**Lakeview Collaborative Forest Landscape**

**Restoration Project (CFLRP) Monitoring Plan**



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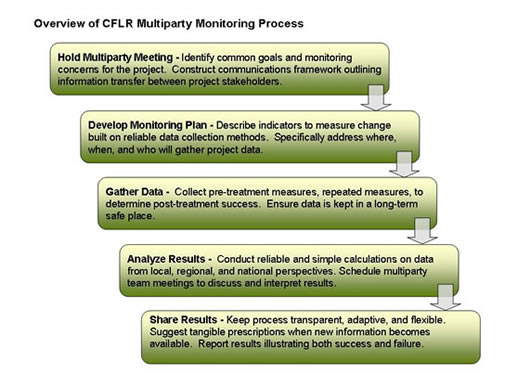
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# INTRODUCTION

The Lakeview Collaborative Forest Landscape Restoration Project (CFLRP) was selected for funding in 2012. Multiparty monitoring, evaluation, and accountability are required to assess the positive or negative ecological, social, and economic effects of project implementation. Monitoring is an essential part of adaptive management, because it provides reliable feedback on the effects of management actions and it allows managers to refine decisions and project design through a learning based approach to management. Multiparty monitoring helps to achieve the CFLRP’s goals of “improving communication and joint problem solving among individuals and groups” to better manage landscapes. Figure 1 provides an overview of the CFLR Multiparty Monitoring Process.

Figure 1. Overview of the CFLR Multiparty Monitoring Process[](http://www.fs.fed.us/restoration/documents/cflrp/multiparty_diagram.pdf)

# BACKGROUND

The Lakeview Stewardship Group was formed in 1998 to examine the policies tied to the Lakeview Federal Sustained Yield Unit and to generally improve management within the Unit. Their leadership and support resulted in the Unit being reauthorized in 2001 as the Lakeview Federal Stewardship Unit (the Unit) with a new restoration-focused policy statement

(<http://www.fs.fed.us/r6/frewin/projects/cert/syupolicy.pdf>)

Collaborators that make up the Lakeview Stewardship Group represent most potential collaborators on the landscape. They include The Collins Companies, Concerned Friends of the Fremont-Winema, Defenders of Wildlife, Fremont-Winema National Forest, Lake County Chamber of Commerce, Lake County Resources Initiative, Lakeview High School, Lakeview Ranger District, Oregon Department of Economic and Community Development, Oregon Wild, Paisley Ranger District, Sustainable Northwest, The Nature Conservancy, The Wilderness Society, and local citizens.

In 2005, the Lakeview Stewardship Group completed a long-range management strategy for the Unit that was developed with the assistance of the Forest Service and is an essential reference for project planning. *The Long-Range Strategy for the Lakeview Federal Stewardship Unit* is the guiding document for the decade-long collaborative effort to help restore the ecological health of the Unit and provide economic and social benefits for the local community. The Strategy is based on a common vision and set of goals and objectives developed by the Lakeview Stewardship Group and adopted by the U.S. Forest Service. Originally released in November 2005, the Strategy was updated in 2010 and again in 2011.

The Lakeview Stewardship Group developed the Biophysical Monitoring Project, which has operated continuously since 2002. The project was designed to answer questions about current conditions and effects of management within the Unit. Hundreds of permanent transects were established in areas identified as characteristic of the general landscape. These baseline transects were designed to be used as controls in future studies and as indicators of change.

The monitoring program allows public access to its processes and results through a website, http://www.lcri.org/monitoring/default.htm. The project goals are to collect relational indicator information from the landscape, from tree top to below ground on the same site; using equipment and methodologies that are relevant, sensitive, relatively inexpensive, standardized, repeatable, and usable; and to create a relational database that allows anyone to query inventory information from the watershed, in order to gauge rates of watershed repair over time. This monitoring program has informed the management and decisions for the last 10 years within the Unit.

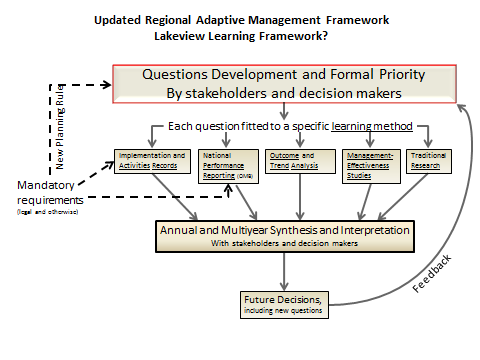
# GOAL OF THE MONITORING PLAN

The goal of the Lakeview CFLRP Monitoring Plan is to outline a monitoring strategy for this landscape for the next 15 years while building on the existing efforts described above. This plan has been developed through a collaborative process with the Lakeview Stewardship Group and it is guided by the multiparty monitoring process outlined in Figure 1. This plan will outline the methods, location and timing of data collection, and who will analyze and interpret the data. This monitoring plan will also estimate the budget necessary to perform the monitoring and to report the results. Lastly, this plan outlines how the results will be shared and incorporated into an adaptive management or learning-based framework. The monitoring plan will be reviewed and updated on an annual basis as new information becomes available or new questions are identified.

# ADAPTIVE MANAGEMENT FRAMEWORK

The Lakeview CFLR multiparty monitoring group has adopted the Pacific Northwest Region 6 Adaptive Management Framework (Figure 2) as a way to organize the overall monitoring and adaptive management framework. This is based on the work of Bernard Bormann at the FS Pacific Northwest Research Station and emphasizes learning as a key emphasis of the monitoring process. Within this framework, the group identified questions that are guided by agreed-on sideboards. This initial step helped the group to narrow the questions to those that are highest priority. Our learning framework can be described as the collaborative and institutional environment that permits the following series of management- and science-based learning processes (Figure 2):

Figure 2. Pacific Northwest Region 6 Adaptive Management Framework



# EMPHASIS ON ADAPTIVE LEARNING

The adaptive management framework includes an emphasis on learning from past and current projects, as well as incorporating this learning into new projects. The accomplishments and framework of the student monitoring team will be carried forward, but with an understanding that the monitoring methods must adapt based on peer review and CFLRP monitoring needs. One of the criteria used in shaping the monitoring questions was whether the question was designed to facilitate line officer decisions; i.e., could the information gained be used to change course in projects if this was indicated.

# QUESTIONS DEVELOPMENT AND PRIORITY

The collaborative group held a workshop in July of 2012 to identify questions of interest to the group. Approximately 65 questions were proposed by the group. In order to filter or narrow these questions down to highest priority questions for monitoring, the collaborative group also identified criteria that were applied to each question. These are concepts the collaborative group felt were important in deciding whether a question becomes part of the final monitoring plan. The criteria are:

1. Does the question provide potential answers that may influence future decisions?
2. Does the question address the goals of the CFLRP and the requirement to monitor social, economic, and ecological values?
3. Does the question address the goals of the *Long-Range Strategy for the Lakeview Federal Stewardship Unit*?
4. Can cost-effective monitoring techniques be developed to answer the question?
5. Does the multiparty monitoring group have ownership in the question?
6. Has the question been answered through previous monitoring efforts?

After the above criteria were applied to the questions, the list was narrowed down to 8 ecological and XX social/economic questions that would be carried forward in the Lakeview CFLRP Monitoring plan. These questions were reviewed and approved by the Lakeview Collaborative Group on February 21, 2013. The questions are:

**Ecological**

1. How effective are restoration treatments in reducing wildfire risk?
2. What are the effects of restoration treatments on tree survival/mortality by diameter class, changes in ladder fuels, and fuel loading pre/post treatment(s)?
3. What is the effect of restoration treatments on moving the Forest landscape toward a more sustainable condition that includes scale and intensity of historic disturbances?
4. What is the historic spatial pattern within the Lakeview Stewardship landscape? How well are treatments mimicking historic spatial patterns?
5. What are the site specific effects of restoration treatments on focal species habitat within a project area?
6. What are the effects of restoration treatments on focal species habitat across the CFLR Project Area?
7. How are restoration treatments impacting ground vegetation and soils?
8. How are restoration projects (road closures, upland/riparian treatment, etc.) impacting water quality?
9. Are Forest Prevention Practices effective in minimizing impacts of restoration treatments (including prescribed fire) on invasive plant species (new and/or existing)?

**Social**

**XXX**

**Economic**

**XXX**

# MONITORING METHOLOGY

A Science Team was convened to develop the appropriate methodology to answer the questions identified above. The Science Team includes those individuals listed above that contributed to the preparation of the Lakeview CFLRP Monitoring Plan. The Science Team reviewed the questions above and determined the appropriate methodology to answer each questions. Different questions tend to fit with a particular type of learning and different types of learning provide evidence of different quality. Three broad modes of learning were considered:

***Implementation monitoring*** simply asks, “Did we do what we said we would do?” Monitoring with this approach might answer the following sample question: “Did our project provide jobs within the local community?”

***Effectiveness monitoring*** helps determine whether or not the project goals were achieved by asking the question, “Did it work?” Monitoring plans taking this approach might answer the following sample question: “Did restoration treatments improve habitat for white-headed woodpeckers?”

***Validation monitoring*** involves checking the assumptions upon which restoration efforts are based. Monitoring with this approach usually shows causality and might answer the following sample

question: “Did restoration treatments result in sustained or improved resiliency/resistance to insect, disease, and drought?”

For questions about whether a management practice, prescription, or landscape strategy is working, management studies may provide more value than effectiveness, validation, or implementation monitoring. Directly comparing two or more management activities, especially with some experimental design, clearly increases the chances that monitoring results can be attributed to the activity and speeds learning by exposing differences faster. There are quite a few different types of management studies (GTR-777) with variable qualities of evidence, from arbitrarily assigning a control as a paired comparison to detailed experimental designs. This method can be closely linked to decisions that actually embed a learning objective. By comparing multiple, viable alternatives simultaneously the possible results may expand a decision maker’s subsequent decision space. That is, if both approaches achieve the desired outcome, more options become available.

# FEEDBACK CHANNELS

This Science Team will also be involved in feedback channels to assure that the monitoring contributes to on-going adaptive management. Adaptive management (AM) for the purpose of this document is “in-house learning, in the course of management, that serves as a major determinant of future decisions.”It is recommended that the following actions take place on an annual basis to assure that feedback channels are in place for learning and informing future decisions:

1. On an annual basis, the Science Team will meet to discuss the results from the monitoring efforts and discuss potential recommendations for future management and decision.
2. An annual report will be completed that compiles all the results and recommendations provided by the Science Team.
3. The annual report will be presented to and discussed with the Lakeview Stewardship Group and to Fremont-Winema National Forest line officers and specialists.
4. The results will be used to inform future project planning and decisions and may result in the identification of new questions that may be added to this monitoring plan. Over time the modifications in project planning that were made based on monitoring results will be documented, thus verifying that an adaptive learning process is in place and working. This will be powerful evidence of actual adaptive management that can serve as an example for others.
5. The monitoring plan will be reviewed and updated on an annual basis as new information becomes available or new questions are identified.

# MONITORING PLAN INFORMATION

Table X. Questions, Goals, Indicators, Scale, Methods, and Who Collects Data and Reports

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Question | Type of Question  Social  Ecological  Economic | Goal | Indicator | Scale  Landscape  Stand | Methods Approach Effectiveness Implementation National Indicator | Methodology | Who Collects Data | Who does the Analysis, Interpretation, and Reporting |
| #1 How effective are restoration treatments in reducing wildfire risk? | Ecological | To quantify the effectiveness of restoration treatments on reducing fire growth and behavior. | Modeled fire growth and behavior. | Landscape | Effectiveness National Indicator | FlamMap FARSITE | FS[[1]](#footnote-2) BPMC[[2]](#footnote-3) TNC[[3]](#footnote-4) | FS BPMC TNC |
| Economic | Estimate fire program management cost savings and risk reductions for the CFLR project area. | Expected suppression costs with and without treatments | Landscape | Effectiveness National Indicator | R-CAT | FS | FS |
| #2 What are the effects of restoration treatments on tree survival/mortality by diameter class, changes in ladder fuels, and fuel loading pre/post treatment(s). | Ecological | To quantify the effects of restoration treatments on vegetation. | Mortality, Forest Structure and Fuel Loading | Stand Landscape | Implementation  Effectiveness | FIREMON FFI | BPMC | BPMC FS |
| #3 What is the effect of restoration treatments on moving the Forest landscape toward a more sustainable condition that includes the approximate scale and intensity of historic disturbances? | Ecological | To assess whether current restoration treatments have resulted in sustained or improved resiliency/resistance to insect, disease, and drought. | Projection of a stands resistance to wildfire, insects and disease, drought based on past radial growth and other stand data. | Stand | Validation | FS stand exam plot data | BPMC | FS |
| Ecological | To quantify the scale and intensity of current restoration treatments and their effectiveness at moving the Forest landscape towards a more sustainable condition. | Change in FRCC rating | Landscape | Effectiveness  Validation National Indicator | FRCC | FS | FS |
| Ecological | To quantify and compare the effects of restoration treatments to the historic disturbance regime. | Fire frequency and severity | Stand Landscape | Effectiveness | GIS analysis | FS | FS |
| #4 What were the historical within-stand spatial patterns on the Lakeview Stewardship landscape? How well are treatments mimicking historic spatial patterns? | Ecological | To understand historic spatial patterns that will help with future prescription writing. | Individuals, clumps, and openings | Landscape | Effectiveness | Churchill et al. 2012 | TNC BPMC | BPMC FS TNC |
| Ecological | To achieve fine scale mosaic pattern across the landscape that existed historically. | Individuals, clumps, and openings | Landscape | Implementation | Comparison to the historic data from stem mapping | TNC  BPMC | BPMCFSTNC |
| #5 What are the site specific effects of restoration treatments on focal species habitat within a project area? | Ecological | To incorporate fine-resolution habitat suitability for nesting white-headed woodpeckers into silvicultural prescriptions and thereby guide ecosystem restoration projects within the range of the species. | Levels of tree clustering, stand densities, and tree characteristics, and the density and size of openings | Stand | Effectiveness | Churchill et al. 2012 | TNC BPMC FS | TNC FS RMRS |
| Ecological | To verify the effectiveness of restoration treatments for improving habitat for white-headed woodpeckers. | White-headed woodpecker occupancy, nesting, and success | Landscape | Effectiveness | Mellen-McClean et al. 2012 | RMRS FS BPMC | RMRS |
| Ecological | To quantify how restoration treatments impact fish habitat. | Stream channel morphology, stream substrate composition, macroinvertebrate populations, riparian and streamside vegetation cover | Site specific | Implementation | Stream cross sections, Wolman pebble counts, macroinvert sampling, photo monitoring | BPMC | BPMC FS |
| #6 What are the effects of restoration treatments on focal species habitat across the CFLR Project Area? | Ecological | To improve and maintain habitat for white-headed woodpeckers (WHWO) at the stand and landscape scale. | Amount of WHWO habitat within CFLR Project Area | Landscape | Effectiveness National Indicator | WHWO HSI models | RMRS | FS |
| Ecological | To improve habitat for fish and wildlife species within aspen, stream, and riparian areas. | Total acres of aspen or riparian habitat in which conifer reduction occurred and the total number of miles of stream enhanced due to in-stream improvements | Landscape | Implementation National Indicator | GIS analysis | FS | FS |
| #7 How are restoration treatments impacting ground vegetation and soils? | Ecological | To quantify vegetation composition and response before and after small tree thinning and prescribed fire within riparian corridors. | Riparian vegetation species composition, bare ground and ground cover, riparian and streamside vegetation cover, age class, extent of riparian vegetation | Stand | Effectiveness Photo Points | BPMC line intercept protocols and photo points | BPMC | BPMC FS |
| Ecological | To quantify how restoration activities such as logging and prescribed fire impact soils | Soil disturbance class | Stand  Landscape | Implementation | FS Soil Disturbance Monitoring Protocols | BPMC | BPMCFS |
| #8 How are restoration treatments (road closures, upland/riparian treatment, etc.) impacting water quality? | Ecological | The desired condition is that watershed condition (at the 6th field watershed) would be maintained in those watersheds currently rated as “good” and improve to “good” in those watersheds currently rated as “fair.” | Watershed Condition Framework (WCF) ratings | Landscape | National Indicator | Watershed Condition Framework | FS | FS |
| Ecological | To quantify the miles of road decommissioned across the entire CFLR project area and within riparian zones. | Miles of road decommissioned and reduction in road density in the 6th field watersheds within the CFLR project area and within riparian areas | Landscape | Implementation National Indicator | GIS analysis | FS | FS |
| Ecological | To determine how restoration projects affect stream temperature | Stream temperature | Site specific | Effectiveness | Hobo water temperature data loggers | FS | FS |
| #9 Are Forest Prevention Practices effective in minimizing impacts of restoration treatments (including prescribed fire) on invasive plant species (new and/or existing)? | Ecological | To minimize the occurrence of new invasive plant sites and/or expansion of existing sites. | Number of new invasive plant sites discovered and/or expansion of existing invasive plant sites within or immediately adjacent to veg. management activities | Stand Landscape | Effectiveness | Pre and post ocular surveys | BPMC FS | FS |

## ****Question #1: How effective are restoration treatments at reducing wildfire risk?****

Current vegetation conditions within the Lakeview Federal Stewardship Unit are not sustainable in the face of extensive, uncharacteristically severe wildfires. Restoration treatments can improve this condition by reducing fuel loadings to produce conditions where wildfires have less damaging effects and can be more readily controlled (LSG Proposal). However, although fuel treatments can alter fire behavior (Agee and Skinner 2005), it is still uncertain whether the benefits of fuels reduction treatments outweigh the costs.

Table XX. Goals, Indicators, Scale, and Type of Monitoring for Question #1

|  |  |  |  |
| --- | --- | --- | --- |
| **Goals** | **Indicators** | **Scale of Monitoring** | **Type of Monitoring** |
| To quantify the effectiveness of restoration treatments on reducing fire growth and behavior. | Modeled fire growth and behavior. | Landscape | Effectiveness National Indicator |
| Estimate fire program management cost savings and risk reductions for the CFLR project area. | Expected suppression costs with and without treatments | Landscape | Effectiveness National Indicator |

**Description of Methodology**

***Indicator #1:*** Fire Behavior Modeling (FlamMap, Farsite)

***Indicator #2:*** R-CAT

**Who will Collect the Data?**

The Forest Service, Biophysical Monitoring Crew and The Nature Conservancy will collaboratively collect data for Indicator #1. The Forest Service will do all data collection for Indicator #2.

**When, How, and Who will Analyze the Data and Report?**

The Forest Service, Biophysical Monitoring Crew and The Nature Conservancy will do all data analysis, interpretation and reporting for Indicator #1. The Forest Service will do all data analysis, interpretation and reporting for Indicator #2. Data collection will occur on an annual basis for both Indicators. Data analysis, interpretation and reporting will collaboratively occur between the Forest Service, Biophysical Monitoring Crew and The Nature Conservancy every 4 years for Indicator #1. Data analysis, interpretation and reporting for Indicator #2 will be completed by the Forest Service every 4 years for Indicator #2. The first year of reporting for will occur in 2014 for both Indicators.

**Where and How the Data will be Stored?**

Outputs will be kept in hardcopy form and in electronic form on the Forest Service computer server.

**Estimate of Budget**

Table X. Estimated budget for data collection, data storage, analysis and reporting for Indicator #1 ($4620) and 2 ($6600)

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Unit** | **# Days** | **Total Cost** |
| Salary – GS 11 | $330 | 34 | $11,220 |
| Subtotal |  |  | $11,220 |
| **Total** |  |  | **$11,220** |

## ****Question #2: What are the effects of restoration treatments on tree survival/mortality by diameter class, changes in ladder fuels, and fuel loading pre/post treatment?****

Fuel treatments are effective at reducing the size and intensity of wildfires and moving the landscape towards a condition reflective of one within the historic range of variability. However, the short-term and long-term tradeoffs of implementing different fuels treatments on tree mortality, fuel stratification and fuel loading at the stand and landscape level is less understood within the Lakeview Federal Stewardship Unit.

Table XX. Goals, Indicators, Scale, and Type of Monitoring for Question #2

|  |  |  |  |
| --- | --- | --- | --- |
| **Goals** | **Indicators** | **Scale of Monitoring** | **Type of Monitoring** |
| To quantify the effects of restoration treatments on vegetation. | Mortality, Forest Structure and Fuel Loading | Stand Landscape | Implementation  Effectiveness |

**Description of Methodology**

FIREMON/FFI

<http://www.frames.gov/partner-sites/firemon/sampling-methods/>

<http://www.frames.gov/partner-sites/ffi/ffi-home/>

**Who will Collect the Data?**

The Biophysical Monitoring Crew will collect data.

**When, How, and Who will Analyze the Data and Report?**

Data will be analyzed using associated FFI software components. Data will be analyzed, interpreted and reported by both the Biophysical Monitoring Crew and Forest Service every 4 years with the first year of reporting beginning in 2014.

**Where and How the Data will be Stored?**

Data will be stored in the FFI database. In addition, electronic spreadsheets and local hardcopy files will be stored at the Fremont-Winema National Forest Supervisor’s Office and/or the Winter Rim or Southeast Zone District Offices.

**Estimate of Budget**

Table X. Estimated budget for data collection, data storage, analysis and reporting

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Unit** | **# Day** | **Total Cost** |
| Salary – GS 11 | $330 | 30 | $9,900 |
| Biophysical Monitoring Crew | $260 | 90 | $18,200 |
| **Total** |  |  | **$28,100** |

## ****Questions #3: What is the effect of restoration treatments on moving the Forest landscape toward a more sustainable condition that includes the approximate scale and intensity of historic disturbances?****

The forests of eastern Oregon have evolved with varying disturbances both at the coarse and fine scales.  Over the past century, management of timber, grazing and fire suppression have led to conditions that are departed from what occurred historically. Disturbances such as mountain pine beetle in ponderosa pine acted like natural thinning agents and as a recycler of stands in lodgepole pine.  Disturbances such as drought and wildfire allowed more resistant species like ponderosa pine to dominate many forested areas. More recently, the Lakeview Ranger District on the Fremont-Winema NF has implemented restoration treatments to mimic natural disturbances while lowering stand densities.  The intent of this monitoring is to determine treatment effectiveness of projects funded by CFLRP. Specifically, are the treatments we’re implementing truly effective at reducing the stands susceptibility to insects, disease, and drought?

“An understanding of fire regimes, ecological departure from historical reference conditions, and landscape pattern is an important part of modern land management. Federal initiatives such as the 2001 National Fire Plan continue to emphasize the restoration of fire-adapted ecosystems and maintenance of land health.” (USDA, USDI 10-Year Comprehensive Strategy and Implementation Plans 2001-2002 in Barrett et al. 2010). Assessing FRCC can help managers gain a landscape perspective of conditions, evaluate risk to ecosystem sustainability, and develop a long-term strategy to improve condition class and assess management implications.

Table XX. Goals, Indicators, Scale, and Type of Monitoring for Question #3

|  |  |  |  |
| --- | --- | --- | --- |
| **Goals** | **Indicators** | **Scale of Monitoring** | **Type of Monitoring** |
| To assess whether current restoration treatments have resulted in sustained or improved resiliency/resistance to insect, disease, and drought. | Projection of a stand’s resistance to wildfire, insects and disease, drought based on past radial growth and other stand data. | Stand | Validation |
| To quantify the scale and intensity of current restoration treatments and their effectiveness at moving the Forest landscape towards a more sustainable condition. | Change in Fire Regime Condition Class (FRCC) rating. | Landscape | Effectiveness  Validation  National Indicator |
| To quantify and compare the effects of restoration treatments to the historic disturbance regime. | Fire frequency and severity | Stand Landscape | Effectiveness |

**Description of Methodology**

***Indicator 1:*** Stands would be monitored via the Common Stand Exam (CSE) protocol for the “quick” level of exams. This methodology includes collecting stand exam data such as tree species, tree diameter at breast height (DBH), and tree height. Signs or symptoms of insect and or disease should also be noted. Evidence of recent growth (i.e., height and diameter) would also be recorded. Stand exams should be taken in areas that have been recently treated (last five years). These treatments should have had the intention of lowering fire risk and stand densities relative to insect and disease thresholds. This information could be obtained at the District where the project record exists.

The number and frequency of stand exams should depend on how variable the residual stand is. If a stand is homogenous, 1 plot per 10 acres is sufficient. If stand is variable more plots will be needed. 30 plots total would be sufficient with a maximum of 50. Crews should plan on taking a variable plot with a nested fixed plot. Tools to measure stand density (e.g., basal area) and growth (in 1/20 inch) will be needed. Examples of tools are prisms, relaskop, and increment borer. If data is recorded in Metric units please record data in English units as well.

Example of how data would be collected:

Plot size: Variable plot (e.g., 10 or 20 BAF[[4]](#footnote-5)) and fixed (e.g., 1/50th, 16.67 ft. radius).

Data to be recorded:

* Species recorded following the NRCS naming convention (e.g., ponderosa pine= PIPO)
* DBH in inches
* Height (if hypsometer is available, if not take height on the first tree measured for each species)
* Live crown ratio in percent
* Crown class (i.e., dominant, intermediate, co-dominant
* Radial growth in 20ths of an inch on the dominant tree in plot. On every other tree bored, bore to get tree age.
* Report any sign of insect or disease (i.e., pitch tubes, boring dust, conks, etc.).

***Indicator 2:*** Fire Regime and Condition Class (FRCC). Frequency of data collection and reporting will be based on timing of LandFire and GNN updates. Reporting will occur every 4 years with the first year of reporting beginning in 2014.

***Indicator 3:*** A GIS analysis of the fire frequency from prescribed fire and/or wildfire. Data collection will occur annually, whereas reporting will occur every 4 years with the first year of reporting beginning in 2014.

**Who will Collect the Data?**

The biophysical monitoring crew will collect that data with assistance from District personnel if needed for Indicator #1. The Forest Service will collect all necessary data for Indicators #2 and 3.

**When, How, and Who will Analyze the Data and Report?**

The Forest, specifically the District Silviculturist, will analyze the data collected for Indicator #1. The computer modeling program Forest Vegetation Simulator (FVS) would be used to analyze the data collected. Training opportunities for the crew may be available depending on time and availability of the District. The Forest Service will do all data analysis, interpretation and reporting for Indicators #2 and 3.

**Where and How the Data will be Stored?**

In order to analyze data in FVS, data would need to be entered via the CSE computer program and then electronically moved into FSVeg, a Natural Resource Management program. The data will be stored in FSVeg where a spatial component to the data can be provided for Indicator #1. Data analysis and storage will be completed by the Zone Fire Ecologists for Indicators #2 and 3.

**Estimate of Budget**

Table XX. Estimated budget for data collection, data storage, analysis and reporting for Indicator #1

| **Expense** | **Cost/Day** | **# Days** | **Total Cost** |
| --- | --- | --- | --- |
| Salary (crew) | $250[[5]](#footnote-6) | 17 | $4,250 |
| Salary (FS) | $310 | 15[[6]](#footnote-7) | $4,650 |
| **Total** |  |  | **$8,900** |

Table XX. Estimated budget for data collection, data storage, analysis and reporting for Indicator #2 and 3

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Unit** | **# Days** | **Total Cost** |
| Salary – GS 11 | $330 | 4 | $1,320 |
| **Total** | **$0** |  | **$1,320** |

## ****Question #4: What were the historical within-stand spatial patterns on the Lakeview Stewardship landscape? How well are treatments mimicking historic spatial patterns?****

The spatial arrangement of environmental features is expected to affect all ecological processes in that environment. A prerequisite for informed natural resource management actions at local, regional, and national scales, therefore, is reliable information about landscape patterns at those scales. Previous assessments of forest and grassland spatial patterns have been limited by the available data. Recent literature (Halpern et al., 2012) illustrated that aggregated retention of dominant trees resulted in much more beneficial effects for the understory than dispersed retention.

The composition of openings, single trees and clumps is highly variable across reference sites (Larson and Churchill 2012), indicating that quantifying a baseline for tree spatial heterogeneity from local reference stands will be a critical component of designing an effective forest restoration and associated monitoring program. The purpose of the reference conditions study is to reconstruct the historic tree spatial patterns across a range of ecological conditions on the Fremont-Winema National Forest and to quantify the natural range of variability in the distribution of individual trees, clumps and openings. The intent of the openings is to influence important ecosystem processes and functions (e.g., fire behavior, wildlife habitat conditions, ponderosa pine or sugar pine regeneration, understory species composition, moisture, etc.) inherent of dry forests on the eastside of Oregon.

Table XX. Goals, Indicators, Scale, and Type of Monitoring for Question #4

|  |  |  |  |
| --- | --- | --- | --- |
| **Goals** | **Indicators** | **Scale of Monitoring** | **Type of Monitoring** |
| To understand historic spatial patterns that will help with future prescription writing. | Individuals, clumps, and openings | Landscape | Effectiveness |
| To achieve fine scale mosaic pattern across the landscape that existed historically. | Individuals, clumps, and openings | Landscape | Implementation |

**Description of Methodology**

Baseline monitoring of reference stand structure and tree spatial patterns will include stem map plots (Appendix A) as well as the QuickMap sampling technique (Appendix C). Install four stem maps for 2013 which would give historic structure to quantify metrics (stem mapping protocol follows in Appendix A and B). The scale of this type of analysis is greater than four acres, and may be as large as ten acres (Larson and Churchill 2012). This same protocol is used on Malheur NF. Methods are currently being developed by Lora Vialpando (FS) and Craig Bienz (TNC) for Black Hills project on the Bly Ranger District that could be applied here.

***Scale of Monitoring***

The traditional definition of a stand does not work well in natural Dry Forests, which are typically highly heterogeneous and composed of intricate mosaics of numerous small (i.e., 1/10th to ½ acre) structural patches. These patches vary from openings dominated by shrubs and tree reproduction to open groves dominated by large old trees and every condition in between. Hence, a new definition of a stand is needed for the Dry Forests. It has two major considerations:

1) Stands are part of a landscape, not independent units. Stands are the “patches” that make up watersheds and landscapes.

2) Stands contain smaller-scale structural patches of tree clumps, openings, and individual trees that make them landscapes within landscapes. For a Dry Forest “stand” to be complete ecologically needs to encompass the diversity of structural conditions found within the mosaic, from the reproduction patch to the old tree grove.

**Who will Collect the Data?**

Biophysical Monitoring Crew and The Nature Conservancy (TNC)

**When, How, and Who will Analyze the Data and Report?**

FS and TNC will analyze the data collected. Results will be presented in the form of a Technical Report that can be immediately used to help development and monitoring of prescriptions associated with the Collaborative Forest Landscape Restoration Program (CFLRP) and dry forest restoration projects across the Fremont-Winema National Forest area.

**Where and How the Data will be Stored?**

The data will be stored at the FS District office and TNC office.

**Estimate of Budget**

Table X. Estimated budget for data collection, data storage, analysis and reporting

| **Expense** | **Cost/Day** | **# Days** | **Total Cost** |
| --- | --- | --- | --- |
| Salary (Crew) | $250 | 15 | $3,750 |
| Salary (Lora) | $310 | 15 | $4,650 |
| Salary (Craig) | $343 | 20 | $6,860 |
| TNC | $972 | 15 | $14,580 |
| Travel | $85.25 | 15 | $1,278 |
| Equipment |  |  | $1,500 |
| Supplies/Materials | $50.00 | 15 | $750 |
| Total |  |  | $33,368 |

## ****Question #5: What are the site specific effects of restoration treatments on focal species habitat within a project area?****

The White-headed Woodpecker (*Picoides albolarvatus*) is a Regional Forester’s sensitive species in Region 6 of the USDA Forest Service (USFS). The white-headed woodpecker has also been identified as a focal species, or indicator species, for mature dry forests based on its strong association with open, dry forest habitat, and its dependence on mature ponderosa pine. This species is a regional endemic species of the Northwest and may be particularly vulnerable to environmental change because it occupies a limited distribution and has narrow habitat requirements in dry conifer forests. Populations of white-headed woodpecker are thought to be declining in the Pacific Northwest. In a Central Oregon study, reproductive success of white-headed woodpecker was too low to offset adult mortality, thus the population declined to the point that occupancy of known territories steadily decreased over the 6-year study period (Frenzel 2004). Research in the Blue Mountains in the late 1970s and early 1980s found the birds to be relatively common, whereas research conducted in the early 2000s in the same areas found no white-headed woodpecker (Altman 2000, Bull 1980, Nielsen-Pincus 2005).

The USDA Forest Service Rocky Mountain Research Station (RMRS) and Pacific Northwest Region (R6) are leading the effort to examine habitat suitability for nesting white-headed woodpeckers. A white-headed woodpecker monitoring strategy has been developed for the Pacific Northwest Region 6 (Mellen-McLean et al. 2012). This protocol is designed to provide reliable, standardized data on the effectiveness of treatments to restore or enhance habitat for white-headed woodpeckers, and the impacts of treatments with other objectives (e.g., fuels reduction, salvage logging) on white-headed woodpeckers across their range in Oregon and Washington. This proposed monitoring fits into a larger monitoring effort taking place on the eastside in Oregon and Washington as well as Idaho.

As part of this Region-wide effort, Mahalanobis and Maxent habitat suitability models have been developed and validated for white-headed woodpeckers (Latif et al. 2012, Latif et al. i*n Review*). This data provides the most accurate habitat mapping for white-headed woodpeckers. These models indicate that white-headed woodpeckers require heterogeneous landscapes characterized by a mosaic of open- and closed-canopied ponderosa pine forests (Wightman et al. 2010, Hollenbeck et al. 2011), which makes them a good focal species for dry forest restoration. However, a better understanding of the fine-scale habitat features around white-headed woodpecker nests could inform dry forest restoration principles. Consequently, monitoring white-headed woodpecker populations and their habitat associations is central to ecological monitoring for the Lakeview CFLR Project, a dry mixed-conifer forest within the range of this species.

Stream and riparian restoration activities (e.g. stream headcut repairs, culvert removal and/or replacement, riparian thinning projects) have the potential for short-term (1-2 years) negative impacts to fish habitat. For example, when heavy machinery is used for stream restoration projects, there is potential for soil compaction and damage to riparian and streamside vegetation, and increased stream sediment delivery to streams may occur.

However, stream and riparian restoration projects are likely to lead to long-term (2 years or greater) improvements to fish habitat. Stream headcut repair projects will lead to increased bank stability and groundwater storage. Following removal of conifers that have encroached into riparian areas, shrub and herbaceous groundcover often increases, which has the potential to increase soil water infiltration and groundwater storage and decrease overland flow and sediment delivery to streams (Pierson et al., 2007; Petersen et al., 2008; Pierson et al., 2010). To determine how restoration projects impact soil resources, pre- and post-implementation monitoring of stream channels and riparian areas is necessary.

Table XX. Goals, Indicators, Scale, and Type of Monitoring for Question #5

|  |  |  |  |
| --- | --- | --- | --- |
| **Goals** | **Indicators** | **Scale of Monitoring** | **Type of Monitoring** |
| To incorporate fine-resolution habitat suitability for nesting white-headed woodpeckers into silvicultural prescriptions and thereby guide ecosystem restoration projects within the range of the species. | Levels of tree clustering, stand densities, and tree characteristics, and the density and size of openings | Stand | Effectiveness |
| To verify the effectiveness of restoration treatments for improving habitat for white-headed woodpeckers. | White-headed woodpecker occupancy, nesting, and success | Landscape | Effectiveness |
| To quantify how restoration treatments impact fish habitat. | Stream channel morphology, stream substrate composition, macroinvertebrate populations, riparian and streamside vegetation cover | Site specific | Implementation |

**Description of Methodology**

***Indicator 1:*** The main goal of this monitoring is to conceptualize and quantify within-stand pattern in terms of clumps, individual trees, and openings (Larson and Churchill 2012) around white-headed woodpecker nest sites. The goal of the method is to ensure that a mosaic pattern of individual trees, clumps, and openings is created that is indicative of sites selected for nesting.

The method has five components. First, stem maps are conducted at known white-headed woodpecker nests. Second, spatial patterns of trees and openings will be quantified and tabulated using the methods from Churchill et al. (2013) that identify tree clumps and openings. Third, openings are quantified. Forth, the cluster table is used, along with stand density targets, opening targets, and other factors, to develop marking guidelines. More information on methodology can be found in Appendix A and B. The final step is implementation and monitoring to determine the effectiveness of treatments in enhancing habitat for white-headed woodpeckers as described in Goal/Indicator #2. See Churchill et al. “Restoring forest resilience: from reference spatial patterns to silvicultural prescriptions and monitoring.” Forest Ecology and Management. 291: 442-457. (2013a).

***Indicator 2:*** The methodology will follow the white-headed woodpecker monitoring strategy developed for the Pacific Northwest Region 6 (Mellen-McLean et al. 2012). The data can be used to better define habitat associations of white-headed woodpeckers, and to design treatments at the stand and landscape scales.

Occupancy of stands by white-headed woodpecker is determined using point count/playback stations along transects. Nests are located during systematic nest surveys conducted within 200 m (656 ft.) of the transects, across treatment and control units (Dudley and Saab 2003).

A BACI (before-after/control-impact) study design is the preferred monitoring design. In this design units are sampled before and after a treatment in both treatment and control units. Monitoring of treatment and control units should continue for at least 1-3 years post-treatment. Pre-treatment monitoring should occur for at least 1 year prior to treatment. A BACI approach is not always possible. In those cases a retrospective monitoring design can be implemented in which treatment and control units are monitored only after the treatment has occurred.

There is little information on the stand condition surrounding white-headed woodpecker nests within post-fire areas. Therefore, the full vegetation data collection would occur at each nest within post-fire areas. There is greater information surrounding nests within unburned forests, so simplified version of the protocol will be used in restoration project areas. Vegetation sampling protocols are described in the white-headed woodpecker monitoring strategy developed for the Pacific Northwest Region 6 (Mellen-McLean et al. 2012). The sample design uses variable radius rectangular plots, and/or transects to sample trees, snags, down wood, and shrubs. Canopy cover, slope, aspect, and topographic position are derived from remotely-sensed data (e.g., USGS and GNN).

More information can be found at:

<http://www.fs.fed.us/r6/sfpnw/issssp/documents2/inv-rpt-bi-pial-monitoring-2011.pdf>

***Indicator 3:*** Permanent stream channel cross-sections will be installed at locations in which stream restoration projects occur (e.g. stream headcut repairs or culvert replacement/removal). Each stream cross-section will be permanently staked, tagged and hidden below ground to be found with a metal detector. Between each stake on the opposing banks height measurements are taken at one-foot increments that generate a profile of the channel. Measurements should be collected approximately every 5 years at the exact point to gauge the channel's lateral movement as well as material buildup from deposition or removal by the natural stream process. Vegetative composition, effective ground cover and canopy surveys are also performed in the immediate area to gauge the level of streambank protection. Measurements of stream channel cross-sections have already occurred at some permanent monitoring locations within the CFLR project area; these will be included in the data set and measurements will continue at these locations in addition to measurements at new locations.

**S**tream pebble counts will be performed ~100-500’ downstream of stream restoration projects. Pebble counts document stream substrate composition, which is an important characterization of fish habitat and can impact the ability of fish to reproduce. For example, an increase in fine particles entering the stream (e.g. resulting from streambank erosion or overland flow) can damage fish eggs and negatively impact sources of food. Stream pebble counts will follow the Wolman Method and measurements will be collected concurrent with monitoring of stream channel cross-sections. Measurements should be collected approximately every 5 years.

There are many publications that document the procedure for collecting Wolman pebble counts. One example is:

<http://limnology.wisc.edu/courses/zoo548/Wolman%20Pebble%20Count.pdf>

A second example, which is a modification of the Wolman method:

[*http://www.fs.fed.us/rm/pubs\_rm/rm\_rp319.pdf*](http://www.fs.fed.us/rm/pubs_rm/rm_rp319.pdf)

Macroinvertebrate sampling will be performed in areas where measurements of stream channel cross-sections and pebble counts occur. Some macroinvertebrate species are very sensitive to pollutants and changes to water chemistry, and quantifying changes in macroinvertebrate populations over time can often be used as an indicator of changes in water quality. Sampling should occur approximately every 5 years.

There are many publications that document the procedure for macroinvertebrate sampling. One example is:

<http://www.fs.fed.us/biology/resources/pubs/feu/pibo/pibo_2008_stream_sampling_protocol.pdf>

Photo-monitoring will be used to document changes in riparian and streambank vegetation over time, following the methods of the Forest Service Photo Point Monitoring Handbook (USDA Forest Service, 2002). Permanent photo points will be installed and monitoring should occur before a project begins, and then every 1-3 years following project implementation.

**Who Will Collect the Data?**

The Nature Conservancy will collect the data for Indicator #1. The Forest Service and the Rocky Mountain Research Station will hire seasonal employees to collect data for Indicator #2. The vegetation data collection would be conducted by the Biophysical Monitoring Crew. The Biophysical Monitoring Crew will conduct monitoring for indicator #3.

**When, How, and Who Will Analyze the Data and Report?**

The Nature Conservancy will analyze the data as described in the 2012 Churchill et al. draft paper and provide a report on an annual basis for Indicator #1. Vicki Saab, Research Biologist with Rocky Mountain Research Station, will analyze the data and provide a report on an annual basis for Indicator #2. The Biophysical Monitoring Crew will analyze the data by creating summary tables of all data collected, which will be reviewed and stored by the Soil Scientist or Hydrologist for indicator #3.

**Where and How the Data will be Stored?**

Data will be housed by the Rocky Mountain Research Station, Forest Service, and The Nature Conservancy in excel spreadsheets for Indicators #1 and 2. Data collection sheets, additional field notes, and summary tables will be scanned and stored on the Forest Service computer server for indicator #3.

**Estimate of Budget**

Table X. Indicator #1 - estimated budget for data collection, data storage, analysis and reporting per year

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Pay Period** | **# Pay Periods** | **Total Cost** |
| Salary – GS-7 | $1,700 | 1 | $1,700 |
| Salary – GS-11 | $3,300 | 1 | $3,300 |
| Vehicle | $1,000 | ½ month | $500 |
| **Total** |  |  | **$5,500** |

Table X. Indicator #2 - estimated budget for data collection, data storage, analysis and reporting per year

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Day** | **# Days** | **Total Cost** |
| Salary – GS-7 | $170 | 60 | $10,200 |
| Salary – GS-5 | $140 | 120 | $16,800 |
| Salary – GS-11 | $330 | 20 | $6,600 |
| Biophysical Monitoring Crew | $240 | 10 | $2,400 |
| Vehicle | $3,000 |  | $3,000 |
| **Total** |  |  | **$39,000** |

Table X. Indicators #3 (will occur at the same time at each location) - estimated budget for data collection, data storage, analysis and reporting per year.[[7]](#footnote-8)

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Day** | **# Days** | **Total Cost** |
| Salary – GS-11 | $330 | 1 | $330 |
| Biophysical Monitoring Crew | $240 | 1 | $240 |
| **Total** |  |  | **$570** |

## ****Question #6: What are the effects of restoration treatments on focal species habitat across the CFLR Project Area?****

The white-headed woodpecker is a Regional Forester’s sensitive species in Region 6 (R6) of the USDA Forest Service (USFS). The white-headed woodpecker has also been identified as a focal species for mature dry forests based on its strong association with open, dry forest habitat, and its dependence on mature ponderosa pine. Dry forest restoration within the CFLR project area is expected to increase white-headed woodpecker habitat over time. See more information above under Question #5.

Aspen, stream, and riparian areas are important habitats for many fish and wildlife species. Some of these areas are in degraded condition due to poor instream conditions and/or conifer encroachment. Riparian enhancement projects within the CFLR project area are expected to improve habitat for fish and wildlife species within aspen, stream, and riparian areas.

Table XX. Goals, Indicators, Scale, and Type of Monitoring for Question #6

|  |  |  |  |
| --- | --- | --- | --- |
| **Goals** | **Indicators** | **Scale of Monitoring** | **Type of Monitoring** |
| To improve and maintain habitat for white-headed woodpeckers (WHWO) at the stand and landscape scale. | Amount of WHWO habitat within CFLR Project Area | Landscape | Effectiveness National Indicator |
| To improve habitat for fish and wildlife species within aspen, stream, and riparian areas. | Total acres of aspen or riparian habitat in which conifer reduction occurred and the total number of miles of stream enhanced due to in-stream improvements | Landscape | Implementation National Indicator |

**Description of Methodology**

Changes in white-headed woodpecker habitat will be evaluated by re-running Mahalanobis and Maxent habitat suitability models every time the GNN data is updated which will provide habitat trends over time in comparison to the current baseline data. It is expected that the GNN data will be updated every 5-10 years.

A GIS analysis will be conducted to determining the total acres of aspen or riparian habitat in which conifer reduction occurred and the total number of miles of stream enhanced due to in-stream improvements (e.g. headcut repairs, culvert replacements, additions of large wood).

**Who will Collect the Data?**

Rocky Mountain Research Station and the Forest Service

**When, How, and Who will Analyze the Data and Report?**

The Forest Service will analyze the data and report in 2013 (baseline), 2014 and 2019.

**Where and How the Data will be Stored?**

Data will be stored by the Forest Service.

**Estimate of Budget**

Table X. Estimated budget for data collection, data storage, analysis and reporting

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/day** | **# day** | **Total Cost** |
| Salary – GS-11 | $330 | 15 | $4,950 |
| **Total** |  |  | **$4,950** |

## ****Question #7: How are restoration treatments impacting ground vegetation and soils?****

Riparian habitats support a broad array of plant, fish and animal species. After decades of fire suppression conifer and juniper have encroached upon these habitat types. This encroachment has encouraged the growth of shade tolerant conifers reducing plant and animal diversity. Riparian restoration activities such as small tree thinning will reduce conifer encroachment and increase vegetation diversity (Ares et al 2009). Opening up these areas will allow provide riparian vegetation more light and resources. Vegetation diversity will provide cover, forage and nest sites for wildlife.

Watershed restoration projects, such as logging and removal of encroaching conifers in riparian areas, have the potential to impact soil resources due to the possibility of soil compaction, erosion, and/or displacement (Elliot, 1999; Luce and Black, 1999; Ares et al., 2005; Moore and Wondzell, 2005). Prescribed fires can also negatively impact soils due to removal of surface litter that protects the soil and creation of hydrophobic (water repellent) soils, which can reduce water infiltration and increase soil erosion (DeBano, 2000; Letey, 2001; Neary, 2008). To determine how watershed restoration projects impact soil resources, pre- and post-implementation soil monitoring is necessary.

Table XX. Goals, Indicators, Scale, and Type of Monitoring for Question #3

|  |  |  |  |
| --- | --- | --- | --- |
| **Goals** | **Indicators** | **Scale of Monitoring** | **Type of Monitoring** |
| To quantify vegetation composition and response before and after small tree thinning and prescribed fire within riparian corridors. | Riparian vegetation species composition, bare ground and ground cover, riparian and streamside vegetation cover, age class, extent of riparian vegetation | Stand | Effectiveness Photo Points |
| To quantify how restoration activities such as logging and prescribed fire impact soils | Soil disturbance class | Stand Landscape | Implementation |

**Description of Methodology**

***Indicator #1:*** The main goal of this monitoring is quantify changes of vegetation composition within riparian corridors pre/post treatment. Riparian vegetation composition will be determined using 1m2 quadrat and 30m line intercept protocols (See <http://www.lcri.org/monitoring/default.htm>).

Quadrats are used to sample vegetation found in one-tenth acre plots that are not necessarily on the line intercept. Quadrates are used as well to sample areas in transition within the plot. The species name and the number of plants per species are recorded along with the percent of effective ground cover. Percent effective ground cover is recorded as litter, moss, or grasses/herbs. A picture of each quadrat is taken and identified by recording the following on a small whiteboard: 1) plot location, 2) quadrat number within the plot, 3) location in the plot, and 4) date.   
  
Location of the quadrat within the plot uses a Cartesian coordinate system with the 30 meter tape stretched from the A stake to the B stake being used as the X axis and the distance above and below the tape as the Y axis. To orient the graphing coordinates correctly, stand with the A stake on your left and the B stake on your right. The area above the 30 meter tape is positive, and the area below is negative. Quadrat distances are measured to the center of the quadrat.   
  
Quadrat pictures are taken with the photographer's back toward the A stake and the whiteboard identifying in the lower right corner of the quadrat.   
  
Quadrat information is combined with line intercept data to calculate species richness. Quadrats from different years can be compared in trend studies to identify changes that are occurring within the quadrat. These can be combined with line intercept data to extrapolate changes occurring within the plot. The standard line intercept protocol of vegetation analysis is employed along the 30 meter tape/transect in the middle of the plot.  
  
The 30 meter transect is divided into 10 subsections each three meters long. The species, number of plants and medium width of each species is recorded for each subsection. Vegetation measurements of density, cover, frequency, importance and diversity are then calculated. All plants are identified by a six letter code consisting of the first three letters of the genus followed by the first three letters of the specie.

Data will be collected after stand layout and before treatment. The area will be sampled again in 5 years.

Photo-monitoring will be used to document changes in riparian and streambank vegetation over time, following the methods of the Forest Service Photo Point Monitoring Handbook (USDA Forest Service, 2002). Permanent photo points will be installed and monitoring should occur before a project begins, and then every 1-3 years following project implementation.

***Indicator #2:*** Pre- and post-implementation monitoring of soil disturbance will follow the Soil Disturbance Monitoring Protocol (USDA Forest Service, 2009). This protocol provides quantification of physical soil attributes that may affect site sustainability and hydrologic function. Within an area of interest (i.e. logging or prescribed burning unit), measurements are collected at a minimum of 30 locations along randomly oriented transects. Measurements at each monitoring location (measurement area defined as a randomly placed 6 inch diameter circle) include forest floor depth and presence and degree of topsoil displacement, erosion, rutting, compaction, burning, platy/massive structure, bare soil, rock and live plant cover, and fine and coarse woody debris. Based upon the measurements collected, the soil condition at each monitoring location is placed into one of four disturbance classes: Class 0 (no disturbance), Class 1 (slight disturbance), Class 2 (moderate disturbance), or Class 3 (severe disturbance). Surveys should occur prior to project implementation, within 1 year following project implementation, and then every 3-5 years. GPS locations will be documented at all monitoring locations. The Fremont National Forest Soil Resource Inventory (Wenzel, 1979) will be used to help plan where monitoring should occur (e.g. a transect should occur within only 1 soil type at a time).

The Soil Disturbance Monitoring Protocol is available at:

<http://www.fs.fed.us/biology/soil/index.html>

**Who Will Collect the Data?**

The Biophysical Monitoring team will collect data for indicator #1. The Forest Service Wildlife Biologist, Hydrologist and Silviculturist will work together to determine locations where monitoring should occur. The Biophysical Monitoring Crew will conduct soil monitoring using the Soil Disturbance Monitoring Protocol for indicator #2. The Forest Service Hydrologist, Soil Scientist, and Silviculturist will work together to determine locations where monitoring should occur.

**When, How, and Who Will Analyze the Data and Report?**

The Biophysical Monitoring team will analyze the data by creating summary tables of all data collected, which will be reviewed and stored by the Wildlife Biologist or Silviculturist for indicator #1. The Biophysical Monitoring crew will analyze the data by creating summary tables of all data collected, which will be reviewed and stored by the Forest Service Soil Scientist or Hydrologist for indicator #2.

**Where and How the Data will be Stored?**

Data collection sheets, additional field notes, and summary tables will be scanned and stored on the Forest Service computer server for indicators #1 and 2.

**Estimate of Budget**

Table X. Indicator #1 Estimated budget for data collection, data storage, analysis and reporting

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Day** | **# Days** | **Total Cost** |
| Salary GS-11 | $330 | 2 | $660 |
| Biophysical Monitoring Crew | $240 | 15 | $3,600 |
| **Total** | **$0.00** |  | **$4,260** |

Table X. Indicator #2 - estimated budget for data collection, data storage, analysis and reporting per year.[[8]](#footnote-9)

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Day** | **# Days** | **Total Cost** |
| Salary – GS-11 | $330 | 1 | $330 |
| Biophysical Monitoring Crew | $240 | 1 | $240 |
| **Total** |  |  | **$570** |

## ****Question #8: How are restoration treatments (road closures, upland and riparian treatments, etc.) impacting water quality?****

In 2011, the Forest Service assessed watershed condition in all 6th field watersheds using the Watershed Condition Framework (USDA Forest Service, 2011a), which is a comprehensive approach to quantify biological and physical watershed conditions. Those 6th field watersheds within the CFLR project area received ratings of either “fair” or “good” for Forest Service lands. The desired condition is that watershed condition (at the 6th field watershed) would be maintained in those watersheds currently rated as “good” and improve to “good” in those watersheds currently rated as “fair.”

Forest management activities have the potential to impact multiple water quality parameters. For example, increased use of existing forest roads and construction of temporary roads during logging operations can increase sediment delivery to streams (Luce and Black, 1999). However, road decommissioning has the potential to decrease stream sediment delivery.

Stream temperature can also be impacted by forest management activities. Stream temperatures often increase following riparian thinning projects and removal of encroaching conifers in RHCAs due to the reduction of vegetation that provided shade to the stream (Bartholow et al., 2000; Anderson et al., 2007; Janisch et al., 2012). However, restoration projects have the potential to lead to long term decreases in stream temperatures. Stream restoration projects often involve planting of native riparian vegetation (e.g. willows and sedges) adjacent to streambanks, which can increase stream shading. Removal of encroaching conifers in RHCAs can lead to long term increases in stream shade due to increases in native shrub and herbaceous vegetation adjacent to streams. Within the CFLR project area, multiple streams are on the Oregon Department of Environmental Quality (ODEQ) 303(d) list of impaired waters, with respect to elevated stream temperature.

Table XX: Goals, Indicators, Scale, and Type of Monitoring for Question #8

|  |  |  |  |
| --- | --- | --- | --- |
| **Goals** | **Indicators** | **Scale of Monitoring** | **Type of Monitoring** |
| To maintain those watersheds currently rated as “good” and to improve to “good” in those watersheds currently rated as “fair.” | Watershed Condition Framework (WCF) ratings | Landscape | National Indicator |
| To quantify the miles of road decommissioned across the entire CFLR project area and within riparian zones. | Miles of road decommissioned and reduction in road density in the 6th field watersheds within the CFLR project area and within riparian areas | Landscape | Implementation National Indicator |
| To determine how restoration projects affect stream temperature. | Stream temperature | Site specific | Effectiveness |

**Description of Methodology**

***Indicator #1:*** To determine if watershed conditions are meeting the desired condition, all 6th field watersheds will be reassessed every 2-3 years following the methodology of the Watershed Condition Classification Technical Guide (USDA Forest Service, 2011b), in which watershed condition is rated using 12 indicators and 24 attributes in four Process Categories: Aquatic Physical, Aquatic Biological, Terrestrial Physical, and Terrestrial Biological.

***Indicator #2:*** The number of miles of forest roads that are decommissioned will be documented with a GPS survey and entered into GIS on an annual basis. GIS analysis will be used to calculate new road densities, by both 6th field watershed and within riparian areas.

***Indicator #3:*** The Forest Service currently measures stream temperature at ~100 locations within the CFLR project area (see attached Figure) at hourly intervals with Hobo Water Temperature Dataloggers. Data is collected from approximately May-October each year (depending on snow levels and site access). The data then goes through QA/QC processing and is entered into the Natural Resource Information System (NRIS) database. Currently, there are multiple perennial streams with in the CFLR project area where stream temperature measurement are not being collected. We propose installing up to 25 (or more depending on availability of funds) additional temperature dataloggers in perennial fish-bearing streams within the project area. The additional sensors will be placed primarily in streams with sensitive fish species that may be impacted by forest management and restoration activities. All sensors are calibrated, deployed, retrieved, and downloaded on an annual basis.

**Who Will Collect the Data?**

The Forest Service will collect data for Indicators #1-3.

**When, How, and Who Will Analyze the Data and Report?**

For indicator #1, a hydrologist or fisheries biologist will reassess WCF in the database and provide a report on any changes to the ratings.

The Forest Service will do all data analysis and reporting. For Indicator #2, the Eastside Roads Manager, or designated employee, will be responsible for collecting GPS measurements, uploading the data into GIS, and performing the necessary road density calculations.

For Indicator #3, all stream temperature probes will be calibrated, deployed, and retrieved from streams by the Forest Aquatic Crew. Data analysis and storage will be completed by Terry Smith, the Fisheries Biologist in charge of stream temperature monitoring on the forest.

**Where and How the Data will be Stored?**

Data will be uploaded and stored in the NRIS database and kept in excel spreadsheets.

**Estimate of Budget**

Table X. Indicator #1 - estimated budget for data collection, data storage, analysis and reporting per year

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Day** | **# Days** | **Total Cost** |
| Salary – GS-9 | $260 | 2 | $520 |
| Vehicle |  |  | $100 |
| **Total** |  |  | **$620** |

Table X. Indicator #2 - estimated budget for data collection, data storage, analysis and reporting per year

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Day** | **# Days** | **Total Cost** |
| Salary – GS-9 | $260 | 2 | $520 |
| Vehicle |  |  | $100 |
| **Total** |  |  | **$620** |

Table X. Indicator #3 - estimated budget for data collection, data storage, analysis and reporting per year

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Day** | **# Days** | **Total Cost** |
| Salary – GS-5 | $140 | 10 | $1,400 |
| Salary – GS-7 | $170 | 10 | $1,700 |
| Salary – GS-9 | $260 | 10 | $2,600 |
| Vehicle | $500 |  | $500 |
| Equipment | $125/probe | 25 probes[[9]](#footnote-10) | $3,125 |
| **Total** |  |  | **$9,325** |

## ****Question #9: Are Forest Prevention Practices effective in minimizing impacts of restoration treatments (including prescribed fire) on invasive plant species (new and/or existing?****

Invasive Plants are non-native plants whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive plants displace native plant communities, increase fire hazard, degrade fish and wildlife habitat, eliminate rare and cultural plants, increase soil erosion, and adversely affect scenic beauty and recreational opportunities. Because of their competitive abilities, invasive plants can spread rapidly across the landscape, unimpeded by ownership or administrative boundaries.

In 2005, the Fremont-Winema National Forest adopted Invasive Species Prevention Practices. These guidelines are designed to minimize the introduction of invasive species, minimize conditions that favor the spread of invasive species, and minimize conditions that favor the establishment of invasive species. The question posed above is to analyze if our Forest Prevention Practices are being effective.

Table XX: Goals, Indicators, Scale, and Type of Monitoring for Question #

|  |  |  |  |
| --- | --- | --- | --- |
| **Goals** | **Indicators** | **Scale of Monitoring** | **Type of Monitoring** |
| To minimize the occurrence of new invasive plant sites and/or expansion of existing sites. | Number of new invasive plant sites discovered and/or expansion of existing invasive plant sites within or immediately adjacent to veg. management activities | Stand and Landscape | Effectiveness |

**Description of Methodology**

To determine the high priority areas within a project area for the Biophysical Monitoring Crew to survey, Forest Service personnel will conduct a GIS exercise that will take 3 items into considerations:

1. Number of invasive plant sites present within the project area and adjacent to the project area prior to the vegetation management activity
2. The type of vegetation management activity that will or has occurred
3. History of vegetation management activities for the project area

Once these high priority areas are identified, the Biophysical Monitoring Crew will be asked to conduct pre and/or post implementation ocular surveys.

**Who will Collect the Data?**

Field data by project area would be collected by the Biophysical Monitoring Crew. Forest Service personnel would collect data while conducting treatments on existing invasive plant sites throughout the entire CFLR boundary.

**When, How, and Who will Analyze the Data and Report?**

The Biophysical Monitoring Crew will submit the invasive plant data sheets to the Forest Service in the fall immediately following the field season. Forest Service personnel will annually update the NRIS Invasive Species Inventory GIS layer with all data collected from the Biophysical Monitoring Crew and Forest Service personnel during the field season. Forest Service personnel will analyze all new and old data by project area to determine impacts (if any) of the vegetation management activity on invasive plant populations.

**Where and How the Data will be Stored?**

Biophysical Monitoring Crew shall submit a hard copy site form for any new invasive plant infestation found and updates on any existing infestation noted. Forest Service personnel complete a hard copy site form for every new invasive plant site discovered. Forest Service personnel record any updates to existing invasive plant infestations on a hard copy site form. The information from the hard copy site forms is incorporated into the NRIS Invasive Species Inventory GIS layer.

**Estimate of Budget**

Table X. Estimated budget for data collection, data storage, analysis and reporting

|  |  |  |  |
| --- | --- | --- | --- |
| **Expense** | **Cost/Unit** | **# Units** | **Total Cost** |
| Salary | $30.84 | 120 | $3,701 |
| **Total** | **$30.84** |  | **$3,701** |
|  | | | | | |

# NATIONAL ECOLOGICAL INDICATORS

Each project is required to develope a set of indicators (Figure 1) that are evaluated based on each individual CFLRP Landscape’s progress towards its Desired Conditions (DCs), as reflected by a set of key objectives, within the four ecological categories explicitly identified within the Act. This maintains each Landscape’s ability to be evaluated on the basis of its own unique objectives while providing a set of metrics that tiers directly to the Act and the proposals that were submitted for funding under the Act.

The Science Team identified desired conditions, indicators, and scoring for the Lakeview CFLRP landscape for each of the Ecological Outcome measures. Reporting for the National Indicators will be based on monitoring identified in this monitoring plan. Table XX below indicates when monitoring for the Lakeview CFLRP Monitoring Plan will be used in response to the National Indicators.

Table XX. Crosswalk between National Indicators and Monitoring Plan

|  |  |
| --- | --- |
| **National Indicator** | **Question** |
| Fire Regime Condition | #1 How effective are restoration treatments in reducing wildfire risk? |
| Fire Regime Condition | #1 How effective are restoration treatments in reducing wildfire risk? |
| Fire Regime Condition | #3 What is the effect of restoration treatments on moving the Forest landscape toward a more sustainable condition that includes scale and intensity of historic disturbances? |
| Fish and Wildlife Habitat Condition | #6 What are the effects of restoration treatments on focal species habitat across the CFLR Project Area? |
| Fish and Wildlife Habitat Condition | #6 What are the effects of restoration treatments on focal species habitat across the CFLR Project Area? |
| Fish and Wildlife Habitat Condition | #6 What are the effects of restoration treatments on focal species habitat across the CFLR Project Area? |
| Watershed Condition | #8 How are projects (road closures, upland/riparian treatment, etc.) impacting water quality? |

## ****Ecological Outcome 1 – Fire Regime Restoration****

***Desired Conditions:***

The goal of the Lakeview Stewardship Landscape is to return fire to the role it historically filled and return sustainability to the forested lands within the Unit. The desired result is an ecosystem within its natural range of variability. Proposed treatments will change strata, resolve the extreme threat of severe fire over a broad area, promote healthy forest conditions and allow fire to take a more natural role. The desired conditions include:

1. To reduce the potential for fire growth and behavior.
2. To reduce fire suppression costs and to reduce risk through restoration treatments.
3. To move the CFLRP Landscape towards a more sustainable condition.

***Methods for Measuring the Desired Condition:***

1. Projected fire growth and behavior will be measured using fire behavior mapping and analysis programs (FlamMap/FARSITE) utilizing LandFire, GNN and local data sources. Data collection will occur annually and results will be reported every 4 years beginning in 2014 to quantify treatment effectiveness at the landscape scale (Lakeview Federal Stewardship Unit).
2. Fire program management cost savings and risk reduction with and without treatments will be measured using the Risk and Cost Analysis Tools Package (R-CAT). Data collection will occur annually and results will be reported every 4 years beginning in 2014 to assess cost savings and risk reduction at the landscape scale (Lakeview Stewardship Unit).
3. Treatment effectiveness will be measured using the Fire Regime Condition Class (FRCC) rating system and reported every 4 years beginning in 2014 to determine and validate whether the landscape (Lakeview Federal Stewardship Unit) is moving towards a more sustainable condition.

## ****Ecological Outcome 2 – Fish and Wildlife Habitat Condition****

***Desired Conditions:***

1. The white-headed woodpecker is a Regional Forester’s sensitive species in Region 6 (R6) of the USDA Forest Service (USFS). The white-headed woodpecker has also been identified as a focal species for mature dry forests based on its strong association with open, dry forest habitat, and its dependence on mature and older ponderosa pine. The desired condition is improved habitat for white-headed woodpeckers at the stand and landscape scale.
2. Road densities are high within the Lakeview CFLR project area, which can result in negative impacts to wildlife and fish species and habitat. The desired condition is a reduction in overall road densities within the CFLR Project Area and within riparian areas.
3. Aspen, stream, and riparian areas are important habitats for many fish and wildlife species. Some of these areas are in degraded condition due to poor instream conditions and/or conifer encroachment. The desired condition is improved habitat for fish and wildlife species within aspen, stream, and riparian areas.

***Methods for Measuring the Desired Condition:***

1. Mahalanobis and Maxent habitat suitability models have been developed and validated for white-headed woodpeckers (Latif et al. 2012). This data provides the most accurate habitat mapping for white-headed woodpeckers in burned and unburned forests. The desired condition will be evaluated by re-running the habitat suitability models every time the GNN data is updated which will provide habitat trends over time in comparison to the current baseline data. It is expected that the GNN data will be updated every 5-10 years. Effectiveness monitoring for white-headed woodpeckers within the CFLR project area will validate whether restoration treatments are maintaining or improving habitat for this focal species.
2. The desired condition will be measured by quantifying miles of road decommissioned and changes in road density over time in the 6th field watersheds within the CFLR Project Area and within riparian areas.
3. The desired condition will be measured by determining the total acres of aspen or riparian habitat in which conifer reduction occurred and the total number of miles of stream enhanced due to in-stream improvements (e.g. headcut repairs, culvert replacements, additions of large wood).

## ****Ecological Outcome 3 – Watershed Condition****

***Desired Conditions:***

In 2011, the Forest Service assessed watershed condition in all 6th field watersheds using the Watershed Condition Framework (USDA Forest Service, 2011a), which is a comprehensive approach to quantify biological and physical watershed conditions. Those 6th field watersheds within the CFLR project area received ratings of either “fair” or “good” for Forest Service lands. The desired condition is that watershed condition (at the 6th field watershed) would be maintained in those watersheds currently rated as “good” and improve to “good” in those watersheds currently rated as “fair.”

***Describe Methods for Measuring the Desired Condition:***

To determine if watershed conditions are meeting the desired condition, all 6th field watersheds will be reassessed every xx years following the methodology of the Watershed Condition Classification Technical Guide (USDA Forest Service, 2011b), in which watershed condition is rated using 12 indicators and 24 attributes in four Process Categories: Aquatic Physical, Aquatic Biological, Terrestrial Physical, and Terrestrial Biological.

## ****Ecological Outcome 4 – Invasive Species Severity****

***Desired Conditions:***

The desired condition is to maintain native or desirable introduces plant communities in a condition that are resistant to undesirable non-native/invasive plan species invasion and establishment. Emphasis to achieving this is to: maintain existing weed free acres in that condition; eradicate new infestations according to forest priorities and provide treatment where appropriate through Early Detection Rapid Response; develop landscape and project level treatments to avoid expanding existing infested sites, non-native/invasive plant cover or total area infested.

***Methods for Measuring the Desired Condition:***

The NRIS Invasive Species Inventory GIS layer will be updated annually with all treatment data. This information will be used to determine the percent of CFLRP landscape that was restored.

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# APPENDIX A DRY FOREST STAND RECONSTRUCTION PROTOCOL

General Specs. and Setup:

* 3ha square plot
* 2 survey teams of 2-3 people
* Common bearings for plot N/S and E/W and declination will be determined at outset. Draw in diagram of plot on survey point datasheet with compass bearings, etc.
* Teams will begin from the same corner to establish their first survey point. All survey points will be back-sighted from there.
* Hammer in survey stake at each survey point. Write survey number on stake: Team # + SP# (e.g., T1-1).
* Record back-sighting information on survey point datasheet.
* For surveying tree/stump/snags/logs, place pole & reflector at face of at breast height. ½ DBH will be added later to HD.
* Offsets are allowed where pole is not visible. Record correct azimuth first and then do offset.
* Survey in full clumps even if they extend past perimeter. Also, survey in gap edges at 10m distance.

Determining “historic” trees

* 1880 is base year for historic trees. Ignore all trees younger than 130 years.
* Core any tree that appears less than 180 years.
* Record all snags and down logs. Logs must have clear root wad location.
* Record all stumps tree is clearly from cohort <130 years old.

Measurements

For each live tree, stump, log, or snag that is >130 years, record:

* Tree number: Team # + First letter of first name + sequential number starting from 1 (e.g 1D-13). For live trees that have metal tags, write down this #.
* Staple paper tag to tree/stump/log/stump in visible location with tree#. Opposite from survey point. For metal tagged live trees, staple blank tag to indicate that tree has been surveyed.
* Survey Point: Team # + SP# (e.g. T2-1)
* Azimuth in degrees: note whether minutes/seconds or decimal degrees.
* Horizontal distance in meters to nearest cm.
* Type: live tree (L), stump (ST), snag (SN), log (LG). If snag and log are both present, record as snag but note that log is present.
* Species: W for WF: P for PP. L for LP
* Diameter: inches: nearest 1/10th inch: (Do not need for live trees)
* Preferentially measure outside bark and dbh where possible.
* Stumps: stump height (~12”).
* Logs: either dbh (4.5’) or stump height.
* Van Pelt rating or cored age for live trees only.

*Stumps, snags, & logs only:*

* Diameter Measure: IB-inside bark or OB-outside bark + SH- Stump hgt or BH: breast hgt.
* Diameter rating: 1: exact ; 2: 0-2" off, 3: 2-4"; 4: 4-6"; 5 6-10" (guess).
* Decay class: (1-5) or estimate year of harvest for stumps.
* Notes: Fire scars, charcoal, or other noteworthy characteristics, tree core taken.

***Questionable trees/stumps/logs/snags***: record on datasheet with ??. Take photo of tag and then 1-3 photos.

# APPENDIX B QUICK MAP RECONSTRUCTION PROTOCOL

General Specs and Setup:

* The goal of this protocol is to quantify the spatial pattern and structure of the pre-settlement stand without a full stem map.
* Flag out plot before marking or use GPS units.
* 2 survey teams of 3-4 people.
* Common bearings for plot N/S and E/W and declination will be determined at outset. Record on datasheet.
* Teams will spread out and do strips of plot.

Recording “historic” trees

* 1900 is base year for historic trees. Ignore all trees younger than 110 years.
* Core a selection of trees to get feel for tree ages, especially trees <150 years.
* Record all snags and down logs that appear from trees <1900. Logs must have clear root wad location.
* Record all stumps tree is clearly from cohort <1900 years old.
* Survey in full clumps even if they extend past perimeter. Note how many trees are out.
* All diameters should be recorded in 1/10th inches. Can be recorded in 1/10th feet, but specify on datasheet.
* GPS center of clump or at individual if possible.
* Clump distance is 20’.

Clump Measurements

For each individual tree or clump, record:

1. ID: First initial of person + sequential #. Make sure there are no duplicate first initial.

***Write ID on paper tag and staple to structure in visible location towards other crew members.***

1. Clump size: number of historic trees in clump, using distance of 20’.
2. #Live old: Number of live-old trees in clump, plus average dbh of these tree(s).
3. # Stumps: Number of historic stumps in clumps + average d-stump height (dsh), inside bark.
4. # Snaglog DC 1-2: Number of snags and logs in clump with decay class 1 or 2 + average dbh-outside bark. Must be historic (<1900).
5. # Snaglog DC 3-5: Number of snags and logs in clump with decay class 3, 4 or 5 + average d-stump height, inside-bark. Must be historic (<1900).
6. Notes for that clumps: # of structures out of plot, good fire scars, questionable structure, unique features, etc.

Live Old Tree Measurements

Record the following measurements for all live trees that are cored. Store and label tree core.

1. Clump ID: Clump ID from above
2. Tree ID: live tree number in that clump (1, 2, 3, 4,etc)
3. Species
4. DBH
5. DSH (diameter at stump height)
6. Age class from visual estimation: very old (VO)>250; old (O) 150-200; mature (M) 100-150; young (Y) <100.
7. Crown Class: D: dominant; CD: co-dominant; I: Intermediate; S: Suppressed
8. Hgt: Tree Height
9. Ring Age: Total age counted from tree rings in field
10. Measurement to year 1900 (110 rings from core edge). Mm is preferred. Can use 1/10th inches, but specify on datasheet.
11. Notes:

# APPENDIX C INVASIVE SPECIES FORMS

**2013 Invasive Plant Form Site ID:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Fremont-Winema National Forest TA #:**\_\_\_\_\_\_\_\_

**NRCS Plant Code:** \_\_\_\_\_\_\_\_\_\_\_\_**Common Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Infested Area: \_\_\_\_\_\_\_\_\_\_**

**Gross Area** (for use at large sites with scattered weeds - record gross and infested area)**:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Weed Cover** (% of ground occupied by weeds in infested area)**:**\_\_\_\_\_\_\_\_\_\_\_ **Number of Plants:** \_\_\_\_\_\_\_\_\_\_\_\_

**Riparian within 100’ of weed site:** Yes No **Scablands:** Yes No \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(If **Yes** – Complete Special Resource Form) (% of Weed Site within Scabland)

**Occupied or Suitable Sensitive Plant/Mollusk Habitat within 100’ of site:**  Yes No

(If **Yes** - Complete Special Resource Form)

**UTM: Datum NAD83, Zone 10**

**Easting: Northing: Easting: Northing:**

1. \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ 4. \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_

2. \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ 5. \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_

3. \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ 6. \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_ \_\_

**Location:** Township\_\_\_\_\_ Range\_\_\_\_\_ Section\_\_\_\_\_ ¼ / ¼ Section\_\_\_\_\_\_\_\_Quad\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |
| --- |
| **Site Type** (circle all that apply)**: Private Roadside Wildfire Rx Fire Nonforested** |
| **Timber Sale Quarry Developed / Dispersed Recreational Area Riparian Misc \_\_\_\_\_\_\_\_\_\_\_\_** |
| **Plantation:** Yes No(circle one)(actual weed site) (define) |

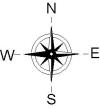
**Directions to Site (road #s):**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Distance to Roads:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **PUR:** Yes No **Difficulty Level:** 1 2 3 **Reported by:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Date:** \_\_\_\_\_\_\_\_\_\_\_\_\_

|  |
| --- |
| **Notes** |

**Marker Installed:**  Yes No \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Sketch of Site:**

[](http://images.google.com/imgres?imgurl=www.philsch.k12.pa.us/schools/fitler/compass.jpg&imgrefurl=http://www.philsch.k12.pa.us/schools/fitler/&h=275&w=254&sz=9&tbnid=_XH_rJgV05kJ:&tbnh=108&tbnw=100&prev=/images?q=map+compass&hl=en&l)

|  |
| --- |
| **Notes (continued)** |

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**2013 Special Resources Form Site ID:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**(Within 100 Feet of Weed Infestations) Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Examiner:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Riparian Resource** | | **river** | **stream/ creek** | **canal** | **spring/ seep** | **roadside ditch \*** | **reservoir** | **pond/**  **lake** | **Livestock water** | **meadow** | **Other:**  (describe below) |
| **Flow** | **Perennial** |  |  |  |  |  |  |  |  |  |  |
| **Intermittent** |  |  |  |  |  |  |  |  |  |  |
| **Ephemeral** |  |  |  |  |  |  |  |  |  |  |
| **Meadow** | **Wet** |  |  |  |  |  |  |  |  |  |  |
| **Moist** |  |  |  |  |  |  |  |  |  |  |
| **Dry** |  |  |  |  |  |  |  |  |  |  |
| **Surface water likely present at time of treatment at weed site** | |  |  |  |  |  |  |  |  |  |  |
| **Distance (range) from riparian area surface water to weed site** | |  |  |  |  |  |  |  |  |  |  |
| **Weed Site likely to be saturated/ inundated at time of treatment** | |  |  |  |  |  |  |  |  |  |  |
| **Distance (range) from area likely to be saturated/inundate**  **to weed site** | |  |  |  |  |  |  |  |  |  |  |
| **Potential for seasonal/periodic ponding or flooding when dry at weed site \*\*** | |  |  |  |  |  |  |  |  |  |  |
| **% of weed site within riparian** | |  |  |  |  |  |  |  |  |  |  |

\* Utilize roadside ditch ***only*** when it is hydrologically connected (within 100 feet) to any of the above riparian types (except dry meadow)

\*\* Includes areas such as ditches, meadows, and flood plains that are hydrologically connected to lakes, ponds, springs, or streams.

**Developed Water Sources for Livestock** (describe system: troughs connected to seep/spring/creek/well, open man-made pit, etc.):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Other** (describe): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Notes** (name of riparian area, etc.)**:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

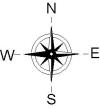
|  |  |  |
| --- | --- | --- |
| **Other Resource Present:**  **Yes No Unknown** | **Sensitive Plant Habitat**  **Suitable / Occupied**  (circle one) | **Mollusks Habitat**  **Suitable / Occupied**  (circle one) |
| **Species** |  |  |
| **Distance (range) from Resource to Weed Site** |  |  |
| **% of weed infestation within 100’ of resource** |  |  |
| **Survey Conducted and Date** | **Yes No Date:** \_\_\_\_\_\_\_\_\_\_\_\_\_ | **Yes No Date:**\_\_\_\_\_\_\_\_\_\_\_ |

**Notes:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Sketch of Site:**

(Include weed site in relation to all riparian/resource

types identified on front side. Include distances.)

[](http://images.google.com/imgres?imgurl=www.philsch.k12.pa.us/schools/fitler/compass.jpg&imgrefurl=http://www.philsch.k12.pa.us/schools/fitler/&h=275&w=254&sz=9&tbnid=_XH_rJgV05kJ:&tbnh=108&tbnw=100&prev=/images?q=map+compass&hl=en&l)

|  |
| --- |
| **Notes** |

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1. Forest Service [↑](#footnote-ref-2)
2. Biophysical Monitoring Crew [↑](#footnote-ref-3)
3. The Nature Conservancy [↑](#footnote-ref-4)
4. BAF is the basal area factor. A predetermined numerical factor resulting in tree tallies that are then converted to basal area per acre. Depending on region, the BAF is usually chosen to provide an average of 5 to 12 trees per sample point (Avery and Burkhart 2002). Foresters working on the Lakeview Ranger District, Lakeview, OR typically use a 10 or 20 BAF. [↑](#footnote-ref-5)
5. $250 is estimating $31 per hour for an 8 hour day. 17 days is estimated on if the crew does approximately 50 plots (maximum) at about 3 plots per day= 17 days. [↑](#footnote-ref-6)
6. 15 days for FS input and analysis time. [↑](#footnote-ref-7)
7. This is for one location. Costs will be adjusted based upon number of locations. [↑](#footnote-ref-8)
8. This is the estimate for soil monitoring at one location (e.g. logging or prescribed burning unit), which would consist of 2-3 transects. Costs will be adjusted based upon number of locations. [↑](#footnote-ref-9)
9. The number of probes can be adjusted based upon funding availability, costs would be adjusted accordingly. The GS-5 and GS-7 days are allocated for deployment and retrieval of dataloggers, and the GS-9 days are allocated for datalogger calibration, download, QA/QC, and database input. [↑](#footnote-ref-10)