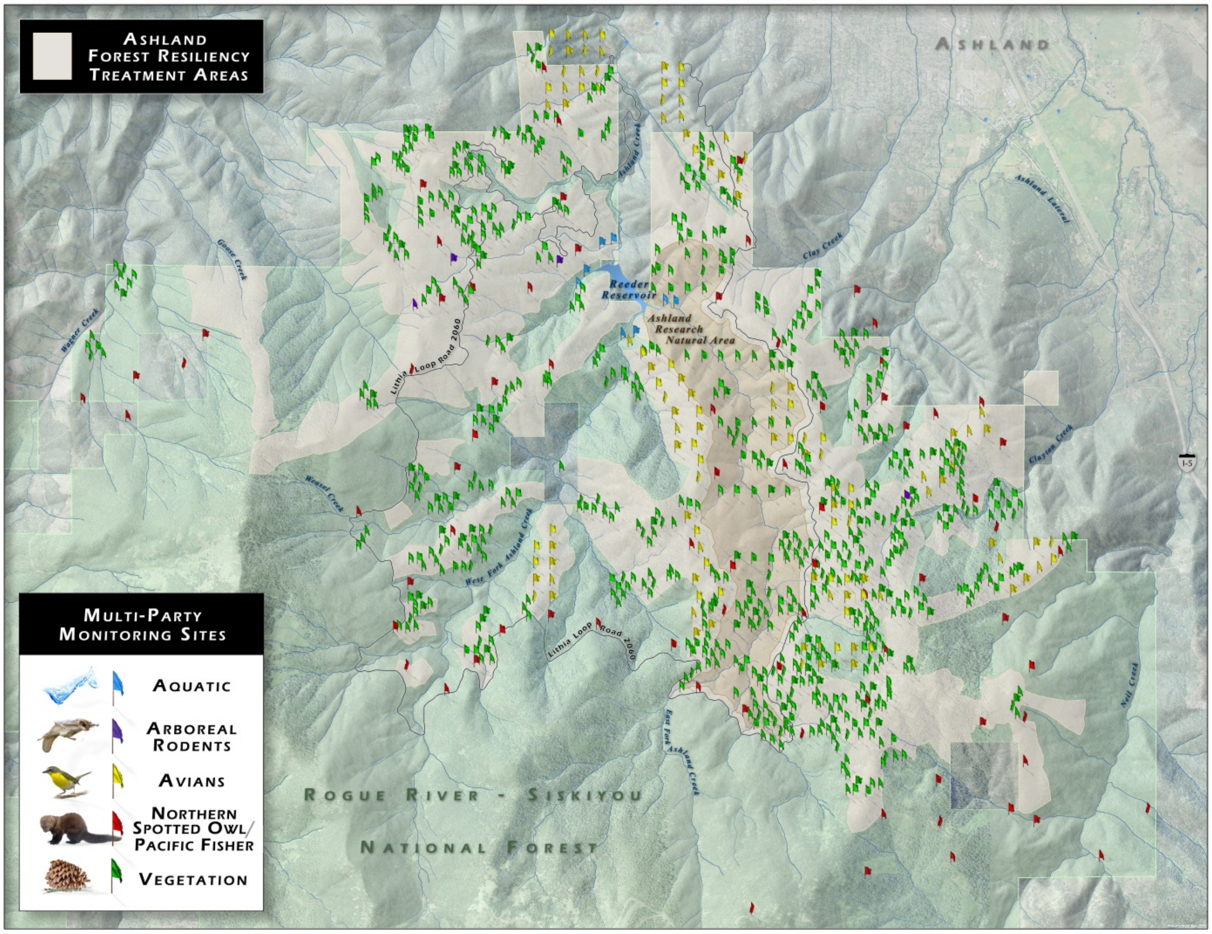
DRAFT Updated Ashland Forest Resiliency Stewardship Project Monitoring Plan - June 2017



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Executive Summary

The Ashland Forest Resiliency Stewardship Project (AFR) entails three primary levels of multiparty monitoring. Administrative monitoring tracks money spent and jobs generated. Implementation monitoring evaluates actions taken relative to the Purposes and Need from the Record of Decision and stakeholder concerns, i.e. "social license". Effectiveness monitoring evaluates how well the project addresses a stakeholder-derived suite of ecological and social concerns. All monitoring components strategically address stakeholder concerns and provide a framework to guide adaptive management.

Cooperators initiated multiparty monitoring in the Ashland watershed to supplement the United States Forest Service (FS) implementation monitoring and to provide information for adaptive management of AFR. This collaborative effort is supported by personnel from the FS, The Nature Conservancy (TNC), Lomakatsi Restoration Project (LRP), the City of Ashland (COA), Southern Oregon University (SOU), the National Park Service (NPS), Klamath Bird Observatory (KBO), and citizen scientists. Expertise and effort on the part of these collaborators has been augmented by volunteer efforts from individuals associated with the Ashland community and SOU students.

Implementation success is indicated by acres treated, conformance to design elements, and how well the prescription targets were attained. Key indicators include fuel model, tree basal area, snag and down wood abundance, quantity of soil disturbance, exotic species presence, overstory canopy cover, and impacts on late successional wildlife habitat with measurement effort scaled to likelihood of impact by resource specialists. In all treated units, change in fuel model is evaluated. In all density management units, basal area and canopy closure are measured before and after treatments. Prescribed burned units are evaluated relative to how they achieve desired vegetation density reduction while minimally impacting legacy trees, large wood, and effective ground cover.

Social monitoring was initiated in 2009 with a survey of AFR stakeholders and has been developed into a longitudinal survey of Ashland registered voters running from 2012 to 2017 conducted by SOU. The Implementation Review Team (a targeted group of technical stakeholders) and regular public tours provide additional barometers of engaged stakeholder support.

Ecological monitoring priorities developed by the stakeholders focused on water quality and quantity; large tree retention and survival; late successional habitat; bird habitat; herbaceous recovery and response, as well as stakeholder initiated research into local fire history. Monitoring is informed by aerial photographs and LiDAR taken in 2006 and 738 permanent Common Stand Exam Plots (CSE) stratified throughout and around the project area in 2009 and 2010. The sample design of the CSE plots characterizes the entire watershed, relying on implementation and separate effectiveness monitoring to quantifying treatment impacts at a unit scale. Primary indicators are species composition, tree density, quadratic mean diameter, fuel loadings, and representative photographs taken before and after treatment.

To monitor water quality, quantity, and aquatic habitat, four permanent transects were established in tributaries to Ashland Creek. Key indicators measured annually since 2010 are residual pool depths, substrate embeddedness, canopy closure, in-stream large wood, and aquatic macroinvertebrate assemblages. Macroinvertebrate sampling has been largely coordinated by SOU and continued sampling has been built into an ongoing entomology class. In addition, the COA developed topographic maps of the underwater sediments

building up in Reeder Reservoir and the sediment catchment ponds above, on the east and west forks of Ashland Creek.

The effectiveness of proposed treatments at retaining the largest trees and augmenting old growth survival are evaluated both on the CSE plots and at individual trees targeted to the actual treatment areas. Individual legacy tree monitoring evaluates 45 trees of four different species treated with a single commercial thinning entry, commercial thinning following non-commercial treatment, and no treatment. Indicators are old growth tree survival, radial growth, vigor, and tree mortality data for the watershed, based on aerial detection surveys performed by US Forest Service Forest Health Protection and Oregon Department of Forestry staff.

Late successional habitat quality and abundance is inferred through wildlife indicators. Population size and habitat use by the Northern Spotted Owl, Pacific Fisher, and arboreal rodent populations are monitored by personnel from the Rogue River-Siskiyou National Forest, Oregon State University, and the USFS Pacific Northwest Research Station, along with TNC, SOU, and volunteers. Vegetation metrics that reflect late successional habitat were measured at the CSE plots and these data were used to generate a multispectral biophysical model to imputed overstory metrics across the project area. Indicators include canopy cover, basal area, trees per acre, and quadratic mean diameter.

Landbird assemblages provide indicators of changing habitat characteristics. Klamath Bird Observatory completed pre-treatment point count surveys in the proposed project area from 2005 to 2007, and has operated a mist-netting and banding station in the Ashland Watershed from 2005 to 2012, providing baseline information about bird communities. To measure potential bird community changes due to fuel reduction treatments KBO also initiated a new study in the Ashland Watershed in 2012 based on units currently planned for commercial thinning with two visits to 14 routes including both treatment and control sites. Indicators of desired ecological conditions are bird community composition and abundance.

The Nature Conservancy staff completed supplemental monitoring of the herbaceous understory on 180 of the CSE plots in the driest biophysical settings in 2010. Indicators are herbaceous cover, richness, and composition.

The fire history for three locations in the watershed was assessed in 2006 by the USFS Pacific Southwest Research Station. Fire histories across a range of biophysical settings have been completed by TNC staff with additional funding and will continue to inform treatment design and evaluation.

Monitoring indicators are used to increase project transparency and public outreach. Indicators also help guide project planning and inform adaptive management. Every attempt will be made to archive the data with TNC and when it is obtained it will be freely available.

Base funding for monitoring coordination is available through 2018 but the framework spelled out here should allow effective fundraising to provide a rigorous evaluation of treatment effects on the landscape. Wildlife and birds can respond rapidly to treatments continued monitoring of their population dynamics annually or possibly biennially. Vegetation measures are typically slower to respond and remeasurement 5 or more years after treatment may be appropriate. Water quality metrics are closely tied to weather patterns and cost effective, and have been measured annually.

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Background

The Ashland Forest Resiliency Stewardship Project (AFR) was developed by the Forest Service (FS) with substantial input from stakeholders including the City of Ashland (COA), concerned local citizens, and The Nature Conservancy (TNC). The FS planning process incorporated key design elements generated by local stakeholders as a "community alternative". From the Purpose and Need in the Record of Decision (ROD), AFR addresses the Need to:

1) Protect values at risk, including:
   a. water quality including the Ashland municipal water supply
   b. threatened species and late successional habitat
   c. human life and property associated with the wildland/urban interface
   d. composition, structure, and processes of ecosystems including diversity of plant and animal communities and the productive capability of ecological systems
   e. legacy pine and Douglas-fir
2) Reduce hazardous fuels
3) Reduce crown fire potential
4) Create forest conditions that are more resilient to wildland fires

The AFR partnership is composed of representatives from the FS, COA, LRP, and TNC, legally enabled under a Master Stewardship Agreement and a Supplemental Project Agreement to execute AFR. Under this agreement, the Partner's share responsibilities for all facets of the project, including monitoring and faithful implementation of AFR as described in the FEIS and the ROD.

During the development of AFR, adaptive management and the desire for multiparty monitoring were highlighted, reinforcing the basic requirements for the project planned under the Healthy Forests Restoration Act (HFRA). These two components are interrelated with meaningful, quantifiable measures of relevant indicators necessary for guiding subsequent management. The term "monitoring", as it is used here, includes both making observations (e.g. data collection), and evaluation of data.

Multiparty monitoring is a process of engaging multiple stakeholders in discussions, information gathering, and mutual learning with a primary objective of increasing project level trust, transparency, and accountability. Within AFR this involves three types of monitoring: 1) Administrative monitoring addresses types of information tracked for the project, such as money spent, jobs created, funding generated, 2) Implementation monitoring evaluates adherence of the actions on the ground to the design, implementation guidelines and prescriptions developed for treatments, 3) Effectiveness monitoring goes beyond the question of, "did we screw it up," to evaluate how well the implemented treatments have achieved the desired outcomes relative to stakeholder concerns. Two types of effectiveness monitoring are used here: 1) Social monitoring allows for consideration of stakeholder concerns periodically throughout the life of the project as well as a measure of outreach effectiveness for reaching the larger community, 2) Ecological monitoring is concerned with the desired ecological outcomes from the project.

Beginning in 2004 the USFS, TNC, COA, and LRP have worked together with interested stakeholders to develop Multiparty Monitoring for the project. Efforts accelerated in 2009 with funding from the National Forest Foundation and the creation of the Monitoring Advisory Committee (MAC). The directive for this group of technical stakeholders was to advise partners on effective monitoring to build understanding and transparency of the project while supporting adaptive management. Interested stakeholders were invited to a workshop in June of 2009 where the following variables were elevated for attention, in order of priority:

1) Water Quality, Quantity, and Aquatic Habitat
2) Large Tree Retention and Survival
3) Late Successional Habitat
4) Bird Habitat
5) Herbaceous Cover and Recovery

Three key strategic approaches were elevated:

1) Completing Monitoring Plan to deliver science
2) Using example marking to facilitate dialogue
3) Developing fire histories

A Monitoring Strategy was drafted by the MAC and included as Appendix TP-A (available online) of the Master Stewardship Agreement and Supplemental Project Agreement. This Monitoring Plan clarifies expectations and roles proposed in that Monitoring Strategy. Implementing the Monitoring Plan is subject to available funding among all parties and other interested stakeholders. Funding from the American Recovery and Reinvestment Act of 2009 provided personnel funding to guide and coordinate the Multiparty Monitoring through September of 2013, and funding from the Joint Chiefs Program and the Oregon Watershed Enhancement Board extend this funding through 2018. This funding will provide a baseline for administrative and implementation monitoring of AFR as well as establishing a foundation and sampling protocols for evaluating treatment effects when further funding sources have been identified.

External technical review of proposed and ongoing work is provided by the Implementation Review Team (IRT), composed of representatives from three organizations deeply involved in local forest management issues. The IRT is convened by The Nature Conservancy and meets periodically as detailed project implementation plans are prepared and packaged by AFR partners for review, and after treatments. The role of the IRT is to provide technical advice to AFR cooperators on proposed and completed implementation of treatments and activities. Review includes evaluation and discussion of implementation plans and their consistency with the overarching project goals and design. The practice of the IRT is to review unit maps, boundaries, prescriptions, marking, operations plans, mitigation provisions, and monitoring results.

Example marking is utilized where trees >8 inches in diameter at breast height (4.5 feet) will be harvested commercially. This facilitates review among AFR partners, with the IRT, and with public.

Fire histories and historical forest conditions are being developed with $500,000 Northwest Conservation Fund grant secured by The Nature Conservancy (Appendix 1). These data help refine prescriptions based on forest setting and provide a baseline for prescribing different stand treatments across a larger landscape.

Multiparty monitoring is guided broadly by stakeholder concerns and driven by engaged citizens and educational groups. Seminars, classes, and capstone students from Southern Oregon University are primary mechanisms for identifying priorities, collecting raw data, summarizing, and presenting monitoring results. Contact information for critically engaged stakeholder can be found in Appendix 2.

Multiparty Monitoring Goals

The goals overarching goals of this multiparty monitoring are to:

a. Evaluate project implementation relative to stakeholder interests and project design.
b. Inform adaptive management, particularly for the 10-year life of the project.
c. Evaluate public awareness of and support for the project.
d. Evaluate treatment short- and long-term impacts on stakeholder identified ecological indicators

Administrative Monitoring

In addition to the collaborative process, AFR must navigate many legislative and administrative channels: a ten-year stewardship agreement is the vehicle for treating 7,600 acres in the Rogue Siskiyou National Forest under this analysis. A stewardship agreement requires high levels of collaborative interaction and co-investment in the outcomes. As such, the efficacy of this vehicle for promoting forest work will be rigorously evaluated. Considerably more attention is paid to the project because much of the project area is in the City of Ashland municipal watershed, McDonald Peak designated Inventoried Roadless Area, and is identified as Late Successional Reserve under the Northwest Forest Plan. 1,408 acres of the project area is the Ashland Research Natural Area, established in 1970 to represent "Pacific" ponderosa pine (*Pinus ponderosa*) and ponderosa pine-Douglas-fir (*Pseudotsuga menziesii*) forests found west of the Cascade Range in southern Oregon and here restoration is prioritized.

In 2009 the project received American Recovery and Reinvestment Act funding to conduct the proposed stewardship on roughly 3100 acres and to initiate Multiparty Monitoring. Many socioeconomic indicators are tracked as part of accounting process associated with ARRA which funds the first four years of the project. Subsequently, funding from the Joint Chiefs and timber receipts have allowed the work to continue. Quarterly activities are reported by the grant administrator (LRP) with substantial input from the AFR partnership board (Table 1). The FS project administrator regularly reviews the sustainability of the project, including funding revenues generated and the overall fiscal health of AFR partnership. Acres of various treatment types are summed quarterly. Finally, as part of the social engagement and outreach AFR partners closely track public events and publications (outreach) associated with the project (Table 1). The data associated with administrative monitoring are archived in an Access database housed by TNC.

Table 1: Ashland Forest Resiliency Stewardship Project administrative monitoring questions.

Category	Indicators	Schedule	Responsible Party*
Grant accountability	Money spent	Quarterly accounting	Justin Cullumbine (LRP)
	Activities	Quarterly accounting	Justin Cullumbine (LRP)
	Acres	Quarterly accounting	Justin Cullumbine (LRP)
	Jobs created	Quarterly accounting	Justin Cullumbine (LRP)
	Outreach	Quarterly accounting	Justin Cullumbine (LRP)
Project sustainability	Funding generated	Annual review	Don Boucher (FS)
	Cooperative status	Annual review	Don Boucher (FS)
Project outreach	Public events	Monthly accounting	Chris Chambers (COA)
	Publications	Monthly accounting	Chris Chambers (COA)

* COA=City of Ashland; FS=US Forest Service; LRP=Lomakatsi Restoration Project

Implementation Monitoring

Multiparty monitoring of implementation evaluates adherence to the overarching project design, guidelines, and prescriptions. However, this effort is tiered with primary responsibility assumed by the FS. Collaborators have added additional implementation oversight (Table 2). At its most basic implementation monitoring keeps track of the number of acres treated by treatment type and monitors adherence to the FS standards and guides. Geospatial data on treatment locations are available from TNC. The FS is responsible for documenting adherence to the standards laid out by the ROD. The AFR ROD provides guidelines for expected and acceptable changes to coarse woody debris (Table 3), snags, soils (Table 4), and hazardous fuels (Table 5).

Quantification of these changes involves a walk-through and professional opinion, or when greater precision is needed, data collection. When data are required, multi-organizational crews are involved. Importantly, not all settings or treatments are likely to require the same rigor of monitoring. For fuels, soils, and sensitive plants the determination of sampling protocol is made by the FS specialists. Additional oversight of implementation comes with frequent public tours and has further been enabled with the creation of the IRT.

Table 2: Indicators representative of how well project goals have been achieved are measured on regular intervals by responsible parties as part of Ashland Forest Resiliency implementation monitoring.

Goals	Indicators	Schedule	Responsible Party*
Implementation success	Acres treated	Quarterly accounting	Don Boucher (FS)
Implementation success	Basal area/acre	Pre- and Post-treatment	Marty Main (COA), Justin Cullumbine (LRP)
Habitat maintained	Canopy cover, canopy layers, professional judgment	Post-treatment	Dave Clayton (FS)
Snags and woody debris retained	Snags and coarse woody debris/acre	Pre- and Post-treatment	Marty Main (COA)
Hazardous fuels reduced	Change in fuel model	Pre- and Post-treatment	Robert Marshal (FS)
Soils minimally disturbed	Detrimental soil disturbance, Effective ground cover	Pre- and Post-treatment	Joni Brazier (FS)
Minimal impact to important plants	Plant distribution and abundance	Pre- and Post-treatment	Clint Emerson (FS)
Legacy trees retained	Large trees in units	Pre- and Post-treatment	Kerry Metlen (TNC)

* COA=City of Ashland; FS=US Forest Service; LRP=Lomakatsi Restoration Project

<u>Pretreatment Tree Monitoring</u>

Stakeholder concern: Prescriptions should be site specific and evaluation of treatment impacts requires a record of pretreatment vegetation

Indicators: Aerial imagery, the species, size, and density of trees, canopy closure, coarse woody debris abundance

Using airborne LiDAR, orthorectified imagery taken in 2006, and extensive experience on the ground, the COA first delineated stands (5 acres minimum) based on forest type in accordance with design elements in the ROD. In each unit a modified stand exam protocol was used with a minimum of 5 plots distributed throughout potentially harvested areas while avoiding exclusions (e.g. landslide hazard zones). At these plots species composition, trees/acre and basal area of trees > 5 in DBH were collected using a variable radius plot. Conifer seedlings and saplings <5 in DBH where counted by size class on a 1/100th acre fixed radius plot with hardwood seedlings and saplings collected on the first quarter of the plot. Canopy cover was measured with a spherical densiometer and down wood >3 inches in diameter was measured on a 50 foot transect. These data will be used to augment the professional opinion of the COA contract forester and project cooperators to guide prescription development and to subsequently evaluate treatment implementation. All data will be entered into FSVeg and in a more readily assessable, to be determined, location with AFR monitoring data.

<u>Forest Structure After Commercial Thinning</u>

Stakeholder concern: Treatments must adhere to constraints of the Record of Decision and certified prescriptions

Indicators: Tree basal area, canopy closure, snags, and downed wood

In those stands receiving commercial thinning (treatments where merchantable sized timber will be removed) commercially sized trees (>8 inches diameter at 4.5 feet) will be marked with paint, identifying them for removal prior to treatment. The marking crews, composed of LRP and COA employees, will record the diameter and species of every tree to be removed (cut-tree). The diameter distribution of cut tree lists will be evaluated and inform implementation feedback. In addition, LRP will grid each subunit with >10 variable radius basal area plots immediately after non-commercial thinning has taken place and immediately after cut-tree designation has taken place. Plots will include no-cut areas such as Fisher Leave Blocks and Landslide Hazard Zones in order to characterize stand level densities, but the data will also be used to evaluate adherence to the prescribed density targets within the treated areas. Data will be placed in a database and available upon request.

During the designation of trees to be removed for density management, basal area will be used as a surrogate for canopy cover with basal area targets likely to achieve the desired canopy cover derived from existing stand composition and the certified silvicultural prescriptions. After treatment implementation, measurements with a handheld spherical densiometer and, when available, LiDAR will be used to evaluate the relationship between canopy cover and basal area and to inform adaptive management but not to determine treatment success.

TNC and COA will also conduct systematic surveys to look for unauthorized harvest of legacy trees. These surveys will look for legacy trees that have been marked to cut (before treatment) and will also look for large stumps that were cut but should not have been (during and after treatment implementation).

The need for snags and downed wood (Table 3) will be determined during prescription development and success at achieving those targets for individual subunits will be determined primarily by professional opinion of the COA contract forester and FS project administrator. In lower slope positions snags per acre will meet the upper one third of the recommended range described by Plant Association Group in the 2003 Upper Bear Assessment (2.7 snags >20 inches DBH) and when deficiencies are noted new snags will be created. In upper slope positions snags will be retained whenever possible while mitigating for wildfire management hazards but no new snags will be intentionally generated.

Table 3: Target number of pieces (> 20 feet in length) of coarse woody debris to be left after treatments associated with the Ashland Forest Resiliency Stewardship Project.

Plant Association Group	Diameter Class		
	< 10"	10"-19.9"	>20"
Dry Douglas-fir	54-93	0-7	0-9
Moist Douglas-fir	54-122	0-7	0-9
Dry white fir	0-94	0-7	0-9
Moist white fir	0-67	0-12	0-11
Cool white fir and moist mountain hemlock	0-69	0-11	0-11
Cool mountain hemlock	0-35	10-33	0-11

Northern Spotted Owl Habitat

Stakeholder concern: Treatments will negatively affect Northern Spotted Owl Habitat

Indicators: Canopy cover, tree canopy layers, snags, coarse wood

Authorized limited impacts of treatment on designated critical habitat for the Northern Spotted Owl (NSO) were analyzed during project development primarily in terms of suitable nesting, roosting, and foraging (NRF) habitat, based on GRS modeled stand conditions and project strategic category (Table 6). Quantification of treatment impacts on suitable habitat will be limited to subunits where density management is occurring; The ROD (FEIS F-17) assumes that in subunits where only non-commercial SL work will be implemented that treatments would have a no significant impact on suitable habitat (Table 6).

Canopy cover is the primary metric for determination of downgraded acres but number of canopy layers, and abundance of snags and coarse wood are also important determinants of NSO NRF habitat suitability. In all instances the professional judgment of the Forest Service and U.S. Fish and Wildlife Service biologists will take precedent for determining habitat status. Treatments that alter forest structure but retain canopy cover >60% "maintain" NRF habitat without altering its function. Treatments that reduce canopy cover below 60% to a minimum threshold of 40% will "downgrade" habitat functionality to dispersal only (FEIS F-17, BO 6-7). Thinning that reduces canopy cover below 60% on patches <0.5 acre do not count as downgraded acres and in no case will the project create openings >0.5 acre with < 40% canopy closure in NSO suitable NRF habitat. A maximum of 1,292 acres may be downgraded project-wide and can occur in portions of home ranges (0.5-1.3 mile) but will not exceed the maximum acres allocated by nest site (Table 7). Across the entire planning area treatments that maintain habitat will also occur within an additional 4,773 acres of NRF and 988 acres of dispersal habitat.

Table 6: Modeled impact, maximum treatment, and minimum canopy cover requirement relative to Northern Spotted Owl (NSO) suitable habitat outside of the 0.5 mile NSO core areas.

Strategic Category	Habitat[1]	Modeled impact	Maximum treatment[2]	Minimum canopy cover[3]	Percent of subunit[4]	Acres of downgrade[5]
Strategic Ridgeline Area	NRF	Maintain	DM	60%	NA	0
	Dispersal	Maintain	DM	40%	NA	0
	Non-habitat	NA	S/L	NA	NA	0
Fuel Discontinuity Network or Research Natural Area	NRF	Maintain	DM	60%	NA	0
	NRF	Downgrade	DM	40%	<15%	Patch area
					>15%	Subunit area
	Dispersal	Maintain	DM	40%	NA	0
	Non-habitat	NA	S/L	NA	NA	0

1. Modeled habitat; NRF = suitable nesting, roosting, foraging, >60% CC and 17” QMD; Dispersal = >40% CC and 11” QMD; Non-habitat = < 40% cc
2. S/L= surface and ladder fuel treatment; DM = density management (commercial removal)
3. Minimum canopy cover is based on entire subunit, including Riparian Reserve and fisher leave blocks
4. Percent of subunit area includes existing gaps, LHZ's, Fisher Leave Blocks and other inclusions
5. Downgrade acres are where treatments reduce canopy cover in suitable NRF to 40-60% over >1/2 acre

Table 7: Acres of suitable nesting roosting and foraging habitat modeled within NSO home ranges before and after treatment with acres available to downgrade. Home ranges may overlap and thus acreages are not additive. Table modified from Table III-24 in the FEIS to the AFR ROD (2009).

NSO Site	Pretreatment NRF	Post-treatment NRF	Available to Downgrade
2007	2290	2276	14
2013	2777	2674	103
2019	2639	2554	85
2023	2418	2333	85
2024	2316	2306	10
2043	2805	2690	115
2046	1616	1417	199
2049	2610	2595	15
2051	2691	2466	225
2071	2483	2359	124
2013A	2762	2741	21
ARRA Funded:			**436**
Entire Project:			**1292**

Prescribed Burning

Stakeholder concern: Prescribed burning is needed to reintroduce the effects of cool fire, but detrimental fire effects need to be minimized

Indicators: Fuel model, canopy base height, canopy closure, fuel abundance, vegetation density, immediate mortality, effective ground cover, large down wood and snags

In 2014, AFR partners agreed to a suite of eight prescribed burn objectives, which the fire effects monitoring tracks on every broadcast underburn:

1. Reduce litter and light surface fuels (1 to 100 hr) by 30 - 80%
2. Reduce understory trees (< 5" dbh) and shrubs by 30 - 80%
3. Limit mortality of intermediate trees (5-12" dbh) to < 40%
4. Retain > 90% dominant/codominant trees (> 12" dbh)
5. Minimize mortality of legacy trees (large, old trees with complex form, providing important habitat value)
6. Retain overall effective ground cover for the unit based on soil erosion hazard class: Moderate (< 35% gradient), > 60% year-1, > 70% year-2; Severe or higher (> 35% gradient), > 70% year-1, > 85% year-2
7. Retain approximately 90% large down logs or snags (>20" diameter)
8. Minimize fire intensity in leave areas

Each objective is linked to a specific monitoring indicator recorded in pre- and post-burn plots, with additional metrics to characterize the unit or inform fire or smoke modeling, and repeat photographs to document fire behavior and effects. Monitoring plots are 0.1 ac, circular, and distributed throughout the unit to capture the range of fuels, topographic settings, stand types, and fire effects. Pre-treatment plot data are collected shortly before the burn. Fire effects monitors record fire weather, behavior, and ignitions during the burn. Post burn data and photos are collected in the fall to allow for full canopy scorch and litter-fall to manifest. In addition to plot-level data, a stratified post-burn unit walk-through maps the final perimeter, and assess some objectives not captured at the plot scale (Appendix 3).

Smoke Dispersion

Stakeholder concern: Smoke will impact Ashland residents

Indicators: Patterns of smoke dispersion

Monitoring smoke dispersion will occur during implementation, following careful planning for the burns and monitoring of weather forecasts to identify favorable weather conditions. Test piles will be ignited and smoke observed to determine if appropriate dispersion patterns will occur. Observers at a distance will relay information about smoke patterns as work progresses and ignitions will be adjusted to achieve stated objectives.

In November 2015 a Met One E-sampler was installed at the Ashland Fire Station #1. It collects hourly air quality samples and can thereby be used to track smoke over time. The hourly data are archived annually with other AFR data. The Met One E-sampler is not an EPA federal reference and is not used to determine air quality compliance. Furthermore, it has been shown to over-predict smoke concentrations by 8-18% necessitating a correction factor (Trent 2006) and sensitive to small perturbations, such as cobwebs on the sensor, necessitating significant quality control.

Change in Fuel Model

Stakeholder concern: Treatments will not reduce fire behavior
Indicators: Change in fuel model

Table 5 presents the desired changes from an array of treatments including burning. These will be evaluated after treatment implementation using a fuel photo series developed collaboratively by engaged public, the FS, and TNC.

Table 5: Assumed change in fuel model (Scott and Burgan 2005) with proposed treatment associated with the Ashland Forest Resiliency Stewardship Project.

	Resulting Fuel Model by Proposed Treatment					
Current Fuel Model	Prescribed burning only	Surface fuel treatments (HP 7 Burning)	Surface fuel treatments (HP, burn, & pruning)	Thin from below to 0.3.-0.5 RSDI	Thin from below to 0.4-0.6 RSDI	Thinning around legacy trees
TU1	TL1	TL1	TL1	TL1	TL1	TL1
TU2	TU1	TL1	TL1	TU1	TL1	TL1
TU5	TL3	TL3	TL1	TU2	TU1	TU2
TL3	TL1	TL1	TL1	TL1	TL1	TL1
TL5	TL3	TL3	TL1	TU2	TU1	TL1
TL8	TL1	TL1	TL1	TL1	TL1	TL1
TL9	TL8	TL2	TL2	TL2	TL2	TL1
SH7	SH4	SH4	SH4	NA	NA	NA
SH8	SH4	SH4	SH4	NA	NA	NA

Soil Disturbance and Effective Ground Cover

Stakeholder concern: Equipment associated with commercial logging will negatively impact soils
Indicators: Detrimental soil prevalence and effective ground cover

In operational units where trees will be removed using a skidder, pretreatment soil disturbance and effective ground cover data will be compared to post treatment data. For all other operational units the FS soil scientist will utilize professional judgment and collect supplemental data as needed.

Soil disturbance is bounded by maximum allowable detrimental soil disturbance (Table 4). The limits were set relative to existing detrimental soil conditions, excluding the permanent transportation system. No more than 5% of the project area will experience detrimental soil conditions where no prior soil disturbance was observed. Where <20% of the site has preexisting detrimental soil conditions, management activities will add no more than 5% detrimental disturbance beyond the existing condition, not to exceed 20% total. Where >20% of the site is in a detrimental soil condition from prior activities the net impact will be to decrease the total area of detrimental impact with no detrimental impacts where soils were previously undisturbed and less than 5% impact on previously disturbed soils.

Table 4: Soil disturbance assesses five potentially detrimental soil conditions. Displaced and burned soils refer to a contiguous area >100 square feet which is >5 feet wide.

Disturbance	Definition
Compaction	Increase in bulk density of ≥15%, reduction in macropore space by ≥50%, and/or a reduction below 15% macro porosity
Puddling	Soil deformation with ruts or imprints ≥ 6 inches
Displacement	Removal of >50% of the A horizon
Burned	Mineral soil significantly changed in color, oxidized to a reddish color, and the next ½ inch of blackened
Surface erosion	Surface soil loss 100 feet through sheet, rill or gully erosion over a contiguous area >100 square feet, or a reduction in effective ground cover below the acceptable thresholds

Effective ground cover is any material which is attached to or lying on the mineral soil surface, which is critical for slowing surface soil movement. The Rogue River National Forest Land and Resource Management Plan (LRMP) and the Record of Decision for AFR both have specific guidelines for how much EGC needs to remain after treatments are complete, with the AFR criteria based on project level soil information and modeling. Effective ground cover minimum requirements are based on soil erosion class. In the moderate erosion class (<35% gradient), effective ground cover of >60% is required in the first year after treatment and >70% is required after the second year. In the severe and very severe erosion classes (>35% gradient), effective ground cover of >70% is required in the first year after treatment and >85% is required after the second year.

Effectiveness Monitoring

Without multiparty monitoring, there would be no effectiveness monitoring of AFR. The questions investigated are solely developed through stakeholder interest and classified into Social and Ecological monitoring (Table 8). In addition to generating ideas, monitoring partners contribute funding significant intellectual and material resources beyond that funded by the project. These questions range widely in temporal and spatial scope and data are collected on different timescales (Table 9).

Table 8: Social and ecological stakeholder concerns are addressed by measuring indicators. Lead collaborators are responsible for collecting the data to evaluate indicators.

Stakeholder Concern	Indicator	Lead Collaborator*
Social monitoring		
Outreach	Effectiveness of AFR outreach	Chris Chambers (COA)
Community support and engagement	Public knowledge and attitudes about AFR	Mark Shibley (SOU)
Ecological monitoring		
Water Quality, Quantity, and Aquatic Habitat	Sediment deposition in creeks	Keith Perchemlides (TNC)
	Macroinvertebrate assemblages	Pete Schroeder (SOU)
	Bathymetry of Reeder Reservoir	Pieter Smeenk (COA)
Large Tree Retention and Survival	Large tree abundance	Kerry Metlen (TNC)
	Large tree vigor	Kerry Metlen (TNC)
	Insect and disease conditions	Ellen Goheen (FSFHP)
Late Successional Habitat	Northern spotted owl	David Clayton (FS)
	Pacific fisher	Craig Thompson (FS)
	Arboreal rodents	Todd Wilson (PNW)
	Late successional vegetation	Kerry Metlen (TNC)
	Partners in Flight focal species	Jaime Stephens (KBO)
Bird Habitat	Landbird community composition	Jaime Stephens (KBO)
	Landbird species abundance	Jaime Stephens (KBO)
Herbaceous Cover	Herbaceous composition	Kerry Metlen (TNC)
Fire History	Fire regimes	Kerry Metlen (TNC)

* COA=City of Ashland; FS=US Forest Service; FSFHP=USFS Forest Health Protection; KBO=Klamath Bird Observatory; PNW=Pacific Northwest Research Station; SOU=Southern Oregon University; TNC=The Nature Conservancy

Table 9: Timeline for Effectiveness Monitoring activities to address Ashland Forest Resiliency Stewardship Project stakeholder concerns. Sampling years either have occurred (prior to 2011) or are proposed to maximize sampling efficacy through the lifetime of the project. All funding beyond 2013 is contingent on future funding.

Indicator	Seasonality												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Social monitoring													
Effectiveness of AFR outreach	x	x	x	x	x	x	x	x	x	x	x	x	2009, 2011-2015
Public knowledge and attitudes	x	x	x	x	x	x	x	x	x	x	x	x	2009, 2011-2015
Ecological monitoring													
Sediment deposition in creeks								x	x	x	x		2010-19
Aquatic macroinvertebrates								x	x	x	x		2010-2019
Bathymetry of Reeder Reservoir				x	x	x	x	x					2007, 2010, 2015
Sedimentation models			x	x									2011
Large tree abundance						x	x	x	x				2010-19
Large tree vigor	x	x	x	x	x	x	x	x	x	x	x	x	2012, 2013, 2017
Insect and Disease Conditions													Annually
Northern spotted owl		x	x	x									2010-19
Pacific fisher		x	x								x	x	2010-19
Arboreal rodents		x	x							x	x		2011, 2012, 2019
Late successional vegetation					x	x	x	x	x	x			2009, 2017
Landbird abundance and community composition (point counts)					x	x	x	x	x	x			2005-2007, 2012, 2015+
Landbird abundance and community composition (banding)					x	x	x	x	x	x			2005-12
Herbaceous composition						x	x	x					2010, 2017
Fire regimes			x	x	x	x	x	x	x	x			2006, 2010-13

Social Monitoring

Stakeholder concern: effective fuel reduction and ecosystem restoration require public understanding and support

Indicators: survey respondent support for project objectives, survey respondent understanding of forest issues, feedback from the Implementation Review Team

Support for the project and success at communicating project goals and successes will be assessed through a series of surveys of the community of Ashland. The first of these was completed in 2009 with funding from the National Forest Foundation. Continued social engagement and evaluation of that component will be conducted by the COA utilizing, among other metrics, random surveys of the community of Ashland. In addition, SOU professor Mark Shibley will conduct a repeated survey of a randomly selected group of Ashland registered voters beginning in 2012 and continue annually through 2015. These two approaches will: 1) evaluate what approaches are effective for communicating goals and information to the local community, 2) document evolving knowledge and attitudes about fuel reduction and forest restoration.

The Implementation Review Team is more integrated with AFR general stakeholders. Thus they provide critical feedback to the AFR partnership board as implementation plans are being developed. Review of unit maps, boundaries, prescriptions, marking, operations plans, mitigation provisions, and monitoring will be filtered through the lens of stakeholder perception. Feedback to the AFR partnership board primarily consists of informal communications but could involve more formal documentation as well.

Ecological Monitoring

Six additional ecological monitoring topics were raised by the stakeholders for which appropriate indicators, inference, and sampling scale and timing varies dramatically (Table 9, Figure 1). Most ecological responses depend on some characterization of vegetation and to some extent all six additional ecological monitoring topics rely on strategic use of vegetation plots and remote sensing to allow adaptive management of highly leveraged monitoring investment.

Specifically, airborne LiDAR and orthorectified imagery taken in 2006, informed with an extensive network of 738 Common Stand Exam (CSE) plots, form the backbone for monitoring vegetation changes across the project area. Forty of the CSE plots were located in the Research Natural Area in 2009. Contractors installed the remainder of the plots in 2010 under supervision from the USFS; personnel from TNC and the COA assisted in inspecting the work. At these plots species composition, trees/acre and basal area of trees > 5 in DBH were collected using variable radius plots. Conifer seedlings and saplings <5 in DBH where counted by size class on 1/100th acre fixed radius plots with hardwood seedlings and saplings collected on the first quarter of the plot. Crown closure was measured with a spherical densiometer. Fuels were measured using one Brown's transects at each point. Four photos were taken at each plot, one in each cardinal direction. For detailed methods see Appendix 4. Primary indicators are basal area, trees per acre, quadratic mean diameter, canopy cover, fuel loadings, occurrence and severity of insects and diseases that impact trees, and vegetation cover by species. These data help structure the sampling, or directly provide monitoring indicators.

Whenever possible research will be promoted in conjunction with AFR in the form of encouragement, logistical support, scientific advice, and limited direct field support. These instances will augment but not replace baseline multiparty monitoring data. As multiparty monitoring data become available they will be archived by TNC and available upon request.

Water Quality, Quantity, and Aquatic Habitat

Stakeholder concern: Management activities could increase sedimentation to Ashland creek, degrading aquatic habitats and filling in Reeder reservoir

Indicators: residual pool depth, substrate embeddedness, macroinvertebrate communities, and sediment accumulation in Reeder reservoir

Strategic use of data already collected for the Ashland municipal water supply, paired with targeted, low cost indicators will allow potential treatment effects to be separated from strong temporal fluctuations in water quality, quantity, and aquatic habitat, but those indicators must be sampled annually (Table 9). Permanent transects installed by FS crews will be resampled annually by multiparty crews, primarily TNC employees and SOU students with direction from FS and NPS personnel (aquatic monitoring protocols in Appendix 5). Residual pool depth, substrate embeddedness, canopy closure, reference photographs, in-stream large wood, and macroinvertebrate communities have been sampled annually since 2010 at four permanent water quality transects (Figure 1). Transects were installed by FS crews but will be resampled annually by multiparty crews, primarily TNC employees and SOU students with direction from FS and NPS personnel. Sediment deposition into Reeder Reservoir and the settling ponds will be assessed by the COA using sonar-generated bathymetry.

Large Tree Retention and Survival

Stakeholder concern: Large, old trees could be cut and removed during commercial thinning, thinning and/or burning could stress large old trees.

Indicators: cut-tree size distribution, legacy tree patch identification, legacy tree vigor response and retention, insect and disease incidence

Stakeholder concerns over retention and survival of large old trees will be addressed through two strategies, careful implementation monitoring (see above) and a rigorous sampling framework for long-term treatment effects.

Legacy tree stands were mapped by TNC; initially by field crews, then by using LiDAR and spectral remotely sensed data to develop maps of large old trees (Appendix 6). Maps will allow effective adaptation during design and implementation of treatments in priority areas, focused surveys of legacy tree retention immediately post-treatment, and provide a framework for sampling legacy tree vigor and growth responses.

Retention and vigor response of legacy trees, defined as > 150 years old, will be limited to critical and relatively abundant tree species in the Ashland watershed: ponderosa pine, Douglas-fir, Pacific madrone, sugar pine, and black oak. Sample plots will be identified and permanently monumented using a steel tag at 4.5 ft on the uphill side of the sample tree. All sample plots will be georeferenced with a differentially corrected location accurate to within 3-5 m. A 5-year treatment response sample period will help inform adaptive management, particularly regarding direct treatment effects, with the realization that responses will be incomplete. Trees will be sampled in the summer of 2013 (pretreatment), 2017 (five-years post treatment), and in 2022 or when funding is available (Table 9). For each species of interest, 30 treated and 15 untreated trees will be selected at sites distributed throughout the watershed, stratified by biophysical setting proportional to representation in the project area: 180 total sample plots. Sampled trees will avoid old clearcuts but 15 of the treated trees will be selected from areas that have previously received treatment (shaded fuel breaks or thinning). This will result in three broad treatments: untreated, neighbor removal, and staged neighbor removal. Sampling assumes that all plots will receive prescribed fire. For further methods see Appendix 7.

Tree mortality data for the Watershed, based on aerial detection surveys performed by US Forest Service Forest Health Protection and Oregon Department of Forestry staff, is available in digital format from 1951 -2016 and will continue to be available on an annual basis. These data will help inform mortality trends for treated and untreated areas. Forest Health Protection will provide information on insect and disease conditions including plot- and survey-based assessments of distribution, severity, and impacts of forest insects and pathogens.

Late Successional Habitat

Stakeholder concern: Active management could detrimentally impact late successional wildlife habitat

Indicators: Population dynamics of late successional wildlife species, habitat use by late successional wildlife species before and after treatment, and distribution of late successional vegetation throughout the watershed before and after project completion

The chief strategy for evaluating changes to late successional habitats will be to use wildlife population dynamics and behavior as bioindicators of late successional habitat quality and quantity. Wildlife biologists with the FS, USFWS, and Oregon State University (OSU) lead this monitoring but they are supported by a host of volunteers, TNC personnel, and SOU students.

Population size, home range size and spatial pattern, and habitat use by the NSO were quantified in 2009[1] by the OSU NSO regional monitoring group, providing an excellent baseline to contrast with posttreatment. Apparent occupancy and the reproductive rates of Northern Spotted Owls are assessed annually by the OSU NSO regional monitoring group. Overall, territory occupancy has been declining since the 90's both in the Ashland watershed and regionally due to several factors, including invasion of Barred Owls while reproductive rates are highly variable, consistent with regional trends[2].

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[1] Schilling, J. W., K. M. Dugger, and R. G. Anthony. 2013. Survival and home-range size of Northern Spotted Owls in southwestern Oregon. Journal of Raptor Research **47**:1-14.

[2] Dugger, K. M., and L. S. Andrews. 2016. Apparent occupancy and reproductive rates of Northern Spotted Owls in the Ashland Watershed, Siskiyou Mountains, Southern Oregon during 1993-1997, 2005-2016. Oregon

Radio tracking of pacific fisher has been ongoing since 2010 with support of the Pacific Southwest Research Station and the RRSM National Forest. Pacific fisher tracking by the Rogue River- Siskiyou National Forest with support from the Pacific. This work has found that >80% of pacific fisher rest platforms are in Douglas-fir dwarf mistletoe brooms. They found that pacific fisher are tolerant of non-commercial mechanical work and pile burning, as well as commercial tree felling and log hauling but avoid active helicopter yarding.

Arboreal rodents (including the Northern Flying Squirrel) have been intermittently monitoring by the Pacific Northwest Research Station using live capture and release methods at six monitoring sites across the watershed beginning in 2011 and continuing to 2016. Landbird communities (below) will also provide inference about late successional habitats in the watershed.

In addition to directly monitoring fauna associated with late seral habitats, late successional habitat has been mapped using the CSE plots and to interpolation from those plots to the entire watershed using remote sensing techniques. The desire is to update these data after treatment and reimpute seral structural states across the project area.

Bird Habitat

Stakeholder concern: fuel reduction treatments may not accomplish meaningful restoration for landbirds

Indicators: landbird community composition, and identification of individual bird species utilizing specific habitats

A principal strategy for evaluating restoration effectiveness is to observe how landbird communities respond to treatments over time. Shifts in landbird communities – along a gradient driven by preference for open through closed forest - will be measured with point count transects calibrated by annual observations at mist net stations in the surrounding area. Point counts were conducted in project areas before treatment (2005-2007, and 2012), and will be repeated > 2 years after commercial thinning, when funding is available. Breeding season songbird point counts were conducted in early June 2012 at 9 sites in the Ashland watershed stratified by slope, aspect, and topographic position ranging in elevation from 2500-5500 ft. Paired stands within sites were sampled to characterize stands that will receive density management treatment (in the summer/fall of 2012 or spring of 2013) and stands that were not scheduled for treatment but avoided historic clearcuts. Monitoring locations were buffered from the treatment edge by at least 50 m and separated by at least 200 m. Detailed methods and baseline results are in Appendix 8 (available online). Beginning in 2005, Klamath Bird Observatory has operated their mist net ecological monitoring station between June and October of every year to learn about bird population trends, breeding success, health, and longevity. Mist nets will be used to capture, band and release birds while surveying the areas using area search and checklist

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Cooperative Wildlife Research Unit, Department of Fisheries & Wildlife, Oregon State University, 104 Nash Hall, Corvallis, OR 97331-3803.

methodologies. It is anticipated that this effort will continue annually for the foreseeable future.

Herbaceous Recovery and Response

Stakeholder concern: fuel reduction treatments might not accomplish meaningful restoration for understory plants, non-native plant species might respond to thinning and/or burning

Indicators: herbaceous cover in Common Stand Exam plots

Recovery and response of the herbaceous plant community will be addressed both by implementation monitoring to evaluate short-term impacts and permanent vegetation plots to evaluate longer trends. Effective ground cover and damage to sensitive plants will be monitored by FS personnel before and after treatments are implemented. In addition, herbaceous plots located at 188 of the CSE plots will allow a quantitative sample of herbaceous cover before and after comparison of herbaceous communities and their response to treatment. This sampling will capture any trends that occur across the entire project area. Further funding will be necessary to return to these plots in to assess treatment response. See Appendix 9 (available online) for more detailed methods.

Research

While AFR is not a designed experiment and funding for monitoring is intended only to guide informed adaptive management, this project could be useful to researchers. If a non-FS researcher would like to conduct their work in association with AFR, they must submit a proposal for review to the MAC and complete any appropriate paperwork. An annual report of research progress should be submitted by April 1st and all products generated should be submitted to the MAC.

Funding

Basic monitoring oversight, some fieldwork, and data management are funded through September 2013 by the American Recovery and Reinvestment Act of 2009. This funding supplements ongoing work by academic, federal, and private collaborators and aggregates those efforts into a cohesive package. Funding for the overall project was obtained from the Joint Chiefs Program and the Oregon Watershed Enhancement Board in 2015 and 2016 and these funding sources will continue to provide some baseline monitoring through 2018.

Funding needed

- Post treatment bird monitoring analysis and report–2017, $135,000
- Overstory, shrubs, herbaceous, fuels, analysis, and report – 2015, 4 crew members, 3 months, >$48,000
- LiDAR flight of 18,000 ac at >$4/ac, $72,000
- Multiparty monitoring coordinator, analyst and writer, half-time, 2017-2020, $50,000/year
- NSO telemetry post treatment, $175,000, OSU NSO monitoring group

Funding obtained

- Macroinvertebrate sample processing ($1000/year – donation from BLM)

- Reference forest conditions ($484,000 over 2011-2016, TNC)
  - Fire histories
  - Stand reconstructions
  - Historical aerial photo acquisition
- Social surveys ($12,000 over 2011-2016 TNC and ARRA)
- Pretreatment (2012) bird monitoring in Strategic Ridgeline Areas ($22,000 ARRA)
- Pacific fisher monitoring ($100,000 from FS and USFWS)
- Northern Spotted Owl annual monitoring ($175,000 from Oregon State University monitoring group)

Science Delivery

Science outreach will be primarily through the AFR website, field tours, local meetings, and upon AFR partnership board review, local media. Raw data will be available upon request but summaries and analysis will be provided as deemed appropriate by the AFR partnership board, and the MAC. Multiparty monitoring data will also be used in planned speaking events. Basic summaries and progress updates will be posted on the AFR monitoring sign at Lamb Saddle and in a biannual monitoring update posted to the AFR website. When and if partner staff capacity to manage the archive is depleted, the database will be maintained at an as-yet unidentified data repository, likely associated with USFS or SOU.

Figures

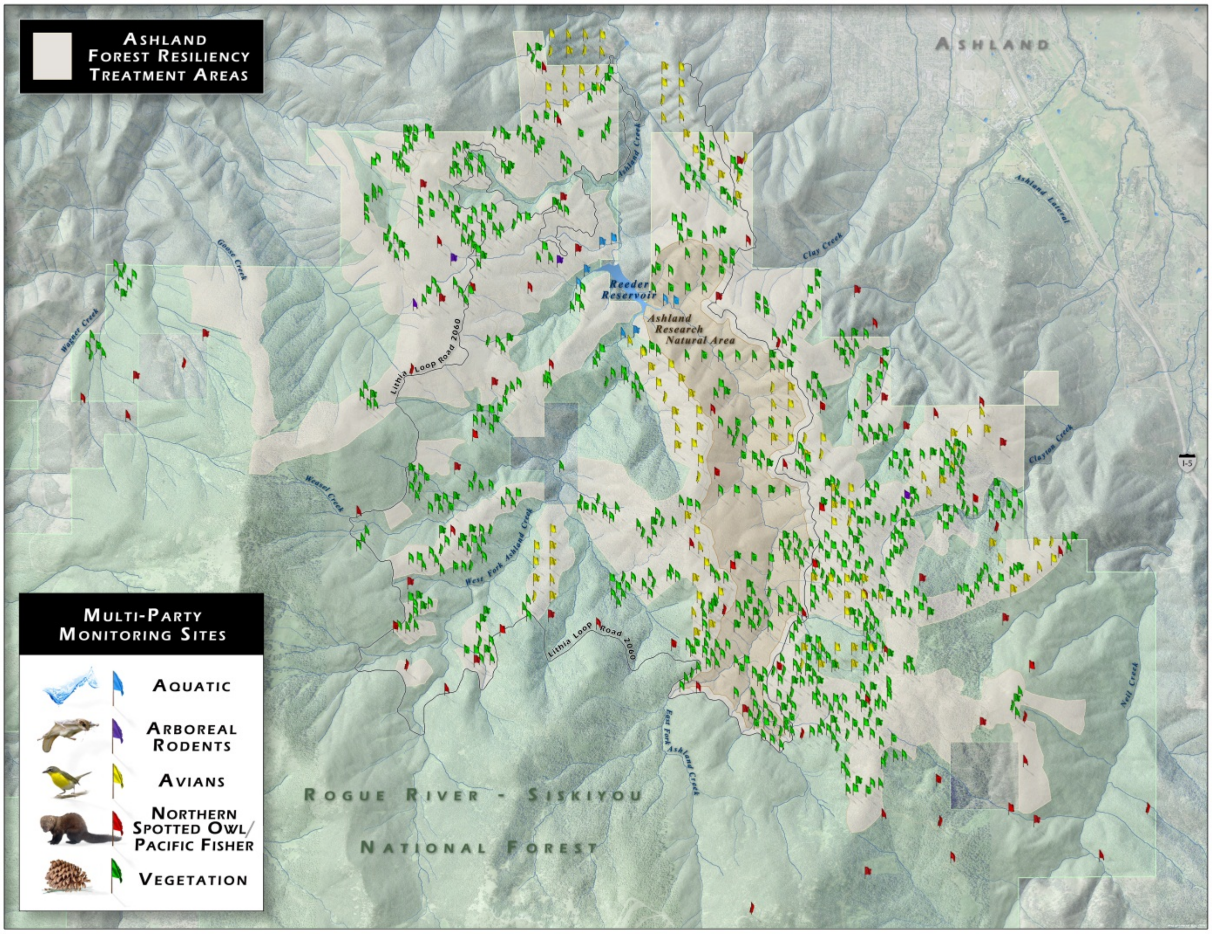

Figure 1: Multiparty monitoring in the Ashland watershed is distributed throughout and around the project area.

Appendixes

Appendix 1: Summary of reference forest condition research to develop restoration guidelines for mixed conifer/hardwood forests of southern Oregon.

Restoring forests resilient to frequent fire in southern Oregon

Funded by Priscilla Bullitt Collins Trust Northwest Conservation Fund

Timeline: from 2011-2015

Darren Borgias, Southwestern Oregon Program Manager,
Dr. Kerry Metlen, Southwestern Oregon Forest Ecologist, The Nature Conservancy in Medford, Oregon

Cooperators: Dr. Carl Skinner, Geographer, U.S. Forest Service Pacific Southwest Research Station; Don Boucher, Rogue River-Siskiyou National Forest; Guenther Castillon, Assistant Forest Silviculturist, Rogue River - Siskiyou National Forest; Tom Sensenig, Ecologist, Rogue River - Siskiyou National Forest, Terry Fairbanks, Medford Bureau of Land Management, Max Bennett, Forestry & Natural Resources Agent, Oregon State University Extension Service, Dr. Mark Shibley, Sociology and Environmental Studies, Southern Oregon University

Forest restoration is a growing emphasis for land managers across the west. Treatments are prescribed to thin densely crowded forests to reduce susceptibility to severe fire and to promote abundant clean water and wildlife. This work will provide baseline knowledge about fire regimes that shaped historical forests, as well as the nature of forests that historically were resilient to frequent fires. Reference forest conditions will provide a baseline for evaluating restoration treatments and for guiding ongoing and future restoration projects.

The Priscilla Billitt Collins Trust Northwest Conservation Fund is one third of a Trust left by Priscilla Bullitt Collins to The Nature Conservancy. The Northwest Conservation Fund is managed by the Washington Field Office and its Board of Trustees for stewardship of lands and waters that further TNC's mission within the Northwest including Washington, Oregon, Idaho, Montana, Alaska, British Columbia and Northern California. This mission is to enhance appreciation for and understanding of the need for excellence in land conservation, adaptive management, and innovative approaches that deliver on-the-ground results.

The Northwest Conservation Fund granted Darren Borgias and Kerry Metlen of The Nature Conservancy in Medford, Oregon $1.5 million to be spent over five years. Beginning in June 2011 we will empirically describe fire histories and historical stand structures across 10 biophysical settings in the Ashland watershed and on three sites in each of the Applegate, Illinois and Middle Rogue watersheds. This will be done using three approaches: analyzing fire scars for evidence of historical fires, identifying historical conditions from existing old trees and downed logs, and by interpreting aerial photographs taken in the 1930's. These data will help refine prescriptions based on forest setting and provide a baseline for prescribing different stand treatments across a larger landscape.

Reference conditions will be used to inform and evaluate stewardship actions in the Ashland watershed and in the Applegate valley. The Ashland watershed is important for the quality of existing old growth forests, meaning that there are legacy trees as components of stands now dominated by younger trees. In the Applegate Valley a more experimental approach will be taken with grant funds used to complete treatments that are part of an existing designed initiated by the Ecological Restoration Institute, Bureau of Land Management, and US Forest Service.

A final component of the study provides outreach to the community through various mechanisms and pairs with work conducted by the Ashland Forest Resiliency project to evaluate knowledge of forests and restoration in the general community. This will involve public surveys administered by Southern Oregon University of communities throughout the Rogue Basin. In 2015 we will host a conference to bring together scientists and practitioners to share lessons learned and promote pragmatic, thoughtful conservation of forests, clean water, and abundant wildlife.

Appendix 2: Contact information for engaged collaborators involved in the Ashland Forest Resiliency Stewardship Project Multiparty Monitoring.

Name	Position*	Phone	email
Bey, Marko	LRP - Director	541-488-0208	marko@lomakatsi.org
Borgias, Darren	TNC - SWOR Program Director	541-770-7933	dborgias@tnc.org
Boucher, Don	FS-Project Manager	541-552-2913	dboucher@fs.fed.us
Brazier, Joni	FS-Soil Scientist	541-471-6760	jdbrazier@fs.fed.us
Chambers, Chris	COA - Forest Resource Specialist	541-552-2066	chamberc@ashland.or.us
Clayton, Dave	FS-Wildlife Biologist	541-618-2054	dclayton@fs.fed.us
Cullumbine, Justin	LRP - Director	541-488-0208	justin@lomakatsi.org
Del Pizzo, Niki	LRP - Education and Outreach	541-488-0208	niki@lomakatsi.org
Emerson, Clint	FS-Forest Botanist	541-247-3656	cemerson@fs.fed.us
Goheen, Ellen	FSFHP-Plant Pathologist	541-858-6126	egoheen@fs.fed.us
Long, Brian	FS-Recreation	541-899-3815	bplong@fs.fed.us
Karns, John	COA-Fire Chief	541-482-2770	karnsj@ashland.or.us
Main, Marty	COA-Contract Forester	541-778-4545	mmain3@mind.net
Metlen, Kerry	TNC-Forest Ecologist	541-770-7933	kmetlen@tnc.org
Mickley, Donna	FS-District Ranger	541-552-2903	dmickley@fs.fed.us
Nauth, Aaron	LRP-Contracting and Workforce	541-488-0208	nauth@lomakatsi.org
Schaupp, Bill	FSFHP-Plant Pathologist	541-858-6125	bschaupp@fs.fed.us
Schroeder, Pete	SOU-Associate Professor	541-552-6871	pschroeder@sou.edu
Shibley, Mark	SOU-Professor of Sociology	541-552-6761	shibleym@sou.edu
Thompson, Craig	PSW-Research Wildlife Ecologist	559-868-6296	cthompson05@fs.fed.us
Marshall, Robert	FS-Fire Management Officer	541-580-5915	rwmarshall@fs.fed.us
Smeenk, Pieter	COA-Associate Engineer	541-552-2413	smeenkp@ashland.or.us
Stephens, Jaime	KBO-Research and Monitoring Director	541-282-0866	jlh@klamathbird.org
Wilson, Todd	PNW-Wildlife Biologist	541-750-7288	twilson@fs.fed.us

*** COA=City of Ashland; FS=US Forest Service; FSFHP: FS Forest Health Protection; KBO=Klamath Bird Observatory; LRP=Lomakatsi Restoration Project; PNW=Pacific Northwest Research Station; PSW=Pacific Southwest Research Station; SOU=Southern Oregon University; TNC=The Nature Conservancy**

Appendix 3: Summary of standard Ashland Forest Resiliency plot-based monitoring method for prescribed fire effects and objective attainment (see objectives in prescribed burning section).

Data field	*Definition and notes*	*Timing*	*Purpose*
PlotID	Unique plot identifier assigned in GIS = "UnitID-[sequential number]"	pre	
Date-	Monitoring dates. Post-burn done at end of growing season before start of fall rains	both	
PhotoID-	Photo ID number from camera. Photo taken eye level plot center out, representative of stand and fuels, include landmarks near and far to aid repeat photo post-burn, bring pre-burn printed images for post repeat	both	Visual record of unit condition and fire effects
PhotoAzm	Compass bearing in degrees (azimuth), plot center to center of photo	pre	Aids repeat photo
GrndPhotoID	Photo ID number from camera. Pre-burn representative ground fuels and understory, taken from edge to plot center, low horizon, no repeat	pre	Use to estimate Objective 1, surface fuel reduction
Slope%	Clinometer, % slope, average above and below plot if variable	pre	Characterizing unit, informs Objective 6, EGC
Aspect	Compass degrees +/- 5	pre	Characterizing unit, informs Objective 6, EGC
Closure%	Densiometer in four directions, up, down, side slopes, using grid-V with 50 quarter cells per direction, keep running tally and divide by 2	pre	Characterizing unit, informs Objectives 3 - 5, tree mortality
EGC%-	Effective ground cover. Line intercept tally of all surface cover with gaps < 0.1 ft, except exposed soil, along two 25 ft transect from 10 ft to 35 ft from plot center, oriented to bearing of aspect + 45 degrees. Total distance covered along both transects in decimal feet x 2 = % EGC	both	Objective 6, EGC
SBfuel-	Fuel model from Scott and Burgan 40 photo series - select based on what fuels/vegetation will carry the fire, what fuel/veg will significantly affect fire behavior, relative loading (low, mod, high), and relative flame lengths	both	Smoke and fire modeling, characterize unit
CBH(ft)-	Minimum height to nearest foot from ground to continuous (< 2 ft gap) ladder fuels to canopy (not isolated trees), 0.1 if to ground, "0" if no canopy	both	Fire modeling input
AreaBurned%	Percent of total plot area with some visible char or consumption from burn, post-burn only	post	Characterizes post-burn unit
1-100hr%Red	Percent reduction in litter and light surface fuels (1 - 100 hr = litter/grass - 3") post-burn only, reference pre-burn ground fuels photo	post	Objective 1, surface fuel reduction
UstorCvr-	Percent cover of LIVE understory shrubs (>12" ht) and trees (<5" dbh)	both	Objective 2, understory reduction
HerbCvr%-	Percent cover of grass, forb, and groundcover shrub species LIVE or having grown that season, walk around plot to estimate, actual cover not occupied area	both	Characterizes post-burn unit, vegetation response baseline
IntMort-	Percent of intermediate trees (5-12" dbh) that are RECENT dead, pre-burn data discerns mortality from causes other than fire	both	Objective 3, intermediate tree mortality
OvrMort-	Percent of (co)dominant trees (>12" dbh) that are RECENT dead, pre-burn data discerns mortality from causes other than fire	both	Objective 4, overstory mortality
Litter-	Depth (to 0.1") of undecomposed surface litter, not live herbaceous fuels	pre	Smoke and fire modeling, informs Objective 1
Duff-	Depth (to 0.1") of consolidated decomposing organic matter, not organic or mineral soil	pre	Smoke modeling, fire modeling
LegMort	Percent of legacy trees in unit estimated killed by burn, walk-through not plot-based, may need to assess again in year-2. Legacy trees are large, old (> 150 yrs) trees with complex form, wide bark plates, and provide important habitat features and aesthetic value	post	Objective 5
LDWloss	Percent loss of large diameter logs and snags (>20" diam), walk-through, not plot-based	post	Objective 7
LeaveSevr	Apparent fire severity in leave areas, reference CBI scale, walk-through, not plot-based	post	Objective 8
StrBuffer	Where applicable, percent of length of perennial streams in unit retaining unburned buffer of duff 25-50 ft wide, and retaining coarse woody material within 50 ft	post	Objective 9

Appendix 4: Contract field guide for Common Stand Exam plots, by the USFS Rogue River-Siskiyou National Forest in 2009 for CSE data collected in 2010, available online.

Appendix 5: Aquatic monitoring protocols for the Ashland Forest Resiliency Stewardship Project, available online .

Appendix 6: Legacy tree remote sensing methodology for the Ashland Forest Resiliency Stewardship Project, available online.

Appendix 7: Large, old (legacy) tree release effectiveness monitoring methods, available online.

Appendix 8: Breeding season songbird point counts results for pretreatment evaluation of nine sites in the Ashland watershed, available online.

Appendix 9: Sample design and protocol for supplemental understory monitoring implemented at 180 of the Common Stand Exam plots, available online.