United States Department of Agriculture

USDA

Biennial Monitoring and Evaluation Report

Fiscal Years 2016 - 2017

Willamette National Forest

Detroit Ranger District

McKenzie Ranger District

Middle Fork Ranger District

Sweet Home Ranger District

for the greatest good

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Cover Photo: Crescent Mountain Trail-Photo by Joanie Schmidgall

Contents

Introduction

Purpose

The purpose of the biennial monitoring evaluation report (BMER) is to help the responsible official determine whether a change is needed in the Willamette National Forest Land and Resource Management Plan (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 this national forest unit, the Willamette National Forest (the Forest). The biennial monitoring evaluation report is not a decision document—it evaluates monitoring questions and indicators presented in the Plan Monitoring Program chapter of the Forest Plan, in relation to management actions carried out in the plan area. The Forest Monitoring Program was recently updated in response to the 2012 National Forest System Land Management Planning Rule (Planning Rule). The Planning Rule stated, "Where a 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 plan 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 started updating its monitoring program in August of 2015 and completed the updates in 2017. These updates were reflected in the 2014-2015 biennial report. 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.

Monitoring and evaluation are continuous learning tools that form the backbone of adaptive management. For this reason, the Forest will produce an evaluation report every two years. This is our second written report of this evaluation since the Forest's change to the monitoring program that was finalized in March 2017. This report indicates whether a change to the Forest Plan, management activities, monitoring program or forest assessment may be needed based on the new information. The 2016 through 2017 biennial monitoring report for the Forest is also available on our website at https://www.fs.usda.gov/detail/willamette/landmanagement/?cid=fse_030883

How the Plan Monitoring Program Works

Monitoring and evaluation requirements have been established through the National Forest Management Act (NFMA) at 36 CFR 219. Additional direction is provided by the Forest Service in Chapter 30 – Monitoring – of the Land Management Handbook (FSH 1909.12).

The Willamette National Forest Plan Monitoring Program (PMP) was updated in August 2015 further refined in March of 2017 for consistency with the 2012 planning regulations [36 CFR 219.12 (c) (1)]. The Willamette National Forest Land Management Plan was administratively changed to include the updated plan monitoring program. For a copy of the current monitoring program go to https://origin-fs.fs.usda.gov/main/willamette/landmanagement/planning. Monitoring questions and indicators were selected to inform the management of resources on the plan area and not every plan component was determined necessary to track [36 CFR 219.12(a)(2)].

Monitoring Activities

Monitoring questions focus on providing necessary information to evaluate effectiveness of plan components and land management in maintaining or achieving progress towards desired conditions and objectives of the 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 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:

i. **The status of select watershed conditions.**
ii. **The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.**
iii. **The status of focal species to assess the ecological conditions required under 219.9.**
iv. **The status of a select set of 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.**

v. **The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.**
vi. **Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.**
vii. **Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.**
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)).**

The biennial monitoring evaluation report represents one part of the Forest Service's overall monitoring program for this national forest unit, the Willamette National Forest (the Forest). The biennial monitoring evaluation report is not a decision document—it evaluates monitoring questions and indicators presented in the Plan Monitoring Program chapter of the Forest Plan, in relation to management actions carried out in the plan area. 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.

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This 2016 through 2017 biennial monitoring report will address all of the monitoring program questions and considerations and serve as a baseline for subsequent biennial monitoring reports. 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 (2016 through 2017), and have had their associated discussions updated in the next section of this report.

Each section describes the details that would support the recommendation options if applicable. 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) an adaptive management finding on whether recommendation options could be considered for future changes or not; the forest plan 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).

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

Monitoring Objectives

There are several objectives for this report, including:

- Assess the current condition (i.e., status) and trend of selected forest resources.
- Document implementation of the Plan monitoring Program including changed conditions or status of key characteristics used to assess accomplishments and progress toward achievement of the selected Land and Resource Management Plan components.
- Evaluate relevant assumptions, changed conditions, management effectiveness, and progress towards achieving the selected desired conditions, objectives, and goals described in the Forest Plan
- Assess the status of previous recommended options for change based on previous monitoring & evaluation reports.
- Document any scheduled monitoring actions that have not been completed and the reasons and rationale why it has not.
- Present any new information not outlined in the current plan monitoring program that is relevant to the evaluation of the selected monitoring questions.
- Incorporate broader scale monitoring information from the Regional Broader Scale Monitoring Strategy that is relevant to the understanding of the selected monitoring question.
- Present recommended change opportunities to the responsible official.

Monitoring Results Summary

The information presented in this monitoring report is summarized in the following table. 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. There are resources for which monitoring was conducted that may suggest a recommendation for changes to monitoring questions and indices. First, question ii.a. has a recommendation of changing the monitoring question to the following: How are aquatic restoration efforts improving aquatic processes as directed by the Aquatic Conservation Strategy Objectives? Second, question v.a. has a recommendation of changing the monitoring question to the following: Is the Forest conducting inventories and protecting sites and are they being maintained, stabilized and repaired into preservation and condition assessments? Finally, question iv.c. has a recommendation of changing the indices to the implementation of monitoring Recovery Action 10 and Recovery Action 32. Questions ii.c. and iv.e which do not need a change to the questions, indices, or the Forest Plan need additional funding to more accurately implement.

Monitoring Item	Do monitoring results demonstrate intended progress or trend toward 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?
i.a. Are Standards & Guidelines maintaining or improving watershed conditions?	Yes	No	No Changes Recommended.
i.b. Have Best Management Practices been implemented and are	Yes	No	No Changes Recommended.

Monitoring Item	Do monitoring results demonstrate intended progress or trend toward 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?
effective at managing water quality consistent with the Clean Water Act?			
ii.a. Are S&Gs maintaining or decreasing the spread of aquatic invasive species?	No	Yes	Possible change to the monitoring question. See Aquatic Invasive Section.
ii.b. Are S&Gs maintaining or improving aquatic habitat (instream, lake, and riparian areas)?	Yes	No	No Changes Recommended.
ii.c. Are project contributing to the persistence of botanical Survey and Manage species?	We have begun to monitor persistence of S&M fungi with Regional Office funds, other species groups unknown	Unknown, too early or no data	Funding for monitoring would enable us to state status of S&M species and whether PDCs meant to protect them are being carried from planning to implementation.
ii.d. Are known populations of invasive plants continuing to spread? Are new infestations occurring?	No, during this time, all new invader weed populations are being treated. Many are being significantly reduced and all are being contained.	No	No Changes Recommended.
iii.a. What is the trend for the mature and late successional habitat above 4000' elevation needed for marten persistence on the Willamette?	Interval of data collection is beyond this reporting cycle.	No	No Changes Recommended.
iii.b. What is the trend for mature and late successional habitat needed for pileated woodpecker persistence on the Willamette?	Interval of data collection is beyond this reporting cycle.	No	No Changes Recommended.
iii.c. What is the trend in elk habitat condition and elk hunting levels and success?	No	No	No Changes Recommended.
iii.d. Are S&Gs maintaining or improving focal fish species?	Yes	No	Winter Steelhead appear to be declining but this is most likely due to impacts outside of the Forest's control.
iv.a. Are S&Gs maintaining or improving	Yes	No	No Changes Recommended.

Monitoring Item	Do monitoring results demonstrate intended progress or trend toward 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?
ecological conditions for T&E species?			
iv.b. What is the trend for mature and late successional habitat needed for Northern spotted owl persistence?	Yes	No	No Changes Recommended.
iv.c. What is the trend for the Northern spotted owl population?	No	Yes	Consider changing monitoring indices with implementation of Recovery Actions 10 and 32. See Northern spotted owl section.
iv.d. What is the trend for Oregon spotted frog populations on the Forest?	Interval of data collection is beyond this reporting cycle.	No	No Changes Recommended.
iv.e. What are the trends for botanical Sensitive Species? Are any species we are monitoring on the decline? If so, have management actions been taken to restore their habitats?	Yes, there are some species in decline. Some management actions have been taken but many not a Regional Priority species and don't qualify for Regional funding.	No	No changes to the Forest Plan or Monitoring questions are recommended. However, Forest Plan management activities fund more habitat enhancement projects.
v.a. Are significant (National Register eligible) historic properties being maintained, stabilized, and repaired according to historic preservation standards?	No. Methods/results are inadequate to answer monitoring questions.	Yes	Need to slightly change the monitoring question. See Cultural Resources for more information.
v.b. Are people having a high level of satisfaction during their visit to Willamette National Forest?	Yes	No	No Changes Recommended.
vi.a. Is the forest reporting and meeting expected adaptations as reported on the national Climate Scorecard?	Yes	No	No Changes Recommended.
vi.b. Is insect and disease below potentially damaging levels?	Yes	No	No Changes Recommended.
vii.a. Are management activity created fuels at acceptable ranges for downed woody material as indicated in Table IV-	Yes	No	No Changes Recommended.

Monitoring Item	Do monitoring results demonstrate intended progress or trend toward 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?
32, on 95% of the affected ac res?			
vii.b. How do timber output estimates in the Forest Plan compare with actual production?	Yes	No	No Changes Recommended.
vii.c. Are we meeting the recommended stocking levels and timeframes required by the National Forest Management Act (NFMA)?	Yes	No	No Changes Recommended.
vii.d. How ecologically sustainable is the level of timber harvest on the forest?	Yes	No	No Changes Recommended.
viii.a. Are Management activities being implemented so that they do not substantially and permanently affect soil conditions?	Yes	No	No Changes Recommended.

Roles and Responsibilities

The Forest Plan 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. Tracy Beck, Willamette National Forest, Forest Supervisor, is the responsible official to whom the recommendations from the report will be provided. He will review this BMER to determine what actions will be needed immediately with respect to recommendations in the report, public comments given and in anticipation of upcoming forest plan revision. This biennial monitoring report was respectfully prepared by an interdisciplinary team of the following Forest Program Managers and resource specialists:

- James Rudisill, Forest Silviculturist;
- Joe Doerr, Forest Wildlife Biologist;
- Jenny Lippert, Forest Botanist;
- Chris Donaldson, Fire Planner;
- Cheryl Friesen, Science Liaison;
- Johan Hogervorst, Forest Hydrologist;
- Wendy Peterman, Soil Scientist;
- Jason McInteer, Forest Archeologist & Tribal Liaison;
- Matt Peterman, Asst. Recreation Staff Officer;
- Tim Lahey, Forest Products Program Manager;
- Allen Hambrick, Asst. Forest Environmental Coordinator;
- Suzanne Schindler, Forest Environmental Coordinator

The Importance of Public Participation

We informed the public of the availability of the 2016-2017 biennial monitoring report for the Willamette National Forest in March 2020. This was posted on the Willamette National Forest website and by mailing a letter through the Gov Delivery system to all the public and interest groups that are subscribers to the forest project subscribers list.

A draft Forest Plan monitoring program was shared with the public in August 2015 for a 30-day comment period. The Forest received only one letter from the public that did not propose any changes. The Forest informed the public that we would begin to prepare our first monitoring report under the new program for years 2014 and 2015. In February of 2017 there were additional refinements made to the monitoring program that would be reflected in the 2014 and 2015 report. A letter was sent to the public in March of 2017 informing the public of changes made to the monitoring questions. No letters were received in response. The forest welcomes your continued involvement and any thoughts you may have to improve our monitoring in the future. Under the new 2012 Planning Rule improving our monitoring program is simpler.

This monitoring report is available to the public through our Forest website https://www.fs.usda.gov/detail/willamette/landmanagement/?cid=fse_030883. The Forest welcomes feedback from the public in regards to this newer monitoring report that will help ensure the public participation process in the effectiveness of the new monitoring program and what the resulting information suggests from a land management perspective.

Forest Supervisor's Certification

This report documents the results of monitoring activities that occurred through Fiscal Year 2017 on the Willamette National Forest. Monitoring on some topics is long-term and evaluation of those data will occur later in time.

I have evaluated the monitoring and evaluation results presented in this report. I have examined the recommended changes to the 1990 Land Management Plan, as amended at this time. I consider the 1990 Land Management Plan sufficient to continue to guide land and resource management of the Willamette National Forest for the near future. A deeper examination of the recommended changes through engagement with resource specialists and the public will occur once we determine that the status and trends of the monitoring items warrant a deeper dive.

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Tracy Beck

Forest Supervisor

Date: 03/03/2020

Watershed Conditions

The Forest Standards and Guidelines provide direction to enable the Forest to meet the goals of maintaining and improving water quality, soil productivity, and air quality. Forest plans are also required to include direction to maintain and restore the ecological integrity of riparian areas. The 2012 planning rule includes a strong set of requirements associated with maintaining and restoring watersheds and aquatic ecosystems, water resources, and riparian areas in the plan area. We have focused our monitoring strategy on priority watersheds that require restoration of structure, function, composition, and connectivity of aquatic ecosystems and watersheds.

(i) The status of select watershed conditions.

Table 1 Monitoring sub-questions addressing status of select watershed conditions

	Monitoring Question	Indicator(s)	Monitoring Results
Water Conditions	**i.a.** Are Standards & Guidelines maintaining or improving watershed conditions?	Watershed Condition Framework (WCF) analysis of key indicators at the 5th and 6th field watersheds scales.	No change is warranted. Implementation of WRAP essential projects led to improved watershed conditions.
BMPs	**i.b.** Have Best Management Practices been implemented and are effective at managing water quality consistent with the Clean Water Act?	Temperature and turbidity	BMPs have been successful at buffering water courses from management or in recommending changes to management for water quality protection. We will continue to monitor summer stream temperature to track recovery after past actions and will continue to implement and monitor use of BMPs to prevent effects to water quality.

Watershed Conditions

i.a) Are Standards and Guidelines maintaining or improving watershed conditions?

Monitoring Results

Watershed Condition Framework (WCF) is tool that the Forest uses to gauge changes in watershed condition. WCF is a national initiative that directed Forests to assess and score each of the 6th field watersheds within the Forest based on aquatic habitat condition, fish distributions, water quality, road densities, and other metrics. Watersheds were given a rating of 1 (properly functioning), 2 (partially functioning) or 3 (not properly functioning) based on an initial assessment conducted in 2010 and updated in 2015. The Forest subsequently identified "priority" sub-watersheds and developed

Watershed Restoration Action Plans (WRAPs) that identified the restorative actions needed to improve the condition of these sub-watersheds. The Forest currently has four sub-watersheds identified and is implementing restoration projects identified by these WRAPs. Table 2 shows the priority sub-watersheds where we are implementing restoration projects and the projected year of completion of all essential projects in each WRAP. During this monitoring report's timeframe, the Forest completed its first WRAP with all associated essential projects -- Staley Creek in 2017. As a result of WRAP essential project completion, the Staley Creek sub-watershed was moved from partially functioning to functioning status under WCF. Find more information about WCF at http://www.fs.fed.us/biology/watershed/condition_framework.html/

Monitoring Discussion, and Adaptive Management Considerations

The Watershed Condition Framework modeling exercise of 2010 and the update of 2015 that confirmed most of the 2010 results have been used to analyze watershed condition, select priority sub-watersheds to focus limited funds, and complete 4 Watershed Restoration Action Plans (WRAPs) for our four Willamette priority sub-watersheds. Once WRAPs were completed, Districts worked to complete essential projects funded by both specially allocated funds from the region as well as trust funds like KV and Stewardship.

In 2017, the Willamette National Forest completed its first WRAP for the Staley Creek sub-watershed in the Upper Middle Fork Willamette. Projects included road decommission, floodplain restoration, dispersed campsite remediation and meadow restoration. Once these high priority projects were completed, the Staley Creek priority sub-watershed was moved from partially functioning condition to functioning condition for WCF.

Essential Projects from Staley WRAP and other projects:

- Road decommission
- Floodplain reconnection
- Dispersed camping site remediation
- Meadow restoration
- Wildfire suppression

Completion of WRAP designated essential projects directly affected the watershed condition at Staley Creek. Naturally occurring fires occurred in the headwaters of Staley Creek during the monitoring period with both positive and negative effects to watershed condition. While fires in 2017 likely created more mosaic vegetation patterns, causing greater diversity for terrestrial wildlife and plants, there would have also been impacts from fire suppression and increased flow and sedimentation during subsequent winter flows. Negative fire effects will only be short term due to suppression rehabilitation. Also, the Lower Staley Creek Floodplain Enhancement Project completed in 2017 created 40 acres of connected valley bottom conditions that will help dampen nutrient, sediment and peak flow fluxes from 2017 and subsequent wildfires. Aquatic organisms will also have much more complex habitat for reproduction and rearing in the lower stream floodplain.

No change is warranted. Implementation of WRAP essential projects led to improved watershed conditions in Staley Creek

No change for Forest Assessment is warranted based on results of the Watershed Condition Framework. On the contrary, products produced during model runs for WCF completion in 2010 and 2015 may be used to inform Forest Assessment in the future.

Table 2: Willamette National Forest Priority Sub-watersheds and Projected WRAP where essential project have been completed (WRAP completion) or are projected to be completed.

Priority Sub-watershed	Completion Year for WRAP	Associated ranger District
Staley Creek	2017 - Done	Middle Fork
Marion Creek	2018	Detroit
Soda Fork Creek	2019	Sweet Home
Cougar Creek	2020	McKenzie River
North Fork Breitenbush	2022	Detroit
Coal Creek	2023	Middle Fork
Trout Creek	2024	Sweet Home

Best Management Practices

i.b) Have BMPS been implemented and are they effective at managing water quality consistent with the Clean Water Act?

Monitoring Results

In October 2006, Oregon Department of Environmental Quality issued the Willamette Total Maximum Daily Load (TMDL) for point and non-point sources of pollutants in the Willamette Basin. This TMDL was completed by Oregon Department of Environmental Quality as a requirement under the Clean Water Act and focused primarily on water temperature by analyzing shade as a surrogate for water temperature. As Designated Management Agencies required by law to meet requirements of the Willamette TMDL, the Willamette and Umpqua National Forests jointly submitted a Water Quality Restoration Plan (WQRP) in April 2008, serving as an implementation plan for the TMDL for the North Santiam, South Santiam, McKenzie River, Middle Fork Willamette, and Coast Fork Willamette Sub-basins (USDA Forest Service, 2008). This WQRP outlines how ongoing active and passive restoration will address critical riparian shading needed to protect and enhance surface water temperatures on the Forest. Given the completion of both the Willamette TMDL and the corresponding WQRP, all streams listed on the 303d list on Willamette National Forest were moved to category 4A, TMDL approved for the updated list in 2010. Through implementation of Forest Plan Standards and Guidelines and adherence to the Northwest Forest Plan, management of stream-side areas is contributing to a trend of improved riparian conditions that will lead to maintained or enhanced water quality over the long term.

Each year the Forest measures summer water temperature at several sites to establish reference conditions and answer specific questions about forest management or watershed restoration projects associated with species listed under the Endangered Species Act. In 2016, 85 sites were successfully monitored during summer, and of these 85 sites, 41 showed a 7-day average maximum temperature exceeding salmon and trout rearing and migration standards (16-18^{o}C), the core cold water habitat standard (16^{o}C) or the bull trout spawning and rearing standard (12^{o}C) established by Oregon Department of Environmental Quality (ODEQ). In 2017, 89 sites were monitored and 45 showed standard exceedances. These maximum water temperature conditions occurred primarily in July and

August, which is typical of past summer water temperature monitoring on the Willamette National Forest. Generally, those sites that exceeded standards occurred in wider main stem channels with less riparian shade, while the cooler water sites tended to be associated with headwater streams and small tributaries with better vegetative cover and contribution from cold water springs at the base of High Cascades geology.

Since 2011, the Willamette National Forest and several other western U.S. Forests have been migrating legacy high quality water temperature data into a national database. The Rocky Mountain Research Station has been taking this data, along with datasets from several organizations and agencies in the west and has composed the NorWeST Stream Temperature Database, Model and Climate Scenarios on an interactive website (http://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html). This effort has taken the collected and quality controlled data at several sites on the Willamette National Forest and used it to look at status and trends of water temperature over the last three decades, as well as modeling climate scenarios for future decades In addition, the Aquatic and Riparian Effectiveness Monitoring Program, set up in 1995 to monitor the effectiveness of the Northwest Forest Plan in Region 6, has begun to put out year-round temperature monitoring devices throughout Oregon and Washington, including 16 sites on the Willamette National Forest. This data will also greatly contribute to future modelling efforts like the NorWeST project.

In 2012, a new set of national protocols was released to provide a consistent set of Best Management Practices (BMPs) to be used, monitored and documented in a national database (USDA 2012), and that same year, the Forest began testing these new protocols. In 2016-2017 testing included BMP monitoring at 14 sites related to recreation, road work, mine reclamation, chemical application, stream restoration, facilities operation and timber harvest. These efforts have been interdisciplinary and have monitored both implementation and effectiveness of BMPs used to protect water quality at each location. The national protocols also require documentation of corrective actions as well as adaptive management suggestions to protect water quality to the greatest degree for all activities. Results from both years indicated both fully successful implementation and effectiveness of BMPs on the Forest as well as areas where the Forest needs to improve the use of BMPs to maximize water quality protection. Improvements needed were primarily in the management of highly used dispersed camping sites in riparian areas, an ongoing challenge for resource managers on the Forest.

Monitoring Discussion, and Adaptive Management Considerations

Summer water temperature results show variable compliance with State standards but indicate a slow improving trend as riparian conditions recover from past management. Results of 14 BMP protocols used to assess implementation and effectiveness of BMPs during and after project implementation for a range of activities showed predominately positive results and also showed some areas where BMP implementation can be improved through adaptive management.

Summer water temperature at the various locations monitored during 2016 and 2017 indicate similar results to those posted in the last decade of monitoring. State standards vary based on locations of known Endangered Species Act (ESA)-listed fish species spawning and migration. Due to cold water inputs from High Cascades springs at some locations, state standards are easily met while in some streams near wilderness in the Western Cascades, state standards are never met, even when no human influence has had an effect. BMP monitoring has helped project implementers assess the use of BMPs during activities such as timber harvest, recreation, stream restoration, chemical application to control

weeds and permitting of water uses. These BMPs have been successful at buffering water courses from management or in recommending changes to management for water quality protection.

We will continue to monitor summer stream temperature to track recovery after past actions and will continue to implement and monitor use of BMPs to prevent effects to water quality. Summer stream temperature is affected by past management, particularly removal of riparian vegetation during harvest, 20-50 year ago. Since 2012, adoption of BMP National Protocols to assess implementation and effectiveness of Project Design Criteria (PDCs). Removal of riparian vegetation 20-50 years ago left a legacy of stream heating during summer with effects to water quality. Riparian vegetation is on an upward trend at most locations being monitored, leading to improved conditions over time. Adoption of BMP monitoring has increased interdisciplinary oversight on the use of BMPs during project implementation to protect water quality. It has also led to adaptive management to improve BMP implementation. Riparian recovery to protect stream temperatures is happening naturally and is being protected by proper management. With regard to BMPs, changes are being made incrementally as BMP monitoring reveals the need.

No change is warranted at this time based on current results of water temperature monitoring or BMP monitoring

Terrestrial and Aquatic Ecosystems

Under the 2012 planning rule, land management plans will include components to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems in the plan area, including preventing invasive species while protecting soil, aquatic resources in the plan area.

Below is a summary of FY16 and FY17 monitoring questions designed to assist the Forest Supervisor in determining the effectiveness of the Forest Plan Standards and Guidelines in protecting and maintaining the terrestrial and aquatic ecosystems while meeting the 2012 Planning Rule.

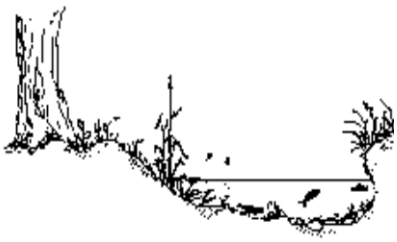
(ii) The status of select watershed conditions including key characteristics of terrestrial and aquatic ecosystems.

Table 3: Monitoring sub-questions addressing terrestrial and aquatic ecosystems.

	Monitoring Question	Indicator(s)	Monitoring Results
Invasive Species	**ii.a.** Are S&Gs maintaining or decreasing the spread of aquatic invasive species?	Includes non-native fish species (brook trout, bass, crappie, etc.) as well as aquatic invasive (New Zealand mud snail, zebra mussel, whirling disease, and non-native plants), aquatic and riparian.	Survey protocol is not designed to monitor AIS distribution changes and there is no statistical power to make any conclusions as to their spread. A change to the monitoring question is warranted and listed above in the summary.
Aquatic	**ii.b.** Are S&Gs maintaining or improving aquatic	1.Core &integrated targets 2. habitat data of current condition	No change in the Forest Plan or monitoring program is warranted at this time. The Plan appears

	habitat (instream, lake, and riparian areas)?	3. management related impacts to aquatic systems	to be working as intended. Riparian Reserve restoration, aquatic habitat restoration have both positively contributed towards the positive trend.
Survey and Manage	**ii.c.** Are projects contributing to the persistence of botanical Survey and Manage species?	Number of S&M sites identified and protected during project planning.	Funding for monitoring would enable us to state status of S&M species and whether PDCs meant to protect them are being carried from planning to implementation.
Weeds	**ii.d.** Are known populations of invasive plants continuing to spread? Are new infestations occurring?	Acres of surveyed lands with new and active invasive species infestations; Acres treated.	Committing additional funding could allow the forest to inventory invasive populations outside project areas to create a more proactive response to invasive species. No changes to the Forest Plan, monitoring questions, or indicators are warranted at this time.

Invasive Species



ii.a) Are Standards and Guidelines maintaining or decreasing the spread of aquatic invasive species?

Monitoring Results

The Aquatic and Riparian Effectiveness Monitoring Program (AREMP) conducts long term monitoring of lands managed by the Forest Service and this program does conduct a rigorous sampling program for aquatic invasive species. In 2016, AREMP surveyed 157 sites in 25 watersheds across the Pacific Northwest Region. AREMP crews recorded 10 verified invasive detections, all which were Himalayan blackberry. AREMP produces annual, 5-year, and 20 year reports, all of which can be located online.

The Willamette National Forest does not directly monitor population trends or distribution of aquatic invasive species (AIS). Data concerning these species is collected incidentally through routine stream surveys at the Forest level. The lack of a statistically rigorous monitoring program does not allow the Forest to draw any conclusions on trends or distribution. Rather than focus the Forest's limited resources on trend determinations, the Forest has invested in prevention programs and measures to reduce the spread of AIS in areas of high risk.

In 2016/2017, the Forest continued the operation of a hot-water pressure wash system for boats at Detroit Lake. This allows visitors to effectively clean their watercrafts prior to launch. Combined with

educational materials, signage, and presentations by Forest Service staff and partners, awareness to a major vector for the spread of aquatic invasive species has been improved at Detroit Lake.

The Willamette National Forest continued working closely with Oregon Department of Fish and Wildlife (ODFW) in 2016/2017 to reduce the stocking of high lakes with brook trout, a non-native species to Oregon. Brook Trout were stocked for decades in the high lakes due to their ability to tolerate harsh environments. However, the majority of the high lakes were historically fishless and the introduction of brook trout had negative consequences for native communities of amphibians and other aquatic organisms. Escapement of brook trout from the high lakes to the rivers containing native bull trout was hindering efforts to recover this Threatened species. Through collaborative efforts between the Forest Service and ODFW, the total number of high lakes in the stocking program has been decreased and brook trout are no longer stocked in sensitive areas.

The Forest has continued to invest in signage, educational materials, awareness programs, and outreach. The Forest hosts an AIS prevention kiosk at Free Fishing Day events annually. Forest Service personnel were onsite to provide educational materials and answer questions in an effort to increase awareness. Additionally, the Forest Service works with State partners to ensure that all boat ramps have information regarding AIS prevention.

The Forest continues to use AIS prevention protocols in our standard survey operations. All Forest Service personnel are required to follow prevention techniques and ensure that equipment and Personal Protective Equipment is free of AIS. Staff from other agencies, partner organizations, and contractors are required to decontaminate their equipment prior to working in the stream.

The Region issued direction in 2014/2015 for AIS prevention as a result of fire operations. This direction requires fire apparatus and equipment to be mobilized in a manner that reduces the potential for AIS spread. Equipment is cleaned and inspected by Forest Service personnel prior to being entered into service. This regional direction has been included in the educational curriculum for fire staff has resulted in an increased awareness for the risk of fire operations contributing to the spread of AIS. In 2016/2017, this has become standard operating procedure and Fireline Resource Advisors routinely inspect and assist fire operations to ensure clean fire apparatus.

It should also be noted that in 2009 the State of Oregon implemented a robust aquatic invasive detection program in which all watercraft entering the state are required to undergo inspection. As stated by Oregon Department of Fish and Wildlife, “inspecting boats coming into the state is the first line of defense in keeping aquatic invasive species such as zebra or quagga mussels, snails, and plants out of Oregon. In 2017, 21,026 inspections were conducted with 299 watercrafts requiring decontamination, including 16 for quagga or zebra mussels.

In summary, the current trend of AIS spread is unknown, however, efforts by the Forest Service have likely reduced the rate of spread by focusing prevention programs on high risk areas. Aquatic inventory surveys do not indicate that AIS detections have increased in the areas that were surveyed, however these are typically not the areas that are most vulnerable to infection. The collaborative effort between the Forest Service and ODFW has resulted in a measurable decrease in a single invasive species spread. The Forest will continue to invest in preventing the spread of aquatic invasive species and has incorporated prevention techniques in several protocols.

Monitoring Discussion, and Adaptive Management Considerations

The Forest Service does not conduct a statistically robust monitoring effort to identify long term trends in Aquatic Invasive Species distribution (AIS) and spread. We are unable to make any conclusions related to the expansion or contraction of AIS distributions.

The Willamette conducts stream inventory monitoring for approximately 20 miles of stream per year. However, this is typically related to future planning areas either for restoration or vegetation management planning. AIS detections are recorded and communicated to the appropriate program managers. However, this survey protocol is not designed to monitor AIS distribution changes and there is no statistical power to make any conclusions as to their spread.

The most likely vector for spread of AIS is through recreational activities (i.e., Boating, wading, etc.). This makes the areas with the highest recreational usage also the most at risk for AIS infestations. These are also the areas least likely to be surveyed during the stream inventories because they are not likely to be including in planning areas.

The State of Oregon started a more robust AIS program in the last decade but this is more focused on prevention and education. The state has set up check points along the border to inspect boats coming from other areas that may have infestations. While these checks are a vital step in preventing spread of AIS, they only catch a fraction of the boaters coming across the border. The FS has also put our limited effort in education and prevention, installing signs, attending events and presenting educational material, and purchasing a hot water pressure washer for the boat ramp on Detroit Lake. However, these efforts do not inform the question of whether aquatic invasive species are spreading.

It is recommended that plan level standards and guides need to be updated to put more emphasis on prevention of AIS spread. Dedicated funding also needs to be provided to monitor for AIS distributions if that is a priority. Currently, AREMP monitors for AIS species as well. However, they also focus on areas of the forest with the least likelihood of being infested. Monitoring efforts need to focus on high recreational usage areas where users are coming from other states (i.e., Reservoirs on the Forest). The use of eDNA could be an effective method for determining presence of AIS

Aquatic Habitat

ii.b) Are Standards and Guidelines maintaining or improving aquatic habitat (instream, lake, and riparian areas)?

Monitoring Results

Lake monitoring on the Forest in 2016 and 2017 included monitoring of water quality properties of Waldo Lake. In addition, the water quality at developed recreation sites on several reservoirs on the Forest were monitored to determine if high concentrations of potentially toxic blue-green algae were present and in some cases samples were collected and analyzed to determine if toxins were present.

In 2016 and in 2017 under an agreement between the Willamette National Forest and Portland State University (PSU), water temperature data was collected in Waldo Lake from stationary instruments that recorded temperatures at various depths at one location in the lake throughout the year. Also

instruments were deployed by Forest Service personnel and PSU to monitor changes in lake level for both years. In 2016 and 2017 Secchi depth readings were taken as a measure of water clarity. Measurements continued to indicate high water clarity with a maximum Secchi depth of 30.5 meters recorded on October 4, 2017. In 2017, PSU collected in-situ vertical profile data of dissolved oxygen using a multi-parameter probe.

Forest Service personnel worked cooperatively with other agencies to monitor potentially toxic algal blooms at several locations during the summer months. Weekly surveillance monitoring visits were made to developed recreation sites on water bodies that are known to have had blooms of potentially toxic blue-green algae in the past. Public health advisories are issued by the Oregon Health Authority (OHA) when reported density of potentially toxic blue-green algae cells or the toxins they produce are above public health based thresholds. The Forest used the OHA's toxin based protocol for monitoring potentially toxic blooms. Throughout the summer seasons visits were made to approximately 25 locations on Detroit, Cougar, Blue River, Hills Creek, and Lookout Point Reservoirs. No water bodies were found to be above the OHA toxin thresholds in 2016 and therefore no public health advisories were issued for any lake on the Willamette National Forest that year. However, in 2017 a sample from Detroit Reservoir was found to have toxins above the OHA health based threshold and a public health advisory was issued for the reservoir on June 2nd and lifted the on June 16th.

Approximately 20 miles of stream were inventoried each year in 2016/2017 to collect information on physical stream habitat characteristics. These surveys have utilized the same protocol since 1999 allowing the Forest Service to look for longer term trends in habitat. Most of the major streams on the Forest have been surveyed and are now being resurveyed. In the majority of cases where the Forest has resurvey data, long term trends appear to be positive with more wood in the streams and riparian areas continuing to recover.

In addition to passive restoration, the Willamette has a robust stream restoration program. In 2016/17, the Forest completed the Deer Creek Floodplain Enhancement project, Staley Creek Floodplain enhancement project, Moose Creek stream restoration project, multiple large wood additions on smaller channels, carcass placements, installation of Aquatic Organism Passage road-stream crossings, and road decommissioning. The Deer Creek project completed in 2016 on the McKenzie Ranger District was the Forest's first attempt at an innovative restoration technique referred to as Stage 0 restoration. The objective with Stage 0 restoration is to reconnect the stream channel to its floodplain following the principles of the channel evolution model proposed by Cluer and Thorne. Monitoring results from this project show an immediate response by fish, including the first spawning by Chinook salmon in Deer Creek since the 1990's. Monitoring results also suggest significant improvements to streambed composition (i.e., Well distributed gravels and fine sediment), pool quality, water velocity, large wood interactions with the stream channel, and floodplain connectivity to mention a few. This project was awarded the Riparian Challenge Award by the Western Division of the American Fisheries Society in 2016, a highly competitive and prestigious award. In 2017, the Forest completed the Staley Creek project on the Middle Fork Ranger District, another Stage 0 project. Monitoring results from this project are similar to that of Deer Creek with some additional monitoring of macroinvertebrate communities and a recolonization of bull trout to the project area. This project was awarded the Riparian Challenge Award in 2017. There are numerous other projects alluded to previously that have all incrementally improved fish and other aquatic associated species habitat on the Forest. Monitoring of these projects will continue with more technical reports and presentations to come.

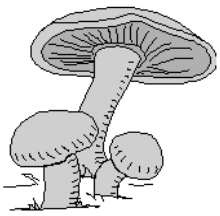
Riparian Reserve management to promote restoration of the Aquatic Conservation Strategy Objectives occurs on approximately 1000 acres of Riparian Reserve lands each year on the Willamette. Approximately 25-40% of the Willamette National Forest is in the Riparian Reserve land allocation depending on the location in the watershed (i.e., Higher drainage density in Western Cascades geology type compared to the High Cascades geology type). Past management practices frequently included clear-cut harvest to the stream edge followed by replanting based on industrial forest production principals. Treatment of these overstocked, monoculture Riparian Reserves is often identified in the purpose and need of large scale planning documents. According to the AREMP 20-year report, riparian and upland scores for watershed condition tended to be low in the western flanks of the Cascades in the general area of the Willamette National Forest. However, the report notes that these areas also showed the most consistent, moderate upward trend in scores over the Northwest Forest Plan area. Although watershed scores are variable in terms of riparian and upslope condition, it does appear that the general trend in the Western Cascades is improving.

Monitoring Discussion, and Adaptive Management Considerations

Aquatic habitat is monitored through a robust stream inventory program and for project specific areas. Stream inventory data spans over two decades utilizing the same survey protocol so robust statistical trends can be examined. Stream and aquatic habitat are trending towards improvement. Stream temperatures are improving through time. Substrate, pool quality, large wood, etc. are trending positive through time. Recovery of riparian areas and aquatic processes continue due to the implementation of the Aquatic Conservation Strategy in the NWFP.

No change in the Forest Plan or monitoring program is warranted at this time. The Plan appears to be working as intended. Riparian Reserve restoration, aquatic habitat restoration have both positively contributed towards the positive trend. Habitat restoration includes Staley Creek, Moose Creek, control of stocking in Riparian Reserves, and road improvements with storage and decommissioning. Clearcutting to the stream edge has been stopped allowing for recovery of riparian areas. Riparian Reserve thinning has put these stands on a trajectory for late successional characteristics. There is increased shade due to the preservation of a no harvest zone near streams.

Survey and Manage



ii.c) Are projects contributing to the persistence of Survey and manage species?

Monitoring Results

Survey and Manage botanical species are being surveyed for in stands that do not meet a Pechman exemption (thinning younger stands, riparian restoration, prescribed burning projects). In 2016 we documented 15 new sensitive and survey and manage species during inventory of 600 acres of habitat and in 2017, we documented more than 44 new sensitive and survey and manage species during inventory of 14,798 acres of habitat. All Category A, B and C species (protect known sites) were buffered in stands greater than 80 years of age. Some more common species such as *Peltigera pacifica* and *Usnea longissima* were buffered in riparian reserves or Green Tree Retention Areas, but may not have always been protected in harvested units. All NEPA documents for large scale projects included an analysis of survey and manage species and impacts to them.

Monitoring Discussion, and Adaptive Management Considerations

In 2017 buffers effectiveness for fungi were monitored on the Sweet Home Ranger District as part of a Regional Office special project and one out of three revisited buffers protecting these species was not left. It is unknown whether this caused a loss of the persistence of this species in this location. We will revisit all 4 sites over several years because we know fungi don't emerge every year. We plan to extend this monitoring of implementation of buffers and their effectiveness to other Districts and types of rare botanical species (lichens, bryophytes, and vascular plants) and fungal populations. No changes to the Forest Plan are warranted at this time.

Weeds

ii.d) Are known populations of invasive plants continuing to spread? Are new infestations occurring?

Monitoring Results

Known infestations are being reduced but invasive plant species follow humans and we are increasing the number of acres we are disturbing with timber harvest and large wildfires. With an increase in recreational use on the Forest, we see weeds popping up in new places, especially false brome and knapweed. Due to the diligence of our staff, we have eradicated many populations of false brome in the past couple of years.

Our annual treatment program accomplishments included 5222 reported acres in 2016 and 4450 reported acres in 2017. The number of acres we are treating is going down as our staff becomes more focused on timber and other project planning and as the number of weed populations is decreasing. We have also refined our reporting to only net areas treated.

Monitoring Discussion, and Adaptive Management Considerations

Most of the monitoring we do for weeds is in recently harvested timber stands and new timber sale planning areas, so that years may go by without monitoring non-project areas (due to lack of budget and capacity). With the help of our partners from Oregon Department of Agriculture, we are able to treat large populations of priority weeds outside of planning areas. Project Design Criteria and post-sale collections for survey and control seem to be largely keeping weed infestations from spreading, when PDCs are followed. There have been places where gaps have been placed on known weed populations (not following recommendations) and weed populations grew exponentially. The species false brome is especially problematic when located in small populations in the understory of thinning units. Pretreating these weeds prior to harvest may be the best way to contain infestations. Funding treatment of new invaders and associated monitoring to determine effectiveness and to prioritize future treatments has proven to be effective. Committing additional funding could allow the forest to inventory invasive populations outside project areas to create a more proactive response to invasive species. No changes to the Forest Plan, monitoring questions, or indicators are warranted at this time.

Focal Species

The Forest Standards and Guidelines provide direction to enable the Forest to meet the goals of protecting and improving species populations and their habitat. Threatened, endangered, and sensitive

species as well as indicator species are monitored for species viability. In the 2012 Planning Rule the forest is to concentrate its efforts on "focal species" or species that are pointers of the integrity of the key ecological conditions.

Below is a summary of FY16 and FY17 monitoring questions designed to assist the Forest Supervisor in determining the effectiveness of the Forest Plan Standards and Guidelines in meeting the Forest's goals.

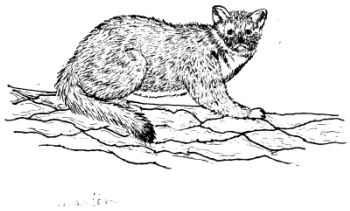
(iii) The status of focal species to assess the ecological conditions required under §219.9.

Table 4: Monitoring sub-questions addressing focal species ecological questions.

	Monitoring Question	Indicator(s)	Monitoring Results
Marten	**iii.a.** What is the trend for the mature and late successional habitat above 4000' elevation needed for marten persistence on the Willamette?	Acres of montane mixed conifer (MMC) forest by late successional forest index categories tracked over time. Changes in snag and dead log levels in MMC relative to historic condition by 5th field watershed on the Forest tracked over time.	Results suggest marten are relatively abundant and well-distributed across the Willamette in the MMC forest. Need to continue to develop and refine trend tools for deadwood abundance in this habitat type. Tracking acres of montane mixed conifer forest by late successional forest index is doable, but would need to be identified as a priority for the Northwest Ecology Group.
Pileated Woodpecker	**iii.b**. What is the trend for mature and late successional habitat needed for pileated woodpecker persistence on the Willamette?	Acres of lowland conifer/hardwood forest by late successional forest index categories on the Forest tracked over time. Changes in snag and dead log levels relative to historic condition by 5th field watershed on the Forest tracked over time. Occupancy rate of pileated woodpeckers in pileated woodpecker management areas tracked over time.	Results suggest pileated woodpecker viability is being maintained across the Forest and the pileated woodpecker management areas are providing habitat as planned. Need to continue to develop and refine trend tools for deadwood abundance. Tracking acres of lowland conifer hardwoods by late successional forest index is doable, but would need to be identified as a priority for the Northwest Ecology Group.
Elk	**iii.c**. What is the trend in elk habitat condition and elk	Changes in elk harvest, success rates, and ODFW elk populations estimates	Elk numbers and hunting success on the Willamette are below desired levels. Tracking changes in early seral habitat is

	Monitoring Question	Indicator(s)	Monitoring Results
	hunting levels and success?	by State Game Management Unit. Changes in estimated elk forage quality and habitat suitability by Big Game Emphasis Area tracked over time. Acres of early seral habitat relative to historic condition by 5th field watershed on the Forest tracked over time.	doable, but would need to be identified as a monitoring priority.
Fish Populations	**iii.d.** Are S&Gs maintaining or improving focal fish species?	Population surveys of rainbow trout, cutthroat trout, Oregon chub, and Pacific lamprey.	FS restoration projects are having a positive impact on fish abundance and spawning in project areas. However, this only captures a small portion of the fish's life cycle and overall population numbers do not appear to be changing.

Marten



iii.a) What is the trend for mature and late successional habitat above 4000' elevation needed for marten persistence on the Willamette?

Monitoring Results

Indicator 1. Acres of montane mixed conifer (MMC) forest by late successional forest index categories tracked over time.

Due to limited resources the expectation is that this indicator will be addressed in a future Forest Plan monitoring report.

Indicator 2. Changes in snag and dead log levels in MMC relative to historic condition by 5th field watershed on the Forest tracked over time.

Comparison of current snag and dead log levels at the forest scale and by 5th-field watersheds relative to historic conditions were reported in the FY 2014-2015 Willamette Forest Plan monitoring report based on analysis by Acker (2015). This section summarizes the 2015 analysis for deadwood levels at the forest-scale relative to reference (i.e., estimated historic) conditions for the Montane Mixed Conifer (MMC) forest type. Most 5th-field watersheds followed the forest-wide trends, with some exceptions that are considered when planning projects in those areas.

Montane Mixed Conifer Forest habitat type-Large (> 20 inches diameter) Downed Logs: 2015 levels of large downed logs were very similar to reference (i.e., estimated historic) conditions.

Montane Mixed Conifer Forest habitat type-Total (> 5 inches diameter) Downed Logs: 2015 levels of total downed logs were generally within the range of reference conditions, except that the portion of the landscape lacking down wood with a minimum diameter of 5 inches is less than half reference

condition (10% of reference condition lacked downed wood compared to 4% in the current condition). This suggested there were adequate levels of downed logs at the forest scale in this habitat type based on historic conditions.

Montane Mixed Conifer Forest habitat type-Large (> 20 inches diameter) Snags: It was estimated there were fewer large snags in 2015 than in the reference condition in this habitat type. In particular, it was estimated that historically 15% of this habitat had no large snags compared to 29% today.

Montane Mixed Conifer Forest habitat type-Total (> 10 inches diameter) Snags: The amount of total snags in this habitat type in 2015 compared to the estimated historic conditions varies by snag density category. Fourteen percent of the habitat was estimated to have no snags in 2015 compared to only 6% in the reference condition, but 17% of the habitat in 2015 had greater than 36 snags/acre compared to only 8% of the reference condition.

Deadwood is typically evaluated at the 5th field watershed scale and twenty 5th field watersheds substantially overlap on the Willamette National Forest. Year 2017 was a historic fire year for the Willamette National Forest with over 70,000 acres within the fire perimeters. Six 5th field watersheds had measurable increases in total snag levels at the 5th field scale in the Montane Mixed Conifer habitat type and four of these watersheds had measurable increases in large snags in the MMC habitat type. Due to the extent of fires in 2017, the Horse Creek watershed is now considered within the estimated historic range of variability in the MMC habitat types based on the analysis provided by Acker (2018).

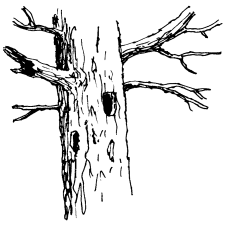
A preliminary trend tool for snags was developed by the Northwest Oregon Ecology Group using Gradient Nearest Neighbor (GNN) data (Willamette National Forest unpublished data). Preliminary results from this analysis showed no significant trend in the abundance of total snags or large snags in the on the Willamette National Forest from 1990 to 2016 in the Montane Mixed Conifer habitat type. Variance in yearly estimates of snags on the Forest is wide however. This tool is undergoing further testing and will be updated with more recent GNN data. We anticipate using the trend tool to report on changes in snag abundance in further forest monitoring reports.

Recent monitoring work suggests that, on the Willamette National Forest, marten are primarily restricted to the montane mixed conifer above about 4000’ elevation, and that most of the suitable habitat is occupied by marten. This finding is consistent with some other studies suggesting marten are primarily restricted to high elevations in the Cascades (Aubry and Lewis 2003, Marcot et al. 2003). Baited camera set surveys conducted on the Forest from 2012-2017 have detected marten at 91% of the stations above 4000’ elevation (n=37) and 0% of the stations below 4000’ elevation (n=33) (n = number of bait stations), (unpublished data, Willamette National Forest wildlife files).

Monitoring Discussion, and Adaptive Management Considerations

Results suggest marten are relatively abundant and well-distributed across the Willamette in the montane mixed conifer forest. There is a need to continue to develop and refine trend tools for deadwood abundance in this habitat type. Tracking acres of montane mixed conifer forest by late successional forest index is doable, but to date the data has not been readily available. The Forest could identify potential sources to obtain this data for the next report (FY 2018/2019).

Pileated Woodpecker



iii.b) What is the trend for mature and late successional habitat needed for pileated woodpecker persistence on the Willamette?

Monitoring Results

Indicator 1. Acres of lowland conifer/hardwood (WLCH) forest by late successional forest index categories on the Forest tracked over time.

Due to limited resources the expectation is that this indicator will be addressed in a future Forest Plan monitoring report.

Indicator 2. Changes in snag and dead log levels relative to historic condition by 5th field watershed on the Forest tracked over time.

Comparison of current snag and dead log levels at the forest scale and by 5th-field watersheds relative to historic conditions were reported in the FY 2014-2015 Willamette Forest Plan monitoring report based on analysis by Acker (2015). A summary of the findings at the forest-scale for the Montane Mixed Conifer habitat is presented in the marten monitoring discussion. This section summarizes the 2015 analysis for deadwood levels at the forest-scale relative to reference (i.e. estimated historic) conditions for the Westside Lowland Conifer/Hardwood (WLCH) forest type. Most 5th-field watersheds followed the forest-wide trends, with some exceptions that are considered when planning projects in those areas.

Westside Lowland Conifer/Hardwood Forest habitat type-Large (> 20 inches diameter) Downed Logs: 2015 levels of large downed logs were very similar to reference (i.e. estimated historic) conditions.

Westside Lowland Conifer/Hardwood Forest habitat type-Total (> 5 inches diameter) Downed Logs: 2015 levels of total downed logs were very similar to reference conditions.

Westside Lowland Conifer/Hardwood habitat type-Large (> 20 inches diameter) Snags: It was estimated there were fewer large snags than in the reference condition in this habitat type. In particular, it was estimated that historically 13% of this habitat had no large snags compared to 31% in 2015.

Westside Lowland Conifer/Hardwood habitat type-Total (> 10 inches diameter) Snags: It was estimated there were fewer total snags than in the reference condition in this habitat type, especially with respect to the amount of area lacking snags. It is estimated that historically 6% of this habitat had no snags compared to 20% in 2015.

Deadwood is typically evaluated at the 5th field watershed scale and twenty 5th field watersheds substantially overlap on the Willamette National Forest. Year 2017 was a historic fire year for the Willamette National Forest with over 70,000 acres within the fire perimeters. Four 5th field watersheds had measurable increases in snag levels at the 5th field scale in the Westside Lowland Conifer/Hardwood habitat type. Three of these watersheds are still below historic levels of snags in this habitat type and the Horse Creek watershed is considered within the estimated historic range of variability based on the analysis provided by Acker (2018).

A preliminary trend tool for snags was developed by the Northwest Oregon Ecology Group using Gradient Nearest Neighbor (GNN) data (Willamette National Forest unpublished data). Preliminary results from this analysis showed no significant trend in the abundance of total snags or large snags in the on the Willamette National Forest from 1990 to 2016 in the Westside Lowland Conifer/Hardwood

habitat type. Variance in yearly estimates of snags on the Forest is wide however. This tool is undergoing further testing and will be updated with more recent GNN data. We anticipate using the trend tool to report on changes in snag abundance in further forest monitoring reports.

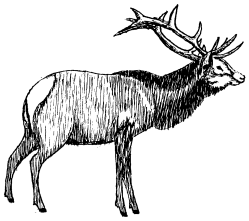
Indicator 3. Occupancy rate of pileated woodpeckers in pileated woodpecker management areas tracked over time.

Twenty five pileated woodpecker land management areas were retained in matrix and adaptive management land use areas on the Willamette National Forest after the update for the 1994 Northwest Forest Plan. These areas each consist of about 300 acres of mature and older forest established to provide breeding habitat for pileated woodpeckers. Pileated woodpecker occupancy surveys in these management areas were begun in 2017 and will be finished in 2018. The complete result of those surveys should be reported in the next 2-year Forest monitoring report. Twelve of 13 (92%) pileated woodpecker management areas surveyed in 2017 had detections of pileated woodpeckers during the breeding season. Incidental observations suggest pileated woodpeckers occur widely across the Forest. The pileated woodpecker is not a Forest Service sensitive species or a species identified by U. S. Fish and Wildlife Service as a species of concern. Breeding bird surveys show a significant increase in pileated woodpecker populations in Oregon from 1996-2015 (Sauer et al. 2017).

Monitoring Discussion, and Adaptive Management Considerations

Results suggest pileated woodpecker viability is being maintained across the Forest and the pileated woodpecker management areas are providing habitat as planned. There is a need to continue to develop and refine trend tools for deadwood abundance. Tracking acres of lowland conifer hardwoods by late successional forest index is doable, but to date the data has not been readily available. The Forest could identify potential sources to obtain this data for the next report (FY 2018/2019).

Elk



iii.c) What is the trend in elk habitat condition and elk hunting levels and success?

Monitoring Results

Indicator 1. Changes in elk harvest, success rates, and ODFW elk populations estimates by State Game Management Unit.

Three Oregon State Wildlife Management Units (WMUs) overlap on the Willamette National Forest: the Santiam WMU, the McKenzie River WMU, and the Indigo WMU. The Oregon Department of Fish and Wildlife (ODFW) collects yearly elk harvest data for each of these WMUs that include number of hunters, total harvest and hunter success. In addition ODFW conducts post-harvest herd composition counts (e.g., bull/cow and calf/cow ratios) and estimates elk population levels for the WMUs. The estimation of elk populations is not an exact science, however, and is based on a number of general assumptions and some professional judgement.

Updated information on estimated elk numbers was provided by ODFW (Chris Yee, personal correspondence) and is added to information presented in the FY 2014-2015 Willamette Forest Plan monitoring report. The estimated elk population in the Santiam WMU was about 4,000 in 1990, peaked at around 5,200 animals about 2005-2008, and has since declined to about 3,000 in 2017. The McKenzie

Unit has declined from about 5,200 elk in 2002 to around 2,400 in 2017. The Indigo Unit was estimated at 4,000 elk in 2002 and at 4,200 elk in 2017 with fluctuations both up and down during the interval in between. In 2017, the Santiam, McKenzie, and Indigo Units were estimated at about 58%, 47% and 93% of the desired elk population State Management Objective by ODFW.

Elk harvest information presented in previous Willamette Forest Plan monitoring reports indicates that elk harvests and hunter success peaked in the late 1990s in all three WMUs and have declined since then. Limited forage on National Forest lands and a need to reduce elk numbers on private lands to lower damage to reforestation are factors responsible for the lower than desired elk numbers. In some areas, elk and deer have shifted from public lands to private lands which have more young clearcuts.

Indicator 2. Changes in estimated elk forage quality and habitat suitability by Big Game Emphasis Area tracked over time

In the FY 2014-2015 Willamette Forest Plan monitoring report, this indicator was analyzed in detail for the time interval 1990-2012 using the westside elk habitat use model (Rowland et al 2013). The intent was to reevaluate that analysis for the time interval 1990-2017. However, the 2017 GNN data that would serve as the bookend for habitat in 2017 has not been completely updated. Therefore it is expected that this indicator will be reevaluated in the next 2 year monitoring report following the methodology used in the FY 2014-2015 report. The historic fire year of 2017 with over 70,000 acres of the Willamette National Forest within fire perimeters may benefit elk habitat by improving forage conditions. It is expected that this will be assessed in the future monitoring reports.

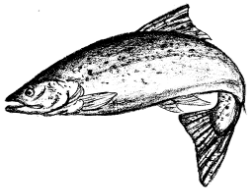
Indicator 3. Acres of early seral habitat relative to historic condition by 5th field watershed on the Forest tracked over time

Due to limited resources the expectation is that this indicator will be addressed in a future Forest Plan monitoring report.

Monitoring Discussion, and Adaptive Management Considerations

Elk numbers and hunting success on the Willamette are below desired levels. Tracking changes in early seral habitat is doable, but would need to be identified as a monitoring priority. Because of the reduction in clearcutting and regeneration harvest to protect the threated Northern spotted owl under the Northwest Forest Plan, it is difficult to meet state management objectives for elk on the Forest. An increase in wildfire could improve elk habitat however. The Forest will continue to look for opportunities to improve elk habitat while balancing needs for Northern spotted owl.

Fish Populations



iii.d) Are standards and guidelines maintaining or improving focal fish species populations?

Monitoring Results

The Willamette National Forest has a limited population monitoring program for fish species. Determining trends of fish populations is under the jurisdiction of the National Marine Fisheries Service (NMFS), US Fish and Wildlife Service (USFWS), and the Oregon Department of Fish and Wildlife (ODFW). There are five year status reviews available for numerous fish species at each of the agency's respective websites and are readily available for public viewing.

The species with the most reliable long-term data sets are Upper Willamette River (UWR) Spring Chinook, UWR Winter Steelhead, and a coterminous population of bull trout. Upper Willamette River Chinook Salmon are classified as stable. UWR Chinook adult fish counts at Foster Dam in 2016 and 2017 are 2824 and 6200 respectively. Unmarked (no adipose fin clip) fish returning to this facility are transported above Foster Dam and tend to spawn on or near Forest Service lands. Of the 6200 fish returning in 2017, 255 were unmarked and outplanted above the dam. UWR Chinook adult fish counts at the Leaburg fish ladder in 2016 and 2017 are 1194 and 1477 respectively, although the record for 2016 appear to be incomplete as the last posted entry occurred in June. A portion of these fish will migrate to the Upper McKenzie river to spawn and do not pass through another detection facility. The remainder migrate up the South Fork McKenzie River and are recaptured at the Cougar fish collection facility for transport above Cougar dam. UWR Chinook fish counts are not readily available for the Dexter facility on the Middle Fork Willamette River or for the Minto Facility on the North Santiam River.

UWR Winter Steelhead adult fish counts at Foster Dam in 2016 and 2017 are 206 and 18 respectively. According to the ODFW South Santiam Hatchery fish count website, UWR Winter Steelhead counts at Foster average 670 fish annually, although it should be noted that 327 was the highest count in the past five years occurring in 2012. The return of 18 UWR Winter Steelhead is the lowest seen in the fish count data available on ODFW's website. The Forest Service has been conducting annual redd count surveys in Moose Creek, Canyon Creek, and Soda Fork creeks. Redd counts (spawning zones) vary from year to year as would be expected with the fluctuations in fish count numbers with 2017 being particularly low. Although the counts of UWR Winter Steelhead are quite variable from year to year, it appears that the population trend is declining. This has been occurring despite attempts to increase downstream passage survival at Foster, habitat restoration above the dam, and a prohibition on recreation harvest of these species. Although the specific cause is unknown, factors such as ocean conditions and predators (i.e., Sea lions, predatory birds) compound the negative pressures of the dam system.

There are two monitoring sites on the Forest for bull trout populations; Anderson Creek and the Upper Middle Fork Willamette River. Both of these sites have shown a relatively stable population trend through time. The Upper McKenzie population is the most stable in the Willamette drainage showing successful recruitment year over year. The Upper Middle Fork population appears to be stable but has plateaued at approximately a dozen adult bull trout. Habitat improvement projects such as Staley Creek completed in 2017 are expected to be beneficial for foraging opportunities for sub-adult bull trout. ODFW also conducts a robust monitoring effort as part of their annual survey work. The Willamette National Forest participates in the annual Bull Trout meeting with ODFW, USFWS, and other partners to review data and identify priority needs.

Relative abundance surveys were conducted in tandem with stream surveys on approximately 20 miles of stream in 2015/2016. These surveys typically inform in-stream restoration project prioritization and design. While these surveys are informative, they do not allow for population analysis because they are performed only a single time. In 2016, these surveys were conducted on the Detroit District and in 2017 the surveys were conducted on McKenzie River District.

Standards and Guidelines directing road system upgrades have a major potential to affect focal fish species populations. Historic road building practices resulted in barriers to fish migration that resulted in isolated populations or localized extirpation. The Willamette National Forest is currently making significant financial investments to improve the road system by removing barriers, up-sizing stream crossings, reducing sediment delivery, and removing or storing unneeded roads to benefit aquatic

species (i.e., Rainbow and Cutthroat Trout). In 2016/2017, approximately 250 miles of road across the Forest underwent road maintenance to reduce sedimentation and improve water quality. Approximately 20 miles of road were put into storage or hydrologically stabilized. This included removal of fish bearing stream crossings that were an impediment to resident fish migration. A new regional database has been developed to better track changes in fish distribution over time as a result of barrier removal.

Aquatic restoration projects have also improved fish populations on a local scale. Habitat improvement projects were benefited approximately 320 miles of stream in the 2016/2017 monitoring period. These include miles of stream improved due to road upgrades/renovation, aquatic organism passage, in-stream restoration, road decommissioning, and road storage projects. Annual (repetitive) relative abundance surveys were conducted on a project-specific basis to monitor fish response as a result of the aquatic habitat improvement projects. Fish response to habitat improvement on Deer Creek and Staley Creek resulted in dramatic increases in fish biomass. In addition, UWR Spring Chinook utilized Deer Creek for spawning for the first time since the 1990s. Snorkel surveys on Staley Creek have identified five bull trout utilizing the project area when there had been no detections previously (including complete salvage of the project reach prior to implementation of the restoration project). Snorkel surveys and redd counts are conducted multiple times a year to gauge the impact of the projects in addition to monitoring of physical channel attributes and macroinvertebrate communities.

Anecdotal evidence collected by the Forest shows that restoration efforts are improving habitat and abundance of both focal and T&E species at a project level. The difficulty is determining if those are “new” fish or fish that simply relocated to better habitat. Either way, the restoration projects are providing much needed habitat and the abundance and diversity at these local sites is improving.

Monitoring Discussion, and Adaptive Management Considerations

The State has a robust monitoring program for focal fish species. Fish population monitoring falls under the jurisdiction of the State. The Forest Service uses this data to evaluate effectiveness of restoration projects.

While Winter Steelhead populations appear to be declining, there is no evidence that this is a result of actions or lack of actions on Forest Service managed lands.

Forest Service restoration projects are having a positive impact on fish abundance and spawning in project areas. However, this only captures a small portion of the fish’s life cycle and overall population numbers do not appear to be changing. No change is necessary to Forest Plan, monitoring questions, or indicators based on this monitoring question.

Threatened and Endangered Species

The Forest Standards and Guidelines provide direction to protect and restore habitat of threatened and endangered species.

(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.

Table 5: Monitoring sub-questions addressing T&E species.

	Monitoring Question	Indicator(s)	Monitoring Results
T&E Fish	**iv.a.** Are S&Gs maintaining or improving ecological conditions for T&E species?	Population of spring Chinook salmon, bull trout, and winter steelhead.	Habitat restoration had noticeable impacts to fish abundance and spawning in restoration areas. However, these did not influence the overall population numbers. Aquatic restoration as part of the Aquatic Conservation Strategy appears to be having the desired effects. Increased quality of habitat resulted in more biodiversity, more biomass, increased spawning, etc.
Spotted Owl	**iv.b.** What is the trend for mature and late successional habitat needed for Northern spotted owl persistence?	Acres of dispersal habitat, suitable habitat, and by old growth site index categories on the Forest tracked over time.	Based on analysis presented in the FY14-15 monitoring report, spotted owl habitat trends were consistent with Northwest Forest Plan assumptions. This analysis needs to be updated in the next monitoring report. .
	iv.c. What is the trend for the Northern spotted owl population?	Estimated number of territorial owls and annual rate of population change.	The spotted owl population continues to decline. A main factor in that decline is the increase in barred owls. A recent study that found that Northern spotted owls have drastically declined since the barred owl invasion in a landscape dominated by old-growth forests where timber harvest and recent fire has not occurred (Mt Rainer National Park) suggests that habitat management (e.g., preserving old forests) may not alleviate competition between the two Strix owl species (Mangan et al. 2019). Habitat protection Recovery Actions for Northern spotted owls include maintaining habitat in high-priority sites (Recovery Action 10) and protecting the highest quality old forest habitat (Recovery Action 32) (USFWS 2011). Forest Service should consider adding the following monitoring indices for Northern spotted owls: High-priority spotted owl sites

	Monitoring Question	Indicator(s)	Monitoring Results
			impaired by management actions and Recovery Action 32 habitat adversely affected by management actions. This could be tracked by signed NEPA decisions.
Spotted Frog	**iv.d.** What is the trend for Oregon spotted frog populations on the Forest?	Changes in numbers of breeding Oregon spotted frogs. tracked over time.	Further monitoring at the Gold Lake site and analysis by USGS at the Mink Lake sites are needed to determine population trends.
Botanical Species	**iv.e.** What are the trends for botanical Sensitive Species? Are any species we are monitoring on the decline? If so, have management actions been taken to restore their habitats?	Changes in numbers of individuals monitored in selected populations over time.	Some species are in a decline and increased funding could help with better monitoring and habitat enhancement.

Threatened and Endangered Fish

iv.a) Are standards and guidelines maintaining or improving ecological conditions for threatened and endangered fish?

Monitoring Results

The Forest conducts presence/absence surveys for fish species to determine distribution across the Forest. These surveys are typically conducted in tandem with vegetation management projects and inform NEPA analyses. In 2016/2017, the Forest conducted approximately ten miles of presence absence surveys. No decrease in the extent of fish distribution was identified.

Per the discussion in previous sections, riparian and aquatic habitat appear to be improving at a moderate pace in the west cascades outside of the wilderness. Despite the numerous restoration projects to directly benefit UWR Winter Steelhead, their population numbers appear to be declining. As stated previously, the annual average number of Winter Steelhead returning to Foster is estimated to be 670 fish. The past five years of count data show less than half of that number in the best year, 2012. In 2017, fish counts reached a low of 18 winter steelhead returning to Foster Reservoir. Whether this is an anomaly or a trend is yet to be determined. National Marine Fisheries Service is responsible for making the official trend determination and will do so considering the whole population, not just the fish returning to Foster dam. The Forest will continue to monitor and implement habitat improvement projects to benefit this species.

UWR Spring Chinook and bull trout appear to have stable population trends. The Forest continues to identify and implement habitat restoration projects to benefit these species. The Forest is currently in the planning process for a large scale restoration project on the South Fork McKenzie River. This project is expected to restore process on approximately 5 miles of stream and 700 acres of floodplain in some of

the most biologically important habitat in the basin. It is anticipated that this project will be a benefit to both UWR Spring Chinook and bull trout.

In 2015, Oregon Chub were delisted from the Endangered Species List with the Forest's habitat restoration efforts contributing to that success. The Forest continues to monitor the Oregon Chub populations on the Middle Fork Ranger District in cooperation with ODFW. This population continues to show an increasing trend.

Monitoring Discussion, and Adaptive Management Considerations

Threatened, Endangered, and Sensitive fish have the best monitoring of all fish species on the Forest. The State monitors these fish as well as the monitoring occurring for the Army Corps dam relicensing. While Winter Steelhead populations appear to be declining, there is no evidence that this is a result of actions or lack of actions on Forest Service managed lands. Forest Service restoration projects are having a positive impact on fish abundance and spawning in project areas. However, this only captures a small portion of the fish's life cycle and overall population numbers do not appear to be changing. Habitat restoration had noticeable impacts to fish abundance and spawning in restoration areas. However, these did not influence the overall population numbers. Aquatic restoration as part of the Aquatic Conservation Strategy appears to be having the desired effects. Increased quality of habitat resulted in more biodiversity, more biomass, increased spawning, etc. The Plan is working as intended so no changes to the Forest Plan, monitoring questions, or indicators are needed.

Spotted Owl

iv.b) What is the trend for the mature and late successional habitat needed for Northern spotted owl persistence?

Monitoring results

Indicator 1. Acres of dispersal habitat, suitable habitat, and by old growth site index categories on the Forest tracked over time.

This question was addressed in the FY 2014-2015 Willamette Forest Plan monitoring report by summarizing information on spotted owl habitat trends provided in the 20-year (1994-2013) Northwest Forest Plan monitoring report at the range-wide and physiographic province scales (Davis et al. 2016) and by accessing trends from 1990-2012 specifically for the Willamette National Forest using owl habitat information provided by the lead author of that report. Currently the 25-year Northwest Forest Plan Northern spotted owl monitoring report is being finalized and data specific to the Willamette National Forest will be provided to continue assessing trends in Northern spotted owl habitat at the Forest scale. The data, however, are not available at this time and this question is expected to be addressed in the next biennial Willamette Forest Plan monitoring report. Refer to the FY 2014-2015 Willamette Forest Plan monitoring report for the best available information on spotted owl habitat trends on the Forest. https://www.fs.usda.gov/detail/willamette/landmanagement/?cid=fse_030883

iv.c) What is the trend for the Northern spotted owl population?

Monitoring Results

Indicator 2. What is the trend for the Northern spotted owl population?

The trend for Northern spotted owl populations on the Willamette National Forest was estimated from the trend in H.J. Andrews Demographic (HJA) Study Area. This information includes the last full analysis of Northern spotted owl population trends for HJA and other demographic study areas for the period 1985-2013 (Dugger et al 2016) and spotted owl monitoring at the HJA Study Area from 2014-2017 (Dugger et al 2018). The HJA Demographic Study Area covers roughly a quarter of the spotted owl habitat on the Willamette National Forest. It is one of 11 study areas across the range of the Northern spotted owl used to estimate range-wide population changes and has been monitored annually for spotted owls beginning in 1987.

Range-wide it is estimated that the Northern spotted owl has declined at a rate of 3.8% a year from 1985 to 2013 (Dugger et al 2016). The HJA Study Area is similar to the observed range-wide decline with an annual observed decline of 3.5% year. The rate of decline for spotted owls appears to be increasing as it was estimated at 2.3% for the HJA Study Area for the period 1992-2006 (Forsman et al. 2011).

The percent of owl territories occupied by a pair of spotted owls in the HJA Study Area has declined steadily since the beginning of the Willamette Forest Plan. In 1990, nearly 90% of spotted owl territories were occupied by a pair (Dugger et al 2018). By 2005, that percentage had declined to 56%. Only 18% and 22% of the territories had pair occupancy in the years 2016 and 2017, respectively.

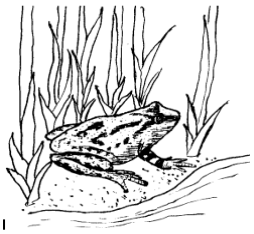
Increasing numbers of barred owls and habitat loss are believed to be factors at least partially responsible for the decline in Northern spotted owls (Forsman et al. 2011, Dugger et al. 2016). In the HJA Study Area, in 2016 and 2017 at least one barred owl was detected on 58% and 62%, respectively, of the spotted owl territories (Dugger et al 2018). In 2005, that percentage was about 30%, while in 1990 barred owls were found on less than 5% of the spotted owl territories (op. cit.).

Monitoring Discussion, and Adaptive Management Considerations

Based on analysis presented in the FY14-15 monitoring report, spotted owl habitat trends were consistent with Northwest Forest Plan assumptions. This analysis needs to be updated in the next monitoring report when new data on Northern spotted owl populations and habitat trends are available. The spotted owl population continues to decline however. A main factor in that decline is the increase in barred owls. A recent study that found that Northern spotted owls have drastically declined since the barred owl invasion in a landscape dominated by old-growth forests where timber harvest and recent fire has not occurred (Mt Rainer National Park) suggests that habitat management (e.g., preserving old forests) may not alleviate competition between the two Strix owl species (Mangan et al. 2019). Habitat protection recovery actions for Northern spotted owls include maintaining habitat in high-priority sites (Recovery Action 10) and protecting the highest quality old forest habitat (Recovery Action 32) (USFWS 2011). It is recommended that the line officer consider adding the following monitoring indices for Northern spotted owls: High-priority spotted owl sites impaired by management actions relative to total high-priority sites and Recovery Action 32 habitat adversely affected by management actions relative to total Recovery Action 32 habitat. This could be tracked by signed NEPA

decisions. No changes to the Forest Plan or monitoring questions are recommended at this time but a change of the indices is warranted.

Spotted Frog



iv.d) What is the trend for Oregon spotted frog populations on the Forest?

Monitoring Results

Indicator 1. Changes in numbers of breeding Oregon spotted frogs tracked over time.

The Oregon spotted frog (*Rana pretiosa*) was listed as federally threatened in 2014 (USFWS 2014) and final critical habitat was designated for the species in 2016 (USFWS 2016). There are three known populations of Oregon spotted frog on the Willamette National Forest, one by Gold Lake on the Middle Fork Ranger District and two in the Mink Lake Basin of the Three Sisters Wilderness on the McKenzie River Ranger District (USFWS 2016). These three populations represent the remaining range of Oregon spotted frog west of the Cascade Crest in Oregon. No new populations have been detected on the Willamette National Forest in recent years despite survey efforts and it is thought very unlikely that any new undiscovered populations of this species occur on the Forest.

The status of population monitoring is presented below.

Gold Lake area:

The Gold Lake population occupies about 292 acres of habitat. Spring egg mass counts have been used to monitor the population (Table 1) which provide a minimum adult population estimate. Surveys have been conducted in 2006, 2007, 2012, 2015, 2016, and 2017. In 2016, only a partial count of the area occurred due to issues with timing the surveys to correspond with the completion of egg laying which varies from year to year. The 2016 partial count is not included in the information summarized below (Table 1). Egg mass counts show that the Gold Lake area contains a relatively large population (USFWS 2014), but estimated minimum frog numbers have declined steadily since the counts began. Sampling variability may explain the observed decline and the latest population estimate still indicates a relatively large population. The Willamette National Forest plans to continue to monitor this population annually if funding is available to see if the counts begin to stabilize or increase or if the decline in numbers is a real trend.

Table 6:Egg mass counts and estimated minimum adult numbers of Oregon spotted frog at Gold Lake area.

Year	Egg Masses	Minimum No. Adults	Source
2006	860	1720	USGS*
2007	729	1458	USGS*
2012	473	946	Forest Service**
2015	425	850	Forest Service**
2017	409	818	Forest Service**

*Chris Pearl, U. S. Geological Society, Corvallis, Oregon, personal communication.
**Unpublished wildlife survey data, Willamette National Forest, Middle Fork Ranger District.

Mink Lake area:

There are two breeding populations of Oregon spotted frog in the Mink Lake Basin, one in an unnamed marsh (referred to as Unnamed Marsh Mud Lake in the final critical habitat rule) and one at Penn Lake. These sites are about 0.93 miles apart (USFWS 2014). A few adults have also been detected in some years at sites within 260-800 meters of the Penn Lake breeding site, but no permanent breeding has been found at these satellite sites. Critical habitat totals 98 acres and includes the two breeding sites, five satellite lakes, ponds and marshes, and the portion of the South Fork McKenzie River connecting Unnamed Marsh Mud Lake and Beaver Marsh (one of the satellite sites near Penn Lake) (USFWS 2016).

Oregon spotted frog populations have been monitored at the two breeding sites by U. S. Geological Survey (USGS) using mark-recapture techniques since 2007, but the data have not been rigorously analyzed for trends. In 2011, the breeding adult population was estimated at 179 (with a 95% confidence interval of 146-238) at Penn Lake and at 38 (with a 95% confidence interval of 35-49) at Unnamed Marsh Mud Lake (Adams et al. 2011). The status of the population is officially listed as unknown at both sites. The Forest Service is currently working with USGS to support continued monitoring of these populations and the expectation is that USGS will analyze the data set for population trends at some future date after more years of data have been collected. Beaver activity has increased in the Mink Lake area, including at Penn Lake breeding site, which is thought to be beneficial to the Oregon spotted frogs. Monitoring changes to spotted frog abundance before and after beaver colonization at Penn Lake site is a part of the USGS study design.

Monitoring Discussion, and Adaptive Management Considerations

Further monitoring at the Gold Lake site and analysis by USGS at the Mink Lake sites are needed to determine population trends. No changes to Forest Plan, monitoring questions, or indicators is warranted at this time.

Botanical Species

iv.e) What are the trends for botanical Sensitive Species? Are any species we are monitoring in decline? If so, have management actions been taken to restore their habitats?

Monitoring Results

Each District averages 3 days of sensitive plant monitoring per year. Most of the sensitive plant populations we have been able to monitor have been stable. However, some are experiencing natural or manmade activities that put them at risk.

We implemented the third set of long term monitoring plots for whitebark pine (*Pinus albicaulis*), a USFWS Candidate species for listing by the USFWS in 2016 up in Mt. Jefferson Wilderness. We now have 3 sets of long term monitoring plots that will be read every 5 years to track population health. This is a part of a larger Regional network of monitoring sites.

We continued working with Portland State University on monitoring (2016) and planting additional *Arabis hastatula* seedlings at Iron Mountain lookout where the population had been extirpated during

lookout removal. During the 3 years of the project, planting techniques for this rocky site were refined so that ultimately 50% of plants survived to flowering.

Monitoring Discussion, and Adaptive Management Considerations

There are other species at the southern edge of their range, such as *Botrychium montanum* and *Botrychium minganense* whose populations are in decline. *Ophioglossum pusillum* populations also seem to be in decline across the forest. Experts haven't developed any ideas on how to stop the decline. We will continue to monitor these populations and propose enhancement of habitat where we are able. Other species are experiencing loss of habitat through tree encroachment in meadows (*Lathyrus holochlorus, Feasera umoquaensis*) and invasive plants moving in (*Polystichum californicum*). We get to habitat restoration as budget and capacity allow. Additional funding is needed to monitor all the species that were recommended in the Forest Plan. No changes to Forest Plan, monitoring questions, or indicators is warranted at this time.

Recreation and Cultural Resources

Recreation on national forests is a major contribution to social, cultural, and economic conditions. This section monitors changes in the recreation experiences the Forest provides and an opportunity to see trends. The Forest strives to provide sustainable recreation opportunities and access for a range of uses which would add to the social and economic health of communities.

Benefits from other areas such as the cultural resources provide a more indirect benefit designed to assist the Forest Supervisor in determining the effectiveness of the Forest Plan Standards and Guidelines in providing protection to these sites.

(v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.

Table 7: Monitoring sub-questions addressing recreation and cultural resources.

	Monitoring Question	Indicator(s)	Monitoring Results
Historic Properties	**v.a.** Are significant (National Register eligible) historic properties being maintained, stabilized, and repaired according to historic preservation standards?	Monitoring data/site condition assessments.	A Change in the Monitoring Question may be warranted. Perhaps the monitoring question should address the matter of whether the Forest is conducting inventories and protecting sites and combine the current maintenance, stabilize and repair into preservation and condition assessments. Ultimately, it may be helpful to align the monitoring with the Heritage Program Manage to Standards (HPMtS).
Visitor Satisfaction	**v.b.** Are people having a high level of satisfaction during their visit to Willamette National Forest?	Percent visitor satisfaction for: Developed sites, General forest areas, Designated wilderness.	For this recreation report, there are no changes deemed necessary in regards to the Forest Plan, the monitoring indices or questions. The monitoring is maintaining desired results.

Cultural Resources

v.a) Are significant (National Register eligible) historic properties being maintained, stabilized, and repaired according to historic preservation standards?

Monitoring Results

Cultural resource management is mandated by Federal laws and regulations to ensure the preservation of our Nation's heritage. The National Historic Preservation Act (NHPA) requires agencies to develop a process for the preservation of historic properties. Section 106 of NHPA requires the agency to take into

account the effects of their undertakings on historic properties through field surveys. Section 110 of NHPA calls for the agency to have a preservation program that identifies, evaluates, and protects historic properties.

The Willamette National Forest (WNF) Heritage program provides for the protection and preservation of historic priorities located on WNF lands. The Heritage program tracks preservation and protection activities through two databases. Our Geospatial Information System (GIS) database tracks spatial locational information with minimal tabular data concerning inventories and sites. The Natural Resource Manager (NRM) Heritage database primarily tracks program accomplishments through project and site data. The NRM database will be used for this report.

During Fiscal Year (FY) 2016 the Heritage program completed 70 projects that covered 1,202 acres of survey and yielded 59 cultural resources. Of these projects, 47 were for Section 106 compliance concerning the identification and evaluation of cultural resources and 22 projects were for Heritage program compliance and the preservation of cultural resources. One project was a programmatic initiative for data migration to an updated GIS database. Section 106 projects were conducted for various program support that included but not limited to Timber, Recreation, Botany, Recreation, Trails, and Fisheries programs.

Of the 22 Section 110 Heritage program compliance projects, the Heritage program conducted 253 acres of survey yielding 16 cultural resources. Cultural resources monitored and assessed included 12 Priority Heritage Assets (PHA). One cultural resource underwent a damage assessment. The Heritage program also complete one National Register of Historic Places nomination. In 2016 volunteer's contributed 584 hours (total value of $24,250.09) for the preservation and protection of historic properties.

During FY 2017 the Heritage program completed seven projects that covered 53 acres of survey and yielded five cultural resources. No projects were recorded as Section 106 in FY 2017.

All seven projects in FY 2017 were for Section 110 Heritage program compliance. The Heritage program conducted 21 acres of Section 110 survey yielding zero cultural resources. Cultural resources monitored and assessed included five Priority Heritage Assets. In 2017 volunteer's contributed 750 hours (total value of $15,000) for the preservation and protection of historic properties.

Management of the Heritage Program for reporting years 2016 and 2017 has provided a snap shot of our programs efforts to preserve and protect cultural resources. Data analysis of FY 2016 NRM database reveals an average picture of the Programs efforts yet work is needed concerning our data tracking and entry. Fiscal Year 2017 NRM database reveals less than average picture of the Programs efforts. In both years, the Program needs to better our efforts with data entry inputs and accuracy. It is important to note that in FY 2017 the Heritage Program implemented a new NRM database platform and performed an updated GIS data migration. The Forest also suffered from a catastrophic fire season. These factors contributed greatly to the lack of reporting in FY 2017.

Monitoring Discussion, Findings, and Adaptive Management Considerations

A Change in the Monitoring Question and Indicator may be warranted. Perhaps the monitoring question should address the matter of whether the Forest is conducting inventories and protecting sites and combine the current maintenance, stabilize and repair into preservation and condition assessments. Ultimately, it may be helpful to align the monitoring with the Heritage Program Manage to Standards.

Recreation

The U.S. Forest Service develops estimates of the volume of recreation use on National Forests through the National Visitor Use Monitoring program. Onsite surveys across the National Forest System is completed every 5 years, the last survey on the Willamette National Forest was 2017.

v.b) Are people having a high level of satisfaction during their visit to Willamette National Forest?

Monitoring Results

Satisfaction

The overall satisfaction results show that about 77% of people visiting indicated they were very satisfied with their overall recreation experience. Another 17% were somewhat satisfied. The results for the composite satisfaction indices were mixed. Satisfaction ratings for perception of safety were at least 80% for all types of sites. Over half of visitors were “very satisfied” with: developed facilities (63%), condition of environment (73%), employee helpfulness (82%), parking availability (66%), parking lot condition (66%), road condition (54%), feeling of safety (79%), scenery (91%), signage adequacy (58%), trail condition (65%), and value for fee paid (70%).

Figure 1: Level of Satisfaction.

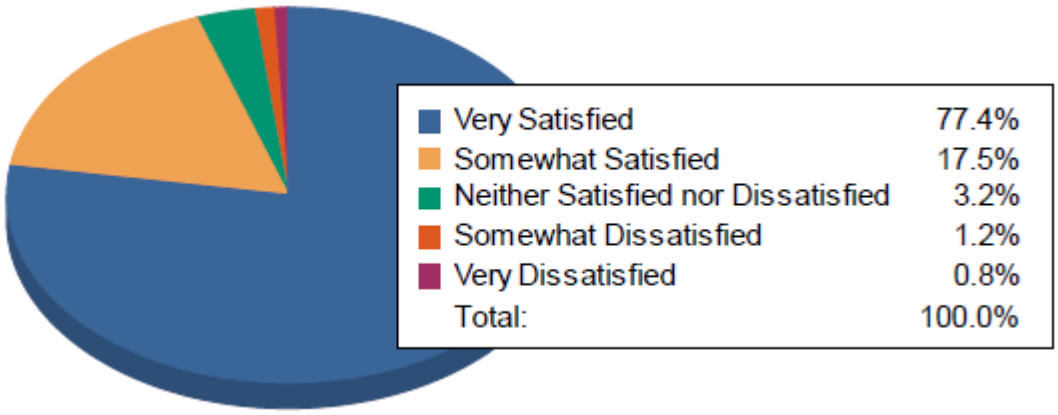


Table 8: Satisfaction Elements for Recreation

Satisfaction Element	Percent Rating Satisfaction as:					Mean Rating§	Mean Importance†	No. Obs‡
	Very Dissatisfied	Somewhat Dissatisfied	Neither Satisfied nor Dissatisfied	Somewhat Satisfied	Very Satisfied			
Restroom Cleanliness	7.1	7.8	13.1	29.7	42.3	3.9	4.4	333
Developed Facilities	0.0	2.2	5.8	28.6	63.4	4.5	4.3	354
Condition of Environment	0.1	4.3	4.0	17.7	73.9	4.6	4.9	501
Employee Helpfulness	0.3	1.2	5.5	10.0	82.8	4.7	4.6	169
Interpretive Displays	2.8	6.8	28.4	21.6	40.5	3.9	4.0	371
Parking Availability	0.6	8.2	10.8	13.8	66.7	4.4	4.3	475
Parking Lot Condition	0.2	2.7	10.3	20.7	66.2	4.5	4.0	452
Rec. Info. Availability	0.7	5.4	16.7	30.1	47.0	4.2	4.3	394
Road Condition	0.5	3.8	10.1	30.6	54.9	4.4	4.5	379
Feeling of Satefy	0.0	1.3	4.2	14.9	79.6	4.7	4.7	495
Scenery	0.0	0.1	2.0	6.7	91.3	4.9	4.8	502
Signage Adequacy	4.3	5.6	6.7	24.8	58.6	4.3	4.4	492
Trail Condition	1.3	2.9	4.8	25.4	65.6	4.5	4.6	404
Value for Fee Paid	0.5	5.7	7.5	16.2	70.1	4.5	4.5	250

Monitoring Discussion, and Adaptive Management Considerations

For this recreation report, there are no changes deemed necessary in regards to the Forest Plan, the monitoring indices or questions. The monitoring is maintaining desired results. Based on National Visitor Use Monitoring (NVUM) results, almost 95% of visitors were very satisfied or somewhat satisfied with their overall experience. The satisfaction rankings are consistently high, regardless of visit type.

Climate Change

This monitoring report describes the resources and services the Forest provides its constituents. Climate change puts these resources at risk. One urgent hazard to the Forest is expanding insect infestations.

The Forest Service has used a climate change scorecard system to track our progress in responding to climate change. The Climate Change Performance Scorecard was administered annually to each national

forest or grassland from 2010-2016. A new scorecard will be implemented beginning summer of FY20. The scorecard will help as the agency moves forward with integrating climate change into our program of work and adjusting land management strategies accordingly.

(vi) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.

Table 9: Monitoring sub-questions addressing climate change and other stressors.

	Monitoring Question	Indicator(s)	Monitoring Results
Climate Change	**vi.a.** Is the forest reporting and meeting expected adaptations as reported on the national Climate Scorecard?	Timely response to regional data calls. Proactive forest level activities towards adaption.	The Willamette National Forest has exceeded minimum indicators in the National Scorecard reporting for all categories through FY2016. Our strong science-management partnerships and substantial local science available from the H.J. Andrews Experimental Forest places the Willamette in a strong position to plan and implement "climate smart" management activities. No changes to the Forest Plan, monitoring question, or indicators are warranted at this time.
Insect&Disease	**vi.b.** Is insect and disease below potentially damaging levels?	Acres affected by type and insect disease.	Based on the results below the listed information and by having a flight annually checking on insect and disease occurrences, there are no recommendations for changes to the Forest Plan or monitoring program.

Climate Change

vi.a) Is the forest reporting and meeting expected adaptations as reported on the National Climate Scorecard?

Monitoring Results

The goal of the Climate Change scorecard is to create a balanced approach to climate change that includes managing forests that adapt to changing conditions, mitigating climate change, building partnerships across boundaries, and preparing our employees to understand and apply emerging science. Upmost importance is the Willamette remain in sync with the Region in meeting this goal.

The Willamette has consistently met or exceeded the benchmarks outlined in the Climate Scorecard (https://www.fs.usda.gov/main/r6/climatechange). We are involved with projects such as floodplain restoration, young stand thinning, and meadow enhancement that all contribute to improved landscape resiliency and resistance to climate change. The Scorecard also includes benchmarks for sustainable operations, such as increasing our use of clean energy; reducing energy consumption through purchase

of energy smart appliances; installing energy efficient lighting and heating/cooling systems; and leasing hybrid vehicles. Reductions in water use by installing drought resistant landscaping at our District and Headquarters Offices has also been part of this benchmark. Efforts have been on-going to improve our purchasing practices to include greener, reusable, and surplus products.

Monitoring Discussion, and Adaptive Management Considerations

The monitoring indicators contained in the Climate Change Scorecard have been of sufficient rigor to indicate progress for this issue.

Our efforts to manage for resilient systems on our landscapes and more sustainable operations in our facilities and business practices are progressing at a steady pace.

The Willamette National Forest has exceeded minimum indicators in the National Scorecard reporting for all categories through FY2016. Our strong science-management partnerships and substantial local science available from the H.J. Andrews Experimental Forest places the Willamette in a strong position to plan and implement "climate smart" management activities. No changes to the Forest Plan, monitoring question, or indicators are warranted at this time.

Insect and Disease

vi.b) Is insect and disease below potentially damaging levels?

Monitoring Results

Monitoring of insect and disease (I&D) activity on the forest is completed each year with results for the impactful pests shown in Table 10. Over the 10 year period of 2008-2017, following the Mountain Pine Beetle (*Dendroctonus ponderosae*) outbreak in the mid-2000s along the Cascade Crest, all I&D levels have returned to endemic levels for species surveyed. Endemic levels of I&D are considered natural and within expected levels of damage resulting from I&D. Within the Willamette National Forest I&D totaled approximately 5,255 acres, which is approximately 40 percent lower than the 10 year average of 8,730 acres.

Monitoring Discussion, and Adaptive Management Considerations

Recent wildfire has caused localized patches of increased insect mortality as a result of an abundance of dead and dying host trees. These dead and dying trees commonly cause localized outbreaks of disease which may cause above average mortality of green trees adjacent to the fire killed trees. The fires typically had a mixed severity which resulted in small areas of high intensity fire, intermixed with areas of moderate to low intensity. A mosaic of mortality resulted between the various fires, as well as the rate of mortality among individual fire perimeters. Overall, from 2008-2017, the forest has had approximately 97,660 acres burned for an average of 9,766 acres annually of which the majority was associated with a few fires, the Tumblebug Complex of 2009, and the Avenue, Whitewater, Separation and Jones Fires of 2017. Based on this information and having a flight annually checking on insect and disease occurrences, there are no recommendations for changes to the Forest Plan or monitoring program.

Table 8: Insect and Disease Survey Results

Forest Pest	Total Acres Affected by I&D 2008-2017	Average Acres Affected by I&D 2008-2017	Acres Affected by I&D 2017
Douglas-fir Beetle	18,892	1,889	749
Douglas-fir Engraver	98	10	9
Fir Engraver	12,834	1,283	3,513
Flathead Borer	25	3	0
Mountain Pine Beetle	44,728	4,473	558
Silver Fir Beetle	9,691	969	389
Western Pine Beetle	1,027	103	38
Totals	87,295	8,730	5,255

Insect and disease aerial survey data is available here.

Meeting Desired Conditions and Objectives

The Forest Standards and Guidelines provide direction to enable the Forest to meet the goals of maintaining and improving water quality, providing a sustainable timber output, while minimizing catastrophic wildfire.

(vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.

Table 9: Monitoring sub-questions on desired conditions and objectives.

	Monitoring Question	Indicator(s)	Monitoring Results
Fuels	**vii.a.** Are management activity created fuels at acceptable ranges for downed woody material as indicated in Table IV-32, on 95% of the affected ac res?	Tons/acre of activity created dead woody material in activity units.	The monitoring results and data collected indicate that the Forest continues to meet the desired conditions outlined in the Forest Plans Standards and Guidelines for fuels management.
Timber Output	**vii.b.** How do timber output estimates in the Forest Plan compare with actual production?	How does the timber volume sold compare to the probable sale quantity (PSQ)?	The monitoring results provided all the information needed to answer the monitoring question and the question is still valid. Not meeting PSQ outputs
Stocking	**vii.c.** Are we meeting the recommended stocking levels and timeframes required by the National Forest Management Act (NFMA)?	Meeting stocking guidelines in the Forest Plan as tiered to the Forest Service handbook.	We have met all regeneration timelines for required reforestation.

	Monitoring Question	Indicator(s)	Monitoring Results
Sustainability	**vii.d.** How ecologically sustainable is the level of timber harvest on the forest?	What is the amount of harvested timber each year compared to the amount of growth and mortality across the forest?	The combination of completed and ongoing planning efforts have resulted and continue to provide for a sustainable harvest of approximately 100 MMBF of saw timber annually.

Post-Management Fuel Level

vii.a) Are management activity-created fuels at or below the maximum acceptable ranges for allowable downed woody material as indicated in Table IV-32, on 95% of the affected acres?

Monitoring Results

Table 10: Acres of Activity Generated Fuels meeting Standards and Guidelines

Acres of Activity Generated Fuels (2017)	Acres of Treated Fuels (2017)	Percentage of Acres meeting S&G FW-252 (2017)	Acres of Activity Generated Fuels (2016-2017)	Cumulative Annual Average Treated Fuels (2016-2017)	Percentage of Annual Acres meeting S&G FW-252 (2016-2017)
3.798 acres	2,479 acres	96%	7,114 acres	5,012 acres	96%

Preliminary Interpretation of Results: In FYs 2016 and 2017 approximately 7,114 acres of harvest activity fuels were inventoried. 5,012 acres received a fuels treatment that reduced the down woody material remaining on the landscape to levels at or below the Standards and Guidelines (S&Gs) found in Forest Wide table 252. Of the 2,102 acres that did not receive a fuels treatment in FY's 2016-2017 approximately 1500 acres had fuels treatments postponed until later dates (FYs 2018-2019), 300 acres did not require any fuels treatments to meet standard and guidelines, and 300 acres were associated with helicopter logged units that did not receive a fuels treatments because they were cost prohibitive. In these units tonnages of down woody material were knowingly in exceedance of S&Gs but left in order to meet other forest management objectives.

Information Sources: Information gathered for this Forest fuels monitoring report was consolidated from the Willamette National Forest fuels AFMO's fuels monitoring reports and the Forest Activities Tracking Database (FACTS). AMFOs completed photo series ocular estimates for post-harvest fuel loading and reported those accomplishment into our tracking database (FACTS).

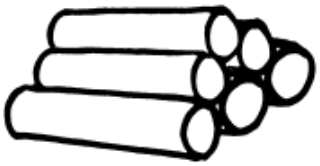
Threshold of Variability: The threshold of variability was not exceeded in fiscal year 2017 or the two years cumulative average.

Monitoring Discussion, and Adaptive Management Considerations

The monitoring results and data collected indicate that the Forest continues to meet the desired conditions outlined in the Forest Plans Standards and Guidelines for fuels management. While total acres treated is a broad indicator of the condition of the Forests fuel levels and profile, this continues to be the best available metric available to ensure that fuels management activities continue to trend toward the desired future condition in reference to post-harvest activities. As funding for post-harvest fuels treatments are tied to revenue generated by timber sales, the ability of the Forest to maintain its level of desired fuels management is conditional upon the economic viability of future timber sales. No changes warranted to the Forest Plan, or the monitoring program.

Timber Output

vii.b) how do the timber output estimates in the Forest Plan compare with actual production?



Monitoring Results

Target accomplishment is measured in terms of volume awarded. In FY 16 and FY 17 the Willamette National Forest assigned target ranged from 75 to 80 mmbf (million board feet). Total volume awarded through timber sales, permits and contract modifications was 78.5 mmbf in FY16 and 76 mmbf in FY17. Total volume awarded amounts are all included in meeting our PSQ (111 mmbf) levels. FY16 volume awarded amounted to 71% of the probable sale quantity (PSQ) with FY 17 award being 68% of PSQ.

The total volume cut from year to year is influenced by the market prices and demand for lumber. A total of 100.7 mmbf volume was cut in FY16 on the forest and 66 mmbf was cut in FY 17. The decrease in FY 17 can be largely attributed to an active fire season which placed the highest level of restrictions on forest operations.

The majority of the timber harvesting program in the past few years, including FY 16 and FY 17 has been in the general forest (MA 14) and matrix land allocations. However, since commercial thinning has become the predominant harvest method, timber sales have been used as a tool to achieve other resource objectives in other land allocations such as riparian reserves and late successional reserves. In recent commercial thinning sales, up to 35% of the total acres thinned in a project area have been in parts of the riparian reserve.

Commercial thinning is the predominant silvicultural prescription being utilized. In order to introduce and develop stand structural and species diversity, 5 to 10% of the thinned acreage includes gaps ranging from 0.5 to 3 acres in size.

Monitoring Discussion, and Adaptive Management Considerations

Market conditions and mill infrastructure remain favorable for selling competitive timber sales and stewardship contracts. The timber market in the southern Willamette Valley is stable due to the presence of multiple landowners including Forest Service, Bureau of Land Management (BLM), State and private (industrial and non-industrial). The high value of Forest Service timber products coupled with accessible markets makes timber sales attractive to local purchasers. Internal decisions on timber sales

and outside factors such as lumber markets at times cause sales not to sell. These no-bid sales are often correctable and resold at a later date.

The monitoring results provided all the information needed to answer the monitoring question and the question is still valid. The monitoring results show a continued trend of not meeting the Forest Plan components in terms of volume outputs. The Forest has invested in increasing timber outputs with the goal of meeting desired outputs in the Forest Plan. These investments are starting to show positive signs for future fiscal year outputs. No change in the Forest Plan or monitoring program is needed at this time.

Stocking Levels

vii.c) Are we meeting the recommended stocking levels and timeframes required by National Forest Management Act (NFMA)

Monitoring Results

The National Forest Management Act (NFMA) establishes the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth and stand conditions designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans.

Certified silviculturists approve all vegetation management prescriptions on the Forest to ensure the Willamette National Forest retains appropriate forest cover. In situations where a disturbance, either from fire or harvest, creates a condition where stocking levels drop below the minimum required amount specified in the Forest Plan, reforestation plans are prepared. Reforestation can be natural or planted and is monitored through stocking surveys up to five years after seedling establishment. The stand is certified after the final stocking surveys demonstrates the regeneration on the site is fully stocked.

Over the course of 2016 and 2017 there were 237 acres were certified as adequately stocked under the expectations of the NFMA law. From this total, 78 acres were monitored from natural regeneration and 159 acres were monitored after planting. Causal agents were both fire and timber harvest.

Monitoring Discussion, and Adaptive Management Considerations

The NFMA regeneration period only applies to regeneration harvesting and is not required for wildfire situation. Both required regeneration needs resulting from harvest and those opportunistic needs resulting from wildfire are maintained in the FACTS database. We have met all regeneration timelines for required reforestation. Wildfire reforestation and restoration needs along with species diversity planting are part of the Forest's planting program. Based on this information and having FACTS as a database of record to track both needs and accomplishments, there are no recommendations for changes to the Forest Plan or the monitoring program.

Sustainable Harvest

vii.d) How ecologically sustainable is the level of timber harvest on the forest?

Monitoring Results

This table shows that in FY 2017, the Willamette sold approximately 77.2 million board feet (MMBF) and lost approximately 341.6 MMBF to natural mortality; while growing nearly 1,319 MMBF. Our excess annual growth after subtracting harvest and natural mortality, is around 900 MMBF. Additionally, the Forest has reinstated regeneration harvest in both natural and managed stands. This process, while balancing needs for other resources, helps capture some natural mortality and better ensures sustainability as plantations grow into harvestable stands in the future and helps provide for stands of all ages across the forest.

Table 11: Compares growth to harvest mortality

	Timberland	Other forest	All forest
Change	Total	Total	Total
Gross growth*	1,068.8	249.8	1,318.6
Mortality**	237.5	104.1	341.6
Net growth	831.3	145.7	977.0
Volume sold/contracted***	77.2	0.0	77.2
Net change:	754.1	145.7	899.8
Area (ac):	1,187,548	416,305	1,603,853

*Based on 900 and 600 bf growth/acres/year for Timberland and Other Forest respectively.

**Based on 200 and 250 bf natural mortality/acres/year for Timberland and Other Forest respectively.

***Based on FY 2017 MMBF Saw-timber sold.

Monitoring Discussion, and Adaptive Management Considerations

The Forest also made progress on planning vegetation management projects that accomplish multiple objectives including wildfire risk reduction, regeneration harvest, commercial thinning in overstocked plantations, and dry forest habitat restoration. The combination of completed and ongoing planning efforts have resulted and continue to provide for a sustainable harvest of approximately 100 MMBF of saw timber annually. As shown in Table 11, the Forest could increase its volume sold to 100 MMBF, which is 23 MMBF over the 2017 volume sold and still have a Net Change (growth) of around 731 MMBF annually. The Forest Probable Sale Quantity (PSQ) identified in the NWFP is 116 MMBF, so by staying below the PSQ and the information in Table 11 our program is considered sustainable so there are no recommendations for change to the Forest Plan or monitoring program.

Land Productivity

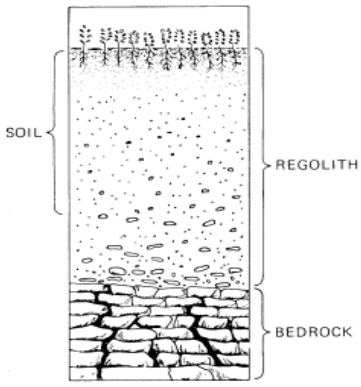
The Forest Standards and Guidelines provide direction to enable the Forest to meet the goals of maintaining and improving water quality, providing a sustainable timber output, while minimizing catastrophic wildfire effects to resources.

(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)).

Table 12: Monitoring sub-question on the productivity of the land.

	Monitoring Question	Indicator(s)	Monitoring Results
Productivity	**viii.a.** Are management activities being implemented so that they do not substantially and permanently affect soil conditions?	% of soils in disturbed condition at the unit and project scale.	Based on the monitoring results, the Forest Plan components are maintaining as desired or anticipated, as all activities resulted in less than 20% areal compaction due to design features being followed or enhancement subsoiling taking place post-sale.

Soil Conditions



viii.a) Are management activities being implemented so that they do not substantially and permanently affect soil conditions?

Monitoring Results

Forest Plan Standards and Guidelines used to protect soil productivity are focused on limiting the extent of compaction and displacement related to the use of ground-based equipment on forest soils, and survey of soil effects from prescribed fire. Soil monitoring data summarized in this report will be from May 1, 2016 to September 30, 2017.

The Forest Plan requires that no more than 20% of an area harvested by ground-based machines should be impacted by roads, landings and skid trails on a given harvest unit. Post-sale reconnaissance and transect monitoring accomplished by the soil scientist on units of Sidewalk Thin, Traverse Thin, North Win Thin, Blanket Thin, Thor Thin, CPP Thin, CPH Thin, Moss Thin, Portland Thin and Niner Thin revealed that Best Management Practices (BMPs) were being used properly to protect soil productivity in ground-based logging locations. BMPs included limiting ground-based machines to slopes less than 30%, using properly designated skid trails and reuse of old skid trails to minimize extent of effects and conducting ground-based operations when soils are not too wet. Monitoring included walking several field treatment units to determine the extent of skid trail impact. On these transects, a shovel or probe is pushed into the soil at regular intervals to test compaction.

During timber sale planning, the Forest Geologist and district Soil Scientist also conduct pre-harvest transects to determine if compaction from past harvest is under or over the Forest Plan standard of 20% aerial extent. Where percent compaction approaches or exceeds the Forest Plan standard, sub-soiling of compacted areas is recommended in the Environmental Assessment. The Forest Geologist revisited the Niner Sale and recommended additional acres of subsoiling above and beyond NEPA prescriptions for soils to alleviate ground-based caused compaction.

Monitoring Discussion, and Adaptive Management Considerations

The monitoring results provided all the information necessary to answer the monitoring questions for the soil resource. Based on the monitoring results, the Forest Plan components are maintaining as desired or anticipated, as all activities resulted in less than 20% areal compaction due to design features being followed or enhancement subsoiling taking place post-sale. No changes are suggested for the Forest Plan or monitoring program. No USFS management activities or other events in the activity area positively or negatively influenced the monitoring results, and they do not show trends or values not anticipated or described in the Forest Plan Assessment.