

Agenda Item No.:	7
Work Plan:	State Forests Work Plan
Topic:	State Forests Management
Presentation Title:	Western Oregon State Forests Draft Forest Management Plan
Date of Presentation:	September 6, 2023
Contact Information:	Ron Zilli, Deputy State Forests Division Chief (503) 741-1098 Ron.F.Zilli@odf.oregon.gov Tyson Wepprich, Adaptive Management Specialist Tyson.M.Wepprich@odf.oregon.gov Nick Palazzotto, Resource Support Unit Manager (503) 945-7366, Nick.Palazzotto@odf.oregon.gov

CONTEXT

Forest Management Plans provide the overarching management direction for State Forests. These plans are developed pursuant to Oregon Administrative Rule and are adopted by the Board of Forestry to codify the Board's finding that management direction meets Greatest Permanent Value (OAR 629-035-0030).

FMP Development

In October 2020, the Board of Forestry (Board) directed the Division to develop a draft Western Oregon State Forests Management Plan (FMP) that would use the draft Western Oregon State Forests Habitat Conservation Plan (HCP) as its mechanism for compliance with the federal Endangered Species Act (ESA). The FMP (Attachment 1) provides an overall high-level forest management approach and goals and strategies for a broad spectrum of forest resources. The HCP provides biological goals and objectives specifically for covered species to ensure compliance with the federal Endangered Species Act. The HCP establishes long-term (70-year) commitments to conservation and provides long-term assurances that forest management will continue under a set of agreed upon conservation measures throughout the life of the HCP. The draft FMP is needed to articulate the complete integrated forest management approach for state forest lands in western Oregon. Together, the FMP, HCP, and other policies guide Implementation Plans, which specify management activity targets to be accomplished over a planning horizon of approximately 10 years.

The Division presented the draft FMP goals and strategies for Board consideration in November 2021 and March 2022 respectively.

Process

Activities since the March 2022 Board meeting:

- Goals and strategies revised according to public and other interested party feedback, including the Board.
- Goals and strategies streamlined by staff resource specialists.
- Project Leadership Group alignment on management approach to clarify how the FMP, HCP, and other operational policies work together to deliver Greatest Permanent Value.
- Internal reviews and revision based on District field staff review.
- Science review and revision of all FMP chapters, with special attention to climate resilience and mitigation, and diversity, equity, and inclusion.

Engagement

FMP engagement activities since the last Board meeting on March 9, 2022, are summarized in the FMP Appendix A. They include:

- State Agency Meetings – approximately monthly through August 2023
- Meetings Open to the Public – 2 meetings
- Forest Trust Land Advisory Committee – 3 meetings
- State Forests Advisory Committee – 4 meetings

Tribal Sovereign Nations Coordination

Oregon Department of Forestry (ODF) recognizes that the Tribes have applied their management practices across the landscape that ODF currently manages since time immemorial. ODF values this rich traditional ecological knowledge and seeks to incorporate Tribal perspectives and management practices into the stewardship of State Forests. To date, the State Forests Division has hosted six Tribal workgroup meetings, open to the nine federally recognized Tribes of Oregon, to develop the Cultural Resources Goals and Strategies for the FMP. Collaboration is ongoing and the Division will continue working with Tribal Partners in the Government-to-Government forum to integrate their interests in ODF's planning and implementation processes at every level.

Draft Adaptive Management Plan and Performance Measures

The draft FMP under consideration by the Board is implemented under an adaptive management framework in which the monitoring of outcomes enables learning and improvement of management strategies. To this end, an Adaptive Management Plan (AMP) will accompany the FMP as stated in the implementation guidelines in the FMP.

The draft AMP (Attachment 2) offers direction and administration for (1) facilitating decision analysis and adaptive management; (2) designing monitoring; (3) reporting monitoring results, analyses, and decisions; and (4) identifying and integrating information and decision needs within state forest lands. The need for an AMP comes from the expanded scope of this FMP that includes adaptive management as a key tenet of its management approach, a companion HCP with extensive monitoring requirements, and a commitment to accountability to the Board and all Oregonians. Monitoring, reporting, and decision-making support will be continuously updated in the AMP and reported in a more nimble and integrative manner that enables timely management responses to new information.

A new set of performance measures will also accompany the FMP (Attachment 3). Performance measures are a select set of metrics that the Board will use to evaluate management outcomes with respect to the objectives and intent expressed through the FMP guiding principles, management approach, and goals. The ten performance measures listed below have component metrics that will be monitored and reported under the process described in the AMP. While performance measures do not encompass all aspects of the Division's monitoring and reporting, their purpose is to provide an up-to-date dashboard for the Board and others to track management outcomes and commitments readily across a broad range of ecosystem services provided by State Forests

Quantifiable targets and acceptable ranges designated by the Board for performance measures' components can indicate whether FMP strategies are working as intended to provide Greatest Permanent Value (GPV). Targets are intended to inform the Board, the Division, and others of potential over- and under-performance but are not considered as

hard constraints on management activities in isolation. The Division is tasked with considering all the goals and strategies, addressing trade-offs, and meeting GPV when implementing the FMP and responding to performance measures.

Performance Measures (arranged alphabetically)

- Adaptive Capacity of Forests
- Aquatic Habitat
- Carbon Storage
- Community Engagement and Public Support
- Division Finances
- Economic Opportunities
- Financial Support for Counties
- Harvest and Inventory
- Recreation, Education, and Interpretation Opportunities
- Terrestrial Habitat

RECOMMENDATION

Information only.

NEXT STEPS

Over the next several months, the Division will:

1. Continue working with the Board to revise the FMP per Board direction.
2. Continue working on modeling a range of temporal and spatial timber harvest scenarios that could be achieved by implementing the FMP. Timber volume and value, carbon storage, and other outcomes from this modeling will be presented to the Board in late fall 2023, with a more detailed socioeconomic analysis of those scenario outcomes to follow.
3. Revise the draft AMP and performance measures in response to feedback and to maintain alignment with the draft FMP and draft HCP. It is anticipated that modeled outcomes of FMP scenarios presented to the Board will include relative comparisons of these performance measures to aid in their decision-making.

Provided that the HCP policy work is on schedule, the FMP will be brought back to the Board to begin the process of adopting the FMP in early 2024.

ATTACHMENTS

- (1) Draft FMP (link to document, available online at <https://www.oregon.gov/odf/board/documents/fmp-hcp/western-oregon-state-forests-management-plan-draft-july2023.pdf>)
- (2) Draft Adaptive Management Plan
- (3) Draft Performance Measures

Item seven, attachment one is available on the Oregon Department of Forestry webpage, <https://www.oregon.gov/odf/board/documents/fmp-hcp/western-oregon-state-forests-management-plan-draft-july2023.pdf>

The title of the document is *Western Oregon State Forests Management Plan, Draft July 2023*

Adaptive Management Plan for State Forests Management
Accompanying the Draft Western Oregon State Forest Management Plan

Contents

Section 1: Vision for the Adaptive Management Plan..... 3

 1a. Adaptive Management Plan Vision 3

 1b. Adaptive Management Plan Goals..... 3

Section 2: Overview of Adaptive Management Plan..... 4

 2a. Definition of Adaptive Management 4

 2b. Key Tools..... 5

 2c. Key Functions 5

 2d. Relation to other Plans and Policies..... 6

Section 3: Staffing and Project Prioritization 9

 3a. Staff..... 9

 3b. Project Prioritization 9

 3c. Resources 10

 3d. Oversight..... 10

Section 4: Monitoring, Reporting Metrics and Quantifiable Targets 11

 4a. Monitoring Approach..... 11

 4b. Reporting Metrics 11

 4c. Quantifiable Targets..... 12

 4d: Monitoring Example..... 13

Section 5: Performance Measures..... 14

 5a. Overview 14

 5b. What are Performance Measures? 14

 5c. History..... 14

 5d. Development of New Performance Measures 14

 5e. Performance Measures Reporting and Changes 15

Section 6: Habitat Conservation Plan Adaptive Management..... 16

 6a. HCP Monitoring..... 16

 6b. Adaptive management for the HCP 16

 6c. HCP Reporting 16

Section 7: Identifying Decision Support Needs from Monitoring.....	17
7a. Overview	17
7b. Decision Context, SDM Scale and Timeline	17
7c. Information Availability.....	18
7d. General Considerations for Constructing Alternatives	18
7e. Decision Process, Implementation, and Consequences for Future Monitoring	20
Section 8: Decision Recommendations	21
Section 9: The AMP Serving All of State Forests	22
9a. Expanding SDM Use.....	22
9b. Prioritization of SDM processes	22
Section 10: Communicating Results.....	23
10a. Overview	23
10b. Presenting Reports to the Board of Forestry.....	23
10c. Public Interface	23
Literature Cited	24
Appendix 1: Literature Review for Staff	25
Appendix 2: Current Reporting Metrics	25
Appendix 3: Performance Measures for the Board of Forestry	25
Appendix 4: Monitoring Plan	25

Section 1: Vision for the Adaptive Management Plan

1a. Adaptive Management Plan Vision

The Oregon Department of Forestry (ODF) manages state forests to achieve Greatest Permanent Value (GPV) through the Western Oregon State Forest Management Plan (FMP). The FMP goals and strategies balance trade-offs to achieve specific GPV benefits – such as providing wildlife habitat, growing resilient forests, storing carbon for climate change mitigation, providing reliable revenue to counties, supporting economic opportunities, and ensuring access for recreation. The forest resource assessment and scientific assumptions used to develop the FMP goals and strategies will change over time, which is why ODF uses adaptive management to monitor resource changes and adjust FMP implementation accordingly. Accompanying the FMP, the Adaptive Management Plan (AMP) provides an expanded roadmap for the processes of monitoring, reporting, and decision support services that aid FMP implementation. The need for an AMP comes from the expanded scope of the draft FMP that includes adaptive management as a key tenet of its management approach, a companion Habitat Conservation Plan (HCP) with expanded monitoring requirements, and a commitment to accountability to the Oregon Board of Forestry (Board) and all Oregonians. With the AMP, monitoring, reporting, and decision support work will be continuously updated and shared in a more nimble and integrative manner than the hierarchy of the FMP, Implementation Plans, and Operations Plans. The AMP shares information from monitoring across plans to report management outcomes more efficiently and ensure that state forests provide GPV.

1b. Adaptive Management Plan Goals

The AMP will be:

- *Transparent.* Interested parties and ODF staff can easily access current work plans and planning documents for decision-making processes and anticipated timelines for delivering results.
- *Understood.* Interested parties and ODF staff know about the AMP and understand its mission and purpose.
- *Effective.* ODF manages state forests to achieve Greatest Permanent Value and can make changes to management practices based on new information.
- *Inclusive.* The AMP integrates interested parties and ODF staff into its processes and incorporates their feedback.
- *Efficient and timely.* The AMP focuses on informing planning and management via developing monitoring efforts that deliver useable results as quickly as possible.
- *Responsive.* When ODF detects issues through monitoring, it works to address management problems creatively, transparently, and effectively.
- *Valued.* Interested parties and ODF staff recognize the benefit that AMP products provide to state forests management and all Oregonians.
- *Reliable.* Decision analysis and monitoring design use the best available science to produce reliable outcomes.

Section 2: Overview of Adaptive Management Plan

2a. Definition of Adaptive Management

One jargon-free definition of adaptive management is “learning by doing and adapting what one does based on what is learned” (Williams et al. 2009). In rule, adaptive management for the FMP means “the process of implementing plans in a scientifically based, systematically structured approach that tests and monitors assumptions and predictions in management plans and uses the resulting information to improve the plans or management practices used to implement them” (OAR 629-035-0000(2)). The FMP Guidelines describe how the planned implementation of adaptive management fits within this definition, which is expanded below.

The State Forests Division (Division) will use adaptive management as a tool within a broader decision-making framework (FMP 4.3.1). The reason for placing “adaptive management” under the umbrella of decision-making is because the term has many definitions in the scientific literature and in more informal usage. For example, in the HCP adaptive management “is a decision-making process used to examine alternative strategies (e.g., conservation actions) to meet the biological goals and objectives, and, if necessary, adjust future management actions based on new information” (WOSF HCP 2022). The OAR and HCP definitions are relatively broad and compatible, but others define adaptive management more narrowly as a specific tool for “recurrent decisions in which uncertainty impedes the choices of action and learning during early decisions can improve later decisions” (Hemming et al. 2022). The Federal Services’ HCP Handbook illustrates the different tools available for changing management at different levels of scientific uncertainty and agreement on management objectives (Figure 1, USFWS and NOAA Fisheries (2016)). The AMP is using the broad definition of adaptive management from OAR and the HCP, which encompasses adaptive management (in a narrow sense) and other tools.

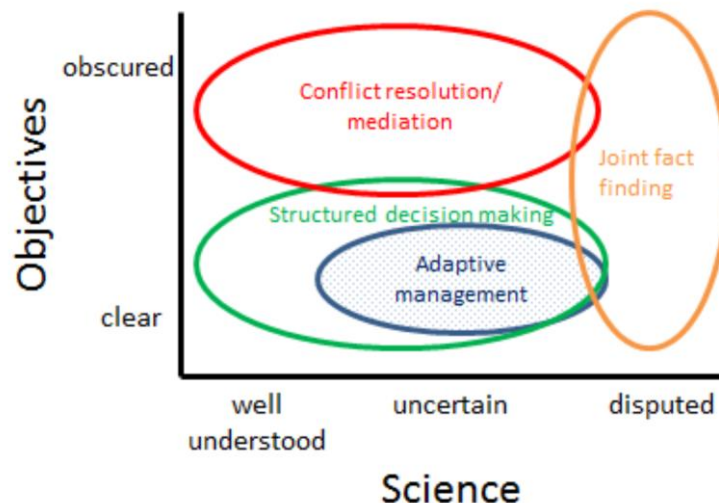


Figure 1: Different tools in a decision-making framework that may include adaptive management in a narrow sense (USFWS and NOAA Fisheries 2016).

2b. Key Tools

The AMP relies primarily on an integrated set of three learning-based tools to achieve its goals: adaptive management, structured decision making (SDM), and adaptive monitoring (FMP 4.3.1). These tools are reviewed in more detail in Appendix 1 for ODF staff desiring a technical background.

- 1) *Adaptive management*, in a narrow sense, enables managers to make a management decision despite having imperfect information. It reduces the uncertainty by purposefully tracking the outcomes of that decision to better inform the decision at the next iteration.
- 2) *Structured decision making* is a “collaborative and facilitated application of multiple objective decision making and group deliberation methods to environmental management and public policy problems” (Gregory et al. 2012). In other words, SDM is a process for enabling decision makers to make informed high-stakes decisions where the outcomes involve trade-offs between multiple objectives. Facilitators may work with interested parties, including ODF staff, to develop decision alternatives and examine trade-offs among the alternatives to creatively arrive at the best suite of alternatives for a decision-maker to consider.
- 3) *Adaptive monitoring* is an approach to designing monitoring that (a) addresses well-defined and tractable questions that are specified in advance of the program, (b) is underpinned by a rigorous statistical design, (c) is based on a conceptual model of factors believed to affect the components of interest, and (d) is driven by a practical need for the information (Lindenmayer and Likens 2009). The adaptive monitoring approach in the AMP embodies this approach by focusing on two goals: accurately estimating each metric and learning about the systems that affect these values.

2c. Key Functions

The AMP offers direction and administration for (a) facilitating decision analysis with SDM, (b) designing monitoring, (c) reporting monitoring and SDM results and analyses, and (d) supporting other information and decision needs within the Division (green box, Figure 2).

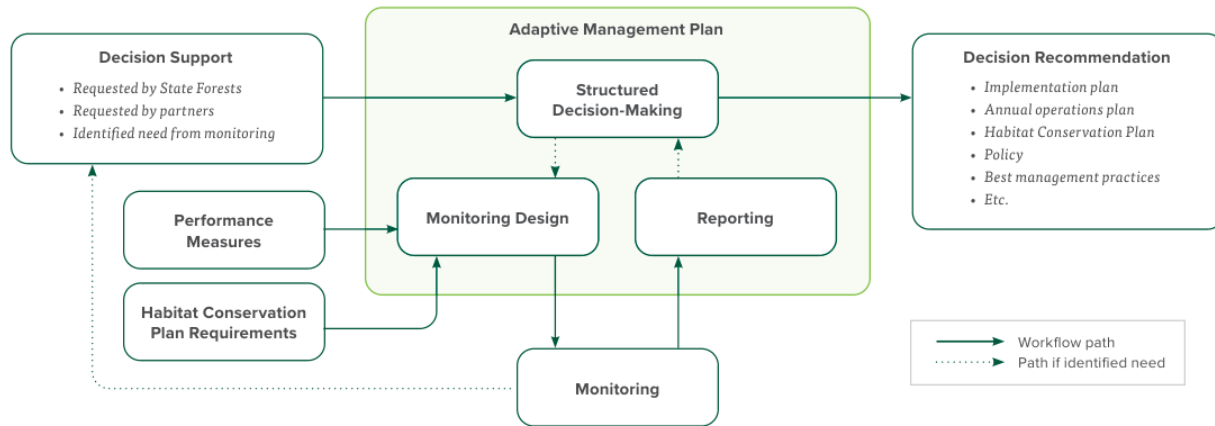


Figure 2. Diagram of the key functions and workflow of the Adaptive Management Plan relative to the Division’s monitoring and decision support needs.

The following list shows the inputs and outputs of the AMP from Figure 2 with the corresponding sections of the AMP. Outputs will have different reporting requirements that are included in their respective AMP sections.

- The AMP will design monitoring for several Division initiatives with *reporting metrics* and *quantifiable targets* (Section 4).
- *Performance measures* are a select set of reporting metrics elevated for the Board to assess the outcomes of the FMP across GPV components (Section 5).
- The HCP has monitoring requirements and an adaptive management process to enact with input from the permit-issuing Federal Services (Section 6).
- If monitoring results indicate that undesirable conditions exist, *decision support* may be triggered (dashed arrow, Figure 2), leading to either an SDM process or directly to management changes (Section 7).
- *Decision recommendations* will be offered at the appropriate level of the Division’s planning, depending on the scope and scale of the management decision (Section 8).
- The Division or partners can request decision support for a management question (Section 9). The AMP develops and facilitates the SDM process.

2d. Relation to other Plans and Policies

The Board provides overall policy direction during FMP development (top row, Figure 3), which culminates in a finding by the Board that the FMP meets GPV prior to the adoption of the FMP as Oregon Administrative Rule (OAR). The FMP includes guiding principles, goals, and strategies. FMP goals are statements of what the State Forester intends to achieve for each forest resource within the planning area consistent with the GPV rule (OAR 629-035-0020). Strategies describe how the State Forester will manage the forest resources in the planning area to achieve the goals articulated in the plan. The AMP develops monitoring for the Board’s performance measures that allows them to review the progress of the FMP implementation.

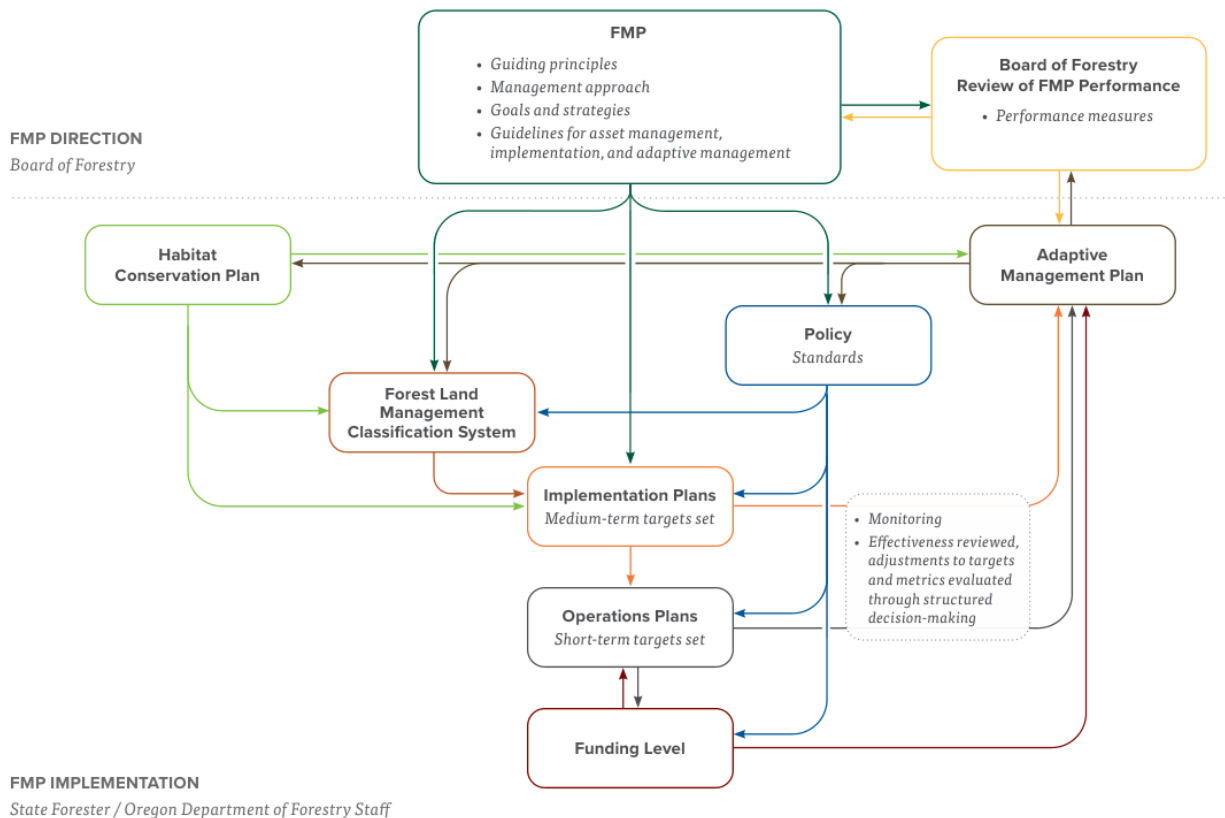


Figure 3. Diagram of the Division’s plans and connections to the Adaptive Management Plan. Reproduced from the Western Oregon State Forest Management Plan Figure 4-1.

The AMP contributes to many aspects of FMP implementation (below dotted line, Figure 3). The FMP directs medium-term strategic Implementation Plans, which in turn direct short-term Operations Plans. The AMP evaluates monitoring results and provides a feedback loop during the planning process. The Division makes strategic changes to management with Implementation Plans, which could include changes to targets for existing reporting metrics or investments in new monitoring to address adaptive management questions.

For some management decisions the AMP will not be involved, such as harvest levels set during the Implementation Plan with an existing process for public and Tribal comment, model forecasting, setting targets, and monitoring outcomes. For AMP-associated monitoring, projects will be developed for inclusion in Implementation Plans with medium-term goals and quantifiable targets. All AMP-associated monitoring (reporting metrics and quantifiable targets) will be tracked in Appendix 2. The Operations Plans will include the specific monitoring by District each year, with details on the lead staff, methods, results, reporting, and timeline collated in Appendix 4.

The AMP develops and reports on HCP monitoring and adaptive management efforts in cooperation with the HCP Administrator in the Division and the Federal Services that grant the Incidental Take Permit (see Section 6). It is likely that monitoring projects and reporting for the HCP will require much of the capacity of the adaptive management program in the first several years after adoption.

To a lesser degree, monitoring and decision-support in the AMP may also be used in adjusting state forests management through policy standards, such as best management practices, or the Forest Land Management Classification System designating the use of an areas of state forests. For example, these changes could be initiated if targets are not met, if the Board requests a policy review, or if the Division initiates decision support for a management problem.

Funding levels determine the financial resources available to implement operations and monitoring. One key function of the AMP will be prioritizing monitoring projects to use resources efficiently (see Section 3b).

Section 3: Staffing and Project Prioritization

3a. Staff

The primary lead for the AMP and its associated projects is the Adaptive Management Specialist in the Information Unit. Other technical staff within the Division will contribute based on the overlap of their assigned duties and AMP project needs. For example, the Biological Support Unit Manager will play a large role as the HCP administrator who will be responsible for its related monitoring, adaptive management, and reporting. Staff from the Information Unit and the Biological Unit will be the main contributors. These include specialists in forest inventory, wildlife biology, aquatic biology, GIS, and monitoring. The Deputy Division Chief and the Information Unit Manager will provide immediate oversight while a charter for an AMP oversight team is developed (Section 3d).

3b. Project Prioritization

The AMP contains a broad suite of monitoring and reporting needs to implement, which may be dependent on ODF staff capacity and financial resources. Multiple sources (public and Tribal engagement, ODF business needs, the HCP, and the Board) may identify needs for decision analysis, adaptive management, or monitoring that will be integrated and prioritized for efficiency.

The AMP sets priorities to develop workplans based on the following criteria comparing potential projects.

- Regulatory requirements, such as HCP compliance monitoring.
- Potential impact on GPV.
- Likelihood of influencing future management decisions.
- Degree of uncertainty or knowledge gap.
- Capacity or feasibility of getting answers in reasonable time and at a reasonable cost.
- Efficient integration with ongoing or planned monitoring.
- Potential for research partnerships.

The AMP team will develop an annual workplan to project the current monitoring and reporting timelines extending 10 years into the future. The timeline will be generated with different assumptions for anticipated funding levels. The workplan will include:

- For years 1-3 provide a detailed schedule of actions required for each project.
- Specify when releases of information will happen for the Board and public.
- Determine analytical assistance needed for a given year across projects to establish whether in-house resources will suffice or if contracting will be necessary.

Project prioritization and the annual workplan are approved by an oversight team (Section 3d).

3c. Resources

Staff assignments will be made by the Information Unit and Resource Support Unit managers. The Deputy Division Chief may identify other staff within the Division who may contribute as needed.

Funding for monitoring will primarily come from ODF's share of the revenues generated from management activities on state forest lands and other funds available for the Division's operations. Other funding will come from the Division's commitments to implement the HCP and forest inventory investments that serve multipurpose monitoring applications. Some specific monitoring projects will be accomplished through budgeted strategic investments. AMP staff will seek out and apply for external grant funding or pursue cross-agency collaborations for monitoring as capacity allows.

3d. Oversight

The AMP's structure represents a broad departure from the Division's current approach to monitoring. The AMP itself should be a work in progress, improving over time. To this end, an oversight team will be convened to monitor the efficacy of the AMP. The oversight team will be comprised of the Information Unit Manager, the HCP Administrator, the Forest Resources Division staff (to be determined), the Division Chief, and agency leadership (to be determined). The team will meet at least twice a year. The oversight team will set and agree to a working charter early in its formation. The charter will clarify team roles and expectations and communicate the team's function and process to new members.

The purpose of the oversight team is to:

- Approve annual workplans for the AMP team's projects and activities.
- Review reporting metrics and HCP monitoring findings.
- Review when quantifiable targets for reporting metrics are not met and provide recommendations for remediation if needed.
- Consider the latest revenue projections, upcoming Adaptive Management Plan projects and priority list, and funding availability.
- Recommend changes to the prioritization and schedule of upcoming efforts.
- Enable meeting transparency (providing minutes, allowing community members to attend meetings, etc.).
- Approve an annual review submitted by the AMP team that serves as a means for communicating to the Board, Division staff, interested parties, Tribes, and the public on the progress and status of the AMP.
- Recommend and approve changes to the AMP as written to improve its performance, potentially using surveys of ODF staff, the Board, or interested parties (e.g., public or Tribal participants in SDM processes or State partner agencies).

Section 4: Monitoring, Reporting Metrics and Quantifiable Targets

4a. Monitoring Approach

This section describes a general strategy to design new monitoring to efficiently provide actionable management information using the adaptive monitoring approach described in Appendix 1. New monitoring may include Board performance measures, HCP compliance and effectiveness monitoring, monitoring of FMP strategies, or adaptive management monitoring recommended through a SDM process. All of these measures are called *reporting metrics* for the purpose of the AMP. Many reporting metrics will have *quantifiable targets* designated to assess whether management is meeting the desired outcomes that are being monitored (i.e., utility thresholds) or exceeding triggers (i.e., decision thresholds) that would indicate a critical deficiency in the desired outcome (Martin et al. 2009).

An organizing theme of the AMP approach is that the choices the Division makes in what to monitor and how to monitor (or whether to monitor at all) could be improved through a decision support framework that incorporates SDM (FMP 4.3.1). This means that the many monitoring projects will be developed deliberately to be useful for management decisions and mindful of tradeoffs between alternatives, especially with regards to constraints within Division staff capacity. The description below of how reporting metrics and quantifiable targets are set resembles an SDM process, because monitoring is a management decision.

These monitoring efforts may have different objectives and constraints depending on the program and may not necessarily follow every aspect of the adaptive monitoring strategy. For example, reporting metrics to support the HCP biological goals and objectives have already been set and the AMP will focus on monitoring design and implementation. Subsequent sections will describe the unique cases of Board performance measures, HCP monitoring, and the SDM process (Sections 5, 6, and 7, respectively).

4b. Reporting Metrics

The AMP team will construct its list of reporting metrics from Board performance measures, HCP compliance and effectiveness monitoring, monitoring of FMP strategies, and adaptive management monitoring. The current list will be updated in Appendix 2 to track AMP work and indicate from where each reporting metric draws its data (i.e., monitoring, forest inventory, asset management) and to which reports they contribute (i.e., HCP reports, BOF annual reports, biennial performance measures reports). Much of the current list is already determined through HCP commitments or performance measures. When constructing new reporting metrics for assessing FMP strategies or as a component of an SDM process, adaptive monitoring will be used (Appendix 1).

The adaptive monitoring approach in the AMP focuses on two goals: accurately estimating each reporting metric and learning about the systems that affect these values (Lindenmayer and Likens 2009). The first goal, accurately estimating a reporting metric value, is necessary for

understanding the state of the reporting metric. The second goal is crucial, as by learning about the system affecting the reporting metric we may (a) conduct future monitoring more efficiently, (b) learn where on the landscape to focus management changes, (c) become informed about what those changes should be, (d) predict the condition of the reporting metric across state forests, and (e) evaluate the appropriateness of the reporting metric itself. With greater understanding about the system, the monitoring approach can change the next time around to provide more precise estimates and predictions.

4c. Quantifiable Targets

A quantifiable target has two components: a measure and a target. The measure provides a specific metric for consistently estimating and reporting the condition of the reporting metric. Measures are described in greater detail in Appendix 1. The target may represent a desired level of achievement for the measure (i.e., utility threshold), which may be a single value or a range of acceptable values. In some cases, the target may represent a trigger indicating a critical level at which a measure cannot exceed or fall below (i.e., decision threshold). In either case, the target is used in assessing whether management may need to change to improve the outcome for the reporting metric (Section 7).

Reporting metrics and their quantifiable targets are used in two contexts. The first is the assessment of the condition of state forests, for which we rely on the target values to judge the status of a reporting metric (e.g., the Board performance measures). The other is for decision-making when a management decision will affect multiple forest resources. Under a decision-making scenario, existing reporting metrics could serve as SDM objectives. Stakeholders develop different management alternatives that involve the reporting metrics, and the performance of different alternatives is judged by examining the predicted responses of the quantifiable target measures. The target values are less important in this context, as SDM relies more on the direction desired for objectives (e.g., maximize, minimize) to assess tradeoffs between alternatives rather than specific targets (Gregory et al. 2012).

To construct quantifiable targets, Gregory et al. (2012) recommend that the group (here, the AMP team) first build conceptual models of factors that influence the reporting metric. The conceptual model is a useful tool. It facilitates dialogue among team members, explicitly capturing and specifying different hypotheses of how factors affect the reporting metric. It can also be used to define the quantifiable target measure, determine the variables that need to be quantified by a monitoring program, provide the structure of statistical models, and by extension assist in estimating the consequences of different management alternatives. Appendix 1 explains these features in greater depth alongside a worked example.

Appendix 1 additionally details how targets may be set for quantifiable targets. Once a measure is selected, the AMP team considers values that would serve as a useful target. The group will consult regulations, literature, and subject-matter experts to set a target. However, they must think about how the target will be evaluated, potentially at broad scales across the landscape. The group works through different scenarios to explore risk sensitivity and refine both the target and the measure. The AMP team is tasked with publicly “showing their work” by providing the

quantifiable target measure, target, and rationale for each reporting metric they oversee in Appendix 2.

The team will assess quantifiable targets relative to monitoring results. Monitoring may trigger a need to review management actions or the accuracy of the monitoring, in which case decision support would be warranted (Section 7).

The targets and measures for quantifiable targets may change with approval, depending on the nature of the reporting metric (i.e., if a reporting metric is set by the HCP or Board, decisions for changes would not rest with the AMP team). The quantifiable target may be revised if new information indicates that it is reasonable to do so. This could include new scientific evidence, a change in regulations, or a change in its measure.

4d: Monitoring Example

Monitoring protocols are needed for monitoring projects that rely on field data. Appendix 1 provides examples for ODF subject matter experts to illustrate the process of developing a new reporting metric that requires field work and a spatial sampling design.

Section 5: Performance Measures

5a. Overview

The Board uses performance measures to evaluate how well the FMP provides Greatest Permanent Value to Oregonians. This document proposes a set of new performance measures for social, economic, and environmental goals that would be adopted with the FMP. Performance measures will provide an up-to-date dashboard for the Board and the public to track the Division's progress towards meeting FMP goals. Performance measures currently vary in their readiness to be reported, as some require new data collection.

5b. What are Performance Measures?

Performance measures are specific metrics that the Division will use to estimate and report the consequences of management with respect to objectives expressed through the FMP guiding principles, management approach, and goals. Draft performance measures were selected by using the following recommended criteria, while acknowledging that tradeoffs between these criteria may influence the final measures (Keeney and Gregory 2005, Gregory et al. 2012).

- **Unambiguous:** a change in the reported measure accurately represents a real change that people interpret in the same way, with adequate accounting for uncertainties.
- **Complete and concise:** the set of measures cover the range of relevant outcomes as concisely as possible without redundancy.
- **Direct:** measures directly describe outcomes, rather than related, easier-to-measure proxies.
- **Operational:** measures can be readily put into practice given practical constraints.
- **Understandable:** measures can be understood and communicated consistently to people in different interest groups with differing levels of technical understanding.

5c. History

The Division reported nine performance measures biennially from 2008-2013,¹ until economic conditions decreased staff capacity and performance measures reporting ceased. Through other reporting mechanisms, the Division continued annual reporting of some metrics such as revenue, timber volume, management treatments, recreational use, education & interpretation participants, and stream restoration projects.

5d. Development of New Performance Measures

The Adaptive Management Specialist led the process of identifying potential metrics, reviewing existing data, and incorporating internal feedback. Potential metrics were derived from annual reports, previous performance measures, draft HCP requirements, FMP goals and strategies, Key Performance Measures reported to the Oregon Legislature, the ODF Climate Change and Carbon

¹ Board of Forestry State Forests Performance Measures Report (2013).
<https://digital.osl.state.or.us/islandora/object/osl%3A33946>

Plan, the 2019 Measurable Outcomes Report, and other group brainstorming meetings. The resulting 150 potential performance measures were consolidated based on values expressed by Board members, the five criteria listed above, and consideration of monitoring projects that could be sustained for long-term reporting.

The proposed performance measures received feedback in February 2023 from District leadership, Salem subject matter experts, the Recreation, Education, and Interpretation team, and outside consultants. After Board member feedback in March 2023, metrics were refined for another round of review by Board members, State Partners, and science reviewers in May 2023. Targets will be drafted after additional analysis of modeled FMP outcomes for different scenarios will be presented to the Board in winter 2023-24. Methodological details for data collection, reporting, and targets for each performance measure will be provided in Appendix 3.

5e. Performance Measures Reporting and Changes

The AMP team will report the status of performance measures to the Board biennially. The Board will decide if changes to the performance measures and their components are needed. If components of performance measures do not meet targets or fall within acceptable ranges, the Board may request the Division to examine the causes of deficiencies and propose corrective management changes. However, performance measures span resources with inherent tradeoffs so a deficiency in one performance measure may not necessarily trigger management changes without considering other resources and constraints.

Section 6: Habitat Conservation Plan Adaptive Management

6a. HCP Monitoring

The Division will monitor and report trends in quantity and quality of habitat for covered species over time within the permit area of the HCP. This will include compliance monitoring to ensure adherence to HCP implementation and management standards, and effectiveness monitoring to determine if conservation actions are having the intended effect on habitat conditions for covered species. Each conservation action in the HCP has compliance and effectiveness monitoring requirements that include targeted actions, metrics, and methodology (HCP Chapter 6). While the terminology is slightly different, the monitoring proposed in the HCP provides reporting metrics and quantifiable targets (if applicable) that will be included in the AMP. The adaptive monitoring strategy described in Section 4 and Appendix 1 could be used for new monitoring developed during the onset of HCP implementation.

The Division will dedicate staff and funding to the HCP monitoring commitments (HCP Chapter 8). Much of the AMP team will be developing the HCP monitoring program as well. The key point of contact for the HCP adaptive management process is the HCP administrator (currently assigned to the Biological Support Unit manager), who will determine the need for adaptive management in consultation with the permit-issuing Federal Services.

6b. Adaptive management for the HCP

Adaptive management will follow the process proposed in the HCP Chapters 6 and 7. The process has similar steps to adaptive management described in Appendix 1. The Division and the Federal Services will respond to changed circumstances, unforeseen circumstances, monitoring results, new information, and improvements in monitoring technology to examine alternative strategies (e.g., conservation actions) to meet the biological goals and objectives of the HCP.

Adaptive management responses will be triggered when changed circumstances, monitoring or other information indicates that existing practices are under- or over-achieving the biological goals and objectives or that alternative practices are available that can achieve the biological goals and objectives more efficiently and effectively. The level of adjustments from adaptive management are expected to fall within the conserved habitat areas or to the HCP's operating conservation program. Adjustments may be included in annual budgets, district Operations Plans, district Implementation Plans, or operational policies. Adaptive management responses fall within the range of covered activities.

6c. HCP Reporting

Adaptive management adjustments will be documented in annual reports submitted to the permitting agencies, along with details on the monitoring program. More extensive 5-year midpoint check-in and 10-year comprehensive reviews will assess the entire monitoring program and conservation actions. These extensive reviews will be the best opportunity to make adaptive management adjustments to the HCP implementation.

Section 7: Identifying Decision Support Needs from Monitoring

7a. Overview

If the reported monitoring results indicate quantifiable targets were not being met, the AMP team with their oversight team would then recommend to the Division's leadership to initiate a decision-support process (Figure 2). Once decision support is requested, a decision support process (SDM) or direct management changes will follow.

The decision maker may decide the team should not enter into a decision-making process and instead should continue monitoring (or similar decision). In this situation, the decision maker is undertaking their own decision process. If the decision maker thinks additional information is necessary and communicates this to the AMP team, then the AMP team can adjust the next round of monitoring to provide the decision maker with crucial missing information (presuming that the uncertainty can be reduced via monitoring).

If the decision maker decides to direct AMP team to enter a decision-making process, the team will provide the decision maker with a suite of well-considered decision alternatives that include changes to management as well as a baseline alternative to continue monitoring. The team is highly encouraged to use a SDM process to create the alternatives. The SDM process may be relatively straightforward and require minimal investment from the Division and others for several reasons:

- There will be a limited number of participants including team members, a neutral facilitator, the decision maker, and additional staff members as needed.
- Team members will have information on the system already as a consequence of monitoring. This includes models, hypotheses, data, and analysis results. The adaptive monitoring (Appendix 1) approach used to collect monitoring data should provide the team with useful information that will help in estimating the consequences of different alternatives.
- The management decision may not impact HCP monitoring metrics and would therefore lack that level of complexity. The decisions may rather center around determining the scale, timeframe, and structure of management actions.

We next describe in greater detail how a management change decision using SDM will be carried out. Appendix 1 explains SDM terms and concepts.

7b. Decision Context, SDM Scale and Timeline

7b.i. Decision Context

The SDM process will begin with a consideration of the decision context. The AMP team will work with Division staff to determine who is needed in the process and when. The process will have a greater chance of providing a decision maker with useful and understandable information

if the decision maker is identified both early on and as part of the process. An SDM facilitator will be selected to assist the process by creating an objective, supportive, and efficient environment. The group will also determine how to communicate their progress and incorporate feedback from outside the group. As described in Appendix 1, the AMP team and the decision maker would likely benefit from conducting a decision sketch – a quick run-through of the SDM process – to better define the decision, the decision’s scope, and the people necessary to include in the SDM group.

7b.ii. SDM Scale and Timeline

The decision maker, AMP team, and ODF staff should additionally discuss the resources available for an SDM process as well as a desired timeline. The decision sketch may help inform the group about the commitment necessary to conduct an informative SDM process, as well as the level of risk (e.g., they may discover in the decision sketch that the decision may be more contentious than anticipated). The timeline for the SDM process will depend on the anticipated complexity of the SDM process, resource availability, and immediacy of the decision.

7c. Information Availability

The SDM group will have monitoring data available for use. The decision sketch may also indicate other information sources that may be useful, including other research projects, management and monitoring projects in other states or nearby regions, and information from ODF policy and field staff, and external experts. The group will need to consider information useful for estimating the consequences of different decisions, including uncertainty around outcomes. The group may proceed by altering or enhancing the influence sketch to explore how different management actions may affect the metric’s measure.

7d. General Considerations for Constructing Alternatives

Developing management change alternatives for an SDM process will likely involve the consideration of a few predictable decision features. There may be other decision aspects and objectives in the process, but the following features are worth consideration.

7d.i. Degrees of Adaptive Management

Appendix 1 describes the linkage between the SDM process and adaptive management. Since the sixth and final step of an SDM cycle involves monitoring the outcomes of a decision, any management decision made will likely fall somewhere between passive and active adaptive management.

A passive adaptive management alternative represents a management change made across the landscape or in all areas where a particular condition (e.g., steep hillslopes) was present. Monitoring would determine whether the change had the desired, predicted outcome. An active adaptive management approach would be more experimental in design, with several different management options implemented in different areas (e.g., harvest units) that are ideally randomly selected, with the outcomes tracked in each. As described in Appendix 1, institutional learning occurs fastest using active adaptive management, but passive adaptive management may

be the easiest to implement. Active adaptive management is most useful where the SDM process identifies a critical knowledge gap that, if resolved, would alter or direct the management decision.

An SDM management change alternative can combine passive and active adaptive management, perhaps applying a specific change across state forests while experimenting with different management changes in a subset of areas (see Figure A1.3 for hypothetical examples).

7d.ii. Spatial Considerations

As alluded to above, the development of SDM alternatives should and likely will include a consideration of where changes to management occur. For instance, Alternative 3 in Figure A1.3 involves maintaining management practices statewide except for an active adaptive management application of management changes in a single geographic area, while Alternative 1 enacts the same management change across all state forests. The SDM group has the latitude to consider where management changes could occur, including different management changes in different regions. The group can also create alternatives that apply different prescriptions to separate regions or parts of the landscape, perhaps as informed by monitoring results.

7d.iii. Temporal Considerations

Since the purpose of the SDM group is to develop possible management actions to correct the trajectory of an underperforming metric, the group may consider and include the timeliness of a metric's change as a decision objective. For instance, one alternative may continue monitoring and gather more data to improve the precision of the estimate for the metric. However, this will postpone making a management decision, meaning that management change to the metric cannot begin to occur for at least the time it takes to complete the next round of monitoring.

Alternatively, a state-wide management change may result in the fastest possible improvement of the metric's condition, assuming the management change is appropriate. Herein lies a trade-off between effectiveness and time to resolution: an active adaptive management approach will not apply the best change across the entire landscape, but it will test more than one management approach that may outperform the status quo. An evaluation of outcomes may reveal an acceptable state-wide approach. Again, strategies may include combinations of passive and active adaptive management.

The SDM procedure offers an opportunity to explore how swiftly it will take a change in management to alter monitoring results for the metric. It may be years to change the outcomes of the metric's estimate. However, the speed at which change will occur can be predicted to set expectations for the Board and public. They can also be used to justify altering monitoring to track how well the management changes are performing. During this time, it may be reasonable to reduce or temporarily halt monitoring efforts to estimate the metric regionally, since a management change decision has already been made and has not had time to effectively change the metric's status on the ground.

7d.iv. Effort and resource availability

The SDM group will need to consider the effort required to enact and monitor a management change. Implementation of a state-wide active adaptive management program would be prohibitively expensive. However, a similar program may be more manageable on a much smaller geographic scale. Passive adaptive management may be easiest to implement and monitor.

7e. Decision Process, Implementation, and Consequences for Future Monitoring

The SDM procedure will follow the steps described in Appendix 1 – review the decision and decision space, develop objectives, construct alternatives, estimate consequences of alternatives, and examine trade-offs. The group may provide the decision maker with a ranked list of alternatives, or a suite of alternatives with an explanation of team member support for different alternatives. The alternatives will include considerations of the monitoring that they will require. At this point the decision maker is tasked with making a decision. They will also likely document the reasoning behind their decision so that they may explain it to the Board and other stakeholders.

The decision itself needs to be carried out, including changes to management and monitoring. The means for integrating the decision into the Division's management depends on the type of management change. A change to standards compliance would likely require a change in operations, along with a communication of the change throughout the Division. Field staff will require an explanation of the change and their supervisors would need to prioritize the shift in staff workload. A change in standards implementation would be brought up in the periodic development of Implementation Plans for public comment.

The decision will also likely affect the next iteration of monitoring for the metric(s) involved. The decision will need to specify the type of monitoring required to verify that the management change worked as intended. The SDM process will also inform the AMP team of the time required to detect an improvement in the metric status. Therefore, when the team reconvenes to develop the next round of monitoring, they will pursue an alternative form of monitoring for the metric(s). The monitoring may entirely shift from an estimation of metric status to effectiveness monitoring.

Section 8: Decision Recommendations

Decision recommendations from the SDM process will be offered at the appropriate level of the Division's planning, depending on the scope and scale of the management decision (Figure 2 and Figure 3). As AMP efforts reach a reporting stage, they will be evaluated by the AMP team and the oversight team. If results potentially warrant changes to strategies or implementation, the team will meet with the relevant decision-makers and request guidance for the next steps.

The timeline for reporting decision analysis products and monitoring results will complement Implementation Planning and comprehensive reviews of HCP implementation. The Implementation Plan is the key opportunity for the decision-making process, public and Tribal engagement, and adaptive management changes based on monitoring. Decisions about monitoring investments over the next decade will be made during implementation planning. The AMP workplan will prioritize information needs for Implementation Plans two years prior to their revisions.

Section 9: The AMP Serving All of State Forests

9a. Expanding SDM Use

The management of State Forests is complex and there may be disagreements about consequential management decisions that do not directly relate to the reporting metrics. For instance, there may be a disagreement about the optimal reforestation planting density and species mix in different regions. A concern may arise that some seedling species and density combinations may be more expensive and less effective than others. The Division may elect to create an SDM process that includes the AMP Team and key Division staff to consider different strategies – and to build understanding and support for the decision that is made. The decision itself may, as described in Appendix 1, involve combinations of broad management change with experimentation in certain regions and monitoring. These efforts could represent a valuable AMP service to the Division.

SDM may be a useful tool if some or all of the following conditions exist:

- The decision is complex, meaning that there are several aspects (objectives) that are relevant to the decision.
- There is disagreement among the deliberating group about the importance of different tradeoffs and objectives inherent in the decision.
- The decision maker would benefit from having a suite of well-thought-out alternatives to consider.
- The decision maker and groups could benefit from learning more about the decision, particularly from different perspectives.
- If the decision is contentious, the Division would benefit from a transparent and defensible decision process.

Figure 2 depicts a pathway for units aside from the AMP to enter into SDM. The units would request decision support from upper management, who could in turn agree that SDM may be of use.

9b. Prioritization of SDM processes

Section 3d states that the oversight team assists in developing and prioritizing a task list for the AMP team. In particular, the oversight team will consider the Division's SDM needs alongside other demands. The Division will need to convey the expected importance of the SDM procedures, and the oversight team will need to explain the consequences of including an SDM process on the monitoring prioritization list and timeline.

Section 10: Communicating Results

10a. Overview

Communication is a critical aspect of the AMP's function. The AMP team will communicate its progress through the existing Implementation Plan engagement, presentations to the Board, and directly interfacing with the public and Tribes.

10b. Presenting Reports to the Board of Forestry

The AMP team will present performance measures reports to the Board biennially to ensure that the Board members are aware of current efforts. The Board can review each performance measure and target, the time that has passed since the last measurement, and the number of performance measures for which information is lacking.

The AMP team will be a part of other reports to the Board regarding FMP implementation, HCP monitoring, IP development, and policy changes resulting from AMP work or SDM processes.

If the level of impact is high, the Board may review progress on SDM procedures, including justifications for initiating SDM, the progress and expected timeline of an ongoing SDM process, and a synopsis of SDM outputs (alternatives) and the Division's subsequent decisions. The decision-maker may be asked by the Board to explain their decision considering associated SDM processes.

10c. Public Interface

The Board meetings will serve partially as a means of informing the public about the Division's actions around the AMP. The Division will consider alternative outlets for information, such as a web subdirectory on its Oregon.gov website for the AMP and its work. The website will provide updated information on reporting metrics and serve as a repository for reports produced by the AMP team. The public will have access to the reporting metrics prioritization and workplans, which are anticipated to be updated once annually. They will also have information on the status of performance measures and anticipated updates.

The SDM process may involve Tribes, interest groups, and technical expert teams. As described in Appendix 1, the SDM procedure is a "deep dive" into the issues surrounding a decision, involving a great deal of effort supporting the SDM team while they investigate alternatives. The entire process is more likely to gain acceptance if there is a public component as well. A website can certainly provide information regarding the stages an SDM process is going through, plus archive and showcase past efforts. More is likely needed. One option is to include a public component to the SDM process. The Division may hold public events to communicate the progress and considerations an SDM team is currently undergoing and allow the public an opportunity to provide feedback. The Division may also send out press releases about the process to help ensure that the broader audience knows about the SDM process and public involvement.

Literature Cited

- Gregory, R., L. Failing, M. Harstone, G. Long, T. McDaniels, and D. Ohlson. 2012. Structured decision making: a practical guide to environmental management choices. John Wiley & Sons.
- Hemming, V., A. E. Camaclang, M. S. Adams, M. Burgman, K. Carbeck, J. Carwardine, I. Chadès, L. Chalifour, S. J. Converse, L. N. K. Davidson, G. E. Garrard, R. Finn, J. R. Fleri, J. Huard, H. J. Mayfield, E. M. Madden, I. Naujokaitis-Lewis, H. P. Possingham, L. Rumpff, M. C. Runge, D. Stewart, V. J. D. Tulloch, T. Walshe, and T. G. Martin. 2022. An introduction to decision science for conservation. *Conservation Biology* 36:e13868.
- Keeney, R. L., and R. S. Gregory. 2005. Selecting Attributes to Measure the Achievement of Objectives. *Operations Research* 53:1–11.
- Lindenmayer, D. B., and G. E. Likens. 2009. Adaptive monitoring: a new paradigm for long-term research and monitoring. *Trends in Ecology & Evolution* 24:482–486.
- Martin, J., M. C. Runge, J. D. Nichols, B. C. Lubow, and W. L. Kendall. 2009. Structured decision making as a conceptual framework to identify thresholds for conservation and management. *Ecological Applications* 19:1079–1090.
- USFWS and NOAA (U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration) Fisheries. 2016. Habitat conservation planning and incidental take permit processing handbook. US Department of the Interior, Fish and Wildlife Service, and US Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service.
- Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. Adaptive management: the US Department of the Interior technical guide. US Department of the Interior.

Appendix 1: Literature Review for Staff

In development

This review of adaptive management, structured decision making, and adaptive monitoring is for ODF technical specialists who will be developing new monitoring programs and facilitating decision-making efforts. Much of this review was contracted by the Division to support a 2018-2019 effort to expand adaptive management and plan new monitoring for each FMP resource strategy. It has been revised in 2023 to complement the AMP for those who desire more scientific background on the tools we will use to monitor, learn from, and implement the FMP.

Appendix 2: Current Reporting Metrics

In development.

This appendix will track all reporting metrics and quantifiable targets for AMP-associated monitoring. This information will be used in district Implementation Plans, Performance Measures reports, and HCP reports.

Appendix 3: Performance Measures for the Board of Forestry

Attached as separate document.

Appendix 4: Monitoring Plan

In development.

For each reporting metric, this document will share details of how they will be monitored, analyzed, and reported. This information will be used for monitoring operations and for sharing information in district Operations Plans and annual HCP reports.

Appendix 3: Performance Measures for the Board of Forestry

Table of Contents (Performance Measures ordered alphabetically)

Summary 1
Adaptive Capacity of Forests 2
Aquatic Habitat 4
Carbon Storage 6
Community Engagement and Public Support 6
Division Finances 9
Economic Opportunities 10
Financial Support for Counties 11
Harvest and Inventory 12
Recreation, Education, and Interpretation Opportunities 13
Terrestrial Habitat 13

Summary

Performance measures are a select set of metrics that the Board of Forestry (Board) will use to evaluate management outcomes with respect to the objectives and intent expressed through the draft Western Oregon State Forests Management Plan (FMP) guiding principles, management approach, and goals. The ten performance measures listed below have component metrics that will be monitored and reported biennially to the Board under the process described in the Adaptive Management Plan. A background description, method of data collection, component metrics and targets, and related State Forests monitoring are provided for each performance measure. Targets or ranges of acceptable values would be set in the future as part of the FMP modeled outcomes and the draft Habitat Conservation Plan (HCP) commitments presented to the Board.

Adaptive Capacity of Forests

Background

Adaptive capacity is one of the key tenets of the FMP management approach so that State Forests maintain ecological function and productivity in response to stressors like climate change or drought and disturbance events such as fires, insect damage, or extreme weather. The proposed components to measure adaptive capacity will include forest attributes that increase forest diversity and complexity at stand and landscape scales.¹ Management influences adaptive capacity through harvest and thinning prescriptions, reforestation, retention of biological legacies, and landscape design. Management to increase adaptive capacity will vary by forest land management class (i.e., emphasis areas) to meet different objectives.

Methods

Data for this measure will be gathered through the Enhanced Forest Inventory (EFI), with updates every five years. The EFI uses a densified network of USFS Forest Inventory and Analysis (FIA) systematic monitoring as its field-based data. Estimates from FIA data can be summarized at larger spatial extents, such as by district or emphasis area class. Finer-scale estimates (e.g., stands or watershed) can be modeled by lidar-based products in the EFI.

Metrics and Targets

Four components (tree size distribution, tree species composition, stand structure, and tree growth rates) are proposed for two emphasis areas: general stewardship and habitat conservation areas (HCAs) (Table 1). Potential targets will be presented with modeled FMP outcomes to the Board.

Related Monitoring

- The Forest Health Unit in the ODF Forest Resources Division provides updates to the Board and State Forests on invasive species, disturbances by insect and disease, and climate change vulnerability (e.g., western redcedar mortality).
- Wildfire risk on State Forests will be assessed in partnership with the ODF Fire Protection Division to provide an all-lands approach to strategic planning and monitoring.
- Retention of biological legacies (leave trees, snags, and downed wood) will be reported for the HCP and as a component of the Terrestrial Habitat performance measure.
- Management to improve or restore stands is reported in Operation Plans and for the HCP (e.g., harvests and replanting to reduce Swiss needle cast impacts).

¹ D'Amato, A. W., & Palik, B. J. (2021). Building on the last “new” thing: exploring the compatibility of ecological and adaptation silviculture. *Canadian Journal of Forest Research*, 51(2), 172-180.

Table 1: Adaptive Capacity of Forests performance measure component metrics and targets

Component	General stewardship		Habitat Conservation Area		Data source	Notes
	Metrics	Targets	Metrics	Targets		
Size class distribution	Frequency across size classes	TBD: evenness across sizes desired	Frequency across size classes	TBD: evenness not necessarily desired	EFI: lidar-derived tree height classes	Alternative: age classes, but height is more accurate for uneven-age stands
Composition	Proportional basal area by tree species & stocking species proportions	Current & desired condition vary by district, report trends	Proportional basal area by tree species, stocking species proportions	Current & desired condition vary by HCA, report trends	FIA, EFI, and stocking surveys	Alternative: diversity indices
Stand structure	Canopy stratification (foliar height diversity)	TBD: tradeoff of stand complexity versus fire risk & other objectives	Canopy stratification (foliar height diversity)	TBD: increasing trend desired for HCP covered species habitat	EFI: lidar derived height diversity by stand	Alternative: heterogeneity indices
Growth rates to gauge species responses to climate change (i.e., drought & temperature stress)	Periodic annual increment for tree species	Stable or increasing trends desired	Periodic annual increment for tree species	Stable or increasing trends desired	Rolling mean of FIA tree size remeasurements summarized by species and region ²	Lagging indicator, could consider ways to incorporate species responses to future climate conditions

² Stanke, H., Finley, A. O., Domke, G. M., Weed, A. S., & MacFarlane, D. W. (2021). Over half of western United States' most abundant tree species in decline. Nature Communications, 12(1), 451.

Aquatic Habitat

Background

For aquatic species covered in the HCP, the primary conservation action for achieving the biological goals of population persistence and resilience is expanding riparian management areas along streams. Passive management of these Riparian Conservation Areas (RCAs) will allow forests to mature over time to address limiting factors for covered species, including wood and gravel recruitment, stream shading, stream temperature, nutrient input, and streambank integrity. Implementing stream enhancement projects, including the promotion of natural beaver colonization, is another HCP conservation action targeting habitat improvement for covered species. Monitoring commitments in the HCP will track trends of aquatic habitat conditions for covered species based on field data to measure the effectiveness of these actions.

Conservation actions and associated monitoring in the HCP also focus on the impact of the transportation network on water quality and fish passage. Roads management can reduce hydrological connectivity by following best-management practices for design, construction, and maintenance to disconnect roads from stream systems. Barriers to fish passage can be reduced through culvert repair and are often prioritized based on fish presence and the miles of habitat upstream that are reconnected for access.

Methods

HCP compliance and effectiveness monitoring would provide most of the data summarized in this performance measure. State Forests, in collaboration with ODFW, the research community, and federal services, will design HCP sampling efforts to select key watersheds to detect changes in aquatic habitat conditions for covered species. State Forests would conduct assessments of the transportation network to prioritize improvements according to HCP commitments.

Metrics and Targets

Five components (physical habitat, riparian forest shading of streams, water temperature, transportation assessment, and beaver colonization) derived from HCP monitoring commitments are proposed (Table 2). Targets would be established in the future once baseline conditions are assessed in the initial years of the HCP.

Related Monitoring

- State Forests has implemented stream enhancement projects with timber sales since the adoption of the Oregon Plan for Salmon and Watersheds. Restoration activities are reported annually to the Oregon Watershed Enhancement Board.

Table 2: Aquatic Habitat performance measure component metrics and targets

Component	Metrics	Targets	Data Source	Notes
Aquatic habitat conditions for covered species	Physical attributes in streams (channel complexity, wood, substrates)	Report trends from HCP effectiveness monitoring	Collaboration with ODFW Aquatic Inventories Project (AIP)	Attributes may be synthesized via a salmonid habitat limiting factors model. ³
Channel shading from riparian forests	Modeled annual sun exposure	Report trends from HCP effectiveness monitoring	EFI models of shade from lidar surveys	
Water temperature	Average annual temperature within HCP permit area	Report trends from HCP effectiveness monitoring	Collaboration with ODFW statewide water temperature monitoring	A 3.5°F increase during the HCP permit term would be an unforeseen circumstance.
Transportation assessment in HCP permit area	Hydrological connectivity and fish passage barriers	Complete initial analysis so that improvements can be prioritized	HCP monitoring commitments	Roads and OHV trails would be included.
Beaver effects on aquatic habitat	Species occurrence and dam abundance	Report trends from HCP effectiveness monitoring	Collaboration with ODFW AIP to include beaver monitoring in key watersheds	

³ Nickelson, T. E., & Lawson, P. W. (1998). Population viability of coho salmon, *Oncorhynchus kisutch*, in Oregon coastal basins: application of a habitat-based life cycle model. *Canadian Journal of Fisheries and Aquatic Sciences*, 55(11), 2383-2392.

Carbon Storage

Background

Carbon sequestration and storage in forests are key climate change mitigation strategies in Oregon.⁴ The FMP carbon resource goal is to contribute to carbon storage on state forest lands and in harvested wood products. State Forests management impacts carbon sequestration and storage in the forest through timber harvest rotation age, no-harvest buffers, retention of biological legacies (i.e., large live trees, snags, and downed wood), and reforestation. Carbon storage in harvested wood products depends on the product type and timber harvest volume. Other sources of emissions, such as those required for operations and manufacturing, and the impact of substituting wood products for nonrenewable products are often included in full lifecycle carbon accounting but are beyond the means of our current data collection.

Methods

Data for carbon pools within the forest will be gathered through the Enhanced Forest Inventory (EFI), with updates every five years. The EFI uses a densified network of USFS Forest Inventory and Analysis (FIA) systematic monitoring as its field-based data. Estimates from FIA data can be summarized at larger spatial extents, such as by district and emphasis area class. Carbon in harvested wood products will use models of long-term storage and decomposition by different product types.⁵

Metrics and Targets

Three components (aboveground live tree carbon, carbon in harvested wood products, and carbon in other forest pools) are proposed for two emphasis areas: general stewardship and habitat conservation areas (HCAs) (Table 3). Targets will be determined in the process of modeling the outcomes of different FMP scenarios presented to the Board.

Related Monitoring

- Statewide and regional carbon monitoring programs by other agencies also use FIA data to report on carbon trends over time by different pools. While these efforts report on different forest ownerships, they have not separated ODF-managed lands from the State/Local ownership category.

⁴ Oregon Global Warming Commission. 2021. Natural & Working Lands Proposal. <https://www.keeporegoncool.org/natural-working-lands>

⁵ Morgan, T.A. et al. (2020). Oregon Harvested Wood Products Carbon Inventory 190-2018. Report prepared for USA Forest Service and Oregon Department of Forestry. www.oregon.gov/odf/forestbenefits/Documents/oregon-harvested-wood-products-carbon-inventory-report.pdf

Table 3: Carbon Storage performance measure component metrics and targets

Component	General stewardship		Habitat Conservation Area		Data source	Notes
	Metrics	Targets	Metrics	Targets		
Live tree carbon storage	Aboveground carbon per acre	TBD	Aboveground carbon per acre	TBD	FIA field data summarized by emphasis area	
Harvested wood product carbon storage	Carbon stored in products minus carbon released via decomposition	TBD	Carbon stored in products minus carbon released via decomposition	TBD	Storage modeled from annual cutout volume by district and emphasis area	
Other carbon pools (soil, dead wood)	Carbon per acre by pool	TBD	Carbon per acre by pool	TBD	FIA field data summarized by emphasis area	

Community Engagement and Public Support

Background

State Forests attained meaningful engagement and feedback with many groups while developing the FMP, including with the nine federally recognized Tribes of Oregon through the Government-to-Government framework (FMP Appendix A). This performance measure aims to continue this engagement to hear whether the public and Tribes believe we are meeting our FMP goals and providing GPV. The process to do so effectively and specifically for State Forests is under development.

The Board has gauged public values surrounding forest management through representative surveys of Oregonians and plans to continue this work through their update to the Forestry Plan for Oregon. At this time, State Forests will rely on the Board's survey efforts to listen to public values and support for forest management. Future investments in surveys may aim for repeatable analyses to demonstrate trends over time, but recently performed surveys provide an adequate baseline for current public views on forest management.⁶

⁶ Oregon Values and Beliefs Center. 2022. State Forest Management. <https://oregonvbc.org/state-forest-management/>

Division Finances

Background

Funding levels for FMP implementation vary with cyclical economic trends because State Forests is primarily funded through timber harvest revenues. There may be periods where revenues limit funding. Annual budget instructions for developing fiscal budgets reflect the Forest Development Fund (FDF) balance and the projected balance based on a 3-year revenue forecast (FMP, 4.1.1 Implementation Priorities).

Methods

The Asset Management Unit reports fiscal metrics quarterly and forecasts State Forests revenue, expenses, and FDF balance with a range of projections annually.

Metrics and Targets

The FDF balance in terms of the months of operating expenses will be the reported metric. The proposed target is to maintain a prudent FDF balance of 6-12 months of operating expenditures, which considers the cyclical nature of the timber markets and permits State Forests to adjust their services to maintain financial viability.

Economic Opportunities

Background

The FMP recognizes the importance of the economic benefits of forests to local communities through the Timber Production and Special Forest Products goals. Historically State Forests has tracked timber harvest volume as a surrogate measure of economic support for local communities, without modeling different components such as direct effects of jobs and wages from harvests, indirect effects from supporting industries, and induced effects from wages being spent. A socioeconomic outcomes analysis of modeled FMP scenarios will be presented to the Board that includes these components of timber harvest income and employment, as well as non-timber income and employment (e.g., recreation, hunting, special forest products, and other uses).

Methods

To measure the benefits of State Forests to economic opportunities, economic impact models will be developed. For timber jobs, projected harvest levels would be used to estimate direct employment and income and the secondary effects that would be supported by the initial harvests. For non-timber jobs, the economic impact is less readily quantifiable and would rely on a literature assessment to estimate relative differences in FMP outcomes.

Metrics and Targets

The socioeconomic outcomes analysis will provide a baseline understanding of the direct and indirect employment and income supported by State Forests. Appropriate targets will be set based on the Board's decision on the FMP.

Related Monitoring

- Statewide reports on the timber industry with State Forests grouped together with the State/Local ownership category.⁷

⁷ Oregon Forest Resources Institute. (2019). The 2019 Forest Report. <https://theforestreport.org/wp-content/uploads/2019/07/OFRI-2019-Forest-Sector-Economic-Report-Web.pdf>

Financial Support for Counties

Background

This performance measure tracks the financial support provided by State Forests to counties through revenue sharing. There is volatility in annual revenue due to log prices and harvest timing by operators. While schools and local taxing districts also are recipients of these funds, distributions are administered by the counties and not easily tracked by State Forests.

Methods

The Asset Management Unit reports revenue transferred from State Forests to counties annually and provides forecasts for expected transfers. These are reported in annual reports for the Council of Forest Trust Land Counties.

Metrics and Targets

Revenues depend on the harvest planning decisions set during Implementation Planning rather than a Board decision. State Forests management is based on sustainable harvest targets rather than revenue targets. An even flow of timber volume may not translate to an even flow of annual revenue for counties. Trends or a range of acceptable values, averaged over several years due to inherent volatility, may be set from the FMP modeling outcomes.

Harvest and Inventory

Background

This performance measure is based on the FMP timber production goal to provide a sustainable and predictable supply of timber for economic opportunity, jobs, and availability of forest products. Harvest levels are the primary source of revenue for State Forests and will impact our ability to meet other integrated resource goals. The intent of this performance measure is to demonstrate how the planned harvest volume targets, cutout volume, and inventory growth accumulate over the course of decadal-scale Implementation Plans. Over time inventory growth should meet or exceed harvest volume. Management choices such as rotation age, harvest method, thinning, and stand improvement investments impact harvest volumes and inventory growth.

Methods

Data sources include annual district reports based on Operations Plans for harvests and the EFI for inventory growth. Inventory changes and forecasts are generally modeled for Implementation Plans or FMP outcomes. Harvests and inventory changes will be reported both by emphasis area (i.e., general ground and HCAs) and in total for the plan area.

Metrics and Targets

Harvest volume is reported annually, with a comparison to even-flow targets set by the Implementation Plans. Harvest levels targets are not set by the Board but developed through Implementation Plans approved by the State Forester. Inventory does not have a current target, but potential targets will be presented with FMP modeled outcomes to the Board.

Recreation, Education, and Interpretation Opportunities

Background

The FMP goal for the Recreation, Education, and Interpretation (REI) program is to create meaningful and enjoyable experiences that foster appreciation and understanding of state forest lands and contribute to community health, sustainable working forests, and economic wellbeing. The program has traditionally relied on visitor counts to track annual use and will continue to report these metrics for the performance measure. However, this metric does not fully capture the diversity of users and activities on State Forests as reflected in the FMP strategy to conduct new visitor use research and monitoring when strategic funding is obtained. New approaches to monitoring would offer more granular location and demographic data than annual counts that could be used to tailor REI resource allocations to visitors' interests.

Methods

Data sources comes from the REI program's annual reporting. New visitor use monitoring would be developed with the consultation of social scientists and subject matter experts when strategic investments are made.

Metrics and Targets

Annual visitor counts at campgrounds and at the Tillamook Forest Center (TFC) will be reported to show trends over time. The intent of a target is not necessarily that the annual number of visitors is increasing, but that the REI program resources are well-spent toward meaningful programs and targeted towards visitors' interests.

Related Monitoring

- Visitor use surveys, community science observations, and trail counters were used to assess the Black Rock Mountain Biking Area for a year as a pilot study for a popular recreation site on State Forests.⁸

⁸ D'Antonio, A., Winder, S., Wood, S., & White, E.M. (2023). Characterizing Visitor Use at Oregon Department of Forestry Recreation Sites: A Pilot Case Study at Black Rock Mountain Biking Area. Report prepared for ODF.

Terrestrial Habitat

Background

The FMP wildlife goal has strategies to promote a diversity of forest types, functional landscapes, structural complexity of stands, and habitat for endangered species and species of concern. The intent of this performance measure is to illustrate trends in forest structure and landscape connectivity that would benefit many wildlife species across forest seral stages (i.e., structure-based biodiversity indicators⁹) even as species distributions shift with climate change.

The commitments in the HCP would differ by emphasis area with the expectation that wildlife strategies would be met across the landscape. For example, timber harvests with retention of trees, snags, and downed wood and RCAs would increase structural complexity in early seral stands. Active and passive management in HCAs would produce higher quality habitat for covered species with greater connectivity between late seral patches as forests within RCAs and HCAs mature over time.

Methods

Data for this measure will be gathered through the EFI, with updates every five years. The EFI uses a densified network of FIA monitoring plots as a systematic sample of various forest metrics across the plan area. Trends over time would be based on rolling means of FIA plot metrics summarized by emphasis area. Landscape metrics or finer-scale estimates (i.e., large trees) are provided by lidar-based model predictions for the point in time of lidar data collection.

Metrics and Targets

Four components (large trees, dead wood, hardwood trees and understory diversity, late seral forest connectivity, and habitat development for covered species) are proposed for two emphasis areas: general stewardship and HCAs (Table 4). Targets will be set to align with HCP commitments.

Related Monitoring

- Compliance and effectiveness monitoring in the HCP provides more detailed information about habitat for covered species.
- Other wildlife monitoring would be included in district Implementation Plans and the Adaptive Management Plan.

⁹ Lindenmayer, D. B., Margules, C. R., & Botkin, D. B. (2000). Indicators of biodiversity for ecologically sustainable forest management. *Conservation biology*, 14(4), 941-950.

Table 4: Terrestrial Habitat performance measure component metrics and targets

Component	General stewardship		Habitat Conservation Area		Data source	Notes
	Metrics	Targets	Metrics	Targets		
Large trees	Occurrence of >30" DBH trees at multiple spatial scales	TBD: expected to increase over time with HCP leave tree prescriptions	Occurrence of >30" DBH trees at multiple spatial scales	TBD: expected to increase over time as restored stands mature	EFI: lidar-derived large tree presence	Trees of this size and larger are components of habitat models for covered species.
Dead wood (large downed wood and snags)	Basal area of snags and volume of downed wood	HCP compliance, expected that retention would be greater than before HCP.	Basal area of snags and volume of downed wood	TBD: increasing trend desired in management for diverse habitat	FIA and HCP compliance monitoring	Trends from FIA across plan area, estimates of change with HCP compliance monitoring
Hardwood trees and understory diversity	Proportional basal area of hardwoods and percent cover of native understory plants	TBD: expected to be maintained through retention and RCAs within harvest units	Proportional basal area of hardwoods and percent cover by native understory plants	TBD: increasing trend desired through HCA management for diverse habitat	FIA for tree basal area and understory species cover.	Elk nutritional models would be a potential synthetic metric for plants monitored by FIA
Connectivity between late seral forest patches	Northern Spotted Owl dispersal habitat by sub-geographic area	HCP compliance, 40% in each area measured at 5-year intervals	Habitat patch sizes by suitability category	Increasing proportion of larger habitat patches within HCAs	EFI: lidar-derived landscape map of late seral forests and dispersal habitat	Landscape resistance to Northern Spotted Owl movement would be a potential synthetic metric
Covered species habitat meets stay-ahead provision in HCP	Acres of habitat harvested versus ingrowth of habitat over time	Set in HCP	Acres of habitat harvested versus ingrowth of habitat over time	Set in HCP	HCP 5- and 10-year monitoring reports, habitat models based on EFI lidar-derived maps	