Northern Blues All-Lands

MULTI-PARTY MONITORING PLAN

Prepared for the Northern Blues Restoration Partnership
by the Northern Blues Monitoring Team

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www.northernblues.org

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NORTHERN BLUES
RESTORATION PARTNERSHIP

The Northern Blues Restoration Partnership is a diverse coalition of partners working together to coordinate and implement restoration projects aimed at achieving forest, watershed and fire resilience on public, private and tribal forestland across the Washington-Oregon Northern Blue Mountains landscape.

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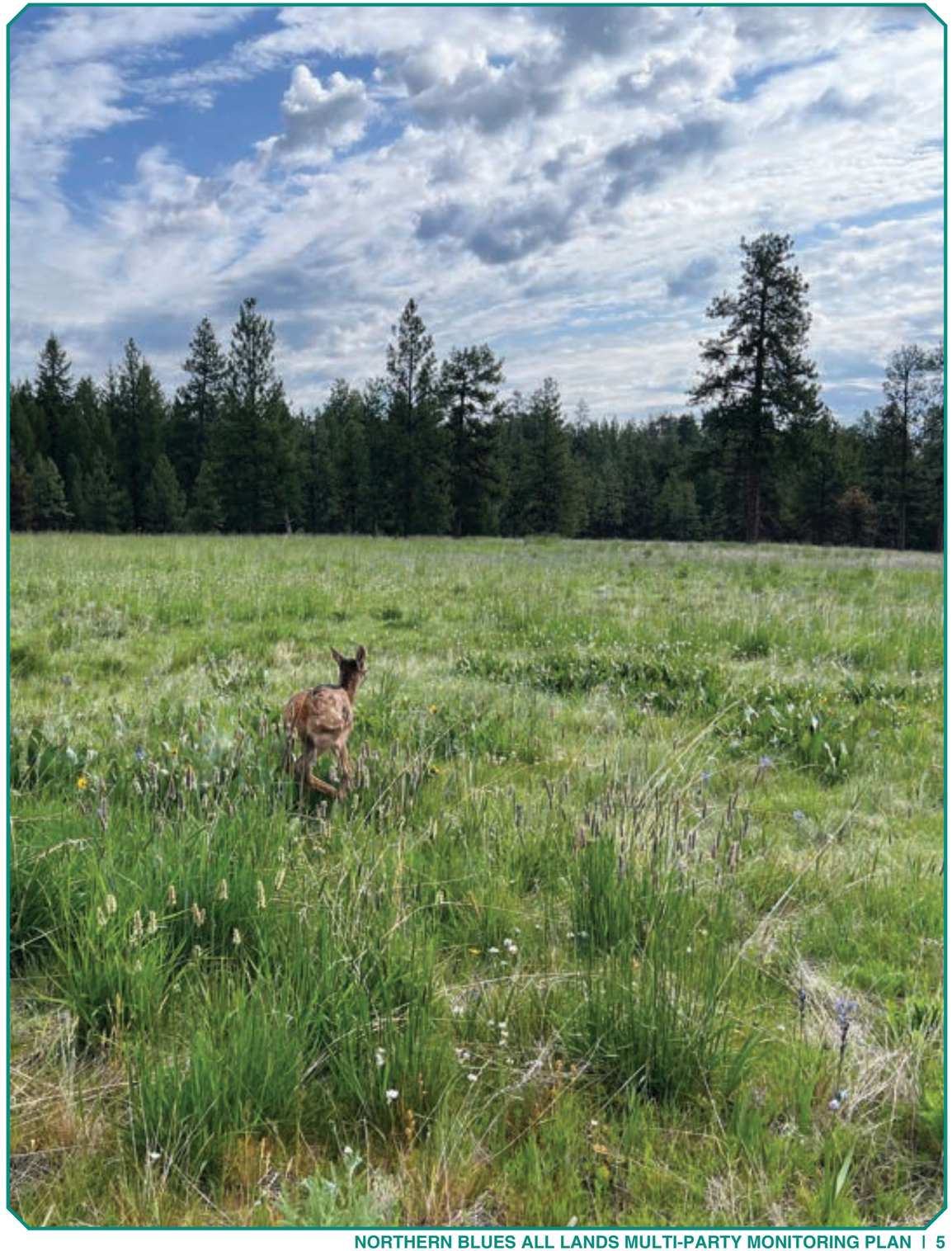

Introduction

The Northern Blues Restoration Partnership (the Partnership) formed to support collaborative, cross-boundary forest restoration in Northeast Oregon and Southeast Washington and a sliver of western Idaho (Figure 1) following the selection of the Northern Blues Collaborative Forest Landscape Restoration Project (CFLRP) for funding in October 2020. The Northern Blues Restoration Partnership works across public, private and tribal forestlands. The CFLRP requires the developing and implementing a Multi-Party Monitoring Plan to address a set of monitoring questions that inform project progress, are of collective interest to stakeholders, and include mandatory core questions from the CFLRP Common Monitoring Strategy.

The Monitoring Team is the resource team within the Partnership that is responsible for developing and implementing the Northern Blues All Lands Multi-Party Monitoring Plan. This document is intended to be updated annually in response to new findings and emerging needs within the Partnership.

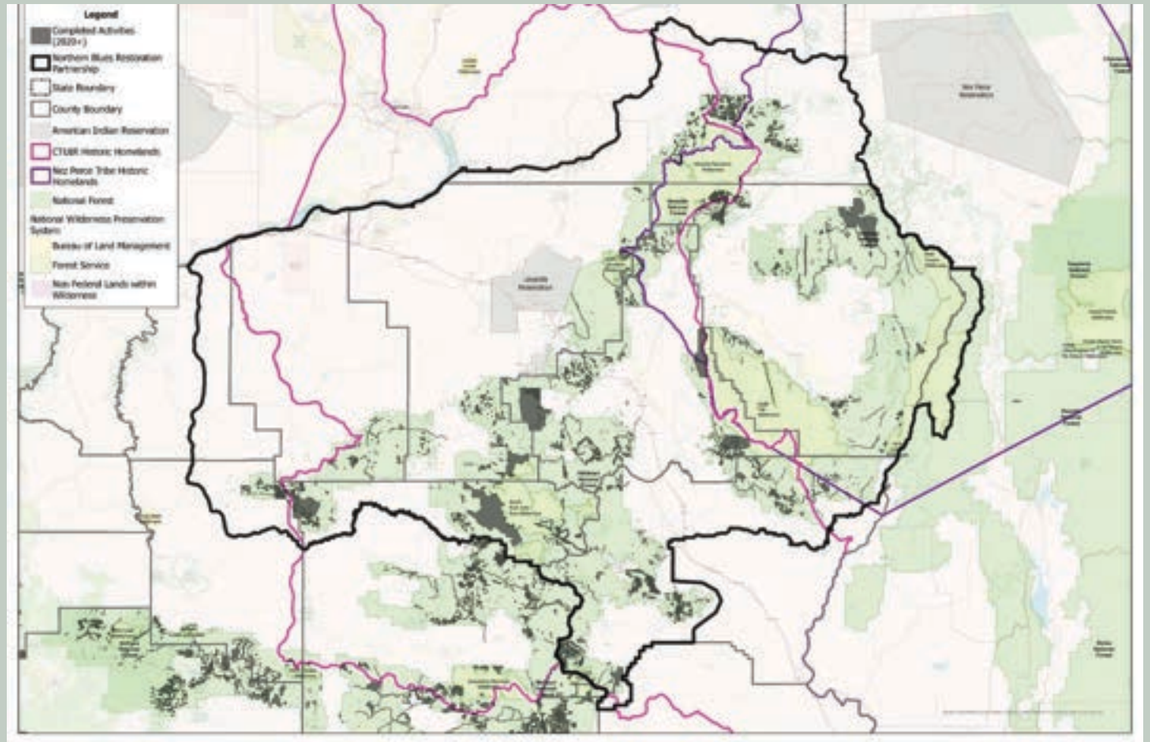

Figure 1. A map of the Northern Blues Restoration Partnership focal area (black outline), highlighting land ownership and designations, and completed project areas (black filled polygons).

Goals of the Monitoring Plan

The goal of this plan is to define a monitoring strategy for CFLRP restoration treatments and an adaptive management framework for the Northern Blues Partnership. The legislation that authorizes the CFLRP program mandates monitoring for 15 years throughout the lifespan of the funding and beyond. Monitoring is intended to evaluate the work done, provide accountability and assess socioeconomic impacts.

The Monitoring Team envisions a monitoring program that follows an annual cycle of planning, implementation, and evaluation that is responsive to manager needs and stakeholder interests (Figure 3). The team proposes annual updates to the plan, particularly in the early years of the collaborative as we encounter new situations and work through these processes for the first time. While our goal is to honor a commitment to monitoring and answering questions we have established, we want this to be a living document that can adapt to the realities of monitoring, adaptive management, and communication of monitoring outcomes.

Figure 2. An adaptive management framework depicting the seasonal cycle of activities undertaken by the Monitoring Team in conjunction with other teams to ensure robust decision making within the Partnership.

Roles of the Northern Blues Monitoring Team

The Northern Blues Monitoring Team is composed of USFS staff, Northern Blues Partnership representatives, and external experts, and is structured to support effective implementation of the monitoring plan.

- The Northern Blues Monitoring Team External Coordinator (Clayton Matheny, cmatheny@wallowaresources.org) (currently housed at Wallowa Resources) facilitates the team, supervises a monitoring crew, gathers and manages data, and serves as the liaison between the team and the All Lands Partnership.
- The Northern Blues CFLRP Monitoring Coordinator (Amarina Wuenschel, amarina.e.wuenschel@usda.gov) serves as the liaison between the team and the USFS leadership.
- Monitoring Team - Develops, implements, and updates the Multi-Party Monitoring Plan. Includes USFS Ecology Team, Natural Resource Staff, other experts representing external partners, and liaisons from other Resource Teams within the Partnership. Interprets data and provides recommendations. Develops annual reports and presentations as needed.
  - John Punches john.punches@oregonstate.edu
  - Paige Stephens paige.stephens@usda.gov
  - Kaci Radcliffe kaci.radcliffe@tnc.org
- Collaborators, Contractors, and Monitoring Technicians - Support monitoring data collection, analysis, and/or storage.

Commitment to Monitoring Reporting

The usefulness of monitoring data lies not in their collection but in how they are interpreted and communicated. Project leads for each field monitoring project will provide annual reporting of the project status to the monitoring team. If field data results are only scheduled to be analyzed in multi-year increments, then a description each year of the number of plots collected and which projects plots were collected on is sufficient. Data (if parties have committed to submitting), analyses and written interpretation will be due the winter after the scheduled analysis (see individual questions for schedules). Written reports should include background, methods, findings and photos. **All project status updates, data, analysis and written reports will be due at the end of February each year.** Note that aquatic monitoring is being undertaken in partnership with a collaborative aquatic restoration and research effort in the Meadow Creek subbasin within the Starkey Experimental Forest. This effort will evolve parallel to our multi-party monitoring and will likely have differing timelines for reporting. This effort will provide mutual monitoring benefits for both the CFLR and CALR programs. As the CALR project evolves, we will update this monitoring plan to reflect questions that can be addressed by this effort.

Monitoring coordinators will be responsible for assembling an **annual monitoring report consisting of data analyses and project updates by the end of March of each year.** The annual monitoring report will be sent to partnership stakeholders and presented to the full All Lands Partnership and its Leadership Team. Oral presentations will be done at the request of partners.

Prioritizing Monitoring Plots

Vegetation monitoring plots will be prioritized on an annual basis and prioritization criteria may shift from year to year depending on needs. However, generally, the following should be considered when deciding to prioritize where to place plots:

- Spatial balance of plots across the two forests and in different regions
- Ensure post-treatment plots are captured in a timely manner; recognizing it will be better to prioritize post-treatment sampling in the latter half of the CFLRP lifespan
- High-priority or contentious projects should be prioritized for pre and post treatment monitoring
- Projects implementing novel, experimental techniques might be prioritized
- Needs of wildlife program, specifically the white-headed woodpecker work which requires stand measurements
- Ensure adequate representation of plots in non-upland vegetation projects (i.e. aspen, riparian forest thinning, etc.)

Adaptive Management Framework

Purpose / Context / Scope

The monitoring committee is committed to providing information to managers to inform their decision making processes and support adaptive management.

Framework & Elements

Background

Natural systems are extremely complex. Many variables interact to influence outcomes, and these outcomes may take years or generations to fully manifest. Ecologists work to discover principles that govern natural systems, which can be applied by land managers to achieve desired results such as reduced drought mortality, lower fire severity, or higher quality habitat for a sensitive species. However, achieving these results is never a certainty because the outcome depends on so many different factors. Predicting long-term effects is especially difficult when we know that the climate is changing and could be significantly different in a few decades (IPCC, 2018). Our current forest conditions are also different from historical conditions, especially in dry forests of the Western United States where fire suppression and logging practices have created a denser, younger forest and shifted species composition towards late-seral, shade-tolerant, fire-intolerant species (Hessburg, et

al. 2005). When present forest conditions are different from both the future and the past, it can be difficult to have clear management guidelines for what will produce the best outcomes in the future. There is a need for a system of management that can deal with uncertainty, allowing flexibility as our knowledge grows or conditions change (Millar, et al. 2007). When implemented correctly, adaptive management provides such a system.

Adaptive management is a system for land management that allows managers and researchers to update their knowledge and potentially change their approach as they observe treatment effects. Such a system shows promise in dealing with issues such as climate change (Conroy, et al. 2011), conserving endangered species (Serrouya, et al. 2019), and implementing effective restoration (Lindsay and Johnston 2020). By reducing uncertainty, adaptive management can also help to build consensus in collaborative restoration (Rumpff, et al. 2011).

Framework

Key elements of an iterative adaptive management framework include decision-making, monitoring, assessment, learning and feedback, and institutional learning. For the purposes of this document, monitoring is the key focus where information facilitates evaluation and learning about management effectiveness and informs broader decision-making – which comes from the implementation and integration of multiple components in assessment and adaptation. This can be referred to as multiple-loop learning. In the first loop, monitoring provides information about treatment effects. In double-loop learning, this information is used to revise assumptions about ecosystems, and in triple-loop learning, this leads to broader changes in norms and decision making (Keene et al. 2005). This sort of social learning is often a key goal in collaborative adaptive management and may be achieved with sufficient monitoring data and buy-in and participation from collaborators and leadership (Fernández-Giménez et al 2019).

Monitoring connects management objectives and specific metrics and protocols so that the data collected are relevant to assessment, learning, and future decision-making. Information from monitoring can be used to:

- Evaluate management effectiveness
    - Compare observed outcomes with desired outcomes to evaluate the effectiveness of management; measure success in attaining objectives and understand constraints/variability that may limit effectiveness
- Understand resource status
    - Estimate resource attributes and trends over time; compare projected vs. actual costs, benefits, and impacts of management alternatives
- Reduce uncertainty about management effects
    - Analyze data against predictions/ hypotheses to better understand systems and processes; identify where adjustments to a project or monitoring will improve understanding of actual conditions and system responses to management

Implementation

Within the monitoring plan, each question has general trigger point guidance. The monitoring team will refine general trigger points to use when analyzing the broader monitoring datasets (i.e., all plots pooled across units). For specific treatments, the monitoring team will suggest trigger points and then work with implementers and subject experts (i.e. USFS or Tribal or other specialists/scientists) to develop specific treatment trigger points for individual units based on the management goals of the treatments. A template will be developed to help managers identify trigger points early in the process and then assess post-treatment results (acknowledging sample size limitations). For the broad assessment and treatment monitoring, the team will interpret the results and discuss, where possible, management effectiveness, resource status, and uncertainties. They may also develop recommendations and decision-making for the Northern Blues CFLRP to review and discuss as part of annual reporting and planning efforts.

For each question, general trigger points have been identified and these will be made more specific and refined iteratively as we work through the adaptive management process on treatment units. Trigger points will first be suggested by the monitoring team and then members of the team will work with implementers and subject experts (i.e. USFS or Tribal or other specialists/scientists) to develop specific treatment trigger points for individual units depending on the management goals of the treatments. A template will be developed to work through identifying manager triggers early in the process and post-treatment we will review data to better understand if these were met (acknowledging sample size limitations).

Using feedback from stakeholders and managers in developing triggers at the unit scale, the monitoring team will refine general management trigger points to use when analyzing the broader monitoring datasets (all plots pooled across units). Based on these findings the monitoring team and partners will interpret results and develop recommendations to be brought to the Northern Blues CFLRP during annual reporting. Monitoring results will potentially be analyzed with managers in a workshop setting.

The monitoring team anticipates this section will be revised and detail added as the team works through the process for the first time.

Data Storage Standards

Data collection efforts that are funded by the Collaborative should adhere to some guidelines to ensure the data can be used effectively. We anticipate these standards will be reviewed and updated as we analyze field data for the first time. In this plan we have specified where data will be stored (see questions for details on where data for each question will be stored) and efforts will be made for backup copies of all databases. We recognize that with cross-boundary work comes the collection of sensitive information. Wallowa Resources, who manages the monitoring crew, commits to the privacy of sensitive data collected on private and tribal lands. This includes, but is not limited to landowner information, location, and species of concern. This data will only be made available in aggregate with the complete dataset with the sensitive pieces omitted (unless otherwise permitted by the landowner). Wallowa Resources and the US Forest Service Blue Mountains Ecology Program will maintain databases, with Wallowa Resources making quality control changes and sharing with the Forest Service so that duplicate databases are maintained. The monitoring team will build an Access database (or some other format that allows for maintaining data integrity) in 2024.

Data Interpretation and Messaging

Data analyses and written syntheses of findings will be reviewed by the monitoring committee who will additionally help interpret the findings and resulting management recommendations. Clearly communicated written synthesis and interpretation of data is a requirement of all projects. It is not sufficient to simply hand off data analyses and graphs. The monitoring team will ally closely with communication specialists and others to ensure the message is clearly and widely conveyed.

Question Development and Prioritization

The Monitoring Team met regularly starting in February 2021 to develop a monitoring plan for the Partnership. The team began by reviewing the lessons learned from related efforts, including the preceding ten years of the national CFLR program, a draft monitoring strategy developed by the Blue Mountains Ecology Team, and the work of other regional partners with strong forest monitoring programs, including the Washington Department of Natural Resources and the Klamath Lake Forest Health Partnership.

In addition to incorporating the Common Monitoring Strategy into the plan, a CFLRP requirement, the monitoring team worked with the Forest Service Regional Ecology group to help develop the common monitoring questions for all CFLRP projects. Then, the team solicited monitoring recommendations from subteams of specialists in CFLRP theme areas and areas of local interest, including vegetation, fuels, wildlife, aquatics and soils, invasive species, biocultural resources, and socioeconomics. The team also undertook pilot monitoring efforts prior to the finalization of the Monitoring Plan to inform vegetation, fuels, First Foods, and wildlife monitoring.

The Monitoring Team used the following questions to evaluate the subteam monitoring proposals.

Does the proposed monitoring:

- Help meet a Common Monitoring Strategy requirement?
- Link to the goals and indicators defined in the Northern Blues CFLR Proposal?
- Have significance to stakeholders and cross-boundary partners or help build common ground?
- Inform adaptive management by addressing uncertainties in treatments?
- Have well-defined, appropriate, and realistic goals?
- Seem feasible and cost effective?
- Use methods that provide the ability to detect treatment effects?

The team will use or expand these criteria in future iterations of the monitoring plan to identify and prioritize monitoring questions that are relevant to the objectives of the Partnership.

Question #1: What is the reduction in fire hazard based on our treatments?

One of the primary goals of the Northern Blues Collaborative and the Collaborative Forest Landscape Restoration Program at large is to reduce the risk of uncharacteristic wildfire. Our intention is to approach this question at two scales. The first broader scale method is part of the common monitoring strategy and thus fire intensity and crown fire probability changes will be evaluated across all collaborative landscapes in the same way. This will be evaluated every five years as Landfire (the base data for the assessment) is updated. We are also planning on doing a finer scale assessment using forest plot measurements which should be more sensitive to changes in fire risk reduction at the treatment scale, and provide more information on treatment effectiveness to practitioners. The forest plot measurements are collected by Wallowa Resources monitoring crews on pre and post treatment as well as control plots (depending on the protocol).

Figure 3. Prescribed burn on Confederated Tribes of the Umatilla Reservation Lands.

Indicator 1: Landscape scale fire intensity (predicted flame lengths)

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

MONITORING TYPE	Effectiveness
DATA SOURCE	IFTDSS, LandFire, FACTS
WHO COLLECTS DATA	USFS personnel
SCALE	Landscape
METHODS	Interagency Fuel Treatment Decision Support System (IFTDSS, https://iftdss.firenet.gov/)
DATA COLLECTION FREQUENCY	Per Landfire
DATA REPORTING FREQUENCY	Per Landfire
METRICS	Flame length condition classes: 1-4 ft., >4-8 ft., >8-11 ft., >11-25 ft., >25 ft.
WHERE IS THE DATA STORED	To-be-determined USFS database
WHO ANALYZES THE DATA	USFS personnel. Currently the intent is to address this from the USFS PNW Regional Office in a position overseen by the Regional Ecologist.
DESIRED CONDITION	Smaller flame lengths are generally desirable, but this isn't the case in all ecosystems

TRIGGER POINT: Reconsider pace and scale of treatments if analysis does not show a change in modeled fire intensity. Given the scale of these analyses and the resources it would require to significantly alter the pace and scale of treatments, this likely needs to be a high level dialogue.

Indicator 2: Landscape scale crown fire probability

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

MONITORING TYPE	Effectiveness
DATA SOURCE	IFTDSS, LandFire, FACTS
WHO COLLECTS DATA	USFS personnel
SCALE	Landscape
METHODS	Interagency Fuel Treatment Decision Support System (IFTDSS, https://iftdss.firenet.gov/) and Firesheds
DATA COLLECTION FREQUENCY	Per Landfire
DATA REPORTING FREQUENCY	Per Landfire
METRICS	Crown fire probability condition classes - FireShed scale: unburnable, surface fire, passive crown fire, active crown fire, and crown fire (combined)
WHERE IS THE DATA STORED	To-be-determined USFS database
WHO ANALYZES THE DATA	USFS personnel
DESIRED CONDITION	A lower probability of crown fire is generally desirable, but this isn't the case in all ecosystems and some heterogeneity is desirable. A lower probability of crown fire in WUI areas is desirable.

TRIGGER POINT: Reconsider pace and scale of treatments if analysis does not show a change in crown fire probability. Given the scale of these analyses and the resources it would require to significantly alter the pace and scale of treatments, this likely needs to be a high level dialogue.

Indicator 3: Stand scale fire intensity (potential fire flame lengths)

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [ ] CFLRP Common [X] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

MONITORING TYPE	Effectiveness
DATA SOURCE	Data collected using Upland Forest Monitoring Protocol and the Riparian Forest Monitoring Protocol as well as USFS plots stored in FSVeg if applicable.
WHO COLLECTS DATA	Wallowa Resources Monitoring Crew
SCALE	Stand
METHODS	Fire and Fuels Extension of the Forest Vegetation Simulator or IFTDSS
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
METRICS	Flame length in feet
WHERE IS THE DATA STORED	FSVeg
WHO ANALYZES THE DATA	Blue Mountain Ecology Program
DESIRED CONDITION	Smaller flame lengths are generally desirable, but this isn't the case in all ecosystems.
OTHER INDICATORS TO BE EVALUATED USING THESE METHODS	Crowning index and surface fuel loads in tons per acre

TRIGGER POINT: We expect to refine the descriptions here after the first run-through of the analysis.

Indicator 4: Wildfire severity patterns with respect to treatment

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

MONITORING TYPE	Effectiveness
DATA SOURCE	FACTS (forest treatment data) and RAVG or alternative source (burn severity data) and potential vegetation data to control for fire regime differences across landscape burned
WHO COLLECTS DATA	USFS Ecologists
SCALE	Landscape
METHODS	Simple GIS analysis of patterns in and outside of treatment boundaries
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
METRICS	Burn severity patch sizes and relative abundance within and outside of treatment areas
WHERE IS THE DATA STORED	FSVeg
WHO ANALYZES THE DATA	Blue Mountain Ecology Program
DESIRED CONDITION	Lower burn severity class in areas that received treatment compared to areas that were left untreated, although acknowledging some forest types will naturally have a mixed severity fire regime.
OTHER INDICATORS TO BE EVALUATED USING THESE METHODS	Some awareness of fire behavior should be taken into consideration. For instance if a fire column collapsed over a treatment area, the monitoring team should forgo making conclusions about treatment effectiveness at high severity fire risk reduction.

TRIGGER POINT: Re-evaluate treatments if burn severity class is not reduced in systems where treatments were implemented repeatedly.

Question #2: What is the effect of the treatments on moving the forest landscape (and individual stands) toward a more sustainable condition reflective of the scale and intensity of historical disturbances?

While we acknowledge that current climate conditions are changing, historical (prior to major Euro-American impacts) forest structure and composition still provide a reference model for forests that were more resilient and/or resistant to forest disturbances. Landscape-scale forest restoration is a major goal of collaborative landscape projects, so it is important to use a benchmark like historic or natural range of variation (or other desired target that defines resistance and resilience to future disturbances and climate change) as a benchmark to evaluate if our treatments are meeting objectives.

The first two indicators - landscape-scale vegetation departure and acres of fire burned - will be assessed using broad-scale widely available data. The third indicator - stand-level vegetation departure - will be evaluated using data collected by Wallowa Resources monitoring crews on pre and post treatment as well as control plots (depending on the protocol).

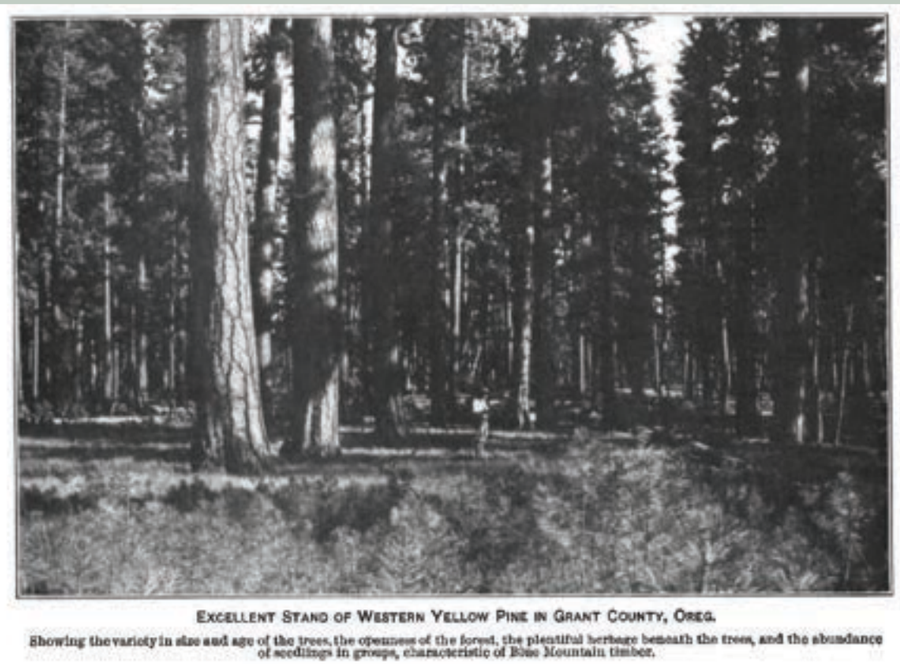

Figure 4. Photo plate from the Thornton Munger bulletin 'Western Yellow Pine in Oregon' published by the U.S. Department of Agriculture in 1917.

Indicator 1: Landscape-scale vegetation departure

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

MONITORING TYPE	Effectiveness
DATA SOURCE	To-be-determined existing USFS databases
WHO COLLECTS DATA	USFS personnel
SCALE	Landscape
METHODS	Huago et al. 2015
DATA COLLECTION FREQUENCY	Every 5 years
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Acres and percent of the total project area in early development, mid closed, mid open, late open, and late closed succession classes.
WHERE IS THE DATA STORED	Existing USFS databases
WHO ANALYZES THE DATA	Regional USFS personnel
DESIRED CONDITION	Landscape-level representation of different seral states is moved closer to the natural range of variation

TRIGGER POINT: Reconsider pace and scale of treatments if analysis does not show a change in crown fire probability. Given the scale of these analyses and the resources it would require to significantly alter the pace and scale of treatments, this likely needs to be a high level dialogue.

Indicator 2: Acres burned by wildfire and prescribed burning annually

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

MONITORING TYPE	Implementation
DATA SOURCE	To-be-determined existing USFS databases
WHO COLLECTS DATA	USFS personnel
SCALE	Landscape
METHODS	Query data from existing USFS databases and partners and compare to Powell HRV guides.
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
METRICS	Acres burned and percent of the total project area under Fire Regimes I-V. Fire severity and patch size metrics can be included too.
WHERE IS THE DATA STORED	Existing USFS databases
WHO ANALYZES THE DATA	USFS personnel
DESIRED CONDITION	Landscape-level representation of different seral states is moved closer to the natural range of variation

TRIGGER POINT: Evaluate and adjust fuel and other treatments and wildfire management if the analysis does not show a decrease in departure from the acres burned under a natural range of variation.

Indicator 3: Forested stand vegetation departure

Extent to which forest stands are shifted back to HRV (or other desired target that defines resistance and resilience to future disturbances and climate change) through treatment and, if applicable, subsequent wildfire?

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

MONITORING TYPE	Effectiveness
DATA SOURCE	FSVeg
WHO COLLECTS DATA	USFS personnel
SCALE	Stand-scale
METHODS	Use FVS historic range of variation analysis (Powell's SDIs) initially, but shift to also comparing plot data to more detailed historic range of variation information as that is developed. Use pre and post treatment plot data and any post-wildfire plot data collected
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
METRICS	Stand structure and composition metrics (density, relative species abundances, tree size class distributions, basal area)
WHERE IS THE DATA STORED	Existing USFS databases
WHO ANALYZES THE DATA	USFS personnel
DESIRED CONDITION	Forested types increasingly approach a stand characteristics within the historic range of variation

TRIGGER POINT: Evaluate and consider adjusting prescriptions if not meeting historic or natural range of variation standards with treatment. Consider treatment scale and prescriptions if post-wildfire analyses indicate an uncharacteristic recovery trajectory in post-fire environments.

Indicator 4: How much of the landscape has been treated and by what types of treatment?

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes, where plot data are collected ☐ No

MONITORING TYPE	Implementation
DATA SOURCE	FACTs or Project coordinator reporting
WHO COLLECTS DATA	CFLRP coordinator
SCALE	Landscape
METHODS	Summary of treatments and treatment types
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
METRICS	Area treated by treatment type
WHERE IS THE DATA STORED	TBD
WHO ANALYZES THE DATA	Monitoring Coordinator
DESIRED CONDITION	That treatments are occuring at an effective pace and scale as described in the proposal

TRIGGER POINT: Re-evaluate treatments and ways of doing business if treatments are not occurring at the pace of CFLRP objectives

Question #3: What are the specific effects of restoration treatments on the habitat of at-risk species and/or the habitat of species of collaborative concern across the CFLR project area?

As stated in the Northern Blues CFLRP proposal, our goal is to “restore spatial variability and structure to improve small mammal and bird habitat.” We are approaching understanding the influence of forest treatments on wildlife populations using a multi-pronged approach. The first indicator (HRV departure) allows us to assess habitat changes at a very broad scale. We also take a more refined look at avian communities and white-headed woodpecker demography to address these important questions in more detail.

To understand avian community dynamics we ask ‘What are the relationships between treatments and avian focal species richness, abundance, density, occupancy, and trend?’ We will accomplish this using standardized avian point count methodology paired with habitat metrics derived from vegetation surveys conducted by CFLRP vegetation monitoring crew. Addressing this question would provide much needed data on avian species distribution in the Blue Mountains, something that is currently lacking. Monitoring a suite of focal species will provide a more robust measure of effectiveness than single species monitoring alone. Changes in abundance, density, and trend of avian focal species will determine whether we are meeting our stated goal of restoring spatial variability and structure to improve small mammal and bird habitat. This data can be combined with data currently being collected in other CFLRPs and adjacent BLM land to derive regional population trend data. Results will help inform our stand-scale and landscape-scale management and strengthen assumptions made in NEPA documents.

Figure 5. US Forest Service interns radio-tracking white-headed woodpeckers in 2022.

We also evaluate focal bird species on a broader landscape scale by tying in landsat imagery to the avian point count data to allow us to understand the relationship between avian focal species distribution and vegetation composition and structure as influenced by vegetation management and wildfire. This approach will allow us to measure landscape-scale ecosystem response to disturbance (both vegetation management and wildfire) in both cool-moist and warm-dry vegetation types over the 10-year duration of the CFLRP. Results will help inform management by indicating whether spatial variability and structure of vegetation is distributed across the landscape in a way that supports ecosystem function and biodiversity. Species distribution models for a full suite of avian focal species will assist with project planning and NEPA analysis as well as aid in prioritizing areas for treatment. Identifying relationships between focal species distribution and Landsat data will provide tools that managers can use well beyond the life of the CFLRP because Landsat data is updated annually and available at no cost. This approach has been used successfully in Southern Oregon on the Rogue Basin CFLRP but is untested east of the Cascades. Applying this methodology across multiple CFLRP areas will strengthen conclusions regarding landscape scale effects of CFLRP treatments and wildfire.

To understand the influence of forest treatments on white headed woodpecker demography we use acoustic recording units to assess woodpecker occupancy, nest site selection, and nest success in relation to forest treatments. White-headed woodpeckers are a focal species for late-successional dry forest and a priority species for the U.S. Forest Service and Oregon and Washington due to the steep decline in their habitat and population trend. However, Blue Mountain Forests do not currently have a monitoring program in place for this species. This analysis will determine whether treatments are affecting white-headed woodpecker occupancy and reproduction. Data from acoustic recording units will be used to develop a protocol that will form the basis of a long-term monitoring program that could be incorporated into future Forest Plans. In addition, this data can be used to develop occupancy estimates for many other species at any point in the future when additional funding becomes available for acoustic data analysis. This is a novel monitoring approach but data from the 2021 pilot season indicate this method is likely to be adopted by other forests in the region due to its relative efficiency.

Additionally, we intend to evaluate if treatments influence white-headed Woodpecker home range size and habitat use and how abundance and carrying capacity may differ among treatment types by radio-tracking birds.This data will improve our understanding of foraging needs of White-headed Woodpecker to inform stand-scale silviculture prescriptions. Only one other CFLRP (Salmon-Weiser) was able to look at space use by white-headed woodpeckers and the results raised concerns regarding the tradeoffs associated with space use and nest success. This data would build on knowledge gained from that study and provide the only data on white-headed woodpecker space use in Region 6. By integrating these data with occupancy probability estimates managers will have the ability to estimate White-headed Woodpecker abundance across a wide range of habitat conditions to monitor population dynamics and trends across treated and untreated areas. Home range estimates will allow for estimation of carrying capacity across the landscape in relation to forest management. Knowing the carrying capacity that treated and untreated stands can support will enable us to prioritize treatment areas and inform the analysis that supports our NEPA effects calls.

Indicator 1: For at-risk species and/or species of collaborative concern, acres treated to move towards desired condition (HRV/departure)

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

MONITORING TYPE	Effectiveness
DATA SOURCE	To-be-determined existing USFS databases
WHO COLLECTS DATA	USFS personnel
SCALE	Landscape
METHODS	Huago et al. 2015
DATA COLLECTION FREQUENCY	Every 5 years
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Acres and percent of the total project area in early development, mid closed, mid open, late open, and late closed succession classes
WHERE IS THE DATA STORED	Existing USFS databases
WHO ANALYZES THE DATA	USFS personnel
DESIRED CONDITION	Increase in the proportion of the landscape restored to the natural range of variation

TRIGGER POINT: Evaluate and adjust fuel and other treatments if the analysis does not show a decrease in vegetation departure

Indicator 2: Probability of occurrence, relative abundance of bird species

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [ ] CFLRP Common [X] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [ ] Yes [X] No

MONITORING TYPE	Effectiveness
DATA SOURCE	Field data, Landsat
WHO COLLECTS DATA	Klamath Bird Observatory, Wallowa Resources
SCALE	Stand to landscape
METHODS	Point counts, stand exams, and remotely sensed habitat layers. Focal species abundance and community composition will be estimated pre- and post-treatment. Bird observations will be paired with Landsat bands to estimate probability of occurrence by habitat type and create focal species distribution models
DATA COLLECTION FREQUENCY	1-2 years pre-treatment and 1-2 years post-treatment
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Focal species density, abundance, population trend, occupancy, species richness, community composition
WHERE IS THE DATA STORED	Avian Knowledge Northwest
WHO ANALYZES THE DATA	Klamath Bird Observatory
DESIRED CONDITION	Focal species habitats will occur in similar quality, quantity, and distribution to what occurred historically to support persistence of populations

TRIGGER POINT: Evaluate and adjust fuel and other treatments if analysis does not show trend toward historical quality, quantity, and distribution of focal species' habitats

Indicator 3: Demographic parameters for white-headed woodpecker with respect to forest treatment

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☐ Yes ☒ No

MONITORING TYPE	Effectiveness
DATA SOURCE	Field data, Landsat, GNN
WHO COLLECTS DATA	USFS, Pacific Northwest Research Station, Oregon Department of Fish and Wildlife, Wallowa Resources
SCALE	Stand to landscape
METHODS	Acoustic recording units, stand exams, nest monitoring, and radio-telemetry
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Occupancy, abundance, nest density, nest success, home range size, carrying capacity
WHERE IS THE DATA STORED	NRM
WHO ANALYZES THE DATA	Pacific Northwest Research Station
DESIRED CONDITION	Increase in quality, quantity, and connectivity of suitable habitat. Population trend will be stable or increasing

TRIGGER POINT: Evaluate and adjust fuels and other treatments if analysis does not show positive trends in quality, quantity, and connectivity of suitable habitat

Question #4: What is the status and trend of watershed conditions in the CFLRP area, with a focus on the physical and biological conditions that support key soil, hydrologic and aquatic processes?

This monitoring question is intended to help address one of the key purposes in the Collaborative Forest Landscape Restoration Program (CFLRP) legislation: “Maintain or improve water quality and watershed function.” The Watershed Condition Framework (WCF) provides a consistent way to evaluate watershed condition at both the national and forest levels. It consists of reconnaissance-level assessments by individual national forests, implementation of integrated improvement activities within priority watersheds, and validation and monitoring of watershed condition class changes. Question 4 leverages the WCF, and the 12 indicators that comprise it – it is recognized that maintaining a watershed’s condition can be a big accomplishment. It’s not expected that CFLRP projects will improve every indicator or every priority watershed.

Figure 6. Conferderated Tribes of the Umatila Reservation Staff and Umatilla National Forest Staff discuss restoration options on Meacham Creek.

Indicator 1: Twelve indicators of the Watershed Condition Framework for subwatersheds affected by restoration actions and/or disturbance events (e.g. wildfire, fuels treatments, etc.)

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [ ] Yes [X] No

MONITORING TYPE	Effectiveness
DATA SOURCE	Watershed Condition Framework (WCF)
WHO COLLECTS DATA	FS personnel update WCF as part of their regular duties
SCALE	Landscape
METHODS	Per WCF Step A, assess the status and trend of overall watershed condition class and of each of the 12 separate indicators that comprise that classification
DATA COLLECTION FREQUENCY	Every 5 years
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Priority watersheds moved to improved condition class
WHERE IS THE DATA STORED	WCF database
WHO ANALYZES THE DATA	FS reports on number of watersheds in improved condition class
DESIRED CONDITION	Positive change in the condition class for priority watersheds

TRIGGER POINT: If there is not a positive change in the condition class after restoration, evaluate indicators to assess whether additional restoration is needed

Indicator 2: Priority subwatersheds affected by restoration actions and/or disturbance events with a change in overall Watershed Condition Class

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [ ] Yes [X] No

MONITORING TYPE	Effectiveness
DATA SOURCE	WCATT
WHO COLLECTS DATA	FS personnel gather information as part of their regular duties
SCALE	Landscape
METHODS	Query database for indicator values
DATA COLLECTION FREQUENCY	Every 5 years
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Watershed condition scores
WHERE IS THE DATA STORED	FS
WHO ANALYZES THE DATA	USFS personnel
DESIRED CONDITION	Maintain or improve watershed condition scores

TRIGGER POINT: Adjust restoration efforts if watershed condition scores deteriorate

Question #5: What is the trend in invasive species within the CFLRP project area?

This monitoring question is intended to help address one of the key purposes in the Collaborative Forest Landscape Restoration Program (CFLRP) legislation: “Prevent, remediate, or control invasions of exotic species.” Invasive plant spread can displace native plant species which provide wildlife forage and habitat, alter hydrology and fire regimes. To both detect early spread of invasives in general, and in particular in relation to collaborative treatment, we are monitoring invasive plant species within the Northern Blues landscape both by reporting annually from the invasives database the US Forest Service tracks invasive treatment and monitoring with and by including invasives in upland and riparian forest monitoring plots.

Figure 7. Grassland in the 2021 Lick Creek Fire footprint on the Umatilla National Forest. Venetata dubia, an invasive annual grass, is establishing in the area.

Indicator 1: Invasive plant acres treated

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

MONITORING TYPE	Implementation
DATA SOURCE	FACTS
WHO COLLECTS DATA	FS personnel and partners
SCALE	Landscape
METHODS	Summarize invasive plant species treatments
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
METRICS	Acres treated
WHERE IS THE DATA STORED	FS databases
WHO ANALYZES THE DATA	FS personnel
DESIRED CONDITION	Continued treatments of invasive plants

TRIGGER POINT: Evaluate monitoring, outreach (private lands), and/or funding availability if acres of invasive treatments are decreasing; evaluate methods of treatment if some weed sites are not effectively controlled each year

Indicator 2: Number of new infestations successfully controlled

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

MONITORING TYPE	Implementation
DATA SOURCE	FACTS
WHO COLLECTS DATA	FS personnel and partners
SCALE	Landscape
METHODS	Summarize number of infestations controlled
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
METRICS	Number of new infestations controlled
WHERE IS THE DATA STORED	FS databases
WHO ANALYZES THE DATA	FS personnel
DESIRED CONDITION	Effective control of invasive plants

TRIGGER POINT: Evaluate monitoring, outreach (private lands), and/or funding availability if acres of invasive treatments are decreasing; evaluate methods of treatment if some weed sites are not effectively controlled each year

Indicator 3: Trend in invasives within the CFLRP project area as documented on field plots

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

MONITORING TYPE	Effectiveness
DATA SOURCE	Monitoring plots
WHO COLLECTS DATA	Wallowa Resources Monitoring Crew
SCALE	Project
METHODS	Calculations can be made in Microsoft Excel or other statistical analysis software/programming languages such as R or Python
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
METRICS	Target invasive plant species presence/absence and percent cover
WHERE IS THE DATA STORED	Northern Blues Restoration Partnership Google Drive Work Folders
WHO ANALYZES THE DATA	Monitoring Coordinator
DESIRED CONDITION	Prevent establishment of invasive plant species following treatment

TRIGGER POINT: Evaluate monitoring, preventative measures, and methods of treatment if weeds invade, persist, and/or increase after treatment

Question #6: How have treatments modified conditions of forests and special habitats?

To better understand if we are meeting treatment objectives across a range of project types and ecological systems (upland forest, riparian forest, aspen and meadows) and to assess resulting intended (and sometimes intended) in species composition and vegetation structure, we use a variety of metrics from data collected. The information collected to address this question are collected by Wallowa Resources monitoring crews on pre and post treatment as well as control plots (depending on the protocol). Where wildfire interacts with plots that have received treatments, we will also analyze how these areas have been affected by wildfire compared with similar untreated areas (i.e. large tree retention, veg composition, regeneration, etc.). While there is some variety in treatment objectives even with the same vegetation type, there are many universals as well (i.e. large tree retention, hardwood cover, etc.). As we analyze data we will remain in communication with project managers to make sure we are evaluating metrics of interest to them and collaborative members. Monitoring results will allow us to adjust treatments in the future depending on resulting conditions from monitored treatments, assess treatment success and ensure no unwanted impacts are occurring. Pre and post treatment data (and in some cases controls) will be analyzed for all indicators.

Figure 8. Silviculturist, Jack Comish, standing in front of the Elk Flat aspen stand.

Indicator 1: Upland forest condition, including retention of relict trees and snags

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

MONITORING TYPE	Effectiveness
DATA SOURCE	Upland forest vegetation and fuels monitoring plots
WHO COLLECTS DATA	Wallowa Resources Monitoring Crew
SCALE	Project
METHODS	Upland Forest Monitoring Protocol
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Photopoints; stand structure; tree species composition, status (dead or alive), basal area; height, height to base of crown, crown ratio, seedling and sapling composition and density; large tree abundance by species, snag abundance and snag size class, decay class, and density; fuel loading, vegetation and bare soil cover and vegetation composition, shrub frequency and height; canopy cover, density of small trees, regeneration
WHERE IS THE DATA STORED	FSVeg, OSU database
WHO ANALYZES THE DATA	Monitoring Coordinator, FS personnel
DESIRED CONDITION	Maintain or improve upland forest conditions

TRIGGER POINT: Evaluate and adjust the prescriptions if the analysis shows a decline in upland forest condition

Indicator 2: Riparian forest condition

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

MONITORING TYPE	Effectiveness
DATA SOURCE	Riparian vegetation and fuels monitoring plots
WHO COLLECTS DATA	Wallowa Resources Monitoring Crew
SCALE	Project
METHODS	Riparian Forest Monitoring Protocol
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Photopoints; stand structure; tree species composition, status (dead or alive), basal area; height, height to base of crown, crown ratio; seedling and sapling composition and density; snag size class, decay class, and density; fuel loading; vegetation and bare soil cover and vegetation composition; shrub frequency and height; canopy cover; riparian hardwood frequency and browse; large tree abundance and species; erosion
WHERE IS THE DATA STORED	FSVeg, OSU database
WHO ANALYZES THE DATA	Monitoring Coordinator, FS personnel
DESIRED CONDITION	Maintain or improve riparian forest conditions

TRIGGER POINT: Evaluate and adjust the prescriptions if the analysis shows a decrease in riparian forest conditions

Indicator 3: Aspen stand condition

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

MONITORING TYPE	Effectiveness
DATA SOURCE	Aspen belt transects
WHO COLLECTS DATA	Wallowa Resources Monitoring Crew
SCALE	Project
METHODS	Aspen Stand Monitoring Protocol
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Photopoints; canopy cover; aspen sucker density and browse; conifer seedling and sapling density; tree species, basal area, and status (live or dead); fuel loading
WHERE IS THE DATA STORED	FSVeg, OSU database
WHO ANALYZES THE DATA	Monitoring Coordinator, FS personnel
DESIRED CONDITION	Increased vigor and health of the aspen stand

TRIGGER POINT: Evaluate and adjust the prescriptions if analysis does not show a significant improvement in stand health and vigor

Indicator 4: Qualitative professional opinion of forest treatments

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

MONITORING TYPE	Implementation and Effectiveness
DATA SOURCE	All Lands Partnership and NBFC members and stakeholders
WHO COLLECTS DATA	NBFC Facilitator
SCALE	Project
METHODS	The NBFC conducts periodic field tours on public and private land, and through feedback and discussion, create standardized documentation of professional opinion regarding treatments
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
METRICS	Field tour report
WHERE IS THE DATA STORED	WR database
WHO ANALYZES THE DATA	NBFC Steering Committee
DESIRED CONDITION	General consensus that treatments are meeting project objectives

TRIGGER POINT: Evaluate and adjust prescriptions if the Partnership members feel treatments are not meeting project objectives

Indicator 5: Wildfire resilience

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

MONITORING TYPE	Effectiveness
DATA SOURCE	Monitoring plots where a wildfire has occurred on recent forest treatments
WHO COLLECTS DATA	Wallowa Resource Monitoring Crew
SCALE	Project
METHODS	A modified version of Upland Forest Monitoring Protocol, Riparian Forest Monitoring Protocol, Aspen Stand Monitoring Protocol . Protocols will include common post-fire metrics such as scorch and torch height. (Corresponds to existing plot protocol)
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Photopoints; stand structure; tree species composition, status (dead or alive), basal area; height, height to base of crown, crown ratio, seedling and sapling composition and density; large tree abundance by species, snag abundance and snag size class, decay class, and density; fuel loading, vegetation and bare soil cover and vegetation composition, shrub frequency and height; canopy cover, density of small trees, regeneration *Depends on veg type*
WHERE IS THE DATA STORED	FSVeg, OSU database
WHO ANALYZES THE DATA	Monitoring Coordinator, FS personnel.
DESIRED CONDITION	Maintain or improve forest resilience to natural and human-caused wildfire. Forest resilience here is defined as retention of some live trees at scales appropriate to forest type, and adequate post-fire tree regeneration.

TRIGGER POINT: Evaluate and adjust the prescriptions and/or pace and scale of treatment if the analysis shows a decrease in wildfire resilience

Question #7: How do cultural plant resources (first foods) respond to treatments in meadows and grasslands?

Background

A diverse group of stakeholders rely on, and benefit from, healthy grassland and meadows of the northern Blue Mountains. Native forbs are a critical component of these ecosystems, and are important for maintaining health and productivity. They make up a significant portion of plant diversity, are important nectar sources for pollinators and increase forage quality and season of use for livestock and wildlife. For Native American tribes and communities, many forbs also provide important food, medicinal, and cultural resources. For example, camas (Camas quamash), biscuitroot (Lomatium spp.), and bitterroot (Lewisia rediviva), are considered First Foods that have sustained tribal people since time immemorial. First Foods are essential to the ongoing culture of tribes and play a fundamental role in health, diet, well-being and cultural identity. Despite their recognized importance, forbs remain one of the least studied groups of plants in western North American rangelands, and research on how these species respond to stewardship and management actions lags far behind that of grass and shrub species. This hinders the development of best practices to manage rangelands to ensure the continued production of ecosystem services that forbs help support, and limits incorporating forbs into many rangeland restoration efforts- a key priority need across the interior West. Moreover, because of our limited knowledge on forb ecology, management and restoration, tribes face key concerns and challenges regarding these critically important cultural food resources that have gone unaddressed for many years.

Figure 9. Harvest of pyaxi (Lewisia rediva)

Project Goals and Approach

Our goal is to initiate a monitoring program focused on key grassland First Foods (referred to as ‘roots’ and ‘celery’) in order to monitor how these species respond to management treatments such as prescribed fire and/or conifer removal, two common management tools utilized by resource agencies in grassland, shrubland and open forests sites. Data collected includes abundance estimates for ~ 15-20 root and celery species, invasive plant abundance, and a number of additional ecological and biophysical site factors. Pilot sampling led by the Confederated Tribes of the Umatilla Indian Reservation and Oregon State University in 2021, developed an efficient, robust sampling protocol. We hope to monitor selected sites 3 times; pretreatment, 1-2 years post treatment, and again 3-4 years later. The sampling design will allow us to determine Root and Celery responses to treatments while taking into account site conditions. We will also be collecting important information on responses of invasive annual grasses such as medusahead, annual bromes and ventenata to treatments. The plots will be permanent, and allow for continued monitoring as appropriate beyond the life of the CFLR 10-year program.

Figure 10. C. Digging bag and cupin, D. harvested xaws (Lomatium cous) & xmas (Camassia quamash). Photos courtesy of Benjamin Drummond.

Indicator 1: Presence, density and frequency of culturally important plants

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☐ CFLRP Common ☒ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

MONITORING TYPE	Effectiveness
DATA SOURCE	Grassland monitoring plots
WHO COLLECTS DATA	CTUIR, OSU and CFLRP Monitoring Crew
SCALE	Plot
METHODS	Measure the presence and abundance of culturally important plant species in a series of 1 m2 plots nested within a 50 m radius circular plot (1.9 acres). Data will be collected in a Before-After Control-Impact (BACI design) .Results will also be utilized to develop species distribution models of key species
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Every 5 years
METRICS	Density (stems/m2), Frequency (% cover), Presence
WHERE IS THE DATA STORED	CTUIR & OSU databases
WHO ANALYZES THE DATA	CTUIR & OSU
DESIRED CONDITION	Stable or increasing abundance of culturally important plant resources

TRIGGER POINT: Evaluate and adjust the type, scale or intensity of treatments if desired trends are not observed

Question #8: Has the social and economic context changed over time, and if so, how?

Indicator 1: Changes in local population, demographic information, unemployment, per capita income, and wildfire exposure

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☒ CFLRP Common ☐ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

DATA SOURCE	Headwaters Economics Economic Profile System
WHO COLLECTS DATA	REV Center
SCALE	County
METHODS	Data will be downloaded and stored in Excel. It is descriptive data and does not require analysis. A REV intern will compile the data into the Partnership Dashboard
DATA COLLECTION FREQUENCY	Every 5 years
DATA REPORTING FREQUENCY	Every 5 years
WHERE IS THE DATA STORED	Partnership Dashboard
WHO ANALYZES THE DATA	REV Center

Indicator 2: Changes in local Forest Service capacity (funding and full-time equivalents)

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☒ CFLRP Common ☐ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☐ Yes ☒ No

DATA SOURCE	FS Database
WHO COLLECTS DATA	CFLRP Coordinator
SCALE	National Forest
METHODS	Query relevant database
DATA COLLECTION FREQUENCY	Every 5 years
DATA REPORTING FREQUENCY	Every 5 years
WHERE IS THE DATA STORED	FS Database
WHO ANALYZES THE DATA	CFLRP Coordinator

Indicator 3: Other local community characteristics

CFLRP COMMON MONITORING STRATEGY OR LOCAL? ☒ CFLRP Common ☐ Local

ALL-LANDS PUBLIC AND PRIVATE LAND? ☒ Yes ☐ No

DATA SOURCE	Headwaters Economics Economic Profile System
WHO COLLECTS DATA	REV Center
SCALE	County
METHODS	Data will be downloaded and stored in Excel. It is descriptive data and does not require analysis. A REV intern will compile the data into the Partnership Dashboard
DATA COLLECTION FREQUENCY	Every 5 years
DATA REPORTING FREQUENCY	Every 5 years
WHERE IS THE DATA STORED	Partnership Dashboard
WHO ANALYZES THE DATA	REV Center

Question #9: How have CFLRP activities supported local jobs and labor income?

Indicator: Modeled number of full and part time jobs supported by project activities; Modeled local labor income supported by project activities

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

DATA SOURCE	FS databases and partners
WHO COLLECTS DATA	CFLRP Coordinator; Monitoring Coordinator, and WR Forestland Program Manager
SCALE	Project
METHODS	Compile data from FS databases and solicit partner information through interviews
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
WHERE IS THE DATA STORED	FS databases and Northern Blues Restoration Partnership Google Drive Work Folders
WHO ANALYZES THE DATA	CFLRP Coordinator; Monitoring Coordinator, WR Forestland Program Manager, and REV Center

Question #10: How do sales, contracts, and agreements associated with the CFLRP affect local communities?

Indicator: Local contract capture (% of sales, contracts, agreements captured by local entities vs leakage outside local area) (from TREAT); Type of work captured locally (technical, equipment intensive, labor-intensive, supplies) (from TREAT); Characteristics of local entities capturing work (small business, minority owned, woman owned, etc.)

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

DATA SOURCE	FS and partner databases
WHO COLLECTS DATA	CFLRP Coordinator and WR Forestland Program Manager
SCALE	Project
METHODS	TREAT estimates are created by FS economists based on inputs from CFLRP project coordinator(s)
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
WHERE IS THE DATA STORED	FS databases and Northern Blues Restoration Partnership Google Drive Work Folders
WHO ANALYZES THE DATA	CFLRP Coordinator and WR Forestland Program Manager

Question #11: Did CFLRP maintain or increase the number and/or diversity of wood products that can be processed locally?

Indicator: Number, size, and types of mills in and around the project area; volume and type of wood products generated in and around the area

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

DATA SOURCE	Project coordinator tracking sheet (which could track where wood products go and that types), mill processing data, other sources as described in methods
WHO COLLECTS DATA	Forest Product Utilization Team
SCALE	Primarily local and county, potentially examine mills and timber products at a broader scale for the CFLRP based on available data
METHODS	Secondary data collection, then triangulation and verification of available data to identify gaps. Team will then determine what qualitative and/or quantitative methods would be most effective, such as a survey, or structured interviews with individuals representing wood products and restoration byproducts, local businesses
DATA COLLECTION FREQUENCY	Ongoing
DATA REPORTING FREQUENCY	Baseline and every 5 years
WHERE IS THE DATA STORED	Northern Blues Restoration Partnership Google Drive Work Folders
WHO ANALYZES THE DATA	Forest Product Utilization Team

Question #12: Did CFLRP increase economic utilization of restoration byproducts?

Indicator: Biomass utilized (biomass harvested/cut across bioenergy and biobased products) – BIO-NRG Agency performance measure (green tons of biomass made available for bioenergy production)

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [ ] Yes [X] No

DATA SOURCE	TIM Database
WHO COLLECTS DATA	FS Coordinator
SCALE	Landscape
METHODS	Query database
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
WHERE IS THE DATA STORED	FS Database
WHO ANALYZES THE DATA	FS Coordinator

Question #13: Who's involved in the Partnership/ Northern Blues Forest Collaborative and how does that change over time?

Indicator: Membership list

CFLRP COMMON MONITORING STRATEGY OR LOCAL?	[X] CFLRP Common [ ] Local
ALL-LANDS PUBLIC AND PRIVATE LAND?	[X] Yes [ ] No
DATA SOURCE	Northern Blues Restoration Partnership Google Drive Work
WHO COLLECTS DATA	Operations Team
SCALE	Local
METHODS	The Operations Team maintains a membership list for the Partnership
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
WHERE IS THE DATA STORED	Northern Blues Restoration Partnership Google Drive Work Folders
WHO ANALYZES THE DATA	Operations Team

Question #14: How well is CFLRP encouraging an effective and meaningful collaborative approach?

Indicator: Perceptions of whether and to what extent collaborative process is meaningful and effective

CFLRP COMMON MONITORING STRATEGY OR LOCAL?	[X] CFLRP Common [ ] Local
ALL-LANDS PUBLIC AND PRIVATE LAND?	[X] Yes [ ] No
DATA SOURCE	Collaborative governance assessment
WHO COLLECTS DATA	SWERI
SCALE	Local
METHODS	SWERI generates and deploys an online survey to all members of the All Lands Partnership in collaboration with members of the Operations Team
DATA COLLECTION FREQUENCY	Every 2-3 years
DATA REPORTING FREQUENCY	Every 2-3 years
WHERE IS THE DATA STORED	SWERI; Northern Blues Restoration Partnership Google Drive Work Folders
WHO ANALYZES THE DATA	SWERI

Question #15: Has the CFLRP and other investments attracted partner investments across the landscape?

Indicator: Funds invested by each collaborator/partner, including in-kind and leveraged; types of investments

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [X] CFLRP Common [ ] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

DATA SOURCE	FS, other partner databases or records tracking, project budget reporting
WHO COLLECTS DATA	CFLRP Coordinator; Monitoring Coordinator; WR Forestland Program Manager
SCALE	Project
METHODS	Compile all data on direct or in-kind investments within the project area
DATA COLLECTION FREQUENCY	Annually
DATA REPORTING FREQUENCY	Annually
WHERE IS THE DATA STORED	Northern Blues Restoration Partnership Google Drive Work Folders
WHO ANALYZES THE DATA	CFLRP Coordinator; Monitoring Coordinator; WR Forestland Program Manager

Question #16: What are the social and economic changes for private landowners by engaging in All-lands projects?

Indicator: Increase in economic opportunities by working together; perceptions and acceptance of prescribed fire or other restoration approaches; changes in awareness regarding prescribed fire

CFLRP COMMON MONITORING STRATEGY OR LOCAL? [ ] CFLRP Common [X] Local

ALL-LANDS PUBLIC AND PRIVATE LAND? [X] Yes [ ] No

DATA SOURCE	Project coordinator tracking sheet, primary data collection
WHO COLLECTS DATA	TBD
SCALE	Local
METHODS	Compile coordinator tracking sheet and any related secondary data (meeting or workshop notes or technical assistance notes or assessments). Team will then determine what qualitative and/or quantitative methods would be most effective, such as questionnaires on related topics for private landowners and other community members to take pre- and post- events (e.g. workshops), as well as a survey on perceptions and acceptance with different forest health approaches.
DATA COLLECTION FREQUENCY	Annually for some data collection, in depth for reporting period, with baseline assessment of perceptions and awareness
DATA REPORTING FREQUENCY	Every 5 years
WHERE IS THE DATA STORED	Northern Blues Restoration Partnership Google Drive Work Folders
WHO ANALYZES THE DATA	TBD

Question #17: What other impacts to local communities have occurred from engagement opportunities with youth, tribal, and other work crews?

Indicator: Type, amount, and impacts of youth/tribal/other opportunities	
CFLRP COMMON MONITORING STRATEGY OR LOCAL?	☐ CFLRP Common ☒ Local
ALL-LANDS PUBLIC AND PRIVATE LAND?	☒ Yes ☐ No
DATA SOURCE	Information from employers and employees from relevant groups/organizations (Baker Resources, Wallowa Resources, NPT, CTUIR, USFS, EOU, and others)
WHO COLLECTS DATA	TBD
SCALE	Local
METHODS	Synthesize and summarize employment and project tracking. Team will then determine what qualitative and/or quantitative approaches would be most effective, such as administering a questionnaire to, or semi structured interviews with youth, tribal, and other work crews, and employers pre- and post-employment
DATA COLLECTION FREQUENCY	Ongoing and in-depth for report
DATA REPORTING FREQUENCY	Every 5 years
WHERE IS THE DATA STORED	Northern Blues Restoration Partnership Google Drive Work Folders
WHO ANALYZES THE DATA	TBD

Appendix A: Existing Protocols, Templates, and Field Trip Reporting Template

- Upland Forest Monitoring Protocol
- Riparian Forest Monitoring Protocol
- Aspen Stand Monitoring Protocol
- Invasive Plant Monitoring Protocol
- First Foods Protocol - due to sensitive content, this protocol is not available to the general public.
- Avian Point Count Protocol

Scan this QR code to view protocols in a Google Drive folder.

Appendix B: Analysis Methods for Monitoring Questions

Placeholder. This section will be completed once data analysis for all questions has been completed.

Appendix C: Data Collection Standards

1. NA will be entered for all entries where a row is not applicable
2. Plot information will be entered for all rows. Can be done when back from the field or end of day.
3. Data will be quality checked after each plot
4. Plot coordinates will be entered in UTMs or metadata for the coordinate system will be explicitly listed for each row if another coordinate system is used.
5. Plot numbers for each plot will be unique and not repeats of plots at other sites. That is, there should be one completely unique ID for each plot. There should not, for instance, be a Plot # 1 in the Kahler unit and another Plot # 1 in the Whiskey unit. Do not use symbols (i.e. “-”) in plot numbers because they will be challenging to deal with when analyzing data in programs like R.
6. Data will be collated into single spreadsheets for each protocol, type of measurement at end of season
7. Units of measurement will be entered at the top of each row (e.g. “DBH (cm)”).
8. Any stand exam style plots (e.g. upland vegetation and riparian forest monitoring) will be entered into .CSE files so they can be uploaded in FSVeg. Each plot will be given a unique stand ID so they can be analyzed together.
9. The same Basal Area Factor needs to be used for data in the same stand for any common stand exam style plots
10. For all measurement types, please enter a plot number and a zero for no occurrences if you don’t observe something. For instance, if you don’t find any invasives at a plot, still enter the plot

number and indicate you found nothing on the sheet.

11. Column names in the datasheet should be consistently used and able to feed directly into analysis packages like R and ArcGIS. There should be no symbols (like # or %) and there should be no spaces, or merged rows or columns, or double row column names.
12. Bare ground should be recorded at all plots when recording invasives data, regardless of whether invasives were detected.
13. At each plot, include information on whether the plot is pre or post treatment or a control plot. If it is supposed to be a post-treatment plot, please indicate whether there is evidence of treatment at the site and general area. Make sure to record whether evidence of thinning and/or burning and/or other treatment is observed at site. Also if the plot is post-treatment, please record the year of treatment.
14. Each plot should designate whether a plot is on private, USFS, or tribal land, what protocol was used to measure at the plot and if the plot was a nest plot or not.
15. Note whether a plot is offset or thrown out, by what distance and direction and why
16. After each field season, forest data funded by the collaborative should be consolidated into a single database with data from all years. A copy of the database should be made and stored separately.

Appendix D: Adaptive Management Framework

Framework

Key elements of an iterative adaptive management framework include decision-making, monitoring, assessment, learning and feedback, and institutional learning. For the purposes of this document, monitoring is the key focus where information facilitates evaluation and learning about management effectiveness and informs broader decision-making – which comes from the implementation and integration of multiple components in assessment and adaptation. This can be referred to as multiple-loop learning. In the first loop, monitoring provides information about treatment effects. In double-loop learning, this information is used to revise assumptions about ecosystems, and in triple-loop learning, this leads to broader changes in norms and decision making (Keene et al. 2005). This sort of social learning is often a key goal in collaborative adaptive management and may be achieved with sufficient monitoring data and buy-in and participation from collaborators and leadership (Fernández-Giménez et al 2019).

Monitoring connects management objectives and specific metrics and protocols so that the data collected are relevant to assessment, learning, and future decision-making. Information from monitoring can be used to:

- Evaluate management effectiveness
  - Compare observed outcomes with desired outcomes to evaluate the effectiveness of management; measure success in attaining objectives and understand constraints/variability that may limit effectiveness
- Understand resource status
  - Estimate resource attributes and trends over time; compare projected vs. actual costs, benefits, and impacts of management alternatives
- Reduce uncertainty about management effects
  - Analyze data against predictions/hypotheses to better understand systems and processes; identify where adjustments to a project or monitoring will improve understanding of actual conditions and system responses to management

Approach

Adaptive management should occur across nested and interlocking levels of work and responsibility that connect design and implementation processes to strategy and policy development. A recommended approach and structure are provided below:

Area	Responsibility	Activity	Outcome
Monitoring	Monitoring Committee, led by CFLRP and external coordinator	• Evaluate and refine monitoring questions, design, protocols, and analysis techniques • Provide information and recommendations to project managers and the leadership team • Incorporate feedback where appropriate	• Monitoring plan and implementation of monitoring work is effective and responsive to requirements and needs over time • Monitoring documents areas of uncertainty and variables
Projects	Individual project/site managers, informed by the monitoring committee	• Evaluate project implementation and effectiveness. • Use monitoring data and information to refine site practices. • Provide feedback and recommendations to the monitoring committee and leadership team	• Project design, implementation, and outcomes are effective. • Continuous learning on-site practices and projects designed to explore areas of uncertainty and variability

Area	Responsibility	Activity	Outcome
Landscape	Leadership team, informed by project and monitoring staff	• Evaluate results of monitoring data and performance of projects as a portfolio of work. • Assess and implement recommendations related to landscape-scale strategies and policies • Provide feedback to the monitoring committee and project managers	• Direction, strategies, and policies are effective in achieving landscape goals. • Knowledge building and evaluation increase certainty and confidence in design-making and prioritization

Implementation

Within the monitoring plan, each question has general trigger point guidance. The monitoring team will refine general trigger points to use when analyzing the broader monitoring datasets (i.e., all plots pooled across units). For specific treatments, the monitoring team will suggest trigger points and then work with implementers and subject experts (i.e. USFS or Tribal or other specialists/scientists) to develop specific treatment trigger points for individual units based on the management goals of the treatments. A template will be developed to help managers identify trigger points early in the process and then assess post-treatment results (acknowledging sample size limitations). For the broad assessment and treatment monitoring, the team will interpret the results and discuss, where possible, management effectiveness, resource status, and uncertainties. They may also develop recommendations and decision-making for the Northern Blues CFLRP to review and discuss as part of annual reporting and planning efforts.

References

Conroy, M.J., Runge, M.C., Nichols, J.D., Stodola, K.W. and Cooper, R.J. 2011 Conservation in the face of climate change: The roles of alternative models, monitoring, and adaptation in confronting and reducing uncertainty. Biological Conservation, **144** (4), 1204-1213.

Fernández-Giménez, M. E., D. J. Augustine, L. M. Porensky, H. Wilmer, J. D. Derner, D. D. Briske, and M. Olsgard Stewart. 2019. Complexity fosters learning in collaborative adaptive management. Ecology and Society 24(2):29. https://doi.org/10.5751/ES-10963-240229

Hessburg, P.F., Agee, J.K. and Franklin, J.F. 2005 Dry forests and wildland fires of the inland Northwest USA: Contrasting the landscape ecology of the pre-settlement and modern eras. Forest Ecology and Management, **211** (1-2), 117-139.

IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)].

Keen, M., V. A. Brown, and R. Dyball. 2005. Social learning in environmental management: towards a sustainable future. Earthscan, London, UK.

Lindsay, A.A. and Johnston, J.D. 2020 Using historical reconstructions of moist mixed conifer forests to inform forest management on the Malheur National Forest.

Millar, C.I., Stephenson, N.L. and Stephens, S.L. 2007 Climate Change and Forests of the Future: Managing in the Face of Uncertainty. Ecological Applications, **17** (8), 2145-2151.

Rumpff, L., Duncan, D.H., Vesk, P.A., Keith, D.A. and Wintle, B.A. 2011 State-and-transition modeling for Adaptive Management of native woodlands. Biological Conservation, **144** (4), 1224-1236.

Serrouya, R., Seip, D.R., Hervieux, D., McLellan, B.N., McNay, R.S., Steenweg, R. et al. 2019 Saving endangered species using adaptive management. Proceedings of the National Academy of Sciences of the United States of America, **116** (13), 6181-6186.

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