2019 CFLRP Ecological Indicator Progress Report

OVERVIEW

Introduction

In 2011, the National Forest Foundation convened CFLRP participants to develop a set of national indicators. The resulting five indicators are economic impacts, fire risk and costs, collaboration, leveraged funds, and ecological condition. Data to support these five indicators comes from a number of sources, including the Treatment for Restoration Economic Analysis Toolkit, collaboration surveys conducted by NFF, and the Annual Reports.

Projects first reported on ecological indicators in 2014. Since then, the CFLRP staff in the US Forest Service Washington Office have worked with colleagues and partners to review and update to template to make improvements while maintaining a consistent protocol to 2014. The intent of the 2019 CFLRP Ecological Indicator Progress Report is to better understand your progress in advancing ecological outcomes. It is not intended to capture everything about your monitoring activities.

To aid you in filling out this report, we recommend that you read the new 2019 Guidance Document. We also recommend that you reference your past Annual Reports and your 2014 Ecological Indicator Progress Reports. For additional help, please email CFLRP@fs.fed.us.

We appreciate the time and energy you dedicate to completing this progress report. This information is critical for understanding the ecological outcomes of your work, telling the national story, supporting communication and transparency, and sharing successful approaches and practices across the nation.

Thank you!

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2019 CFLRP Ecological Indicator Progress Report

Project Name: Deschutes CollaborativeForest Project (DCFP) State: Oregon

FIRE REGIME

Narrative
- Note: All boxes in this template will scroll, so you have as much space as you need.

1. Did you make any changes to your desired condition(s) for fire regime as compared to the 2014 Ecological Indicator Report?
Please briefly describe:

Yes ☐ **No** ☑

2. Did you make any changes to your monitoring methodologies for fire regime as compared to the 2014 Ecological Indicator Report? Please briefly describe:

Yes ☐ **No** ☑

Monitoring methodologies remained the same to 2014 ecological indicator monitoring. Vegetation Condition Class, a metric of ecological departure comparing S-Class distribution for each Biophysical Setting (BpS) to its Historic Range of Variability (HRV), was utilized to measure change in the level of departure from HRV from base 2009 conditions with present day conditions across the CFLR landscape.
To determine effects of restoration treatments on fire behavior and forest resilience in BpS of interest (Dry and Moist Mixed Conifer and Ponderosa Pine) a wildfire hazard analysis (a combined flame length crown fire metric) was completed comparing base 2009 conditions with

3. Did you use any new or updated baseline data for evaluating your fire regime progress for the purposes of this report?
Please briefly describe:

Yes ☑ **No** ☐

In 2014, 2009 GNN combined with Landfire 2010 was used to establish baseline conditions as well as 5 year progress for both landscape and project level VCC and Fire Hazard analysis. Sensitivity analysis suggested the baseline should be retained for 10 year progress analysis for VCC and landscape level fire hazard. However a new baseline was utilized for project level fire hazard analysis as the modeling platform of choice was the utilization of IFTDSS and LANDFIRE 2012 is the most historic version of LANDFIRE data embedded within IFTDSS and limited treatments had occurred in projects of interest between 2010 and 2012. Beginning this 10 year monitoring analysis with LANDFIRE (Refresh 2010) in IFTDSS

4. Did your projects experience any unanticipated developments that positively or negatively affected expected progress towards your desired conditions for fire regime? (e.g. wildfire in the project area, litigation outcome, change in collaborative participation, etc.)

The Pole Creek fire of 2012 and Milli Fire of 2017 burned portions of the CFLR landscape. These fires have been adequately accounted for in all analysis and have both positive and negative impacts on Fire Hazard and Vegetation Condition Class metrics utilized in the ecological indicator monitoring process utilized. For example, wildfire in ponderosa BpS can alter condition class and wildfire hazard positively in low to moderate burn areas but can push condition class negatively in areas of high severity burns where large open structure is lost.

5. What were the most difficult barriers or challenges you experienced in progressing towards your desired conditions for fire regime? If you adapted to address these challenges please provide a brief description of how.

65% of the CFLN project area is classified as Wildland-Urban Interface (WUI) and was strategically designed in close proximity to the communities of Bend , Sisters, and Sunriver Oregon. Approximately 110,000 people of Central Oregon permanently call this area home and In addition, a 2016 "Visit Bend" survey shows over 3 million visitor trips to the Bend area annually, with numbers steadily increasing in the summer months. This has been a significant barrier to landscape level prescribed fire treatments, a key component in Eastside Dry forest restoration, due primarily to smoke constraints. We continue to address this issue through community outreach and collaboration with the DCFP staff convening a new Smoke and Public Health working group composed of state and federal forest and prescribed fire managers, county and state public health agencies, and air quality regulators to develop a new strategy and online platform to disseminate essential information. These efforts have significantly furthered social license for hazardous fuels and restoration efforts locally while also contributing to the ability to increase the pace

6. Did you include the effects of treatments on areas adjacent to the active treatment area? Yes ☐ No ☑

If yes, please briefly describe your methodology for including these adjacent acres, and describe any work conducted across land ownership in support of desired conditions for fire regime.

Progress analysis and reporting was completed for Forest Service lands only.

Desired Conditions

*In this report, the term "**desired conditions**" refers to landscape and resource conditions (as defined collaboratively by stakeholders and land managers) that you are seeking to achieve and maintain for your CFLRP landscape over the next 10+ years. Desired conditions are outcome-driven not output-driven, and should link to your project's CFLRP proposal while being measurable. (Note: The term "desired condition" is used somewhat differently in the Forest Service's Land Management Planning Process. In that context, it is not time bound, and often represents long-term social, economic and ecological goals, while the term "objective" is used to represent specific, measurable and time-bound benchmarks to be achieved while working toward desired conditions in a forest plan area.) In this report, the term "**landscape**" refers to the landscape identified in your CFRLP project proposal or in subsequently-approved proposal edits. See cover page for links to guidance.*

7. Project-scale Desired Conditions Target for Fire Regime:

[>66] % change (relative to the desired condition) occurs across [trmt] % of the project areas by [10/01/2019]

[ ] % change (relative to the desired condition) occurs across [ ] % of the project areas by [ ]

Please include 1-5 *quantifiable* desired condition statements upon which the above target is based:

Treatment in monitored project areas result in >66% (weighted by percent area treated) or higher reduction in mean potential flame length and/or reduction in crown fire activity.
The percent of the landscape treated within each individual project area to date is used to weight the scoring percentages(Good 66-100%

Example: Treatments in the project area result in a 23% reduction in potential flame length.
Example: 75% of all prescribed burn projects meet prescription objectives as quantified in burn plan.

8. Landscape-scale Desired Conditions Target for Fire Regime:

[100] % change (relative to the desired condition) occurs across [28] % of the landscape area by [10/01/2024]

[66] % change (relative to the desired condition) occurs across [28] % of the landscape area by [10/01/2019]

Please include 1-5 *quantifiable* desired condition statements upon which the above target is based:

1. Modeled ecological departure indicates that forest vegetation is restored to Vegetation Condition Class 1 with low fire hazard across 57,500 acres (28% of the CFLR landscape), for a total of 105,183 acres (51%) of the DCFP Landscape Area in VCC1 and low fire hazard by 2024.
2. For the 10-year (2019) Target for Fire Regime Restoration: 66% or greater of treatment acres (57,500) will be in VCC 1 with low fire hazard by

Examples: Modeled ecological departure indicates that forest vegetation is restored to Vegetation Condition Class 1 with low fire hazard across 51% (105,183 acres) of the CFLR landscape; Fuel models indicate reduced likelihood of supporting a stand replacing fire across 8.5% of the CFLR landscape (73,000 acres); Fire-adapted landscapes transition from shrub-dominant understory fuel model to a grass/forb dominant understory fuel model across 50% of the CFLR landscape.

9. Please select the broader goals that are central to your desired condition(s) for fire regime for the Project-scale (P) and Landscape-scale (L) :

P	L	
☑	☑	Reduced risk/likelihood of uncharacteristic wildfires (high severity, widespread, high mortality, active crown fire/crown fire initiation)
☑	☑	Re-establish natural fire regimes and move landscape to historical range of variability and/or natural range of variability
☑	☑	Restore/maintain fire dependent and tolerant species
☐	☐	Restore/maintain native species
☑	☑	Restore/maintain heterogeneity (species, size classes)
☑	☑	Increase use of prescribed fires
☐	☐	Other. Please describe:

10. Please select the key outcomes you are hoping to achieve on the landscape through attainment of the broader goals you selected above:

- ☑ Increase options/opportunities for managers to control/manage wildfires
- ☑ Protect communities and high valued resources/reduce risk of loss
- ☑ Protection of water quality/supply
- ☑ Public and firefighter safety
- ☑ Reduced fire supression costs and avoided costs
- ☐ Other. Please describe:

11. Given these goals, please state the evaluation metric(s) you are using to monitor progress towards your desired conditions for fire regime for this report. Note: This evaluation metric is something you are measuring or counting to monitor fire regime change. It has a unit of measurement attached to it.

1. Acres in Vegetation Class 1.
2. Acres in Low Fire Hazard Class (based on a combination of Crown Fire and Flame Length metrics).

Examples of fire regime evaluation metrics: basal area in square feet per acre (for tree density), quadratic mean diameter in inches (for tree sizes), litter and duff depths in centimeters (for fire hazard), percent canopy cover (for opennesss), fuels treatment effectiveness, tons of fuel loads removed (for fire hazard), avoided costs

Data and Methodology

12. Select the type(s) of monitoring you used to assess Project-scale (P) and Landscape-scale (L) progress towards fire regime desired conditions for this report. Select all that apply:

P	L	
☑	☑	**Baseline Data Collection** (i.e. was data collected prior to treatment to be used for later comparison?)
☑	☑	**Accomplishment Reporting** (i.e. was progress tracked using acres and miles reported?)
☐	☐	**Implementation Monitoring** (i.e. were the treatments implemented as prescribed?)
☑	☑	**Effectiveness Monitoring** (i.e. were treatments effective at meeting the stated objectives?)
☐	☐	**Effectiveness Monitoring Pilot Study** (i.e. was a trial run conducted to assess considerations of crafting an effectiveness monitoring plan?)
☐	☐	**Ecological Impacts Monitoring** (i.e. were there any unforeseen ecological consequences that could compromise treatment success?
☐	☐	**Other.** Please describe:

13. Select the methodologies used to assess Project-scale (P) and Landscape-scale (L) progress towards fire regime desired conditions for this report. Select all that apply and provide a brief description for each:

P	L	
☐	☐	Field-based sampling/plots:
☑	☑	Remote sensing: GNN datasets ☐ LiDAR ☐ Aerial photography ☐ NAIP ☑ Landsat ☑ Other:
☑	☑	Treatments implemented (e.g. acres or miles accomplished): FACTS spatial analysis of treatments completed over 10 yr period
☑	☑	Modeling (include type and indicators used): Vegetation Condition Class and S-Class via GNN processing, Flammap, IFTDSS
☑	☑	Measuring a reduction in the fire risk index: Fire Hazard analysis via above modeling
☐	☐	Observation/expert opinion:
☐	☐	Fuels treatment effectiveness:
☑	☑	GIS analysis: Raster computation and analysis to derive final outputs
☐	☐	Other:

14. Where is the data that is being used for monitoring Project-scale (P) and Landscape-scale (L) progress toward fire regime desired conditions being stored? Select the databases categories that apply and provide a description of the specific datasets being used. Include links if available:

P	L	
☐	☐	FSVeg:
☐	☐	Forest Inventory and Analysis (FIA):
☐	☐	Fuels Treatment Effectiveness Report Database:
☐	☐	GNN:
☐	☐	VMap:
☐	☐	Feat-Firemon Integrated Database:
☑	☑	FACTS (please select performance measure): ☑ FP-FUELS-NON-WUI ☑ FP-FUELS-WUI ☐ FOR-VEG-EST ☑ FOR-VEG-IMP ☐ OTHER:
☑	☑	Local database: T:\FS\NFS\Deschutes\Project\SO\opsCFLR2019\GIS
☐	☐	Inspection reports/contract record:
☑	☑	Other: IFTDSS

Project-scale scoring

From the beginning, CFLRP intended to shift towards desired conditions at the landscape-scale. As the disturbances and processes of interest occur at a landscape-scale, we need a landscape-scale assessment. It's a challenge to look at the impacts at that scale, given the scale itself as well as time delays (e.g. it takes more time to shift outcomes at landscape-scale than project-scale). While landscape-scale is the focus, project-scale assessments allow projects to bring in their monitoring data and look at treatment outcomes.

Each management action funded through CFLRP will have its own project-level objectives that are designed to contribute to achieving desired conditions at larger scales. Project-scale scoring should reflect how well the results of an individual management activity met the objectives for that project. Individual projects may not meet every desired condition of the CFLRP project. Project-scale scoring is conducted by the multi-party monitoring group following completed management activities.

An individual activity might not need to lead to a fully restored acre, but if it sets the landscape up for the next treatment it may still get a good rating. For example if a successful thinning doesn't restore a fire regime, but it sets up landscape for subsequent burns that might, it could still receive a "Green" rating. There may be many reasons for not scoring a "Green," including ecological and sociological considerations beyond the scope of the CFLRP project as well as recognition of unanticipated barriers or challenges. Note that scoring a "Yellow" or "Red" does not necessarily mean that work was not accomplished.

If you need to summarize scores across different desired condition targets, please refer to Guidance Document for additional instruction.

- **Green** = Expected progress is being made towards desired conditions across 75% or more of our CFLRP project areas.
- **Yellow** = Expected progress is being made towards desired conditions across 26% - 74% of our CFLRP project areas.
- **Red** = Expected progress is being made towards desired conditions across 25% or less of our CFLRP project areas.

Ecological Indicator	Green, Yellow, or Red score and % of the CFLRP project areas resulting in measurable progress as defined above	Are you achieving your CFLRP objectives? Yes or No? If "no", briefly describe why in the box below and use the narrative section as needed.
Fire Regime	Green (100%)	Yes

Please briefly describe how you calculated your score.

Fire Regime Restoration: greater than 75% of monitored project areas achieved expected progress towards desired conditions as outlined below.
The percent of the landscape being treated at the individual project level to date is utilized to weight the scoring percentages(Good 66-100% reduction, Fair 33-66% reduction, Poor 0-33% reduction) to determine the success within each project area. For example, SAFR had 17390 footprint acres of treatment (52% of

Scoring for National Reporting

Landscape-scale scoring

Few (if any) CFLRP-funded Landscapes propose to meet every proposed desired condition on every acre or achieve landscape-scale objectives through the mechanical treatment of every acre within their landscape boundary. Rather, multiple projects with multiple objectives (fire risk reduction, wildlife habitat improvement, stream restoration, etc.) should facilitate meeting these broader objectives. Scoring at the landscape-scale reflects the degree to which individual Landscapes are moving towards Desired Conditions at broader spatial extent. Landscape-scale scoring is conducted by the multi -party monitoring group at each Landscape.

"Expected progress" will be defined using 10-year benchmarks for FY 2010 projects and 8-year benchmarks for FY 2012 projects for each desired condition based on a percentage of the lifetime outcome specified for the landscape in each proposal. There may be many reasons for not scoring a "Green," including ecological and sociological considerations beyond the scope of the CFLRP project as well as recognition of unanticipated barriers or challenges. Note that scoring a "Yellow" or "Red" does not necessarily mean that work was not accomplished.

If you need to summarize scores across different desired condition targets, please refer to Guidance Document for additional instruction.

- **Green** = Expected progress is being made towards desired conditions across >66 % of our CFLRP landscape area.
- **Yellow** = Expected progress is being made towards desired conditions across >33 % of our CFLRP landscape area.
- **Red** = Expected progress is being made towards desired conditions across <33 % of our CFLRP landscape area.

Ecological Indicator	Green, Yellow, or Red score and % of the landscape across which progress is being made towards desired conditions	Are you achieving your CFLRP objectives? Yes or No? If "no", briefly describe why in the box below and use the narrative section as needed.
Fire Regime	Green (94% of proposed 105,183 acres)	Yes

Please briefly describe how you decided on the percentage thresholds used above for the scoring categories and how you calculated your score.

Note: The final scoring was based on "averaging" the outputs for 1 and 2 below. The decision to assign a single "Green" rating was based on the fact that 5 (a majority) of 8 metrics were Good, 2 of 8 were Fair (with significant tempering in fire hazard in categories not used for rating), and 1 was Poor.

1. The 2024 Desired Condition is to realize a net increase of 57,500 acres of forest in VCC1, or a 121% increase over the 2009 baseline acreage. This will mean a total of 105,183 acres of the DCFP Landscape Area will be in VCC1 by 2024. However, because much of 10 year Proposed Treatment Footprint is largely in the

2019 CFLRP Ecological Indicator Progress Report

Project Name: Deschutes Collaborative Forest Project State: Oregon

WATERSHED CONDITION

Narrative - *Note: All boxes in this template will scroll, so you have as much space as you need.*

☐ If watershed condition is not part of your CFLRP proposal and landscape restoration strategy, please let us know by checking this box.

1. Did you make any changes to your desired condition(s) for watershed condition as compared to the 2014 Ecological Indicator Report? Please briefly describe: **Yes** ☐ **No** ☑

2. Did you make any changes to your monitoring methodologies for watershed condition as compared to the 2014 Ecological Indicator Report? Please briefly describe: **Yes** ☐ **No** ☑

3. Did you use any new or updated baseline data for evaluating your watershed condition progress for the purposes of this report? Please briefly describe: **Yes** ☐ **No** ☑

4. Did your projects experience any <u>unanticipated developments</u> that positively or negatively affected expected progress towards your desired conditions for watershed condition? (e.g. wildfire in the project area, litigation outcome, change in collaborative participation, etc.)

In 2012 the 26,000 acre Pole Creek Fire burned through several of the the headwater drainages of the CFLRP area including Upper Whychus Creek, a WCF priority subwatershed. This negatively affected water quality, fire effects and forest cover attribute ratings in some the affected subwatersheds for the 2014 5-year monitoring report. These attribute ratings for the current 10- year monitoring period are showing recovery.

The 2017 24,000 acre Milli Fire also burned partly (approximately half) within the CFLRP area, negatively affecting a soil erosion attribute score in

5. What were the <u>most difficult barriers or challenges</u> you experienced in progressing towards your desired conditions for watershed condition? If you adapted to address these challenges please provide a brief description of how.

One challenge in completing the Ryan Ranch project (0.3 miles of riverbank restoration, and reconnecting a 70 acre wetland to the Deschutes River) was an ongoing discussion with the irrigation districts regarding the need of a water right for the project. The issue was finally resolved in late 2018, and the project was implemented.

Another challenge was funding for Whychus Roads. Both competitive Legacy Roads funding, as well as CFLR funding was redirected to other

6. Are you using the <u>Priority Watershed(s)</u> identified through the Watershed Condition Framework to focus CFLRP watershed restoration work and monitoring for this report? Yes ☑ No ☐ Our CFLRP does not have Priority Watersheds ☐

If <u>no</u>, please briefly describe why you are not using the Priority Watersheds:

If <u>yes</u>, is there a Watershed Restoration Action Plan (WRAP) developed for the Priority Watershed(s)? Yes ☑ No ☐

7. Our Priority Watershed(s)of focus for this report cover 7.4 % of the CFLRP landscape

8. Please select <u>up to three</u> conditions <u>in each category</u> for <u>why it was chosen</u> as a Priority (these are available in the WCATT entry):

Category 1: Resource Values

- ☐ Wilderness
- ☑ Wild and Scenic River
- ☐ Experimental Watershed
- ☐ Municipal Watershed
- ☐ Outstanding Resource Water
- ☑ Species protection area
- ☐ Class 1 Air Shed
- ☑ Other: salmon/steelhead rei

Category 2: Concerns and Threats

- ☑ Water Quality
- ☐ Water Quantity
- ☑ Riparian Structure and Function
- ☑ Species Habitat
- ☐ Wildfire Risk
- ☐ Invasive Species
- ☐ Other:

Category 3: Opportunities

- ☑ Improve Condition
- ☐ Maintain Condition
- ☑ Potential Partnership
- ☐ Non-NFS Land Collaboration
- ☑ Larger Scale Restoration
- ☐ Leverage FS funds
- ☐ Socio-economic
- ☐ Other:

Desired Conditions

*In this report, the term "**desired conditions**" refers to landscape and resource conditions (as defined collaboratively by stakeholders and land managers) that you are seeking to achieve and maintain for your CFLRP landscape over the next 10+ years. Desired conditions are outcome-driven not output-driven, and should link to your project's CFLRP proposal while being measurable. (Note: The term "desired condition" is used somewhat differently in the Forest Service's Land Management Planning Process. In that context, it is not time bound, and often represents long-term social, economic and ecological goals, while the term "objective" is used to represent specific, measurable and time-bound benchmarks to be achieved while working toward desired conditions in a forest plan area.) In this report, the term "**landscape**" refers to the landscape identified in your CFRLP project proposal or in subsequently-approved proposal edits. See cover page for links to guidance.*

9. Project-scale Desired Conditions Target for Watershed Condition:

100 % change (relative to the desired condition) occurs across 100 % of the project areas by 12/31/2024

90 % change (relative to the desired condition) occurs across 100 % of the project areas by 12/31/2019

Please include 1-5 *quantifiable* desired condition statements upon which the above target is based:

The watershed/fisheries projects being implemented in the CFLRP area include Glaze Riparian, TSID, Tumalo Creek riparian planting, Snow Creek AOP, Ryan Ranch, Whychus Floodplain, Pole Creek culvert, Uncle John, Indian Ford (including Glaze Meadow, 4 AOPs, aspen enhancement, and instream wood, and user created riparian road decom.), and Whychus Roads Phase 1. The following are the total accomplishment anticipated

Examples: Over 50% of roads that will be used for activities in project areas have received or are planned for BMPs; Over 170 acres of riparian area are improved and floodplain reconnected, 2 miles of stream are restored, and dam removal results in 13 miles of fish passage.

10. Landscape-scale Desired Conditions Target for Watershed Condition:

100 % change (relative to the desired condition) occurs across 82 % of the landscape area by 12/31/2024

92 % change (relative to the desired condition) occurs across 82 % of the landscape area by 12/31/2019

Please include 1-5 *quantifiable* desired condition statements upon which the above target is based:

Watershed Condition Classification of the 17 subwatersheds within the CFLRP area has 14 (82%) in a Condition Class 1 (Properly Functioning) by 2024.

Examples: 50% of the essential projects identified in the watershed WRAP are implemented; Watershed Condition Classification indicates that 14 of the 17 subwatersheds (82% of the CFLRP Landscape Area) are in Condition Class 1 (Properly Functioning); The Watershed Condition Classification for the fire regime and wildfire indicators are improved for 17% of the landscape (30% of the expected treatment area).

11. Please select the indicator(s) below related to watershed condition that you are trying to affect to achieve your quantifiable desired condition(s):

- ☑ Water quality
- ☑ Water quantity
- ☑ Aquatic habitat (fragmentation, woody debris, channel shape and function)
- ☑ Aquatic biota (life-form presence, native species, exotic/invasive species)
- ☑ Improve riparian/wetland vegetation condition
- ☑ Roads and trails (road density, road maintenance, proximity to water, mass wasting)
- ☑ Soils (erosion, productivity, contamination)
- ☑ Fire regime and wildfire (fire condition class, wildfire effects)
- ☑ Forest cover
- ☐ Rangeland vegetation
- ☑ Terrestrial invasive species (extent and rate of spread)
- ☑ Forest health (insects and disease, ozone)
- ☐ Other. Please describe:

12. **Please select the actions you are implementing to work towards your desired condition(s):**

- ☑ Road decommissioning
- ☐ Road maintenance and/or improvement
- ☐ Trail maintenance and/or improvement
- ☑ Mechanical thinning
- ☑ Prescribed fire/controlled burn
- ☑ Culvert replacement
- ☑ Reintroduction of native species
- ☑ Removal of exotic/invasive species
- ☑ Other. Please describe: stream/riparian/floodplain/wetland

13. Please state the evaluation metric(s) you are using to monitor progress towards your desired conditions for watershed condition.
Note: This evaluation metric is something you are measuring or counting to monitor watershed condition. It has a unit of measurement attached to it.

> Watershed condition class (1, 2, 3) is the primary metric for tracking our progress toward our desired condition. This metric is a synthesis of the combined restoration work accomplished in the CFLRP area that includes stream/riparian/floodplain/wetland restoration (stream miles, watershed acres), aquatic organism passage projects (stream miles), fuels reduction (acres), invasive weed treatment (acres), road and trail decommissioning/closure (miles).

Examples of evaluation metrics: Fine sediment volume (mL), fine sediment weight (g), basal area in square feet per acre (for tree density), number of woody debris pieces in a specific size class per stream mile (for fish habitat), stream flow rate (liters/sec), miles of road decommissioned (miles), fish population (number of fish per sweep).

Data and Methodology

14. Select the <u>methodologies</u> used to assess Project-scale (P) and Landscape-scale (L) progress towards watershed condition desired conditions in this report. Select all that apply and provide a brief description for each:

P	L	
☐	☐	National BMP monitoring (protect water quality):
☐	☐	Streambed coring:
☐	☐	Float method (water flow):
☐	☐	Current meter (water flow):
☑	☐	Fish occupancy/use surveys:
☑	☐	Ground-based photo points or photo plots:
☑	☐	Aerial surveys, aerial photography, or remote sensing:
☐	☑	GIS analysis:
☑	☑	Treatments implemented (e.g. acres or miles accomplished) used as proxy for monitoring outcomes:
☐	☑	Modelling used as proxy for monitoring outcomes:
☑	☐	Other: Level 2 stream survey

15. Where is the the data that is being used for monitoring Project-scale (P) and Landscape-scale (L) progress toward watershed condition being stored? Select the <u>database</u> categories that apply and provide a description of the specific <u>datasets</u> being used. Include <u>links</u> if available:

P	L	
☑	☑	GIS database:
☐	☐	County database:
☐	☑	State database:
☐	☐	Tribal database:
☐	☑	Citizen Science database:
☑	☑	Watershed Classification and Assessment Tracking Tool (WCATT):
☐	☐	USFS database of record (e.g. FACTS, WIT, WorkPlan, etc.): *please select performance measure from the table below*
☐	☐	Other:

Performance Measure Shorthand	Description	Database	P	L
BIO-NRG	Green tons from small diameter and low value trees removed from NFS lands and made available for bio-energy production	TIM	☐	☐
FOR-VEG-EST	Acres of forest vegetation established	FACTS	✔	✔
FOR-VEG-IMP	Acres of forestland vegetation improved	FACTS	✔	✔
FP-FUELS-NON-WUI	Acres of hazardous fuels treated outside the wildland/urban interface (WUI) to reduce the risk of catastrophic wildland fire	FACTS	✔	✔
FP-FUELS-WUI	Acres wildland/urban interface (WUI) high-priority hazardous fuels treated to reduce the risk of catastrophic wildland fire	FACTS	☐	☐
HBT-ENH-LAK	Acres of lake habitat restored or enhanced	WIT	✔	✔
HBT-ENH-STRM	Miles of stream habitat restored or enhanced	WIT	✔	✔
HBT-ENH-TERR	Acres of terrestrial habitat restored or enhanced	WIT	✔	✔
INVPLT-NXWD-FED-AC	Highest priority acres treated annually for noxious weeds and invasive plants on NFS lands	FACTS	✔	✔
INVSPE-TERR-FED-AC	Highest priority acres treated for invasive terrestrial & aquatic species on NFS lands	FACTS	✔	✔
RD-DECOM-NON-SYS	Miles of road decommissioned (non-system)	WIT	✔	✔
RD-DECOM-SYS	Miles of road decommissioned (system)	ROADS	✔	✔
RD-HC-IMP	Miles of high clearance system roads improved	ROADS	☐	☐

Performance Measure Shorthand	Description	Database	P	L
RD-HC-MAIN	Miles of high clearance system roads receiving maintenance	ROADS	☐	☐
RD-PC-IMP	Miles of road reconstruction and capital improvement	ROADS	☐	☐
RD-PC-MAIN	Miles of system roads receiving maintenance	ROADS	☐	☐
RG-VEG-IMP	Acres of rangeland vegetation improved	FACTS	☐	☐
S&W-RSRC-IMP	Acres of water or soil resources protected, maintained or improved to achieve desired watershed conditions	WIT	✔	✔
SP-NATIVE-FED-AC	Number of priority acres treated annually for native pests on Federal lands	FAD	☐	☐
STRM-CROS-MITG-STD	Number of stream crossings constructed or reconstructed to provide for aquatic organism passage	WIT	✔	✔
TL-IMP-STD	Miles of system trail improved	TRAILS	☐	☐
TL-MAINT-STD	Miles of system trail maintained	TRAILS	☐	☐
TMBR-SALES-TRT-AC	Acres of forestlands treated using timber sales	FACTS	☐	☐
TMBR-TRT	Acres of forestlands treated to achieve healthier conditions	FACTS	☐	☐
WTRSHD-CLS-IMP-NUM	# of watersheds moved to an improved condition class or sustained in properly functioning condition (Class 1)	WCATT	☐	✔

16. Please describe why the datasets or performance measures you selected in Question 15 above are appropriate for assessing progress towards your watershed desired conditions.

The functioning condition of a watershed includes an evaluation of the functioning condition of physical and biological processes from ridge top to valley bottom. This includes upland vegetation conditions, roads and trails, and the condition of streams, lakes, wetlands, riparian areas,and floodplains

Project-scale scoring

From the beginning, CFLRP intended to shift towards desired conditions at the landscape-scale. As the disturbances and processes of interest occur at a landscape-scale, we need a landscape-scale assessment. It's a challenge to look at the impacts at that scale, given the scale itself as well as time delays (e.g. it takes more time to shift outcomes at landscape-scale than project-scale). While landscape-scale is the focus, project-scale assessments allow projects to bring in their monitoring data and look at treatment outcomes.

Each management action funded through CFLRP will have its own project-level objectives that are designed to contribute to achieving desired conditions at larger scales. Project-scale scoring should reflect how well the results of an individual management activity met the objectives for that project. Individual projects may not meet every desired condition of the CFLRP project. Project-scale scoring is conducted by the multi-party monitoring group following completed management activities.

An individual activity might not need to lead to a fully restored acre, but if it sets the landscape up for the next treatment it may still get a good rating. For example if a successful thinning doesn't restore a fire regime, but it sets up landscape for subsequent burns that might, it could still receive a "Green" rating. There may be many reasons for not scoring a "Green," including ecological and sociological considerations beyond the scope of the CFLRP project as well as recognition of unanticipated barriers or challenges. Note that scoring a "Yellow" or "Red" does not necessarily mean that work was not accomplished.

If you need to summarize scores across different desired condition targets, please refer to Guidance Document for additional instruction.

- **Green** = Expected progress is being made towards desired conditions across 75% or more of our CFLRP project areas.
- **Yellow** = Expected progress is being made towards desired conditions across 26% - 74% of our CFLRP project areas.
- **Red** = Expected progress is being made towards desired conditions across 25% or less of our CFLRP project areas.

Ecological Indicator	Green, Yellow, or Red score and % of the CFLRP project areas resulting in measurable progress as defined above	Are you achieving your CFLRP objectives? Yes or No? If "no", briefly describe why in the box below and use the narrative section as needed.
Watershed Condition	Green - 100%	Yes

Please briefly describe how you calculated your score.

The score reflected above includes an analysis of only the watershed/fisheries projects planned and accomplished within CFLRP area for the 10 year implementation period. The watershed/fisheries projects being implemented in the CFLRP area included Glaze Riparian, TSID, Tumalo Cr riparian planting, Snow Cr. AOP, Ryan Ranch, Whychus Floodplain, Pole Creek culvert, Uncle John diversion, Indian Ford (including Glaze Meadow, Pine Street culvert AOP, Herman

Scoring for National Reporting

Landscape-scale scoring

Few (if any) CFLRP-funded Landscapes propose to meet every proposed desired condition on every acre or achieve landscape-scale objectives through the mechanical treatment of every acre within their landscape boundary. Rather, multiple projects with multiple objectives (fire risk reduction, wildlife habitat improvement, stream restoration, etc.) should facilitate meeting these broader objectives. Scoring at the landscape-scale reflects the degree to which individual Landscapes are moving towards Desired Conditions at broader spatial extent. Landscape-scale scoring is conducted by the multi - party monitoring group at each Landscape.

"Expected progress" will be defined using 10-year benchmarks for FY 2010 projects and 8-year benchmarks for FY 2012 projects for each desired condition based on a percentage of the lifetime outcome specified for the landscape in each proposal. There may be many reasons for not scoring a "Green," including ecological and sociological considerations beyond the scope of the CFLRP project as well as recognition of unanticipated barriers or challenges. Note that scoring a "Yellow" or "Red" does not necessarily mean that work was not accomplished.

If you need to summarize scores across different desired condition targets, please refer to Guidance Document for additional instruction.

- **Green** = Expected progress is being made towards desired conditions across 93 % of our CFLRP landscape area.
- **Yellow** = Expected progress is being made towards desired conditions across 86 % of our CFLRP landscape area.
- **Red** = Expected progress is being made towards desired conditions across 79 % of our CFLRP landscape area.

Ecological Indicator	Green, Yellow, or Red score and % of the landscape across which progress is being made towards desired conditions	Are you achieving your CFLRP objectives? Yes or No? If "no", briefly describe why in the box below and use the narrative section as needed.
Watershed Condition	Green - 100%	Yes

Please briefly describe how you decided on the percentage thresholds used above for the scoring categories and how you calculated your score.

Of the 17 subwatersheds contained within the CFLR area, three of them had enough attribute classifications that would be either affected by activities outside of the CFLRP area, or had factors that were beyond the span of control of the USFS to move the ratings of those attributes to an improved condition. The other 14 subwatersheds (82%) were assessed as subwatersheds whose overall functioning condition, as it is assessed through the Watershed Condition Framework (WCF), could be substantially affected by activities or disturbance within the subwatershed.

2019 CFLRP Ecological Indicator Progress Report

Project Name: Deschutes Collaborative Forest Project State: Oregon

FISH & WILDLIFE HABITAT

Narrative - *Note: All boxes in this template will scroll, so you have as much space as you need.*

☐ If wildlife habitat is not part of your CFLRP proposal and landscape restoration strategy, please let us know by checking this box.
☐ If fish habitat is not part of your CFLRP proposal and landscape restoration strategy, please let us know by checking this box.

1. Did you make any changes to your desired condition(s) for fish & wildlife habitat as compared to the 2014 Ecological Indicator Report? Please briefly describe: **Yes** ☑ **No** ☐

There were no changes to landscape-level desired conditions, which are (1) 105,183 acres (51% of the CFLR landscape) in VCC1 by 2024 and (2) 25 miles of Level 2, 3, 4, and 5 roads within the CFLR landscape closed or decommissioned.

At the project level, the desired condition is 100% implementation of planned aquatic and riparian vegetation restoration activities. In 2014, the desired condition was treatment and improvement of 121 acres of open meadow habitat and 60 acres of aspen stringer meadow habitat on the

2. Did you make any changes to your monitoring methodologies for fish & wildlife habitat as compared to the 2014 Ecological Indicator Report? Please briefly describe: **Yes** ☐ **No** ☑

3. Did you use any new or updated baseline data for evaluating your fish & wildlife habitat progress for the purposes of this report? Please briefly describe: **Yes** ☑ **No** ☐

The baseline data for project level monitoring and for % acres in VCC1 did not change.

The baseline for roads (GIS layer) was updated between 2011 and 2014 and this resulted in more open roads in 2014 due to better information. Therefore, there was no way to compare 2009 to 2014 at that time, and 2014 open road miles is being used as the baseline for this report. In 2014, there were 1120.8 miles of open road on the CFLR landscape.

4. Did your projects experience any unanticipated developments that positively or negatively affected expected progress towards your desired conditions for fish and wildlife habitat? (e.g. wildfire in the project area, litigation outcome, change in collaborative participation, etc.)

Two large wildfires occurred within or partially within the project area - Pole Creek and Milli. These resulted in the loss of forested habitat for wildlife species, loss of riparian habitat and an increase of sediment within streams. They did provide short-term primary cavity excavator habitat due to the increase in snag habitat.

The Ryan Ranch Slough Restoration project was anticipated to be implemented much sooner than it was as a result of political pressures involving water rights and a connection to mitigation relative to a Habitat Conservation Plan (HCP) that is being developed for this area. This delayed the development/enhancement of wetland habitat for a variety of wildlife species, including the threatened Oregon spotted frog.

5. What were the most difficult barriers or challenges you experienced in progressing towards your desired conditions for fish and wildlife habitat? If you adapted to address these challenges please provide a brief description of how.

Roads - Funding challenges for implementation; we lost our legacy roads and CFLN funding due to other funding priorities. In addition, there were staffing challenges (i.e. turnover) that led to delayed decisions/implementation of projects. We applied for private sources of funding for road decommissioning and were granted the funding for the remaining work left in the Whychus watershed.

Population growth has led to increasing recreation pressure, more social trails due to new technologies in equipment and things like crowd sourcing data (this data isn't always correct and is uncontrollable). We also have limited enforcement ability as resource protection ranks low on law enforcement's priorities. In addition, expired forest orders can't be enforced. We met with our partners and assisted in the development of the Deschutes Trails Coalition where they are aiding in trail closures, the development of planning tools, and assisting with media outreach to

6. Did you include the effects of treatments on areas adjacent to the active treatment area? Yes ☑ No ☐
If yes, please briefly describe your methodology for including these adjacent acres, and describe any work conducted across land ownership in support of fish & wildlife habitat.

This occurred primarily as a result of aquatics projects. Installation of culverts and road closures considered the zone of effect of the treatments. Dam removals and riparian restoration treatments created habitat for migrating fish species.

Species habitat and road density are calculated at the watershed scale and includes FS lands only.

Desired Conditions

*In this report, the term "**desired conditions**" refers to landscape and resource conditions (as defined collaboratively by stakeholders and land managers) that you are seeking to achieve and maintain for your CFLRP landscape over the next 10+ years. Desired conditions are outcome-driven not output-driven, and should link to your project's CFLRP proposal while being measurable. (Note: The term "desired condition" is used somewhat differently in the Forest Service's Land Management Planning Process. In that context, it is not time bound, and often represents long-term social, economic and ecological goals, while the term "objective" is used to represent specific, measurable and time-bound benchmarks to be achieved while working toward desired conditions in a forest plan area.) In this report, the term "**landscape**" refers to the landscape identified in your CFRLP project proposal or in subsequently-approved proposal edits. See cover page for links to guidance.*

7. Project-scale Desired Conditions Target for Fish & Wildlife Habitat:

[ ] % change (relative to the desired condition) occurs across [ ] % of the project areas by [ ]

[100] % change (relative to the desired condition) occurs across [80] % of the project areas by [10/01/2019] *(OPTIONAL. Use if separate, additional target is needed for aquatic habitat)*

Please include 1-5 *quantifiable* desired condition statements upon which the above target is based:

The aquatic desired condition reflected above includes an analysis of only the watershed/fisheries projects planned within CFLRP area for the 10 year implementation period. The watershed/fisheries projects being implemented in the CFLRP area included Glaze Riparian, TSID, Tumalo Cr riparian planting, Snow Cr. AOP, Ryan Ranch, Whychus Floodplain, Pole Creek culvert, Uncle John diversion, Indian Ford (including Glaze

Example: 50 miles of inaccessible salmon spawning habitat is made accessible by removing one dam.
Example: Stands have a basal area of 50-80 square feet/acre, which is ideal for red-cockaded woodpecker.
Example: Stands between 5,000-8,000 ft elevation are dominated by ponderosa pine, with 5-10 trees per group, and openings 0.25- 1 acre.

8. Landscape-scale Desired Conditions Target for Fish & Wildlife Habitat:

[66] % change (relative to the desired condition) occurs across [51] % of the landscape area by [10/01/2019]

[100] % change (relative to the desired condition) occurs across [80] % of the landscape area by [10/01/2019] *(OPTIONAL. Use if separate, additional target is needed for aquatic habitat)*

Please include 1-5 *quantifiable* desired condition statements upon which the above target is based:

1. Modeled ecological departure indicates that forest vegetation is restored to Vegetation Condition Class 1 across 57,500 acres (28%) of the CFLR Landscape), for a total of 105,183 acres (51%) of the CFLR landscape in VCC1 by 2024.
2. Reduce disturbance to wildlife species by closing or decommissioning 25 miles (2.28%) of Level 2, 3, 4, and 5 roads within the Deschutes

Example: Slash pine is replaced by longleaf pine ecosystem across 5,000 acres of our CFLRP landscape.
Example: Coniferous forests across the CFLRP landscape have an average canopy cover at or above 50%.
Example: All identified inventoried aquatic organism passages at road/stream crossings that were found to be a barrier (10) are accessible for identified aquatic species at all life stages.

Habitat

9. Please select the categories of the broader goals related to fish & wildlife habitat that you are trying to achieve through your quantifiable desired condition(s):

- ☑ Open forest habitat (e.g. wider tree spacing, less mid-story vegetation)
- ☐ Grass/forb/shrub abundance and/or diversity (e.g. native or desired)
- ☑ Wildlife security (e.g. reduced disturbance and/or mortality to fish or wildlife)
- ☑ Rare or sensitive ecosystem protection and/or restoration (e.g. longleaf, bluestem, riparian, meadow, aspen or wetland habitat)
- ☑ Horizontal Complexity (e.g. "mosaic"/diversity of habitat types, patch sizes, and/or patterns)
- ☑ Vertical complexity (e.g. number of canopy layers)
- ☑ Forest structures (e.g. snags, downed wood, den trees)
- ☐ Mast-producing plant abundance and/or diversity (e.g. acorns, nuts, fruits, or berries eaten by wildlife)
- ☐ Sustainable flow of habitat age-classes through time (e.g. planning the proportion of early-, mid-, and late-seral stands)
- ☑ Habitat connectivity/availability (e.g. increased access to or availability of desired habitat)
- ☑ Aquatic habitat connectivity (e.g. culverts are passable to all aquatic organisms, no dams, stream diversions)
- ☑ Aquatic habitat complexity (e.g. downed wood, pools, riffles, etc)
- ☑ Aquatic sedimentation levels (e.g. suspended sediment or fine sediment in spawning gravels)
- ☐ Other. Please describe:

10. Please state the evaluation metric(s) you are using to monitor progress towards your desired conditions for fish & wildlife habitat for this report. Note: This evaluation metric is something you are measuring or counting to monitor habitat change. It has a unit of measurement attached to it.

For fish habitat, we use miles of stream access for fish migration, miles of side channel improved, stream miles of habitat improved, acres of riparian habitat planted or restored, and number of large wood pieces per mile.

Road density is also used for wildlife species.

Examples of habitat evaluation metrcs: basal area in square feet per acre (for tree density), number of trees per acre (for tree density), quadratic mean diameter in inches (for tree sizes), litter and duff depths in centimeters (for fire hazard), percent canopy cover (for opennesss), percent ground cover (for forage), seedling survival per acre per year (for reforestation), number of woody debris pieces in a specific size class per stream mile (for fish habitat), grass dry weight clippings used to calculate grass pounds per acre (for forage abundance)

Populations

11. Please select the categories of broader goals related to fish & wildlife populations that you are trying to achieve through your quantifiable desired condition(s). Then list the specific species of interest related to each category you select.

- ☑ Maintain abundance/density: Northern spotted owl, Oregon spotted frog, Redband trout
- ☑ Increase abundance/density: White-headed woodpecker, Oregon spotted frog
- ☐ Decrease abundance/density:
- ☑ Maintain native species diversity: All native wildlife species
- ☐ Increase native species diversity:
- ☑ Translocation/reintroduction: Salmon/Steelhead
- ☑ Optimal sustained yield of game species: Mule Deer
- ☑ Ecosystem function/food webs: Northern spotted owl, Mule deer, White-headed woodpecker
- ☑ Spatial extent of population: Salmon/steelhead
- ☐ Other. Please describe:

12. If relevant for your CFLRP project, please state the evaluation metric(s) you are using to monitor progress towards your desired conditions for fish & wildlife populations. Note: This evaluation metric is something you are measuring or counting to monitor population change. It has a unit of measurement attached to it.

Road density

VCC - see Fire Regime section.

Miles of fish passage restored.

Acres of riparian restoration restored.

Examples of population evaluation metrics: number of wildlife encounter events per unit area via point counts or remote cameras (for wildlife usage), number of pellet groups along transects used to calculate animal density per unit area (for mammal usage), presence/absence of a plant community-associated wildlife species in the project area, presence of aquatic species as indicated by eDNA

☐ Please check this box if you are not evaluating fish & wildlife populations.

Data and Methodology

13. Select the <u>type(s) of monitoring</u> you used to assess Project-scale (P) and Landscape-scale (L) progress towards fish & wildlife habitat desired conditions for this report. Select all that apply.

P	L	
☑	☑	**Baseline Data Collection** (i.e. was data collected prior to treatment to be used for later comparison?)
☑	☑	**Accomplishment Reporting** (i.e. was progress tracked using acres and miles reported?)
☑	☐	**Implementation Monitoring** (i.e. were the treatments implemented as prescribed?)
☑	☐	**Effectiveness Monitoring Pilot Study** (i.e. was a trial run conducted to assess considerations of crafting an effectiveness monitoring plan?)
☑	☐	**Effectiveness Monitoring** (i.e. were treatments effective at meeting the stated objectives?)
☑	☑	**Ecological Impacts Monitoring** (i.e. were there any unforeseen ecological consequences that could compromise treatment success?)
☐	☐	**Other.** Please describe:

14. Select the <u>methodologies</u> used to assess Project-scale (P) and Landscape-scale (L) progress towards fish & wildlife habitat desired conditions for this report. Select all that apply and provide a brief description for each:

P	L		
☐	☐	Common Stand Exams (USFS procedures):	
☐	☐	Understory vegetation plots or transects:	
☑	☑	Fish or Wildlife occupancy/use surveys:	Northern spotted owl and northern goshawk surveys, Oregon spotted frog egg mass surveys
☑	☑	Stream surveys:	
☑	☑	Remote motion-capture cameras:	Carnivores, seasonal water level change monitoring
☐	☐	Ground-based photo points or photo plots:	
☐	☑	Aerial surveys, aerial photography, or remote sensing:	Aerial photo for mapping riparian vegetation, radio tracking chinook/salmon
☑	☐	Treatments implemented (e.g. acres or miles accomplished):	
☐	☑	Modeling (include type and whether ground-truthed):	Wildlife species habitat; spotted owl habitat is ground truthed
☑	☑	GIS analysis:	
☐	☐	Other:	

15. Where is the the data that is being used for monitoring Project-scale (P) and Landscape-scale (L) progress toward fish & wildlife habitat desired conditions being stored? Select the <u>database</u> categories that apply and provide a description of the specific <u>datasets</u> being used. Include <u>links</u> if available:

P	L		
☑	☑	GIS database:	
☐	☐	County database:	
☐	☑	State database:	Oregon Dept Fish and Wildlife (mule deer data); streamflow and temperature data
☐	☐	Tribal database:	
☐	☐	Citizen Science database:	
☑	☑	FSVeg:	
☑	☑	NRIS:	Wildlife, Aquatic
☐	☐	Other USFS database of record: *please select performance measure from the table below*	
☑	☐	Other:	PGE, Watershed Council, FACTS

Performance Measure Shorthand	Description	Database	P	L
BIO-NRG	Green tons from small diameter and low value trees removed from NFS lands and made available for bio-energy production	TIM	☐	☐
FOR-VEG-EST	Acres of forest vegetation established	FACTS	☐	☐
FOR-VEG-IMP	Acres of forestland vegetation improved	FACTS	✔	✔
FP-FUELS-NON-WUI	Acres of hazardous fuels treated outside the wildland/urban interface (WUI) to reduce the risk of catastrophic wildland fire	FACTS	✔	✔
FP-FUELS-WUI	Acres wildland/urban interface (WUI) high-priority hazardous fuels treated to reduce the risk of catastrophic wildland fire	FACTS	✔	✔
HBT-ENH-LAK	Acres of lake habitat restored or enhanced	WIT	☐	☐
HBT-ENH-STRM	Miles of stream habitat restored or enhanced	WIT	✔	✔
HBT-ENH-TERR	Acres of terrestrial habitat restored or enhanced	WIT	✔	✔
INVPLT-NXWD-FED-AC	Highest priority acres treated annually for noxious weeds and invasive plants on NFS lands	FACTS	☐	☐
INVSPE-TERR-FED-AC	Highest priority acres treated for invasive terrestrial & aquatic species on NFS lands	FACTS	☐	☐
RD-DECOM-NON-SYS	Miles of road decommissioned (non-system)	WIT	☐	☐
RD-DECOM-SYS	Miles of road decommissioned (system)	ROADS	✔	☐
RD-HC-IMP	Miles of high clearance system roads improved	ROADS	☐	☐

Performance Measure Shorthand	Description	Database	P	L
RD-HC-MAIN	Miles of high clearance system roads receiving maintenance	ROADS	☐	☐
RD-PC-IMP	Miles of road reconstruction and capital improvement	ROADS	☐	☐
RD-PC-MAIN	Miles of system roads receiving maintenance	ROADS	☐	☐
RG-VEG-IMP	Acres of rangeland vegetation improved	FACTS	☐	☐
S&W-RSRC-IMP	Acres of water or soil resources protected, maintained or improved to achieve desired watershed conditions	WIT	☐	☐
SP-NATIVE-FED-AC	Number of priority acres treated annually for native pests on Federal lands	FAD	☐	☐
STRM-CROS-MITG-STD	Number of stream crossings constructed or reconstructed to provide for aquatic organism passage	WIT	✔	✔
TL-IMP-STD	Miles of system trail improved	TRAILS	☐	☐
TL-MAINT-STD	Miles of system trail maintained	TRAILS	☐	☐
TMBR-SALES-TRT-AC	Acres of forestlands treated using timber sales	FACTS	☐	☐
TMBR-TRT	Acres of forestlands treated to achieve healthier conditions	FACTS	☐	☐
Other:			☐	☐
Other:			☐	☐

16. Please describe why the datasets or performance measures you selected in Question 15 above are appropriate for assessing progress towards your fish & wildlife habitat desired condition(s).

Vegetation, fuels, wildlife and fish databases aid in assessing changes to vegetation across the landscape and inform how we are progressing toward the natural range of variability. The roads database helps to inform on the quality of habitat and how human disturbance is affecting habitat.

Project-scale scoring

From the beginning, CFLRP intended to shift towards desired conditions at the landscape-scale. As the disturbances and processes of interest occur at a landscape-scale, we need a landscape-scale assessment. It's a challenge to look at the impacts at that scale, given the scale itself as well as time delays (e.g. it takes more time to shift outcomes at landscape-scale than project-scale). While landscape-scale is the focus, project-scale assessments allow projects to bring in their monitoring data and look at treatment outcomes.

Each management action funded through CFLRP will have its own project-level objectives that are designed to contribute to achieving desired conditions at larger scales. Project-scale scoring should reflect how well the results of an individual management activity met the objectives for that project. Individual projects may not meet every desired condition of the CFLRP project. Project-scale scoring is conducted by the multi-party monitoring group following completed management activities.

An individual activity might not need to lead to a fully restored acre, but if it sets the landscape up for the next treatment it may still get a good rating. For example if a successful thinning doesn't restore a fire regime, but it sets up landscape for subsequent burns that might, it could still receive a "Green" rating. There may be many reasons for not scoring a "Green," including ecological and sociological considerations beyond the scope of the CFLRP project as well as recognition of unanticipated barriers or challenges. Note that scoring a "Yellow" or "Red" does not necessarily mean that work was not accomplished.

If you need to summarize scores across different desired condition targets, please refer to Guidance Document for additional instruction.

- **Green** = Expected progress is being made towards desired conditions across 75% or more of our CFLRP project areas.
- **Yellow** = Expected progress is being made towards desired conditions across 26% - 74% of our CFLRP project areas.
- **Red** = Expected progress is being made towards desired conditions across 25% or less of our CFLRP project areas.

Ecological Indicator	Green, Yellow, or Red score and % of the CFLRP project areas resulting in measurable progress as defined above	Are you achieving your CFLRP objectives? Yes or No? If "no", briefly describe why in the box below and use the narrative section as needed.
Fish and Wildlife Habitat	Green- 100% Fish	Yes

Please briefly describe how you calculated your score.

Fish- We completed 100% of the projects and met the project project objectives.

Scoring for National Reporting

Landscape-scale scoring

Few (if any) CFLRP-funded Landscapes propose to meet every proposed desired condition on every acre or achieve landscape-scale objectives through the mechanical treatment of every acre within their landscape boundary. Rather, multiple projects with multiple objectives (fire risk reduction, wildlife habitat improvement, stream restoration, etc.) should facilitate meeting these broader objectives. Scoring at the landscape-scale reflects the degree to which individual Landscapes are moving towards Desired Conditions at broader spatial extent. Landscape-scale scoring is conducted by the multi -party monitoring group at each Landscape.

"Expected progress" will be defined using 10-year benchmarks for FY 2010 projects and 8-year benchmarks for FY 2012 projects for each desired condition based on a percentage of the lifetime outcome specified for the landscape in each proposal. There may be many reasons for not scoring a "Green," including ecological and sociological considerations beyond the scope of the CFLRP project as well as recognition of unanticipated barriers or challenges. Note that scoring a "Yellow" or "Red" does not necessarily mean that work was not accomplished.

If you need to summarize scores across different desired condition targets, please refer to Guidance Document for additional instruction.

- **Green** = Expected progress is being made towards desired conditions across >66 % of our CFLRP landscape area.
- **Yellow** = Expected progress is being made towards desired conditions across >33 % of our CFLRP landscape area.
- **Red** = Expected progress is being made towards desired conditions across <33 % of our CFLRP landscape area.

Ecological Indicator	Green, Yellow, or Red score and % of the landscape across which progress is being made towards desired conditions	Are you achieving your CFLRP objectives? Yes or No? If "no", briefly describe why in the box below and use the narrative section as needed.
Fish and Wildlife Habitat	Green (88.5%)	Yes

Please briefly describe how you decided on the percentage thresholds used above for the scoring categories and how you calculated your score.

Landscape-scale scoring is based on the desired condition to restore 57,500 acres (28% of the CFLR landscape) to VCC1, for a total of 105,183 acres (51%) of the CFLR landscape in VCC1 by 2024.

The target is set for year 15 of this CFLR project, so "green" expected progress in 2019 (year 10) is >66% of the target met.

2019 CFLRP Ecological Indicator Progress Report

Project Name: Deschutes Collaborative Forest Project State: Oregon

INVASIVE SPECIES

Narrative - *Note: All boxes in this template will scroll, so you have as much space as you need*

☐ If invasive species is not part of your CFLRP proposal and landscape restoration strategy, please let us know by checking this box.

1. Did you make any changes to your desired condition(s) for invasive species as compared to the 2014 Ecological Indicator Report? Please briefly describe: **Yes** ☑ **No** ☐

In 2014 the desired condition was 4.8 percent of the project area, about 9800 acres, restored by 2019.
In 2019, efficacy, or reduction in invasive plant density, at or above the national average of 80%, was added.

2. Did you make any changes to your monitoring methodologies for invasive species as compared to the 2014 Ecological Indicator Report? Please briefly describe: **Yes** ☐ **No** ☑

3. Did you use any new or updated baseline data for evaluating your invasive species progress for the purposes of this report? Please briefly describe: **Yes** ☐ **No** ☑

4. Did your projects experience any unanticipated developments that positively or negatively affected expected progress towards your desired conditions for invasive species? (e.g. wildfire in the project area, litigation outcome, change in collaborative participation, etc.)

- We had a contaminated material source near the Welcome Center off Century Drive. Annual treatments are underway to keep the material source clean and clean up the effects of contamination where the materials were used.
- We implemented a biocontol for toadflax, which has been very effective.
- We moved from an agreement with the county to a contract with positive results, more infected acres were treated with less non-target spraying.
- There has been an increase in long-term camping, which has impacts in where we are able to treat due to INVP sites being camped on or closely adjacent. There has been some harassment of government employees by long-term campers that has contributed to inability to access some treatment areas.

5. What were the most difficult barriers or challenges you experienced in progressing towards your desired conditions for invasive species? If you adapted to address these challenges please provide a brief description of how.

- Adjacent private lands where invasive plant populations are not adequately addressed, primarily a problem in wildland urban interface near subdivisions that include vacation properites, such as Tetherow and Sunriver.
- More invasive plant inventory and monitoring has led to the discovery of more invasive plant sites, which puts more demand on site treatments, and the ecology of invasive plants generally includes the ability to spread quickly into recent disturbances, including restoration projects.
- Even with additional funding provided through the CFLR, time and resources continue to be a challenge to getting all areas treated.

Desired Conditions

*In this report, the term "**desired conditions**" refers to landscape and resource conditions (as defined collaboratively by stakeholders and land managers) that you are seeking to achieve and maintain for your CFLRP landscape over the next 10+ years. Desired conditions are outcome-driven not output-driven, and should link to your project's CFLRP proposal while being measurable. (Note: The term "desired condition" is used somewhat differently in the Forest Service's Land Management Planning Process. In that context, it is not time bound, and often represents long-term social, economic and ecological goals, while the term "objective" is used to represent specific, measurable and time-bound benchmarks to be achieved while working toward desired conditions in a forest plan area.) In this report, the term "**landscape**" refers to the landscape identified in your CFRLP project proposal or in subsequently-approved proposal edits. See cover page for links to guidance.*

6. Project-scale Desired Conditions Target for Invasive Species

[ ] % change (relative to the desired condition) occurs across [ ] % of the project areas by [ ]

[ ] % change (relative to the desired condition) occurs across [ ] % of the project areas by [ ]

Please include 1-5 *quantifiable* desired condition statements upon which the above target is based:

N/A. We feel that treatment of invasive plants is more effective when considered at the landscape scale, due to ease and speed of movement of seed and propagules.

Example: Cogongrass is reduced to less than 25% cover.
Example: Using the prevention protocols on all projects, no new invasive species infestations are established.

7. Landscape-scale Desired Conditions Target for Invasive Species:

80 % change (relative to the desired condition) occurs across 3 % of the landscape area by 10/01/2014

80 % change (relative to the desired condition) occurs across 5 % of the landscape area by 10/01/2019

Please include 1-5 *quantifiable* desired condition statements upon which the above target is based:

• 2.4 % of the landscape was restored by reducing invasive species severity (preventing, controlling or eradicating targeted invasive species) to meet desired conditions by 2014.
• 4.8% of the landscape restored by reducing invasive species severity (preventing, controlling or eradicating targeted invasive species) to meet

Example: The increase in coverage of Leafy Spurge and Rush Skeletonweed is prevented on 500 acres of sensitive botanical habitat within our CFLRP landscape.
Example: All known populations of Yellow Star Thistle are contained along 100 miles of FS roads and trails within our CFLRP landscape.
Example: The presence of feral swine is surveyed and mapped on 500 acres within our CFLRP landscape.

8. Please select the categories of the broader goals related to invasive species that you are trying to achieve through your quantifiable desired condition(s):

- ☑ Inventory and Mapping
- ☑ Risk Assessment
- ☐ Prevention
- ☑ Maintenance at current levels
- ☐ Containment below thresholds
- ☑ Reduction
- ☐ Eradication
- ☑ Increased resilience. Recognizing *invasive species are not constrained to disturbed areas*, please describe your definition of resilience in an invasive species context:
- ☐ Other. Please describe:

9. For each invasive species you have addressed within your CFRLP landscape, please list the action(s)[1] you have taken to work towards your invasive species desired conditions, the acres and/or miles you have accomplished, and the efficacy of each action*:*
(All of the following data is reported in FACTS.)

Target Invasive Species	Action Taken	Land Ownership	Acres	Efficacy (%)
spotted knapweed	herbicide, manual treatment (hand-pulling), seeding treated are	USFS	2147	80
medusahead rye	herbicide	USFS	201	90
ox-eye daisy	herbicide	USFS	4.5	90
reed canarygrass	herbicide, mechanical removal with backhoe	USFS	113	70
diffuse knapweed	herbicide, manual	USFS	1268	80

[1] Actions taken to address an invasive species might include inventory & mapping, hand removal, mechanical removal, release of a biological control agent (an organism that kills the target species), ground-based herbicide application, aerial herbicide application, tarping, grazing, preventative weed wash stations, trapping invasive animals, etc.

10. Please briefly describe the specific negative impacts each of your target invasive species causes that you are trying to avoid. These impacts can be environmental, economic, cultural, or human/animal health-related.

Spotted knapweed impacts are loss of native species diversity through competition with and suppression of native plants, increase in fine fuels in infested areas, loss of quality pollinator habitat (pollinators do not get adequate nutritional value from spotted knapweed).
Medusahead rye impacts are loss of native species diversity through competition, loss of wildlife forage and habitat, increase in fine fuels in infested areas, decreases quality of recreational experience.

Data and Methodology

11. Select the methodologies used to assess Project-scale (P) and Landscape-scale (L) progress towards invasive species desired conditions for this report. Select all that apply and provide a brief description of each:

P	L	
☐	☐	Aerial surveys/inventories/mapping:
☐	☑	Ground surveys/inventories/mapping:
☐	☐	Environmental sampling (wood, soil, water, infected tissue, etc.):
☐	☑	Observations of individuals:
☐	☐	Observations of damage:
☐	☐	Observation of tracks, scat, nests, etc.:
☐	☐	Trap samples:
☐	☐	eDNA:
☐	☐	Other:

12. Where is the the data that is being used for monitoring Project-scale (P) and Landscape-scale (L) progress toward invasive species desired conditions being stored? Select the databases categories that apply and provide a description of the specific datasets being used. Include links if available:

P	L	
☐	☑	GIS database:
☐	☐	County database:
☐	☐	State database:
☐	☐	Tribal database:
☐	☐	Citizen Science database:
☐	☐	Forest Inventory and Analysis (FIA) database:
☐	☑	USFS database of record (FACTS - *select performance measures*):
		☑ INVPLT-NXWD-FED-AC Highest priority acres treated for noxious weeds and invasive pests ☐ INVSPE-TERR-FED-AC Highest priority acres treated for invasive terrestrial & aquatic species
☐	☐	Other:

Project-scale scoring

From the beginning, CFLRP intended to shift towards desired conditions at the landscape-scale. As the disturbances and processes of interest occur at a landscape-scale, we need a landscape-scale assessment. It's a challenge to look at the impacts at that scale, given the scale itself as well as time delays (e.g. it takes more time to shift outcomes at landscape-scale than project-scale). While landscape-scale is the focus, project-scale assessments allow projects to bring in their monitoring data and look at treatment outcomes.

Each management action funded through CFLRP will have its own project-level objectives that are designed to contribute to achieving desired conditions at larger scales. Project-scale scoring should reflect how well the results of an individual management activity met the objectives for that project. Individual projects may not meet every desired condition of the CFLRP project. Project-scale scoring is conducted by the multi-party monitoring group following completed management activities.

An individual activity might not need to lead to a fully restored acre, but if it sets the landscape up for the next treatment it may still get a good rating. For example if a successful thinning doesn't restore a fire regime, but it sets up landscape for subsequent burns that might, it could still receive a "Green" rating. There may be many reasons for not scoring a "Green," including ecological and sociological considerations beyond the scope of the CFLRP project as well as recognition of unanticipated barriers or challenges. Note that scoring a "Yellow" or "Red" does not necessarily mean that work was not accomplished.

If you need to summarize scores across different desired condition targets, please refer to Guidance Document for additional instruction.

- **Green** = Expected progress is being made towards desired conditions across 75% or more of our CFLRP project areas.
- **Yellow** = Expected progress is being made towards desired conditions across 26% - 74% of our CFLRP project areas.
- **Red** = Expected progress is being made towards desired conditions across 25% or less of our CFLRP project areas.

Ecological Indicator	**Green, Yellow, or Red score and % of the CFLRP project areas resulting in measurable progress as defined above**	**Are you achieving your CFLRP objectives? Yes or No? If "no", briefly describe why in the box below and use the narrative section as needed.**
Invasive Species		

Please briefly describe how you calculated your score.

We did not include project scoring for invasive plants in our five year report. We feel that treatment of invasive plants is more effective when considered at the landscape scale, due to ease and speed of movement of seed and propagules.

Scoring for National Reporting

Landscape-scale scoring

Few (if any) CFLRP-funded Landscapes propose to meet every proposed desired condition on every acre or achieve landscape-scale objectives through the mechanical treatment of every acre within their landscape boundary. Rather, multiple projects with multiple objectives (fire risk reduction, wildlife habitat improvement, stream restoration, etc.) should facilitate meeting these broader objectives. Scoring at the landscape-scale reflects the degree to which individual Landscapes are moving towards Desired Conditions at broader spatial extent. Landscape-scale scoring is conducted by the multi -party monitoring group at each Landscape.

"Expected progress" will be defined using 10-year benchmarks for FY 2010 projects and 8-year benchmarks for FY 2012 projects for each desired condition based on a percentage of the lifetime outcome specified for the landscape in each proposal. There may be many reasons for not scoring a "Green," including ecological and sociological considerations beyond the scope of the CFLRP project as well as recognition of unanticipated barriers or challenges. Note that scoring a "Yellow" or "Red" does not necessarily mean that work was not accomplished.

If you need to summarize scores across different desired condition targets, please refer to Guidance Document for additional instruction.

- **Green** = Expected progress is being made towards desired conditions across 90 % of our CFLRP landscape area.
- **Yellow** = Expected progress is being made towards desired conditions across 70 % of our CFLRP landscape area.
- **Red** = Expected progress is being made towards desired conditions across 0-69 % of our CFLRP landscape area.

Ecological Indicator	Green, Yellow, or Red score and % of the landscape across which progress is being made towards desired conditions	Are you achieving your CFLRP objectives? Yes or No? If "no", briefly describe why in the box below and use the narrative section as needed.
Invasive Species	Green, 161%	Yes

Please briefly describe how you decided on the percentage thresholds used above for the scoring categories and how you calculated your score.

The scoring is based on the actual number of acres restored across the CFLR Landscape (15,755 acres of 9,800 acres have been treated to date, which is 161%). The reason our percent treated is above 100% is partly because the number of invasive plant infestations increased from 2009 to 2019, largely due to increased inventory and monitoring. Importantly, although the total acreage of invasive sites across the CFLRA increased between 2009 and 2019, a substantial number of sites have smaller population sizes in 2019 than 2009. Between 2016 and 2019, Forest Service employees reported zero invasive species at 57 known high-priority infestation sites within the CFLRA on the Bend-Fort Rock ranger district, including 32 in 2019 alone. In 2014, only 13 high-priority infestation sites on

Monitoring References and Resources

1. Briefly describe any key lessons learned about integration across these 4 ecological sub-indicators.
For example, if you planned fuels reduction treatments (Fire Regime) strategically around a Priority Watershed (Watershed Condition).

Current and future ecological trade-offs and tendency for "present bias" across indicator areas remains a real factor in project planning and implementation within the CFLR landscape and beyond. Finding common ground (weighing the specific present day needs to future needs in terms of ecosystem sustainability and resiliency) and has been a true success of the collaborative process associated with the Deschutes CFLR

2. Briefly describe the roles of the parties involved in setting the desired conditions, and collecting, assessing, and sharing the data used in this report:

Deschutes National Forest resource specialists and DCFP staff worked together to set desired conditions and assess and share the data. Data collection and analysis were performed by Deschutes National Forest staffers.

3. Please acknowledge the people who assisted with completing this 2019 CFLRP Ecological Indicator Report:

Fire Regime: Trevor Miller, Lauren Miller, Mike Simpson. Watershed: Jason Gritzner. Fish & Wildlife Habitat: Lauri Turner, Mike Riehle. Invasive Plants: Marlo Fisher, Charmane Powers, Maureen Durrant, Jenifer Ferriel

4. Please provide links to your past CFLRP monitoring reports developed by the USFS, partners, etc.:

See attached:
2019 CFLRA Ecological Monitoring Report: Changes in Invasive Plant Infestations

Examples: Uncompahgre CFLRP Monitoring of Forest Spatial Patterns; Four Forest Restoration Initiative Bird Survey Report 2015

5. Please provide links to your CFLRP monitoring plans and any approved revisions (or include as an attachment):

https://www.fs.fed.us/restoration/documents/cflrp/results/Deschutes_monitoring.pdf

Examples: Colorado Front Range Multi-Party Monitoring Plan; Dinkey Landscape Ecological Monitoring Plan

6. Please provide links to technical reports or other literature utilized in determining and assessing the desired conditions used in this report:

Examples: Historical Forest Attributes of the Western Blue Mountains of Oregon; Restoring Ponderosa Pine Forests of the Colorado Front Range

2019 CFLRA Ecological Monitoring Report

Changes in Invasive Plant Infestations

According to national guidance for the CFLRA ecological outcome monitoring, the Forest Service is required to report annual treatments of high priority invasive species within the CFLRA, as well as the percent reduction in invasive plant density (efficacy) at treated sites. Invasive species sites are defined by priority according to the 2012 Invasive Plant EIS, while the size and location of treatments continue to be monitored and updated in Forest Service databases. In 2019, additional funding allowed for a seasonal Forest Service employee to conduct extensive, detailed monitoring of high-priority invasive sites before and after treatments occurred. It is important to note that although the CFLRA boundary was expanded in 2016, this report is based off of the 2014 boundary to consistently compare 2014 and 2019 monitoring data.

Questions

- **4L-1a:** How many acres of high-priority invasive plant infestations are treated across the landscape? How many do we have?
- **4L-1b:** Where are treatments located relative to known invasive plant infestations?
- **4L-2:** What is the average percent reduction in invasive plant density (efficacy) across all treated areas?

Methods

Pre-Treatment Surveys

Known invasive species sites were monitored in the CFLRA by a seasonal employee in 2014 and 2019. In 2019, **123** infestation sites were surveyed for invasive species before treatment occurred, adding up to **2,088** acres. Pre-treatment surveys are important, as they inform treatment applicators about the current extent of infestation at the site. These pre-treatment surveys may also be referenced when revisiting the site post-treatment and assessing the percent reduction in invasive plant density.

Post-Treatment Surveys

In 2019, post-treatment surveys of invasive sites were focused on high-priority, large-acre infestations where herbicides were applied (e.g. gravel pits). Herbicide application was introduced in the 2012 Invasive Plant EIS, and for this reason, it is important that the efficacy of chemical treatments continues to be monitored. Post-treatment monitoring for invasive species occurred on **28** sites, adding up to **212** acres. The average percent reduction in invasive plant density is **83.9%**, which is above the national average of 80%.

Table 1: Acres of high-priority invasive plant infestations treated in 2014 and 2019. Total acres and acres treated both increased from 2014 to 2019 (see results section for discussion).

Year	2014	2019
Total High-Priority Infestations (acres)	2,264	2,707
High-Priority Infestations Treated (acres)	2,213	2,312

Table 2: High-priority acres treated and average percent reduction in invasive plant density (% efficacy) in 2014 and 2019. While acres treated increased from 2014 to 2019 (see results section for discussion), treatment efficacy remains above that national average of 80%.

Year	2014	2019
High-Priority Acres Treated	2,213	2,312
% Efficacy	86.1	83.9

Photo Point Monitoring

Photo points were established across **60** infestation sites during 2019 monitoring. This is the first time photo points have been established for the majority of these sites, as only 2 sites on the Bend-Fort Rock Ranger District had recorded photo points in 2014. Surveyors in 2024 can return to these points and visually observe the changes in the vegetation composition over time. Photo points can be found in Pinyon using the following folder pathway: Invasives-USE-THIS-ONE>CFLR>PhotoMonitoring. Additionally, these photo points are attached to GPS coordinates in Avenza Maps on the Deschutes NF Motor Vehicle Use Map. Each GPS coordinate is labeled with the site name and corresponding photo point number, which matches the photo point number in Pinyon. Further work is needed to export and share these GPS coordinates. Photo points were also recorded at 2 sites before and after treatment in 2019. These images are useful in determining the percent reduction in invasive plant density post-treatment.

Images 1 & 2: Photo points taken at a site near the 46/41 road junction in 2019 before herbicide treatment (left) and after (right). Before treatment, spotted knapweed (Centaurea stoebe ssp. micranthos) was found in and alongside the road. After treatment, the knapweed populations declined.

Images 3 & 4: Photo points taken at the Tetherow pit site prior to treatment in 2014 (left) and 2019 (right). In 2014, the open area of the pit was dominated by spotted knapweed (Centaurea stoebe ssp. micranthos). In 2019, this area has more mullein (Verbascum thapsus) and native woody shrubs with significantly reduced numbers of knapweed.

Results

We continue to have high acres of treated sites, similar to 2014, but we are achieving long-lasting results with the herbicide. In the past we relied on large groups to do manual removal, which resulted in many plants pulled and lots of acres treated. The manual treatments achieved lower efficacy over time due to the lack of effectively being able to remove deeply rooted perennials, such as the dominant invasive spotted knapweed. In addition, if not done carefully, manual removal can create more disturbance to a site, increasing the potential for the already established invasives to remain or for new invasives to establish.

The sites that have been thoroughly treated with herbicide have reduced significantly in population size and density. The footprint of the infestation often remains the same because there will likely be remnant plants due to an established seed bank or missed plants; this is why the acreage has not decreased significantly although many of the populations have. There are several infestations that received herbicide treatments and are reduced significantly in size that they can easily be pulled before going to seed. A high-use reacreation site, Meadow Camp Day Use, has been adopted by a volunteer group (Coalition for the Deschutes) who will pull the site once a year for regular maintenance.

Also important to note, one of the highest priority species, Medusahead, was eradicated from two out of four sites in the CFLR boundary. At one of the Medusahead sites, a smooth-wire fence was installed to deter public disturbance in the site while it received herbicide treatments. Medusahead has been reduced from thousands of plants with a wide distribution over 20 acres to a few small clumps in isolated patches (approximately 200 plants). The site will be revegetated with native plants in 2020.

According to the 2018 National Visitor Use Monitoring Survey, forest-wide visitation increased 65% from 2013 to 2018. As recreation increases, so do the vectors that cause invasive recruitment and infestation growth. For instance, boats, cars, pets, and bicycles are all vectors for the spread of invasive species. Many new sites discovered since 2014 are located near recreation sites, trails, and roads. The correlation between increased recreation usage and new invasive sites suggests that the treatment of invasive species will continue to be an integral task of the Deschutes National Forest in order to restore the CFLRA.

In addition to an increase in recreation, more invasive sites were discovered within the last 5 years due to increased project work and funding from CFLR. With an increase in funds, the Forest Service was able to conduct more surveys for invasive species, and thus discovered more infestation sites than in 2014.

Decreased Presence of Invasive Populations at Known Sites

Although the total acreage of invasive sites across the CFLRA increased between 2014 and 2019, a substantial number of sites have smaller population sizes in 2019 than 2014. Between 2016 and 2019, Forest Service employees reported zero invasive species at **57** known high-priority infestation sites within the CFLRA on the Bend-Fort Rock ranger district, including **32** in 2019 alone. In 2014, only **13** high-priority infestation sites on the Bend-Fort Rock Ranger district were reported to have zero plants. Additionally, of the sites on BFR surveyed before treatment in both 2019 and 2014, **65%** had decreased population sizes in 2019. These trends suggest that while more invasive sites have been found since 2014, the Forest Service is observing decreases in populations at a higher rate in 2019.

Table 3: High-priority infestation sites on BFR with zero reported plants

Year	2014	2019
High-priority infestation sites in CFLRA (BFR)	165	279
Sites visited with zero plants	13	32
% of total sites with zero plants	7.8%	11.4%

Timber Sale Areas

While a handful of invasive species sites were recorded in timber sale areas in from 2015-2019, these sites contain infestations of low-priority species, such as *Verbascum thapsus* (mullein) and *Cirsium vulgare* (bull thistle). Conversely, high priority species such as spotted knapweed (*Centaurea stoebe ssp. micranthos*) were not commonly found among skid roads, landings, and other disturbances associated with timber sales and other logging treatments. High priority sites where *C. stoebe ssp. micranthos* is found include heavy recreation use areas, roadsides, and gravel pits. For this reason, these are the areas where the majority of invasive monitoring surveys occurred, as opposed to within timber sale areas.

Image 5: V. thapsus (mullein) rosettes infesting an old road used for logging treatments near the McKenzie gravel pit on the Sisters Ranger District. While Centautrea diffusa (diffuse knapweed), a

Invasive Plant Treatments within the CFLRA 2015-2019

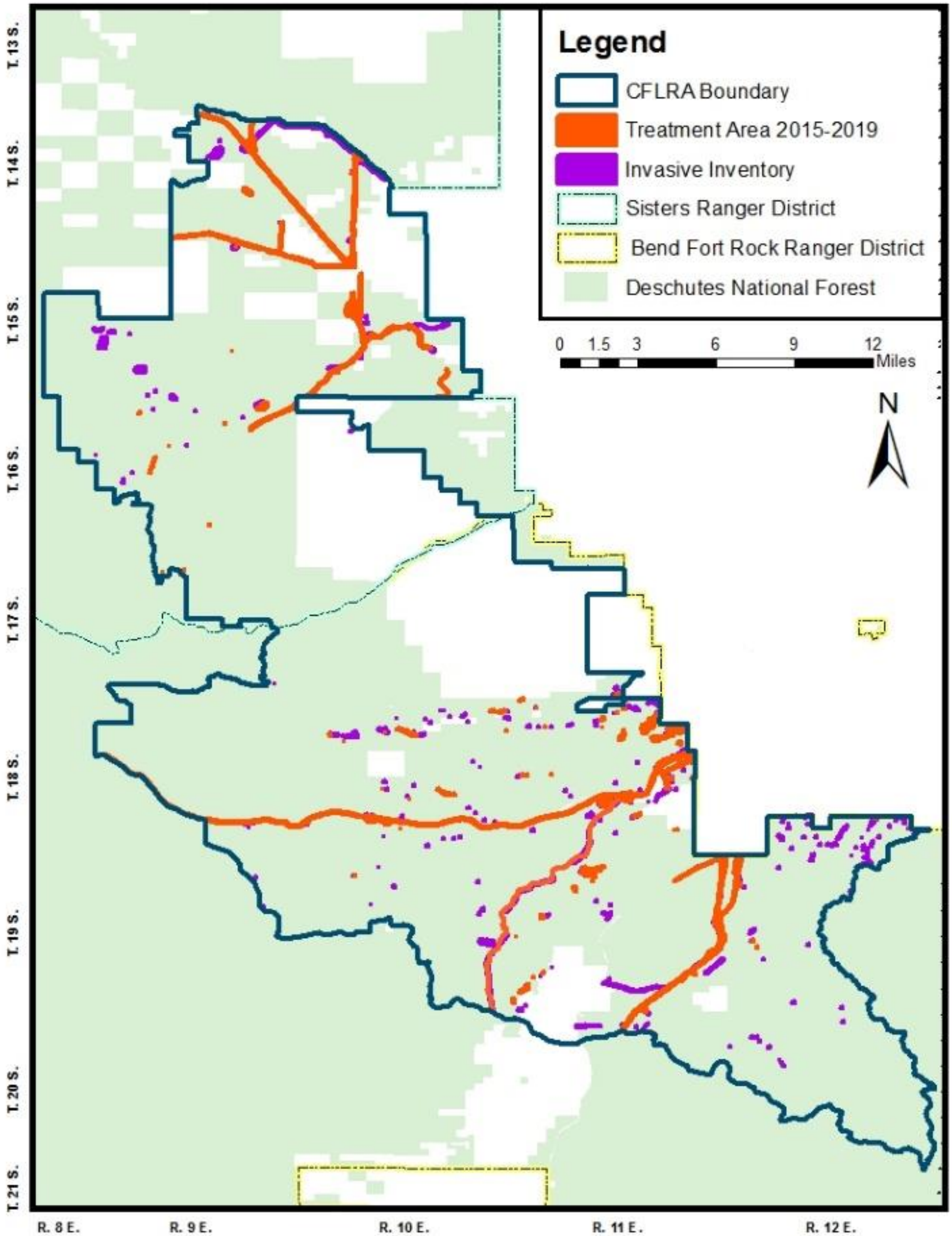


Figure 1 Dense knapweed infestation at a site adjacent to the Deschutes river (PAU 11-69). This was taken prior to herbicide treatment in 2015.

Figure 2 Same site, slightly different angle, native grasses have returned after five years of targeted knapweed herbicide treatments. This year, 2019, native grass seed was spread in the patches of bare ground where knapweed used to dominate.

Report written by Ellie McNairy, 10/24/2019

DESCHUTES COLLABORATIVE FOREST PROJECT

CHANGES ON THE LANDSCAPE AND DCFP PROJECT OUTCOMES, 2010-2014

Ecological Monitoring Report

DCFP Ecological Monitoring Report

Contents

Summary

This report summarizes the results of ecological outcome monitoring of the first five years (2010-2014) of the Deschutes Collaborative Forest Project (DCFP). It includes results of landscape-level monitoring for the 257,850-acre DCFP landscape, subwatershed-level monitoring for the Upper Whychus Subwatershed, and project-level monitoring for five DCFP projects. Major findings are summarized below.

Landscape-level trends in forest structure, fire regimes, and wildlife habitat
To determine changes in forest structural conditions and fire regimes on the DCFP landscape over the first five years of the DCFP, scientists modeled and analyzed changes in forest succession class distribution, vegetation conditions class, and fire behavior for 2009 (pre-DCFP baseline) and 2014. Results show modest but desirable shifts from closed to more open forest conditions, an increase in early seral conditions, and reduced wildfire hazard and crown fire potential as a result of vegetation treatments and beneficial effects of wildfires on the landscape. By moving forest structure closer to historical conditions, these changes are restoring more natural fire behavior and making associated wildlife habitats more resilient to disturbances in the frequent, lower fire severity forest types on the DCFP landscape.

Open, single-story, late-successional ponderosa pine wildlife habitat is the forest habitat type at the greatest deficit on the DCFP landscape. The Forest Service modeled changes in this habitat for 2011 and 2015 using nesting habitat requirements for white-headed woodpecker, the indicator species for this forest type. The model results show a 34% reduction in this habitat type across the DCFP landscape due to habitat loss from wildfire. White-headed woodpecker habitat is expected to increase in time as trees grow and snags become soft enough for use by this species.

Landscape-level trends in watershed condition
The DCFP objective is to have 14 of the 17 subwatersheds on the DCFP landscape in condition class 1 (i.e., functioning properly) by 2024. By November 2014, eleven of the subwatersheds were in condition class 1. Four subwatersheds showed improvement in watershed condition scores due to Forest Service projects implemented between 2010 and 2014.

Landscape-level trends in treating invasive plant infestations
The Forest Service monitored number of acres of invasive plant infestations treated and reduction in invasive plant density on treated sites. The Deschutes National Forest has been able to increase its rate of treatment since application of its 2012 Invasive Plant EIS, which for the first time allowed the use of herbicides as well as manual treatment. For the 2010-2014 time period, the average percent reduction in invasive plant density on treated sites was 83.8%, exceeding the national standard of 80% reduction.

Water quality and aquatic habitat trends in the Upper Whychus Subwatershed
The Upper Deschutes Watershed Council (UDWC) monitors water temperature and habitat conditions for salmonid fish populations in the Whychus Creek Watershed. UDWC data show significant stream flow increases and associated water temperature decreases in the Upper Whychus Subwatershed due to instream flow protection in Whychus Creek, although more instream flow is needed to meet the state temperature standard for salmonid rearing and

migration. Although no local cause-and-effect research has been done, DCFP projects contribute to reduced stream temperature through increased water depth and shading. The UDWC monitoring data also show a trend toward macroinvertebrate taxa that prefer lower temperatures and lower fine sediment conditions. The reduction in sediment is likely attributable in part to DCFP aquatic restoration projects.

Project effects: Aquatic and riparian restoration projects

The Whychus Floodplain Restoration and Dam Removal Project and the Three Sisters Irrigation District Fish Passage and Channel Restoration Project were partially completed in 2014. A primary goal of each of these projects is to improve fish passage and habitat quality for native and anadramous fish in Whychus Creek. Monitoring results to date show that objectives of restoring fish access, providing habitat complexity, restoring floodplain connectivity, stabilizing streambanks and floodplains, and promoting riparian vegetation growth are being achieved.

Monitoring on the Glaze Forest Restoration Project showed that water quality mitigation measures were met in the Indian Ford riparian area and that conifer thinning occurred in 93% of the aspen stringer meadow habitat.

Project effects: Upland restoration and fuels reduction projects

Fire behavior and wildlife habitat impacts were modeled for pre- and post-treatment conditions on the Glaze Forest Restoration, Sisters Area Fuels Reduction (SAFR), and West Tumbull Hazardous Fuels Reduction projects. In all three cases, fire modeling showed a reduction in acres in the extreme wildfire hazard class and an increase in acres in the low wildfire hazard class. Model results also showed that more acres would burn as surface fire than as crown fire on all three projects, a desirable shift in the low-fire-severity forest types that dominate these projects.

Wildlife habitat modeling for the Glaze, SAFR, and West Tumbull projects showed a reduction in white-headed woodpecker nesting habitat and in mule deer hiding cover. The loss of habitat is attributable to thinning treatments in dense stands, which reduced deer hiding cover and where the remaining trees now require time to grow in order to reach the size requirement for white-headed woodpecker nesting habitat. There was no change in elk hiding cover or in elk or deer thermal cover due to project treatments.

Using monitoring results

These ecological outcome monitoring results have multiple uses. They help build a common understanding of landscape-scale trends and project effects. They can be used to inform multiparty monitoring field reviews and DCFP management recommendations. They also can be used to assess whether observed changes are desirable and what, if anything, needs to change for the DCFP to better meet its stated goals.

Monitoring plan considerations

This was the DCFP’s first round of ecological outcome monitoring, and lessons learned from this effort can inform future DCFP monitoring. In some cases, monitoring questions were not answered exactly as described in the monitoring plan, and some questions could not be answered due to a lack of data or project timing. These issues are noted at the end of this report for future DCFP monitoring subcommittee discussion.

Introduction

The Deschutes Collaborative Forest Project (DCFP) monitoring subcommittee and Deschutes National Forest resource specialists developed the DCFP's ecological monitoring plan to track biophysical trends on the DCFP landscape and measure ecological effects of DCFP projects. This report summarizes the results of the first round of ecological outcome monitoring which was conducted in 2014, the fifth year of this Collaborative Landscape Restoration Program (CFLRP) effort.

DCFP projects implemented 2010-2014

The 257,850-acre DCFP landscape includes 205,028 acres on the Deschutes National Forest and 52,822 acres of private land. All DCFP activities take place on the Forest Service land. The following major aquatic and terrestrial restoration projects were either mostly or fully implemented during this period and are discussed in this report:

> Glaze Forest Restoration (Glaze Meadow) Project – 1,200-acre project to restore old growth forest condition and Riparian Habitat Conservation Areas with ecologically-driven forest thinning, shrub mowing, and prescribed fire.
>
> Sisters Area Fuels Reduction (SAFR) Project – 17,573-acre project to reduce the risk of high intensity wildfires and improve forest health through thinning, mowing, and prescribed fire.
>
> West Tumbull Hazardous Fuels Reduction Project – 1,300-acre project designed to increase the number of acres in Fire Hazard Condition Class 1 and 2, decrease the number of acres in Condition Class 3, and provide safe ingress and egress to residents and firefighters by reducing fuel loads through thinning, mowing, and prescribed fire.
>
> Three Sisters Irrigation District Fish Passage and Channel Restoration (TSID) Project – project designed to improve habitat conditions for native and anadromous fish in Whychus Creek by installing a fish screen, restoring in-stream fish passage upstream of the TSID dam, and restoring channel and floodplain function downstream of the dam.
>
> Whychus Floodplain Restoration and Dam Removal Project – 281-acre project to restore fish passage and restore the floodplain on one mile of Whychus Creek that had deteriorated from channel alterations and berm construction.

In addition, some thinning, fuels treatment, and prescribed burning that had been planned prior to the DCFP was implemented in other project areas. Several smaller restoration projects like culvert removals, riparian plantings, aspen restoration, and invasive species treatments also were implemented. Lastly, there were two large wildfires, the Rooster Rock Fire and the Pole Creek Fire, which combined burned over 20,000 acres of the 257,850-acre DCFP landscape. Within the Pole Creek Fire, 6,464 acres where low-severity underburning occurred were determined to have accomplished restoration treatment through a naturally ignited wildfire event. Landscape-level monitoring results include the effects of these activities and fires as well as the projects listed above.

Monitoring questions

As required by the Forest Service, the DCFP monitoring subcommittee and Deschutes National Forest program leaders developed a set of ecological outcome monitoring questions to be included in the DCFP's ecological monitoring plan for 2014. Questions were selected because they can be measured using feasible and defensible methods and met one or more of the following criteria:

- meets a national monitoring requirement
- addresses a DCFP goal
- informs adaptive management
- builds common ground
- builds scientific knowledge
- informs future planning

The questions recommended for monitoring in 2014 are listed in Table 1 below, in the order they are discussed in this document. Questions are numbered according to whether they address one of four indicator categories: fire regime restoration (1), fish and wildlife habitat condition (2), watershed condition (3), or invasive species severity (4). The letters indicate whether the question will be answered at the DCFP landscape level (L), subwatershed level (S), NEPA project level (P), or treatment level (T). Seven questions address more than one indicator category, and three are monitored at both the landscape and project level.

Using monitoring results

The DCFP's ecological monitoring plan was implemented for the first time in 2014. This report summarizes the results of that monitoring, including lessons learned about the monitoring questions and methods selected for the plan.

The results described in this report have many potential uses. They help build a common understanding of landscape-scale trends and project effects and can be used for both national reporting and public outreach on the need for and benefits of the DCFP. For instance, the data on successional class distribution and vegetation condition classes help show where and how far the landscape is departed from historic reference conditions and to what extent DCFP activities are addressing these departures.

These results also can inform and be informed by DCFP multiparty monitoring field reviews. The discussions of Glaze, SAFR, and West Tumbull projects in this report include multiparty monitoring findings that help interpret the outcome data and make recommendations for management adaptations based on observed outcomes.

The ecological outcome monitoring results also can be used by the DCFP and Deschutes National Forest staff to assess whether observed changes are desirable and what, if anything, needs to change for the DCFP to better meet its stated goals and the goals of the Collaborative Forest Landscape Restoration Program. They can be used to inform Forest Service planning and by the DCFP restoration planning subcommittee to inform recommendations to the Deschutes National Forest.

Table 1. List of DCFP ecological monitoring questions

What is the change in acres of forest successional classes for all plant association groups and the ecological departure (condition class) of each plant association group relative to its historical range of variability? (1L-1, 2L-1)
What are the effects of restoration treatments on fire behavior and forest resilience to fire within ponderosa pine, dry mixed conifer, and moist mixed conifer plant association groups? (1L-2, 1P-1)
What is the effect of restoration treatments on understory plant cover in ponderosa pine, dry mixed conifer, and moist mixed conifer plant association groups? (1P-2, 2P-9, 4P-1)
What is the change in acres of open, single-story, late-successional ponderosa pine forest habitat? (2L-4, 2P-2)
What is the change in total system road and trail densities? (2L-2)
What is the change in acres of core habitat? (2L-3, 2P-1)
What is the change in miles of hydrologically connected total system roads and trails with all streams in each HUC 6 subwatershed? (3S-4)
What is the change in Watershed Condition Framework condition score for all HUC 6 subwatersheds in the CFLR landscape? (3L-1)
How many acres of high-priority invasive plant infestations are treated across the DCFRP landscape? (4L-1a) Where are treatments located relative to known invasive plant infestations? (4L-1b)
What is the average percent reduction in invasive plant density across all treated areas? (4L-2)
What are the effects of terrestrial and aquatic restoration treatments on water quality in the Upper Whychus subwatershed? (3S-1)
What is the effect of aquatic restoration treatments on aquatic organisms and species of concern (2P-7, 3P-3)
What is the change in riparian vegetation health in response to restoration treatments? (2P-5, 3P-1)
What is the change in aquatic ecosystem health in response to stream channel, floodplain, wetland, and meadow restoration treatments? (2P-6, 3P-2)
How are DCFP projects affecting fish passage? (2P-8, 3P-4)
What is the change in acres and improvement of meadow habitat? (2P-3)
What is the change in acres of hiding cover and thermal cover for deer and elk? (2P-4)
How do restoration treatments affect fire behavior when wildfire burns through treated stands in ponderosa pine, dry mixed conifer, and moist mixed conifer plant association groups? (1P-3)
What is the change in total system road and trail density in each HUC 6 subwatershed? (3S-2)
What is the change in total system road and trail density in riparian zones and sensitive land types in each HUC 6 subwatershed? (3S-3)
How many new invasive plant infestations were found in treatment areas on selected NEPA projects? (4T-1)

Landscape-level trends

Changes in forest succession class distribution

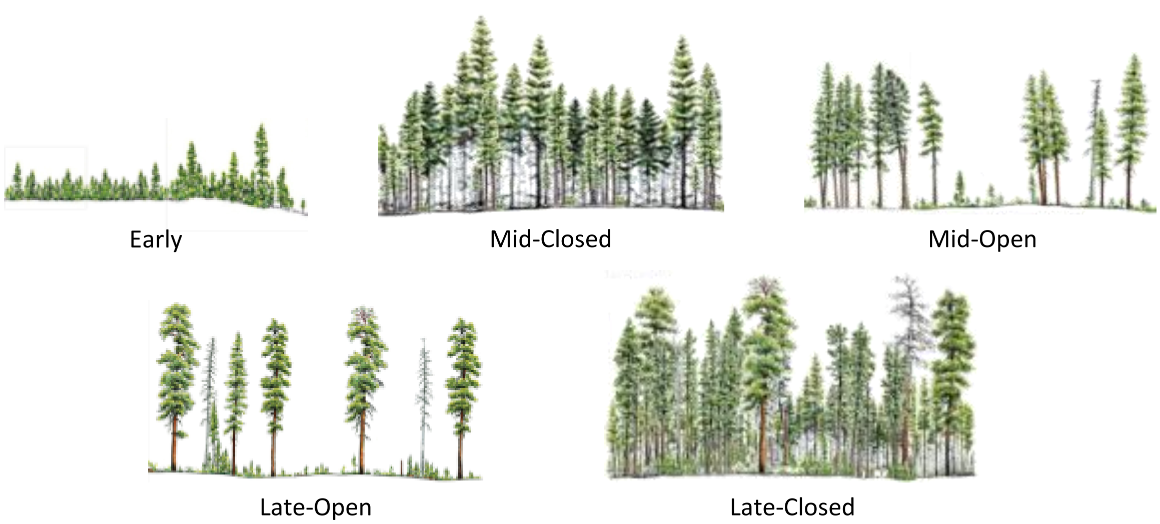
One of the principle DCFP goals for forest restoration is to move the landscape toward more natural and heterogeneous structural conditions closer to its historical range of variability (HRV). The scientific community understands HRV to be a more resilient condition that will provide a wider range of wildlife habitat types and support natural fire regimes and other disturbance processes, particularly in the face of future climate uncertainty. Consequently, it is a commonly used benchmark for overall ecological resilience.

One way to characterize structural conditions at the landscape scale is by using LANDFIRE succession classes. Succession classes describe the forest vegetation species composition, cover, and height. There are five LANDFIRE succession classes: early-seral, mid-seral closed-canopy, mid-seral open-canopy, late-seral open-canopy, and late-seral closed-canopy (Figure 1).

Question 1L-1a & 2L-1a

What is the change in acres of forest successional classes for all plant association groups (PAGs)?

Figure 1.The five LANDFIRE succession classes



Due to past management and fire exclusion, dry forests like those that dominate nearly two-thirds of the DCFP landscape typically have small deficits in the early succession class and large deficits in the open-canopy (particularly late-open) succession classes relative to natural or historical conditions. DCFP vegetation treatments in frequent, low-severity fire forests typically are designed to reduce tree density; restore early seral, fire-tolerant species and understory vegetation; and reduce the overabundance of closed-canopy (particularly mid-closed) forest conditions. These changes are intended to put treated stands on a trajectory to develop into more open forests consistent with historical conditions for these forest types.

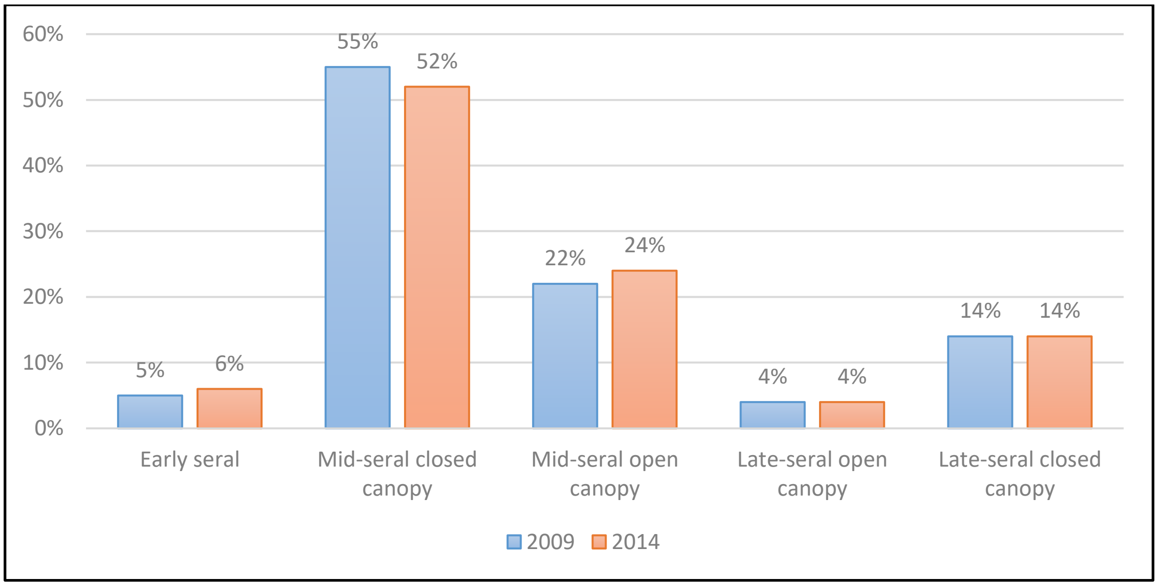
Methods

To determine changes in succession classes between 2009 and 2014, Forest Service and The Nature Conservancy (TNC) scientists used GNN data.[1] Percent of the landscape in each succession class prior to the DCFP was determined based on 2009 GNN data. 2014 forest structure data were developed by updating the 2009 GNN data using project implementation data, post-fire monitoring data, and input from Deschutes National Forest silviculturists and fuels specialists on changes to forest structure following treatments and wildfires.

Results

Figure 2 shows modeled changes in relative abundance of each forest succession class across the DCFP landscape between 2009 (pre-DCFP baseline) and 2014 (year 5 of the DCFP project). Across the landscape, there was a 3% reduction in mid-seral closed-canopy forest, a 2% increase in mid-seral open-canopy forest, and a 1% increase in early seral conditions.

Figure 2. Modeled abundance in each succession class on the DCFP landscape, 2009 and 2014



The desired outcome of the DCFP is "to restore a forested landscape that can be managed within the natural range of variability…"[i], also known as the historical range of variability (HRV). Figures 3-5 compare modeled HRV reference conditions to modeled changes in relative abundance of each forest succession class in the dry ponderosa pine, warm/dry mixed-conifer, and cool/moist mixed-conifer plant association groups (PAGs). Changes show modest progress toward reference conditions. The greatest change was in the dry ponderosa pine PAG, in which 4% of the closed-canopy forest was moved to open-canopy conditions; these changes are

[1] Gradient Nearest Neighbor (GNN) maps consist of 30 meter pixel (grid) imputed maps with associated data (tree size, density, snag density, canopy cover, percent down wood cover, etc.). They are developed using satellite imagery to assign data from known field plots to pixels with no data that have the same satellite imagery signature.

mostly attributable to the SAFR project treatments adjacent to the town of Sisters. Changes in the mixed-conifer PAGs were mostly due to the Pole Creek fire.

Figure 3. Modeled abundance of each successional class in the dry ponderosa pine PAG

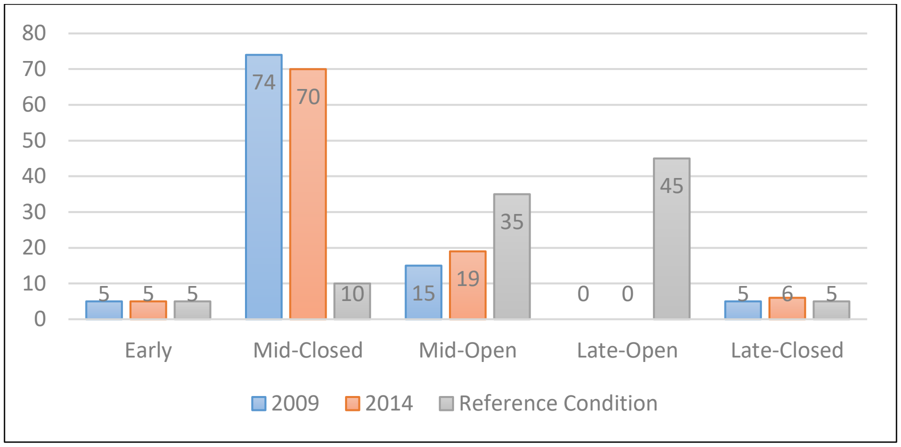


Figure 4. Modeled abundance of each successional class in the warm/dry mixed-conifer PAG

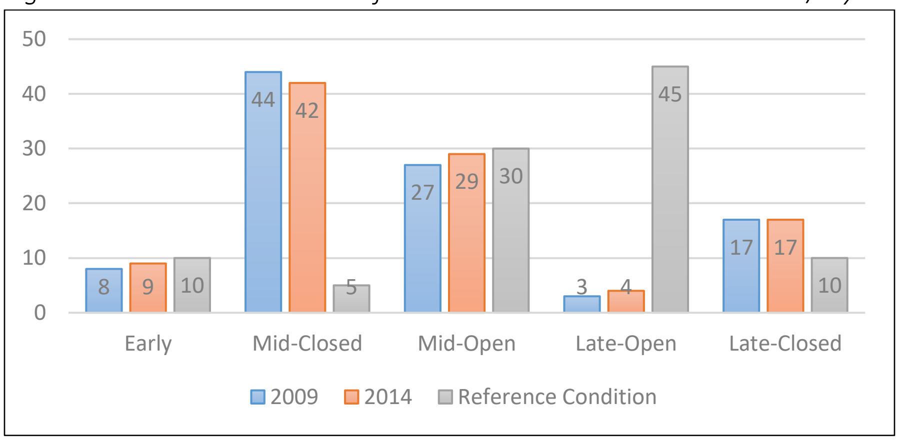
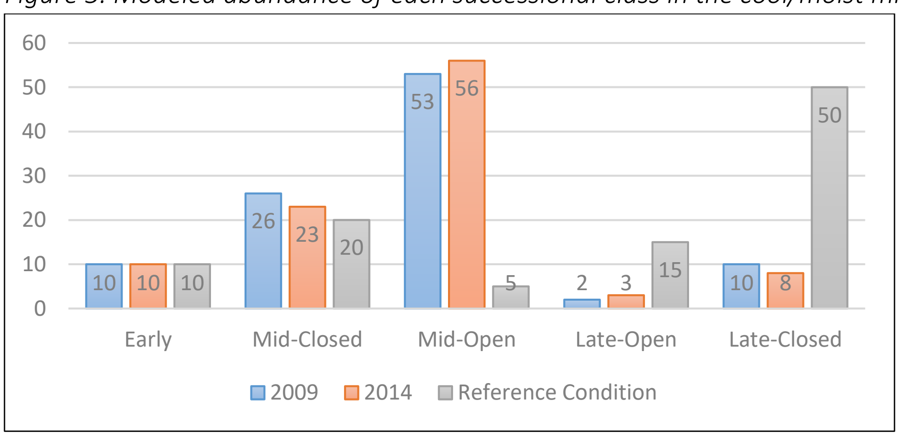


Figure 5. Modeled abundance of each successional class in the cool/moist mixed-conifer PAG



Changes in Vegetation Condition Class

Question 1L-1b & 2L-1b
What is the change in ecological departure (condition class) of each plant association group (PAG) relative to its historical range of variability (HRV)?

A second way to measure the forest's departure from its historical range of variability is through LANDFIRE Vegetation Condition Class (VCC). VCC (formerly known as Fire Regime Condition Class) is used to represent how far current forest conditions are departed from historical reference conditions, which are determined using ecologically-based forest state and transition models that incorporate natural disturbance (i.e., fire) and forest succession. Areas classified VCC3 are 67% or more departed from these historical reference conditions. Areas classified VCC2 are 34%-66% departed, and areas classified VCC1 are 33% or less departed. In other words, forests classified as VCC1 are closest to historical conditions.

Methods

VCC was calculated for the 205,028-acre Deschutes National Forest portion of the DCFP landscape. VCC was determined using 2009 GNN forest structure attributes and 2009 LANDFIRE (surface fuel model and topography) data. A Forest Service scientist used post-fire monitoring data and worked closely with Deschutes National Forest silviculturists and fuels specialists to calculate how and where DCFP vegetation treatments and wildfires affected forest structure, then used that information to create the 2014 data layers. A TNC scientist used the 2009 and 2014 data layers to model VCC in 2009 and 2014 and determine changes in vegetation departure.

Results

Figure 6 shows changes in VCC on the Deschutes National Forest portion of the DCFP landscape. Between 2009 and 2014 there was a 6% decrease in VCC3, 1% increase in VCC2, and 5% increase in VCC1 across the landscape, as shown in Figure 3. The DCFP's desired condition for reducing departure is to have 57% of the 205,322-acre landscape in VCC1 by 2024. Although the modeled results show only modest progress toward this goal in the first five years of the DCFP, it is important to note that improvements are also occurring *within* classes. For example, even though a change from 63% departed to 39% departed is not captured a shift from VCC2 to VCC1, it is nonetheless positive movement towards less departed, more resilient forest conditions.

Figure 6. Percent of the landscape in each Vegetation Condition Class, 2009 and 2014

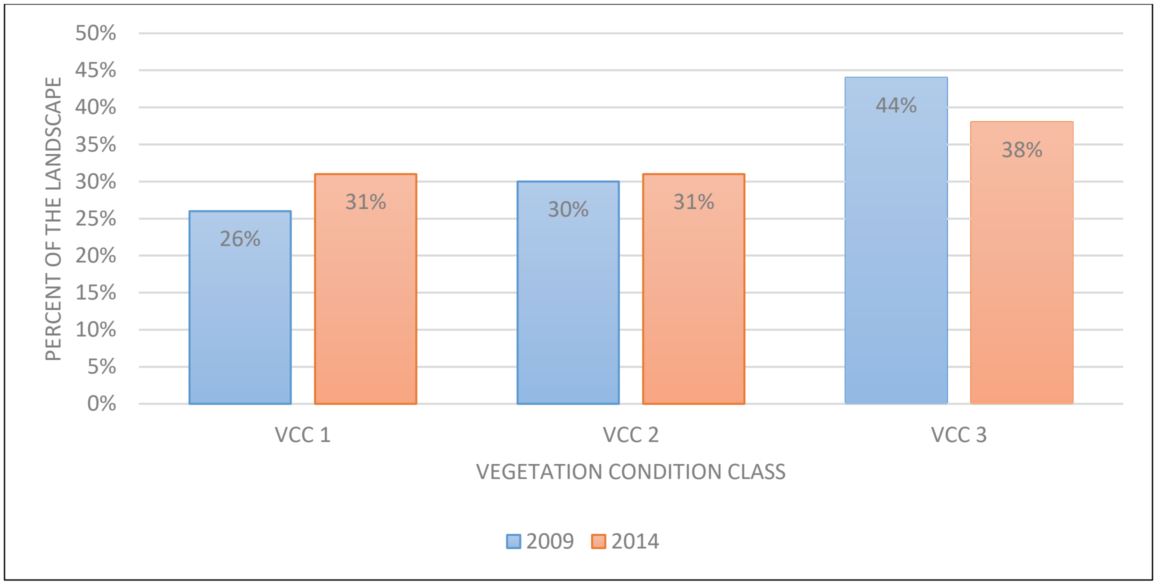


Table 2 shows changes in vegetation condition class for three plant association groups between 2009 and 2014. The most significant changes were in the cool/moist mixed-conifer PAG, where 10% of the PAG moved from VCC1 to VCC2 and VCC3, and in the dry ponderosa pine PAG, where there was a 10% increase in VCC1. Most of the changes in the cool/moist mixed-conifer PAG were due to the Pole Creek Fire. About half of the changes in the warm-dry mixed-conifer PAG were attributable to the Pole Creek Fire, and about half to Forest Service project treatments. In the dry ponderosa pine PAG, most of the changes were due to Forest Service treatments.

Table 2. Percent of the Forest Service portion of the landscape in each VCC, by PAG, 2009 & 2014

	VCC1 (0-33% departure)		VCC2 (34-66% departure)		VCC3 (67-100% departure)	
Plant Association Group	2009	2014	2009	2014	2009	2014
Mixed Conifer - Cool/Moist	55%	45%	45%	51%	0%	4%
Mixed Conifer - Warm/Dry	29%	31%	14%	24%	57%	45%
Ponderosa pine - Dry	17%	27%	8%	5%	75%	68%

Changes in modeled fire behavior

Question 1L-2

What are the effects of restoration treatments on fire behavior and forest resilience to fire within ponderosa pine, dry mixed conifer, and moist mixed conifer plant association groups (PAGs)?

Another principle DCFP goal is to restore "natural fire regimes … by reducing … uncharacteristic fuels … and breaking up the homogeneous stand structure found across the … landscape … to allow the return of fire in this landscape at ecologically appropriate lower intensities."[ii] On the DCFP landscape, this applies in particular to dry ponderosa pine, warm/dry mixed-conifer, and to a lesser but nonetheless important extent the cool/moist mixed-conifer forest types.

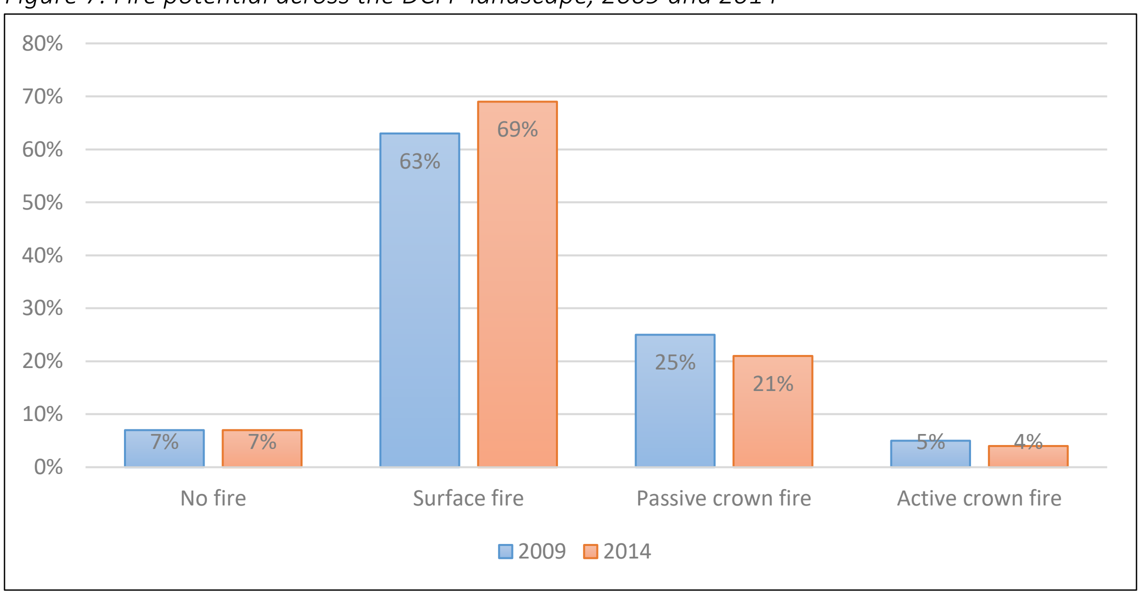
Methods

The Forest Service modeled changes in fire behavior across the landscape in 2009 and 2014 using the FlamMap model. FlamMap uses forest and fuel characteristics along with topography and weather parameters to predict fire behavior across the landscape–including the potential for crown fire and changes in flame lengths. As with the succession class and VCC calculations, 2009 GNN and LANDFIRE data were used to model baseline conditions. To model 2014 conditions, the Forest Service modified the 2009 data using 2010-2014 post-fire monitoring data, project prescriptions, and input from Deschutes National Forest silviculturists and fuels specialists. A Forest Service scientist applied the modeled flame length and fire type data to a matrix that defines hazard into wildfire hazard classes.

Results

Figure 7 shows modeled changes in fire potential for conditions in 2009 and 2014. Across the DCFP landscape there was a 1% reduction in active crown fire potential, 4% reduction in passive crown fire potential, and 7% increase in surface fire potential.

Figure 7. Fire potential across the DCFP landscape, 2009 and 2014



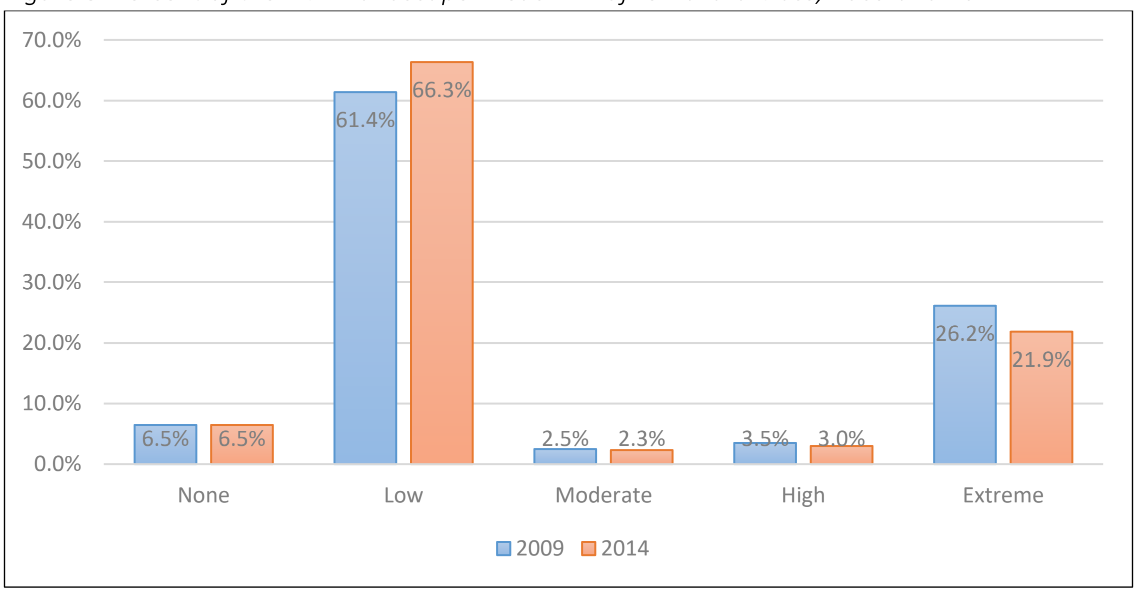
As shown in Table 3, six percent of the dry ponderosa pine forest type changed from passive crown fire to surface fire potential between 2010 and 2014. Half of this change was due to SAFR project treatments. In the mixed-conifer forest types, most of the reduction in active and passive crown fire potential was due to the Pole Creek Fire.

Table 3. Crown fire potential on the DCFP landscape, by PAG

Plant Association Group (PAG)	No fire		Surface fire		Passive crown fire		Active crown fire	
	2009	2014	2009	2014	2009	2014	2009	2014
Mixed Conifer - Cool/Moist	0%	0%	57%	73%	30%	19%	13%	7%
Mixed Conifer - Warm/Dry	1%	1%	61%	68%	28%	23%	10%	8%
Ponderosa pine - Dry	1%	1%	68%	74%	29%	23%	1%	1%

Figure 8 shows estimated changes in wildfire hazard class over the first five years of the DCFP based on Forest Service expert opinion. There was an estimated 4.3% reduction in the extreme wildfire hazard class, 0.5% reduction in the high wildfire hazard class, and 4.9% increase in the low wildfire hazard class.

Figure 8. Percent of the DCFP landscape in each Wildfire Hazard Class, 2009 and 2014



Changes in wildfire hazard class track with both desired and expected changes, particularly in the dry ponderosa pine PAG. Low severity burning in the Pole Creek Fire helped achieve some goals, particularly in the cool/moist mixed conifer PAG.

MONITORING UNDERSTORY VEGETATION

Question 1P 2, 2P 9, and 4P 1: *What is the effect of restoration treatments on understory cover in ponderosa pine, dry mixed conifer, and moist mixed conifer plant association groupss?*

Increasing understory plant abundance and diversity is critical to improving habitat for many wildlife species and is a goal of many DCFP stakeholders. Understory plant composition and cover also are important components of fire regime because of the influence of grasses, shrubs, and small trees on fire behavior. In order to better evaluate understory vegetation response to treatments, DCFP is conducting photopoint monitoring on the Glaze, West Bend, and Rocket projects. These three projects were selected because they are highly visible projects in commonly treated vegetation types. Baseline photopoint data were gathered in summer 2014.

The photopoint methodology was developed to provide robust data on vegetation response more quickly and across larger areas than would be feasible with plot based monitoring of species diversity and abundance. Photo points are located in the principal treatment types and vegetation types for each project. A combination of vertical and horizontal photos are taken at each photo point. The vertical photos allow qualitative assessment of species presence and distribution and understory cover densities. The vertical and horizontal photos can be used to assess surface and ladder fuel loading and to calibrate fuel model inputs for subsequent fire behavior modeling. Understory photos also can be used to evaluate areas for specific wildlife habitat parameters for species of special interest, such as pollinators and land birds. With repeat photopoints, it will be possible to assess changes in species composition, vegetation structure, fuel conditions, and habitat

Changes in open, single-story late-successional ponderosa pine wildlife habitat

Question 2L-4

What is the change in acres of open, single-story, late-successional ponderosa pine forest habitat?

The open, single-story, late-successional ponderosa pine wildlife habitat type has been shown to be the forest habitat type at the greatest deficit on the DCFP landscape due to past management and fire exclusion.

Methods

The Forest Service used the Wildhab tool to model open, single-story, late-successional ponderosa pine forest habitat using structural components required for nesting by the white headed woodpecker, the indicator species for this plant association group. 2011 GNN data were used to model baseline conditions. To model 2015 conditions, Forest Service scientists used treatment and fire data to update the 2011 GNN data.

Results

The Wildhab model results show a 34% reduction in white-headed woodpecker nesting habitat across the DCFP landscape (Table 5). The reason for the large reduction in acres is habitat loss from wildfire, especially the 2012 Pole Creek Fire. White headed woodpecker habitat is expected to increase in time as trees grow and snags become soft enough for use by this species.

Table 5. Change in White-headed woodpecker habitat on the DCFP landscape, 2011-2015

Species Habitat	CFLRA 2011 Landscape Acres	CFLRA 2015 Landscape Acres	Difference - Acres
White-headed Woodpecker	50,952 acres	33,486 acres	-17,466 acres

Changes in road densities

Question 2L-2

What is the change in total system road and trail densities?

Road density is of particular concern to the DCFP because roads affect wildlife habitat and watershed conditions in myriad ways, including sediment delivery to stream systems and human disturbance to wildlife.

Methods

The Forest's GIS database for roads was updated in 2013, erasing prior data, and trails data were not added until 2015. Therefore, there are no baseline (pre-2010) data for road and trail density and changes in total system densities could not be calculated for the first five years of the DCFP. The Forest Service calculated motorized road density in 2014 using the updated database and also reported miles of road decommissioned.

Results

In 2014, road density on the DCFP landscape was 2.78 miles per square mile. The 2010 DCFP project proposal set a target of decommissioning 25 miles of roads on the DCFP landscape by 2019. Between 2010 and 2013, approximately 5.5 miles of road were decommissioned.

Changes in core habitat

Question 2L-3

What is the change in acres of core habitat?

Core habitat is habitat undisturbed by disturbance from forest roads and trails, both motorized and non-motorized. It helps maintain wildlife species viability and functional habitat by reducing the extent and impact of human disturbance in the forest.

Methods

Core habitat was measured as all lands greater than 200 meters from Deschutes National Forest system roads and trails mapped on Forest Service GIS layers. Pre-DCFP core habiatat could not be determined because of the 2013 update of the Forest's GIS roads database. Existing core habitat was calculated using the Forest's 2015 GIS data for roads and trails.

Results

In 2015, 150,126 acres, or 58% of the DCFP landscape, were undisturbed core habitat. This information will help the Forest assess where to focus future efforts to more effectively "block up" core habitat, and where it is more appropriate to have a higher density of roads and trails.

MONITORING ROAD-STREAM INTERACTIONS

Question 3S 4: *What is the change in miles of hydrologically connected total system roads and trails with all streams in each HUC 6 subwatershed?*

In 2014, the Deschutes National Forest surveyed all roads on the DCFP landscape to identify sites where the road system is hydrologically connected to the stream network and potentially contributing sediment to streams, where inadequate culvert conditions are contributing to an increased risk of failure, and where stream crossing configurations pose a risk of diversion potential (i.e., rerouting streams from their natural channels). Road stream connectivity and stream diversion potential were recorded and described on field forms, mapped with GPS units, and stored in a GIS database. Culvert risk was evaluated based on size, positioning, conditions, and obstructions. All features were photo documented. The survey identified 78 points where roads are hydrologically connected to streams by a road, ditch, rut, rill, or gully and nine locations where water is potentially being diverted from the natural stream channel. It also identified 20 culverts that are damaged or buried under debris. Seventy of the 77 culverts on the DCFP landscape are not sized to 1.5x bankfull width, a common metric for culvert adequacy. These data are being used to prioritize sites for watershed restoration. They also provide a baseline for future monitoring of road stream interactions.

Changes in watershed condition score

Each Collaborative Forest Landscape Restoration Program project is required to use the Forest Service's Watershed Condition Framework (WCF) to monitor watershed condition in every 6^{th} Order subwatershed (Hydrological Unit Code 6, or HUC 6) on its CFLR landscape.

Question 3L-1

What is the change in Watershed Condition Framework condition score for all HUC 6 subwatersheds in the CFLR landscape?

Methods

Under the Watershed Condition Framework, the Forest Service assigns watershed condition scores to 6^{th} Order subwatersheds. The watershed condition score is a weighted average of 24 attributes that contribute to a functioning watershed condition (Table 6). Teams of USFS specialists evaluate each attribute in each subwatershed and assign it a score of 1 (properly functioning), 2 (functioning at risk), or 3 (impaired function). Individual attribute scores identify problem areas and are used to help prioritize watershed restoration activities. The overall watershed condition score gives a coarse measure of watershed health in each subwatershed.

Table 6. Watershed condition attributes in the Watershed Condition Framework

Aquatic Physical	Aquatic Biological	Terrestrial Physical	Terrestrial Biological
Impaired waters (303d listed)	Life form presence	Open road density	Fire condition class
Water quality problems (not listed)	Native species	Road maintenance	Wildfire effects
Flow characteristics	Exotic and/or invasive species	Proximity to water	Forest Cover
Habitat fragmentation	Riparian/wetland vegetation condition	Mass wasting	Rangeland vegetation condition
Large woody debris		Soil productivity	Terrestrial invasive species: extent and rate of spread
Channel shape and function		Soil erosion	Insects and disease
		Soil contamination	Ozone

Results

According to the 2014 watershed condition assessment, of the 17 6^{th}-level subwatersheds in the DCFP landscape, 11 are properly functioning (condition class 1, scores 1.0-1.66) and 6 are functioning at risk (condition class 2, scores 1.66-2.33) (Table 7). There are no watersheds in condition class 3 (scores 2.33-3.0) on the DCFP landscape. The desired condition for watershed condition on the landscape is to have 14 of the 17 subwatersheds in condition class 1 by 2024.

Table 7. 2014 Conditions Class Scores for Subwatersheds on the DCFP Landscape

Level-6 Subwatershed	2011 Score	2014 Score	2014 Condition Class
Benham Falls – Deschutes River	1.7	1.7	2
Lava Island Falls – Deschutes River	1.6	1.7	2
Overturf Butte – Deschutes River	1.6	1.7	2
Upper Tumalo Creek	**1.7**	**1.5**	1
Lower Tumalo Creek	1.8	1.8	2
Three Creek	1.8	1.8	2
Snow Creek Ditch	1.4	1.4	1
Bull Creek	1.3	1.2	1
Deep Canyon Dam – Deep Canyon	1.5	1.5	1
Headwaters Squaw Creek	**1.7**	**1.6**	1
Upper Squaw Creek	**1.8**	**1.7**	2
Upper Trout Creek	1.3	1.3	1
Upper Indian Ford	1.6	1.6	1
Lower Trout Creek	1.6	1.6	1
Lower Indian Ford	**1.5**	**1.4**	1
Middle Squaw Creek	1.3	1.3	1
Stevens Canyon	1.4	1.4	1

Four subwatersheds showed improvements in condition scores due to DCFP projects:

- The Upper Tumalo Creek subwatershed was reclassified due to improvements in riparian vegetation condition and channel shape and function. The channel was reconstructed and the Forest Service has led youth groups in riparian area plantings. In addition, the West Tumbull project included thinning in the riparian area.
- The Headwaters Squaw Creek subwatershed showed improvements to the habitat fragmentation attribute as a result of a culvert removal on Snow Creek. There was also a reduction in road density in this subwatershed from decommissioning approximately one mile of road.
- In the Upper Squaw Creek subwatershed, the Three Sisters Irrigation District project, particularly the dam removal, resulted in improvements to the habitat fragmentation attribute.
- The channel shape and function attribute in the Lower Indian Ford subwatershed improved from condition class 2 to condition class 1 due to restoration on Indian Ford Creek. This subwatershed condition also improved from decommissioning of the Brooks-Skanlin road crossing.

Condition scores were worse in 2014 in two subwatersheds, Lava Island Falls and Overturf Butte. However, these score changes were due not to actual changes on the ground but to improvements to road density mapping which corrected the inventory of existing roads on the GIS layer. Similarly, the improvement in the Bull Creek subwatershed condition score reflects roads database updates, not actual on-the-ground changes.

Changes in invasive plant infestations

Question 4L-1a

How many acres of high-priority invasive plant infestations are treated across the DCFP landscape?

Question 4L-1b

Where are treatments located relative to known invasive plant infestations?

Question 4L-2

What is the average percent reduction in invasive plant density across all treated areas?

National guidance for CFLR ecological outcome monitoring requires the Forest Service to report acres of priority invasive species infestations treated and the efficacy (reduction in plant density) of invasive plant treatments.

Methods

Priority infestations are identified in the 2012 Invasive Plant EIS and size and location of treatments are recorded in Forest Service databases.

Prior to 2014, the efficacy of invasive species treatments was evaluated through post-treatment professional monitoring of treated sites. In 2014, additional DCFP monitoring funding allowed the Forest Service to hire a seasonal employee to conduct more thorough, accurate, and extensive monitoring. This involved measuring plant density immediately prior to treatment and immediately post-treatment on 1020 of the 2213 acres treated.

Results

Since 2012 implementation of the Invasive Plant EIS, which for the first time allowed the use of herbicides as well as manual treatment, the Forest has been able to treat more acres and contain more infestations. Yearly, treatments are conducted on the highest priority infestations. Figure 9 shows where infestations and treatments are located on the landscape. Table 8 shows the rate of treatment since the DCFP was initiated. The DCFP target is to treat 9,800 acres by 2019.

Table 8. Acres of invasive plant infestations treated on the DCFP landscape

Year	2010	2011	2012	2013	2014
Acres treated	900	972	1,422	1,140	2,213

Table 9 shows the average percent reduction in invasive plant density each year since the DCFP was initiated. Across all years the average percent reduction in invasive plant density was 83.8%, exceeding the national standard of 80% reduction in all but 2013.

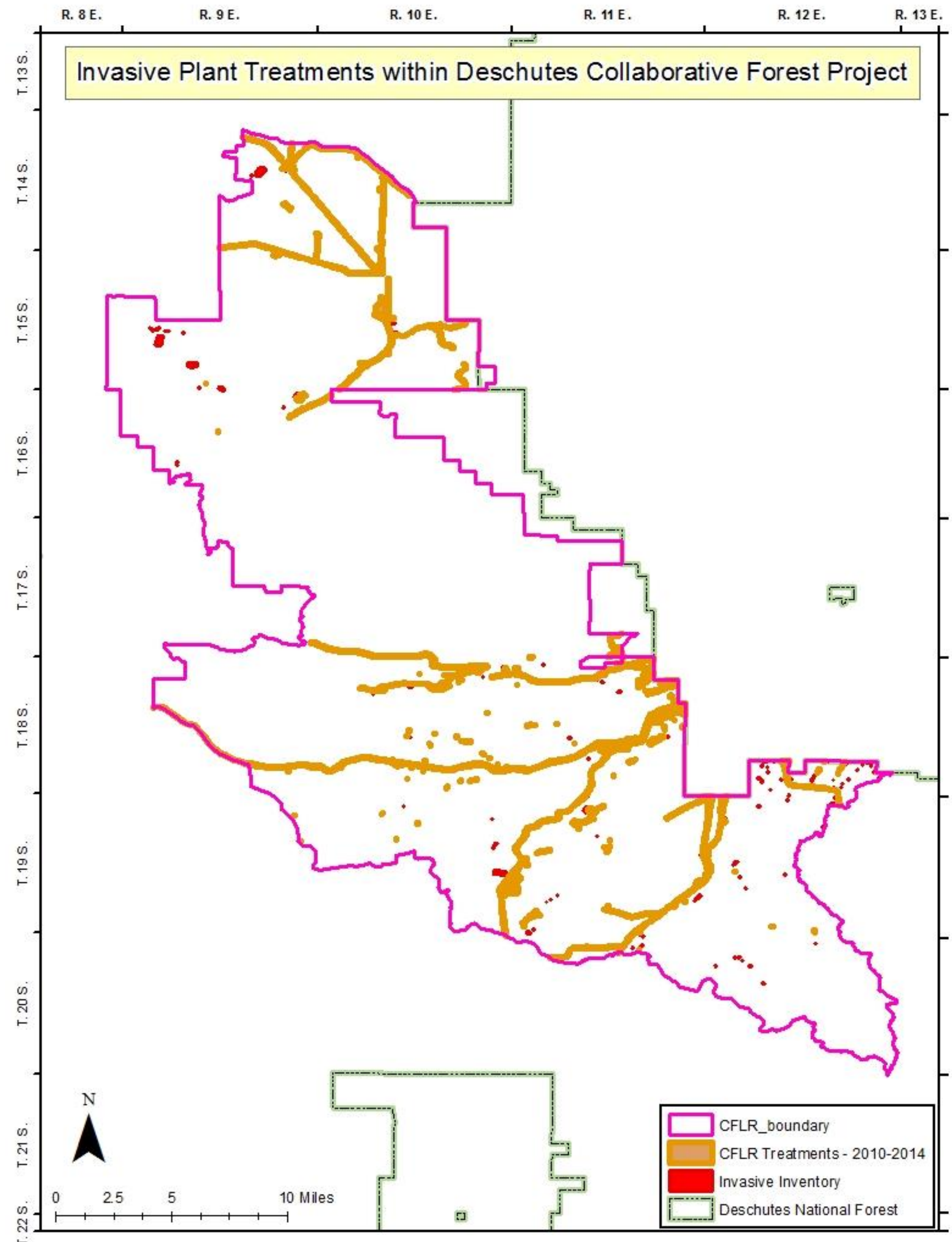
Table 9. Average percent reduction in plant density in treated areas

Year	2010	2011	2012	2013	2014
% Efficacy	83	82	86.5	78.6	86.1

Using manual and herbicide treatments in combination and conducting multiple treatments, such as herbicide treatment followed by hand-pulling of missed plants, increases efficacy. In 2014, a majority of sites received both manual and herbicide treatments and there was about a 3% increase in treatment efficacy at those sites.

The extra seasonal staff hired to monitor treatment efficacy was able to verify and update infestation information and locations and conduct additional invasive species surveys on roadsides within the DCFP landscape. Information provided by this monitoring in 2014 provided district staff in-depth data to help identify additional and/or more effective treatment recommendations to be implemented in future years.

Figure 9. Map of invasive plant inventory and treatments, 2009-2014



Water quality and aquatic habitat trends in the Upper Whychus Subwatershed

One of the DCFP's goals is to support the reintroduction of steelhead and Chinook salmon into the Upper Deschutes Basin, primarily in Whychus Creek. According to the DCFP proposal, "key objectives for restoring these watersheds and facilitating the re-introduction of steelhead and Chinook salmon to Whychus Creek are restoring natural stream channel morphology and floodplain connection, reducing road densities, restoring native riparian plant communities (particularly hardwoods), and addressing barriers to fish passage."[iii]

The most complex and highest quality fish habitat in Whychus Creek is found in the depositional, low gradient, broad valley reaches. However, most of Whychus Creek is in a transport state, meaning it is confined and efficiently transporting its bedload, either naturally or from degradation. Currently, only 10% of Whychus Creek is made up of depositional reaches, but there is the potential to restore an additional 25% of the total creek length to these low gradient, broad valley habitat types.[iv] Land acquisition and restoration in the watershed have been targeting these habitat types. Partners in these activities include the Upper Deschutes Watershed Council, U.S. Forest Service, Aequinox, Deschutes River Conservancy, and Deschutes Land Trust.

Methods

The Upper Deschutes Watershed Council (UDWC) monitors water temperature and habitat conditions for reintroduced anadromous fish populations throughout the Whychus Creek Watershed.[v] These UDWC monitoring efforts measure important trends in aquatic habitat conditions along the length of Whychus Creek, including Upper Whychus Creek, but are not designed to draw a cause and effect relationship between DCFP watershed restoration activities and changes in water quality or aquatic habitat.

Water temperature

Question 3S-1

What are the effects of terrestrial and aquatic restoration treatments on water quality in the Upper Whychus subwatershed?

Over 90% of the natural flow from the headwaters of Whychus Creek is diverted for irrigation, and the main water quality issue in Upper Whychus Creek is increased temperatures due to low flows. The creek is listed as impaired for temperature under section 303(d) of the Clean Water Act. Upper sections of Whychus Creek also have low pH, but that appears to be due to the natural geology of the watershed.

The state standard for salmonid rearing and migration is 18 degrees Celsius. Analysis of 2000-2014 temperature and flow data identified 62 cubic feet per second (cfs) as the minimum flow necessary to meet the 18°C temperature standard +/- 2.6°C at Forest Service Road 6360, the worst point for water temperature on Whychus Creek for which temperature data are available. Low flows are considerably below 62 cfs, as can be seen in Figure 10, which shows August median flows at the Oregon Water Resources Department's gage in Sisters City Park for the years 2000 through 2014. The August data show an upward trend from a median August flow of less than 10 cfs prior to 2006 to over 20 cfs in recent years.

Figure 10. August Median Whychus Creek Discharge at Sisters City Park

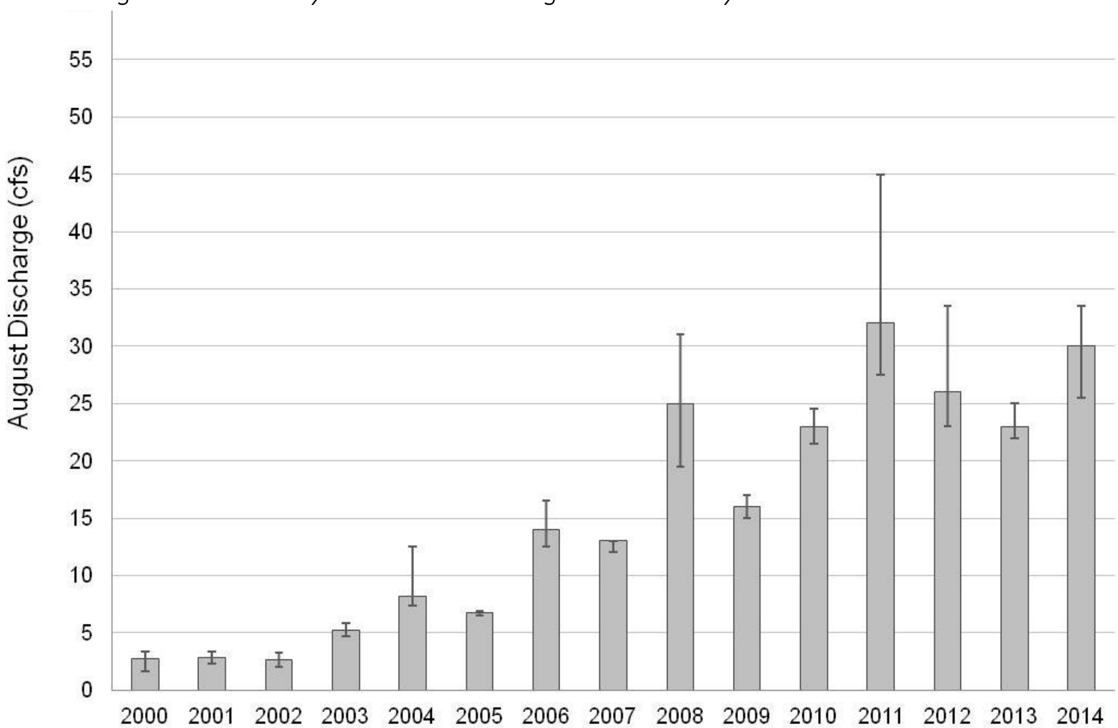
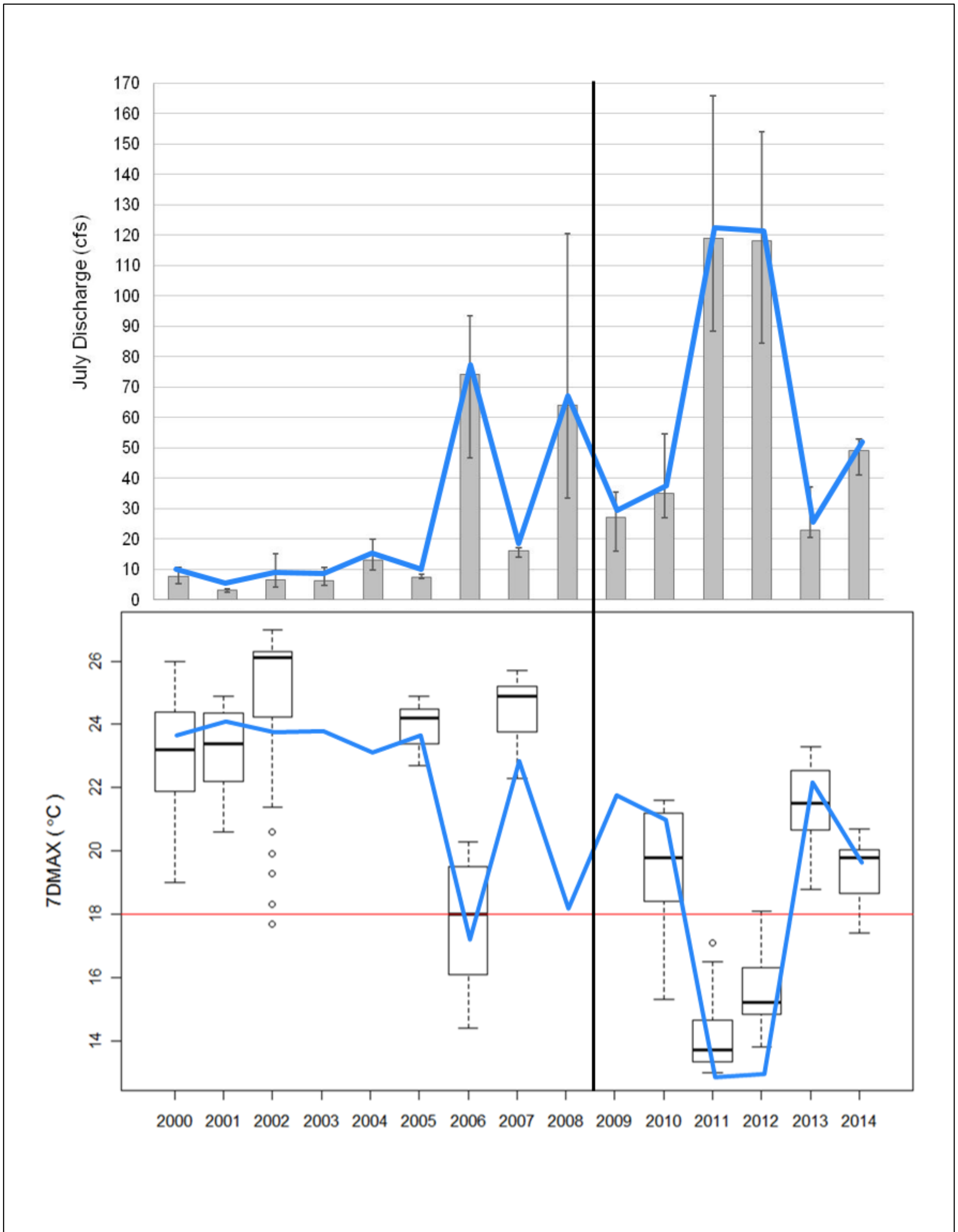


Figure 11 shows July median flows at the ODWR gage and July 7-day moving average maximum daily temperatures at the Forest Service Road 6360 creek crossing. July was selected because it is the month with the lowest observed flows and highest observed temperatures. Stream flow in July is affected by snowmelt, so the July median flow trends show more year-to-year variation than do August median flows, but there is still a visible increase in median flows since 2005. Temperatures have fallen considerably since 2007 following significant gains in stream flow restoration. However, as in all but a few years, July 2014 temperatures at Road 6360 exceeded 18°C.

The data in Figures 10 and 11 show significant increases in stream flow, with resultant decreases in stream temperature. The flow increases and related temperature decreases are attributable to instream flow protection efforts by the Three Sisters Irrigation District, other private water rights owners, and the Deschutes River Conservancy, which have increased base stream flows. Additional instream flow protection is needed to reliably reduce stream temperature to the state temperature standard for salmonid rearing and migration.

While DCFP aquatic habitat restoration and riparian restoration efforts within the Upper Whychus subwatershed and on the DCFP landscape more broadly do not directly affect stream temperature through improvements to instream flow as discussed above, they contribute to temperature improvements through increased water depth and shading and otherwise enhance watershed function and condition as described on pages 25-29.

Figure 11. Whychus Creek July Median Discharge at Sisters City Park and 7-Day Maximum Temperatures at Road 6360



Habitat for aquatic organisms

Question 2P-7 and 3P-3

What is the effect of aquatic restoration treatments on aquatic organisms and species of concern?

Although fish habitat is the primary interest for DCFP, fish population is not a good metric of fish habitat in Whychus Creek because of annual releases of fry and smolts. Instead, the Upper Deschutes Watershed Council and the Xerces Society monitor benthic macroinvertebrate populations, which are sensitive to change in water quality. Differences in macroinvertebrate community composition can reflect stream temperature and the amount of fine sediment suspended in the water column.

Macroinvertebrate populations were monitored in 2005, 2009, 2011, 2012, 2013, and 2014. The results show that the macroinvertebrate community is clearly changing across time in response to changing flow and temperature conditions. In recent years, the macroinvertebrate community has been increasingly characterized by taxa that prefer lower temperatures and lower fine sediment conditions. This suggests colder water temperatures resulting from a trend toward increasing flows and reduced fine suspended sediment. Although no local cause-and-effect research has been done on the effect of upstream log placement and riparian plantings on lower sediment loading in streams within the CFLR area, a wide body of research does point to this relationship and supports local observations.

Project-level monitoring

Aquatic and riparian restoration projects

From 2010 through 2014 Deschutes Collaborative Forest Project funding supported two major watershed restoration projects in the Upper Whychus Subwatershed: the Whychus Floodplain Restoration and Dam Removal Project and the Three Sisters Irrigation District Fish Passage and Channel Restoration Project. A primary goal of each of these projects is to improve fish passage and habitat quality for native and anadramous fish in Whychus Creek. Other goals include increasing floodplain connectivity to the creek channel and restoring riparian vegetation. The Indian Ford Creek Restoration Project, which has similar goals, was still in the planning stages in 2014.The Glaze Forest Restoration Project also includes riparian habitat restoration on Indian Ford Creek and in Glaze Meadow in the Upper Whychus Subwatershed.

Three Sisters Irrigation District Fish Passage and Channel Restoration Project

Question 2P-5 and 3P-1
What is the change in riparian vegetation health in response to restoration treatments?
Question 2P-6 and 3P-2
What is the change in aquatic ecosystem health in response to stream channel, floodplain, wetland, and meadow restoration treatments?
Question 2P-8 and 3P-4
How are DCFP projects affecting fish passage?

The purposes of the Three Sisters Irrigation District (TSID) project were to restore fish access to Whychus Creek upstream of the TSID dam, increase the survival of fish migrating through this reach of the creek, increase fish spawning habitat area, and increase refugia for rearing juvenile during high water events. Project objectives and activities planned to meet these objectives included:

- restoring fish access to 11 miles of habitat above the TSID dam by burying the dam and building a 350-foot long roughened channel below the dam;
- providing habitat complexity and pool habitat by plugging 250 feet of the highly simplified and laterally contained channel, creating a meander bed, creating four flood flow paths, and building four pools;
- restoring floodplain connectivity by removing berms and raising the streambed to allow flows greater than bankfull to access the floodplain;
- stabilizing the stream bank and floodplains and providing the stream channel with shade by planting sedge mats, grasses, shrubs, and trees; and
- adding approximately 550 logs with root wads to the stream and floodplain to help slow water velocities, form pools, add cover to pools, and retain fine soil to encourage survival of planted vegetation.

Methods

Monitoring on this project included:

- cross-sectional and longitudinal profiles to measure changes in streambed and water surface elevations;
- a Forest Service Level 2 stream survey to identify habitat features and conditions;
- photo points to track vegetation and channel morphology changes;
- vegetation plots to measure riparian plant survival; and
- Wolman pebble counts to measure changes in streambed and bank composition.

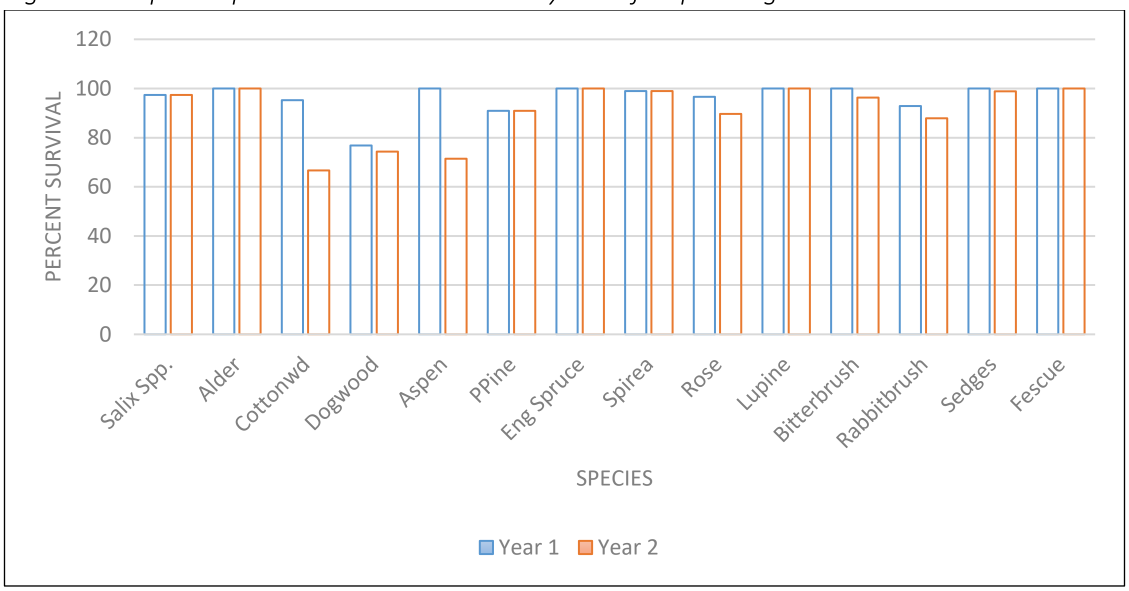
Results

Photo points and cross-sectional and longitudinal profiles of the creek bed show that the objectives of restoring fish access, restoring channel stability, and restoring floodplain connectivity were achieved. Floodplain connectivity was observed during flood events and can be seen in longitudinal profiles (the design water surface line matched the 2012 water surface line which indicates the bed did not change significantly after the winter 2011/2012 flood season).

Approximately 550 logs with root wads were placed to slow flow, create pools, and increase habitat complexity. Logs placed in the channel and floodplain were tagged to track their movement. Inspections by Forest Service personnel found that fewer than 20 logs left the project reach and there was no damage caused by log movement.

Riparian plant survival was monitored using transects and photo points and showed 99% riparian vegetation establishment success after one year and 94% success after two years, as shown in Figure12.

Figure 12. Riparian plant survival one and two years after planting



In riffle cross-sections in the added meander, sediment size was relatively unchanged after the 2011 flood compared to pre-project conditions. In the roughened channel, the substrate size was increased during construction to resist high flood events. Wolmann pebble counts show that the size of rock remaining in 2011 was approximately twice that of the pre-project condition. In both areas there was relatively little change between 2011 and 2012. This may indicate that stability was achieved, since there were many high flow events (300 cubic feet per second and greater) between sampling periods.

Whychus Floodplain Restoration and Dam Removal Project

Question 2P-5 and 3P-1
What is the change in riparian vegetation health in response to restoration treatments?
Question 2P-6 and 3P-2
What is the change in aquatic ecosystem health in response to stream channel, floodplain, wetland, and meadow restoration treatments?
Question 2P-8 and 3P-4
How are DCFP projects affecting fish passage?

The purpose of this project was to restore fish habitat and stream function on a section of Whychus Creek that had deteriorated from historical channel alterations and berm construction for flood control. The project was designed to allow fish passage upstream during migrations, reconnect the channel to the floodplain, restore fish spawning grounds, and provide off-channel habitat for fish rearing during flood events. Project activities include:

- removing a dam to provide fish passage to 13 miles of the creek;
- creating 7 miles of perennial stream habitat in the 1.25-mile reach;
- removing berms and opening entrances to historical side channels to restore floodplain connectivity;
- filling incised channels, placing woody debris (whole trees) in channels and the floodplain, and planting riparian vegetation to dissipate flood energy, create slow water habitat and pools for trout and salmon, increase shade, and help protect streambanks from erosion; and
- thinning second-growth ponderosa pine stands on terraces to release hardwoods, reduce wildfire risk, facilitate the growth of large trees to provide future large wood recruitment and shade, and provide instream wood to the restoration project.

Methods

Monitoring on this project includes:

- transects and vegetation grids for annual riparian vegetation survival monitoring;
- groundwater wells to measure to measure floodplain connectivity;
- cross sections, longitudinal profiles, photo points, and aerial photos to measure changes in channel morphology;
- Level 2 stream surveys to measure changes in habitat features and conditions;
- Wolman pebble counts to measure changes in streambed and bank composition; and
- angular canopy density measurements for shade monitoring.

Results

This project was partially implemented by November 2014: the dam had been removed, two-thirds of the central channel had been built and partially activated, approximately two miles of side channels reconnected, and woody debris had been added to the central channel and floodplain. Initial groundwater well monitoring and observation during flood events show improvements in floodplain connectivity and slow-water habitat. Additional monitoring results will be available in future years.

Glaze Forest Restoration Project riparian restoration activities

One goal of the Glaze project was to move riparian areas – including streamside forests, aspen groves, and meadows – toward conditions more reminiscent of their fire-maintained past.

The Glaze project included restoration in the Indian Ford Riparian Habitat Conservation Area (RHCA), with the following objectives:

- thin to encourage large tree development and growth of aspen, hardwoods, and shrubs;
- reduce risk of high intensity/severity fire to protect key ecosystem elements;
- create stand conditions for eventual development of uneven age structure;
- improve soil and light conditions for desired native bunchgrass and forb species;
- protect water quality by maintaining stream shading and minimizing sedimentation.

Question 2P-5 and 3P-1
What is the change in riparian vegetation health in response to restoration treatments?
Question 2P-6 3P-2
What is the change in aquatic ecosystem health in response to stream channel, floodplain, wetland, and meadow restoration treatments?
Question 2P-3
What is the change in acres and improvement of meadow habitat?

Methods

Monitoring in the Indian Ford RHCA included 5 angular canopy density plots, 13 sedimentation monitoring transects, and agency inspections. Monitoring in the meadow included soil surveys and photo points. Aspen monitoring is underway (see sidebar on next page), but post-treatment aspen monitoring results were not available in 2014. A multiparty monitoring field review of this project was conducted in 2013.

Results

To protect water temperature, Oregon Department of Environmental Quality anti-degradation rules for 303(3) listed streams do not allow any short-term reduction in stream shade. As a result, the Glaze RHCA treatment specified no thinning within 12 feet of the stream and limited conifer removal to trees less than 20 feet tall between 12 and 28 feet of the stream and trees less than 60 feet tall between 28 and 50 feet of the stream. Monitoring results showed that shade requirements were met: there was no detectible change in angular canopy density on any of the five shade monitoring plots. However, multiparty field review post-treatment suggested that more conifer thinning was needed within 50 feet of the stream to release hardwoods and shrubs. Based on this recommendation, the Forest Service and Department of Environmental Quality have developed an exception to 303(d) anti-degradation shade restrictions to allow removal of more conifers in riparian areas with a temporary increase in temperature if there is an expected long-term benefit of more shade from hardwoods and shrub regeneration.

Another lesson learned from monitoring this project was that soil disturbance and sedimentation mitigation measures may have been overly stringent. To avoid sediment delivery that could affect fish habitat, the prescription allowed only hand thinning between 12 and 50 feet of the stream. Between 50 and 300 feet of the stream mechanical thinning was allowed only over frozen ground. The 13 sedimentation transects, located from the stream edge to 50 feet away from the stream, showed very little soil disturbance from the hand thinning and no signs of erosion; all transects met streamside management zone requirements. Beyond the 300' RHCA boundary, the mitigation measure limiting mechanical thinning to periods with frozen ground was revised due to a lack of days with frozen ground. Soil scientist inspection of treatments outside of the RHCA found that thinning over dry ground had very light impact. Project staff recommended that the soil scientist conduct an experiment on the sedimentation effects of thinning over dry ground between 50 and 300 feet from the creek to determine if objectives still can be met if the mitigation measures are revised to allow treatment in the RHCA over dry ground as well as frozen ground.

The soil survey showed that historically there were 121 acres of open meadow habitat and 60 acres of apen stringer meadow habitat that were heavily encroached with lodgepole pine and ponderosa pine. The project thinned conifers on approximately 56 acres, or 93% of the aspen stringer meadow habitat. Participants on the DCFP's 2013 multiparty monitoring field review agreed that removing more conifers around the meadow would have better met meadow restoration goals.

Upland restoration monitoring for the Glaze project is discussed on pages 30-32.

MONITORING ASPEN REGENERATION

Aspen stands are biodiversity hotspots and provide critical habitat to wildlife. They also are in deficit on the DCFP landscape, totaling approximately 360 inventoried acres. Aspen treatments on the Glaze Forest Restoration, Sisters Area Fuels Reduction, and Indian Ford Restoration projects will treat about 50% of the aspen on the DCFP landscape. These three projects include treatments intended to encourage aspen regeneration through conifer thinning, prescribed burning, and fencing to reduce browse. Conifers of any size can suppress growth of aspen suckers, compete for soil moisture, and supply a constant flow of needle cast which limits aspen regeneration. Fire is used to successfully reduce conifers, slash, duff, and other competing vegetation and promote suckering. Protection of aspen from browsing ensures terminal leaders are free to grow and hastens the development of aspen into the mid and over story.

Aspen regeneration is being monitored through use of photo points (qualitative) and line transects (quantitative). Line transect measurements include counting number of suckers in the area 25 feet on either side of 100 foot transects and measuring duff/fine fuel levels. Photo point plots are located within and among the aspen stands to capture images of stand conditions. For both qualitative and quantitative methods pre treatment measurements were taken and will be compared to post treatment conditions when restoration activities are completed. This ongoing monitoring will help evaluate the effectiveness of these treatments on DCFP projects.

Upland restoration and fuels reduction projects

Three upland fuels reduction and forest restoration projects – The Glaze Forest Restoration Project (Glaze project), Sisters Area Fuels Reduction Project (SAFR project), and West Tumbull Hazardous Fuels Reduction Project (West Tumbull project) – were implemented and largely completed between 2010 and 2014.

Glaze Forest Restoration Project

Riparian monitoring for the Glaze project was described on pages 28-29. The ecological goals of the upland treatments for the Glaze project included:

- Move both second-growth and old-growth forest areas toward structural attributes typical of fire-maintained old-growth ponderosa pine forests;
- Reduce competing live ground, ladder, and canopy vegetation to enable the reintroduction of low-intensity fire; and
- Lower the risk of moderate to high-intensity wildfires.

Methods

Upland monitoring on this project included fire behavior modeling using FlamMap. White-headed woodpecker nesting habitat (a surrogate for open, single-story, late-successional ponderosa pine forest habitat) and deer and elk cover were modeled for pre-treatment and post-treatment conditions using Wildhab. In 2013, the DCFP conducted a multiparty monitoring field review of this project.

Results

Modeled fire behavior showed that 142 acres that would have burned as crown fire in 2009 would be surface fire in 2014, a 29% reduction in crown fire potential (Figure 13). Average modeled flame lengths were reduced from 12.9 to 8.6 feet, moving the project area from very high to high flame length class.

Question 1P-1

What are the effects of restoration treatments on fire behavior and forest resilience to fire?

Based on FlamMap outputs, Forest Service expert opinion found there was a 13% reduction in acres in the extreme wildfire hazard class due to Glaze Forest Restoration Project treatments, and a 12% increase in acres in the low wildfire hazard class (Figure 14). An increase in acres in the low hazard class indicates that future wildfire is likely to burn with less intensity, resulting in more historic, low-severity effects appropriate for the low fire severity forest types that dominate the project.

Figure 13. Modeled fire behavior on the Glaze Project, 2009 and 2014

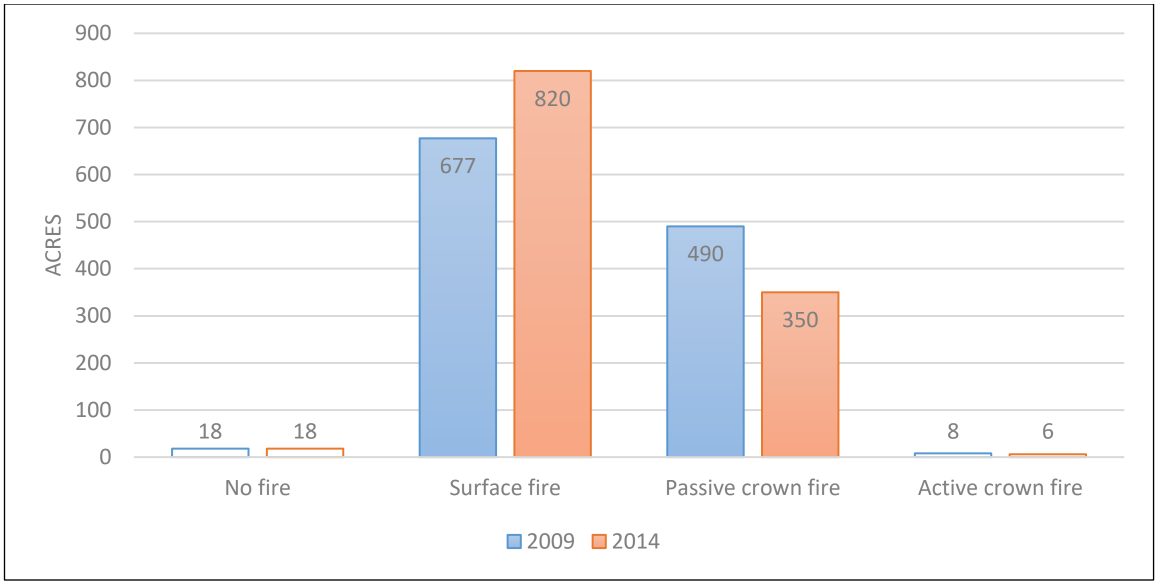
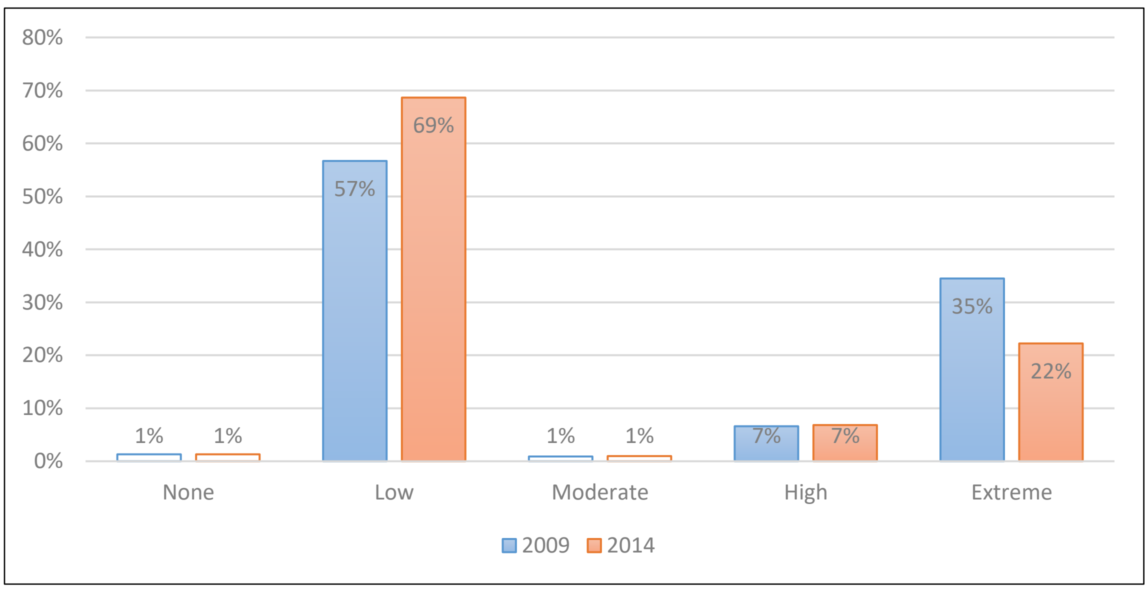


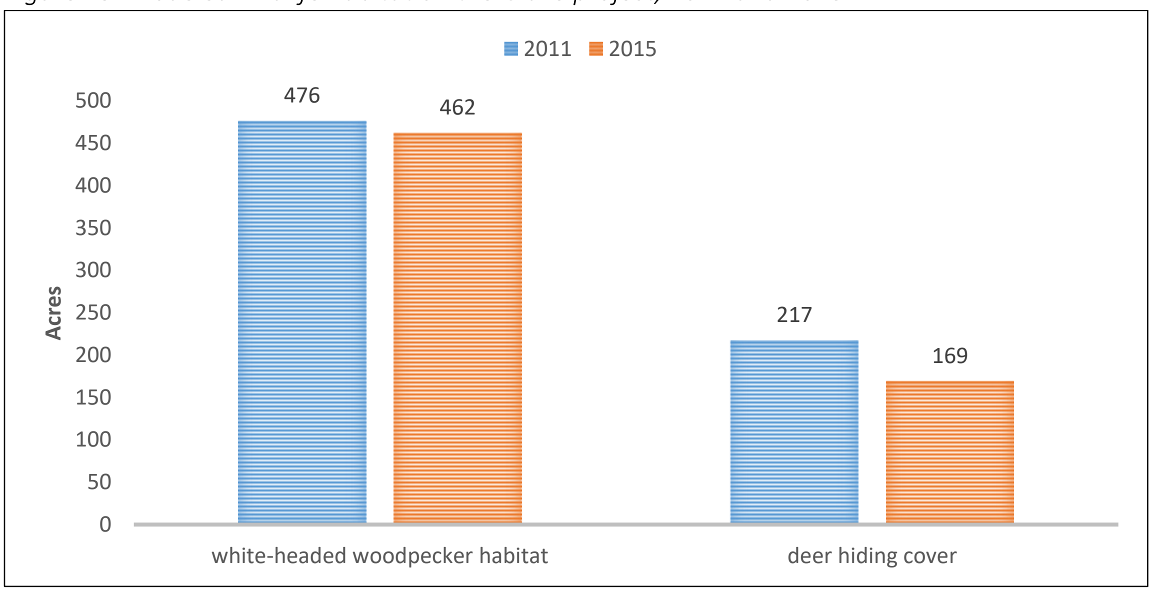
Figure 14. Percent of Glaze project area in each wildfire hazard class, 2009 and 2014



Question 2P-2
What is the change in acres of open, single-story, late-successional ponderosa pine forest habitat?
Question 2P-4
What is the change in acres of hiding cover and thermal cover for deer and elk?

Wildhab model results show a 3% decrease in white-headed woodpecker nesting habitat and a 22% decrease in deer hiding cover as a result of the project treatments (Figure 15). There was no change in acres of deer thermal cover, elk hiding cover, or elk thermal cover. The loss of habitat is attributable to thinning treatments in dense stands which reduced deer hiding cover and where the remaining trees now require time to grow in order to reach the size requirement for white-headed woodpecker nesting habitat. Although white-headed woodpecker nesting habitat was reduced, this species' risk is reduced and habitat enhanced due to the removal of the mid-story trees, which allows for better foraging and increased predator detection.

Figure 15. Modeled wildlife habitat on the Glaze project, 2011 and 2015



Sisters Area Fuels Reduction Project

The goals of the Sisters Area Fuels Reduction (SAFR) project included:

- reducing uncharacteristically high levels of competing live vegetation and reintroducing the more natural role of low intensity ground fire and
- reducing uncharacteristically high levels of hazardous fuels in ground, ladder and canopy vegetation.

Methods

Ecological monitoring on the SAFR project included fire behavior modeling and wildlife habitat modeling, as on the Glaze project. Where the Peterson Ridge Fire burned into SAFR treatments, Fuel Treatment Effectiveness Monitoring (FTEM) was used. In addition, the DCFP conducted a multiparty monitoring field review of this project in 2011.

Results

Modeled fire behavior changed from crown fire to surface fire on 3,874 acres, a 26% reduction (Figure 16). Modeled average flame lengths were reduced from 13.0 to 10.0 feet, moving this project area from very high to high flame length class. This suggests that the canopy will be less susceptible to a crown fire and more likely to burn as a surface fire during a potential wildfire event.

Question 1P-1

What are the effects of restoration treatments on fire behavior and forest resilience to fire?

Based on FlamMap results, Forest Service expert opinion is that 11% of the SAFR project area moved from high and extreme fire hazard to low fire hazard as a result of project treatments (Figure 17). An increase in acres in the low hazard class indicates that on nearly 4,000 acres, future wildfire is likely to burn with less intensity resulting in more historic, low-severity effects appropriate for the low fire severity forest types that dominate the project.

Figure 16. Modeled fire behavior on the SAFR project, 2009 and 2014

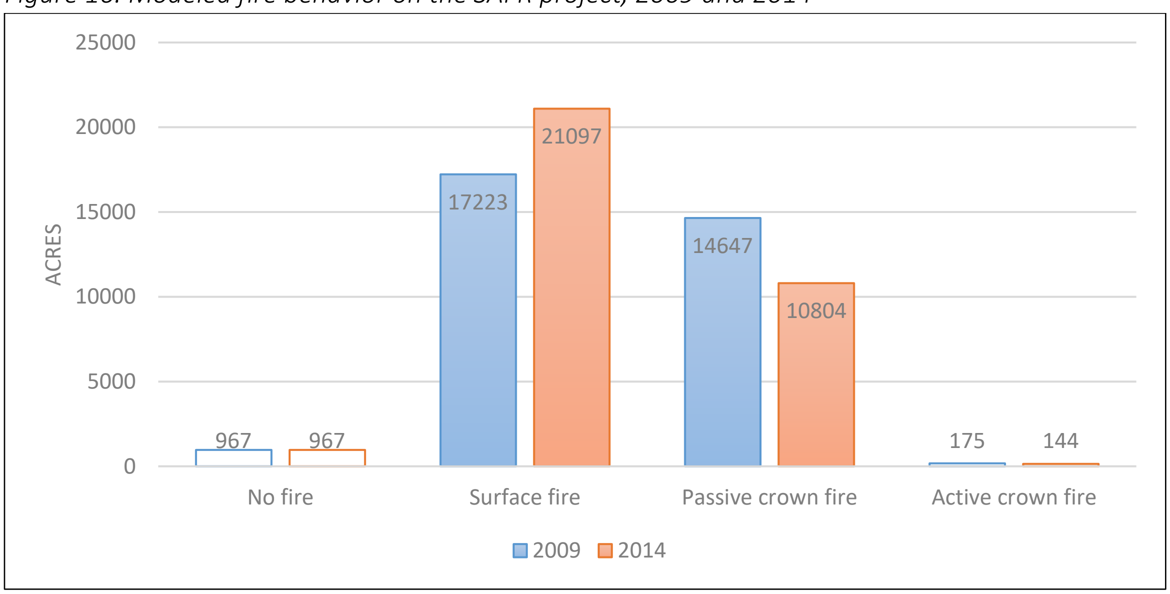
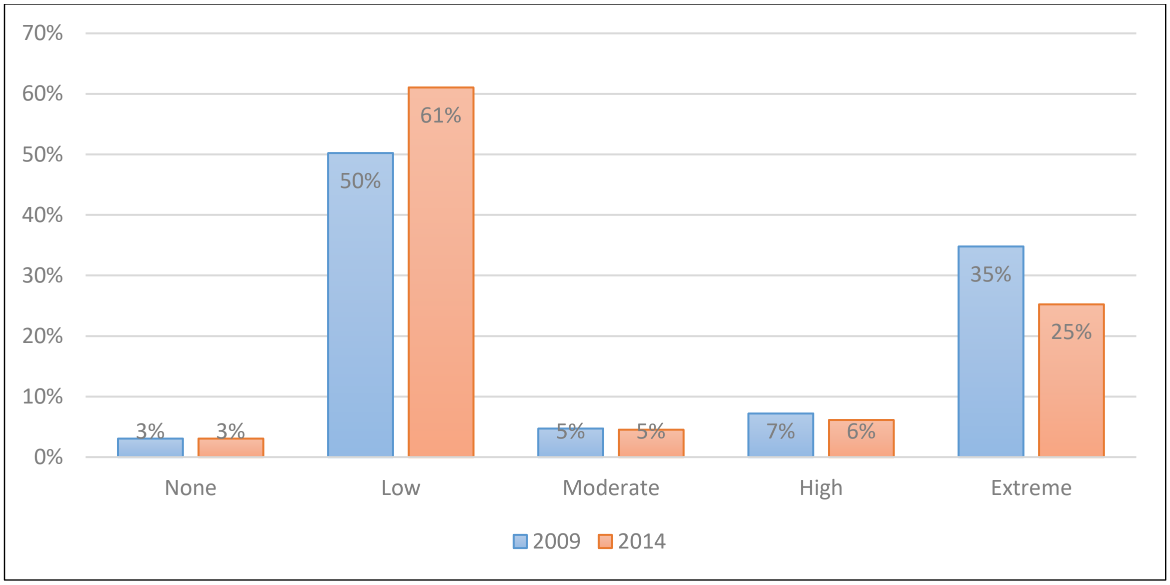


Figure 17. Percent of the SAFR project area in each wildfire hazard class, 2009 and 2014



DCFP and Deschutes National Forest participants on the 2011 post-implementation field review agreed that on at least one unit more second-growth ponderosa pine trees should have been removed to achieve wildfire risk reduction and other forest health goals.

The Peterson Ridge Fire burned into a SAFR treatment area in 2012. According to the Fuel Treatment Effectiveness Monitoring report, the treatment helped control the fire.

Question 1P-3

How do restoration treatments affect fire behavior when wildfire burns through treated stands?

Wildhab model results showed a 25% decrease in white-headed woodpecker nesting habitat (Figure 18). Similar to the changes in the Glaze project, the loss of habitat is attributable to thinning treatments in dense stands where the remaining trees now require time to grow in order to reach the size requirement for white-headed woodpecker nesting habitat. However, risk is reduced and habitat is enhanced due to the removal of the mid-story trees, which allows for better foraging and increased predator detection.

Question 2P-2

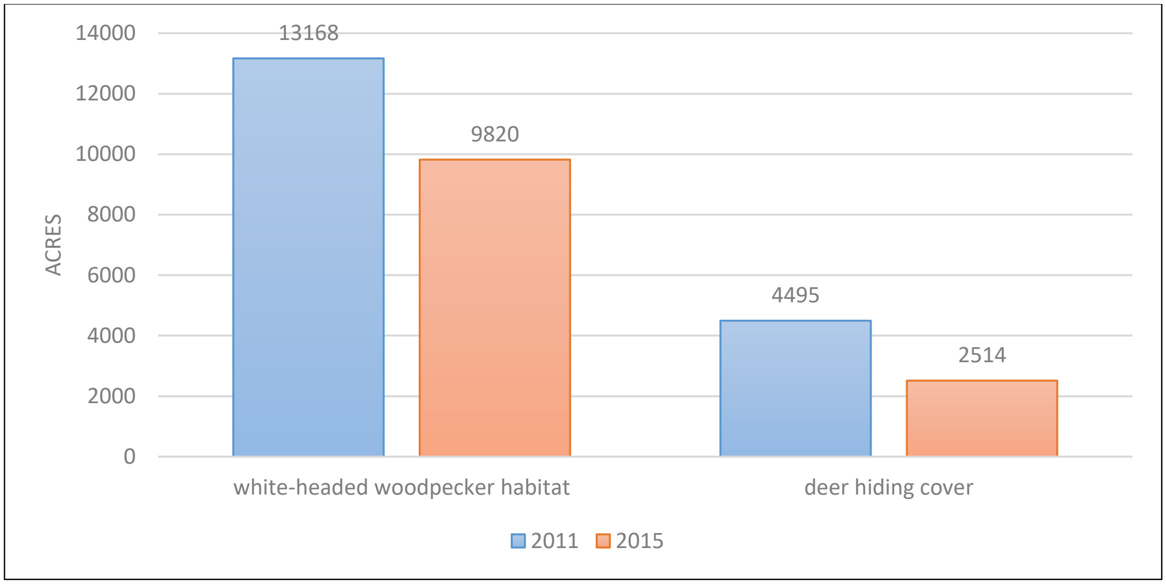
What is the change in acres of open, single-story, late-successional ponderosa pine forest habitat?

Question 2P-4

What is the change in acres of hiding cover and thermal cover for deer and elk?

The Forest Service also modeled deer hiding cover, elk hiding cover, deer thermal cover, and elk thermal cover for the SAFR project area in 2011 and 2015. The model showed no change in thermal cover for either species or for elk hiding cover. There was a 44% decrease in deer hiding cover (Figure 18) due to the thinning treatments in dense stands.

Figure 18. Modeled wildlife habitat on the SAFR project, 2011 and 2015



West Tumbull Hazardous Fuels Reduction Project

According to the Environmental Assessment for this project, the primary purpose was to reduce fuel loadings within the project area:

> The desired condition in this project area is to have fuel loadings consistent with those found in a system with low intensity surface fires with a frequent fire return interval. Surface and ladder fuels would be reduced to levels where, if a wildfire started, the likelihood that it would remain on the ground would be higher than under pre-treatment current conditions. Similarly, aerial (crown) fuels would be at levels that, should a fire occur, a [sustained] crown fire would be less likely to occur.[vi]

Methods

Monitoring on this project included fire behavior modeling and wildlife habitat modeling, as described for the Glaze project. The DCFP conducted a multiparty monitoring field review of this project in 2012.

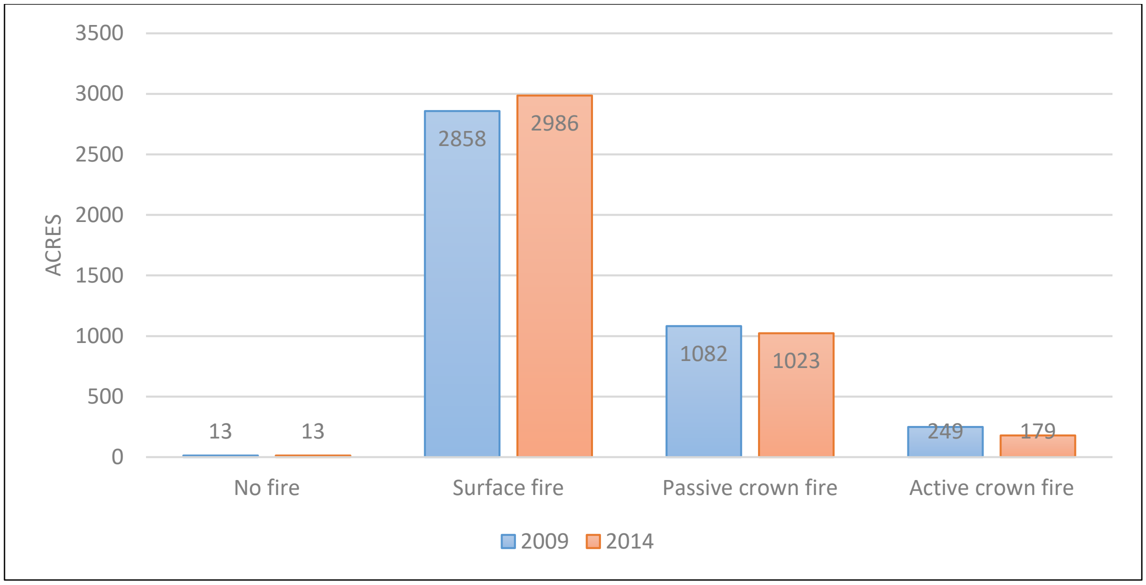
Results

Modeled fire behavior for the West Tumbull project area shows a change from crown fire type to surface fire type on 128 acres, a 10% reduction (Figure 19). Average modeled flame lengths were reduced from 17.9 to 15.3 feet, which is still in the very high flame length class.

Question 1P-1

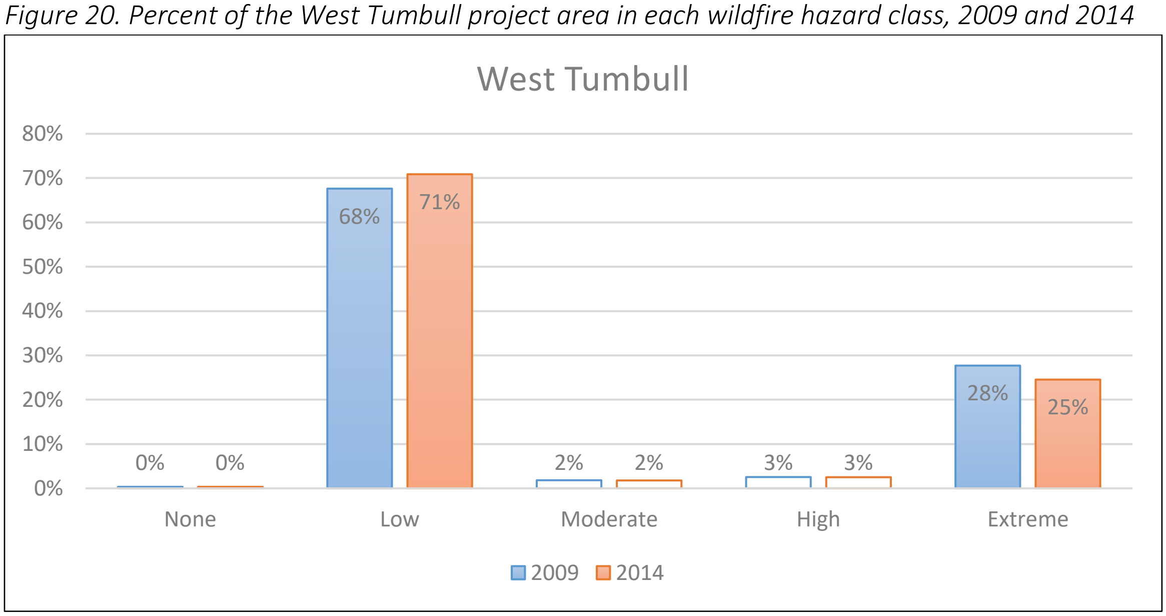
What are the effects of restoration treatments on fire behavior and forest resilience to fire?

Figure 19. Modeled fire behavior on the West Tumbull project, 2009 and 2014



Based on FlamMap model results, Forest Service expert opinion is that 3% of the West Tumbull project area moved from extreme wildfire hazard class to low wildfire hazard class as a result of project treatments (Figure 20). These results suggest that although for the areas that have been treated future potential fire behavior has been improved, there is still more work that could be done to achieve DCFP goals on this part of the landscape. On the multiparty monitoring field review, participants discussed some design criteria and mitigation measures, including a 12-inch diameter cap on tree removal and wildlife habitat mitigation measures, which limited the agency's ability to achieve greater fuels reduction.

Figure 20. Percent of the West Tumbull project area in each wildfire hazard class, 2009 and 2014

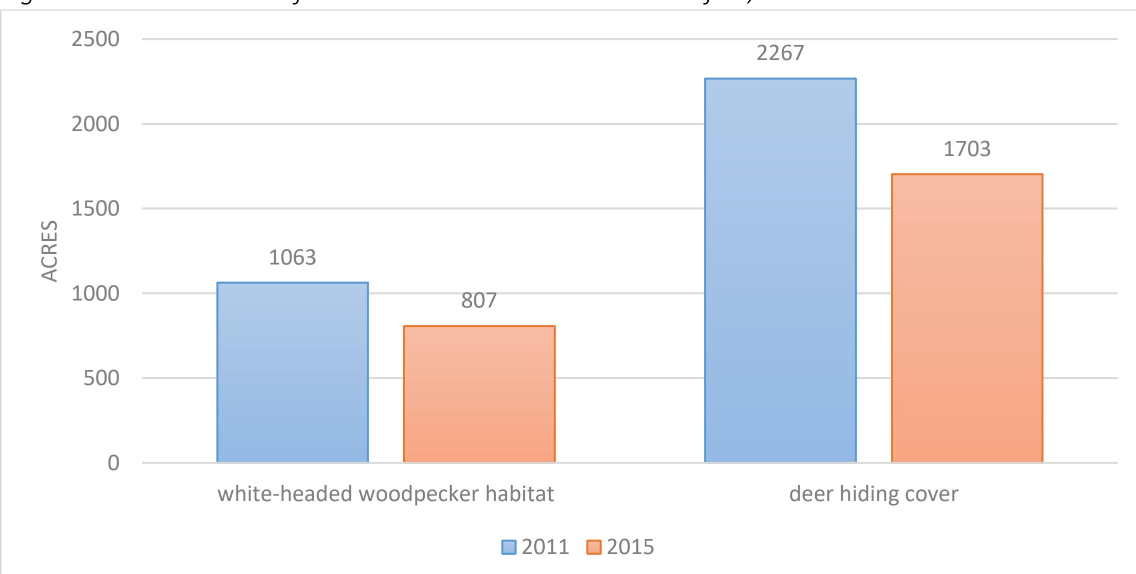


Question 2P-2
What is the change in acres of open, single-story, late-successional ponderosa pine forest habitat?
Question 2P-4
What is the change in acres of hiding cover and thermal cover for deer and elk?

Wildhab model results show a loss of 24% of the white-headed woodpecker nesting habitat due to project activities and a 25% decrease in deer hiding cover due to thinning treatments in dense stands (Figure 21). There was no change in acres of elk hiding cover, or deer or elk thermal cover.

As noted above, the loss in white-headed woodpecker nesting habitat is attributable to thinning treatments in dense stands where the remaining trees now require time to grow in order to reach the size requirement for nesting habitat. However, risk to white-headed woodpecker is reduced and habitat is enhanced due to the removal of the mid-story trees, which allows for better foraging and increased predator detection. The loss of deer hiding cover was due to thinning of dense, over-stocked stands.

Figure 21. Modeled wildlife habitat on the West Tumbull Project, 2011 and 2015



Monitoring plan considerations

Questions not answered in 2014

Six questions were not fully answered due to lack of data.

1P3. How do restoration treatments affect fire behavior when wildfire burns through treated stands in ponderosa pine, dry mixed conifer, and moist mixed conifer PAGs?

Although the Pole Creek Fire burned into the SAFR project area, MBTS and BARC data were not analyzed to determine whether treatments had any effect on wildfire behavior. Similarly, although two small wildfires burned into SAFR treatment areas in 2012, the FTEM database did not record whether or how treatments changed fire behavior (the database did note that on the Peterson Ridge Fire the treatment helped control the fire). In future, it will be important to ensure that these questions are answered during Fuel Treatment Effectiveness Monitoring.

2L2. What is the change in total system road and trail densities?

3S2. What is the change in total system road and trail density in each HUC6 subwatershed?

3S3. What is the change in total system road and trail density in riparian zones and sensitive land types in each HUC 6 subwatershed?

It was not possible to answer these three questions because the Deschutes National Forest's road inventory was improved in 2013 to better align with Lidar hillshade data, which show roadbeds more clearly. This update added several roads that were not previously recorded in the GIS database and erased the less accurate inventory that existed prior to initiation of the DCFP in 2010, so it is not possible to create an accurate pre-DCFP baseline of road density. Total system road densities were calculated for 2014, the fifth year of the DCFP. Going forward, it should be possible to monitor changes since 2014 in total system road and motorized trail density across the landscape, in each HUC 6 subwatershed, in riparian zones (primary contributors to aquatic impacts), and in sensitive land types (prone to mass wasting).

2L3, 2P1. What is the change in acres of core habitat?

It was not possible to fully answer the core habitat question because of the lack of pre-2013 road and trail data. In addition to roads and motorized trail GIS data, the Deschutes National Forest's new GIS layer for non-motorized trails was used in the core habitat calculation. This data layer is still under development and may be adjusted to add previously existing but unmapped nonmotorized trails, which would reduce the area of core habitat calculated for 2015. Core habitat was not calculated at the project level because the trails database was considered incomplete and therefore less accurate at the project scale. Also, core habitat data are more useful at the landscape level, where they can be used to guide future project planning.

4T1. How many new invasive plant infestations were found in treatment areas on selected NEPA projects?

This question was not answered because the selected project, the Pole Creek project, was not complete in 2014. Pre-implementation surveys were conducted in 2013 and the Pole Creek project was completed in 2015. Post-project surveys will begin during the 2016 field season.

Question methods and wording

Monitoring methods or question wording may need to be revised for the following questions.

1L2, 1P1. What are the effects of restoration treatments on fire behavior and forest resilience to fire within ponderosa pine, dry mixed conifer, and moist mixed conifer PAGs?

Nicole Vaillant at the Western Wildland Environmental Threat Assessment Center has written a summary of the methods used to answer this question that should be appended to the DCFP's Ecological Monitoring Plan. Although the monitoring plan calls for using FSIM instead of FlamMap to monitor fire regime changes, because of time constraints FlamMap was used for the 2014 analysis. A full-blown exposure analysis or risk assessment using FSIM requires a 6-month to 1-year time commitment, and there are very few people in the country who can run FSIM. The method discussion for this question could be revised to recommend using either FlamMap or FSIM, with the understanding that in 2014 the data analysis and FlamMap modeling cost over $10,000 and FSIM modeling would be considerably more expensive.

3S1. What are the effects of terrestrial and aquatic restoration treatments on water quality in the Upper Whychus subwatershed?

Water quality in the Upper Whychus subwatershed is monitored by the Upper Deschutes Watershed Council, and monitoring does not attempt to show the direct or indirect effects of DCFP projects. In the Upper Tumalo subwatershed water quality is monitored by the City of Bend and again is not designed to specifically correlate water quality changes to DCFP project activities. To more accurately reflect the available monitoring data this question could be reworded to read, "What are the changes in water quality measures in the Upper Whychus and Upper Tumalo subwatersheds?"

3S4. What is the change in miles of hydrologically connected total system roads and trails with all streams in each HUC6 subwatershed?

The survey conducted in 2014 identified hydrologically connected roads but not trails. In addition, it identified all at-risk culverts on the DCFP landscape. To more accurately reflect these data, this question could be reworded to, "What is the change in miles of hydrologically connected total system roads with all streams and what is the number of at-risk culverts in each HUC6 subwatershed?"

2P7, 3P3. What is the effect of aquatic restoration treatments on aquatic organisms and species of concern?

When secondary data are used it is not possible to show causality between DCFP aquatic restoration treatments and changes in aquatic organisms and species of concern. In 2014 this question was answered only for Whychus Creek using benthic macroinvertebrate data gathered by the Xerces Society and UDWC. That monitoring does not examine the causes of changes in macroinvertebrate populations and did not monitor effects of DCFP activities. In future, for some species, the Forest Service may conduct treatment-specific monitoring. However, when this question is being answered with secondary data it would be more accurately worded, "What are the trends in aquatic species habitat and aquatic species of concern?"

2P3. What is the change in acres and improvement of meadow habitat (wet and dry)?
Although the monitoring plan says this question will be answered using Wildhab modeling of forest structural components required by Great gray owl as well as soil survey and photo points, the Wildhab modeling was not used because the meadow is a small portion of the total Glaze Forest Restoration Project area and model results would not have shown measurable change at the project level. The soil survey and photo points were used to monitor change in acres and improvement of meadow habitat.

2P-5 and 3P-1. What is the change in riparian vegetation health in response to restoration treatments?
Since the Deschutes National Forest is specifically monitoring aspen regeneration on some DCFP projects and aspen is a key concern of some DCFP members, it may be appropriate to add "including aspen " or "and aspen stands" to this question. Will Brendecke at the Sisters Ranger District has provided further background information on aspen regeneration and monitoring that could be added to the DCFP's ecological monitoring plan.

Cost considerations

Although monitoring costs were not closely tracked, the largest allocation of DCFP funds went to answer four questions: 1L1/1L2 (change in succession classes and VCC), 1L2/1P1 (fire behavior modeling), 3S4 (hydrologically connected roads), and 4L2 (invasive plant treatment efficacy). In future, it may be useful to track monitoring expenditures in order to do a cost-benefit assessment for each monitoring question.

Contributors

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Endnotes

[i] Allen, J., T. Mafera, A. Walz, and P. Chang. 2010. Deschutes Skyline Landscape: A Proposal from the Deschutes National Forest and their Collaborators for the Collaborative Forest Landscape Restoration Program. USFS. http://www.fs.fed.us/restoration/documents/cflrp/2010Proposals/Region6/Deschutes/DeschutesSkyline_CFLRP_Proposal.pdf. Accessed 12/14/15.

[ii] Allen, J., T. Mafera, A. Walz, and P. Chang. 2010. Deschutes Skyline Landscape: A Proposal from the Deschutes National Forest and their Collaborators for the Collaborative Forest Landscape Restoration Program. USFS. http://www.fs.fed.us/restoration/documents/cflrp/2010Proposals/Region6/Deschutes/DeschutesSkyline_CFLRP_Proposal.pdf. Accessed 12/14/15.

[iii] Allen, J., T. Mafera, A. Walz, and P. Chang. 2010. Deschutes Skyline Landscape: A Proposal from the Deschutes National Forest and their Collaborators for the Collaborative Forest Landscape Restoration Program. USFS. http://www.fs.fed.us/restoration/documents/cflrp/2010Proposals/Region6/Deschutes/DeschutesSkyline_CFLRP_Proposal.pdf. Accessed 12/14/15.

[iv] Most of Whychus Creek is downstream of the DCFP landscape. Approximately 1.75 project miles in the TSID and Whychus Floodplain projects are within the low gradient, broad valley habitat targeted for restoration.

[v] For more details of the UDWC's Whychus Creek water quality monitoring, see: Mork, L. 2015. Whychus Creek Water Quality Status, Temperature Trends, and Stream Flow Restoration Standards. Upper Deschutes Watershed Council. http://www.upperdeschuteswatershedcouncil.org/wp-content/uploads/2015/06/Whychus-Creek-Water-Quality-Status_2014.pdf accessed 12/14/15. For more information on macroinvertebrate monitoring in Whychus Creek see: Mazzacano, C.A. 2015. Effectiveness Monitoring in Whychus Cree; Benthic Macroinvertebrate Communities in 2005, 2009, and 2011-2014. Upper Deschutes Watershed Council. http://www.upperdeschuteswatershedcouncil.org/wp-content/uploads/2015/04/Benthic-Macroinvertebrate-Communities-in-Whychus-Creek-2005_2009_-and-2011to2014.pdf accessed 12/14/15.

[vi] USDA Forest Service. 2009. *Environmental Assessment – West Tumbull Hazardous Fuels Reduction Project.* Bend-Ft. Rock Ranger District, Deschutes National Forest, Deschutes County, Oregon.

Deschutes Collaborative Forest Project 5 year Ecological Monitoring Report Fire Regime Restoration

Table of Contents

Report Intent

This report was completed by Nicole Vaillant (nvaillant@fs.fed.us) to document the processing completed to answer the *Fire Regime Restoration* question for the CFLR Ecological Indicator 5-yr Progress Report for the Deschutes Collaborative Forest Project (DFCP). The "DCFP Ecological Monitoring Plan – A Working Document" was used as the guidance for the analysis completed.

People who helped with various parts of the processing include: Chris Zanger (czanger@tnc.org), Pete Caligiuri (pcaligiuri@tnc.org), Deana Wall (deanawall@fs.fed.us), Peter Powers (peterpowers@fs.fed.us), Mike Simpson (mlsimpson@fs.fed.us), Lauren Miller (laurenmiller@fs.fed.us)

Fire Regime Restoration – CFLR Progress Report

The following information is required to fill out the *CFLR Ecological Indicator Progress Report* form for reporting to the WO.

Initial Landscape-scale Desired Conditions for the life of the project as defined by the Collaborative

Desired Conditions Target for Fire Regime Restoration: **33%** change (relative to the desired condition) occurs across **18%** of the landscape area by **FY2014** date.

As recommended by Pete Caligiuri, a goal of 33% change is the goal because at this time period it is 1/3 of the way through the monitoring period.

The target percentage of the landscape is based on the expected outputs supplied by Laurie Turner. Only the acers affected by mechanical thinning, hand thinning, mastication/mowing, prescribed fire, biomass removal and pile and burn are included in the calculation. The total expected acreage for the fire regime question for the first 5 years is 37,110 ac. The total FS owned acreage is 205,322 ac. Therefore, the total expected change is **18%** (37,110/205,322 = 18.1%).

Estimated acres treated for DCFP by fiscal year.

Treatment	Secondary Treatment	2010	2011	2012	2013	2014
Mechanical Thinning	**Biomass**	1955	2118	2125	872	10812
Hand Thinning	**Pile and Burn**	1151	647	1759	415	925
Mastication/Mowing	**None**	2000	3113	3100	300	1825
Prescribed Fire	**None**	200	500	1848	845	600

Landscape-scale scoring

Few (if any) CFLR-funded Landscapes propose to achieve landscape scale objectives through the mechanical treatment of every acre within their landscape boundary. Rather, the use of strategically placed restoration treatments should facilitate meeting these broader objectives. Scoring at this level reflects the degree to which individual Landscapes are resulting in Desired Conditions at broader spatial extents.

- Good = Expected progress is being made toward Desired Conditions across **25%** of the CFLR landscape area.
- Fair= Expected progress is being made toward Desired Conditions across **8-24%** of the CFLR landscape area.
- Poor= Expected progress is being made toward Desired Conditions across **<8%** of the CFLR landscape area.

Current Landscape-scale Evaluation

Ecological Indicators	Datasets and/or databases of records used	Good, Fair, Poor and (%) landscape across which progress is being made towards desired conditions	Are you achieving your CFLRP objectives? (Y/N)	If NO, briefly explain…
Fire Regime Restoration	*GNN, LANDFIRE, FACTS*	*Good*	*Y*	*N/A*

Narrative Fire Regime Restoration:
The final scoring was based on "averaging" the outputs for 1L-1 and 1L-2. Averaging is used loosely here. The single "Good" rating was based on a majority call 6/8 Good rankings = Good. The following scoring guide was used:

Landscape:

- Good = 75-100% of expected progress across 25% of the CFLR landscape (> 9,182 ac)
  - (33% * 75% = 24.75 %) --> 24.75% * 37,100 ac = 9,182 ac
- Fair = 25-74% of expected progress across 8.25 % of the CFLR landscape (3,061 and 9,182 ac)
  - (33% * 25% = 8.25 %) --> 8.25% * 37,100 ac = 3,061 ac
- Poor = 0-24% of expected progress less than 8.25 % of the CFLR landscape (< 3,060 ac)

Biophysical setting (BpS) change is based on multiplying the above thresholds by the percentage of the landscape occupied by the BpS.

Ponderosa pine – Dry (41% of the landscape)

- Good = 75-100% of expected progress across 25% of the CFLR landscape (> 3,765 ac)
- Fair = 25-74% of expected progress across 8.25 % of the CFLR landscape (1,255-3,764 ac)
- Poor = Poor = 0-24% of expected progress less than 8.25 % of the CFLR landscape (< 1,255 ac)

Mixed Conifer - Cool/Moist – Dry (9% of the landscape)

- Good = 75-100% of expected progress across 25% of the CFLR landscape (> 826 ac)
- Fair = 25-74% of expected progress across 8.25 % of the CFLR landscape (275-826 ac)
- Poor = 0-24% of expected progress less than 8.25 % of the CFLR landscape (< 275 ac)

Mixed Conifer - Warm/Dry (13% of the landscape)

- Good = 75-100% of expected progress across 25% of the CFLR landscape (> 1,193 ac)
- Fair = 25-74% of expected progress across 8.25 % of the CFLR landscape (398-1,193 ac)
- Poor = 0-24% of expected progress less than 8.25 % of the CFLR landscape (< 398 ac)

1L-1. What is the change in acres of forest successional classes for all PAGs and the ecological departure (condition class) of each PAG relative to its historic range of variability (HRV)?

The desired condition is to have as much of the landscape in VCC1 as possible. However, because much of the treatments will occur in the Ponderosa pine – Dry, Mixed Conifer - Cool/Moist, and Mixed Conifer - Warm/Dry those BpS' will be assessed individually as well.

- Landscape: 10,250 ac increase in VCC1 = ***Good***
- Ponderosa pine – Dry: 8,181 ac increase in VCC1 = ***Good***
- Mixed Conifer - Cool/Moist – Dry: 1,807 ac decrease in VCC1 = ***Poor***
    - The change for this BpS is unique to all the others, the rest show an increase in area within VCC1.
- Mixed Conifer - Warm/Dry: 504 ac increase in VCC1 = ***Fair***
    - Although not accounted for in our goal of VCC1, 5,410 ac did move to a less departed state going from VCC3 to VCC2 showing progress.

1L-2. What are the effects of restoration treatments on fire behavior and forest resilience to fire within ponderosa pine, dry mixed conifer, and moist mixed conifer PAGs at the landscape level?

The desired condition is to increase area with low wildfire hazard as a result of treatment.

- Landscape: 12,432 ac increase in low fire hazard = ***Good***
- Ponderosa pine – Dry: 5,088 ac increase in low fire hazard = ***Good***
- Mixed Conifer - Cool/Moist – Dry: 2,951 ac increase in low fire hazard = ***Good***
- Mixed Conifer - Warm/Dry: 1,837 ac increase in low fire hazard = ***Good***

Project-scale scoring

Each management action funded through CFLR will have its own project-level objectives that are designed to contribute to achieving Desired Conditions at larger scales. Project-scale scoring should reflect how well the results of an individual management activity met the objectives for that project. Individual projects may not meet every desired condition of the CFLRP project. Project-scale scoring is conducted following completed management activities by the multi -party monitoring group at each Landscape.

- Good = 75% or more of implemented treatments result in measurable progress towards individual ***project-level*** objectives.
- Fair = 26% - 74% of implemented treatments result in measurable progress towards individual ***project-level*** objectives.
- Poor = 25% or less of implemented treatments result in in measurable progress towards individual ***project-level*** objectives.

Current Project-scale Evaluation

Ecological Indicators	Datasets and/or databases of records used	Project Level Good, Fair, Poor and (%) treatments resulting in measurable progress as defined above	Are you achieving your CFLRP objectives? (Y/N)	If NO, briefly explain…
Fire Regime Restoration	***GNN, LANDFIRE, FACTS***	***Good***	***Y***	***N/A***

Narrative Fire Regime Restoration:

The desired condition is to increase area with low wildfire hazard as a result of treatment.

The fire hazard metric using FlamMap modeling methods and analyzing outputs to see if overall hazard rating has been reduced only in the Glaze Meadow, SAFR and West Tumbull projects per the DCFP Monitoring Plan document.

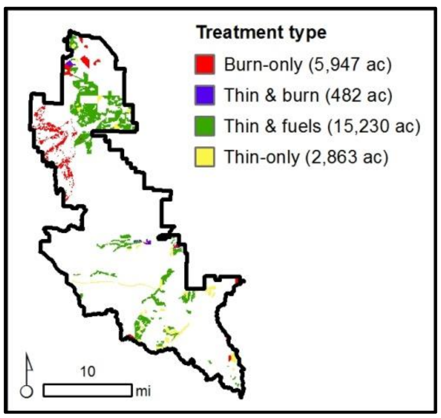
An assignment of good, fair or poor is assigned to each project based on reductions to undesired modeled fire behavior. The percent of the landscape being treated and the scoring percentages were used to determine each rating. For example, in West Tumbull only 20% of the landscape was treated, so a 15% reduction in either crown fire activity or flame length is needed to receive a good score. If a project was within 5% of a higher category the higher category was scored because of additional benefits outside of treatments not modeled within FlamMap.

- Glaze Meadow treatments resulted in a 33% reduction in potential flame length and a 29% reduction in potential crown fire activity within the whole project area. ***Fair***
- SAFR treatments resulted in a 23% reduction in potential flame length and a 27% reduction in potential crown fire activity within the whole project area. ***Good***
- West Tumbull treatments resulted in a 25% reduction in potential flame length and a 15% reduction in potential crown fire activity within the whole project area. ***Good***

Fire Regime Restoration – Data Supporting the CFLR Progress Report

1L-1. What is the change in acres of forest successional classes for all PAGs and the ecological departure (condition class) of each PAG relative to its historic range of variability (HRV)?

Two time periods were modeled, 2009 (existing conditions) and 2014 (5 year time period). GNN data representing 2009 was used as the baseline data for the analysis. GNN data is a raster based data source available for CA, OR, and WA and is linked to FVS tree list data making it ideal for this type of analysis. For the 2014 time period, all activities completed between FY09 and FY14 documented in FACTS were used to make updates. Forest derived, forest type specific silvicultural prescriptions were applied where appropriate along with simulated prescribed fire and modeled with FFE-FVS to create the 2014 data. It was assumed that all treatments were completed at the same time (i.e., trees were not grown out after treatment to the 2014 time period). Where neither silvicultural treatments nor fire were applied no changes were made that would affect S-Class. A total of 24, 898 ac were changed.

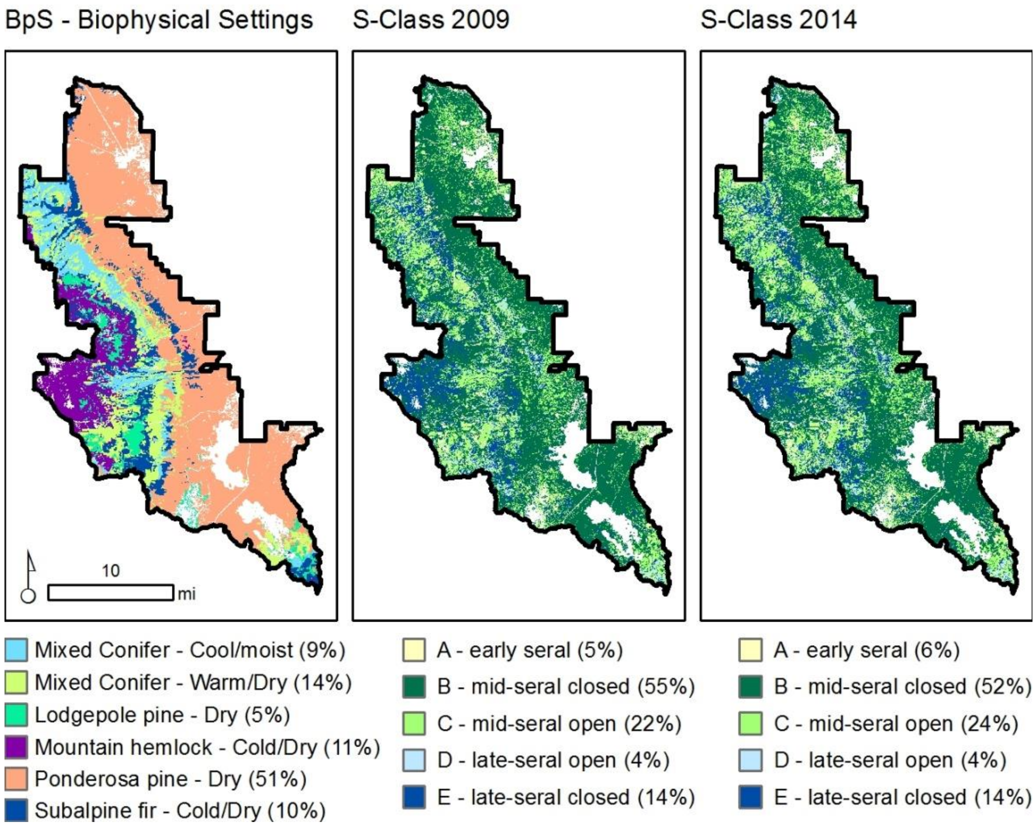


Treatment type foot print for 2014 S-Class and VCC calculations.

Although the *Monitoring Plan* specifies using Plant Association Groups created by the Deschutes National Forest, biophysical settings (BpS) created through the ILAP program and cross-walked to LANDFIRE classes were used. This decision was made because the LANDFIRE BpS classes were the most appropriate data for the S-Class and Vegetation Condition Class (VCC) analyses.

Successional class (S-Class)

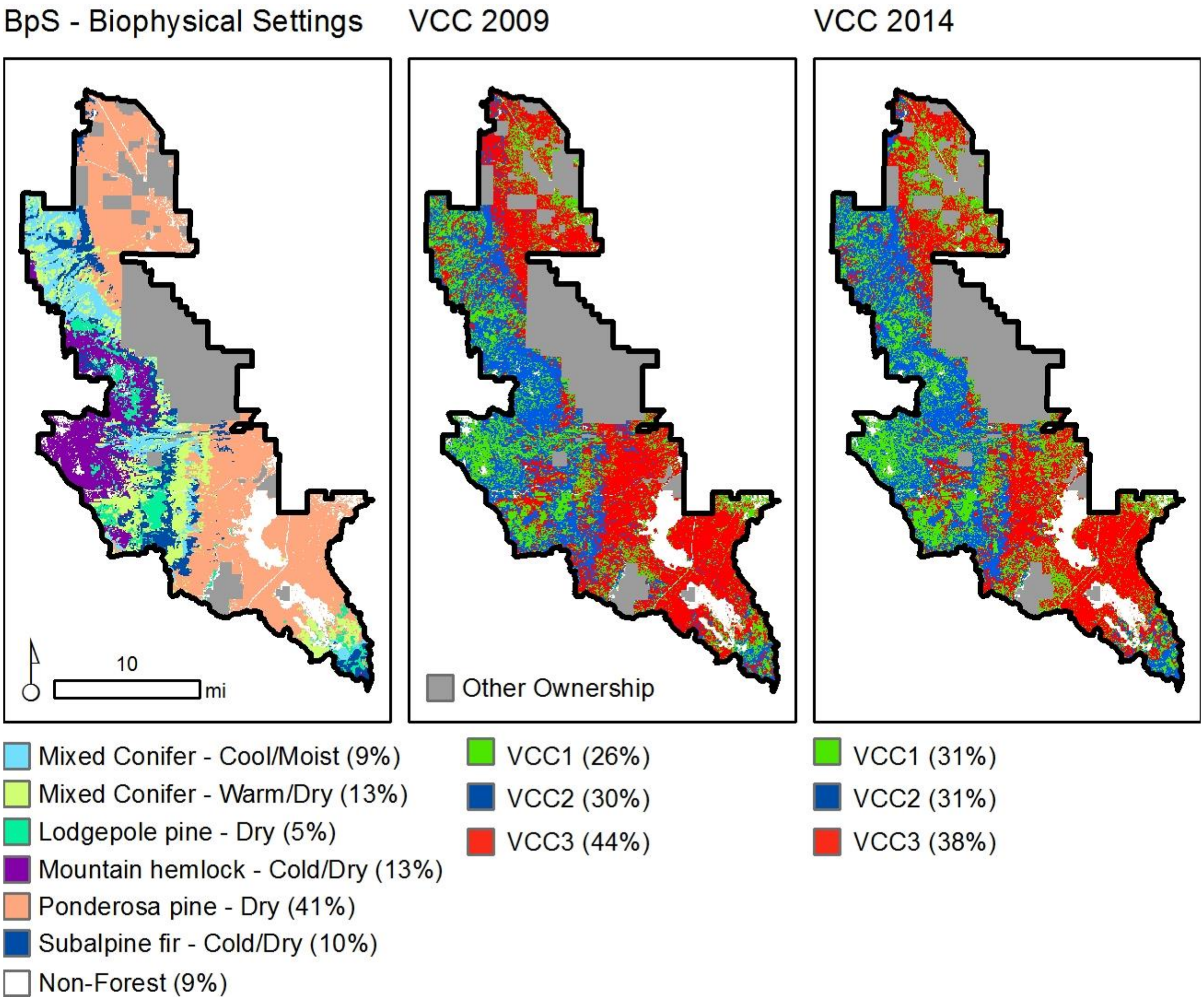
Successional class (S-Class) is a representation of the current stage of a given stand/forest and is most often based on tree density by diameter and canopy cover. S-Class was derived by Chris Zanger, according to the LANDFIRE tool (see FRCC Mapping Tool User Guide v3.0.0 2012) using trees per acre and cover by diameter classes derived from GNN tree list data modeled through FVS by Nicole Vaillant.



Maps of biophysical settings (left), S-Class for 2009 (center), and S-Class for 2014 (right), with percentage of the landscape denoted for each category.

Vegetation Condition Class (VCC)

Vegetation Condition Class (VCC) is a metric of ecological departure and will be used for National Reporting. VCC is created using the LANDFIRE Mapping Tool selecting outputs for "Stratum Veg Departure" and "Stratum Veg Condition Class", which compares the abundance of each S-Class for each BpS to its Historic Range of Variability (HRV, derived from modeled reference condition). Again both the 2009 and 2014 time periods were modeled.



Maps of biophysical settings (left), VCC for 2009 (center), and VCC for 2014 (right), with percentage of the landscape denoted for each category.

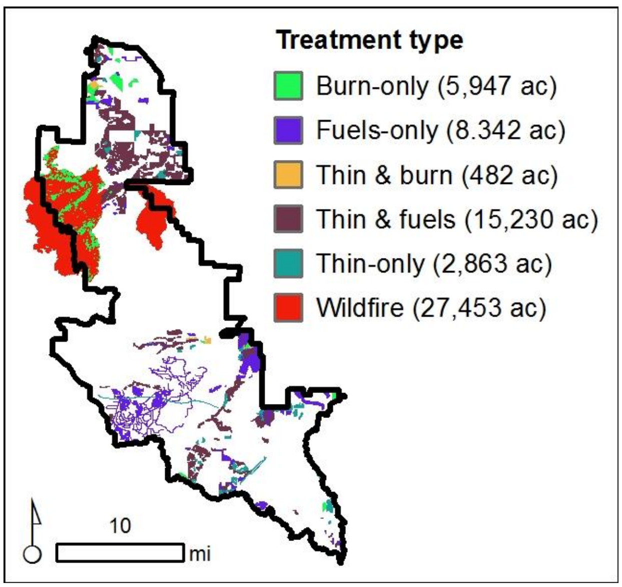
Acres in each VCC by BpS and time period for the FS owned portion of the DCFP landscape.

Biophysical Setting	VCC1 (0-33% departure)		VCC2 (34-66% departure)		VCC3 (67-100% departure)	
	2009	2014	2009	2014	2009	2014
Lodgepole pine - Dry	3,452	4,764	7,197	5,885	-	-
Mixed Conifer - Cool/Moist	10,226	8,419	8,294	9,405	-	696
Mixed Conifer - Warm/Dry	7,802	8,306	3,640	6,490	15,260	11,900
Mountain hemlock - Cold/Dry	10,533	12,389	14,355	12,738	238	-
Ponderosa pine - Dry	14,396	22,577	6,787	4,282	62,936	57,210
Subalpine fir - Cold/Dry	1,274	1,479	15,270	17,909	2,853	0
All	47,683	57,933	55,543	56,709	81,287	69,805

The acres in the table above were used to score 1L-1 for the National Reporting.

1L-2. What are the effects of restoration treatments on fire behavior and forest resilience to fire within ponderosa pine, dry mixed conifer, and moist mixed conifer PAGs at the landscape level?

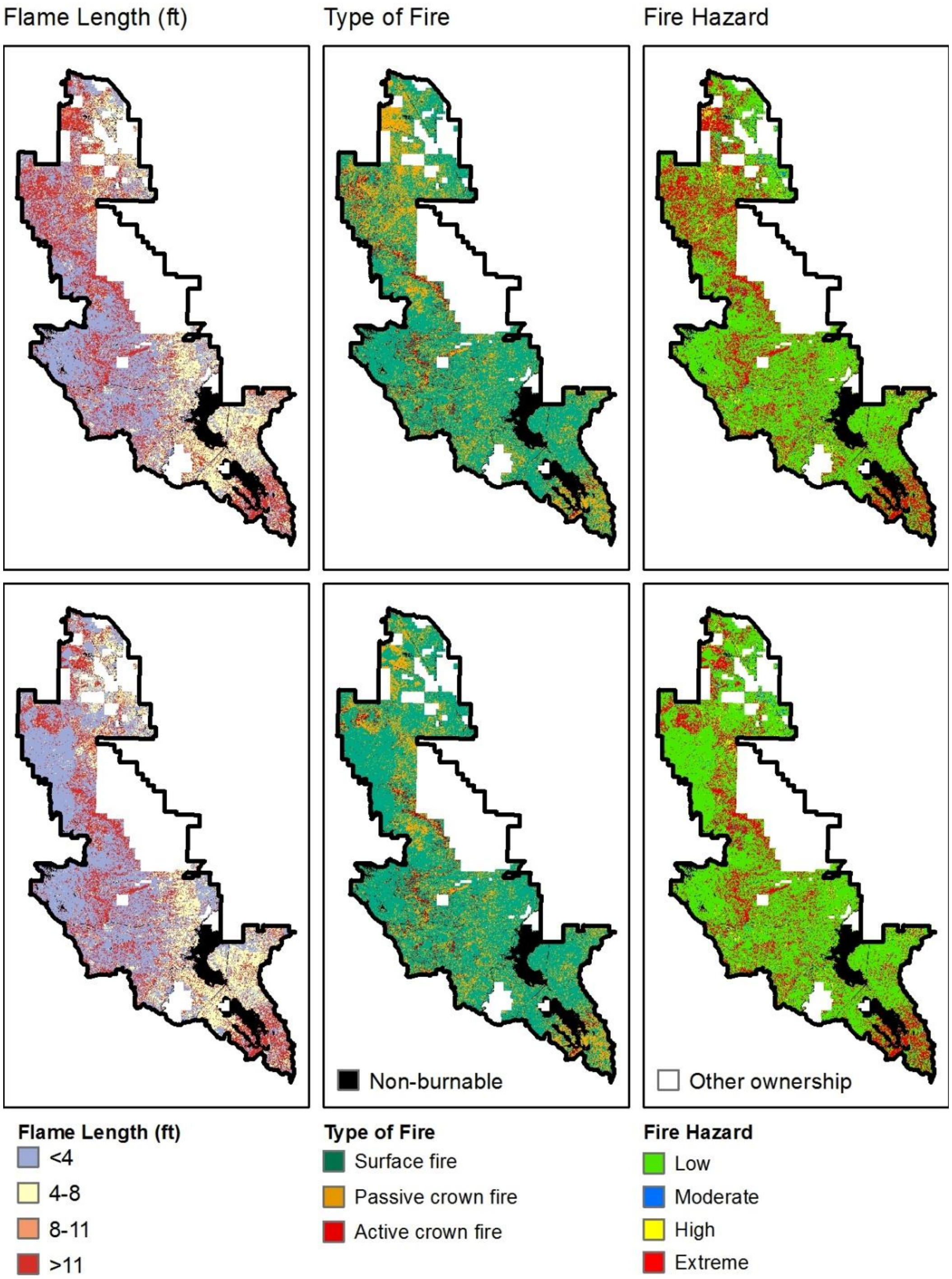
The 2009 landscape was created using LANDFIRE (Refresh 2010) fuel models and topography data with GNN tree list data modeled through FVS to generate the needed canopy characteristics. For the 2014 time period, all activities completed between FY09 and FY14 documented in FACTS, and wildfires >1,000 ac were used to make updates. Forest derived, forest type specific silvicultural prescriptions were applied where appropriate along with simulated prescribed fire and modeled with FFE-FVS to create the 2014 data. It was assumed that all treatments were completed at the same time (i.e., trees were not grown out after treatment to the 2014 time period). Fuel models were updated using expert opinion from the Forest. In the 2010 Rooster Rock and 2012 Pole Creek Fires for acres not claimed in FACTS, canopy characteristics and fuel models were updated based on BAER/BARC maps and expert opinion from the Forest. Only treatments claimed in FACTS were used for National Reporting scoring.



Treatment type foot print for 2014 landscape file creation for fire behavior modeling.

FlamMap Fire Hazard

Two landscapes representing 2009 and 2014 were run though FlamMap, a landscape-level fire behavior model, to look at static fire behavior under the 97th percentile fire weather conditions. Crown fire activity and flame length were combined to create a single wildfire hazard rating.



Maps of flame length (left), crown fire type (center), and wildfire hazard (right), modeled in FlamMap for 2009 (top) and 2014 (bottom).

Acres in each fire type by BpS and time period for the DCFP landscape.

Biophysical Setting	Surface fire (%)		Passive crown fire (%)		Active crown fire (%)	
	2009	2014	2009	2014	2009	2014
Lodgepole pine - Dry	7,212	7,498	2,940	2,701	497	449
Mixed Conifer - Cool/Moist	10,639	13,591	5,564	3,581	2,343	1,374
Mixed Conifer - Warm/Dry	16,500	18,335	7,529	6,195	2,697	2,197
Mountain hemlock - Cold/Dry	19,692	20,326	3,981	3,465	1,599	1,481
Other	4,490	4,667	2,066	1,899	106	96
Ponderosa pine - Dry	58,463	63,450	24,540	19,650	1,219	1,121
Subalpine fir - Cold/Dry	11,533	12,890	5,705	4,595	2,184	1,938
All	128,529	140,757	52,324	42,085	10,645	8,656
All (% of burnable lands)	67%	74%	27%	22%	6%	5%

Acres in each flame length class by BpS and time period for the DCFP landscape.

Biophysical Setting	<4 ft		4-8 ft		8-11 ft		>11 ft	
	2009	2014	2009	2014	2009	2014	2009	2014
Lodgepole pine - Dry	6,682	6,980	753	698	340	302	2,873	2,668
Mixed Conifer - Cool/Moist	10,043	13,140	916	771	566	357	7,022	4,278
Mixed Conifer - Warm/Dry	15,185	17,206	1,811	1,630	693	576	9,038	7,315
Mountain hemlock - Cold/Dry	19,505	20,159	545	437	248	214	4,974	4,461
Other	2,789	3,193	1,626	1,492	570	501	1,677	1,476
Ponderosa pine - Dry	25,783	31,854	33,216	32,110	4,578	3,953	20,643	16,303
Subalpine fir - Cold/Dry	10,177	11,641	1,599	1,508	613	479	7,033	5,795
All	90,165	104,174	40,465	38,647	7,608	6,381	53,259	42,296
All (% of burnable lands)	47%	54%	21%	20%	4%	3%	28%	22%

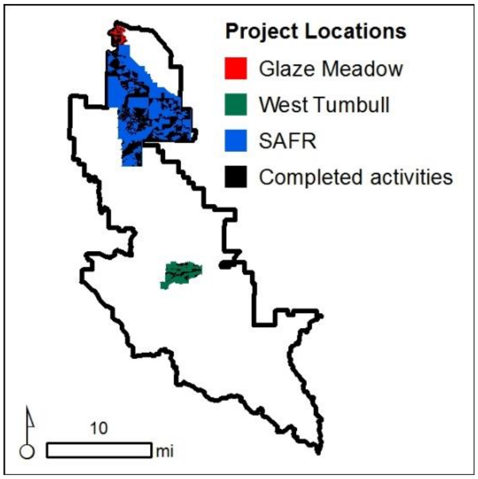
Acres in each fire hazard class by BpS and time period for the DCFP landscape.

	Low (%)		Moderate (%)		High (%)		Extreme (%)	
BpS	2009	2014	2009	2014	2009	2014	2009	2014
Lodgepole pine - Dry	7,194	7,477	312	272	294	257	2,848	2,643
Mixed Conifer - Cool/Moist	10,653	13,604	371	362	503	305	7,019	4,275
Mixed Conifer - Warm/Dry	16,582	18,419	482	483	629	514	9,034	7,311
Mountain hemlock - Cold/Dry	19,741	20,365	325	245	234	201	4,972	4,460
Other	4,246	4,512	390	352	402	370	1,624	1,427
Ponderosa pine - Dry	57,705	62,793	2,127	1,909	3,824	3,282	20,566	16,236
Subalpine fir - Cold/Dry	11,572	12,955	259	250	564	429	7,027	5,789
All	127,693	140,125	4,265	3,874	6,450	5,357	53,090	42,142
All (% of burnable lands)	67%	73%	2%	2%	3%	3%	28%	22%

The acres in the table above were used to score 1L-2 for the National Reporting.

1P-1. What are the effects of restoration treatments on fire behavior and forest resilience to fire within the same PAGS at the project level?

According to the *Monitoring Guide* only the Glaze Meadow Restoration (1,193 ac), SAFR (33,012 ac), and West Tumbull (4,202 ac) projects are to be considered.



Activity type	Glaze Meadow	SAFR	West Tumbull
Burn-only	-	600	-
Fuels-only	-	747	60
Thin-only	70	618	56
Thin & burn	-	251	47
Thin & fuels	620	9669	686
Wildfire	-	476	-
Total	690	12,361	849
% of project	58%	38%	20%

Location of the Glaze Meadow Restoration, SAFR, and West Tumbull projects with completed activities.

Percent of total area in each fire type and mean flame length by time period for the Glaze Meadow Restoration, SAFR, and West Tumbull projects.

Project	No fire (%)	Surface fire (ac)		Passive crown fire (ac)		Active crown fire (ac)		Flame Length (ft)	
		2009	2014	2009	2014	2009	2014	2009	2014
Glaze Meadow	18	677	820	490	350	8	6	12.9	8.6
SAFR	967	17,223	21,097	14,647	10,804	175	144	13.0	10.0
West Tumbull	13	2,858	2,986	1,082	1,023	249	179	17.9	15.3

The acres in the table above were used to score 1P-2 for the National Reporting.

Project level score

An assignment of good, fair or poor is assigned to each project based on the specifications noted above. The percent of the landscape being treated and the scoring percentages were used to determine each rating. For example, in West Tumbull only 20% of the landscape was treated, so a 15% reduction in either crown fire activity or flame length is needed to receive a good score. If a project was within 5% of a higher category the higher category was scored because of additional benefits outside of treatments that are not modeled within FlamMap.

Glaze Meadow treatments resulted in a 33% reduction in potential flame length and a 29% reduction in potential crown fire activity. ***Fair score***.

SAFR treatments resulted in a 23% reduction in potential flame length and a 27% reduction in potential crown fire activity. ***Good score.***

West Tumbull treatments resulted in a 25% reduction in potential flame length and a 15% reduction in potential crown fire activity. ***Good score.***

Data Processing Details

Creating the existing conditions (2009) scenario

- Create a new GNN raster (gnn09_mask) with the non-burnable mask created from LANDFIRE data (non_burnable_mask)
    - Unmasked GNN data with FVS ready database (mr200_2009des)
- Run all stands through FVS for 2 cycles using the specified variant for each
    - Allow the model to choose the fuel model based on the 40
    - Use only 2009 outputs
- Update any CBH = -1 to 0
- Add a Stand_CN = 0 and update the fuel model = 99 and rest =0 this will be for the non-burnable mask.
- Create the LCP using 2009 GNN data for the canopy characteristics and LANDFIRE data for the fuel model and topography.

Creating the 2014 scenario

FACTS data

To avoid double and triple dipping I had to do a lot of “cleaning” of the FACTS data. In the end I ended up with an activities layer that included a chronological treatment “plan” for all areas treated. There were between 1-5 activities per piece of ground.

- I obtained the FY10-14 FACTS data from the Deschutes on 10/16/14
- I only included the activities where “FISCAL_YEAR_COMPLETED” was 2010-2014, and “EXCLUDE_ACCOMPLISHMENT” was N
- I then removed the following “NEPA_DOC_NAME” activities because they did not have any definable impact on forest structure or fuels.
    - 2007 Fire restoration, Animal damage control revision decision, Invasive plant treatment ROD1, Invasive plants treatment, Post-wildfire reforestation planting, Riparian reserve post-wildfire planting project, Sugar Pine Ridge and weight station forest planting, 18 Fire roadside salvage CE, and 18 Fire salvage recovery project.
- Next I removed the following “ACTIVITES” because they did not have any definable impact on forest structure or fuels.
    - Animal Damage Control for Reforestation, Certification-Planted, Certification of Natural Regeneration without Site Prep, Fill-in or Replant Trees, Fuel Inventory, Genetic Evaluation Plantation Operations, Invasives - Mechanical /Physical, Invasives - Pesticide Application, Invasives - Treatment Activity Monitoring, Low Intensity Stand Examination, Plant Trees, Plantation Survival Survey, Post Treatment Vegetation Monitoring, Pretreatment Exam for Release or Precommercial Thinning, Salvage Cut (intermediate treatment, not regeneration), Seed Orchard Operations, Silvicultural Stand Examination, Site Preparation for Natural Regeneration – Manual, Site Preparation for Natural Regeneration – Mechanical, Special Products Removal, Stand Diagnosis Prepared,

Stocking Survey, Watershed Resource Non-Structural Improvements Soil Productivity, Wildlife Habitat Improvement, Range Control Vegetation, Leave Trees (wildlife reasons) – Area.

- Then I searched and removed all of the duplicates in the data by sorting based on area.
- Next, I concatenated the “NEPA DOC NAME”, “ACTIVITY” and “COMPLETED DATE”.
- I split the file into individual shapefiles based on the concatenation, then unioned them based on “NEPA DOC NAME” and created a list of the activities in order of occurrence based on the “COMPLETED DATE”
    - If a given NEPA project had duplicates of a given activity, like Piles, I used the most recent date only.
    - If a “Stand Silvicultural Trt” was claimed and another one like PCT or CT was also done I dropped the generic one.
    - I cleaned up slivers (<1 ac) by merging them with the most logical touching poly.
- After each NEPA was cleaned I unioned them all back together again. Then cleaned this up first by merging slivers (<1 ac). Then by looking at where NEPAs overlapped.
    - If it was obvious or the same activity type I let one trump another.
    - If not I “merged” them into one with both NEPAs noted.

FACTS data location:

T:\FS\NFS\Deschutes\Project\SO\opsCFLR2014\GIS\Workspace\nvaillant\Activities

Updating the fuel models in the treatment areas

With guidance from Deana I simplified some of the fuels “ACTIVITIES” and have a fuel treatment change scheme. I used the most recent “ACTIVITY” to dictate the change to make.

- Chipping with FA = Mow
- Compacting/Crushing of Fuels with “WORKFORCE_CODE” FA and FY10-12 = Mow
- Compacting/Crushing of Fuels with “WORKFORCE_CODE” FA and FY13-14 = Mastication
- Compacting/Crushing of Fuels with “WORKFORCE_CODE” SC = Mastication
- Compacting/Crushing of Fuels with “WORKFORCE_CODE” CT = Mow
- Rearrangement of fuels = Lop & Scatter
- Control of Understory Vegetation = Mastication
- Tree Release & Weed = Mow

Activity	Pre Fuel Model	Post Fuel Model
Prescribed or wildfire	Any	181
Mowing	GR, GS, SH, TU TL	121 181
Lop & Scatter	Any	202
Mastication	Any	184
Pile or yarding	Any	No change
No fuel treatment after thinning	Any	201

Creating the post-treatment canopy characteristic changes for GNN

- I intersected the Activity layer, GNN and 2009 PNV layer to assign a PAG to each point
  - Simplified PAGS based on KCP prescriptions from Pete Powers (LP, PP, MC)
  - Then I did a query to find unique FCID/PAG/Activity combinations for running in FVS. I ended up with 3,000 ish
- I created new StandInit and TreeInit tables to run through FVS with the new Unique StandCN based on FCID/PAG/Activity. I linked this back to GIS to be able to apply the runs spatially.
- I created a few KCPs based on Pete Powers help to represent the silvicultural treatments that happen locally. And ran them through based on unique FCID/PAG/Activity calls.

FVS_Rx	**KCP**
Burn Only	underburn.kcp
CT	*_cut.kcp
CT, PCT CT, PCT SEED, PCT SHELT, or SILVICS	*_cut.kcp
PCT	*_pct.kcp
PCT CT Burn	*_cut_burn.kcp
PCT Burn	*_pct_burn.kcp

- The FVS run results for 2009 were joined back to create updated canopy characteristics post treatment.
- For the prune, I just lifted the CBH to 10' if it was lower.

FVS data location:

T:\FS\NFS\Deschutes\Project\SO\opsCFLR2014\GIS\Workspace\nvaillant\GNN_FVS

Updating areas burned by wildfire

Both the Rooster Rock (2010) and Pole Creek (2012) fires impacted the CFLR. Updates were made according to the methods outline below created by Lauren Miller created for updating LANDFIRE data within the part of Pole Creek that is being claimed for Melvin Butte (formerly Popper). These updates were made only for areas not claimed by FACTS. This was only done for fire modeling and not for S-Class/VCC. The BAER/BARC maps were used to define severity

- Within areas with low vegetation mortality OR underburned/unburned:
  - Canopy grids were not modified
  - Fuel models: 165 → 181
  - Fuel models: 122 → 161
  - Fuel models: 185 → 183

- GR→101 (addition to Lauren Millers' methodology)
- GS, SH→161 (addition to Lauren Millers' methodology)
- TU, TL→181 (addition to Lauren Millers' methodology)

- Within areas with moderate vegetation mortality:
  - Canopy Cover was reduced by 50%
  - Canopy Base Height was increased by 50%
  - Canopy bulk density was reduced by 50%
  - Canopy height grid was not modified
  - Fuel models: Within areas covered by a timber model: → 181
  - Fuel models: Within areas covered by grass models → no change
  - Fuel models: Within areas covered by a shrub model → 101
- Within areas with high vegetation mortality
  - Canopy Cover → 0
  - Canopy Base Height → 0
  - Canopy Bulk Density → 0
  - Canopy height → 0
  - Fuel models → 101

Fire data location:

T:\FS\NFS\Deschutes\Project\SO\opsCFLR2014\GIS\Workspace\nvaillant\Activities

S-Class/VCC

- I ran the 2009 data through FVS with a compute statement to get all the information that Chris Zanger needed. I did this for all the unique FCIDs.
- Post treatment I also calculated S-Class but have to use the 2010 calculation due to tree cuts/mortality not showing up in 2009.
- Chris Zanger then ran the S-Class tool by BpS type using the data I provided to create the mapped S-Class data used.

S-Class data location:

T:\FS\NFS\Deschutes\Project\SO\opsCFLR2014\GIS\Workspace\nvaillant\SClass

VCC data location:

T:\FS\NFS\Deschutes\Project\SO\opsCFLR2014\GIS\Workspace\nvaillant\VCC

FlamMap runs

FlamMap was run for both the 2009 and 2014 landscapes using the same fire weather parameters. These were the 97th percentile conditions using the Lava Butte RAWS with a wind gust adjustment applied.

- 1 hr = 2%, 10-hr = 3%, 100-hr = 6%, woody = 60%, herb = 30%, wind = 19 mph out of the SW

Crown fire activity and flame length were modeled and a hazard matrix was completed based on flame length and crown fore activity.

FlamMap data location:

T:\FS\NFS\Deschutes\Project\SO\opsCFLR2014\GIS\Workspace\nvaillant\FlamMap

FSim modeling

FSim modeling was completed but was not analyzed not used for the National Reporting. There was not enough time to incorporate this information.

FSim data location:

T:\FS\NFS\Deschutes\Project\SO\opsCFLR2014\GIS\Workspace\nvaillant\FSim