Lakeview Collaborative Forest Landscape Restoration (CFLR) Project Monitoring Plan

AMY MARKUS, EMILY JANE DAVIS, TOM DEMEO, *AND* ***BERNARD BORMANN,***
WITH ***LORA ARCINIEGA, CRAIG BIENZ,SARA LOVTANG, CASSANDRA MOSELEY, VINCE PACIFIC, LUCAS PHILLIPS, GREGG RIEGEL, CHAYLON SHUFFIELD, CLAIR THOMAS, JEANETTE WILSON,*** *AND* ***BRYAN YOST***

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About the authors

Amy Markus is a forest wildlife biologist for the U.S. Forest Service.

Emily Jane Davis is an assistant professor and extension specialist in the College of Forestry, Oregon State University.

Thomas Demeo is a regional vegetation ecologist for the U.S. Forest Service.

Bernard Bormann is a research forest ecologist and physiologist for the U.S. Forest Service.

Contributors:

Lora Arciniega is a silviculturist for the U.S. Forest Service

Craig Bienz is director of the Nature Conservancy Sycan Marsh Program.

Sara Lovtang is an ecologist for the U.S. Forest Service.

Cassandra Moseley is director of the Ecosystem Workforce Program and Institute for a Sustainable Environment, University of Oregon.

Vince Pacific is a hydrologist for the U.S. Forest Service.

Lucas Phillips is a rangelands management specialist for the U.S. Forest Service.

Gregg Riegel is an ecologist for the U.S. Forest Service.

Chaylon Shuffield is a fire ecologist for the U.S. Forest Service.

Clair Thomas is crewleader for the Lakeview Biophysical Monitoring Crew.

Jeanette Wilson is a botanist and invasives specialist for the U.S. Forest Service.

Bryan Yost is a wildlife biologist for the U.S. Forest Service.

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For more information:
Ecosystem Workforce Program
Institute for a Sustainable Environment
5247 University of Oregon
Eugene, OR 97403-5247
541-346-4545
ewp@uoregon.edu
ewp.uoregon.edu

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Introduction

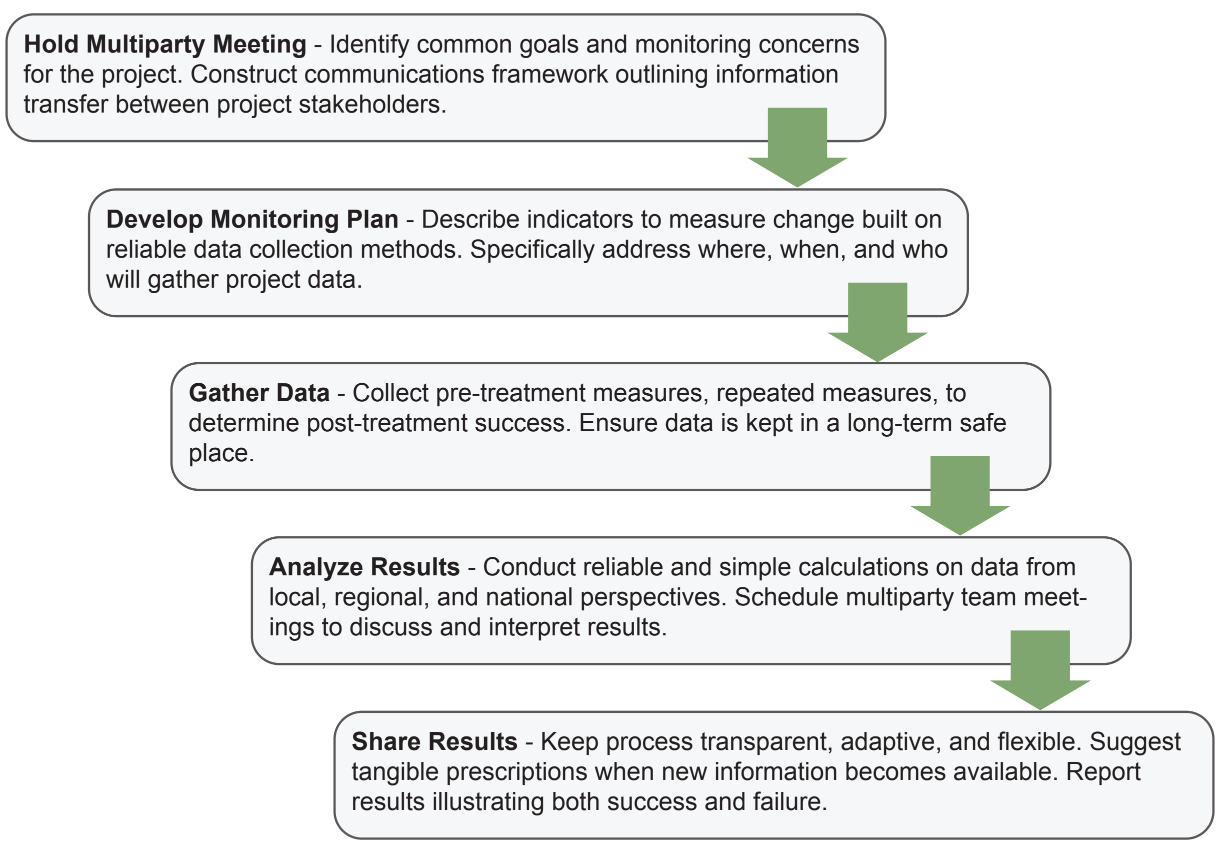
The Lakeview Collaborative Forest Landscape Restoration Project (CFLR) was selected for funding in 2012. Multiparty monitoring, evaluation, and accountability are required to assess the positive or negative ecological, social, and economic effects of projects implemented. Monitoring is an essential part 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 CFLR'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.

Background

The Lakeview Stewardship Group was formed in 1998 to examine the policies tied to the Lakeview Federal Sustained Yield Unit and generally improve management of 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 (see: http://www.fs.fed.us/r6/frewin/projects/cert/syupolicy.pdf).

Collaborators that make up the Lakeview Stewardship Group (LSG) 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,

Figure 1. Overview of CFLR Multiparty Monitoring Process



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 now being implemented. 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 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 CFLR 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 outlines the methods, location, 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 following diagram (Figure 2) as a way to organize the overall monitoring and adaptive management framework. 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.

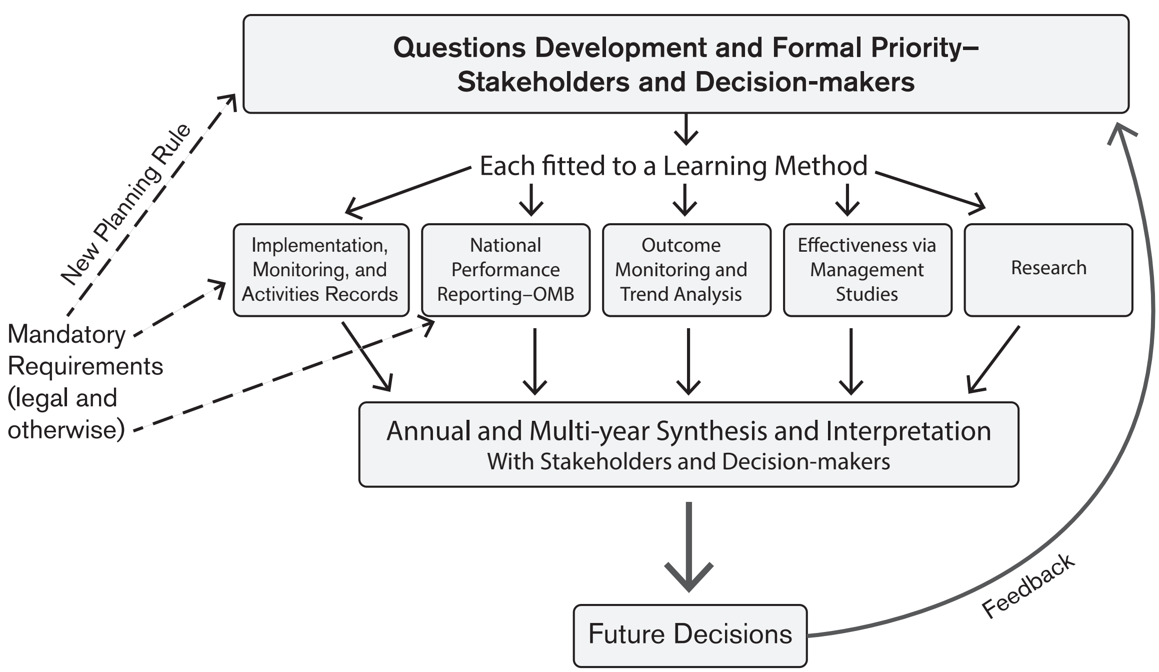
Questions Development and Priority

The collaborative group held a workshop in July of 2012 to identify questions of interest to the group. Approximately 65 questions were expressed 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 CFLR 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 14 ecological, social, and economic questions that would be

Figure 2. Pacific Northwest Region 6 Adaptive Management Framework



carried forward in the Lakeview CFLR Monitoring plan. These questions were reviewed and approved by the Lakeview Collaborative Group on Feb. 21, 2013. The questions are:

Ecological

1. How effective are fuels treatments in reducing wildfire risk?
2. What are the effects of fire and/or mechanical 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 the 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 riparian/upland treatments impacting ground vegetation and soils?
8. How are projects (road closures, upland/riparian treatment, etc.) impacting water quality?
9. Are Forest Prevention Practices effective in minimizing impacts of vegetation management treatments (including prescribed fire) on invasive plant species (new and/or existing)?

Socioeconomic

10. What is the socioeconomic context of the Lake County region (will not/cannot link socioeconomic changes to CFLR, but will provide some contextual data on socioeconomic trends)? What are the overall economic impacts of the CFLR projects?
11. How much and what kinds of CFLR work are captured locally?
12. What are the costs, local capture, and treatment outcomes of different project implementation mechanisms?
13. What are the total and matching funds in CFLR? Is CFLR increasing the Forest Service and partners' abilities to leverage funds?

Science Team and Feedback Channels

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 CFLR Monitoring Plan. This Science Team will also be involved in feedback channels to assure that the monitoring contributes to ongoing 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 decisions.
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.
5. The monitoring plan will be reviewed and updated annually as new information becomes available or new questions are identified.

Ecological Monitoring Overview

Table 1. Questions, Goals, Indicators, Scale, Methods, and Who Collects Data and Reports

Question	Question Type: Social/ Ecological/ Economic	Goal	Indicator
#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 a
	Economic	To estimate fire program management cost savings and risk reductions for the CFLR project area.	Expected suppression
#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 Struc
#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 ease, drought based o
	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 ratin
	Ecological	To quantify and compare the effects of restoration treatments to the historic disturbance regime.	Fire frequency and se
#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, ar
	Ecological	To achieve fine scale mosaic pattern across the landscape that existed historically.	Individuals, clumps, ar
#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 WHWO into silvicultural prescriptions and thereby guide ecosystem restoration projects within the range of the species.	Levels of tree clusteri tics, and the density a
	Ecological	To verify the effectiveness of restoration treatments for improving habitat for WHWO.	WHWO occupancy, ne
	Ecological	To quantify how restoration treatments impact fish habitat.	Stream channel morp tion, macroinvertebrat vegetation cover
#6– What are the effects of restoration treatments on focal species habitat across the CFLR Project Area?	Ecological	To improve and maintain habitat for WHWO at the stand and landscape scale.	Amount of WHWO ha
	Ecological	To improve habitat for fish and wildlife species within aspen, stream, and riparian areas.	Total acres of aspen c reduction occurred ar enhanced due to in-st
#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 sp ground cover, riparian class, extent of riparia
	Ecological	To quantify how restoration activities such as logging and prescribed fire impact soils	Soil disturbance class
#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
	Ecological	To quantify the miles of road decommissioned across the entire CFLR project area and within riparian zones.	Miles of road decomm in the 6th field waters within riparian areas
	Ecological	To determine how restoration projects affect stream temperature	Stream temperature
#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 invasi sion of existing invasiv adjacent to veg. mana

	Scale: Landscape/ Stand	Methods Approach: Effectiveness/ Implementation/ National Indicator	Methodology	Who collects data
nd behavior	Landscape	Effectiveness, National Indicator	FlamMap FARSITE	FS BPMC TNC
costs with and without treatments	Landscape	Effectiveness, National Indicator	R-CAT	FS
cture and Fuel Loading	Stand, Landscape	Implementation, Effectiveness	FIREMON FFI [25]	BPMC
resistance to wildfire, insects and dis- n past radial growth and other stand data.	Stand	Validation	FS stand exam plot data	BPMC
ng	Landscape	Effectiveness, Validation, National Indicator	FRCC	FS
everity	Stand, Landscape	Effectiveness	GIS analysis	FS
nd openings	Landscape	Effectiveness	Churchill et al. 2012 [28]	TNC BPMC
nd openings	Landscape	Implementation	Comparison to the historic data from stem mapping	TNC BPMC
ng, stand densities, and tree characteris- nd size of openings	Stand	Effectiveness	Churchill et al. 2012 [28]	TNC BPMC FS
esting, and success	Landscape	Effectiveness	Mellen-McClean et al. 2012 [24]	RMRS FS BPMC
hology, stream substrate composi- e populations, riparian and streamside	Site specific	Implementation	Stream cross sections, Wolman pebble counts, macroinvert sampling, photo monitoring	BPMC
bitat within CFLR Project Area	Landscape	Effectiveness, National Indicator	WHWO HSI models	RMRS
r riparian habitat in which conifer nd the total number of miles of stream tream improvements	Landscape	Implementation, National Indicator	GIS analysis	FS
pecies composition, bare ground and and streamside vegetation cover, age n vegetation	Stand	Effectiveness, Photo Points	BPMC line intercept protocols and photo points	BPMC
	Stand, Landscape	Implementation	FS Soil Disturbance Monitoring Protocols	BPMC
Framework ratings	Landscape	National Indicator	Watershed Condition Framework	FS
nissioned and reduction in road density sheds within the CFLR project area and	Landscape	Implementation, National Indicator	GIS analysis	FS
	Site specific	Effectiveness	Hobo water temperature data loggers	FS
ve plant sites discovered and/or expan- ve plant sites within or immediately agement activities	Stand, Landscape	Effectiveness	Pre and post ocular surveys	FS

Acronyms

BPMC: Biophysical Monitoring Crew

FRCC: Fire Regime Condition Class

FS: Forest Service

HSI: Habitat Suitability Index

TNC: The Nature Conservancy

RMRS: Forest Service Rocky Mountain Research Station

R-CAT: Risk and Cost Analysis Tools

WHWO: White-headed woodpecker

Question #1

How effective are fuels treatments at reducing wildfire risk?

Current vegetation conditions within the Lakeview Stewardship Landscape are not sustainable in the face of extensive, uncharacteristically severe wildfires. Restoration treatments (thinning and prescribed burning) 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 2. Goals, Indicators, Scale, and Type of Monitoring for Question #1

Goals	Indicators	Scale of Monitoring	Type of Monitoring
To quantify the effectiveness of fuels treatments on fire growth and behavior.	1.1 Modeled fire growth and behavior.	Landscape	Effectiveness National Indicator
Estimate fire program management cost savings and risk reductions for the CFLR project area.	1.2 Expected suppression costs with and without treatments	Landscape	Effectiveness National Indicator

Description of Methodology
Indicator 1.1: Fire Behavior Modeling (FlamMap, Farsite)
Indicator 1.2: R-CAT

Who will Collect the Data?

The Forest Service, Biophysical Monitoring Crew and The Nature Conservancy will collaboratively collect data for Indicator 1.1. The Forest Service will do all data collection for Indicator 1.2.

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 1.1 every four years. The Forest Service will do all data analysis, interpretation and reporting for Indicator 1.2 every four years. Data collection will occur on an annual basis for both indicators. 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 3. Estimated budget for data collection, data storage, analysis and reporting for Indicator 1.1 ($4,620) and 1.2 ($6,600)

Expense	Cost/Unit	# Days	Total Cost
Salary — GS 11	$330	34	$11,220
Total			**$11,220**

Question #2

What are the effects of fire and/or mechanical 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 Stewardship Landscape.

Table 4. Goals, Indicators, Scale, and Type of Monitoring for Question #2

Goals	Indicators	Scale of Monitoring	Type of Monitoring
To quantify the effects of prescribed fire and mechanical treatments on vegetation.	2.1 Mortality, Forest Structure and Fuel Loading	Stand Landscape	Implementation

Description of Methodology
Indicator 2.1: FIREMON/FFI
http://www.frames.gov/partner-sites/firemon/sampling-methods/

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 collected and compiled annually using FFI. 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?
FFI database, excel spreadsheets and local hardcopy files.
http://www.frames.gov/partner-sites/ffi/ffi-home/

Estimate of Budget:

Table 5. Estimated budget for data collection, data storage, analysis and reporting for Question #2

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

Question #3

What is the effect of the treatments on moving the Forest landscape toward a more sustainable condition that includes 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 National Forest 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 CFLR. Specifically, are the treatments 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. Developed in 2003, the Fire Regime Condition Class (FRCC) assessment system has provided a vital connection between managers' understanding of fire regimes, ecological departure, and efforts to maintain sustainable landscapes" (USDA, USDI 10-Year Comprehensive Strategy and Implementation Plans 2001–2002 in Barrett et al. 2010).

Table 6. Goals, Indicators, Scale, and Type of Monitoring for Question #3

Goals	Indicators	Scale of Monitoring	Type of Monitoring
To assess whether treatments have resulted in sustained or improved resiliency/resistance to insect, disease, and drought.	3.1 Projection of a stands resistance to wildfire, insects and disease, drought based on past radial growth and other stand data.	Stand	Effectiveness
To quantify and compare the scale and intensity of current restoration treatments to historic disturbances.	3.2 Change in Fire Regime Condition Class (FRCC) rating.	Landscape	Effectiveness National Indicator
To quantify and compare the effects of prescribed fire and mechanical treatments to the historic disturbance regime.	3.3 Fire frequency	Stand Landscape	Effectiveness

Description of Methodology

Indicator 3.1: 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, one 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 fix 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[1]) 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 20^{ths} 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.).

1 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.

Indicator 3.2: 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 3.3: 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?

Biophysical monitoring crew with assistance from District personnel if needed for Indicator 3.1. The Forest Service will collect all necessary data for Indicators 3.2 and 3.3.

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

The Forest, specifically district silviculturist, will analyze the data collected for Indicator 3.1. The use of 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 3.2 and 3.3.

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 3.1. Data analysis and storage will be completed by the Zone Fire Ecologists for Indicators 3.2 and 3.3.

Estimate of Budget:

Table 7. Estimated budget for data collection, data storage, analysis and reporting for Indicator 3.1

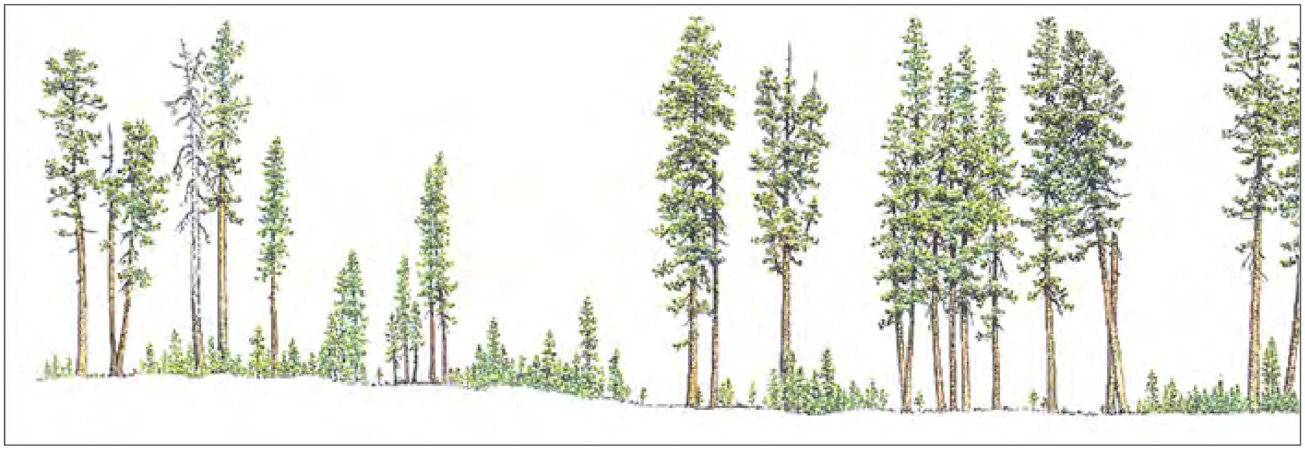
Expense	Cost/Unit	# Days	Total Cost
Salary (crew)	$250[2]	17	$4,250
Salary (FS)	$310	15[3]	$4,650
Total			**$8,900**

Table 8. Estimated budget for data collection, data storage, analysis and reporting for Indicators 3.2 and 3.3

Expense	Cost/Unit	# Days	Total Cost
Salary — GS 11	$330	4	$1,320
Total			**$1,320**

2 $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.

3 15 days for FS input and analysis time.



Question #4

What is the historical spatial pattern within 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., 2102) 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 to dry forests on the eastside of Oregon.

Table 9. 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 & Implementation
To achieve fine scale mosaic pattern across the landscape that existed historically.	Individuals, clumps and openings	Landscape	Effectiveness & Implementation

Description of Methodology

Indicator 4.1: 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 B). 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 at ten acres (Larson and Churchill 2012).

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 (CFLR) 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 10. Estimated budget for data collection, data storage, analysis and reporting

Expense	Cost/Unit	# 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 Inland 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 six-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).

Mahalanobis and Maxent habitat suitability models have been developed and validated for white-headed woodpeckers (Latif et al. 2012, Latif et al. in 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 (one to two 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 (two 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 11. 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.	5.1 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.	5.2 White-headed woodpecker occupancy, nesting, and success	Landscape	Effectiveness
To quantify how restoration activities impact fish habitat.	5.3 Stream channel morphology, stream substrate composition, macroinvertebrate populations, riparian and streamside vegetation cover	Site specific	Implementation

Description of Methodology

Indicator 5.1: 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. Fourth, 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 5.2. See Reference to Churchill et al. (2013a) below.

Indicator 5.2: The methodology will follow the white-headed woodpecker monitoring strategy 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. 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 meters (656 feet) 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 one to three years post-treatment. Pre-treatment monitoring should occur for at least one 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 5.3: 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 five 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.

Stream 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 col-

lected approximately every five 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

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 five 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 5.1. The Forest Service and the Rocky Mountain Research Station will hire seasonal employees to collect data for Indicator 5.2. The vegetation data collection would be conducted by the Biophysical Monitoring Crew. The Biophysical Monitoring Crew will conduct monitoring for indicator 5.3.

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 5.1. Vicki Saab, Research Biologist with Rocky Mountain Research Station, will analyze the data and provide a report on an annual basis for Indicator 5.2. 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 5.3.

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 5.1 and 5. 2. Data collection sheets, additional field notes, and summary tables will be scanned and stored on the Forest Service computer server for indicator 5.3.

Estimate of Budget:

Table 12. Indicator 5.1 – 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 13. Indicator 5.2 – estimated budget for data collection, data storage, analysis and reporting per year

Expense	Cost/Unit	# 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 14. Indicator 5.3 (will occur at the same time at each location) – estimated budget for data collection, data storage, analysis and reporting per year[4].

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

4 This is for one location. Costs will be adjusted based upon number of locations.

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 15. 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.	6.1 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.	6.2 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

Indicator 6.1: 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.

Indicator 6.2: 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 16. Estimated budget for data collection, data storage, analysis and reporting for Question #6

Expense	Cost/Unit	# Days	Total Cost
Salary — GS 11	$330	15	$4,950
Total			**$4,950**

Question #7

How are riparian and upland 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. Conifer encroachment within riparian corridors has also reduced instream water for aquatic species.

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 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 17. Goals, Indicators, Scale, and Type of Monitoring for Question #7

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.	7.1 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	7.2 Soil disturbance class	Stand Landscape	Implementation

Description of Methodology

Indicator 7.1: 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 1m^2 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 specie name and the number of plants per specie 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 species.

Data will be collected after stand layout and before treatment. The area will be sampled again in five 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 7.2: 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 one 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 7.1. 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 7.2. 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 7.1. 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 7.2.

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 7.1 and 7.2.

Estimate of Budget:

Table 18. Indicator 7.1 – Estimated budget for data collection, data storage, analysis and reporting for Question #7

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

Table 19. Indicator 7.2 – Estimated budget for data collection, data storage, analysis and reporting per year.[5]

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

5 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.

Question #8

How are projects (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 20: 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."	8.1 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.	8.2 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 impact stream temperature.	8.3 Stream temperature	Site specific	Implementation

Description of Methodology

Indicator 8.1: 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 8.2: 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 8.3: 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 8.1, 8.2, and 8.3.

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

For indicator 8.1, 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 8.2, 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 8.3, 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 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 21. Indicator 8.1 – estimated budget for data collection, data storage, analysis and reporting per year for Question 8

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

Table 22. Indicator 8.2 – estimated budget for data collection, data storage, analysis and reporting per year

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

Table 23. Indicator 8.3 – estimated budget for data collection, data storage, analysis and reporting per year

Expense	Cost/Unit	# 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[6]	$3,125
Total			**$620**

6 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.

Question #9

Are Forest Prevention Practices effective in minimizing impacts of vegetation management 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 24: Goals, Indicators, Scale, and Type of Monitoring for Question #9

Goals	Indicators	Scale of Monitoring	Type of Monitoring
To minimize the occurrence of new invasive plant sites and/or expansion of existing sites.	9.1 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

Indicator 9.1: 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 25. Estimated budget for data collection, data storage, analysis and reporting for Question #9

Expense	Cost/Unit	# Days	Total Cost
Salary	$30.84	120	$3,701
Total			**$3,701**

Socioeconomic Monitoring Overview

Socioeconomic monitoring helps the Forest Service and partners better understand the effects of their restoration activities on workers, communities, and economies. It can include a variety of measures and types of methods[7]. The socioeconomic monitoring questions here (#s 10–13) were designed with the following considerations: 1) to reflect the priorities of the Lakeview Stewardship Group, 2) to include required CFLR measures, and 3) to be a parsimonious set of measures that focus on the issues that matter most and that generate information that will be used. The questions were developed and refined through a subcommittee including stewardship group members and the Forest Service. To estimate changes that can be attributed to the CFLR Program, the socioeconomic monitoring effort will rely on a baseline assessment (for the period prior to CFLR funds being used, FYs 2007–2011) as well as annual monitoring to compare against that baseline. Socioeconomic monitoring steps therefore will be:

- Conduct baseline assessment for FY 2007–2011 (completed by late May 2014). The baseline will measure all the indicators here, as well as some basic socioeconomic status information such poverty, unemployment, size of forestry and forest products workforce, free and reduced lunch, and number of SNAP clients. These will not be treated as monitoring indicators because we may not able to clearly prove a causal link between CFLR projects and changes in these broader socioeconomic conditions, but they do provide important contextual information.
- "Retroactively" monitor outcomes of CFRLP since its start (FY 2012) to present (completed by late May 2014)
- Annually monitor changes against the baseline in spring of each year and present results for discussion with the stewardship group and Forest Service
- Assist science team with a final monitoring report at the end of the CFLR project

7 For a list of known socioeconomic indicators in forest restoration, see Ecosystem Workforce Program Briefing Paper #55, http://ewp.uoregon.edu/sites/ewp.uoregon.edu/files/BP_55.pdf.

Table 26. Socioeconomic monitoring methods and questions addressed

Component	Questions Addressed	Methods/Purpose
Socioeconomic statistics reporting	#10	To provide contextual information about the overall socio-economic condition of the Lake County area. Will obtain from existing governmental databases.
Economic impact modeling	#11	Helps refine TREAT model inputs and model economic impacts
Analysis of Forest Service and any partner records	#12, #13, #14	Provides information about local capture of CFLR projects (#12), provides information about types of mechanisms used and their outcomes (#13), provides records of funds expended and matching funds (#14)
Analysis of Collins Co. records	#11, #12, #13	Helps refine TREAT model inputs and model economic impacts (#11), provides information about subcontracted work and local impacts (#12), assess costs and benefits of implementation mechanisms from Collins's perspective (#13)
Analysis of Lake County Watershed Council records	#13	Provides records of retained receipts and restoration accomplished through stewardship projects
Business interviews	#11, #12, #13	Helps refine TREAT model inputs (#11), identify importance of CFLR projects to local business health (#12), assess costs and positive aspects of implementation mechanisms from contractors' perspectives (#13)
Forest Service focus groups	#13	Understand costs, positive aspects, and rationale for implementation mechanisms

Question #10

What is the socioeconomic context of the Lake County area?

It is not possible to link changes in a larger-scale trends measured at the county level to CFLR projects, unless the magnitude of those projects was substantial. However, tracking social and economic trends in an area of interest can help provide the Forest Service and collaborators with perspective on the conditions at hand. It can also help spur more informed, data-based discussions of social and economic needs in the collaborative group.

Table 27. Goals, Indicators, Scale, and Type of Monitoring for Question #10

Goals	Indicators	Scale of Monitoring	Type of Monitoring
To track key social and economic trends to keep perspective on the conditions in Lake County	(Measured both as baseline and change over time) 10.1 • Employment in various sectors • Median household income • Unemployment rate • Poverty rate • Number of students eligible for free and reduced lunch • School enrollment • Dropout rates	County	Contextual and non-causal

Description of Methodology
Indicator 10.1: Data for these indicators can be downloaded from publicly-accessible databases available online from sources including Oregon Department of Education, Oregon Labor Market Information System, the US Census, and Oregon Rural Communities Explorer.

Who Will Collect the Data?
Ecosystem Workforce Program (EWP) staff technicians will download the data.

When, How, and Who will Analyze the Data and Report?
The data will be downloaded and stored in Excel in Summer 2014. It is descriptive and does not require analysis. It will be reported in a table as part of the annual monitoring report. Both the rate for that year and change since the baseline will be reported.

Where and How the Data will be Stored?
Data and metadata will be stored on the secure and password protected server at the University of Oregon. Data formats will be Excel. Data will also be stored on a password-protected computer at the Lake County Resources Initiative office in Lakeview.

Estimate of budget:
It is not easily possible to break down monitoring costs by question; a final total budget estimate for all socioeconomic monitoring is available from EWP.

Question #11

What are the overall economic impacts of the CFLR projects?

Supporting employment and healthy communities through forest stewardship has been a long-standing goal of the Lakeview Stewardship Group, and is also an important objective of the Lakeview CFLR. Economic activity is created through direct employment, purchases of materials and supplies, and spending in local communities by employees (Sundstrom et al. 2011). It includes job creation and retention, income to employees and business owners, and economic activity (business sales) generated in a defined impact region. This is a required monitoring question for the CFLR Program.

Table 28. Goals, Indicators, Scale, and Type of Monitoring for Question #11

Goals	Indicators	Scale of Monitoring	Type of Monitoring
To identify the effects of CFLR projects on employment and economic activity	(Measured both as baseline and change over time) 11.1 Job creation and retention, labor income, and business sales. The direct/indirect/induced economic activity resulting in the local impact area.	Local	Effectiveness National Indicator

Description of Methodology

Indicator 11.1: Annual economic impacts for all CFLR projects are currently estimated by the Forest Service using the TREAT model (Treatments for Restoration Economic Analysis Tool). Inputs to the TREAT model include: annual FS and contributed project funding, value of projects provided to local contractors, Forest Service staff supported by CFLR funds, wood products generated from treatments, and assumptions about numbers of employees required for treatments and wood products manufacturing. The

Lakeview Stewardship Group expressed some concerns about the assumptions in these inputs as well as the definition of the impact area. Therefore, monitoring will seek to:

1. Examine TREAT assumptions and possibly adjust them to better reflect local economic context and impact area, possibly providing alternate estimates of local impacts and leakage. Use business interviews (Question #12) to help with refining inputs.
2. Re-model economic impacts annually using refined inputs.

This method of refining model inputs and validating with businesses was similarly used in the Deschutes Collaborative Forest Project's multiparty monitoring framework.

Who will Collect the Data?
The Ecosystem Workforce Program (EWP) at the University of Oregon.

When, How, and Who will Analyze the Data and Report?
Refining the TREAT model and re-running it will occur in Summer 2014 as part of the baseline socioeconomic assessment. Business interview data will be collected in alignment with: 1) suitable times of the year (e.g. late fall) for contractors, 2) the Forest Service's required reporting timeline, and 3) the LSG's overall monitoring and reporting processes. This data and data for all other socioeconomic questions will be gathered for a baseline in Summer 2014, and repeated annually at this time of year. Data will be analyzed and prepared in a "working draft" report that contains analyzed data in condensed formats and basic written syntheses. This will be shared with the LSG in their October 2014 meeting to allow learning and adapting. The working draft will then be revised and finalized for inclusion in the larger annual monitoring report. The LSG will ensure that this report reaches stakeholders and businesses.

Where and How the Data will be Stored?
Data and metadata will be stored on the secure and password protected server at the University of Oregon (UO). Business interview data storage will follow requirements for Human Subjects Research at UO, including password protection and confidentiality provisions if those are necessary. Data formats will include Microsoft Word, Excel, R, and Access. Data will also be stored on a password-protected computer at the Lake County Resources Initiative office in Lakeview.

Estimate of Budget:
It is not easily possible to break down monitoring costs by question; a final total budget estimate for all socioeconomic monitoring is available from EWP.

Question #12

How much and what kinds of CFLR project work are captured locally?

"Local capture," or the percentage of Forest Service work that local businesses perform, is an important measure of local economic impacts. It can reflect the capacity of local businesses to respond to agency needs, and the alignment of agency management decisions with local capacity. However, many factors affect local capture. For example, there may be few local businesses able to perform the work. Agency managers must consider best value to the government and American people in contracting decisions, as well as safety, efficiency, and other criteria—all of which could result in a non-local contractor being selected. The Lakeview Stewardship Group is interested in understanding local capture as part of a larger effort to increase economic outcomes from restoration in the Lake County area. To that end, they also would like to understand if CFLR projects have created opportunities for local businesses and workers that would not be otherwise possible. Although this question cannot be answered unequivocally, interviews can help describe the relative significance of CFLR projects to business health. Regional economic impacts within a defined impact area are modeled in Question 11, but this question deepens analysis of local capture and economic outcomes.

Table 29. Goals, Indicators, Scale, and Type of Monitoring for Question #12

Goals	Indicators	Scale of Monitoring	Type of Monitoring
To identify the contributions of CFLR projects to local employment and economic activity	(Measured both as baseline and change over time) 12.1. Amount and percent of total project dollars (timber sales, contracts, agreements, etc.) captured by local businesses annually 12.2. Number and percent of jobs created associated with local companies 12.3. Business responses to annual interview/survey describing the importance of CFLR to their work; noting it is an opportunity that would not otherwise be possible	Local	Effectiveness National Indicator

Description of Methodology

Indicator 12.1, 12.2, and 12.3: Data for indicators 12.1 and 12.2 will be collected from Forest Service databases (FPDS, FACTS, TIMS), CFLR reports from the Fremont-Winema NF, and records of projects subcontracted by Collins; and analyzed using Excel and R. Data for Indicator 12.3 will be collected through the business interview. The business interview will be a short set of questions about their business, the importance of CFLR projects to their work, their satisfaction with the timing and duration of the contracts (see Question #13) and ground-truthing of the modeled economic impacts numbers. We will attempt to interview all businesses that have implemented CFLR projects as well as Collins and subcontractors through Collins; we anticipate approximately 10 interviews. We will take detailed notes during interviews.

Who will Collect the Data?

The Ecosystem Workforce Program at the University of Oregon and Emily Jane Davis from Oregon State University. Davis will assist specifically with the business interview component.

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

EWP already has access to the necessary Forest Service databases and will analyze the data specific to CFLR projects. They will also collect any necessary CFLR records from the Fremont-Winema NF. Business interview data will be collected in alignment with: 1) suitable times of the year for contractors, 2) the Forest Service's required reporting timeline, and 3) the LSG's overall monitoring and reporting processes. This data and data for all other socioeconomic questions will be gathered for a baseline in Summer 2014, and repeated annually at this time of year. Data will be analyzed and prepared in a "working draft" report that contains analyzed data in condensed formats and basic written syntheses. This will be shared with the LSG in their October 2014 meeting to allow learning and adapting. The working draft will then be revised and finalized for inclusion in the larger annual monitoring report. The LSG will ensure that this report reaches stakeholders and businesses.

Where and How the Data will be Stored?

Data and metadata will be stored on the secure and password protected servers at the University of Oregon and Oregon State University. Business interview data storage will follow requirements for Human Subjects Research at UO and OSU, including password protection and confidentiality provisions if those are necessary. Data formats will include Microsoft Word, Excel, R, and Access. Data will also be stored on a password protected computer at the Lake County Resources Initiative office in Lakeview.

Estimate of Budget:

It is not easily possible to break down monitoring costs by question; a final total budget estimate for all socioeconomic monitoring is available from EWP.

Question #13

What are the costs, benefits, and outcomes of different project implementation mechanisms?

How projects are implemented—e.g. the type of mechanism used or timing and duration of project—can affect costs to the Forest Service as well as the profitability of the project for the contractor. The Lakeview Stewardship Group expressed an interest in understanding: 1) how well different project implementation mechanisms work for local businesses and 2) the outcomes of stewardship mechanisms in particular. We will track some characteristics of CFLR projects by type of work.

Table 30. Goals, Indicators, Scale, and Type of Monitoring for Question #13

Goals	Indicators	Scale of Monitoring	Type of Monitoring
To evaluate the costs, local capture, and treatment outcomes of different mechanisms (service contracts, stewardship contracts, and agreements) for restoration work; particularly to 1) identify mechanisms that work best for local businesses, including Collins; and 2) test if stewardship produces notably different outcomes.	(Measured both as baseline and change over time) 13.1. For each type of mechanism (service contracts, stewardship contracts, and agreements): 1. Range and median duration of projects 2. Number of acres treated 3. Costs per acre 4. If businesses performing work were local 5. For stewardship only: Dollar amount of retained receipts reinvested in restoration 13.2 Qualitative responses from Forest Service about the costs and benefits of different mechanisms and why used 13.3 Qualitative responses from contractors that are very satisfied or satisfied with how CFLR projects were implemented	Local (defined as Lake County or otherwise)	Effectiveness

Description of Methodology

Indicators 13.1, 13.2, and 13.3: Data for Indicator 13.1 will be collected from Forest Service databases (FPDS, FACTS, TIMS). For Indicator 13.1(5), data will be collected from Lake County Watershed Council records if there is any stewardship work performed. Data for indicator (a) will be analyzed using Excel and R. Data for Indicator 13.2 will be collected through a focus group with the CFLR Coordinator and contracting staff for the Fremont-Winema. Data for Indicator 13.3 will be collected through the business interview described under Question #12.

Who will Collect the Data?

The Ecosystem Workforce Program at the University of Oregon and Emily Jane Davis from Oregon State University. Davis will assist specifically with the business interview and Forest Service focus group component.

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

EWP already has access to the necessary Forest Service databases and will analyze the data specific to CFLR projects. They will also collect any necessary CFLR records from the Fremont-Winema NF. EWP and Davis will conduct a focus group with the CFLR Coordinator and contracting staff for the Fremont-Winema in Summer 2014. Business interview data will be collected in alignment with: 1) suitable times of the year (e.g. late fall) for contractors, 2) the Forest Service's required reporting timeline, and 3) the LSG's overall monitoring and reporting processes. This data and data for all other socioeconomic questions will be gathered for a baseline in Summer 2014, and repeated annually at this time of year. Data will be analyzed and prepared in a "working draft" report that contains analyzed data in condensed formats and basic written syntheses. This will be shared with the LSG in their October 2014 meeting to allow learning and adapting. The working draft will then be revised and finalized for inclusion in the larger annual monitoring report. The LSG will ensure that this report reaches stakeholders and businesses.

Where and How the Data will be Stored?

Data and metadata will be stored on the secure and password protected servers at the University of Oregon and Oregon State University. Business and Forest Service interview data storage will follow requirements for Human Subjects Research at UO and OSU, including password protection and confidentiality provisions if those are necessary. Data formats will include Microsoft Word, Excel, R, and Access. Data will also be stored on a password-protected computer at the Lake County Resources Initiative office in Lakeview.

Estimate of Budget:

It is not easily possible to break down monitoring costs by question; a final total budget estimate for all socioeconomic monitoring is available from EWP.

Question #14

What are the total and matching funds used?

CFLR encourages collaborative forest restoration. One indicator of collaboration and capacity is the amount of funds that the Forest Service, partners, and collaboratives are able to bring to restoration projects.

Table 31. Goals, Indicators, Scale, and Type of Monitoring for Question #14

Goals	Indicators	Scale of Monitoring	Type of Monitoring
To understand if CFLR is increasing the Forest Service and partners' abilities to raise and leverage funds	(Measured as annual amounts and change over time) 14.1. Total direct CFLR funds, total matching funds, and total leveraged funds	Lake County	National indicator

Description of Methodology

Indicator 14.1: Data on CFLR, matching, and leveraged funds will be collected from Fremont-Winema NF, LCRI, and other partner records and summed in Excel. Analysis will include breakdowns of funds by their source and use.

Who will Collect the Data?

The Ecosystem Workforce Program at the University of Oregon.

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

This data and data for all other socioeconomic questions will be gathered for a baseline in Summer 2014, and repeated annually at this time of year. Data will be analyzed and prepared in a "working draft" report that contains analyzed data in condensed formats and basic written syntheses. This will be shared with the LSG in their October 2014 meeting to allow learning and adapting. The working draft will then be revised and finalized for inclusion in the larger annual monitoring report. The LSG will ensure that this report reaches stakeholders and businesses.

Where and How the Data will be Stored?
If EWP is selected to collect the data, data and metadata will be stored on the secure and password protected server at the University of Oregon. Data will be in Excel and Word. Data will also be stored on a password protected computer at the Lake County Resources Initiative office in Lakeview.

Estimate of Budget:
It is not easily possible to break down monitoring costs by question; a final total budget estimate for all socioeconomic monitoring is available from EWP.

National Ecological Indicators

Each project is required to develope a set of indicators (Figure 1) that are evaluated based on each individual CFLR 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.

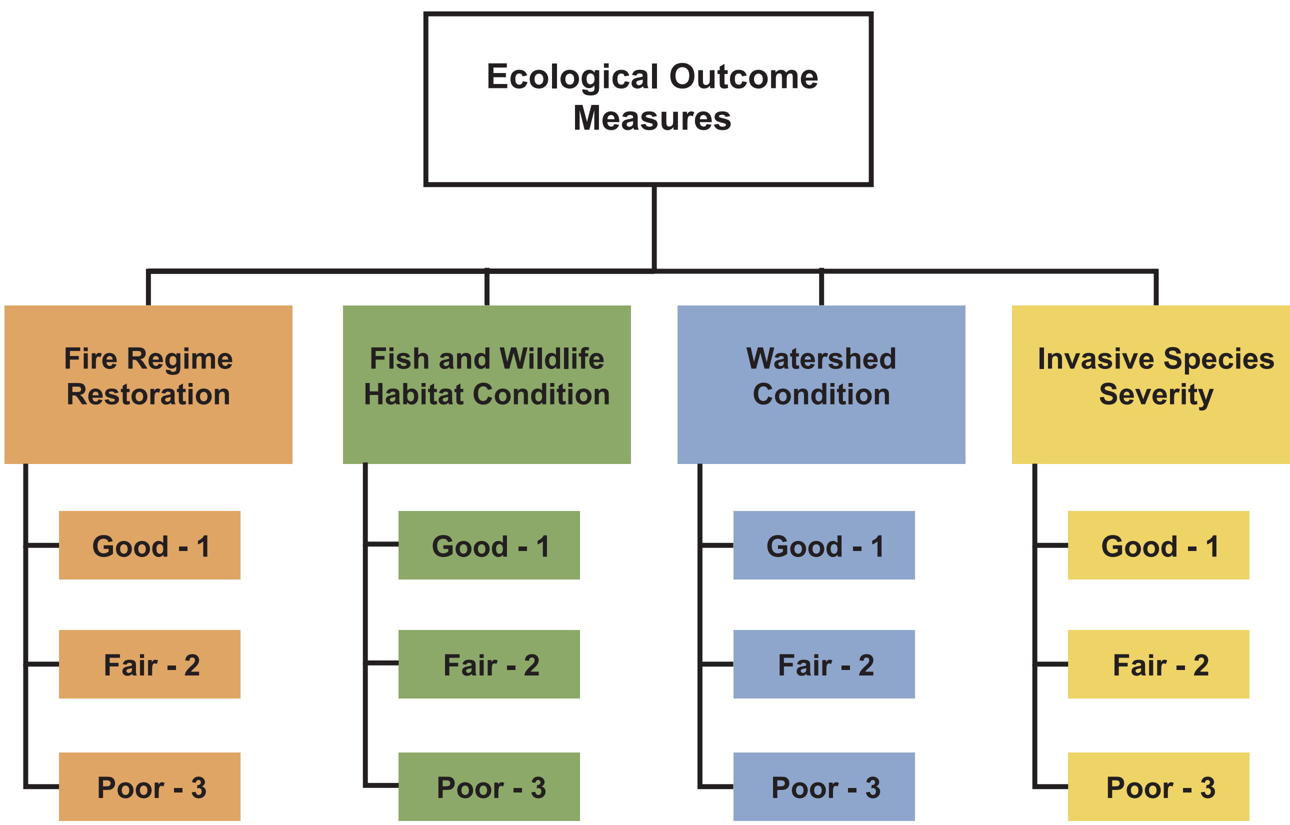
The Science Team identified desired conditions, indicators, and scoring for the Lakeview CFLR landscape for each of the Ecological Outcome measures. When possible, reporting for the National Indicators will be based on monitoring identified in this monitoring plan.

Ecological Outcome 1 – Fire Regime Restoration

Desired Conditions Target for Fire Regime Restoration: 100 percent change (relative to the desired condition) occurs across 7.3 percent of the landscape area by 2014.

The goal of the Lakeview CFLR Landscape is to return fire to the role it historically filled and thus return sustainability to the forested lands. The desired result is an ecosystem within its natural range of variability. Moving the landscape towards a sustainable range of variation should lead to reduced potential for fire growth and behavior, reduced fire suppression costs and risk. Treatments moving the Lakeview CFLR Landscape towards a more sustainable condition are designed to consider the scale and intensity of historic disturbances. 1. Reducing potential for fire growth and behav-

Figure 3. Ecological Outcome Measures



ior. The cumulative "footprint" of acres that show improved fire behavior: Data are not yet available to compare total acres with modeled Crown Fire at the end of FY 2011 ('Crown-A') with total acres with Crown Fire at the end of FY 2014 ('Crown B') using Landfire and/or GNN data. Therefore, best available information/data was used, where appropriate. Specifically, the FACTS database was used to determine treatment type. Professional judgment was used to assess the treatments ability to reduce the threat of stand-replacing fire. When data becomes available, we will use the following steps/data to determine percent change: "Crown-A' minus 'Crown-B' will equal acres of reduced Crown fire 'Crown-Reduced Footprint'. Cumulative footprint = area covered by 'Flame-Reduced Footprint' and/or 'Crown-Reduced Footprint' and/or 'Ground-Increased Footprint'. FlamMap/FARSITE will be used in conjunction with Landfire, GNN and FFI data to input fuel variables as prescribed in NEPA to show success of treatments.

<u>Assumptions/Metrics:</u> Treatments will reduce fuel loading and break-up vertical and horizontal fuel continuity within stands and across CFLR Landscape producing conditions where wildfires will have less damaging effects and can be more readily managed. It is assumed that treatments were designed and strategically placed during the NEPA process to contribute to desired CFLR Landscape conditions.

2. Moving landscapes towards a sustainable range (Fire Regime Condition Class (FRCC) rating). The cumulative "footprint" of acres that validate whether the Lakeview CFLR Landscape is moving towards a more sustainable condition: Data are not yet available to compare FRCC rating end of FY 2011 ('FRCC-A') with FRCC rating end of FY 2014 ('FRCC-B). 'FRCC-A' condition class departure minus 'FRCC-B' condition class departure equals = acres of improved rating 'FRCC-Improved Footprint'. Cumulative footprint = area of improved condition class 'FRCC-improved Footprint' validating whether the Lakeview CFLR Landscape is moving towards a more sustainable condition. Assumptions: All current determinations are based on photo points and Fire Regime Condition Class

definitions combined with local fire history records, determination by Fire Management Officer, and personal inquiry. FACTS database was used to determine treatment type, ability to reduce the threat of stand-replacing fire, and categorized by level of progress towards moving to desired conditions.

<u>Assumptions/Metrics:</u> It is assumed that treatments improve FRCC rating and were designed and strategically placed during the NEPA process to contribute to desired CFLR Landscape conditions.

Expected Progress toward Desired Condition in three years:

- Good = Expected progress is being made towards Desired Conditions across 4.9 percent or more of the CFLR landscape area (>23,541 acres).
- Fair = Expected progress is being made towards Desired Conditions across 2.5–4.8 percent of the CFLR landscape area (11,771–23,540 acres).
- Poor = Expected progress is being made towards Desired Conditions across less than 2.4 percent of the CFLR landscape area (<11,770 acres).

Ecological Outcome 2 – Fish and Wildlife Habitat Condition

Desired Conditions Target for Fish and Wildlife Habitat Condition: 100 percent change (relative to the desired condition) occurs across 4.6 percent of the landscape area by 2014.

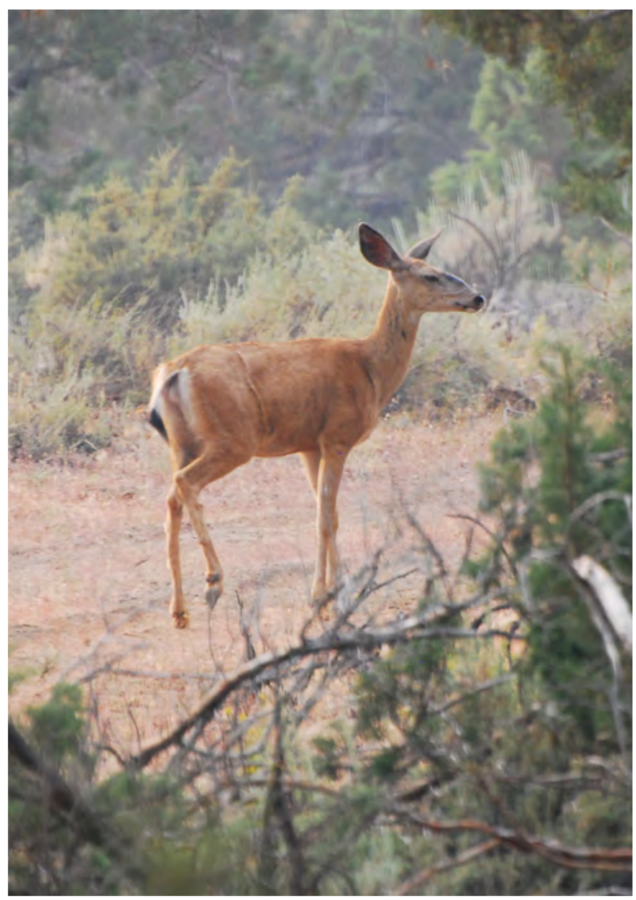
The desired condition is improved habitat for white-headed woodpeckers at the stand and landscape scale, reduction in overall road densities within the CFLR Project area and within riparian areas, and improved habitat for fish and wildlife species within aspen, stream, and riparian areas.

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 ponderosa pine. The desired condition is improved habitat for white-headed woodpeckers at the stand and landscape scale. 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.

<u>Assumptions/Metrics:</u> Mahalanobis and Maxent habitat suitability data have not been updated for 2014 to reflect changes in white-headed habitat. Therefore, acres treated will contribute to overall improved white-headed woodpecker habitat at stand and landscape level since individual treatment specifications are designed to restore ponderosa pine stands to an improved condition, which also improves open, dry forest habitat.

2. 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 in-stream conditions and/or conifer encroachment. The desired condition is improved habitat for fish and wildlife species within aspen, stream, and riparian areas. 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).

<u>Assumptions/Metrics:</u> CFLR Proposal stated 65 miles of stream habitat restored or enhanced and 26,000 acres of terrestrial habitat restored or enhanced by 2020.



Expected Progress toward Desired Condition in 3 years:

- Good = Expected progress is being made towards Desired Conditions across 2.9 percent or more of the CFLR landscape area (>23,541 acres; >5,721 acres).
- Fair = Expected progress is being made towards Desired Conditions across 1.6–2.9 percent of the CFLR landscape area (11,771–23,540 acres; 2,861–5,720 acres).
- Poor = Expected progress is being made towards Desired Conditions across less than 1.5 percent of the CFLR landscape area (<11,770 acres; <2,860 acres).

Ecological Outcome 3 – Watershed Condition

Desired Conditions Target for Watershed Condition: 100 percent change (relative to the desired condition) occurs across 12.7 percent of the landscape area by 2014.

1. 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.” To determine if watershed conditions are meeting the desired condition, all 6th field watersheds will be reassessed following updates to the WCF using 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. Watershed condition will be evaluating riparian/upland treatments on level of impact to ground vegetation and soils, and how projects (road closures, upland/riparian treatment, etc.) are impacting water quality. The WCF has not been updated since 2011. Therefore, data are not avail-

able to determine whether the 6th field watersheds have been maintained with a rating of "good" and improved to "good" in those watersheds currently rated as "fair."

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. 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.

Assumptions/Metrics: Treated acres will improve or maintain Watershed Condition. Total acres treated adjusted to nine years since CFLRP was not awarded until 2012. Road decommissioning as a stand-alone treatment is equivalent to 200 acres per mile of watershed improvement.

Expected Progress toward Desired Condition in 3 years:

- Good = Expected progress is being made towards Desired Conditions across 8.4 percent or more of the CFLR landscape area (average > 40,873 acres).
- Fair = Expected progress is being made towards Desired Conditions across 4.3–8.3 percent of the CFLR landscape area (average 20,436–40,872 acres).
- Poor = Expected progress is being made towards Desired Conditions across less than 4.2 percent of the CFLR landscape area (average <20,435 acres).

Ecological Outcome 4 – Invasive Species Severity

Desired Conditions Target for Landscape Scale Invasive Species Severity: 0.1 percent of the CFLR landscape area was restored by reducing invasive species severity (preventing, controlling, or eradicating targeted invasive species) to meet desired conditions by 2014.

1. The desired condition is to maintain native or desirable 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. The NRIS Invasive Species Inventory GIS layer and Forest GIS layer will be updated annually with all treatment data. This information will be used to determine the percent of CFLR landscape that was restored.

Assumptions/Metrics: CFLRP Proposal stated management of noxious weeds and invasive plants on 1,303 acres to be treated over 9 years.

Expected Progress toward Desired Condition in 3 years:

- Good = Expected progress is being made towards Desired Conditions across 0.07 percent or more of the CFLR landscape area (>287 acres).
- Fair = Expected progress is being made towards Desired Conditions across 0.04–0.06 percent of the CFLR landscape area (143–286 acres).
- Poor = Expected progress is being made towards Desired Conditions across less than 0.03 percent of the CFLR landscape area (<143 acres).

References

Agee, James K. and Skinner, Carl N. 2005. Basic Principles of Forest Fuel Reduction Treatments. Forest Ecology and Management. 211: 83–96.

Altman, Bob. 2000. Conservation strategy for landbirds in the northern Rocky Mountains of eastern Oregon and Washington. Version 1.0. Oregon and Washington Partners in Flight. Unpublished Report, 128 pp. *http://www.orwapif.org/pdf/northern_rockies.pdf.*

Anderson, P.D., Larson, D.J., & Chan, S.S. 2007. Riparian buffer and density management influences on microclimate of young headwater forests of western Oregon. Forest Science, 53, 254–269.

Ares, A., Terry, T.A., Miller, R.E., Anderson, H.W., & Flaming, B.L. 2005. Ground-based forest harvesting effects on soil physical properties and Douglas-fir growth. Soil Science Society of America Journal, 69, 1822–1832.

Ares, A., S.D. Berryman, and K.J. Puettmann. 2009. Understory vegetation response to thinning disturbance of varying complexity in coniferous stands. Journal of Applied Vegetation Science. 12(4): 472–487.

Avery, T. E.; Burkhart, H. E. 2002. Forest Measurements Fifth Edition. McGraw-Hill Series in Forest Resources. New York, New York.

Barrett, S.; Havlina, D.; Jones, J.; Hann, W.; Frame, C.; Hamilton, D.; Schon, K.; Demeo, T.; Hutter, L.; and Menakis, J. 2010. Interagency Fire Regime Condition Class Guidebook. Version 3.0 [Homepage of the Interagency Fire Regime Condition Class website, USDA Forest Service, US Department of the Interior, and The Nature Conservancy]. Available: http://www.frcc.gov/.

Bartholow, J.M. 2000. Estimating cumulative effects of clearcutting on stream temperatures. Rivers, 7, 284–297.

Brower, Zar & von Ende. 1990. Field and Laboratory Methods for General Ecology, 3rd Ed. Wm. C. Brown Pulishers, pp. 81–86. Quadrat and plot protocol.

Brower, Zar & von Ende. 1990. Field and Laboratory Methods for General Ecology, 3rd Ed. Wm. C. Brown Pulishers, pp. 87–92. Line intercept protocol.

Bull, Evelyn L. 1980. Resource Partitioning among woodpeckers in northeastern Oregon. PhD Dissertation, University of Idaho, Moscow. 109 pp.

Churchill, D. J., A. J. Larson, M. C. Dahlgreen, J. F. Franklin, P.F. Hessburg, and J. A. Lutz. 2013a. Restoring forest resilience: from reference spatial patterns to silvicultural prescriptions and monitoring. Forest Ecology and Management. 291: 442–457.

Churchill, D.J., M.C. Dalhgreen, A.J. Larson, and J.F. Franklin. 2013b. The ICO approach to restoring spatial pattern in dry forests: Implementation guide. Version 1.0. Stewardship Forestry, Vashon,Washington, USA.

DeBano, L.F. 2000. The role of fire and soil heating on water repellency in wildland environments: a review. Journal of Hydrology, 231–232, 195–206.

Dudley, J., and V. Saab. 2003. A field protocol to monitor cavity-nesting birds. USDA Forest Service, Research Paper RMRS-RP–44.

Elliot, W.J., Page-Dumroese, D., & Robichaud, P.R. 1999. The effects of forest management on erosion and soil productivity. Proceedings of the Symposium on Soil Quality and Erosion Interaction, Keystone, CO, July 7, 1996. Ankeney, IA: Soil and Water Conservation Society. 16 p. http://forest.moscowfsl.wsu.edu/smp/docs/docs/Elliot_1-57444-100-0.html.

Frenzel, R.W. 2004. Nest-site occupancy, nesting success, and turnover rates of white-headed woodpeckers in the Oregon Cascade Mountains in 2004. Audubon Society of Portland, Oregon Department of Fish and Wildlife, Bureau of Land Management, and U.S. Forest Service, Portland, OR. Unpubl. Rept. 35 pp.

Hollenbeck, Jeff, Victoria A. Saab, and Richard W. Frenzel. 2011. Habitat suitability and nest survival of white-headed woodpeckers in unburned forests of Oregon. Journal of Wildlife Management 75: 1061–1071.

Latif, Quresh S., Victoria A. Saab, Kim Mellen-McLean, and Jonathan G. Dudley. In review. Validation of habitat suitability models for nesting White-headed Woodpeckers using occupancy analysis. Submitted to Diversity and Distributions.

Latif, Quresh S., Victoria A. Saab, and Jonathan G. Dudley. 2012. Potential nesting habitat for White-headed Woodpecker in Deschutes and Fremont-Winema National Forests. USDA Forest Service, Rocky Mountain Research Station. Unpublished Report [on file Portland, OR].

Letey, J. 2001. Causes and consequences of fire-induced soil water repellency. Hydrological Processes, 15, 2867–2875.

Luce, C.H., & Black, T.A. 1999. Sediment production from forest roads in western Oregon. Water Resources Research, 35, 2561–2570.

Mellen-McLean, K., V. Saab, B. Bresson, B. Wales, A. Markus, and K. VanNorman. 2012. White-headed woodpecker monitoring strategy and protocols. USDA Forest Service, Pacific Northwest Region, Portland, OR. Unpublished document. 18 p.

Moore, R.D., & Wondzell, S.M. 2005. Physical hydrology and the effects of forest harvesting in the Pacific Northwest: a review. Journal of the American Water Resources Association, 41, 763–784.

Neary, D.G., Ryan, K.C., & DeBano, L.F. 2005 (revised 2008). Wildland fire in ecosystems: effects of fire on soils and water. Gen. Tech. Rep. RMRS-GTR-42-vol.4. Ogden,UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Nielsen-Pincus, Nicole. 2005. Nest site selection; nest success, and density of selected cavity-nesting birds in northeastern Oregon with a method for improving accuracy of density estimates. M.S. Thesis. University of Idaho, Moscow. 96 pp.

Sundstrom, S., C. Moseley, E.J. Davis. And M. Nielsen-Pincus. 2011. A quick guide to monitoring economic impacts of ecosystem restoration and stewardship. Ecosystem Workforce Program, University of Oregon.

USDA Forest Service. 2002. Photo Point Monitoring Handbook. General Technical Report PNW-GTR-526.

USDA Forest Service. 2009. Forest Soil Disturbance Monitoring Protocol. General Technical Report WO-82a.

USDA, USDI. 2002. A Collaborative Approach For Reducing Wildland Fire Risks to Communities and the Environment. 10-Year Comprehensive Strategy, Implementation Plan. Washington, D.C. 27 p.

Wightman, C., V. Saab, C. Forristal, K. Mellen-McLean, and A. Markus. 2010. White-headed woodpecker nesting ecology after wildfire. Journal of Wildlife Management 74(5):1098–1106.

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-siting 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:

- 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.
- Clump size: number of historic trees in clump, using distance of 20'.
- # Live old: Number of live-old trees in clump, plus average dbh of these tree(s).
- # Stumps: Number of historic stumps in clumps + average d-stump height (dsh), inside bark.
- # 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).
- # 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).
- 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.

- Clump ID: Clump ID from above
- Tree ID: live tree number in that clump (1, 2, 3, 4,etc)
- Species
- DBH
- DSH (diameter at stump height)
- Age class from visual estimation: very old (VO)>250; old (O) 150–200; mature (M) 100–150; young (Y) <100.
- Crown Class: D: dominant; CD: co-dominant; I: Intermediate; S: Suppressed
- Hgt: Tree Height

APPENDIX B Cont.

- Ring Age: Total age counted from tree rings in field
- Measurement to year 1900 (110 rings from core edge). Mm is preferred. Can use 1/10th inches, but specify on datasheet.
- Notes:

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