantity (PSQ) of 67 MMBF. In 1995, the PSQ level was adjusted downward to 64 MMBF to reflect the need to protect areas around spotted owl activity centers. Since then, there have been new wilderness designations that occurred in 2009, and in 2020 the Labor Day Fires, including Riverside Fire, affected much of the Forest's land base where timber harvest should occur. These two instances likely have reduced the Forest's PSQ (and ASQ), but at this time they have not been recalculated to reflect these changes.

In addition to PSQ, the Forest has an annual schedule of timber targets ultimately set by congressional appropriation. In August 2022, the Regional Forester sent a letter to all forests acknowledging that large-scale wildfires and litigation have impacted the Region's ability to deliver on expected timber volume, and what is required is "a more resilient workflow for planning and implementation associated with active management." With this in mind the Regional Forester made the decision to "establish an active management strategy for each Forest and the Region as a whole…which includes the requirement that each unit…maintain at least (three) years of NEPA shelf stock and one year of prep shelf stock…for commercial timber production at the designated FY26 achievement level." Known as the '3+1 strategy', the Forest, after analysis of its current condition, will be expected to meet a base target of 5 MMBF in FY23 and FY24, 10 MMBF in FY25, and the designated achievement level of 15 MMBF base target by FY26 onward. However, annual targets are not necessarily static, and things could change in the political environment. For example, there could be additional pressures to increase targets for the Region to deliver on expected timber volume, in which case the Forest's available NEPA shelf stock should be flexible enough to support meeting these unexpected changes to its base target.

In fiscal year 2020, the Forest awarded two Stewardship Sales (IRTCs), where the value of timber products is greater than the value of services, and one timber sale. Since the Labor Day Fires, the primary source of timber awarded has come from the disposal of material created from wildfire primary and contingency lines, and the abatement of danger trees along roads (Table 10). In addition to timber sales to support fire recovery cleanup, four additional sales are planned for advertisement and award in 2023, one of which is through the Good Neighbor Authority with the Oregon Department of Forestry. Two upcoming Integrated Resource Service Contracts (IRSCs), where the value of the timber product is less than the value of the total services and therefore must be supplemented with additional funds, are also planned in calendar year 2023. The way the IRSCs were designed is that timber material is not mandatory and will be subject to agreement. The awarded volumes are shown in Table 10.

Data

Table 10. Awarded timber each fiscal year.

Fiscal Year	Amount of Timber Awarded (MMBF)	% of Forest Target Achieved	% Stewardship
2020	23.6	66%	77%
2021	18.6[17]	n/a	n/a

[17] One timber sale, Plan, replaced the volume for another with the same name that was closed because of litigation with the Crystal Clear Restoration project. This replacement volume would not be counted towards timber awarded for the year.

Fiscal Year	Amount of Timber Awarded (MMBF)	% of Forest Target Achieved	% Stewardship
2022	8.4	n/a	64%[18]

Monitoring Discussion, Findings, and Adaptive Management Considerations

The Forest historically attempts to provide a mix of contract types that are either traditional timber sales or stewardship contracts. Much of the revenue generated from the stewardship contracting projects, i.e., IRTCs, is used to accomplish restoration projects such as fuel reduction activities, road maintenance, road decommissioning, fish passage projects, and wildlife habitat enhancement. Some projects are accomplished directly by the stewardship contractor, and some are funded by retained receipts generated by the project and the value of the timber removed. The last time the Forest awarded IRTCs was in FY20, and since then has been unable to put together such contracts as it focused on fire recovery the past few years.

It should be noted that timber sold from deck sales created from danger tree abatement are not considered in calculating a Forest's base target. Base targets include those from "green timber." Although the Forest is selling a percentage of its timber from fire recovery efforts, the volumes from these sales are not counted towards its base target.

The Forest has made regular progress on planning projects that authorize timber sales and stewardship contracts. Project planning is documented through the NEPA process, taking from one to three years with Environmental Analyses (EAs) and up to one year with CEs (Categorical Exclusions). Since the Labor Day Fires, the Forest has focused on fire recovery, with a reduction in planning for vegetation management projects especially on the westside of the Forest. Having said that, with the base targets assigned, the Forest should have sufficient NEPA shelf stock to meet the expected timber volume at least in the short term (Table 11).

Table 11. Completed planning efforts.

Name	District	Date Decision Signed
Hunter Integrated Resource (EA)	Clackamas	March 2018
Rocky Restoration (EA)	Barlow	February 2019
North Clack Integrated Resource (EA)	Clackamas	January 2020
Zigzag Integrated Resource (EA)	Zigzag	September 2021
South Fivemile Insect and Disease (CE)	Barlow	April 2022
Grasshopper Restoration (EA)	Barlow	January 2023
Gate Insect and Disease (CE)	Barlow	April 2023

The eastside of the Forest, which was affected by the White River Fire in 2020, was able to complete fire recovery planning and now continues to successfully produce insect and disease and fuel break CE projects and other EAs. Each CE generally covers fewer acres than an EA. Therefore, the CEs may not sustainably produce sufficient timber for harvesting over time. Also, these projects under CEs include fuels treatments which may not provide as much of a timber harvest component with the removal of nonmerchantable material through mechanical thinning or other means. The eastside of the Forest will continue to look for opportunities for projects that increase health and resiliency across larger landscapes, which may then contribute to increasing shelf stock.

[18] The one stewardship sale contributing to the amount of timber awarded was an Integrated Resource Service Contract (IRSC). The contract, which included danger tree abatement and a site preparation of a unit for reforestation, was supplemented with Fire Recovery Funds received in 2022 in order for the sale to be successful.

In the past three years the westside's interdisciplinary team has experienced changes to its members as some have moved on to other positions or retired. Key positions are now filled, but the team is relatively new and will need some time to learn how to work together and understand processes. Also, once elements of fire recovery efforts have been largely completed, the team can shift their focus on vegetation management projects to generate timber products.

One thing of note is that in January 2023 the Forest was designated a Wildfire Crisis Landscape or National Priority Landscape. The Forest has been tasked to implement fuels treatments to support the Forest Service's 10-year wildfire strategy. It is not currently clear how much this will contribute to annual timber targets. The two priorities of the Forest, meeting timber target and meeting fuel targets, may not necessarily complement each other in that fuel targets may not contribute to timber targets readily. Currently plans are being put together to create a new team which would focus on supporting the National Priority Landscape projects, which could relieve pressures on current interdisciplinary teams so that they can focus on other Forest priorities, including vegetation management projects.

Although no longer claimable towards target, the Forest's firewood program was affected by the COVID-19 pandemic and the closure of much of the Forest to the public because of the Labor Day Fires (Figure 10). During the pandemic it was difficult to offer permits to customers, and access was closed to potential firewood-collecting sites because of the large quantity of danger trees needing abatement along roads. With the re-opening of the Forest Service Road 46 and Highway 224 within the last year, much of the Clackamas River District has re-opened to the public. There are and will be many opportunities for offering both firewood for personal use and commercially for the next few years as nonmerchantable decked material and snags converting to down large woody debris become available.

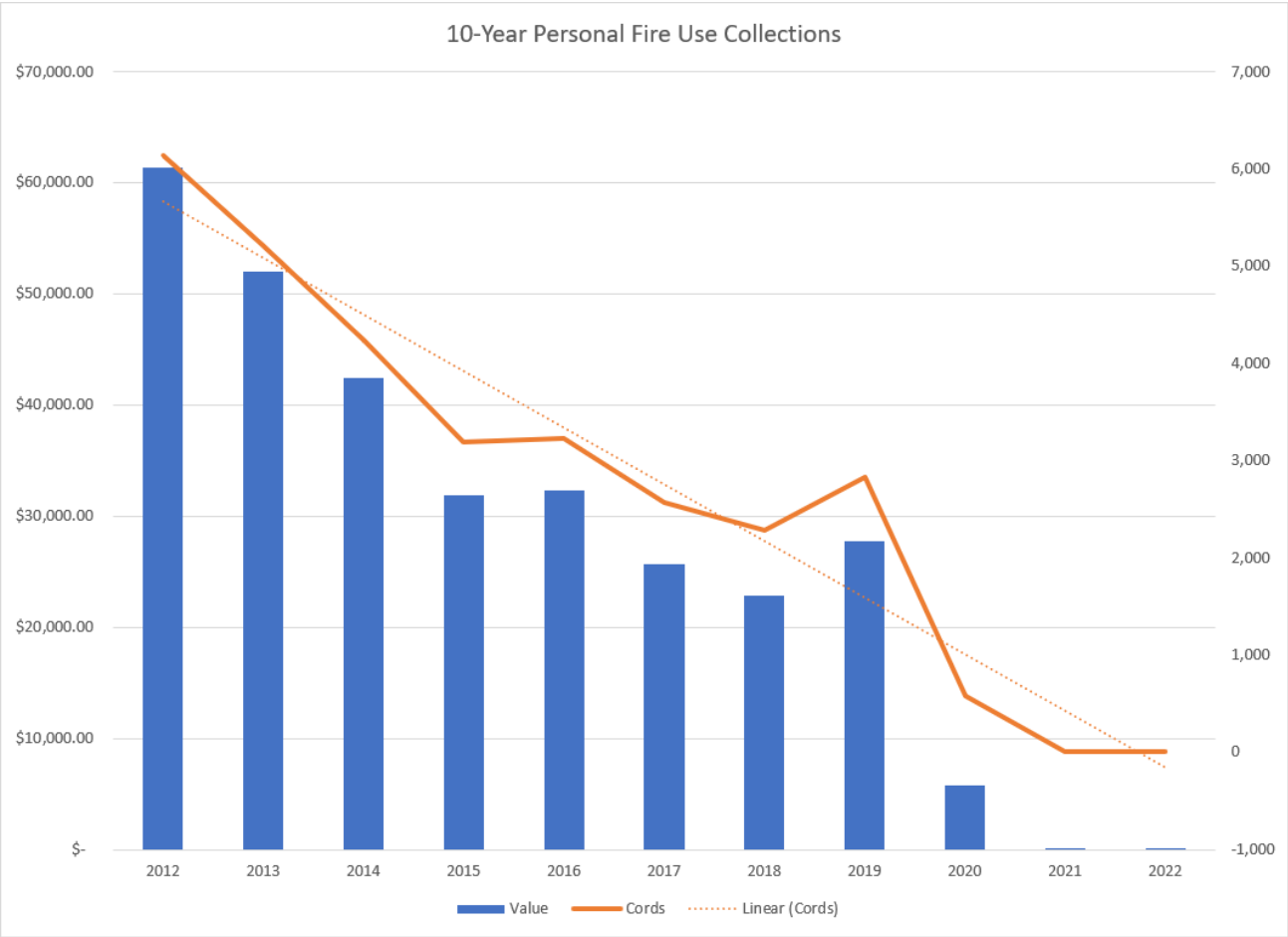

Figure 10. 10-year Personal Firewood Use. Charge-use, i.e., firewood collected with intentions of selling, experienced a similar trend.

Timber Land Base

Are there any changes in the land base available for producing timber?

- The monitoring question is tracking Forest Plan Desired Condition: Timber harvest comes from lands suitable for growing timber.
- Monitoring Indicator: Change in acres of land use allocations permitting timber harvest.

Monitoring Results

From 2020 to 2023 there were no changes to the land bases available for producing timber. The land base available for producing timber is defined within management area (MA) direction for each of the MAs that are described in the Forest Plan. Many of the MAs overlap one another. The information in this section is denoted by what would be defined as the dominant MA, even though other MA objectives may also be nested within the area. In some cases, the MA may cover a higher percentage than what Table 12 shows but in those cases the MA would not be the dominant MA, therefore those acreages are not displayed in this section. On the other hand, physical changes, previously discussed, as a result of large-scale wildfires have reduced the available land base for producing timber in the short term and for many decades to come.

Data

Approximate land base percentages for each of the Forest's MAs (Table 12) are based on the dominant MA status as described in the Forest Plan and as estimated from GIS spatial analysis. The table denotes which of those MAs have allowances for timber harvest activities. Percentages displayed in the table are approximates and were derived using GIS data systems.

Table 12. Land base percentages[19].

Management Area	Emphasis	% of Forest in MA	Timber Harvest Should Occur?[20]	Timber harvest may occur, but only when harvest supports MA goals, objectives, or desired future conditions.
A1	Wild Rivers (Outside of Wilderness) & Scenic and Recreational Rivers	1-4%	No	No (A1: Wild) Yes (B1: Scenic & Recreational)
A2	Wilderness	31%	No	No
A3	Research Natural Area	0%	No	No
A4	Special Interest Area	2%	No	Yes
A5	Unroaded Recreation	1%	No	Yes

[19] The data displayed in this table are considered approximates and are generated using spatial data systems (i.e., GIS). Note that some of the MAs round to 0% due to the minimal nature of the land base occupied; assuming less than one percent but greater than zero would be appropriate.

[20] Where 'Yes' is indicated, this would be the case where the MA overlaps Matrix. Where these MAs are overlapped by the NWFP's LSRs or Riparian Reserves, the answer in this column would be 'No', and the answer in the adjacent column would be 'Yes.'

Management Area	Emphasis	% of Forest in MA	Timber Harvest Should Occur?[27]	Timber harvest may occur, but only when harvest supports MA goals, objectives, or desired future conditions.
A6	Semi-Primitive Roaded Recreation	0%	No	Yes
A7	Special Old Growth	0%	No	Yes
A8	Not applicable			
A9	Key Site Riparian	1%	No	Yes
A10	Developed Recreation	0%	No	Yes
A11	Winter Recreation Areas	1%	No	Yes
A12	Outdoor Education Area	0%	No	Yes
A13	Bald Eagle Habitat Area	0%	No	Yes
B1	Wild Rivers (Outside of Wilderness) & Scenic and Recreational Rivers	1-4%	Yes	No (A1: Wild) Yes (B1: Scenic & Recreational)
B2	Scenic Viewshed	16%	Yes	Yes
B3	Roaded Recreation	1%	Yes	Yes
B4	Pine-Oak Habitat	2%	Yes	Yes
B5	Pileated Woodpecker/Pine Marten Habitat Area	0%	Yes	Yes
B6	Special Emphasis Watershed	10%	Yes	Yes
B7	General Riparian Area	Not Mapped	Yes	Yes
B8	Earthflow	3%	Yes	Yes
B9	Wildlife/Visual Area	0%	Yes	Yes
B10	Deer and Elk Winter Range	1%	Yes	Yes
B11	Deer and Elk Summer Range	1%	Yes	Yes
B12	Backcountry Lakes	0%	Yes	Yes
C1	Timber Emphasis	24%	Yes	Yes
D	Bull Run Watershed	9%	No	No
LSRs	Habitat for northern spotted owls and other dependent species	25%	No	Yes

Management Area	Emphasis	% of Forest in MA	Timber Harvest Should Occur?[27]	Timber harvest may occur, but only when harvest supports MA goals, objectives, or desired future conditions.
Riparian Reserves	Protection of streams and other aquatic resources	30%	No	Yes

In focusing on just the Management Areas where timber harvesting should occur (excluding those portions thereof that overlap with Wilderness or Wild and Scenic Rivers) roughly 10% of C1 and 20% of B land allocations were affected by the Labor Day Fires (Table 13). Estimated mortalities were taken from Rapid Assessment of Vegetation Condition (RAVG) data, which took a snapshot of tree canopy after the fires were considered out. When second order fire affects (insects and disease) are taken into consideration it is likely that those areas which experienced lower mortality rates as assessed with RAVG could likely have higher rates of mortality over time, especially after the "heat dome" experienced in June 2021.

Table 13. Affected Land Bases where Timber Harvest Should Occur

Management Area	% Mortality Tree Estimated	Acres Affected[30]	Total Acres in Management Area	% Management Area Affected
B1	>50%	125	968	13%
B2	>50%	3,327	89,124	4%
B3	>50%	352	5,577	6%
B6	>50%	9,155	59,040	16%
B8	>50%	1,847	14,179	13%
B10	>50%	587	7,621	8%
B11	>50%	325	8,923	4%
B12	>50%	14	1,908	1%
B1	<50%	320	968	33%
B2	<50%	5,129	89,124	6%
B3	<50%	570	5,577	10%
B6	<50%	5,775	59,040	10%
B8	<50%	8,023	14,179	57%
B10	<50%	1,356	7,621	18%
B11	<50%	340	8,923	4%
B12	<50%	363	1,908	19%
C1	>50%	11,249	249,397	5%
C1	<50%	13,680	249,397	5%

Monitoring Discussion, Findings, and Adaptive Management Considerations

The most recent changes to the Forest's MAs occurred in 2009 under the congressional action of the Omnibus Public Land Management Act, which designated three new wilderness areas, expanded existing wilderness areas, and designated nine new Wild, Scenic, and Recreational River corridors. Over 30 percent of the Forest is

designated wilderness.

The NWFP identifies approximately 40 percent of the Forest as "Matrix" lands. Within the total matrix allocation, approximately 14 percent of the Forest land base is "timber emphasis," wherein the primary objective is timber production. The remainder of matrix land that is outside of timber emphasis designation, the emphasis on vegetation management exists, however timber management is undertaken in these areas as a means to meet other (primary) resource objectives (e.g., scenic viewshed, deer and elk winder range, special emphasis watershed, etc.).

The Labor Day Fires have impacted parts of Management Areas where timber should be harvested. With as high as 100% mortality initially estimated when fires were considered out, and second-order fire affects experienced by surviving trees that are succumbing to mortality, these portions of affected Management Areas could have difficulty becoming reforested. If salvage operations were to occur on these land bases and reforestation were to occur naturally or artificially it would still take decades before they produce harvestable, merchantable material for the timber industry. The eastside of the Forest has been able to identify a location where the removal of dead trees is worthwhile in order to reforest artificially. Currently, on the westside of the Forest there are no plans for salvage operations on fire-affected management areas where timber should be harvested because of the need to re-open roads first for public safety. Salvage logging could be assessed once roads are opened. However, it will have been a few years since the fires occurred, and any dead trees, standing or down, could have deteriorated enough to be of little or no worth to the timber industry.

Based on this information, a change to the Forest Plan may be warranted regarding the designation of acres defined as suitable for timber harvest. A simple analysis of C1/Matrix lands may be a good starting point for understanding the remaining availability of timber emphasis land base.

Regeneration Requirements

Are we meeting the 5-year regeneration period required by the National Forest Management Act (NFMA)?

- The monitoring question is tracking Forest Plan Desired Condition: Areas harvested are adequately restocked within five years of final harvest (36 CFR §219.27), and Standards and Guidelines: FW-358, C1-019 through C1-021.
- Monitoring Indicator: Meeting stocking guidelines in the Forest Plan as tiered to the Forest Service Handbook.

Monitoring Discussion, Findings, and Adaptive Management Considerations

Reforestation activities have resulted in an increase in acres becoming fully restocked. This information was obtained from surveys for areas that have naturally regenerated to fully stocked levels, and areas where fully stocked status was obtained through both natural regeneration and plating. Events that reduce stocking below fully stocked as defined by the Forest Plan will continue to happen. The reforestation program is designed to identify and restock these areas using the best processes available. A change to the Forest Plan or to management activities is not recommended at this time.

Suitable Miles

How many miles are suitable for passenger cars and high clearance vehicles?

- The monitoring question is tracking the Forest Plan direction provide safe, efficient access for the movement of people and materials involved in the use and management of the Forest, and Standards and Guidelines: FW-419 and FW-420.
- Monitoring Indicators: Miles of road being maintained each year for all vehicles. Miles of roads providing safe access for use and management of the Forest.

Monitoring Results

Routine road maintenance activities, timber sales as well as partnerships and permits positively influenced the monitoring results. Maintenance activities occurred through:

- The annual road maintenance program;
- Permits and partnerships; and,
- Active timber sales.

The annual road maintenance program, timber sales, permits and partnerships performed necessary road maintenance to roads on the system to meet road maintenance objectives and provide more miles of safe access to the forest. Approximately 370 miles of road on the forest have an operational maintenance of level 3-5. Approximately 160 miles of road have received some road maintenance each year. These have activities have helped to move some road miles toward providing (or continuing to provide) safe access for use and management of the forest.

Many roads dependent on their position on the landscape, frequency of use, type of use and original construction require little to no maintenance yearly while still continuing to provide safe access for use and management. Based on available data in the monitoring results as well as other indicators, the Forest does not maintain enough road miles each year to maintain all operational maintenance level 3-5 roads (roads maintained for passenger cars) commensurate to their objectives and standards. Each year approximately 160 miles out of 370 miles of road are maintained for passenger vehicles. While not all roads need each maintenance activity provided yearly, for the purposes of this report we will assume that on average each road mile will need some form of maintenance every year to keep them at standard without accruing deferred maintenance. This would indicate that less than half of the roads or 43 percent identified for operational maintenance level 3-5 (maintained for passenger cars) are being maintained regularly to the given standard.

Monitoring Discussion, Findings, and Adaptive Management Considerations

It is necessary to increase the maintenance of the roads in the Forest Plan area to meet all standards of the maintenance level. Increasing the number of miles of road maintained in a given year will allow more roads to meet the Forest Plan standard and road management objectives. Increasing the number of miles maintained each year is not feasible given the current declining budget model, increasing occurrence of deferred maintenance on roads, and increasing road maintenance costs.

The miles of road being maintained each year is less than half the number of miles of maintenance level 3-5 roads designated on the Forest. Some of these road miles are repeat maintenance each year and the indicator does not take into account for repeat maintenance. Tracking maintenance more closely will allow us to track the progress more precisely. While road maintenance is an iterative process, it is important to perform necessary maintenance yearly or we will not progress as necessary. The Forest Plan describes that we are to base the construction, reconstruction, and maintenance on the management objectives of the road. The indicators for this monitoring report demonstrate that we do not meet the standard of the maintenance required. As budgets decline, the number of miles maintained to standard may also decrease. Declining budgets, accumulation of deferred maintenance and increasing costs of road maintenance may be the reasons we are not progressing or trending in a positive direction towards maintaining all road miles to their standard. As we continue to make decisions which convert road maintenance levels to a lower operational maintenance level standard, we may see some improvement in the percentage of roads maintained for passenger cars. As we approach the minimum level of roads needed to meet safe and efficient travel and management of the forest, we may have less opportunity to reduce maintenance levels and remove roads from the system.

A change to the Forest Plan is not recommended at this time. Forest Plan standard FW-420 states that all arterial and collector routes need to be maintained for low clearance vehicles. Some collector routes are more valuable and have a greater use than others. It may be useful to define a different standard for the design vehicle to allow maintenance to be applied to more valuable routes based on other factors. More information would be necessary to inform decisions for this factor. If this change was determined warranted, this may allow us to focus maintenance for passenger cars on certain roads and reduce the operational maintenance levels on other roads that have a more limited use.

Travel Management

Are road management activities being implemented in accordance with the latest access and travel management direction?

- The monitoring question is tracking Forest Plan Standards and Guidelines: FW-419 through FW-424.
- Monitoring Indicators: Miles of road converted into desired maintenance level and/or that have achieved the road management objectives.

Monitoring Results

The following list of management projects over the period of this monitoring report resulted in decisions that would (upon implementation) convert more miles of road into the desired maintenance level as well as making progress towards the latest travel management direction. Table 14 summarizes the approximate miles of road that were changed to a decommissioned or closed status. These projects also allowed the interdisciplinary team to take a hard look at recommendations from the Travel Analysis Report[21] (TAR) and moved more roads towards the road management guidance identified from that report.

- Forest planning/vegetation management projects:
    - Polallie Cooper Hazardous Fuels Reduction
    - Hunter Integrated Resource Project
    - Crystal Clear Restoration
    - North Clack Integrated Resource Project

Table 14. Approximate miles of closed and decommissioned roads.

Miles	Status Update	TAR Likely Needed
2	Decommission	No
7	Decommission	Yes
1	Closure(storage)	No
49	Closure(storage)	Yes

Monitoring Discussion, Findings, and Adaptive Management Considerations

A change to forest management activities may be warranted. While there has been progress toward the desired maintenance levels and recommendations of the TAR, it is an iterative process, and we have more progress to make. Changes to the road system are considered each time we enter a planning area and those changes would likely bring us closer to the desired future condition for a minimum road system. While decisions have been made, not all decisions made have completed implemented. Implementing more or all of the decisions made during the same year or following year as the decision is signed would bring us closer to our desired management objective conditions on the ground. Although it would be helpful, implementing in that way would require significantly more funding which is not available at this time.

The Forest is trending in a positive direction towards meeting the goals and desired outcomes of system road management. Miles of road are being converted and objective maintenance levels are progressing towards the desired future condition. The Forest continues decommission roads and is moving towards an effective and affordably sustainable transportation system.

[21] fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd486512.pdf

Management Systems and Productive Capacity of the Land

Productive Capacity of the Land

Are management activities being implemented so that they do not substantially and permanently impair the productive capacity of the land?

- The monitoring question is tracking Forest Plan Standards and Guidelines: FW- 022 through FW-038.
- Monitoring Indicator: Extent of detrimental soil disturbance in an activity unit.

Monitoring Results

The COVID epidemic and the large fires of 2020 disrupted monitoring schedules between 2020 and 2022. Fire recovery became a priority, which diminished capacity and relegated soil condition monitoring to a secondary priority. The result was a smaller sampling set compared to previous monitoring periods.

BMP monitoring was conducted on three activity units where ground-based mechanical treatments occurred. Although the BMP monitoring is intended to evaluate the effects to water resources, the extent of ground impacts on soils can be assessed simultaneously for these types of activity.

Two of the monitoring sites were located on the east side of the Forest and the other was on the west side (Ashes-Caldera, Badger, Buck contract areas). Monitoring concluded that the extent of detrimental soil conditions had been limited to less than 15 percent at all three sites. Contract administrators had used contractual clauses to keep the footprint of the primary trails and landings limited in size and extent. They also ensured that a portion of those surfaces were water-barred and covered with a protective layer of slash afterward.

Soil condition monitoring using the Forest Soils Disturbance Monitoring (FSDM) protocol did not take place during the monitoring period. In comparison, this type of monitoring was conducted at ten sites across the Forest between 2017 and 2019. In the future the goal is to resume FSDM back to our former capacity.

Restorative actions aimed at enhancing or restoring the productive capacity of the land, along with measures to protect it, happen on an annual basis on the Forest. The Forest has a target of at least 3,100 acres to restore degraded areas or to enhance and maintain existing soil productivity on selected sites every year. The Forest met that target in 2020, fell short in 2021, and exceeded it in 2022. Over the combined monitoring period however, the accomplishment achieved 105 percent of the total three-year target by enhancing and restoring soil productivity on about 9,775 acres.

This work included reforestation, invasive weed treatments, riparian planting, seeding, erosion control, precommercial thinning, dispersed campground rehabilitation, repair of user-created OHV trails, and aquatic restoration. Nearly half of this restoration acreage occurred within burn scars. More is expected in the burned over areas in future years. Exceeding the assigned target can be attributed primarily to successes in securing partnership funds and retained receipts.

Data

The Forest conducts BMP monitoring annually and soil condition monitoring semi-annually to determine if ground disturbing activities are impairing the productive capacity of the land. Additionally, individual sites are identified where the intensity of effects resulting from human use and disturbance has been high.

The Forest Plan directs detrimental effects to soils from ground disturbing activities be minimized, and that soil productivity be protected, maintained, or restored. BMPs and PDC are defined and prescribed during planning phases of a project to limit the extent of detrimental soil impacts. Projects to enhance and restore soil and site productivity are planned and implemented every year too. They come in a variety of activities and occur at sites across the Forest.

Results of BMP monitoring are recorded in a national corporate database every year. Soil condition monitoring is voluntarily conducted by individual soil specialists, typically every other year. Results are

sometimes entered into a database maintained by the Forest Service research branch. Data are also managed and stored locally. The results of soil restoration accomplishments are also entered annually into several primary corporate data systems that are managed nationally by the Washington Office.

Monitoring Discussion, Findings, and Adaptive Management Considerations

The monitoring that occurred from 2020 to 2022 indicated that soil productivity standards and guidelines were met at the sample sites. However, the sample size was not suitable enough to offer a confident representation of overall achievement of Forest Plan objectives for productive capacity. In contrast to this low monitoring performance, the acres of soil restoration that the Forest achieved exceeded its combined planned target. A lot of work was accomplished over the three-year period, which is illustrative of the Forest's commitment to restoring and maintaining the productive capacity of the land.

Complementary to those accomplishments was the planning for future treatments to restore and maintain productivity. A decision signed in 2021 authorizes the reforestation of tens of thousands of acres that burned over in the 2020 wildfires. Tree planting in riparian corridors along many miles of rivers and streams impacted by the fires was also planned. Agreements with the Oregon Department of Agriculture through their county affiliates were renewed and the funding secured to treat invasive plants on hundreds of acres. Native grass seed mixes were ordered and bought for application to denuded and disturbed areas and at aquatic restoration project sites. Contracts were prepared to implement roadside erosion control projects using wood shred generated by the grinding of post-fire slash. Several hundred cubic yards of a soil amendment in the form of biochar was created using an air curtain burner, which was hired to augment slash disposal. This material is intended for use to enhance soil quality at degraded sites.

Additionally, measures to minimize impacts to soil resources were prescribed as standard elements of project planning. BMPs recommended in the form of project design criteria were prescribed in planning across the Forest aimed at addressing forest health, timber stand improvements, forest management, special uses, facility upgrades, road improvement, recreation projects, and danger tree abatement.

Conclusion

As the Forest maintains a focus on long-term outcomes of management with respect to key social, economic and ecological systems, the following recommendations are a result of this monitoring report. Monitoring suggests that forest management activities are being conducted in a manner that meets the Forest Plan desired conditions, goals, objectives and standards and guidelines for most areas (Table 1). However, monitoring data suggests the forest is in a declining trend for early seral habitat type for deer and elk even though some vegetation management projects include the creation and enhancement of forage at a small scale. A change in management strategy at the project and landscape level is recommended for these species. In an effort to see a positive trend for deer and elk habitat, it is recommended that future projects should incorporate big game forage enhancement opportunities to a greater extent. On trend with recommendations related to management activities, mortality at the stand-level would benefit from increased pace-and scale vegetation treatments because reducing inter-tree competition would generally increase forest resilience and resistance to pests, as well as reduce size and intensity of wildfire. To facilitate such actions, it is also recommended to increase the number of projects the Forest analyzes and implements where the driving purpose and need of the project is related to providing forest products in addition to continuing beneficial integrated resource work. Monitoring results also show recommendations for the Forest to increase internal engagement between soil specialists and project contract administrators to benefit soil inventory and planning.

While the Forest is actively participating in applying Environmental Analysis and Decision Making (EADM) towards gaining efficiencies, the recommendations in management activities would also be connected to realizing improvements in the Forest's planning processes under the NEPA. Newly enacted NEPA regulations from the CEQ will be applied to future planning projects on the Forest.

Monitoring the amount of timber awarded each year resulted in two recommendations to change or update the Forest Plan: 1) PSQ; and 2) acres classified as suitable timber for harvest. Currently, the Forest has an annual awarded timber volume that is about half of the PSQ identified in the Forest Plan. Thirty years of amendments to the Forest Plan have not resulted in updates to the calculations of the acres that are considered suitable for timber harvest. Having a better understanding of suitable timber harvest acres would

likely benefit many aspects of land management decision making.

Transportation system monitoring resulted in a recommendation to update FW-420 so that roads are maintained in a more efficient and practical manner. Changing this standard would likely reduce costs and time spent on maintaining roads that hold a classification level for which they are not utilized.

Additional monitoring is needed before recommendations can be made regarding the populations of the Oregon spotted frog at Camas Prairie. A new low count of egg masses was documented in 2019. However, it is suspected that the egg mass counts are highly correlated to cyclical water year fluctuations. More investigation is needed to ensure accuracy of the suspected correlation. Current efforts are underway to better understand the hydrology of Camas Prairie to assess if habitat is becoming less suitable for Oregon spotted frogs. Development of a site management plan may be necessary.

The Forest will continue its commitment to monitor and evaluate the effectiveness of our management actions. This process will continue to allow the Forest Plan to remain an active, relevant, usable document.

Appendix A: Monitoring Program Matrix

Plan Component	Monitoring Question	Indicator(s)
I) The status of select watershed conditions.		
Standards and Guidelines: FW-055 to FW-058 NWFP Standards and Guidelines: Aquatic Conservation Strategy, General Monitoring Objective (1).	Have Best Management Practices (BMPs) been implemented and are they effective at managing water quality consistent with the Clean Water Act?	U.S. Forest Service National BMP Annual Monitoring Protocols.
II) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.		
Standards and Guidelines: FW-137 NWFP Standards and Guidelines: Riparian Reserves & Aquatic Conservation Strategy	Are Standards and Guidelines effective in maintaining or enhancing fish habitat capability?	Number of stream miles currently occupied by representative fish species (i.e., steelhead, chinook, coho, and bull trout).
NWFP Standards and Guidelines: Survey and Manage Species.	Are habitat improvement projects contributing to the persistence of Survey and Manage species?	Acres of habitat enhanced for Survey and Manage species.
Standards and Guidelines: FW-375 to FW-377, FW-384, Forest Plan Amendments #13 and #15.	Are known populations of invasive species continuing to spread? Are new infestations occurring?	Acres of surveyed lands with new and active invasive species infestations. Acres treated for invasive species.
Standards and Guidelines: FW-001 to FW-021, B8-001 to B8-055.	Are projects designed to prevent reactivation or acceleration of landslides, debris slides, debris flows, and earthflow areas?	Description of projects that are near landslides, debris slides, debris flows, and earthflow areas and how the projects affect stability.
III) The status of focal species to assess the ecological conditions required under §219.9.		
Desired Condition: Habitat is managed for the pileated woodpecker.	What is the trend for mature and late-successional habitat needed for pileated woodpecker persistence?	Acres of late-successional and old growth habitat on the Forest tracked over time.
Desired Condition: Habitat is managed for the American pine marten.	What is the trend for mature and late-successional habitat above 3500 feet needed for American marten persistence?	Acres of late-successional and old growth habitat above 3500 feet elevation on the Forest tracked over time.
Desired Condition: Habitat is managed for other wildlife species represented by the named management indicator species.	What is the trend for oak pine habitat needed for gray squirrel persistence?	Acres of oak pine habitat tracked over time.

Plan Component	Monitoring Question	Indicator(s)
Desired Condition: Habitat is managed for other wildlife species represented by the named management indicator species.	What is the trend for early-seral habitat needed for deer and elk persistence?	Acres of early-seral habitat tracked over time.
IV) The status of a select set of the ecological conditions required under §219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.		
Standards and Guidelines: FW-139 to FW-147 NWFP Standards and Guidelines: Riparian Reserves & Aquatic Conservation Strategy.	Are Standards and Guidelines effective in maintaining or enhancing aquatic habitat complexity?	Number of stream miles currently occupied by Endangered Species Act listed fish species (i.e., steelhead, chinook, coho, and bull trout).
NWFP Standards and Guidelines: Late-Successional Reserves.	What is the trend for mature and late-successional habitat needed for northern spotted owl recovery?	Acres of late-successional and old growth habitat on the Forest tracked over time.
Standards and Guidelines: FW-175.	What is the trend for Oregon Spotted Frog populations at Camas Prairie?	Tracking visual encounter surveys over time.
V) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.		
Standards and Guidelines: FW-622, FW-624.	Are significant (National Register eligible) historic properties being maintained, stabilized, and repaired according to historic preservation standards?	Monitoring data and/or site condition assessments.
Desired Condition: There are five Wilderness areas on the Forest that will provide primitive recreation opportunities along with scenic, historical and ecological experiences. Standards and Guidelines: A2-005 to A2-035, A2-048 to A2-050.	Are the physical/biological, managerial, and social settings of each Wilderness Resource Spectrum (WRS) maintained consistent with the standards for wilderness management?	Wilderness Performance Program Score Card – 10 elements associated with wilderness stewardship will be selected[1].

[1] The WSP framework contains four mandatory elements (agency management actions, workforce capacity, education, and wilderness character baseline) and the will select six other elements from a list of 15: Invasive Species; Air Quality Values; Natural Quality of Wilderness Character; Natural Role of Fire; Water; Fish and Wildlife; Recreation Sites; Trails; Non-Compliant Infrastructure; Motorized Equipment / Mechanical Transport Use Authorizations; Agency Management Actions; Opportunities for Solitude; Opportunities for Primitive and Unconfined Recreation; Cultural Resources;

Plan Component	Monitoring Question	Indicator(s)
Desired condition: Activities such as hunting, sightseeing, off-road vehicle use, dispersed camping, cross-country skiing, and fishing are typical.	Has the Off-Highway Vehicle Record of Decision 2010 been implemented?	Development and designation of designated trails in INFRA Roads and Trails databases.
Desired condition: Outdoor recreation opportunities on the Forest are available in a variety of settings. Opportunities for dispersed recreation in a roaded setting are plentiful. Activities such as hunting, sightseeing, ORV use, dispersed camping, cross-country skiing, and fishing are typical. Opportunities for dispersed recreation in unroaded areas are less plentiful.	Are people having a high level of satisfaction during their visit to Mt. Hood National Forest?	Percent visitor satisfaction for (1) developed sites, (2) general areas, and (3) designated wilderness.
VI) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.		
Desired Condition: The Bull Run continues to be managed for high quality water. Standards and Guidelines: FW-054-060, 078-079, 84, 130 FW-071, D-001 to D-021.	Is the production of pure, clear, raw, potable water being sustained for municipal use?	Changes in the quality and quantity of sustainable, municipal water supply.
Standards and Guidelines: FW-381 to FW-383.	What are the current tree mortality rates and patterns across the Forest?	Detectable acres of high tree mortality.
VII) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.		
Objective: Long term sustained yield capacity and timber growth since previous decade.	Is total growth and productivity exceeding mortality over all forest disturbances? Every five to ten years?	Track growth, harvest, stocking, and mortality by land use allocation over time.
Objective: Produce a continuing supply of wood products, maintain an even flow of harvest and provide a positive economic return to the government.	What is the rate of harvest of stands available for timber management?	Acres of timber harvested by land allocation.
	How much timber is being awarded?	Awarded timber each fiscal year.

Livestock Grazing; Outfitters and Guides; Other Special Provisions (e.g., dams, airstrips, mines); Workforce Capacity; Education; and, Wilderness Character Baseline.

Plan Component	Monitoring Question	Indicator(s)
Desired Condition: Timber harvest comes from lands suitable for growing timber.	Are there any changes in the land base available for producing timber?	Change in acres of land use allocations permitting timber harvest.
Desired Condition: Areas harvested are adequately restocked within five years of final harvest (36 CFR 219.27). Standards and Guidelines: FW-358, C1-019 to C1-021.	Are we meeting the 5-year regeneration period required by the National Forest Management Act?	Meeting stocking guidelines in Forest Plan as tiered to Forest Service Handbook.
Goal: Provide safe, efficient access for the movement of people and materials involved in the use and management of the Forest. Standards and Guidelines: FW-419, FW-420.	How many miles are suitable for passenger cars and high clearance vehicles?	Miles of road being maintained each year for all vehicles. Miles of roads providing safe access for use and management of the Forest.
Standards and Guidelines: FW-419 to FW-424.	Are road management activities being implemented in accordance with the latest access and travel management direction?	Miles of road converted into desired maintenance level and/or that have achieved the road management objectives.
VIII) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land (16 U.S.C. 1604(g)(3)(C)).		
Standards and Guidelines: FW-022 to FW-038.	Are management activities being implemented so that they do not substantially and permanently impair the productive capacity of the land?	Extent of detrimental soil disturbance in an activity unit.

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