Management Strategy for the Washington State Department of Fish and Wildlife's Forests

Washington Department of Fish and Wildlife
Wildlife Program
600 Capitol Way North
Olympia, WA 98501-1091

Prepared by

Richard Tveten, Restoration Ecologist

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Director, Washington Department of Fish and Wildlife

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1.0 WDFW Forests

1.1 Introduction

This management strategy for the Washington State Department of Fish and Wildlife's (WDFW's) forests describes the forests owned by the agency, its vision for them and how they will be managed to achieve that vision. The purpose of the document is to provide a clear, consistent strategy to ensure that limited resources are effectively used to manage the agency's roughly 200,000 acres of forest as fish and wildlife habitat. Approximately half of WDFW's forests are in relatively good condition or are on natural trajectories to become so and would not benefit from active management. The remaining forests have been impacted by harvest activities prior to acquisition, have become degraded as wildlife habitat by widespread fire exclusion or are at risk to severe insect outbreaks and wildfires. As such, these forests would benefit from projects to restore and maintain desired conditions.

The first section describes the various forest types managed by WDFW including their historic conditions, current conditions (which are often very different from historic conditions) and desired ranges of future conditions to meet ecological, social and economic objectives. The second section defines agency management strategies and how work is prioritized, implemented and tracked. The third section is intended to be a resource for project proponents and includes both standards and procedures to ensure that projects are properly planned, executed and documented.

Other complimentary documents will provide additional information related to the strategy for managing WDFW forests. These documents will include the following:

- Wildlife area specific forest management plans
- A master list of forest management needs and potential projects
- Instructions for inventorying forests

Each forested wildlife area will develop a wildlife area specific forest management plan as part of their wildlife area management plan. These plans do not repeat general information within this statewide strategy document but focus on:

- Providing accurate, more detailed descriptions of forests
- Defining suitable management areas and potential projects based on local knowledge
- Articulating the rationale for projects using common prioritization criteria defined within this document

All wildlife area specific forest management plans are developed following a template based upon the agency mission, vision and strategies defined within this document. The template helps individual wildlife area managers efficiently provide information and ensure that all potential projects are developed in a consistent manner. Collectively, these plans will constitute the statewide forest inventory and are the source for identifying management needs and projects.

The master list of forest management needs and potential projects is derived from information provided in wildlife area specific forest management plans. Projects on the list are ranked based on the prioritization factors articulated in this document. While the list is intended to identify the most important and urgent management needs on a statewide basis, the state forester and wildlife area managers can use discretion when choosing projects for implementation. As a result, project order may not follow the ranked order on the master list. Economic and social factors, funding opportunities, staff availability and specific wildlife area needs will influence the sequencing of projects.

It is important to note that WDFW strives to manage its forests so that restoration/habitat maintenance activities provide financial benefits to the agency and local economies rather than act as a constant, financial drain. To the degree feasible projects will be scheduled so that they also serve as sources of revenue to support wildlife area management. While generating revenue and local economies is not the driving force behind WDFW's forest management program, such outcomes are consistent with all of the department's mission and goals as well as the Washington Department of Fish and Wildlife 2011-2017 Strategic Plan.

Finally, a wide variety of information sources will be accessed or stored by the forestry program to inform statewide forest management.

- NatureServe forest distribution information
- LANDFIRE information relating to forest succession classes, departure from historic conditions, historic fire return intervals and recent wildfire perimeter data
- The best available information on insect outbreaks and outbreak predictions
- Forest practice application data depicting the location, time and nature of projects
- Project spatial information
- Harvest records
- Ecological integrity assessment information
- Prescribed fire records
- Priority Habitat and Species information

1.2 Vision Statement for WDFW Forests

The vision for WDFW's forests is:

> WDFW preserves, protects and perpetuates its forests as fish and wildlife habitat while providing sustainable fish and wildlife recreational and commercial opportunities. To ensure that habitat is protected, WDFW forests will generally be managed for high ecological integrity.

1.3 Forest Inventory

WDFW does not yet have a complete, detailed inventory of its forests but is working towards completing such an inventory as resources allow. There are detailed inventories for the Sinlahekin and Sherman Creek wildlife areas. Partial inventories also exist for parts of the Oak Creek, Scotch Creek, Klickitat and Methow wildlife areas. The remainder of WDFW's forests has not yet been inventoried in detail. Consequently, this document contains a rudimentary inventory based largely on remote sensing data.

The following information describes the different types of forest presumed to be on WDFW lands, their general condition and the size and scale of disturbances that affect them. It is important to note that the accuracy of this information is limited, and estimates regarding quantities and locations of different forest types within this document should be considered preliminary. Specific wildlife area forest management plans will be more accurate to the degree that wildlife area managers have additional knowledge and inventory information.

A complete inventory will be developed over time. Since all forests cannot and need not be managed immediately, forest inventories will be conducted strategically. For instance, areas with known, urgent needs like elevated high fire risks and high insect-driven tree mortality will be inventoried prior to new acquisitions that were recently logged and may not need active management for decades.

1.3.1 Forest Types

Table 1 identifies WDFW's different forest types, their relative abundance, dominant tree species, maintenance processes, threats and consequences of not dealing with threats based on the draft Field Guide to Washington's Ecological Systems (Rocchio, J. and R. Crawford 2008). As only brief summaries are provided in **Table 1**, hyperlinks to detailed descriptions of each forest type are provided therein. Additional information that can be used to evaluate the ecological integrity of WDFW forests is available in the Department of Natural Resources' (DNR's) Natural Heritage Program Ecological Integrity Assessment website. Vegetation maps used to estimate the amount of each forest type on WDFW lands in **Table 1** are based upon NatureServe's Ecological Systems classifications.

Forest conditions are described within this inventory based upon a variety of available data sources. LANDFIRE geospatial layers are used to depict succession classes and levels of departure from historic conditions as well as historic fire regimes. LANDFIRE is a shared effort between the U.S. Forest Service and the U.S. Department of the Interior. Data layers showing the perimeter of past wildfires and intense insect outbreaks are also used to characterize forests. It is important to note that LANDFIRE data products are designed to facilitate national- and regional-level strategic planning. Due to accuracy concerns, they are not intended for site-specific project planning.

The distribution of the various forest types identified in **Table 1** is shown on wildlife area specific maps within individual wildlife area management plans. That way, it is clear which wildlife areas contain which forest types. As an example, **Figure 1** shows the distribution of forest types present on the Soda Springs Unit of the Klickitat Wildlife Area which contains more East Cascades Oak-Ponderosa Pine Forest and Woodland than all other wildlife areas combined.

Figure 1. Forest Type Distribution Map – Soda Springs Unit of the Klickitat Wildlife Area.

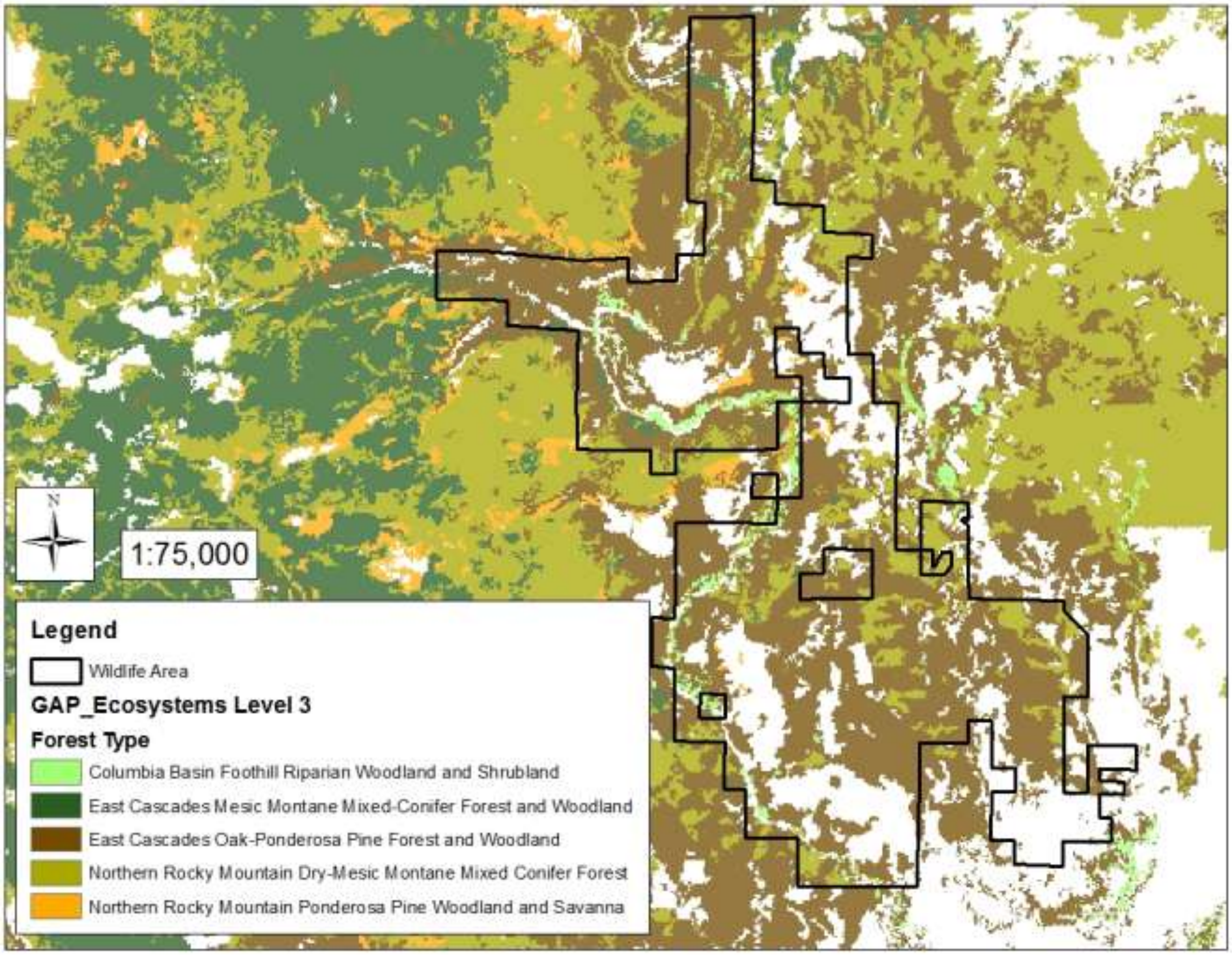


Table 1. WDFW-Owned Forest Types.

Forest types*	Acres**	Percent of forest acres	Historically dominant trees	Natural Historic/Maintenance processes/Disturbance ***	Threats to Ecological Integrity	Consequences (present or future) of not addressing threats
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	74,000	37%	Douglas-fir and ponderosa pine	Frequent low intensity fire	Tree harvesting and fire exclusion	Shifting to dense, late seral stands that are prone to unnaturally intense insect outbreaks stand replacing fires.
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	56,000	28%	Ponderosa pine	Low intensity fire (FRI****3-7 years)	Overharvesting and fire exclusion	Shifting to dense, late seral stands that are prone to unnaturally intense insect outbreaks stand replacing fires.
East Cascades Oak-Ponderosa Pine Forest and Woodland	11,000	5%	Oregon white oak creek and ponderosa pine or Douglas-fir.	Low-intensity fire (FRI 20 years)	Overharvesting and fire exclusion	Fire exclusion leading to denser stands via cloning and conifer invasion.
East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	11,000	5%	Douglas-fir with grand fir and/or western hemlock.	Moderate-severity (FRI 50-100 years), stand-replacement (FRI 150-500 years).	Overharvesting and fire exclusion	Shifting to homogenous, dense, late seral stands that are prone to increasingly susceptible insect outbreaks stand replacing fires.
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	10,000	5%	Engelmann spruce and subalpine fir dominating either mixed or alone.	Blowdown, insect outbreaks (30-50 years), mixed-severity fire, and stand-replacing fire (FRI 150-500 years).	Overharvest	Reduced woody debris and truncated succession.
Columbia Basin Foothill Riparian Woodland and Shrubland	9,000	5%	Black cottonwood, white alder, quaking aspen, sugarberry, water birch or ponderosa pine.	Temporary flooding during spring runoff. Damage due to rafted ice and logs. Beaver cropping.	Overharvest	Vegetation removal.
North Pacific Lowland Riparian Forest and Shrubland	8,000	4%	Big leaf maple, red alder, black cottonwood, Sitka willow, Pacific willow and Oregon ash.	Major flooding events	Overharvest	Reduced wood in streams, increase peak flow and increased mass wasting.
North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest	7,000	4%	Douglas-fir with western hemlock co-dominant or occasional in the understory.	Mixed severity fire (FRI <100 to several hundred years). Wind disturbance. Bark beetles and fungi on small scale. Landslides.	Overharvest and plantation forestry	Less diverse tree canopies, reductions in snags, coarse woody debris, and truncated succession.
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	4,000	2%	Black cottonwood is the key indicator species. Also present quaking aspen, paper birch and water birch.	Annual flooding	Overharvest	Vegetation removal.
Northern Rocky Mountain Mesic-Montane Mixed Conifer Forest	4,000	2%	Western hemlock, Western red cedar, and Douglas-fir. Associates: white pine, lodgepole pine, grand fir, Pacific yew and western larch.	Moderate-severity fire (FRI 50-100 years). Stand-replacement fire (FRI 150-500 years).	Overharvesting	Stands at all seral stages tend to lack snags, have high tree densities, smaller trees and more shade-tolerant species. Late seral forests of shade-intolerant species largely absent.
Rocky Mountain Subalpine-Montane Riparian Woodland	1,000	<1%	Subalpine fir and/or Engelmann spruce. Others: Douglas-fir and quaking aspen.	Flooding	Overharvesting and fire exclusion	Vegetation removal, conversion to Douglas fir plantations or transition to denser stands where fires excluded
North Pacific Montane Riparian Woodland and Shrubland	900	<1%	Lodgepole pine, Black cottonwood and quaking aspen red alder.	Requires flooding	Overharvesting and fire exclusion	Reduced wood in streams, increase peak flow and increased mass wasting.
North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland	900	<0.01%	Douglas-fir. Associates: madrone, lodgepole pine, big leaf maple and grand fir.	Historically had moderately frequent low to moderate-severity fires.	Fire exclusion and timber harvest	Reduces canopy complexity and large woody debris. Increased in tree density. Grassy understories replaced by deciduous shrubs.

North Pacific Maritime Dry-Mesic Pacific Douglas-fir-Western Hemlock Forest and North Pacific Mesic-Wet Douglas-fir-Western Hemlock Forest combined	800	<1%	Douglas-fir + western hemlock or western red cedar comprising over 10% of the tree canopy.	Stand replacing fire. FRI < 100-several hundred years. Moderate-severity fires more common. Bark beetles and fungi operate on a small scale.	Overharvest and plantation forestry	Less diverse tree canopies, reductions in coarse woody debris, and truncated succession.
North Pacific Hypermaritime Sitka Spruce Forest	500	<1%	Sitka spruce	Summer fog. Wind storms.	Overharvest and plantation forestry	Harvest and replacement with Douglas-fir plantation forestry
Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	500	<1%	Engelmann spruce and subalpine fir dominating. Douglas-fir may persist.	Disturbance includes blowdown, insect outbreaks and stand-replacing fire. Mean FRI for stand-replacing fire is 222 years.	Overharvest and plantation forestry	Less diverse tree canopies, reductions in coarse woody debris, and truncated succession.
Rocky Mountain Aspen Forest and Woodland	400	<1%	Quaking aspen, some ponderosa pine.	Avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver. Natural FRI 7-10 years.	Fire exclusion and grazing	With fire exclusion and alteration of fine fuels, fire rejuvenation of aspen habitat has been greatly reduced. Conifers now dominate many stands.
Northern Rocky Mountain Western Larch Savanna	<200	<0.01%	Western larch. Also present grand fir, subalpine fir, Engelmann spruce, or hemlock (western or mountain).	Generated by stand-replacing fire (FRI 80-200 years). Maintained by low intensity, high frequency fires.	Fire exclusion and timber harvest	Fire exclusion has led to invasion of Grand fir, subalpine fir, Engelmann spruce and hemlock.
North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest	<200	<0.01%	Western red cedar and western hemlock	Wind storms	Overharvest and Douglas-fir plantation forestry	Harvest and conversion to Douglas-fir plantations.
North Pacific Oak Woodland	<200	<0.01%	Oregon white oak and Douglas-fir	Frequent pre-settlement fires	Fire exclusion, and Douglas-fir plantation forestry	Many oak woodlands have been invaded by Douglas-fir and been converted to a different habitat.
North Pacific Broadleaf Landslide Forest and Shrubland	<200	<0.01%	Red alder and big leaf maple	Land slides	Timber harvest, development and invasive species	Loss of slide-specific plant communities, increased instability in some cases.
Rocky Mountain Lodgepole Pine Forest	<200	<0.01%	Lodgepole pine	Stand-replacing fire. Mean fire interval of 112 years.	Overharvest and fire exclusion	Fire exclusion has left many single-canopy Lodgepole pine sites unburned with multilayered stands.
North Pacific Hardwood-Conifer Swamp	<200	<0.01%	Western hemlock, Sitka spruce, Alaskan yellow cedar, lodgepole pine, red alder, Oregon ash or paper birch.	Wind storms and beaver activity	Overharvest and development	Conversion to all their dominance, altered hydrology, mass wasting and increases in invasive species.

*Table populated using information in the Washington State Department of Natural Resources Natural Heritage Program's *Field Guide to Ecological Systems* February 7, 2008. Additional information is available on each forest type in hyperlinked *Ecological Integrity Assessment* documents.
**General estimates for relative perspective only – acre total constantly changes with acquisitions and land exchanges.
***There are mosaic patterns of Fire Return Intervals and intensity within specific forest types.
****Fire Return Interval is the average period between fires under the presumed historical fire regime.

1.3.2 Assessing Ecological Integrity

WDFW has chosen to assess ecological integrity as a means of measuring how well it's fulfilling its mission to preserve, protect and perpetuate fish, wildlife and ecosystems on forest lands that it manages (Schroeder et. al. 2012). Ecological integrity can be defined as "the structure, composition, and function of an ecosystem operating within the bounds of natural or historic range of variation." WDFW relies upon an approach developed by NatureServe and the Natural Heritage Network to assess the current ecological integrity of a system compared to reference or benchmark examples. This approach is called the Ecological Integrity Assessment (EIA). Ecological integrity assessments can give a general sense of conservation value, past and future management effects, and restoration success. For more information see Ecological Integrity on Wildlife Areas in Washington State.

WDFW is collaborating with the Washington Natural Heritage Program to develop tools to assess ecological integrity of the various forest types that it manages. WDFW will be applying the ecological integrity assessment framework to monitor the ecological integrity of forests over time, a process we are calling Ecological Integrity Monitoring or EIM. Ecological integrity assessments or monitoring can occur at three levels:

- Level 1 – relies on Geographic Information System (GIS) and remote sensing data
- Level 2 – uses rapid field-based metrics
- Level 3 – uses more rigorous, quantitative field based metrics

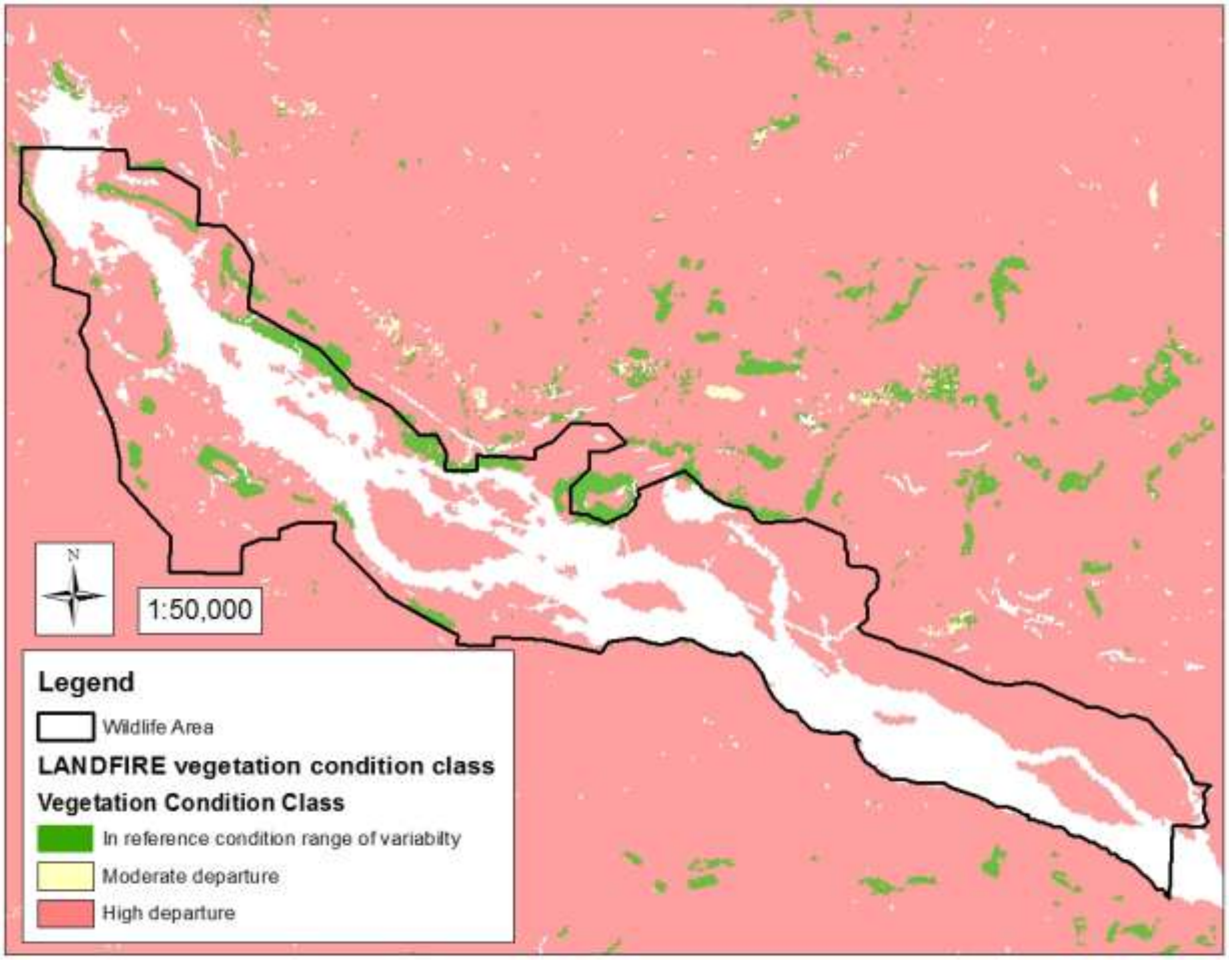
Level 1 assessments are applicable to all forest ecosystems and are based primarily on remote sensing imagery. They use metrics such as fragmentation, road density, development indices and other remotely-sensed data that are known to affect landscape integrity. These data are then used to model the ecological integrity of systems on the wildlife area and can also be used to assess integrity in the surrounding landscape as a comparison.

Whenever projects are planned, more thorough assessments will be performed to document pre-project conditions and consider possible prescription elements to improve ecological integrity.

Level 2 and Level 3 assessments take place in the field and are designed to provide an assessment ranking for a particular forest stand. Level 2 EIAs are considered a "rapid assessment" and are designed to take only minutes to complete a plot. This is the "workhorse" assessment tool that is a compromise between efficiency and assessment accuracy. Level 3 EIAs examine similar metrics to those used in Level 2 but the sampling is more rigorous and time consuming. Level 3 sampling is commonly used to verify the accuracy of the more rapid Level 2 efforts and when additional detail on key ecological metrics is desired.

LANDFIRE vegetation departure classification maps and succession class maps were used to perform a Level 1 ecological integrity assessment for all WDFW forests. Vegetation condition class maps and succession class maps show the degree to which communities have changed in terms of species composition, structural stage and canopy closure using methods described in the Interagency Fire Regime Condition Class Guidebook. Vegetation condition class maps categorize forests as being; 1) within, 2) moderately departed from or 3) highly departed from, the natural range of historic variability. **Figure 2** is an example Vegetation Condition Class Map for the Mount Saint Helens Wildlife Area where plantation forestry has resulted in high departure from historic conditions on a landscape scale. As the figure shows, Mount Saint Helens Wildlife Area forests are highly departed from what would be expected under natural conditions (see the following section for a discussion on succession class ratios).

Figure 2. Vegetation Condition Class Map – Mount Saint Helens Wildlife Area.



As LANDFIRE maps are not accurate enough for project level planning, wildlife area manager observations are needed to verify the condition of forests. Additionally, ecological integrity monitoring will be performed to document pre-project conditions and inform prescription development. Level 2 assessment metrics have been developed for most forest ecological systems in Washington and can be found at Department of Natural Resources' (DNR's) Natural Heritage Program [Ecological Integrity Assessment website](). Level 2 assessment scorecards and procedures for implementing the ecological integrity monitoring process in the field are available at [Ecological Integrity Assessments: Monitoring and Evaluation on WLAs](). Managers interested in conducting monitoring projects should contact the state forester.

1.3.3 Identifying Forest Succession Classes

Forests can include a variety of succession classes depending on their maturity and disturbance regimes. Succession classes include:

- Early seral – Predominately very young trees.
- Mid seral open – Dominated by medium aged, widely spaced trees.
- Mid seral closed – Dominated by medium aged, closely spaced, moderate sized trees.
- Late seral open – Dominated by old, widely spaced, large trees.
- Late seral closed – Dominated by old, closely spaced, large trees.

Different forest types naturally have different ratios of succession classes based upon their natural disturbance dynamics. For instance, dry forest types that evolved with frequent fires tend to have high proportions of late seral open forests. In contrast, moist forests types that rarely experienced fire or other major disturbances tend to have higher proportions of late seral closed forests (Agee 1993).

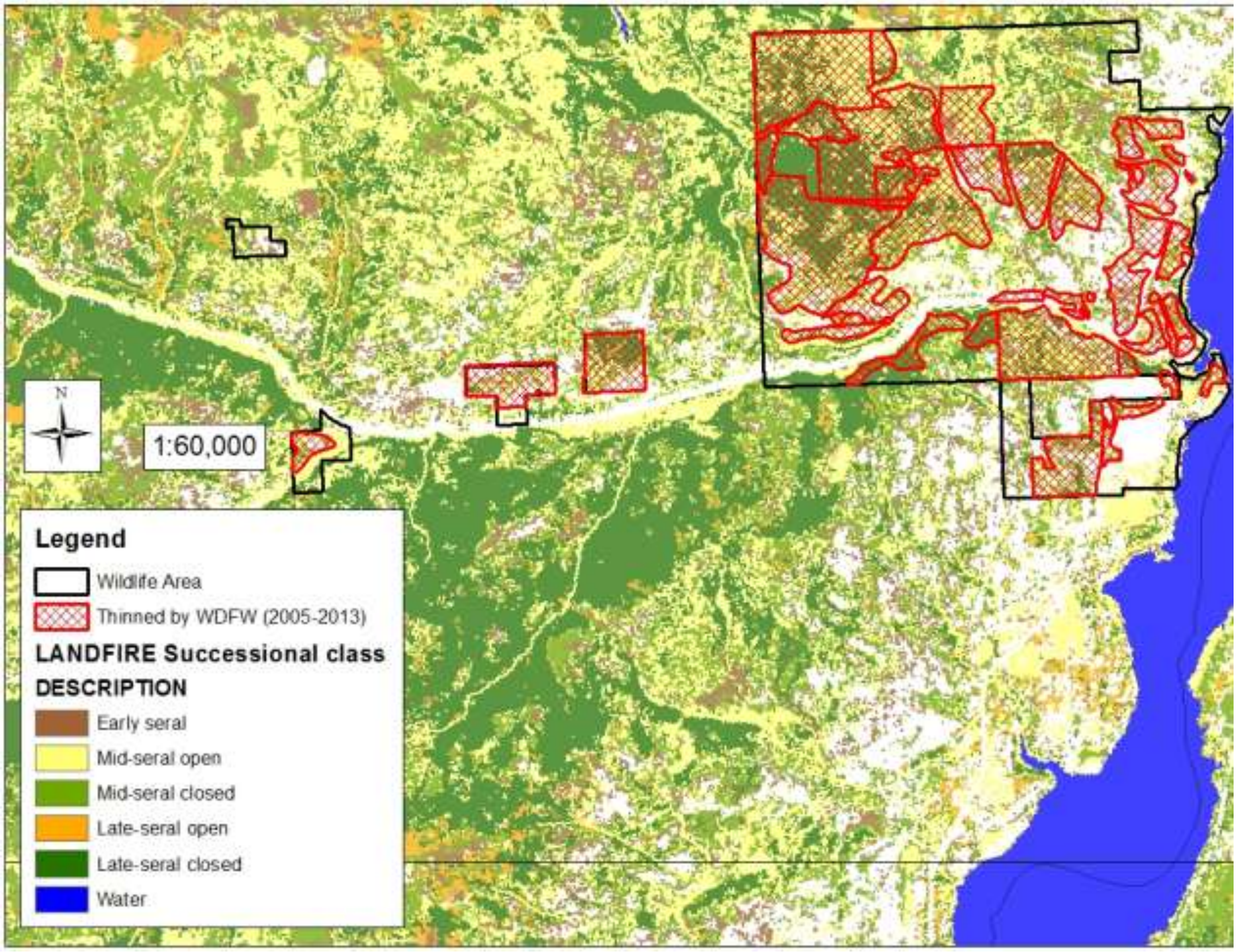
Common reasons for succession class ratios to vary from their normal ranges include widespread timber harvesting and fire regime modification (Hessburg et al 2005). Whenever forests have succession class ratios that are highly divergent from the normal range for a given forest type, one should consider the possibility that the forests may be degraded and may not function normally. For instance, forests that evolved with frequent fires tend to become overstocked with mid seral and late seral closed forests when wildfires are suppressed. Such forests are prone to unnaturally intense insect outbreaks and wildfires.

Figure 3 shows the Succession Classes of forests in the vicinity of the Sherman Creek Wildlife Area. **Figure 3** illustrates how the age and structure of stands can be helpful when assessing habitat suitability, disturbance history, fire risks and forest health risks. Historically, the dominant forest types in the area contained large proportions of open, late seral forests. Such stands were not as vulnerable to large crown fires, insect outbreaks and disease as many of today's forests which have become denser with an overabundance of small trees (Harrod et. al. 1999 and Hessburg et. al. 2005). Likewise, currently overstocked forest conditions often lack open understory areas that are believed to be important for species that depend on open areas like flammulated owls (McCallum 1994). A large proportion of the Sherman Creek Wildlife Area is being thinned to promote late seral open conditions which are largely absent from the surrounding landscape compared to historic conditions.

1.4 Disturbance Processes

Many forest types are created or maintained by disturbances such as fire, wind storms, insects, disease, floods and landslides. Without such disturbances Washington could not have its full diversity of forest types or complex mosaics of different seral stages. Disturbance processes that continue to operate within natural ranges of variability should be viewed as necessary, regenerative influences. While people generally have no control over some of these disturbances (e.g., wind storms), humans can influence some disturbance types like wildfire (Agee 2002) and flooding. Widespread fire suppression and commercial timber management have greatly influenced the distribution, spatial patterns, and seral stages of forests.

Figure 3. Forest Successional Classes – Sherman Creek Wildlife Area.



WDFW strives to ensure that its forests reflect the high levels of diversity and complexity associated with historic conditions or contribute to such conditions on a landscape scale. To that end WDFW is supportive of collaborative efforts to develop landscape analyses to inform managers regarding historic disturbance regimes and current disturbance patterns. The agency also supports increased communication among landowners to better understand their respective management strategies so that WDFW can manage its lands with the foreknowledge of how adjacent lands will be managed and, as appropriate, develop collaborative projects/management strategies.

1.4.1 Fire and Fuels

Fire has profound effects on forests. As the frequency and the nature of fire has changed since the advent of modern fire suppression and exclusion programs, fire is described separately under both historic and contemporary conditions.

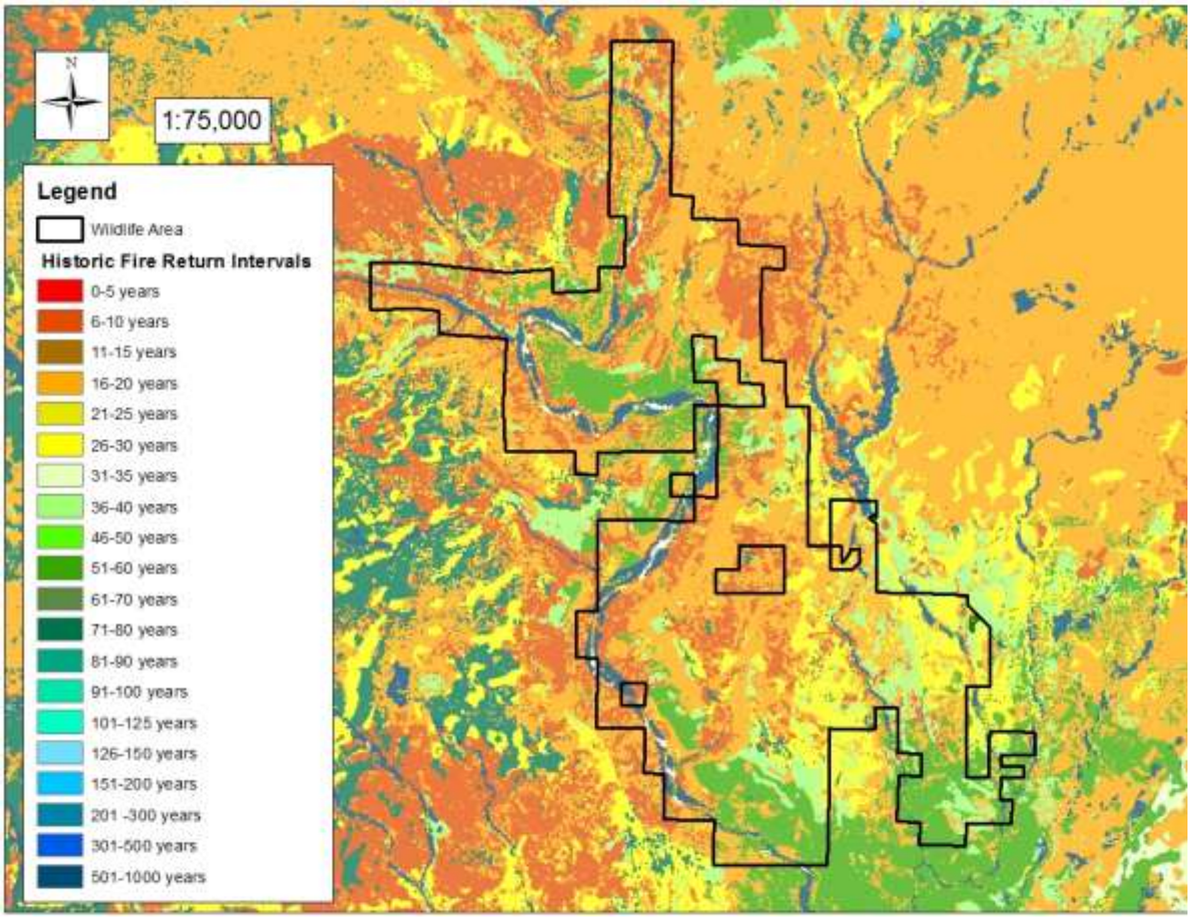
Historic Fire Regimes

Historically fire was an important, natural process in creating and maintaining various forest types (Agee 1993). Historic Fire Regime maps were created using LANDFIRE spatial layers to depict historic fire return intervals. A fire return interval is the average period between fires.

Historic fire return intervals show the degree to which fire was important in maintaining forest structure and health. As an example, **Figure 4** shows the diversity of fire regimes on the Soda Springs Unit of the Klickitat Wildlife Area where frequent fires are necessary to maintain oak woodlands. Such maps will be included in wildlife area specific forest management plans.

Areas that burned frequently prior to the modern era of fire exclusion are prone to changes in vegetation composition and structure (Arno et. al. 1997). These changes increase the landscape-level homogeneity and the opportunity for large insect outbreaks and large crown fires. In contrast, in areas where the period of modern fire suppression has been shorter than the historic fire intervals, fire exclusion has had relatively little effect.

Figure 4. Historic Fire Return Intervals Map – Soda Springs Unit of the Klickitat Wildlife Area.



Altered Fire Regimes

As shown in **Table 1,** historic fire return intervals varied greatly among forest types and fires that occurred frequently in many forests. Fire exclusion efforts have greatly extended fire return intervals in many areas. The extension of fire return intervals in fire-dependent, dry forests (66% of WDFW forests) increases vulnerability to widespread insect outbreaks and alters the nature of wildfires from relatively low-intensity disturbance events that maintain ecological integrity to large, high intensity disturbance events that can degrade some forests (Rocchio and Crawford 2008).

According to the LANDFIRE fire perimeter data, wildfires burned up to 12,400 acres of WDFW forest lands and 25,000 acres of non-forest land between 1999 and 2007. Most forest fires occurred in dry forests of eastern Washington which have been highly altered by fire exclusion. While the amount of forest burned is not greater than historic averages, many fires were unnaturally intense, stand-replacing fires due to accumulated fuels. When such fires are large, forest structure across large landscapes can become more homogeneous with increased potential for even larger more contiguous wildfires and insect outbreaks (Hessburg at. al. 2005) which could be viewed as further divergence from historic conditions. While nearly all wildfires on WDFW lands have been suppressed before burning large tracts of forest, the School Fire on the Wooten Wildlife Area burned about 7,500 acres of forest and killed most of the trees on the wildlife area. It is important to note that LANDFIRE fire perimeter data does not include data on fire intensity or unburned areas within the perimeter of a fire. Therefore, the impacts of fires at specific locations should not be inferred from wildfire perimeter data. Site-specific evaluations are required to determine whether a fire has improved or degraded given areas within the perimeter of a wildfire.

1.4.2 Timber Harvest and Management

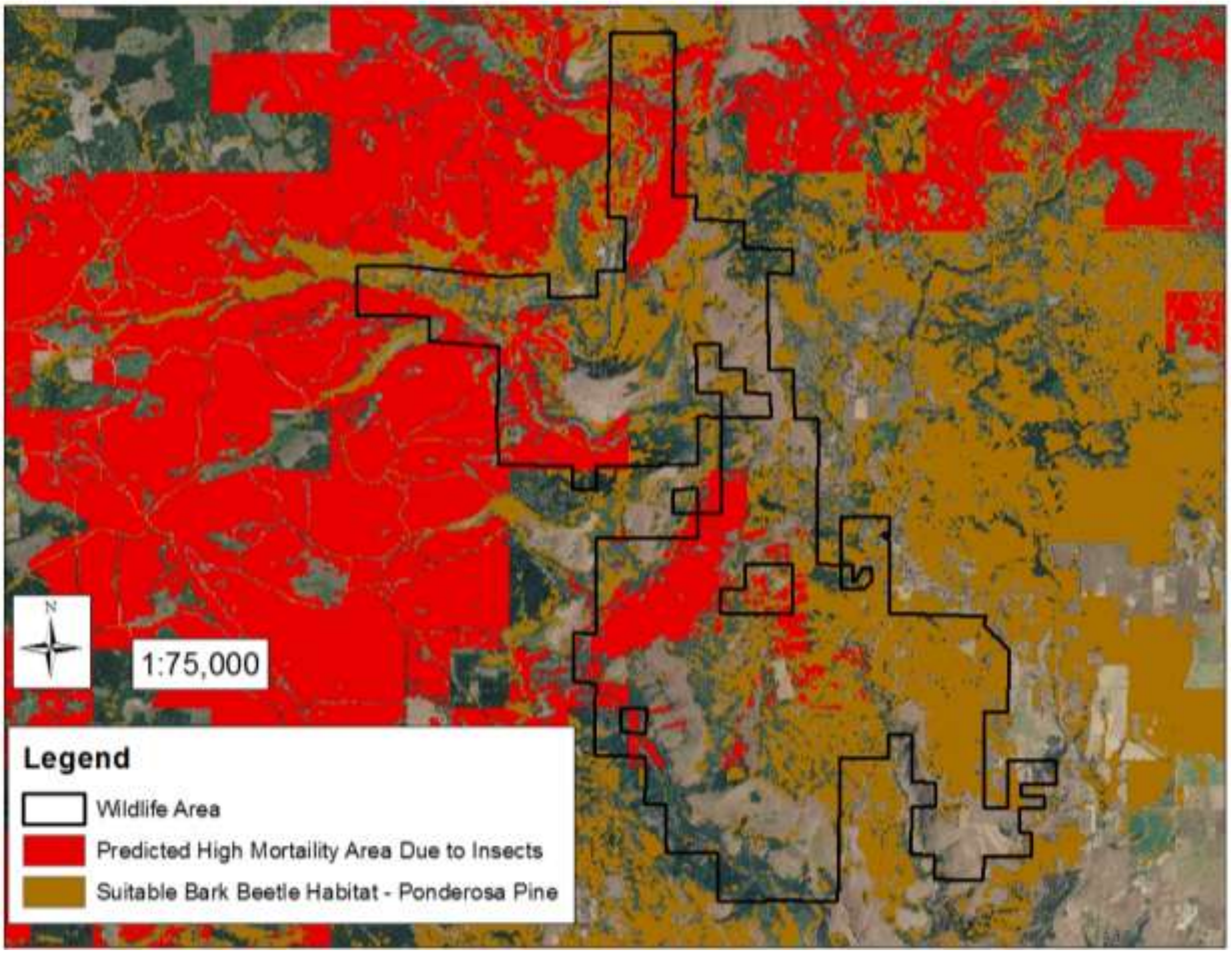
Logging, which is often followed by intense single species planting, is a dominant disturbance in many of Washington's forest types which contain marketable trees, particularly in western Washington. In many cases forests were extensively cut and replanted as plantations prior to WDFW ownership or prior to attainment of timber rights. Timber management in dry forests that favors large areas with high densities of small trees can contribute to unnaturally large, severe wildfires and other disturbances such as insect outbreaks (Agee 2002). Accordingly, the state forest health law acknowledges the need for landowners and managers to "maintain their forest lands and avoid contributing to forest insect or disease outbreaks or increasing the risk of uncharacteristic fire" (RCW 76.06.040). WDFW's forest management program generally involves restoring forests that were impacted by past logging, plantation growing practices and, in the case of dry forests, both past logging and fire exclusion.

1.4.3 Insect Outbreaks

In healthy forests with high ecological integrity, insect outbreaks are often natural disturbances that increase structural diversity. In recent years, however, as fire regimes have been altered by fire exclusion, insect outbreaks have changed (Hessburg et. al. 2000). Today's insect outbreaks can be larger in size and intensity such that they can degrade ecological integrity. Eastern Washington forests have been especially vulnerable to insect outbreaks where fire exclusion has resulted in contiguous patches of overstocked trees (Agee 2002). Climate change may exacerbate the already increased vulnerability of forests to insects associated with fire exclusion (Dale et. al. 2001).

The Washington State Department of Natural Resources issued a Forest Health Hazard Warning in 2012. The Forest Health Hazard Warning Landowner Assistance Center contains information to help people better understand where outbreaks have occurred, where they are predicted to occur and how to manage forests to reduce their vulnerability to insect outbreaks. The U.S. Forest Service also tracks insect damage to Washington's forests on their Forest Health Protection website. While the USDA Forest Service tracks the extent of insect outbreaks, they do not, however, provide detailed maps showing the level of tree mortality. Site-specific evaluations are still needed. When relevant to specific wildlife areas, maps are provided in specific wildlife area forest management plans showing the extent to which wildlife areas are experiencing or vulnerable to unnaturally intense insect outbreaks. As an example, **Figure 5** shows areas where widespread tree mortality is anticipated in the general vicinity of the Soda Springs Unit of the Klickitat Wildlife Area per the 2006 National Insect and Disease Risk Map.

Figure 5. Areas of Predicted High Tree Mortality – Soda Springs Unit.



1.5 Distinctive Roles and Contributions of WDFW Forests

WDFW's roughly 200,000 acres of forest land provide numerous benefits to the citizens of Washington. WDFW forest lands were largely acquired based on their value as fish and wildlife habitat. In accordance with its mission, WDFW primarily manages forests as fish and wildlife habitat and places for wildlife-related recreation. For instance, wildlife area forests provide important habitat for deer and elk where the public is allowed to hunt for them. Wildlife area forests also provide habitat for non-game species which are also enjoyed by the public. WDFW forests provide additional benefits that are often overlooked such as protecting reliable sources of drinking water. WDFW forests also help support local economies in the form of timber-related jobs and serve as sources of timber revenue that help support land management activities.

With its wildlife habitat conservation and wildlife related recreation mandate, WDFW lands are managed to provide conditions that are not often found in the surrounding landscape. For instance, most forests are managed to maximize late seral conditions to benefit species that depend on such conditions; often in areas where late seral forests are otherwise lacking. Finally, some areas may be managed for prolonged early seral conditions to benefit deer, elk and early successional obligates where surrounding forests are managed as plantations and periods of early succession are greatly reduced (Swanson et. al. 2011).

1.6 Management History

While it is neither feasible nor appropriate that all forests be actively managed, WDFW has a long history of using silvicultural management to restore or enhance habitats where appropriate. Silvicultural and prescribed fire projects can improve forest health and improve habitats for both game and non-game species. Such projects can also reduce wildfire risks. Unfortunately, forest thinning and prescribed fire work has usually been on a small scale (well under <1% year on average) which is not enough to counter the effects of widespread fire exclusion which affects most of WDFW's dry forests (Agee 2002).

It is important to note that some forests on WDFW wildlife areas are not or have not always been managed for wildlife. WDFW does not always obtain timber rights when it acquires property or assumes management responsibilities. In some cases, the previous owners retained timber rights for decades. In other cases, WDFW leases land for wildlife grazing and recreation but not for timber management. Finally, there are cases in which WDFW acquires land on which no active forest management is allowed.

WDFW attained its first wildlife area in 1938 and forest management records extend back to 1962. Records associated with timber harvest projects between 1962 and 1999 do not include detailed information pertaining to individual projects or the rationale for them. However, during that time period, 5,217 acres (141 acres/year) were treated. Projects were conducted to improve habitat or salvage trees following major disturbances such as wildfires, severe insect outbreaks, windstorms and volcanic eruption.

Records associated with harvest since 2000 are more complete. Details associated with every project are provided on Forest Practice Applications, maintained in a Department of Natural Resources (DNR) database, and the locations of every project are spatially recorded. Between 2000 and mid-2012, restoration thinning was performed on 6,819 acres (620 acres/year) to improve habitat and reduce fire hazards. Proactive thinning projects were primarily conducted on the Sherman Creek and L.T. Murray wildlife areas. During this same time salvage thinning occurred on 2,818 acres (256 acres/years). By far the largest amount of salvage (2,488 acres) occurred on the Wooten Wildlife Area following the 2006 School Fire. An additional 330 acres of salvage occurred on the Olympic and Johns River wildlife areas following a severe wind storm in 2009.

As of 2013, prescribed burning has been applied to three wildlife areas as a forest management tool. The bulk of prescribed fires were set on the Sherman Creek Wildlife Area where 320 acres was repeatedly burned by the USDA Forest Service in 1966, 1978 and 2000. Additional burning occurred in 1967 (20 acres), 1968 (40 acres) and 1969 (320 acres) following harvest activities. Prescribed fire has been more recently used on the Sinlahekin Wildlife Area in 2003 (445 acres) and 2011 (300 acres). Prescribed fire was also applied to the Oak Creek Wildlife Area in 2009 (573 acres) in cooperation with USDA Forest Service.

1.7 Desired Future Conditions – All Forest Types

This section defines desired future conditions that forests will guide forest management to meet ecological, social and economic expectations associated with WDFW's mission. Forests will be managed to restore and maintain ecological integrity by restoring forests to their historic ranges of variability. This includes the eventual attainment of late seral forests conditions in proportions consistent with historic ranges of variability. To that end, most WDFW projects will promote the accelerated development of late-seral forests. Likewise, the agency will selectively retain dominant trees within existing late seral forests consistent with historic ranges of variability. Removal of large trees, however, may be necessary when:

- Trees pose safety hazards.
- Prolonged fire suppression is resulting in
    - desired plant communities to be displaced (i.e. Fir trees overtopping pines, oaks, aspen and prairies) or
    - large tree densities above historic ranges of variability.

While ecological integrity will be the primary metric when it comes to desired future conditions, it is important to note that not all forested acres will be managed primarily for ecological integrity. In some cases specific forest areas may be managed primarily for other values like the promotion of priority wildlife species or management of wildfire risks. It is anticipated that most projects will improve ecological integrity even when the primary focus is to address other values. For example, projects needed to reduce wildfire threats to nearby homes may simultaneously improve ecological integrity. In some cases projects may have a localized detrimental impact to ecological integrity in order to realize other benefits or realize ecological benefits on a larger-scale or in the long term. Examples include:

- Fuels management projects may reduce the ecological integrity within parts of the project footprint in order to protect nearby homes or nearby forests containing priority species like northern spotted owls or western gray squirrels.
- Variable density thinning may be used to accelerate succession as well as create open patches and larger clearings (Harrington et.al. 2005) to improve forage for large ungulates. When viewed at a very small scale open patches could be viewed as detrimental. Such openings may actually increase ecological integrity, however, when viewed on landscape scales.
- Forests exhibiting high ecological integrity could be removed from locations where they have invaded lands previously occupied by other plant communities such as prairies where fire exclusion does not allow for prairie maintenance.

1.7.1 Ecological Conditions

As WDFW is charged with preserving, protecting and perpetuating its forests as fish and wildlife habitat, it is important to track the ecological condition of its forests and define desired future conditions. Until there is a complete forest inventory, WDFW cannot thoroughly quantify the condition of its forests. Consequently, estimates are not provided indicating how many acres are considered to have high or low ecological integrity. As more information is collected, such estimates may be possible. Nevertheless, some general observations about WDFW forests can be made. While many stands exhibit high levels of ecological integrity and provide high quality habitat for fish and wildlife, some do not or may not continue to do so because of previous forest practices, fire exclusion or both. Common problems associated with current forest conditions include:

- Lack of structurally complex larger trees
- Lack of snags and downed logs
- Unnatural forest succession class ratios/structure/species composition and distribution
- Shifts in species composition and tree density (which can lead to):
    - Widespread insect-driven mortality
    - Susceptibility to increasingly large and intense crown fires
    - Water quality and watershed function impairment

Desired Future Ecological Conditions

Forests will be largely managed to achieve and maintain ecological integrity by restoring them to their historic ranges of variability. It is presumed that the historic ranges of variability (species composition, structure, fuel levels and disturbance regimes) will:

- Provide high quality habitat for fish and wildlife, especially priority species
- Be resilient to and support natural disturbance processes by maintaining;
    - fuel levels that are compatible with ecologically beneficial fire
    - low vulnerability to unnaturally intense insect outbreaks or disease
- Support clean air and watershed functions
- Increase resilience/adaptability to climate change
- Protect and preserve rare and unique plant communities

It is important to note that some of WDFW's forests already meet these desired conditions. However, according to LANDFIRE vegetation condition class maps the percentage of WDFW forests that are currently within historic ranges of variability is low. It is important to remember, however, that LANDFIRE vegetation condition class maps are imprecise and based on satellite imagery. Future monitoring will provide more accurate assessments of forest conditions in relation to desired future conditions.

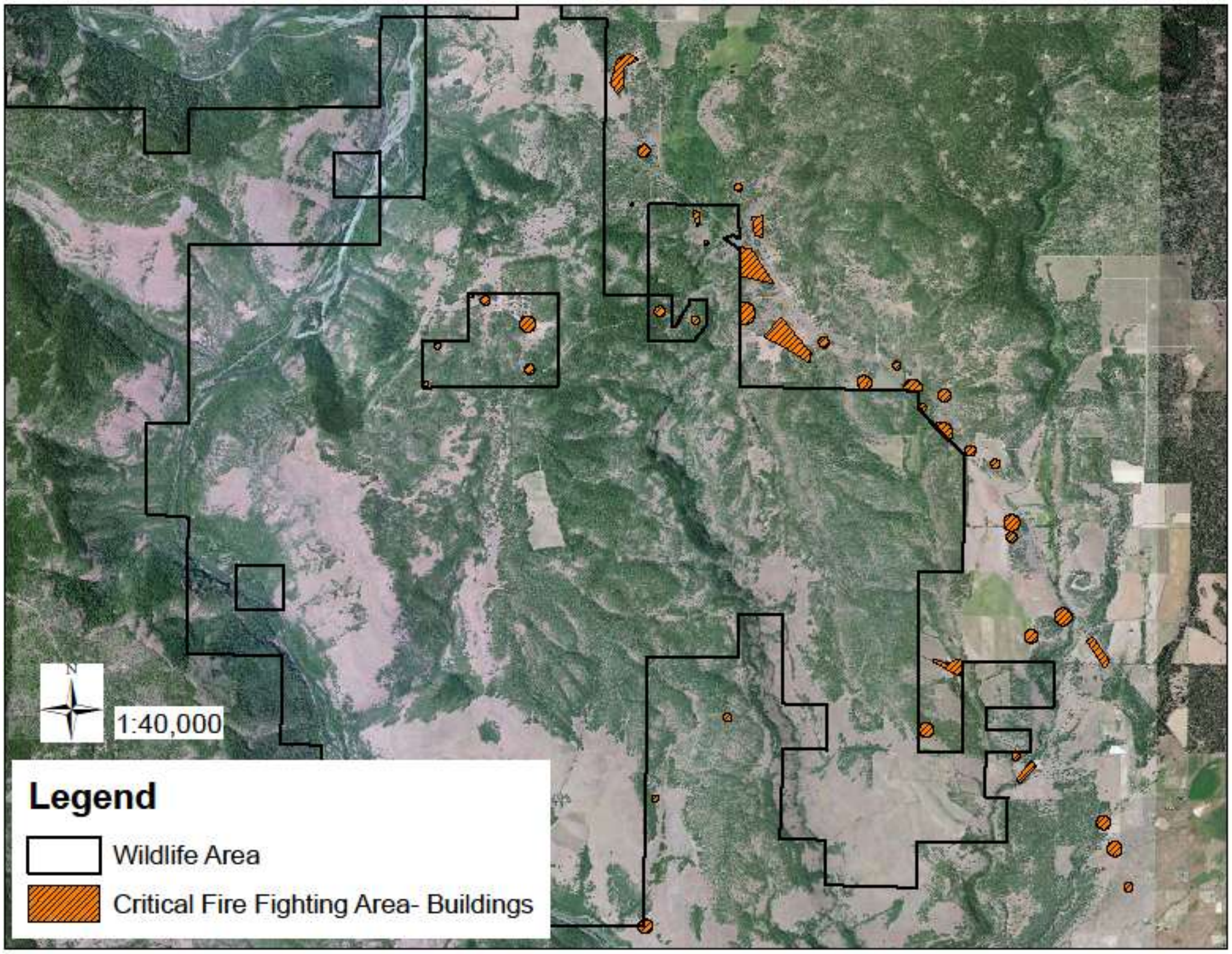
Desired future conditions identified for some forests may include exceptions to historic reference conditions in order to:

- Reduce unacceptable fire hazards to human structures
- Reduce unacceptable fire risks from campgrounds and other areas with high human use
- Favor rare or priority forest types
- Protect or enhance habitats for priority species
- Address climate change
- Avoid working in dangerous, sensitive terrain or prohibitively expensive areas

WDFW recognizes that climate change may be great enough such that historic conditions are no longer appropriate benchmarks for establishing desired future conditions. See Section 1.7.3 and 2.5 for further discussion on climate change considerations.

Figure 6 shows the Soda Springs Unit of the Klickitat Wildlife Area as example of a unit where managing fire hazards along some perimeters to protect adjacent homes may be an overriding management priority. Likewise, targeted fuel management could reduce the risk of fires originating near homes from threatening priority species within the unit.

Figure 6. Important Fuel Management Area Example – Klickitat Wildlife Areas.



1.7.2 Priority Species Considerations

Per WDFW's Policy 5309 Managing Forests on WDFW Lands, all project proposals shall incorporate the following state plans to ensure that they properly consider benefits and impacts to priority species:

- Priority Habitats and Species management recommendations
- State Threatened and Endangered Flora and Fauna Recovery Plans
- U.S. Fish and Wildlife Species Recovery Plans

- State of Washington Natural Heritage Plan
- Wildlife Area Management Plans

While not specifically identified in policy 5309, all silvicultural activities on WDFW Land must comply with the WDFW Wildlife Areas Habitat Conservation Plan (once complete) and WDFW recovery plans. As deer and elk are priority species, herd management plans should also be considered. Also, WDFW recognizes that new information or better understanding may require changes in the way forests are managed over time.

1.7.3 Climate Change Considerations

Climate change could result in future conditions that are not compatible with historic ranges of variability. If that happens the historic ranges of variability would no longer be appropriate for defining ecological integrity and desired future conditions would have to be redefined. For now, WDFW will follow strategies developed by the USDA Forest Service for addressing climate change in Responding to Climate Change in National Forests: A Guidebook for Developing Adaptation Options (Peterson et. al. 2011) in which strategies are defined to promote resistance, resilience and adaptation in response to climate change (see **Section 2.5**). WDFW, however, is looking into USDA Forest Service tools for anticipating sustainable conditions in the future.

1.7.4 Social/Economic Conditions

While the primary agency directive is to preserve, protect and perpetuate fish and wildlife, WDFW is also charged with providing sustainable fish and wildlife recreational and commercial opportunities. As such, and in accordance with conservation initiative principles, social conditions are considered in decision-making. This section identifies current and desired future conditions in relation to the social and economic impacts of forest management.

Current Social/Economic Conditions

Currently, WDFW forests provide many desirable social and economic benefits such as:

- Quality habitat for fish and wildlife species that attract the public for recreation.
- Opportunities for proactive restoration projects to help support local economies in terms of forestry jobs or wood products.

Forest stands in a poor condition can pose impacts such as:

- Potential for intense, large fires that can threaten adjacent lands, impact watershed functions and impair air quality.
- Elevated fuel loads and fire risk associated with WDFW forests may contribute to restrictions on recreational activities.
- Unnatural dense conditions prone to insect outbreaks that pose a forest health risk to adjacent lands.

Desired Future Social/Economic Conditions for WDFW Forests

As desired future conditions are realized nearly all WDFW forests will:

- Provide high quality habitat for fish and wildlife, especially priority species.
- Have fuel levels that;

    - are compatible with ecologically beneficial fire
    - address safety concerns
    - are more compatible with recreational access during the fire season
- Have low vulnerability to unnaturally intense insect outbreaks.
- Support clean air and watershed functions.
- Support local economies and generate revenue to the degree possible where compatible with other objectives.

1.8 Desired Future Conditions by Forest Type or Groups of Similar Forests

In general, the various forest types will be managed to the ranges of historic variability described in the Draft Guide to Ecological Systems and the ecological integrity assessments guidance documents provided on the Natural Heritage Ecological Integrity Assessment Site. For broad planning purposes, however, similar forest types have been combined into general categories which can be addressed using general management approaches. Upland conifer forests are often put into three categories based on their historic fire regimes (Agee 1993). It is important to note that forests do not neatly fit into specific fire regime categories. Forests can experience a variety of fire behavior (Franklin et. al. 2008) as fire conditions fluctuate. Nevertheless, natural fire regime categories can be helpful when it comes to selecting management approaches.

1.8.1 High Fire Frequency/Low Fire Intensity Conifer Forests

High fire frequency/low fire intensity conifer forests comprise approximately 131,000 acres or 66% of wildlife area forests. **Table 2** lists the forest types within this category and estimates how much of each type currently exists on wildlife areas. For more information on each forest type, and the conditions associated with high or low ecological integrity, click on the hyperlinks within **Table 2** to descriptions of each forest type, including photographs and maps showing statewide distributions in the draft Field Guide to Washington's Ecological Systems.

Table 2. High Fire Frequency/Low Fire Intensity Conifer Forests.

Forest type (Hyperlink to ecological integrity assessment)	Estimated Acres
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	74,000
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	56,000
Northern Rocky Mountain Western Larch Savanna	200

Historic Conditions

In general, these forests historically included substantial amounts of open forest with fire resistant, shade intolerant trees. Forests often included large, open grown trees and a diverse, well developed understory. Throughout much of these forests, fuel loads were low and trees were resistant to frequent low-intensity fires. Per Agee (1993) and as shown in **Table 1** these forest tended to have fire return intervals of less than 25 years.

Current Condition

Most of WDFW's high fire frequency/low fire intensity conifer forests are substantially degraded by past logging and ongoing fire exclusion. Widespread ecological changes include:

- Most large conifers have been removed.
- Tree density has dramatically increased with a disproportionate increase in small shade-tolerant, fire-intolerant trees (See **Figure 7**).
- The loss of understory vegetation.
- Increased vulnerability to unnaturally large, intense crown fires.
- Loss of habitat for species dependent on open forest conditions.

Figure 7. Examples of Degraded High Fire Frequency/Low Fire Severity Forests – Methow Wildlife Area.

Desired Future Conditions

The desired future ecological conditions for these historically open, fire dependent forests include the following:

- Fuels are managed so that when wildfires occur, they are of the ecologically appropriate intensity and could serve to maintain forest structure.
- High proportion of open stands, with fire-tolerant species, regardless of seral stages.
- A high proportion of open, late-seral forests with large, structurally complex trees.
- Diverse and native understory vegetation.
- Snags and downed wood levels consistent with fire regimes.

The desired future social conditions for historically open, fire dependent forests include all of the items listed in **Section 1.7.4.**

Figure 8. Desired Future Conditions for Ponderosa Woodland and Savanna – Methow and Sinlahekin Wildlife Areas.


1.8.2 Moderate to Low Fire Frequency Conifer Forests

Moderate to low fire frequency conifer forests cover roughly 32,000 acres (15%) of WDFW forest lands. These forests largely exist in somewhat moist to very moist areas near the coast and in the mountains. Moderate to low fire-frequency conifer forests are grouped together in this section because they warrant different management approaches than forests that are dependent on frequent, low-intensity fires. As forests in this group tend to naturally experience fire less frequently, forests tend to naturally contain higher proportions of closed, mid-seral and late-seral conditions. **Table 3** lists the forest types within this category and indicates roughly how much of each type exists on WDFW lands. For more information on each forest type, and the conditions associated with high or low ecological integrity, click on the hyperlinks within **Table 3.** Descriptions of each forest type, including photographs and maps showing their state wide distributions, are provided in the Draft Guide to Ecological Systems.

Table 3. Moderate to Low Fire Frequency Conifer Forests.

Forest Type	Fire Severity*	Acres
East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	Moderate to high	11,000
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	Moderate to high	10,000
North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest	High	7,000
Northern Rocky Mountain Mesic-Montane Mixed Conifer Forest	Moderate to high	1,000
North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland	Generally moderate, but sometimes low	900
North Pacific Maritime Dry-Mesic Pacific Douglas-fir-Western Hemlock Forest and North Pacific Mesic-Wet Douglas-fir-Western Hemlock Forest combined	Moderate to high	800
North Pacific Hypermaritime Sitka Spruce Forest	High	500
Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	High	500
North Pacific Hypermaritime Western Red-cedar-Western	High	<200

Hemlock Forest		
North Pacific Broadleaf Landslide Forest and Shrubland	High	<200
North Pacific Hardwood-Conifer Swamp	Rarely burns	<200

*Generalized – all forest types can experience a low to high fire severity depending on fuel and weather conditions.

Historic Conditions

As shown on **Table 1** these forest types tended to have fire return intervals typically exceeding 25 years, with mixed severity fires often occurring at intervals of less than 100 years and high severity fires associated with fire return intervals exceeding 100 years. Fires were typically of moderate or high intensity, sometimes resulting in partial or complete stand replacement (Agee 1993).

Forests that experienced infrequent high severity fires often exhibited a preponderance of late seral closed conditions and windstorms were often the more important disturbance events, especially near the coast (Rocchio, J. and R. Crawford 2008). Additionally, insects and disease also created small-scale forest openings. Forests that experience more frequent mixed severity fires formed structurally complex mosaics with patches of all seral stages (Agee 1993). Snags and large downed wood were often abundant in both mixed and high severity fire forests.

Current Conditions

WDFW owns few late seral forests and numerous early and mid seral forests. In general, most forests were greatly impacted by timber harvest prior to acquisition of land or timber rights by WDFW. Many forests were converted to early seral stands with greatly reduced numbers of snags and large downed wood which reduces species richness (Swanson et. al. 2011). Nevertheless, most WDFW forests are naturally recovering from past logging, currently provide good habitat and are on natural trajectories towards climatic climax forests. Some forests, however, have been converted to densely stocked single-species plantations, usually Douglas fir, that provide relatively poor habitat and are unable to recover as quickly. **Figure 9** shows undesirable conditions that, over time, WDFW intends to correct.

Figure 9. Undesired Plantation Conditions in a Low Fire Frequency Forest – Mount Saint Helens Wildlife Area.

Desired Future Conditions

Desired future ecological conditions for moderate to low fire frequency forests include:

- Species composition appropriate to forest type and seral stage.
- Succession class ratios including late seral stands with large trees, within the range of natural historic variability. In some instances, however, WDFW may manage forests to disproportionately provide succession class conditions that are otherwise lacking in the overall landscape. For instance, if the surrounding landscape is managed such that nearly all forests are in relatively early seral conditions, WDFW may manage forests to provide a disproportionately high ratio of late seral forest.
- Canopy layer complexity in more mature stands.
- Appropriate levels of snags and downed wood by forest type per ecological integrity assessment scorecards, priority habitat and species recommendations and input from the local habitat biologist.

The desired future social conditions include all of the items listed in **Section 1.7.5. Figure 10** shows examples of desired future conditions.

While a range of successional conditions is appropriate and will always occur due to wildfires, windstorms and other disturbances, most stands will be managed with the intent of reaching later seral conditions due to the widespread reduction of climax-conditions in the state. It is anticipated that periodic, unavoidable disturbances will largely ensure that adequate amounts of early and mid seral stands are present in these forest types.

Figure 10. Example of Desired Future Conditions in Low to Moderate Fire-frequency Forests.

Courtesy of Roger Ottman – Fire and Environmental Research Application Digital Photo series

1.8.3 Riparian Forests

Riparian forests cover 23,000 acres (12%) of WDFW forest lands. Riparian forests are considered to be Priority Habitats. As Forest Practice rules restrict active management within riparian zones, riparian forests are largely passively managed. There are circumstances, however, when some level of management may be needed within riparian zones. For instance, the School Fire salvage project included cutting of hazard trees, placing large wood in riparian buffers and planting.

Historic Conditions

Riparian forests exist in floodplains and are often dependent on flooding and fluvial processes to maintain their distinct qualities compared to surrounding forests. Successional stages and species composition vary based on frequency and severity of flooding or, in some cases, beaver activity (Rocchio, J. and R. Crawford 2008). Productive stands in relatively stable systems often contained very large trees. **Table 4** provides links to descriptions of riparian forest types. Fire return intervals and intensities are variable.

Table 4. WDFW Managed Riparian Forest Types.

Forest Type	Acres
Columbia Basin Foothill Riparian Woodland and Shrubland	9,000
North Pacific Lowland Riparian Forest and Shrubland	8,000
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	4,000
Rocky Mountain Subalpine-Montane Riparian Woodland	1,000
North Pacific Montane Riparian Woodland and Shrubland	900

Current Conditions

WDFW's riparian forests range from pristine to highly-altered. While many riparian forests are in good condition, some forests were previously eliminated by reservoir construction or conversion to agriculture. Others have been altered by diking, dredging and dams. In addition, roads were often constructed next to streams. Large trees, especially conifers, are often lacking due to past timber harvest. Riparian forests within matrices of once open, fire-dependent forests are often more densely vegetated than in their historic conditions.

Desired Future Conditions

Riparian forests will include the following:

- Species composition appropriate for each forest type.
- Successional class ratios consistent with flood regimes and channel migration.
- Appropriate levels of large trees present, especially conifers, where previously lost.
- Appropriate levels of snags and downed wood.
- Conditions that support stream function and characteristics (bank stability, shade, large wood, etc.).
- Abandonment and relocation, where appropriate, of stream side roads.

The desired future social conditions include all of the items listed in **Section 1.7.5** excluding the support of local economies and generation of revenue via active forest management.

1.8.3 Oak Woodland

Oak woodlands comprise roughly 11,000 acres (5%) of WDFW forests. Almost all of WDFW's oak woodlands consist of East Cascades Oak-Ponderosa Pine Forest and Woodland. Less than 200 acres are identified as North Pacific Oak Woodland. Oak woodlands are considered by WDFW to be priority habitats.

Historic Conditions

These woodlands were historically open and dominated by fire resistant, shade intolerant oak trees. Ponderosa pine and Douglas-fir were often present but were prevented from displacing oaks by frequent natural or man-made fires. These woodlands often included large open-grown trees and diverse well developed prairie vegetation in the understory. Fuel loads were low and trees were resistant to frequent, low-intensity fires.

Current Conditions

Most of WDFW's historically open oak woodlands are substantially degraded due to succession and some have been lost. Absence of fire has allowed conifers to overtop oaks with Douglas-fir as the primary invader. Widely-spaced large conifers have often been removed and replaced with dense stands of young conifers. Oak cloning in the absence of fire has resulted in dense patches of small oaks in areas not over topped by Douglas-fir. Grass understory is usually replaced by brush or young trees. Fuel loads are unnaturally high and often capable of producing crown fires that top-kill oak trees. **Figure 11** shows examples of undesirable conditions.

Figure 11. Examples of Degraded Oak Woodland – Oak Creek Wildlife Area.

Desired Future Conditions

Desired future ecological conditions for oak woodlands include:

- Fuel levels consistent with historic fire regimes.
- A high proportion of late seral stands with large, open grown trees.
- Diverse, native herbaceous understory vegetation.
- Snags and downed wood present at levels consistent with fire regimes.

The desired future social conditions for historically open, fire dependent forests include all of the items listed in Section 1.7.2.2. **Figure 12** illustrates desired future conditions in which fuels loads are low and understory vegetation is diverse.

Figure 12. Examples of Desired Future Condition for Oak Woodlands.

Richard Tveten Allison Warner

1.8.4 Aspen Forests

Rocky Mountain Aspen Forest and Woodland constitutes approximately 400 acres or <0.1% of WDFW forests. Hadfield and Magelssen (2004, 2006) conclude that this forest type occupied a considerably larger area in Washington in the past than now. Aspen stands are considered Priority Habitats.

Historic Conditions

Aspen are dependent on disturbance. Fire, avalanches, insect outbreaks, disease, windstorms and beavers allowed these stands to persist on sites that would otherwise succeeded into conifer forests. With a presumed historic fire return interval of 7-10 years, aspen stands were usually in varying stages of regeneration. Some Ponderosa pine were often scattered in aspen stands (Rocchio, J. and R. Crawford 2008).

Current Conditions

Many aspen stands have already been lost to fire exclusion that enables conifer encroachment (**Figure 13**). Many remaining stands are also becoming overshadowed by conifers. Fuel loads are unnaturally high. Many groves are decadent and lack reproduction due to lack of sunlight or disturbance.

Figure 13. Degraded Aspen Forests – Sinlahekin and Methow Wildlife Areas.

Richard Tveten

Tom McCoy

Desired Future Conditions

The following list and **Figure 14** shows the desired future conditions for [Rocky Mountain Aspen Forest and Woodland]:

- Most stands are clear from excessive conifer encroachment
- Stands of all regeneration stages and vigor are present
- Fuel loads are within historic range of variability

The desired future social conditions for historically open, fire dependent forests include all of the items listed in Section 1.7.5.

Figure 14. Example of Desired Future Condition of Aspen Forests – Wells and Sinlahekin Wildlife Areas.

Richard Tveten

2.0 Forest Management Strategy

2.1 Introduction

This section provides the strategy that WDFW will use to achieve and maintain the desired future conditions of forests that it owns or manages. The strategy includes:

- Defining areas suitable for active management
- Defining management approaches
- Establishing objectives for attaining desired conditions
- A prioritization approach
- A monitoring program

2.2 Suitable Active Management Areas

While all WDFW forests are important habitat and wildlife related recreational resources, it is neither feasible nor appropriate that all forests be managed silviculturally. This section identifies how suitable management areas are to be consistently defined in wildlife area specific forest management plans. As individual projects are developed and site specific details are learned, suitable management areas will be refined. Likewise, the suitability of disturbed areas may be re-evaluated following major disturbance events to determine whether or not harvest operations should be considered.

The first step in identifying suitable management areas is to evaluate whether or not forested areas are degraded or at risk of degradation. Forests that are functioning at high levels of ecological integrity and cannot be effectively improved via active forest management are not considered suitable. Likewise, forests that are degraded but are naturally recovering in such a manner that active management could not appreciably accelerate succession are not considered suitable for active management.

The second step in identifying suitable management areas is to identify and exclude areas where active forest management is prohibited or otherwise discouraged. Active forest management may be prohibited or discouraged for many reasons including:

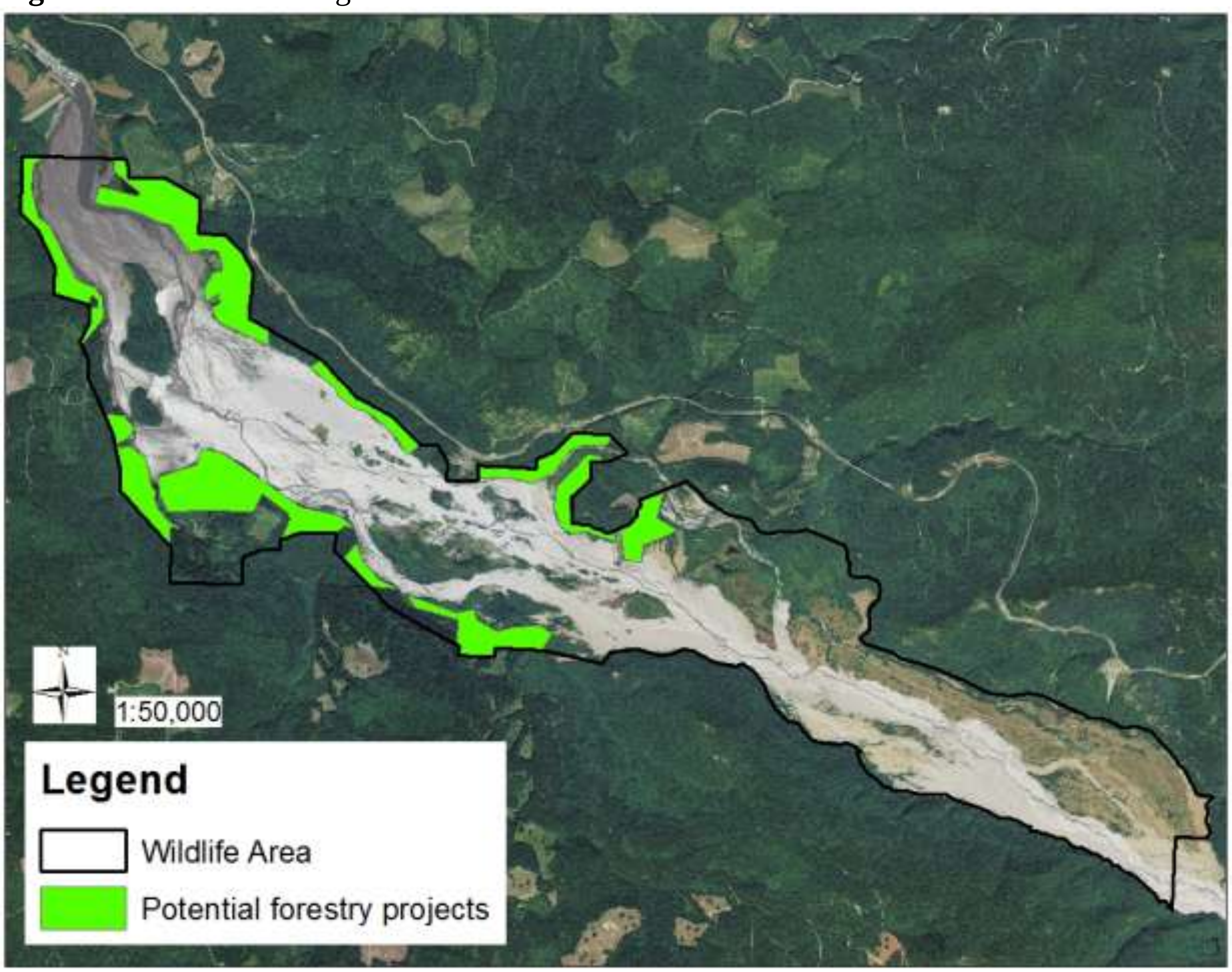
- Deed restrictions or grant encumbrances
- Forest Practice Rules
- Wildlife Areas Habitat Conservation Plan conservation measures.
  In the event that species needing protection are not included in the Wildlife Areas Habitat Conservation Plan, the following plans may be appropriate for identifying areas unsuitable for management:
    - State Threatened and Endangered Flora and Fauna Recovery Plans
    - U.S. Fish and Wildlife Species Recovery Plans
    - Priority Habitats and Species management recommendations
    - The Washington State Natural Heritage Plan

The third step in defining suitable management areas is to exclude inaccessible areas. Areas may be inaccessible because building access to them is unrealistic or undesirable. While it is theoretically possible that all areas could be accessed via helicopter, if it is unlikely that such techniques would ever be used for proactive management projects, such areas should be excluded. Accessibility can be re-evaluated in the event of major disturbances.

Suitability maps are generated by wildlife area managers as part of wildlife area specific plans. Collectively, suitability maps identify places where potential forestry projects will be considered. As an example, Figure 15 shows suitable management areas on the Mount Saint Helens Wildlife Area. In this example, forest areas considered unsuitable for forestry projects include old growth stands, which are limited in the watershed, highly unstable areas, and inaccessible “islands” in the ever-shifting debris plain.

While an important factor that cannot be ignored, economic viability is not a factor in determining site suitability for management. Suitability in this this document is based on whether or not projects can improve forest conditions to meet management objectives and whether or not it is legally and logistically feasible to execute a project in a given area. Economic viability is a critical factor that changes over time depending on market conditions and access to mills. As such, economic viability analyses are conducted periodically as economic variables fluctuate.

Figure 15. Suitable Management Areas – Mount Saint Helens Wildlife Area.



Social and political viability is also an important factor that must be taken into consideration when deciding to pursue projects. Nevertheless, social and political concerns may not be related to actual forest management needs. Likewise, social and political viability can change over time independently of forest management needs. As such, social and political viability is not considered when defining and ranking suitable forest management areas. Social and political viability, however, will be considered when implementing projects so that effort is not wasted on projects that are not socially viable. If it becomes apparent that social and political concerns substantially impede the agency's ability to address priority management issues, actions will be taken to address the problem.

2.3 Management Approaches

There are four general forest management approaches that WDFW applies to its forests depending on stand conditions. These approaches are described in **Table 5**.

Table 5. Forest Management Approaches**.**

Forest Condition	Management Approach
Natural processes are functioning normally and forests are at high levels of ecological integrity or are on trajectories to attain high levels of ecological integrity.	Passive management. Only intervene as necessary to protect forests from unnatural threats like excessive human caused fires or invasive species outbreaks.
Natural processes have been altered or eliminated (usually fire exclusion) and forests are not providing high quality habitat or are on trajectories that will not provide high quality habitat.	Active management. Restore the natural process or simulate, to the degree possible, the effects of such processes. Examples include: 1. Variable thinning to maintain and restore structure including forest openings of variable sizes and shapes, accelerate succession, correct species composition or reduce fuels. 2. Implement prescribed fire. 3. Create snags or downed wood. 4. Plant desirable species.
Past harvest or disturbance has eliminated important forest attributes and stands are not on trajectories to provide high quality habitat.	Active management. Restore conditions or correct trajectories. 1. Thin stands to accelerate succession. 2. Restore appropriate species composition. 3. Create snags or downed wood.
Disturbance events like wildfires, insect outbreaks and windstorms have created an abundance of dying or dead trees that are: 1. Outside the historic range of variability. 2. Create wildfire or safety hazards. 3. Create conditions inconsistent with management objectives.	Harvest some of the dead or dying trees when consistent with the restoration strategy for the given forest type or land management objectives.

Figure 16. Restoration Project Example – Methow Wildlife Area Before and After Thinning.

Tom McCoy

2.4 Post-Disturbance Harvest Considerations

Large disturbance events including wildfires, windstorms, insect outbreaks and volcanic eruptions can kill large numbers of trees and greatly alter forests. In many instances, especially when forests are functioning within historic ranges of variability, such events may be viewed as positive, even essential for maintaining forest ecosystems. Accordingly, most disturbances do not prompt active forest management. In some cases, however, post-disturbance projects, which include the harvest of trees, are conducted to restore habitat, protect public safety/infrastructure and manage wildfire risk.

Post-disturbance harvest projects may have ancillary benefits. Such benefits may include provision of wood for riparian restoration activities, revenue generation for reinvestment back into Wildlife Areas, or support of local economies. While such benefits may be substantial, they are not sufficient alone to justify projects. Projects must be justifiable based on ecological neutrality or enhancement in the short and/or long-term.

2.4.1 Post-Disturbance Ecological Restoration Projects

The basis for post-disturbance projects including tree harvest is to restore forests whose structure, spatial distribution or patterns, species composition or biomass levels have diverged from their historic ranges of variability prior to the disturbance event. This is especially significant in eastern Washington. Forest degradation on WDFW wildlife areas is largely attributable to the following human activities:

- Past tree harvests which removed too many large trees and altered species composition
- Fire-suppression which enables excess numbers of trees to become established results in species composition shifts and alters disturbance events like wildfires and insect outbreaks
- Past plantation silviculture which altered species composition and forest structure

Forest restoration projects are designed to restore degraded forests or put them on trajectories to eventually attain desired future conditions. While most restoration projects usually occur in the absence of disturbance events, they may also occur immediately after disturbance events. WDFW post-disturbance projects generally have the same basic goals and prescriptions as restoration projects that are planned in the absence of disturbances. Disturbance events can reduce the number of trees available to serve as live forest components, alter species composition and transform forest components (e.g., live to dead, standing to down, etc.). As a result, post-disturbance restoration activities may be designed differently than a project in the absence of a disturbance event. Examples of how disturbance events can alter the design of forest restoration projects include the following:

- Focus may shift to selectively thinning dead/dying trees that would have otherwise been removed as live trees.
- Retention tree criteria might be altered to save trees that otherwise might have been taken when disturbance events change the pool of available retention trees.
- Extra measures may be taken to protect and encourage development of surviving trees because fewer trees are available to promote forest recovery.
- Planting strategies may be modified to address undesired species composition shifts.

The following sections outline the types of post-disturbance projects that are most likely to occur.

2.4.1.1 Non-forest Habitat Restoration

Many non-forest habitats have been degraded by invading trees. Trees have invaded and degraded many non-forest habitats because of fire suppression, active tree planting or past grazing. As an example, many prairies in the Puget Sound Basin have been lost to conifer encroachment. Prairie restoration projects in the absence of disturbance could involve the removal of all live trees, snags and downed logs. Similarly, post-disturbance projects in forests on historical prairies may target the scene's desired conditions. While WDFW may elect to leave some trees, snags and logs, we may remove all of them if such features hinder the restoration of important non-forest habitats.

2.4.1.2 Eliminating Plantation Conditions

Tree plantations including Christmas tree farms are present on some wildlife areas. In some cases these plantations consist of non-native tree species. In others, vegetation consists of native trees that are not well adapted to the location where they were planted. Restoration of these areas with or without a disturbance event might include the removal of all live trees. If snags and downed logs are present, projects strive to leave snags and downed log densities consistent with the range of variability associated with the forest type that historically occurred in the project area.

2.4.1.3 Oak Woodland Restoration

Conifers have degraded or replaced many oak woodlands because of fire suppression, active planting of conifers and cutting of oaks. Oak woodland restoration projects in the absence of a disturbance event could involve the removal of all live conifers and downed logs, and post-disturbance projects may do the same to protect oaks from competition, unnaturally intense wildfires or prepare sites for future management using prescribed fire. Post-disturbance project snag retention standards should match snag retention standards for projects occurring in undisturbed areas.

It is important to note that the ecotone between oak woodlands and conifer forests can range from abrupt to a gradual transition of conditions. Therefore, post-disturbance project prescriptions should match prescriptions for ecotones associated with undisturbed forests. As the appropriate levels of trees, snags and downed logs to retain is project-specific and based on local site conditions, decisions on what to retain are made on a case-by-case basis with interdisciplinary team input.

2.4.1.4 Restoring Aspen Woodlands

Many aspen woodlands have been lost to or degraded by invading conifers as a result of fire suppression, past grazing and forest management activities that favor conifers. Aspen woodland restoration projects in the absence of disturbance events can involve the removal of all live conifers. Post-disturbance projects may also remove live conifers. While large conifer trees may be removed to restore aspen stands, old legacy trees will be retained. Likewise, snags and downed logs created by disturbances will be retained at levels consistent with the presumed historic range of variability.

It is important to note that the ecotone between aspen woodlands and conifer forests can range from abrupt to a gradual transition of conditions. Therefore, post-disturbance project prescriptions should match prescriptions for ecotones associated with undisturbed forests. As the appropriate levels of trees, snags and downed logs to retain is project-specific and based on local site conditions, decisions on what to retain are made on a case-by-case basis with interdisciplinary team input.

2.4.1.5 Restoring High Fire Frequency/Low Fire Intensity Conifer Forests.

Most of WDFW’s high fire frequency/low fire intensity conifer forests are substantially degraded by historical forest management practices, including past and ongoing fire suppression (Franklin, et al 2013). Widespread ecological changes include:

- Most large conifers have been removed.
- Tree density has dramatically increased with a disproportionate increase in small shade-tolerant, fire-intolerant trees.
- The loss of understory vegetation.
- Increased vulnerability to unnaturally large, intense crown fires.

- Loss of habitat for species dependent on open forest conditions.

In the absence of large disturbance events, forest restoration projects in high fire frequency/low fire intensity conifer forests involve thinning to protect the largest, most fire resilient trees or promote the development of such trees. Such projects often endeavor to ensure adequate snag densities compared to the historical ranges of variability. In cases where there are insufficient snags compared to the historical range of variability, existing snags are protected and additional snags may be created. In cases where there is an overabundance of snags which put live trees at elevated wildfire risk, snags in excess of the historic range of variability may be removed. In addition to thinning trees, such projects may also reduce amounts of downed wood, especially around live trees. Finally, if desired native or site-appropriate species are underrepresented, restoration projects may involve planting of such species that are best adapted to handle drought, insects and wildfire.

In general, post-disturbance projects in such forests strive to achieve the same results that restoration projects would have in the absence of disturbance. When fires are mild, post-disturbance harvest projects closely mirror restoration projects with the only difference being that some of the removed trees were killed by the disturbance event. Wildfires in degraded forests, however, often kill substantially more trees, including target retention trees, and reduce the likelihood of successfully retaining legacy trees and achieving the desired composition and structure possible if a restoration project were completed prior to the fire. Under such circumstances tree retention standards, whether the trees are alive or dead, are largely designed to match retention standards for projects that would have occurred in the absence of disturbance.

2.4.2 Non-Ecological Harvest

WDFW may conduct post-disturbance projects to address safety concerns, protect infrastructure or maintain designated land uses. Such projects might not be justifiable on a purely ecological basis, but are necessary for WDFW to meet its obligations relating to public access and recreation. Projects may include removing trees that fall or are at risk of falling onto roads and power lines, campgrounds or other high use areas. Projects may also include removing trees from wildlife food plots, some of which WDFW is required to maintain as hydroelectric project mitigation sites. When feasible, harvested materials will be used for stream enhancement projects or, if merchantable, will be sold to support local economies.

2.4.3 Wildfire Risk Management

WDFW owns forests lands where there are heightened concerns regarding wildfire such as the wild land urban interface. In such areas, WDFW implements projects to protect neighbors from uncharacteristically intense wildfires. In general, wildfire risk management projects are designed to restore forests to their historical ranges of variability and minimize or preclude uncharacteristic fire behavior. In some cases, however, fuel treatments may be more aggressive to protect adjacent structures. WDFW may adjust management priorities when disturbance events change the distribution of high wildfire risk areas. Disturbance events, however, do not change the desired future conditions for disturbed areas.

2.4.4 Post-Disturbance Project Related Conservation Strategies

Landscape and patch/individual tree scales should both be considered when designing a post-disturbance restoration activity (Franklin et al 2013). Likewise, both short-term and long-term effects should be considered.

Landscape Level Conservation Strategies

Projects should be designed to protect or restore special habitats on a landscape scale such as to

- Protect streams, rivers, seeps, lakes, wetlands and their buffers
- Protect patches that survive the disturbance
- Maintain connectivity
- Ensure that diversity is maintained across a landscape

Patch/Individual Tree Level Conservation Strategies

Projects should be designed to protect important features at the stand level

- Retain live legacy trees and recruits to replace them when present
- Retain adequate snags and logs (on average across the landscape) representative of the larger diameter classes of appropriate species given the site and aspect representative of historic conditions
- Avoid undisturbed patches
- Consider landscape context and protect adjacent undisturbed areas

Project Should Have Short and Long-Term Goals Relating to the Following

- Creation of a balance of forest types and habitat features associated with them
    - Encourage redevelopment of late succession forests if lacking
    - Protect early-seral forests where underrepresented
- Contribute to and support maintenance of appropriate fire management
- Support management strategies for priority species including:
    - Threatened and endangered species (including post-disturbance specialists)
    - Game species

2.4.5 Best Management Practices

Post-disturbance projects will be implemented in such a way that they do not cause unacceptable short-term impacts. Post-disturbance projects may pose higher risks for negative impacts than other projects because they can subject vegetation and soils to a second disturbance event. Risks that may be elevated in association with post-disturbance projects include:

- Increased erosion potential
- Accelerated runoff rates
- Damage to naturally regenerating vegetation

Accordingly, the following measures will be implemented on post-disturbance projects:

- Whenever possible work will be conducted on snow or frozen ground to minimize disturbing soils or recovering vegetation. If working on snow or frozen ground is not an option, work will be conducted on dry ground.

- To the maximum degree possible, work will be conducted prior to post-disturbance vegetation re-growth.
- Replanting will be done using locally adapted seed.
- To the maximum degree possible, traffic will be limited to existing roads.
- Equipment will be selected that minimizes impacts.

As every disturbance event can pose unique challenges, disturbed areas will be individually evaluated to determine what other practices might be necessary.

2.5 Applying Climate Change Considerations to Management Approaches

As climate change could greatly affect forests, the USDA Forest Service has completed a vulnerability assessment and recommended actions for national forests in the Pacific Northwest (Devine et. al. 2012). As most WDFW forests are in close proximity to national forests, the assessment and recommendations are applicable to WDFW forests. The primary conclusion of the study is that high elevation tree species are at risk and should be a focus of conservation. WDFW manages about 10,000 acres of the moderately high elevation forests where such species can be found. The primary recommendation pertaining to active management of such forests is to "focus on increasing stand diversity of native forest trees through thinning and planting." Such actions would also help meet DNR recommendations to increase disease resistance. The report also includes recommendations for preserving genetic diversity including seed banks when necessary.

For now, WDFW will follow strategies developed by the USDA Forest Service for addressing climate in Responding to Climate Change in National Forests: A Guidebook for Developing Adaptation Options (Peterson et. al. 2011)**.** Climate adaptation strategies are briefly summarized in **Table 6**. As applicable, WDFW will implement the strategies.

Most of WDFW's forest management needs require actions that are consistent with actions needed to address climate change. Examples of actions needed to address the immediate concerns that also make forests more resilient to climate change include thinning to address forest health concerns, restoring appropriate species composition, reducing fuels and accelerating succession. Accordingly, there is no need at this time to develop projects with a specific focus on climate adaptation. It is important to note, however, that in some specific instances forests may be managed in a way that does not make them more resilient to climate change. An example would some spotted owl habitats in Eastern Washington where forests may be left untreated. Surrounding forests, however, may be treated to protect the untreated areas from large wildfires.

USDA Forest Service staff at Pacific Northwest Research Station Forest Sciences Library and the Okanogan–Wenatchee National Forest has developed tools for anticipating future conditions in light of climate change (Hessburg et. al. 2013). WDFW is exploring the possibility of collaborating with them on joint inventory and analysis efforts so future changes can be better anticipated. Such information could suggest different management actions like changing target tree densities or which species to use when replanting.

Table 6. Climate Adaptation Strategies.

Strategy	Description	Actions
Promote resistance to climate change	Promote the ability of species, ecosystems or environments to resist forces of climate change and maintain values and ecosystem services.	▪ Utilize post fire planting to maintain native species. ▪ Place fuel reduction treatments around high-value riparian areas and old growth.
Develop resilience to climate change	Promote the capacity of a system or environment to withstand or absorb increasing impact without changing state.	▪ Focus on maintaining, reconnecting, and reestablishing ecosystem processes and functions. ▪ Increase the amount of restoration thinning and place treatments to increase resilience across large landscapes. ▪ Thin to lower densities. ▪ Increase habitat quality through creation and protection of legacy structures.
Assist response to climate change	Actions that ease transitions in response to climate.	Increase habitat quality and connectivity for species movement, especially in riparian and late-successional forests.
Realign highly disturbed ecosystems	Restore historic community type or replace it with one that can survive under present or future conditions.	▪Remove forests that under complete fire exclusion have invaded warmer and drier sites like grasslands and shrub steppe. ▪Eliminate plantations stocked with mal-adapted tree species.

2.6 Defining Potential Projects Within Suitable Management Areas

In cooperation with the WDFW forester, wildlife area managers will define potential projects within their wildlife area specific forest management plans. Potential project areas and management needs usually do not need to be defined in great detail within the plans as their main purpose is to identify all of the agency's forest management needs. For example, if a wildlife area has 2,000 acres of overstocked Ponderosa pine savanna all needing the same basic treatment, that area could be identified as a potential project even though work may occur as several smaller projects over many years.

2.7 Project Ranking Strategy

The three factors that are considered when ranking work are ecological integrity, priority species management and risk abatement (**Table 7**). While revenue generation and economic support is important, it is not considered in the ranking strategy because all economic benefits can be realized as all necessary work is completed, regardless of project order. Post-disturbance projects, however, can take precedence over other prioritized work and are performed as quickly as necessary to address immediate risks (like hazard trees) and harvest trees before their economic value is lost.

It is important to note that the project ranking strategy but is not intended as a means to resolve conflicts between competing values. For instance, managing forests for ecological integrity may directly conflict with the management needs of a priority species. Also, different priority species may be simultaneously harmed or helped by a project depending on how it is designed. Such conflicts will be resolved via internal cross-program coordination.

Table 7. Project Ranking Factors.

Scoring Factor	**Ecological Integrity Benefits***	**Benefits to Priority Species/Habitats**	**Risk Abatement (wildfire, forest health)**
Score -1	Not allowed at the project scale but losses in one area could be offset by gains in another.	Could result in small to moderate losses.	Could result in small to moderate losses (highly unlikely).
Score 0	There is minimal or no opportunity for improvement.	There is minimal or no opportunity for improvement.	Stand poses minimal or no opportunity for improvement.
Score 1	Could result in moderate improvements.	Could result in moderate improvements.	Could result in moderate improvements.
Score 2	Could result in large improvements.	Could result in large improvements.	Could result in large improvements. Required by fuel mgmt. or forest health warnings/hazard orders.

*Use EIA scorecards once available

Specific thresholds for differentiating between moderate and large improvements are not provided in this document. Such distinctions will be made with interdisciplinary input as projects are defined. Factors considered in making the distinction between moderate and large improvements include the following:

- Project size
- Magnitude of ecological integrity score improvement
- Magnitude of wildfire risk reduction (on site and surrounding landscape)
- Magnitude of forest health improvement/insect risk reduction
- Benefits to priority species
    - Number of species to benefit
    - Core habitat improved
    - Connectivity maintained or restored
    - Degree that PHS recommendations are met

While this document largely focuses on the planning and execution of active management, it is important to note that passive management can have far reaching consequences to ecological integrity, priority species and risks. In many cases passive management provides the greatest benefits. In other cases, however, passive management has detrimental effects when natural processes such as wildfire are altered. That said, when prioritization scores are developed for active management projects, simple before/after comparisons are not adequate. The level of benefits should be estimated considering the trajectory of forests. Projects that prevent anticipated degradation should receive higher scores than ones that don't.

2.8 Forest Management Needs List

All ranked potential projects will be included on a statewide forest management needs list. This list will allow interested parties to view identified forest management needs, see how the agency ranks them and why. This list will also help enable cross-program communication so that priority species specialists, game managers and others can better understand program priorities, support projects that provide cross-program benefits and coordinate activities including research and monitoring.

2.9 Scheduling the Implementation of Projects.

The project ranking scores will be used to help focus efforts where the greatest gains can be achieved. While in a perfect world implementation of projects would begin with the project having the highest ranking score and end with the one having the lowest ranking score, projects will not necessarily be completed in the order suggested by project ranking scores. Many other factors must be considered in determining the order in which projects are completed including:

- Economic viability
- Social viability
- Funding
- Staffing resources
- Field conditions
- Disturbance events presenting short windows of opportunity
- Cross-program benefits

In most cases proactive forest management projects must be self-supporting and can't proceed unless they are economically viable. As economic viability of projects constantly fluctuates with wood commodity prices and accessibility to mills, economic viability analyses must be performed on a periodic basis. As economic viability fluctuates, the subset of projects that are economically viable constantly changes. As such, WDFW must be strategic in how it schedules projects to best capitalize on market conditions. This requires flexibility in how projects are scheduled.

Projects must also be socially and politically viable. For example, public support for forest thinning to address wildfire hazards can change dramatically based on recent wildfire history. It is important to assess public support and/or sensitivity to proposed projects, and then develop and implement appropriate outreach strategies prior to finalizing projects.

WDFW sometimes obtains grants that will pay for forest management projects. These grants enable projects in areas where active management may not otherwise be feasible because projects are not economically viable. In most cases grant funds must be used quickly or be forfeited. As such, projects for which grant funding has been obtained will be executed promptly.

Staffing resources also affect the order in which projects are completed. When wildlife areas have resources to expedite projects on their land, they are encouraged to do so. In cases where wildlife area managers have the ability to address forest management needs on their particular wildlife area, such work should be encouraged regardless of how such work ranks statewide.

Field conditions may affect the order in which projects are executed. For example, work on a particular project may require frozen ground or snow. If necessary conditions are not available, efforts may be focused on other projects until acceptable conditions are present.

Major disturbances may necessitate post-disturbance harvest projects. Such projects may addresses immediate risks like hazard trees along a public road or longer term restoration needs. As the value of timber needed to cover the cost of such work diminishes rapidly, such projects may take priority over other project work.

All of the above factors may lead to projects being completed in an order that varies greatly from the project ranking list. While project rankings can be helpful in prioritizing work it is not intended to dictate the order in which projects must occur. To some degree the ranking list will serve as a tool to evaluate where on the project ranking spectrum work actually occurs and the degree to which the most pressing forest management needs are being addressed.

2.10 Performance Risks

While this document establishes goals and strategies for promoting desired future conditions it is important to note that circumstances beyond the agency's control could influence the timing or degree to which work is accomplished. Factors that could pose significant performance risks include:

- Uncertain scale, location and intensity of disturbances (fire, insect and disease outbreaks)
- Staffing level uncertainties
- Changes in restrictions from the Endangered Species Act and/or Forest Practices Rules
- Market conditions (access to mills, timber prices, etc.)
- Imperfect information (satellite imagery to assess forest and fuel conditions)
- Litigation
- Severe weather events and climate change

3.0 Plan Implementation

3.1 Introduction

This section summarizes policies and procedures for implementing projects and tracking program effectiveness. The policies are designed to ensure that all projects contribute in a consistent manner to achieving or documenting progress towards desired future conditions. As policies and procedures change over time, and some are still under development, they are not included in their entirety within this document. Rather, they are referenced where appropriate.

It is important to note that WDFW strives to manage its forests so that restoration/habitat maintenance activities provide financial benefits rather than act as a constant, financial drain on the agency. Within that context restoration projects may be scheduled so that they also serve as sources of revenue to support wildlife area management and help support local economies.

While generating revenue and local economies is not the driving force behind WDFW's forest management program, such outcomes are consistent with the department's mission and goals.

In this way, management of WDFW forests reflects the overall agency mission (Washington Department of Fish and Wildlife 2011-2017 Strategic Plan).

3.2 Project Development and Implementation Procedures

The following procedures will be employed to ensure that planning requirements are met.

3.2.1 Project Planning

Major steps in project planning include:

- Forest staff and wildlife area managers propose projects based on one or more goals within the Management Strategy for the Washington State Department of Fish and Wildlife's Forests.
- Potential sale boundaries will be defined, surveyed and flagged.
- Forest staff will consult with Real-estate to confirm that WDFW has all of the necessary rights to harvest within the potential sale area.
- Forest staff will develop harvest prescription with input from the District Team and other agency experts.
- The forest staff develops Timber Sale Appraisals.
- Projects are approved by the director or the Commission in accordance with the delegation of authority prepared by the Commission.

3.2.2 **Permits, Required Reviews and Public Notification**

In addition to attaining Forest Practice Applications, the following evaluations and public notification processes will be completed as appropriate.

- Endangered Species Act Section 7 consultations
- Cultural Resources Evaluations
- State Environmental Policy Act

3.2.3 **Contract Administration and Oversight**

Advertising and contracting is conducted in accordance with requirements for state agencies. Forest staff and wildlife area staff provides oversight to ensure that the operator uses proper logging techniques and that the Department is getting the value back for the timber.

3.2.4 Post Project Follow-Up

The following actions will be taken following all projects to ensure compliance with Forest Practice Rules relating to reforestation and road management.

- Ensure that reforestation requirements are met via planting or natural recruitment.
- Review and revise Road Maintenance and Abandonment Plan as necessary to reflect changes to the road system.

3.3 Documentation and Record Keeping Requirements

Documentation is essential to track program efforts, attainment of objectives and the degree to which desired future conditions are attained. Important aspects of all projects requiring Forest Practice Applications will be recorded and entered by DNR into their GIS database along with project location information for easy evaluation and retrieval. Project contracts, prescriptions, and harvest records will be electronically stored and backed up so information can be linked to spatially-enabled project information.

3.3.1 Active Management Benefit Tracking

The same factors that are used to prioritize projects are used to quantify project benefits at the project scale and to determine program impacts over time. The location of each project will be mapped in GIS to spatially track management activities. Project tracking will quantify acres improved in the following ways.

- Restoration /enhancement
    - Acres of corrected species composition
    - Acres of desired successional class achieved or put on a trajectory to be achieved
    - Acres of overstocking corrected
    - Acres with desired level of snags/downed wood

      Note: these could be translated to gains in ecological integrity if the prescriptions match metrics included on the ecological integrity scorecards
- Forest health risk and liability abatement
    - Acres of unnaturally stagnated or decadent conditions corrected
    - Acres of unnaturally high fuel loads corrected
    - Acres of fire corridor breaks created
    - Acres rendered more resilient to insect outbreaks
- Priority habitats and species benefitted
    - Acres restored (mature/old growth, oak, aspen, riparian)
    - Ares of habitat restored for PHS species

      Note: these could be translated to gains in ecological integrity if the prescriptions match metrics included on the ecological integrity scorecards
- Economics
    - Revenue generated
    - Wood products (board feet and/or dollar value as measure of economic support)

Forest staff and wildlife managers will coordinate with local habitat biologists so that priority species monitoring efforts can be associated with the above monitoring.

3.3.2 Ecological Integrity Monitoring.

WDFW is developing an ecological integrity assessment monitoring program to track ecological integrity on WDFW lands in general and as a means to quantify the impacts of specific management actions. Once complete such monitoring may be used to provide detailed analyses regarding project benefits and impacts. Level 2 Ecological Integrity Assessment monitoring would most likely be conducted. Such monitoring could better characterize ecological integrity by quantifying features like snags and logs. Level 2 assessments may also identify small features like suppressed aspen clones that might otherwise go undetected. Such information, once available, could contribute to better projects in the future. As the program is still under development, such monitoring is a goal to be achieved in the future once the program is fully developed.

3.3.3 Landscape Trend Analysis

Landscape evaluation via remote sensing data will allow WDFW to better understand the effects of silvicultural management in conjunction with disturbance and succession and see the degree to which the agency is achieving and maintaining desired conditions. By viewing the locations of projects in context with landscape scale changes, WDFW will be able to:

- View changes in forests that are not actively managed and evaluate whether they are moving towards or away from desired conditions.
- Evaluate the effects of silvicultural management and the degree to which they moderate the effects of disturbances like insect outbreaks and severe wildfires.
- Better understand the duration of project benefits. For instance, the benefits of thinning and prescribed fire projects in fire-dependent forests are temporary and may only last for the duration of the historic fire return interval. Conversely, thinning of forests in Western Washington may greatly accelerate succession and have long lasting impacts. As projects and land trends are tracked over time, the ability to schedule activities to maintain fire-dependent forests should improve.

Tracked conditions include:

- Abundance and location of forest types
- Successional stage distribution and abundance
- Degree of departures from reference condition
    - Successional class ratio
- Forest health risk and liability abatement
    - Unnaturally stagnated or decadent conditions
    - Fuel loads and wildfire risks
    - Insect outbreaks and vulnerability
    - Disease outbreaks and vulnerability

Forest evaluations will be periodically conducted using updated satellite imagery. The frequency of such evaluations, however, cannot exceed the satellite data that is made available. For now the goal would be to evaluate forests using satellite imagery every five years except for insect outbreaks which can be tracked annually.

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