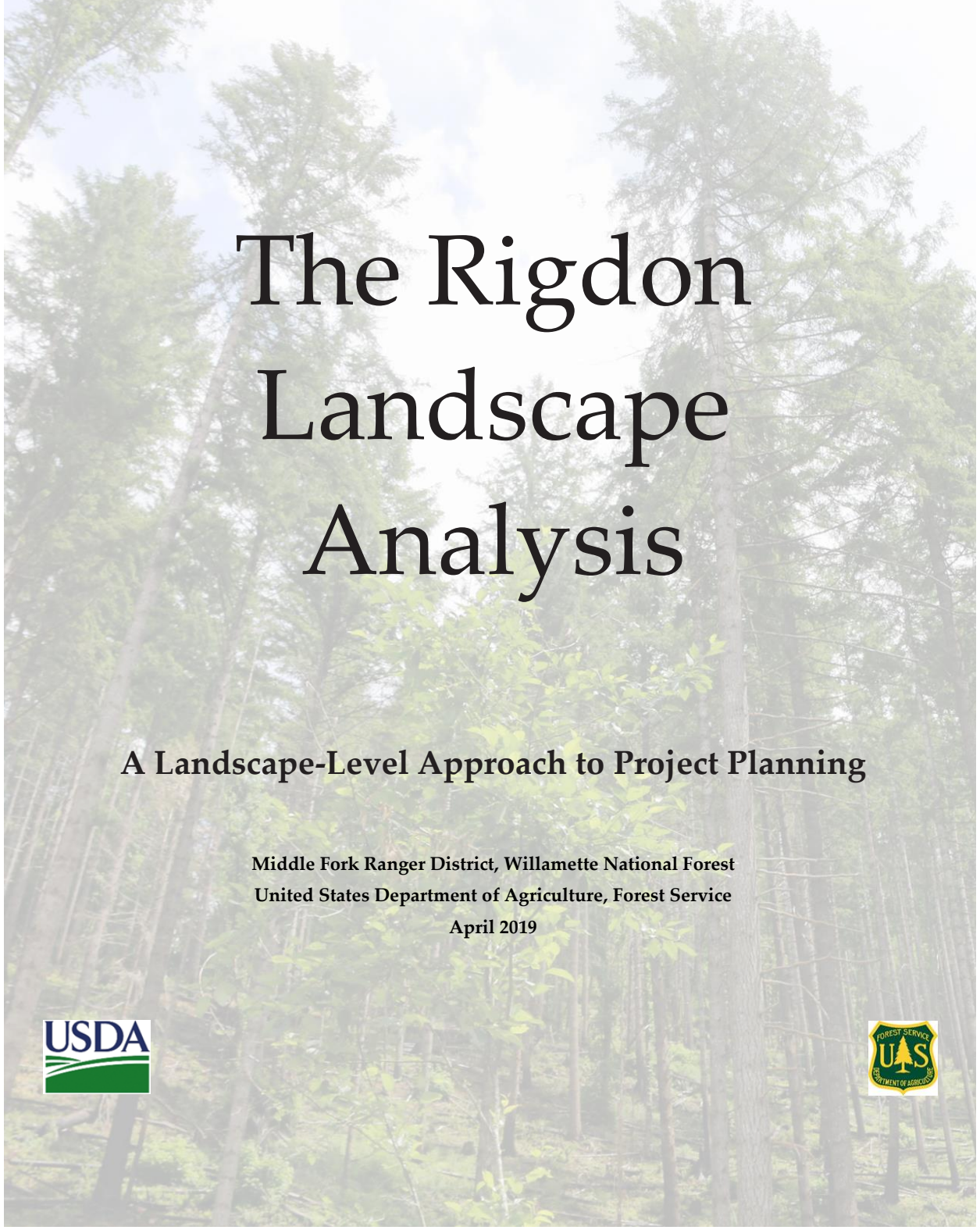

The Rigdon Landscape Analysis

A Landscape-Level Approach to Project Planning

Middle Fork Ranger District, Willamette National Forest
United States Department of Agriculture, Forest Service
April 2019

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Chapter I Background

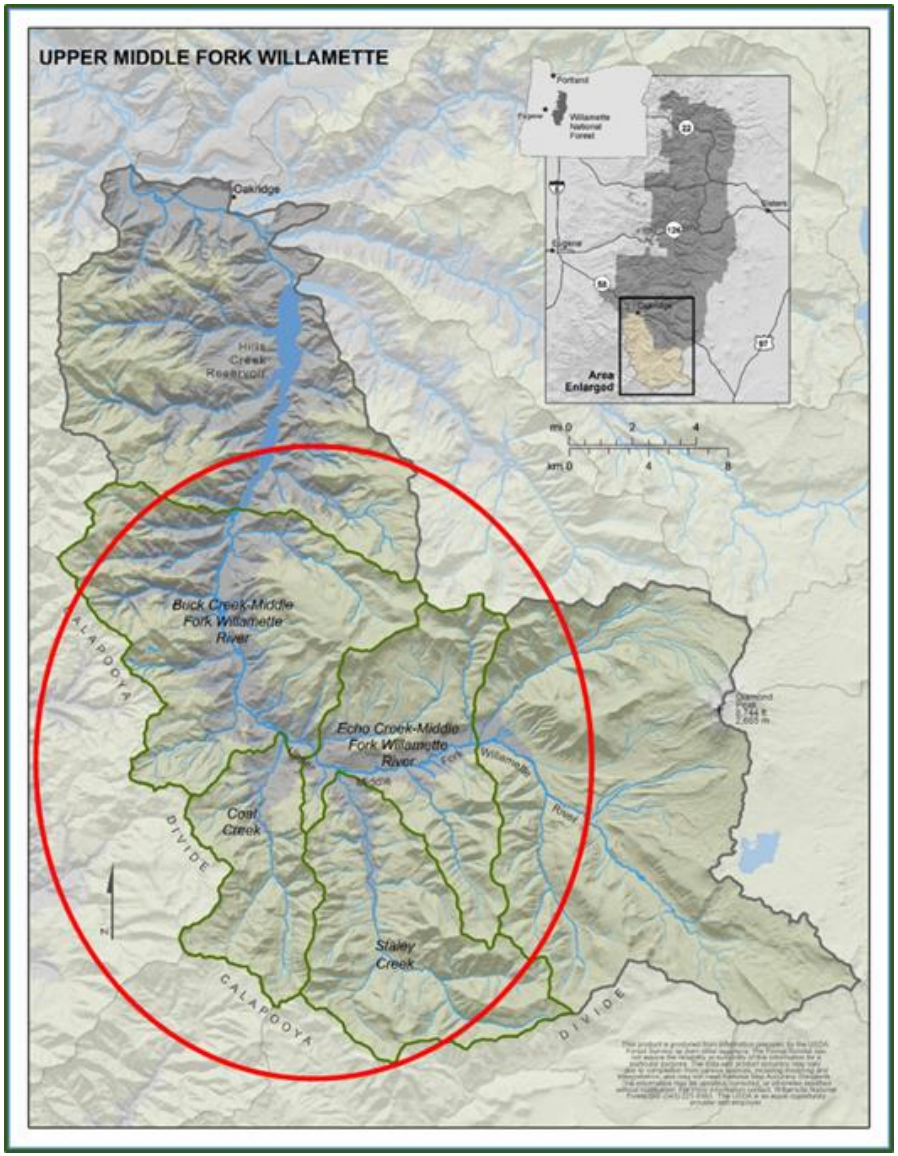


Figure 1 Vicinity map of the Rigdon landscape

The Rigdon Landscape

The Rigdon landscape encompasses an area south of Oakridge, Oregon within the Headwaters Middle Fork Willamette River and Hills Creek Reservoir watersheds. This area, 104,000 acres in size, is bounded by the High Cascades to the east and the Calapooya Mountains to the west and south.

The landscape is a unique and diverse area that is important for people and natural resources. The area contains the northernmost extent of contiguous mixed conifer forest on the Westside of the Cascades, habitat for spring chinook, bull trout and the Northern spotted owl, as well as important cultural sites. The area produces forest products and offers an abundance of recreational opportunities from hunting to horseback riding to hiking.

Figure 2 Looking east into the eastern edge of the Rigdon landscape

There have been several independent efforts in the area over the years with an overarching goal of reestablishing resilient habitats and maintaining resources. Yet, there is no unified plan for the area that identifies valued resources and their role in ecosystem function and flow, assesses stressors and barriers on the ecosystem and identifies restoration efficiencies at multiple scales. The Rigdon landscape analysis develops a "restoration blueprint" for four subwatersheds in the area concentrated around the northern most extent of mixed conifer forest. The blueprint is more than just a watershed analysis update and builds upon the watershed action plan for the area. This restoration strategy describes and spatially displays how the landscape operates as an ecological system and identifies target landscape objectives and patterns which can then be used to inform:

- ✓ Strategies for conservation and restoration efforts that balance the social, ecological and economic aspects of a landscape.
- ✓ Decisions about places where resiliency can be enhanced and where we can align our restoration opportunities to improve our efficiency and allow better leveraging of funds.
- ✓ Opportunities to integrate restoration goals to increase landscape health and function.

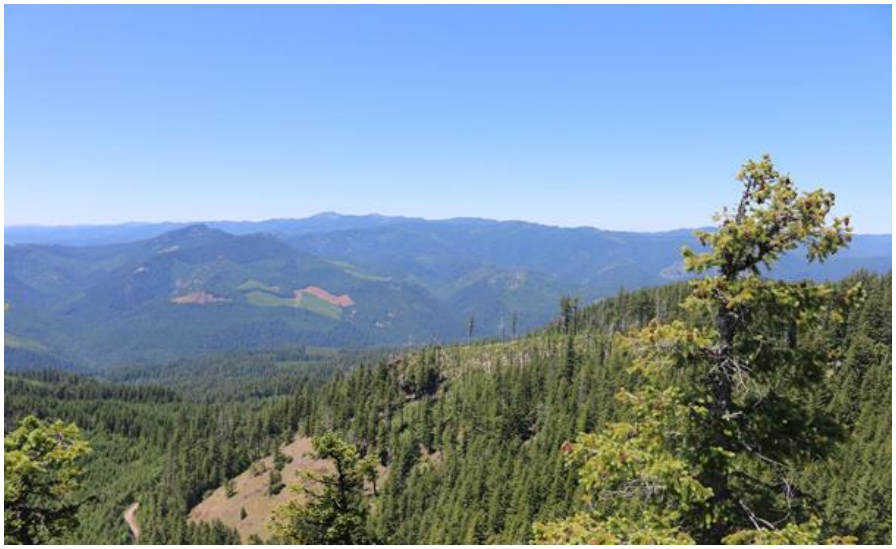


Figure 3 View from Moon Point looking southwest into the Rigdon landscape

Landscape Scale Assessment

"If you don't know where you're going, any road will take you there"

(Diaz and Apostle, 1992)

"If you don't see the whole puzzle you don't know if you are missing any pieces"

(Rigdon planning team member)

For the assessment, the Rigdon planning team modified a process called Forest Landscape Analysis and Design (FLAD) (Diaz and Apostle, 1992). The FLAD process was designed to develop desired landscape patterns that would inform land management objectives. The FLAD process lays out an approachable way to categorize and analyze the landscape that can help document and describe to others, particularly outside the agency, understand the landscape analysis and planning process.

Compared to other recent landscape analyses done for project planning, this use of the FLAD is unique in the scale of the assessment. Examples such as the Cool Soda (Willamette NF) and the White River (Mt. Hood NF) planning efforts focused on the project-level scale of tens of thousands of acres, so the scope was relatively manageable and the practitioners could connect inferences directly to on-the-ground actions. However, Rigdon is a larger landscape spanning over 100,000 acres. By zooming out to the landscape scale, team members incorporated a broader understanding of landscape elements, flows, their interactions, natural processes, and the surrounding context. As a result, the Rigdon landscape analysis is seen as more strongly connected to and influenced by the overarching ecological processes. Looking at the landscape scale ensures all the pieces of the whole picture are included in the analysis. The purpose of the assessment is to provide a means by which the Rigdon landscape can be understood and can inform future project planning to help shape the landscape.

Figure 4 Rigdon landscape

FLAD Process Overview

A landscape assessment precedes a NEPA analysis. Through this process the planning team and stakeholders can develop a better understanding of the landscape by viewing the ecological system as being comprised of integrated resources. This knowledge supports a well-informed NEPA process so ideas and decisions are realistic and attainable.

The FLAD process follows eight steps through two phases. In the analysis phase, the first five steps lead to information explaining the character and function of the landscape as an ecological system. The second phase is the design phase in which participants identify objectives and then spatially describes those objectives on the landscape.

Analysis Phase

In the first step, participants identify landscape elements such as patches, matrix, and corridors. In the second step, participants identify landscape flows including water, fire, wildlife, and humans. Then in the third step people determine interactions between these identified elements and flows. In the fourth step, they describe natural succession and the disturbance regime that have been operating on the landscape. Then in the fifth step, they consider linkages between the area of interest and the surrounding landscape. This completes the first phase.

Design Phase

This phase encompasses the last three steps. In the sixth step, participants derive desired landscape patterns from the analysis phase, as well as existing documentation like the Forest Plan and the Northwest Forest Plan. Then in the seventh step, they verbally describe desired conditions of these intended landscape patterns. And in the eighth step, they map the areas of the landscape within which a particular landscape pattern is desired, based on objectives.

While incorporating over-arching ideas, the process is detailed and thorough. The outcome provides practitioners with a comprehensive understanding of the landscape as well as a strong foundation of ecological knowledge upon which to construct their desired landscape outcomes. The results are more integrated, inclusive and extensive, thereby fostering more likely continued success.

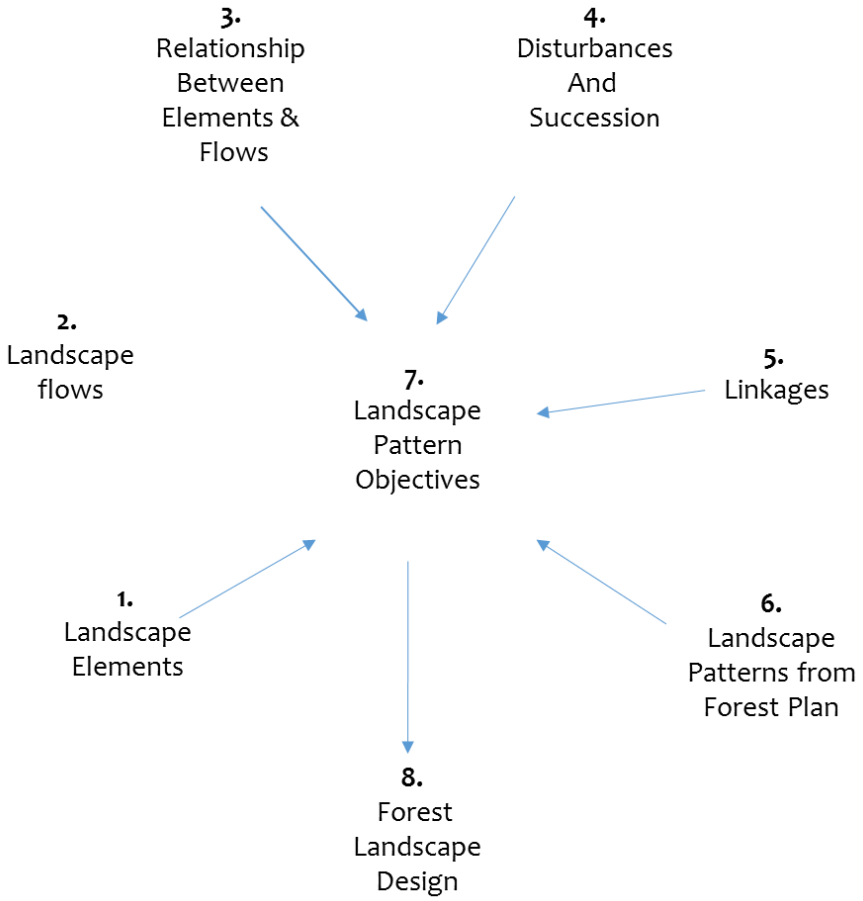


Figure 5 Eight steps of the FLAD process

Interdisciplinary Team

Planning Silviculture Fire Ecology Botany Soil Wildlife

The U.S. Forest Service engages in public forestland management for long-term sustainability, resiliency, ecological restoration, watershed protection, collaboration, and networking within an interdisciplinary team environment. To address and understand the Rigdon landscape, the Middle Fork Ranger District created an interdisciplinary team comprised of multiple resource specialists. The goal of this interdisciplinary team is to integrate ideas and resources. The FLAD process is slightly segregated into various natural resources and specialists focus on their own area of expertise. Utilizing their expertise as well as knowledge from the watershed analysis and watershed action plan, the team sought to make a variety of associations including between upland and aquatics, wildlife habitat with recreation use, roads with wildlife, aquatics with terrestrial.

This is a systems-thinking approach. The goal was to not only integrate the people involved in the landscape analysis, but to further incorporate their ideas. The team looked at resources separately while also considering how each resource influenced other resources. Ultimately this led to an integrated understanding about how the resources work together to form a functioning ecosystem.

Water Fish Fire Recreation Engineering Heritage

District Ranger Deputy District Ranger GIS

Southern Willamette Forest Collaborative

The Southern Willamette Forest Collaborative (SWFC) is a community-based forest collaborative in Oakridge, Oregon that works with the Willamette National Forest, Middle Fork Ranger District. The SWFC mission is to promote local forest management solutions that foster ecological resiliency and promote socioeconomic health in the southern Willamette Forest area and communities. SWFC participants include community organizations, agencies, conservation groups, small businesses and community members. The SWFC convenes diverse stakeholders to increase the pace and scale of restoration on the District by developing social agreement, building trust, and exploring innovative ways to do business.

The SWFC Rigdon Collaboration Committee (RCC) began in the fall of 2016 to provide collective input to the Rigdon interdisciplinary team (IDT). The RCC is open to the public and works with a dedicated facilitator, established policies and procedures, and is guided by a leadership subcommittee. The SWFC collaborative process is to first engage in shared learning followed by consensus decision making. The RCC hosted field trips, classroom sessions, and joint meetings with the IDT. After the shared learning phase, four subcommittees drafted landscape level zones of agreement (ZOAs) for desired outcomes for aquatics, human uses, wildlife and vegetation. The ZOAs were then workshopped by the larger committee and presented to the IDT for consideration. Over time, the RCC will reconvene to develop project and site specific ZOAs as needed. Participants look forward to engaging in public outreach and education for Rigdon projects and eventually participating in multi-party monitoring.

Chapter II Flows and Elements

FLAD Steps 1, 2, & 3

Chapter Summary

This chapter is a synthesis of information describing the Rigdon landscape and how the parts of the landscape interact. The Rigdon planning team, along with input from the Southern Willamette Forest Collaborative, developed this series of maps and associated key findings about natural processes, historical conditions, and current conditions in an integrated manner.

First, the major landscape flows (those things that move across or through landscapes) are outlined. Next, the major elements are described in terms of the matrix or fabric (the most connected portion of the landscape), patches, and corridors. The effect of each of these elements on the major landscape flows is described to allow a review of landscape interaction.

This chapter provides a means by which the Rigdon landscape can be understood as a system and to use this knowledge to help identify target landscapes and management activities.

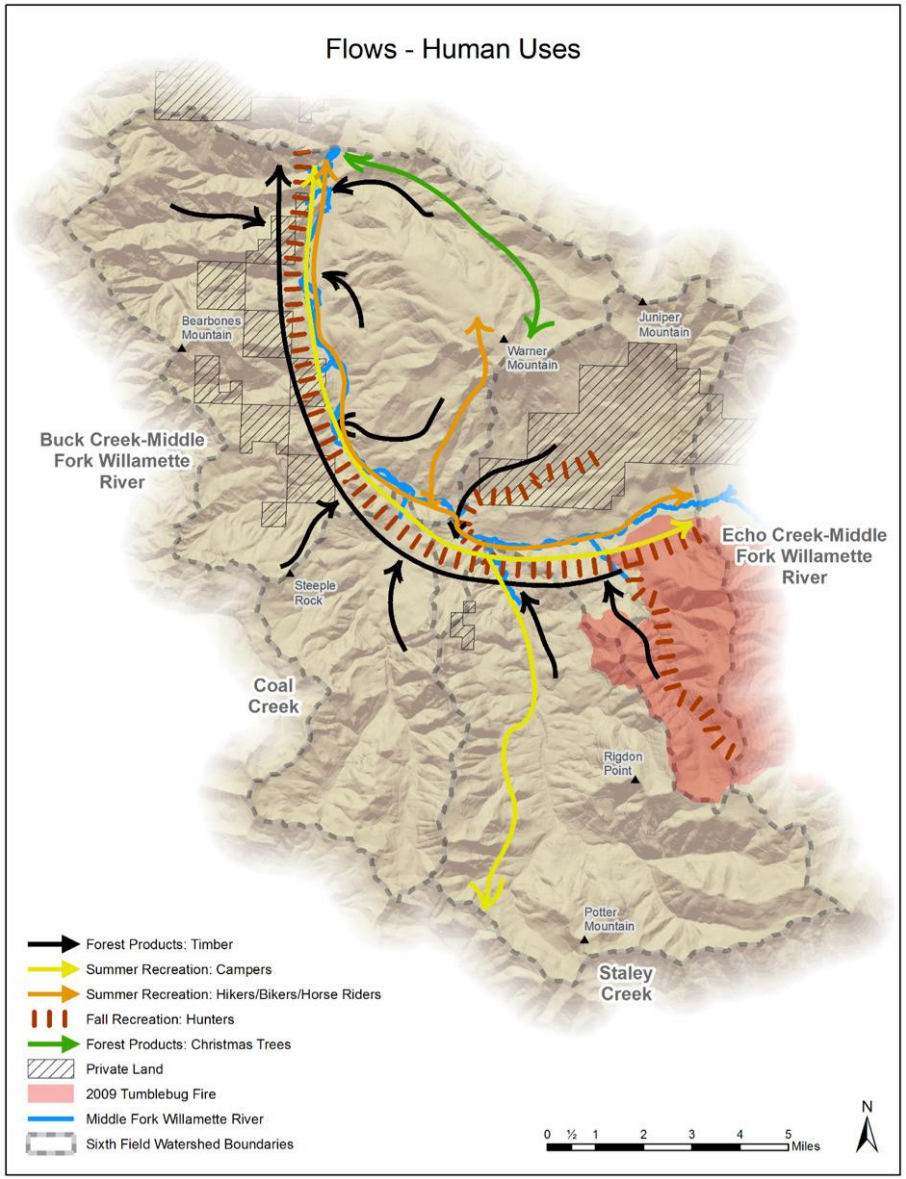
Collaborative Participation

Early in the process the Rigdon planning team joined the SWFC Rigdon Collaboration Committee (RCC) for a series of shared learning sessions to begin to understand the Rigdon landscape and introduce the RCC to the Forest Landscape and Design (FLAD) process. The RCC subsequently worked to sort topics important to them under four major categories (Human Use, Vegetation, Aquatics and Wildlife) and brainstorm current and desired conditions. These four major categories served as the beginning framework for the Rigdon planning team to synthesize describing the landscape and how the parts of the landscape interact.

Once the planning team developed interim descriptions of landscape flows and elements, a workshop was conducted with RCC to share information and obtain feedback. The workshop was highly interactive and the RCC members provided valuable insight and offered many suggestions. The Rigdon planning team, along with the input provided by the RCC, developed the following series of maps and associated key findings about natural processes, historical conditions, and current conditions in an integrated manner.

Figure 6 Field trip with Collaborative to the edge of the Jims Creek Restoration Project

Figure 7 Field Trip with Collaborative viewing the Rigdon landscape



Flows – Human Uses

Description

Five flows associated with human uses were identified and mapped:

- Fall recreation - hunters
- Summer recreation - campers
- Summer recreation - bikers, hikers, horseback riders
- Forest products - Christmas trees
- Forest products - timber harvesting

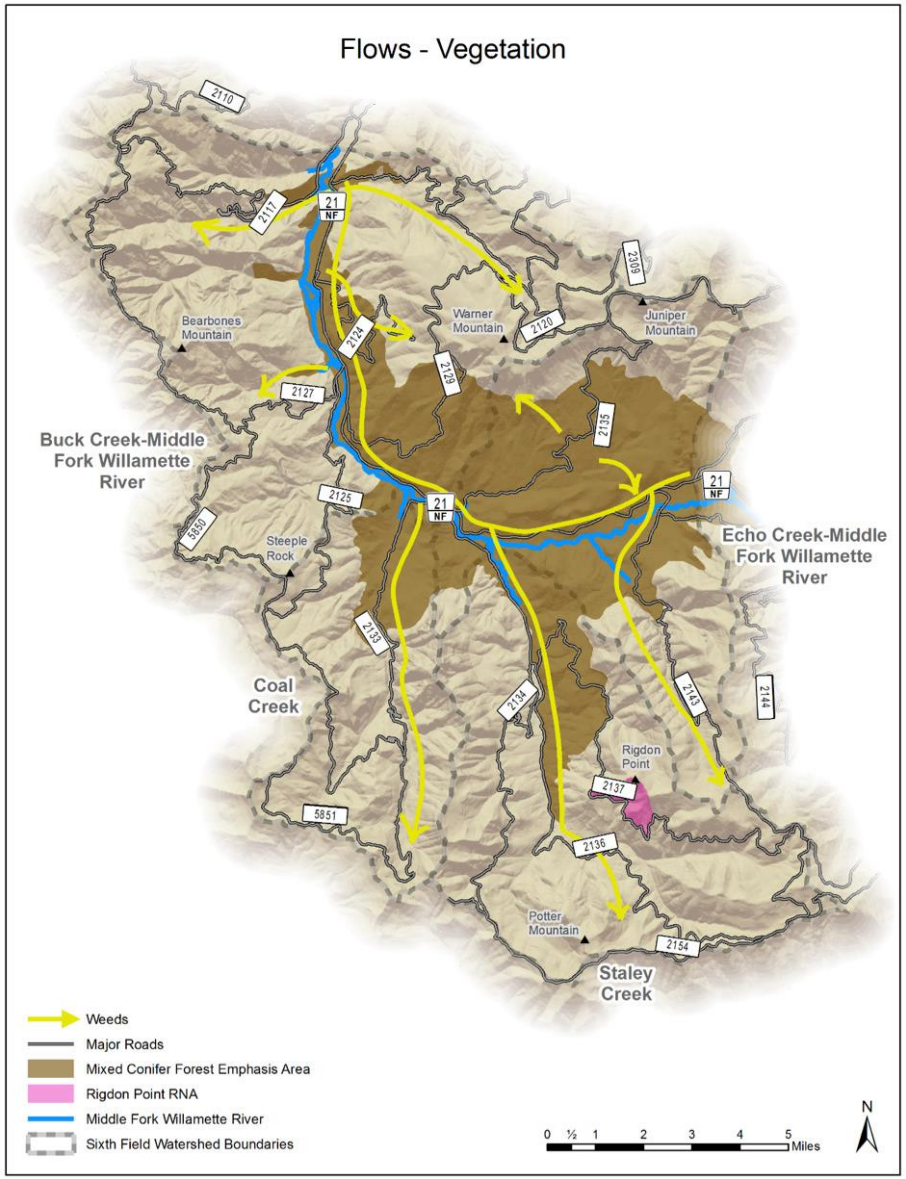
Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Evidence suggests people used this landscape for centuries for both sustenance and travel. As a key trade route for the Klamath and Molalla tribes, they hunted, fished, and managed this landscape. Temporary camps have been found along the major riverways throughout the landscape.
- Vegetation in the landscape (e.g. camas and acorns), especially in the mixed conifer area, was a staple in the native diet. Culturally modified trees found in abundance in Jim's Creek area are evidence of their use of these trees for food and medicine.
- This was also an important travel corridor for early settlers and later as a military wagon road facilitating trade over the Cascade Mountains.
- Use in this area was seasonal and life-sustaining.
- Sheep grazing was influential at certain times as well.

Key Findings: Current Conditions

- Recreation flows are primarily concentrated along the Middle Fork Willamette River corridor utilizing the five developed campsites and trails in and along the river.
- Some of the summer recreation flows extend up towards the Warner Mountain area, using existing trails, and road 2134. Some of the fall recreation flows extend into the Tumblebug fire area and the adjacent larger private lands.
- Hunting and the Tumblebug fire area correspond to the dispersed campsites used at the time.
- Forest product flows are more dispersed across the area utilizing all existing system roads and flowing down into the Middle Fork Willamette River corridor and out. Christmas tree harvesting is focused in the northern part of the area.
- Poor road conditions also influence flows.



Flows - Vegetation

Description

Five flows associated with vegetation were identified:

- Invasive species - weeds
- Unique plant genetic flow – knobcone pine & Alaska yellow cedar
- Sensitive plant species genetic flows
- Unique plant association genetic flow – mixed conifer species (ponderosa pine & Oregon white oak)

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Natural processes, such as fire and wind, were key drivers of all genetic plant flows. Disturbances served to create appropriate seedbeds, open knobcone pine cones, and allow flow to freshly disturbed areas.
- Native people may have aided genetic flows through planting and managing landscapes. This may be especially true in the mixed conifer areas, where camas, ponderosa pine, and Oregon white oak were prevalent.
- Wildlife aids in genetic flows.
- Aquatic (water) aids in genetic flows.
- Weed seed source was less historically and had a slower transport pace.

Key Findings: Current Conditions

- Humans are the primary vectors of weeds and invasive species, and flows mostly follow major roads such as road 23 and the four digit roads as well as in and out of recreation areas.
- The unique plants and associations have genetic flows that are along the edges of their natural range. The knobcone pine occurs within the Rigdon Point RNA and is dependent upon fire to flow. The Alaska yellow cedar occurs up in the higher elevations and is rare in this area. For the mixed conifer, the pine and oak flow is likely towards the south facing drier areas in the emphasis area.
- The sensitive plant species in this area are found primarily in the meadows that tend to occupy the higher elevation areas. They are also found in the riparian corridors, although flows are limited.
- Wildlife management is currently influencing the flow of vegetation.
- Allowing or suppressing fire is influencing the flow.
- Planting after fire and harvest is influencing the flow.

Flows – Fire

Description

Two major types of flows associated with fire were identified:

- Ignition sources – human
- Ignition sources - natural

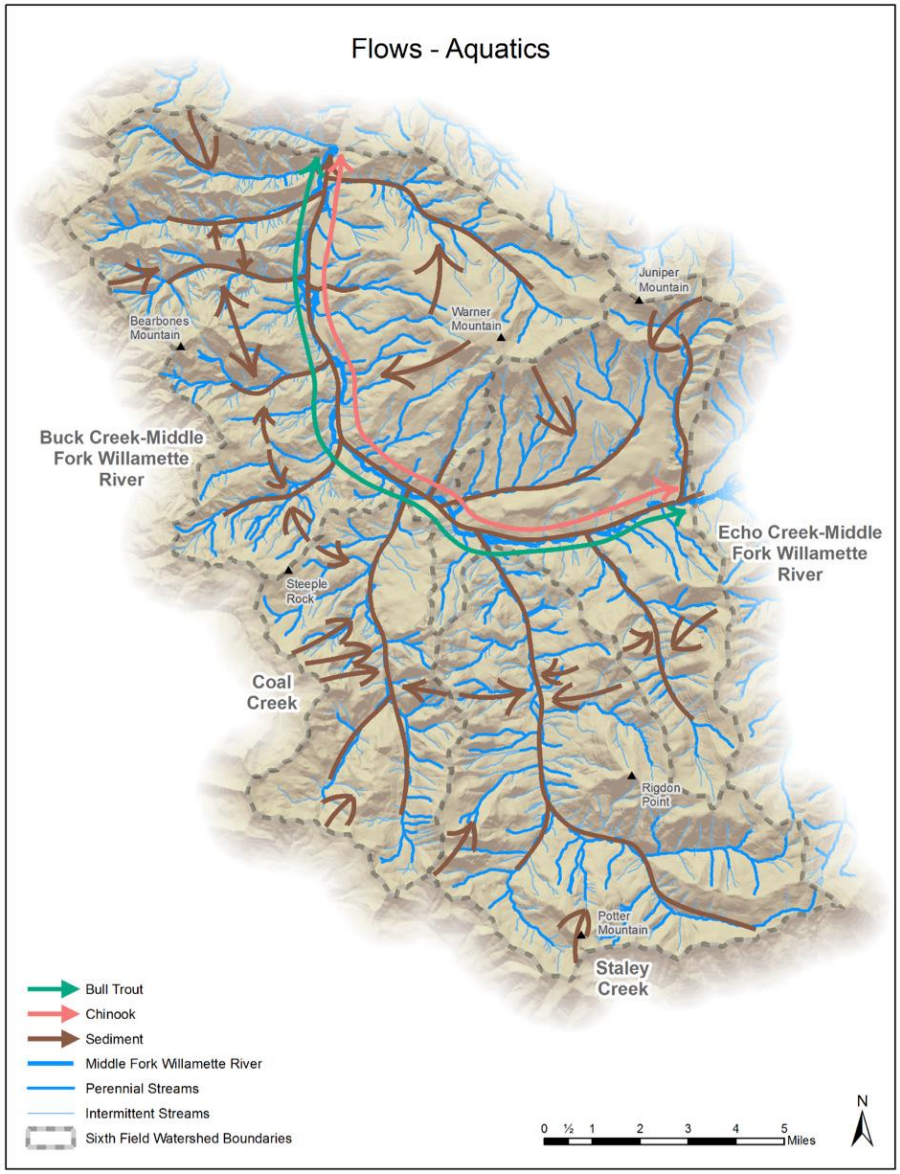
Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Fire has been a dominant disturbance flow through the landscape for centuries. Flows have varied in frequency, severity and size.
- Moister portions of the landscape have seen fire flows less frequently, with more severe effects. Drier portions of the landscape have seen frequent fire flows, with mixed to low severity effects.
- Ignitions may have been from various sources. Lightning played a major role in initiating fire flow. Native people may have ignited fires to manage portions of the landscape, especially in the mixed conifer area. European settlers were also known to set fires for clearing and land management.
- Natural ignitions were likely large in number, resulting in variable flows, depending on fire weather and fuel conditions.
- Spring fire starts could have burned longer in the past.

Key Findings: Current Conditions

- Fires suppression has altered the vegetation and fuel conditions and changed the fire regimes.
- Specifically, frequent fire flows have been affected by fire suppression, changing the flow pattern and effects.
- Today the fire flows may be more extreme due to changed vegetation and fire suppression. Closed forest with high canopy cover dominates the landscape providing a continuous canopy fuel. This may have increased fire flows during extreme weather conditions. The Tumblebug fire along the eastern edge of the area is a good example of the current potential flows in more extreme fire weather.
- Human use has increased and the impact from human ignitions is greater than historically.



Flows – Aquatics

Description

Eleven major aquatic flows were identified:

- Water Quality – Temperature
- Water Quality – Turbidity
- Water Quality – Nutrients
- Water Quality – Quantity
- Water Quality – Overland Sediment
- Water Quality – Large Wood Material
- Aquatic Population – Spring Chinook
- Aquatic Population – Bull Trout
- Aquatic Population – Other Native Fishes
- Aquatic Population – Macro Invertebrates
- Aquatic Population – Wildlife

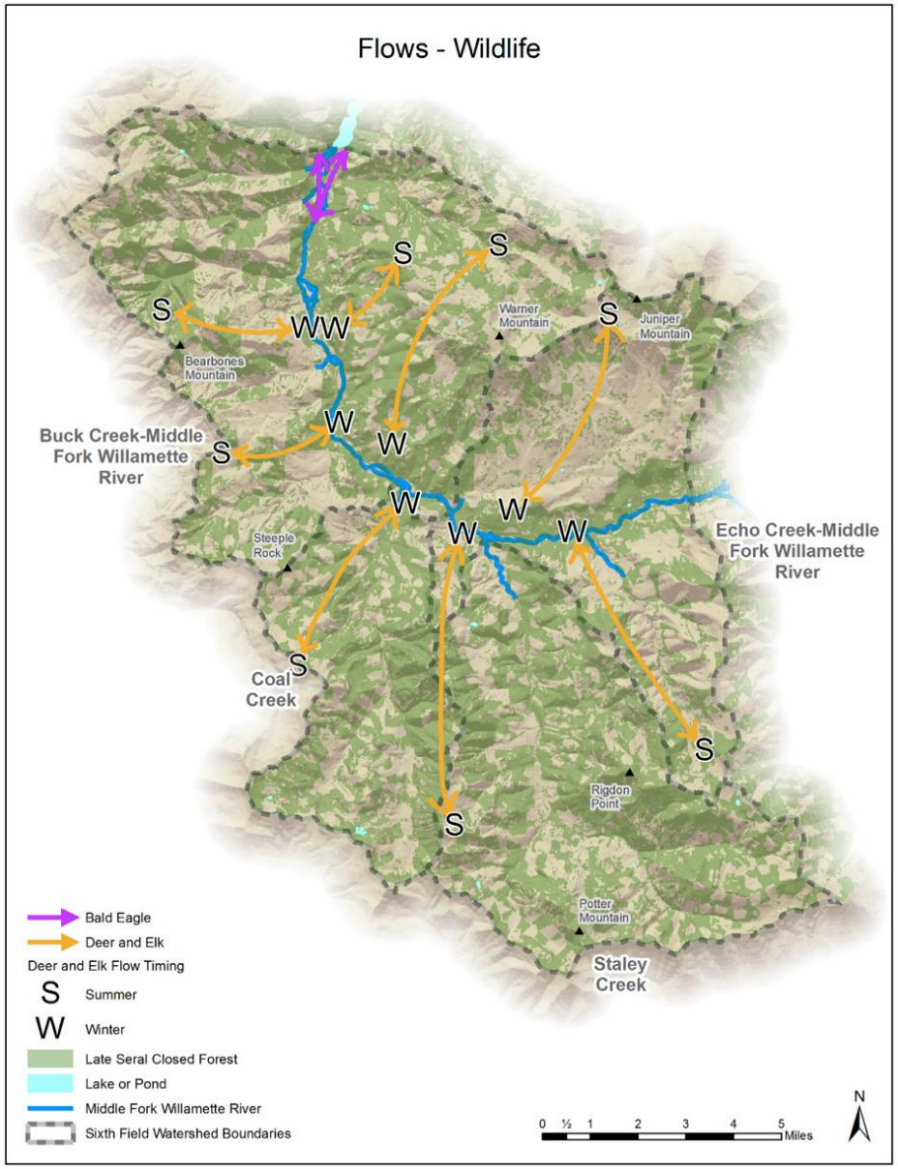
Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Watersheds were formed by volcanism, uplift, and climate (i.e. glaciation).
- Naturally occurring periodic disturbances (floods, landslides, fires, and droughts) influenced flow patterns and the distribution of aquatic populations.
- Prior to western land management practices, unaltered watersheds were resilient to natural disturbances and maintained high water quality and habitat complexity due to properly functioning hydrological processes.
- Anastomosed or connected wetted woodlands were found within unconstrained valley segments of riparian areas.
- All life stages of spring Chinook, bull trout, and other aquatic organisms thrived throughout their historic range.

Key Findings: Current Conditions

- Western land management practices have affected the timing, frequency, duration, and magnitude of naturally occurring periodic disturbances, generally leading to cumulative negative effects to water quality and aquatic populations. Global climate change has affected water quality and aquatic populations within the planning area.
- The effects of increased water temperature, turbidity, and overland sediment flows have negatively impacted water quality and aquatic populations.
- Streams have been directly and indirectly modified by the construction of infrastructure within the riparian area.
- Wood recruitment and retention has been reduced or eliminated due to clear-cuts, riparian harvest, and stream cleaning.
- Degraded and disconnected floodplains impair natural processes and reduce habitat complexity and resiliency; dams have severed flows of aquatic populations.
- The persistence of Spring Chinook and bull trout populations depends on continual management intervention.



Flows – Wildlife

Description

Eight major flows associated with wildlife were identified:

- Big Game – Deer & Elk
- Pollinators – Bumblebees, Butterflies & Hummingbirds
- Cavity Excavators
- Late Seral Species – Red Tree Voles
- Late Seral Species – Northern Spotted Owl
- Special Status Species – Northwestern Pond Turtles
- Special Status Species – Bald Eagles
- Beavers

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Natural processes, like fire, wind, insects, pathogens, and aquatic flows played key roles in providing habitats and patterns (see matrix, patch, and corridor key findings).
- Wildlife flows, especially elk and deer, may have been influenced by native management of the area, specifically in the mixed conifer area.
- Late seral habitat had better connectivity in the past to facilitate wildlife flows.
- Late seral habitat was more prevalent in moister, higher elevations to facilitate wildlife flows in those portions of the landscape.

Key Findings: Current Conditions

- Elk flows are from higher, cooler areas in the summer to lower areas in the winter. Some deer follow this pattern, but many do not migrate seasonally. Availability of early-seral habitat may be limiting for populations.
- Pollinators are scattered across the watershed, and flow is driven by availability of flowering plant species and distribution. Natural disturbances create habitat for pollinators. Meadows and early-seral habitat are important.
- Flow of cavity excavators is driven by the abundance of snags and down wood. Some species have very specific habitat requirements such as open canopy pine-oak and recently burned areas.
- Northern spotted owls are dependent on adequate levels of late seral habitat occurring within their home range. Flows are within home ranges during the breeding season with more wide-ranging foraging in the winter. Mid-seral stands provide dispersal habitat and young may disperse within and between watersheds.
- Pond turtle flows are seasonal and typically occur within one mile of key aquatic habitats (ponds and reservoirs). Availability of late seral habitat near Hills Creek Reservoir is important for bald eagle flows and persistence. Beaver flows are along stream and riparian corridors, but can disperse throughout watersheds if conditions are favorable.
- Riparian corridors are functioning to connect late seral patches across the watershed. Important for species with limited capability to disperse such as red tree voles.

Elements - Matrix (Fabric)

Late Seral Closed Forest

Description

The dominant element in this landscape is the older forest with a high canopy cover referred to as late seral closed forest. Some stands are structurally complex, while others have limited understory features due to overstory canopy covers often exceeding 60%. Composition of the late seral closed forest varies across the landscape, from Douglas-fir dominated forest, to mixed conifer species forests (incense cedar, Oregon white oak, ponderosa pine, sugar pine), to true fir and mountain hemlock forests in higher elevations.

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- The conditions and characteristics of the late seral closed forest varied within the landscape. Landform conditions (e.g. degree of dissection), disturbance type, frequency and severity played a key role.
- The mixed conifer forest was dominated by a more open forest condition, with some heterogeneity in landscape pattern, influenced by landform and topography.
- Late seral closed forest was likely dominant in the upland, more mesic forest types, and along higher order river systems in moister vegetation types.
- Late seral closed forest, although prevalent in the more mesic landscapes, had fine scale variability due to insects, pathogens, wind, fire and other natural processes.

Key Findings: Current Conditions

- Late seral closed forest occupies about 54% of the landscape and most of this forest has had no or limited harvesting.
- Late seral closed forest is absent from the private land. Under private ownership, the dominant conditions are mid-seral closed canopy with patches of early seral.
- The late seral closed forest distribution has been affected by land management, and natural disturbance processes. Connectivity and edge have been most heavily affected.

Elements - Matrix (Fabric)

Late Seral Closed Forest

Effects on Human Use Flows

- The late seral closed forest has a limited overall effect on the recreation flows in the area, but the flows are concentrated in the Middle Fork Willamette River corridor. This corridor is dominated by the presence of older, closed canopy forest.
- Hunters avoid this forest type and prefer to hunt in areas of more diverse patches.
- Current timber harvesting flows in the area also avoid this type of forest and focus on mid seral patches due to current management direction.
- The late seral closed forest contains many of the cultural heritage sites.

Effects on Vegetation Flows

- This forest type provides a barrier to invasive weed flows. Weeds general require more open, disturbed conditions, tend to flow immediately adjacent to roads or waterways, and usually do not penetrate very far into closed forest conditions.
- Closed canopy forests inhibit the genetic flow of unique plant species such as pine and oak generally requiring more open, disturbed conditions.
- Closed canopy forests can foster the genetic flow of some rare plant species that generally can survive and/or thrive under closed canopy forest.

Effects on Aquatic Flows

- Late seral closed forest is generally beneficial to the water quality and aquatic flows in this area. These forests provide shade, contribute large woody material, filter overland sediment, and generally maintain high water quality. This, in turn, benefits all aquatic populations.

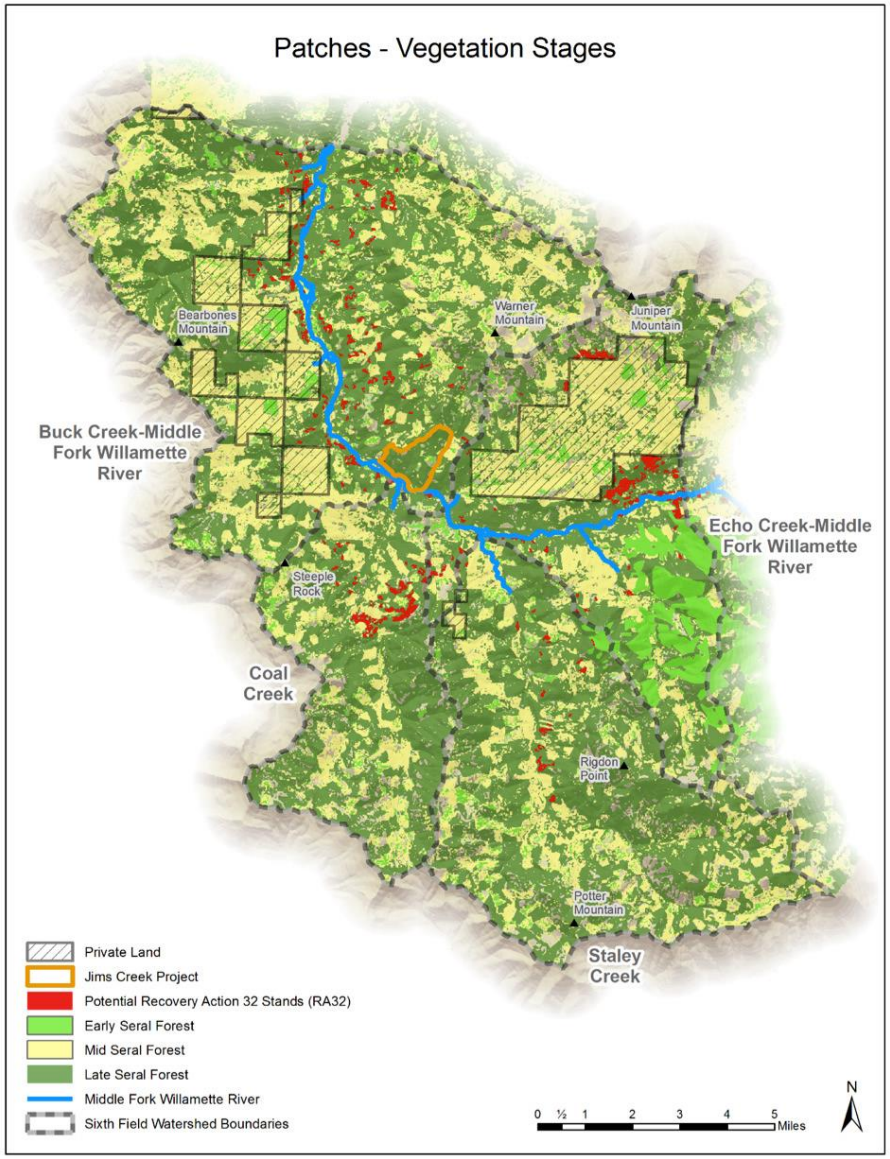
Effects on Wildlife Flows

- The late seral closed forest has a limited effect on the bald eagle and pond turtle flows, but foster all the other wildlife flows especially the Northern spotted owl and Red tree vole flows .
- Deer and elk use this forest type as travel and bedding areas, but rely more on early seral habitat for food sources.

Effects on Fire Flows

Late seral closed forest can both inhibit and foster fire flows in the area. Human ignition flows are generally along the major roads and near the recreation areas and can start as a ground-based fire. Microclimate conditions in these forests inhibit rapid fire flow under less than extreme fire weather. Under extreme fire weather, however, the lack of horizontal diversity can create conditions for crown fire to move throughout the closed forest.

- Late seral conifer forests have abundant lichen throughout their tree crowns, adding to the aerial fuel, and increasing ground to crown fire flow.



Elements – Patches Vegetation Stages

Description

These patches on the landscape reflect the different life stages of forest in terms of structure and function. They consist of the following:

- Early seral forest (the establishment stage of a forest following a disturbance such as fire or regeneration harvesting)
- Mid seral forest (stands develop into a dense, closed canopy forest where new trees are prevented from establishing and existing live trees may die due to competition)
- Late seral forest (where stands develop characteristics including large live trees, multiple canopy layers, coarse woody debris accumulation, and small gap-type disturbances)
- RA32 forest (high quality late seral habitat for the Northern spotted owl as described in Recovery Action 32 of the 2011 Recovery Plan). These stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components, such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Seral patch types and distribution across the landscape was greatly influenced by an array of biophysical factors including wind, fire, insects, and pathogens.
- In the lower drier forests, a mixed conifer forest dominated with pines, oaks, and other hardwoods present in the more open patches. Many open and early seral patches in this forest type had high grass cover. Mid and late seral forests tended to be more open canopy than in higher elevations. Open canopy cover in this forest type was influenced by landform, topography, and frequent fire.
- In the more mesic or higher elevation forests, the mid and late seral patches were likely closed canopy. Early seral and open forest patches existed and created fine scale diversity but there was likely more closed canopy late seral patches than the lower, drier parts of the landscape.
- Infrequent, high severity fires may have created large patches of complex early seral on the landscape, with large snags and down wood present.

Elements – Patches Vegetation Seral Stages

Key Findings: Current Conditions

- Early seral patches are generally small and scattered across the area except for the large patch along the eastern edge of the area resulting from the 2009 Tumblebug fire. The smaller patches are uniform in size and shape and generally resulted from recent regeneration harvesting. They lack some of the structure found in the Tumblebug fire patch (e.g. scattered legacy trees, snags, and down wood).
- The mid seral patches are the result of regeneration harvesting in the last 50 years. Large blocks of this patch occur on private land. The patches on federal land are dispersed throughout the landscape. They are generally larger than the early seral patches but still lack the structure often found following a fire disturbance (e.g. snags and down wood).
- Most of the late seral patches across all forest types is closed canopy as a contiguous feature on the landscape. The Jim's Creek project area has one of the few examples of late seral open canopy forest in the area.
- Mapping of the high quality late seral habitat, RA32, show these patches are small and scattered across the landscape. Some larger concentrations of patches north of Sacandaga and in the Coal Creek drainage also occur.

Effects on Human Use Flows

- Early seral patches attract the fall recreation hunting flows, but have limited effect on the summer recreation flows.
- Timber production flows are greatest in the mid seral patch type.
- The effect of late seral patches, which are primarily closed forest, are described in the matrix section.
- RA32 can be a barrier to forest product flows due to management considerations.

Effects on Vegetation Flows

- All seral patch types provide a source and habitat for some vegetation flows, but also inhibit other flows. Patch size plays a role as well, with small patches more limited in flow than larger patches.
- Species such as Knobcone and ponderosa pine have had opportunities to flow into the Tumblebug Fire early seral patches. However, early seral patches may inhibit some rare species. Flows will vary from early seral created by management versus patches created by fire.
- The mid seral patches can provide a source and habitat for terrestrial weeds, but often inhibit the other vegetation flows.
- Late seral and RA32 patches can provide a source and habitat for some vegetation flows, but species flows dependent on open canopy conditions such as ponderosa pine, oak, and knobcone pine are inhibited if the patches are in closed forest condition.

Effects on Aquatic Flows

- Early seral patches created from harvest increase water temperature, turbidity, and overland sediment flows. They also reduce water storage, inhibit large wood material supply, and foster nutrient input. They inhibit cold water species such as spring chinook and bull trout, have little effect on macroinvertebrates, and foster some aquatic wildlife flows. Much of this depends on the size, composition, structure, and distribution of the patches in the area.
- Mid seral patches inhibit increases in water temperature and turbidity, foster overland sediment flows, water quantity, and large wood material accumulation. However, they may inhibit nutrient input. Overall, they have little effect on most aquatic population flows, but foster aquatic wildlife flows.
- Late seral and RA32 patches have a similar effect to water quality flows as mid seral patches except they inhibit rather than foster overland sediment flows. They foster spring chinook and bull trout and aquatic wildlife flows.

Effects on Wildlife Flows

- Early seral patches foster deer, elk, bald eagle, and pollinator flows. They can be neutral to or inhibit the late seral species flows depending on size and distribution. In addition, they have a limited effect on beaver and pond turtle flows.
- Mid seral patches have a limited effect on the bald eagle, beaver, and pond turtle flows. They inhibit pollinator flows, while fostering deer, elk, and the late seral species flows by providing forage and dispersal connectivity. The effect depends on patch configuration.
- Late seral patches have a limited effect on the bald eagle and pond turtle flows, but foster all the other wildlife flows. RA32 is especially critical for Northern spotted owl and Red tree vole flows.

Effects on Fire Flows

- The effect of early seral patches on fire flows is dependent upon whether the patches have surface fuels and where they are located in relation to surrounding landscape. They may inhibit crown fire flows if patches are large enough. The large patch of early seral originating from the Tumblebug fire has increased short term flow potential for future surface fire, although fire behavior may make containment easier and may further inhibit crown fire potential in the larger landscape.

Elements – Patches Vegetation Seral Stages

Effects on Fire Flows Continued.

- Mid seral patches are primarily closed canopy forest in this area and can either inhibit or foster flows depending on where they are located, ground fuel distribution, and if fires are surface or crown. Some of the mid seral closed canopy forests are very difficult to burn.
- Similar to mid seral patches, late seral patches and RA32 are primarily closed canopy forest in this area and can promote fire flows in the canopy. The distribution of these patch types in context to the surrounding landscape would influence the degree of flow.

Elements – Patches Vegetation Communities

Description

This group consists of plant communities in non-forest or rare forest habitats, as well as unique plant species. The group is categorized into:

- Wet non-forest communities (wet, mesic, and sedge meadows, seeps and springs, swamps, sitka alder patches, vine maple patches and moist rocky areas)
- Dry non-forest communities (dry meadows, and dry rocky areas)
- Plant species designated as Threatened, Endangered, or Sensitive (TES) in accordance with the Endangered Species Act
- Unique forest habitat with oak, sugar pine, western white pine or knobcone pine,
- Mixed conifer forest

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- These communities are present because of suitable micro-site conditions (soil related, topographic, and climatic).
- Although physical processes were the primary drivers, disturbance played a key role. Dry non- forest communities, mixed conifer and unique forest habitats were all influence by frequent mixed severity fires, landslides, and other disturbances in the past.
- The mixed conifer forest contained more open canopy conditions with areas an abundant grass and shrub understory.
- Wet non-forested areas may have been maintained by a more constant and longer lasting snow pack, soil related conditions more suitable for water retention, and proximity to water sources.

Current Condition: Key Findings

- The wet non-forest communities are small and dispersed throughout the landscape.
- The dry non-forest communities are primarily rocky areas and found on south facing slopes throughout the area.
- The mixed conifer forest occupies the low elevation portion of the area primarily on the drier south facing slopes. Many patches in this type have increased in density over the last 100 years, and ponderosa pine, Oregon white oak and sugar pine are declining.
- Moist meadows are being encroached by conifers and invasive weeds.

Elements – Patches Vegetation Communities

Effects on Human Use Flows

- Most non-forest communities inhibit or have limited effect on recreation and forest product flows except hunters are often attracted to the communities used by deer and elk. Some trails (e.g. Dome Rock, Young's trail) go through non-forest communities and draw people who want to view wildflowers.
- TES plant species generally have no effect on recreation flows but their habitat protection status can inhibit forest product flows.
- Mixed conifer forest is currently a more closed forest than historically and isn't generally affecting human use flows. Flows may be increased in the limited more open areas (e.g. Jims Creek).

Effects on Vegetation Flows

- All the identified vegetation communities are susceptible to invasive species and any disturbance can increase their flow.
- Dry non-forest communities foster the flow of unique dry and xeric plant species. Wet non-forest communities foster flow of mesic to wet plant species.

Effects on Aquatic Flows

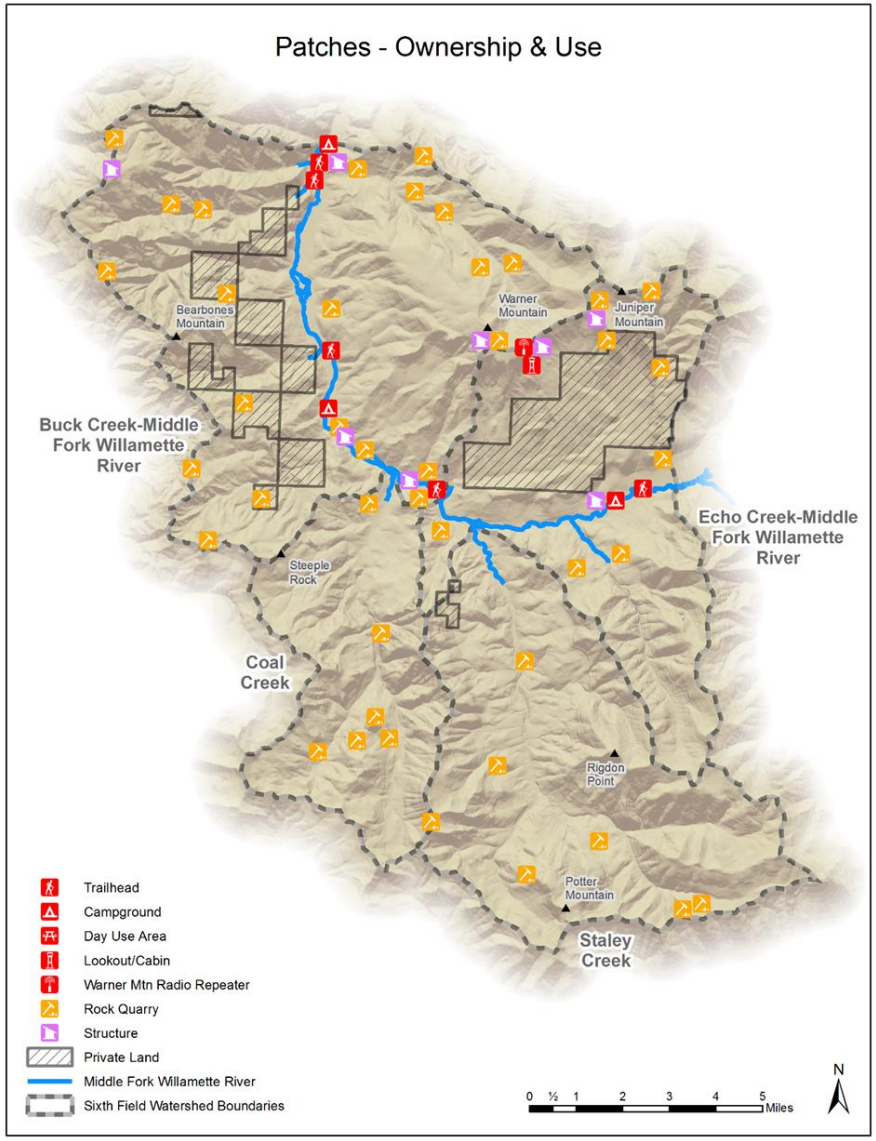
- Wetlands and other wet vegetation communities foster aquatic flows.
- Dry non-forest communities have little impact on aquatic flows.

Effects on Wildlife Flows

- Wet and dry non-forest communities, as well as the more open forest communities with pine, oak and mixed conifer species can foster deer & elk flows by providing forage.
- All of these vegetation communities foster pollinator flows.
- Wet and dry non-forest communities can inhibit late seral wildlife species flows that have small home ranges but have no effects on species with large home ranges like the Northern spotted owl.

Effects on Fire Flows

- Wet and dry non-forest communities can inhibit crown fire flows under certain fire weather conditions. They have a limited effect under extreme fire weather due to their small size.
- Today's mixed conifer forest, with a more closed canopy than historically, can promote crown flows under extreme fire weather conditions.



Elements – Patches Ownership & Use

Description

This group is a compilation of ownership types and structures or areas created by humans. The group consists of:

- Private Land
- Administrative sites - Recreation (campgrounds, day use areas, trailheads, etc.)
- Administrative sites - Rock quarries (both active and inactive)
- Administrative sites - Structures (buildings within campgrounds, pumping station buildings, lookout towers, etc.)

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Historical trails and temporary camps are found throughout the landscape where there was tribal hunting and gathering areas.
- In the late 1800's a way station occupied what is now known as Rigdon Meadows. This station provided meals, repairs and small item to travelers along the Emigrant Road and Oregon Central Military Wagon Road.
- Sheep herders utilized patches of open forest likely in meadows or in the open mixed conifer forested areas for grazing.

Current Conditions: Key Findings

- The recreation sites and structures are concentrated along the Middle Fork Willamette River corridor.
- The private land is interspersed in this landscape but there are two different patch size/patterns: one large contiguous patch in the Echo Cr. subwatershed and a series of smaller checkerboard pattern patches in the western portion of Buck Cr. subwatershed. The private land is all industrial timber land.
- The rock quarries are spread throughout the landscape but most are inactive.

Effects on Human Use Flows

- In general, recreation flows are attracted to all of the ownership and use patches. Recreation sites and structures, as well as rock quarries attract recreationists for day use and camping opportunities.
- Private land attracts fall recreation flows but is barrier to the summer recreation flows, including dispersed camping in the area. Current timber harvesting is concentrated on the private land fostering a forest products flow.

Elements – Patches Ownership & Use

Effects on Vegetation Flows

- Private land generally inhibits vegetation flows, except in the case of weeds where it becomes a habitat or a source for invasive species.
- Administrative sites generally have limited effect on vegetation flows but can be a source for weeds and inhibit TES species flows.

Effects on Aquatic Flows

- Private land generally inhibits the aquatic population flows in the area and has a mixed effect on water quality flows. It can increase turbidity, nutrient, and overland sediment flows while inhibiting temperature, quantity and large wood input flows.
- Administrative sites generally have a limited effect on aquatic flows can increase turbidity and overland sediment flows.

Effects on Wildlife Flows

- Private land might provide limited forage to promote deer and elk flows but inhibits most of the other wildlife flows due to lack of structural and plant species diversity.
- Administrative sites may inhibit or provide a barrier to wildlife flows due to noise disturbance and avoidance factors.

Effects on Fire Flows

- Administrative site patches increase human ignition source flows. Once fires start, however, some sites may inhibit fire flow due to a lack of ground fuels and more open canopies.
- Private land can decrease human ignition source flows because they close access during high fire conditions. Once fires start, however, their closed canopy forests can foster crown fire flow under extreme fire weather conditions.

Elements – Patches Aquatic Communities

Description

This group consists of the following aquatic communities:

- Lakes & Ponds
- Unconstrained Valleys (Valley confinement describes the degree to which bounding topographic features limit the lateral extent of the valley floor and the floodplain along a river. Unconfined or unconstrained valleys are generally less extensive than confined valleys, but host a diverse array of terrestrial and aquatic organisms and provide disproportionately important ecosystem functions
- Aquatic Habitat Patches (i.e. pools)
- Floodplains (an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Lakes and ponds provided habitat for aquatic and terrestrial species.
- Unconstrained valleys provided complex habitats, supported water quality and crucial function for habitat, sediment, wood sinks, and water quality.
- Functioning floodplains were connected to the surrounding aquatic system.
- Aquatic habitat patches were complex and abundant throughout the area.

Current Condition: Key Findings

- The lakes and ponds in this area are scattered and small (1/10 to 2 acres in size). They are buffered as special habitats and protected under the Aquatic Conservation Strategy.
- Aquatic habitat patches are reduced and simplified.
- Floodplain maintenance, formation, connectivity, and function are greatly reduced.
- The location of unconstrained valleys remains the same throughout the area, however the hydrological and ecological functions are heavily degraded.

Effects on Human Use Flows

- The scattered lakes and ponds attracts the summer recreation flows but their habitat protection status inhibits forest product flows.
- Unconstrained valleys, aquatic habitat patches and floodplains generally have little effect on human use flows but do inhibit forest product flows.

Elements – Patches Aquatic Communities

Effects on Vegetation Flows

- Aquatic communities have little or no effect on most vegetation flows but can foster or increase rare plant species flows by providing a seed source or propagule source.

Effects on Aquatic Flows

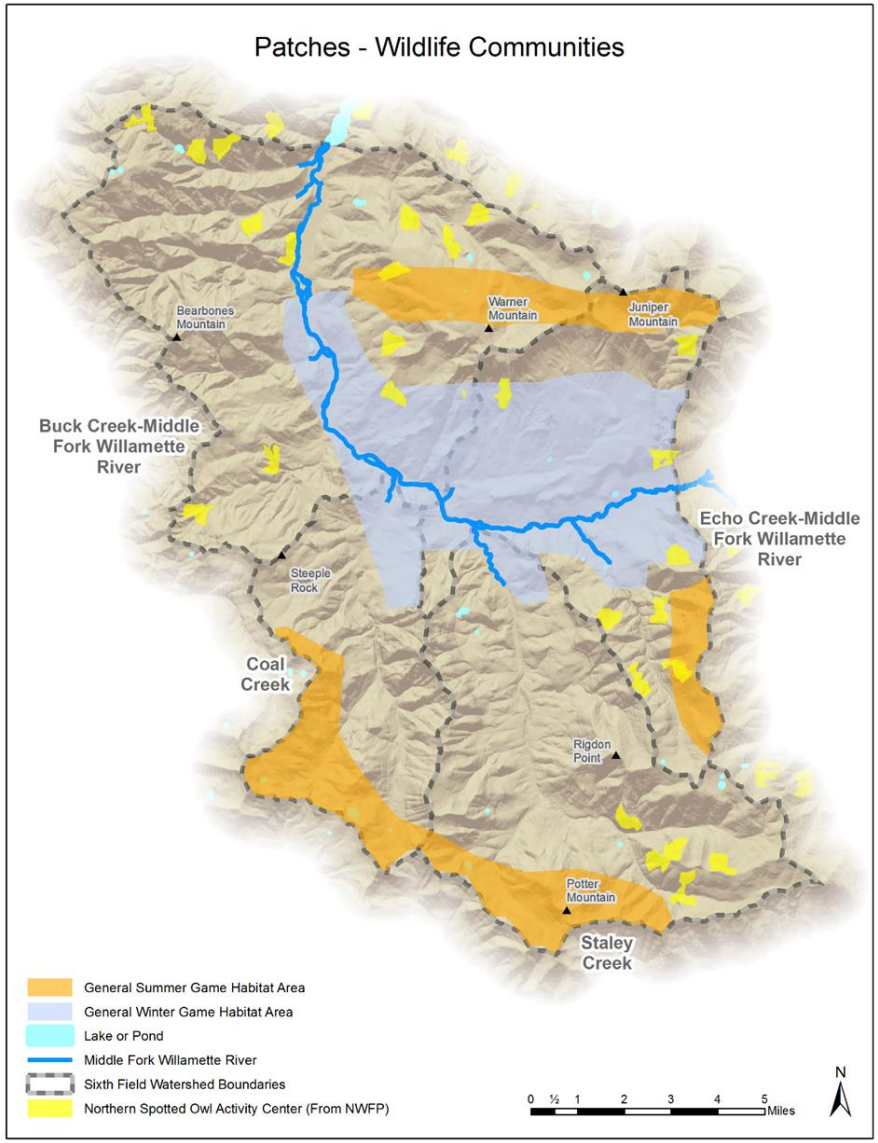
- The water associated communities (i.e. everything except big game range) are beneficial to aquatic flows fostering water quality flows such as temperature, quantity, nutrient and aquatic population flows.

Effects on Wildlife Flows

- Aquatic communities have limited effect on late seral species flows with larger home ranges, such as the Northern spotted owl and red tree vole, but foster late seral species and the special status species with small home ranges dependent upon moisture such as beavers and pond turtles.

Effects on Fire Flows

- Aquatic communities can inhibit fire flows if large enough.



Elements – Patches Wildlife Communities

Description

This group consists of the following wildlife communities:

- Big game summer/winter range (area where deer and elk concentrate seasonally)
- Northern spotted owl habitat patches (both the 100-acre habitat patches designated in the Northwest Forest Plan and active nest patches)
- Red tree vole high priority site designations
- Northwestern pond turtle key aquatic habitat patches

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Historically, the wildlife patches for those wildlife species dependent upon late seral forest (Northern spotted owl and red tree vole) were likely larger, more numerous and connected.
- Big game summer/winter patch location changed over time following disturbances that created/maintained early seral forest.

Current Condition: Key Findings

- Management has altered and/or reduced the amount of habitat for big game, Northern spotted owl and red tree voles by reducing the amount of early and late seral forest on the landscape.
- For Northwestern pond turtles, basking and nesting habitat has been potentially reduced because of stream channel and floodplain degradation.

Effects on Human Use Flows

- These wildlife patches have limited effect on recreation flows.
- Timber production flows avoid northern spotted owl habitat patches and red tree vole areas redirecting the flow elsewhere.

Effects on Vegetation Flows

- These wildlife patches have limited effect on vegetation flows.

Effects on Aquatic Flows

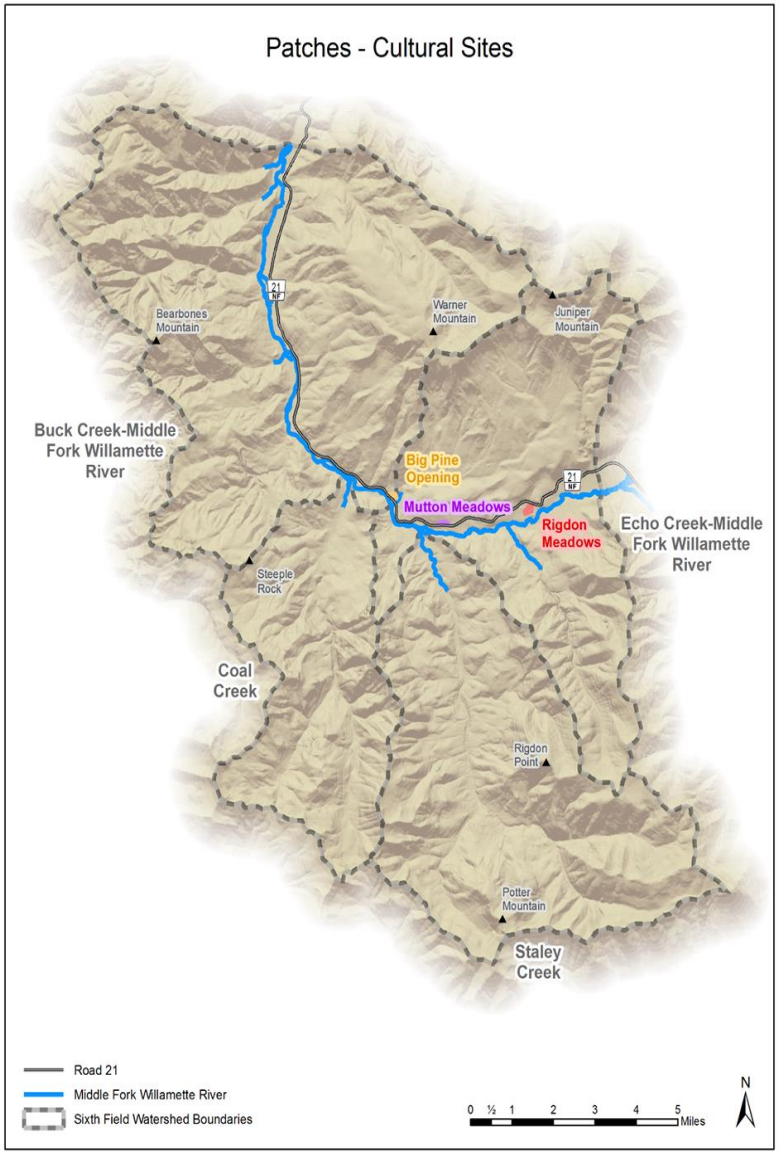
- These wildlife patches have limited effect on aquatic flows.

Effects on Wildlife Flows

- The Northern spotted owl, red tree vole and Northwestern pond turtle patches promote wildlife flows by providing areas of refugia for many other species.

Effects on Fire Flows

- The Northern spotted owl and red tree vole patches may have a buildup fuels from management restrictions and could promote the flow of fire.



Elements – Patches & Corridors Cultural Sites

Description

These patches and corridors represent the historical use of the landscape. Over half of the recreation sites in this landscape are also cultural sites. This group consists of:

- Klamath-Molalla Trail – historic travel route utilized by indigenous people (located roughly in the location of Road 21)
- Free Emigrant Trail – historic travel route used by early emigrants providing a shortcut from the Oregon Trail to the Willamette Valley (located roughly in the location of Road 21)
- Oregon Central Military Wagon Road – historic travel route overlaying the Free Emigrant Trail to facilitate travel and trade over the Cascade Mtns.)
- Cultural sites – Areas used by early travelers (Rigdon Meadows, Big Pine Opening, Mutton Meadows)
- Cultural sites – Culturally modified trees (trees utilized by indigenous people to harvest inner bark for food and medicine)
- Cultural sites – Other prehistoric sites (areas used by indigenous people) such as the Jim's Creek area

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- The general area now occupied by Road 21 was important corridor used by indigenous people and early travelers into the area. Much of the historical use of this area was in the Middle Fork Willamette River Corridor.
- Prehistoric cultural sites are small patches scattered throughout the landscape.
- Meadows or opening such as Rigdon Meadows, Big Pine Opening, and Mutton Meadows were patches used by early travelers.

Current Condition: Key Findings

- Cultural sites are protected.
- Cultural sites can be used by tribes for traditional/cultural purposes.

Effects on Human Use Flows

- Limited effects on current recreation flows but recreation flows do match historical flows.
- Timber product flows may be interrupted or redirected to avoid protected cultural sites.

Elements – Patches & Corridors Cultural Sites

Effects on Vegetation Flows

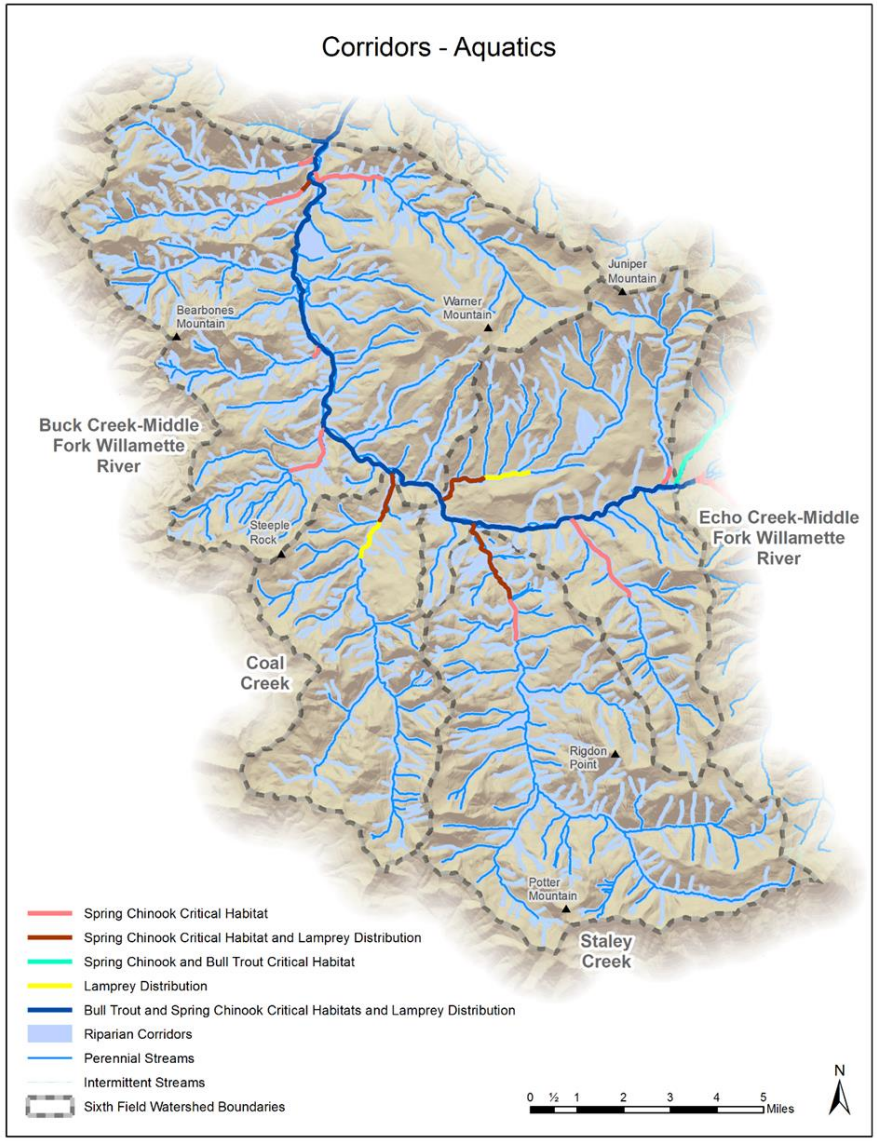
- Limited effects on flows. Culturally modified trees provide some insight into pre-settlement land use, including potential management of the surrounding landscape.

Effects on Aquatic & Wildlife Flows

- Limited effects on flows.

Effects on Fire Flows

Limited effects on flows but historically increased human ignition source flows through underburning.



Elements – Corridors Aquatics

Description

These corridors connect water-dominated features as well as aquatic populations. The group consists of:

- Rivers/streams
- Riparian areas (i.e. those areas adjacent to rivers/stream margins and banks dominated by vegetation that is directly related to the adjacent water)
- Bull Trout critical habitat
- Spring Chinook critical habitat

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Riparian areas were continuous corridors.
- Streams were unobstructed by dams or other infrastructure that reduced or eliminated connectivity.
- Habitat complexity and availability throughout streams and riparian areas connected patches of aquatic and terrestrial populations.

Current Condition: Key Findings

- Management has affected the integrity of many riparian systems and many are in a degraded condition.
- Roads and culverts have specifically affected riparian systems disrupting natural processes.
- Habitat complexity is reduced and more disconnected within the stream and riparian corridors

Effects on Human Use Flows

- Aquatic corridors attract recreation users in the area and foster their flows.
- Aquatic corridor protect buffers inhibit forest product flows.

Effects on Vegetation Flows

- Aquatic corridors provide a pathway for invasive species flows and foster native and sensitive plant species flows.

Effects on Aquatic Flows

- Riparian areas are beneficial to water quality and aquatic population flows by fostering water temperature, nutrients, quantity, and large wood input flows; by inhibiting turbidity and overland sediment flows; and fostering aquatic populations.
- Rivers/streams are beneficial to water quality and aquatic population flows by providing

Elements – Corridors Aquatics

the corridor for water and habitat for aquatic populations.

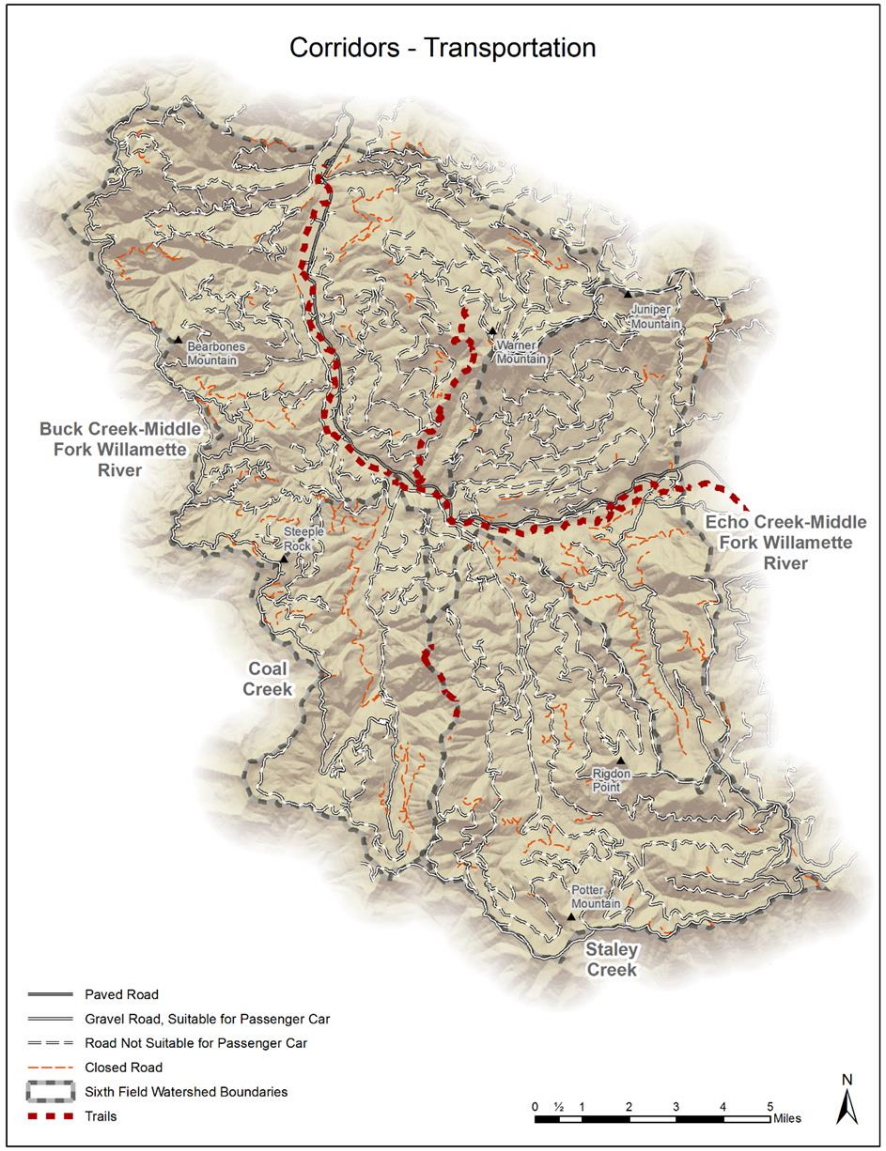
- Spring Chinook and Bull Trout habitat corridors are certainly beneficial to the flows of those species but have little effect on the water quality and other aquatic species flows.

Effects on Wildlife Flows

- Riparian areas and rivers/streams foster wildlife flows providing a water source, travel corridors, bedding, forage, dispersal and connectivity between habitats.
- Spring Chinook and Bull Trout habitat corridors have limited effect on wildlife flows.

Effects on Fire Flows

- Riparian areas and river/streams inhibit fire flows.
- Spring Chinook and Bull Trout corridors have no effect on fire flows.



Elements – Corridors Transportation

Description

These corridors represent how human travel across the landscape and consist of:

- Current road system
- Trails (Most popular are the Middle Fork and Youngs Rock Trails)
- Historic trails and roads (discussed in the Cultural Sites Patches and Corridor section)

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Ridges and river corridors were the most popular travel routes for the indigenous people in this area.
- Most early travelers used the Middle Fork Willamette River corridor for travel.

Current Condition: Key Findings

- The road system corridors today are extensive throughout the landscape and important for fire management and travel. Major roads are in poor condition and are not maintained to road standards. Some roads have been closed.
- The trail system is not extensive in this area but generally follows or flows from the Middle Fork Willamette River corridor or travels to high points in the landscape.

Effects on Human Use Flows

- Roads and trails attract, foster, and increase the human use flows in the area.

Effects on Vegetation Flows

- Roads and trails are corridors and sources of invasive species fostering their flow.

Effects on Aquatic Flows

- Roads have a variety of effects on water quality flows by inhibiting temperature, quantity and large wood material flows; and by increasing turbidity and overland sediment flows.
- Roads generally inhibit aquatic population flows.
- Mid-slope and valley bottom culverts are important for aquatic flows.
- Trails generally have little effect on water quality and aquatic population flows but can foster turbidity and overland sediment flows and inhibit Spring Chinook and Bull Trout flows.

Elements – Corridors Transportation

Effects on Wildlife Flows

- Roads can foster big game flows by providing open travel corridors but can inhibit flows being a source of disturbance and causing mortality. Trails also provide open travel corridors but are also a source of disturbance.
- Roads and trails can act as an attractant to pollinator flows by proving forage along their edges.
- Roads inhibit late seral species flows acting a barrier, being a source of disturbance and causing mortality. Trails can also be a source of disturbance and inhibit late seral species with small home ranges such as mollusks.
- Roads and trails have limited effect on beaver flows.
- Roads can attract bald eagle flows for potential forage of carrion but both roads and trails can inhibit flows as a source of disturbance.
- Roads can attract pond turtles flows who may use the cutbanks as a nesting habitat but inhibit the flows by causing mortality. Trails can foster flows by providing a travel corridor.

Effects on Fire Flows

- Roads and trails increase human ignition source fire flows. They also serve to aid in fire suppression, so may aid in inhibiting fire flows under certain fire weather conditions.

Elements – Corridors Vegetation

Description

This group includes both terrestrial and aquatic weeds. Terrestrial weeds are also discussed in the Flows – Vegetation section.

Landscape Patterns

Key Findings: Natural Processes/Historical Conditions

- Invasive weeds were historically introduced by wildlife movement and early settler grazing.
- Weed movement was slower than today and less extensive.

Current Conditions: Key Findings

- Invasive species continue to be introduced by hikers, bikers, logging equipment and as forage species.
- Today, terrestrial weed corridors are concentrated along the major roads (i.e. road 21 and 4-digit roads) and flow from other disturbed areas (private land and larger fires).
- Treatment has worked well for isolated populations. Once a species is established on a road where it can spread in disturbed land continuously it is harder to contain.
- Most terrestrial species are able to colonize and establish in disturbed, open canopy conditions. Some species are not able to persist in closed canopy forests.

Effects on Human Use Flows

- Recreation and forest product flows increase weed flows throughout the area but the effect of weeds on human use flows is limited.
- Invasive aquatics can form dense mats that restrict boat access and kill fish species that people like to fish.
- Invasive weeds can take over trails and roadways making travel difficult and less scenic.

Effects on Vegetation Flows

- Weeds can effect vegetation flows by inhibiting plant communities and species from becoming established.

Effects on Aquatic Flows

- Negatively impact water quality and aquatic population flows if they cause waterways to become dry or choke the stream with vegetation.
- Some terrestrial weeds are less able to hold soil in place and could lead to erosion. However, some invasive plants can hold the soil in place and prevent erosion.
- Aquatic weeds have a negative impact on aquatic organisms and by reducing water quality, available light and available oxygen. They can increase sedimentation, cause the loss of native plants that provide food and habitat for fish.

Elements – Corridors Vegetation

Effects on Wildlife Flows

- Invasive plants can decrease the amount and diversity of native vegetation and amount of forage for pollinators and other wildlife species.
- Some invasive plants have less nutrients for wildlife species

Effects on Fire Flows

- Weeds can increase both human and natural ignition source flows by providing ground fuel.
- Some invasive plant species can alter the ground fuels making fires burn more intensely and spread faster.

Chapter III Context

FLAD Steps 4 & 5

Chapter Summary

This chapter provides an understanding of the natural processes and succession occurring in the Rigdon landscape and how these are affected by and/or affect landscape patterns. Understanding these processes and landscape pattern effects shapes our understanding of landscape function and resilience. FLAD Step 5 – Linkages is briefly discussed in this chapter. This step considers how the area fits into the context of the larger landscape. The Rigdon planning team did not approach linkages as a separate step in the process instead including them in the discussion on flows, natural processes, and landscape patterns from management considerations.

Climate

The Rigdon landscape is in a transitional area where the semi-arid climate of Northern California and Southern Oregon meets the temperate climate of the Pacific Northwest "rainshadow" region. The hydrologic cycle has been mostly rain-dominated historically, with some snow-dominated areas at high elevations. Current and future trends may shift the entire area to rain-dominated.

According to the Forest Service Climate Change maps, historically, the Rigdon area received approximately 35 to 79 inches of rain annually (https://www.fs.fed.us/rm/boise/AWAE/projects/NFS-regional-climate-change-maps/categories/us-raster-layers.html). The April 1 Snow Water Equivalent (SWE) was 10 to 30 inches, and the annual average temperature was 5° to 10° C (40° to 50° F). Snow residence time (SRT) was historically 30 to 75 days per year.

Using an ensemble of downscaled General Circulations Models to project future trends (for the next 70 years), these conditions are all likely to change in dramatic ways. Precipitation is projected to increase 1 to 5%. Annual Average Temperature is projected to increase approximately 4° C (39°F), and April 1 SWE is projected to decrease by 80 to 100%. SRT is also projected to decrease 80 to 100% to 5 to 10 days per year.

The changes in types and timing of precipitation, coupled with the intensification of summer temperatures, is likely to increase evaporative demand, resulting in an overall increase in the drying effect in the Rigdon landscape.

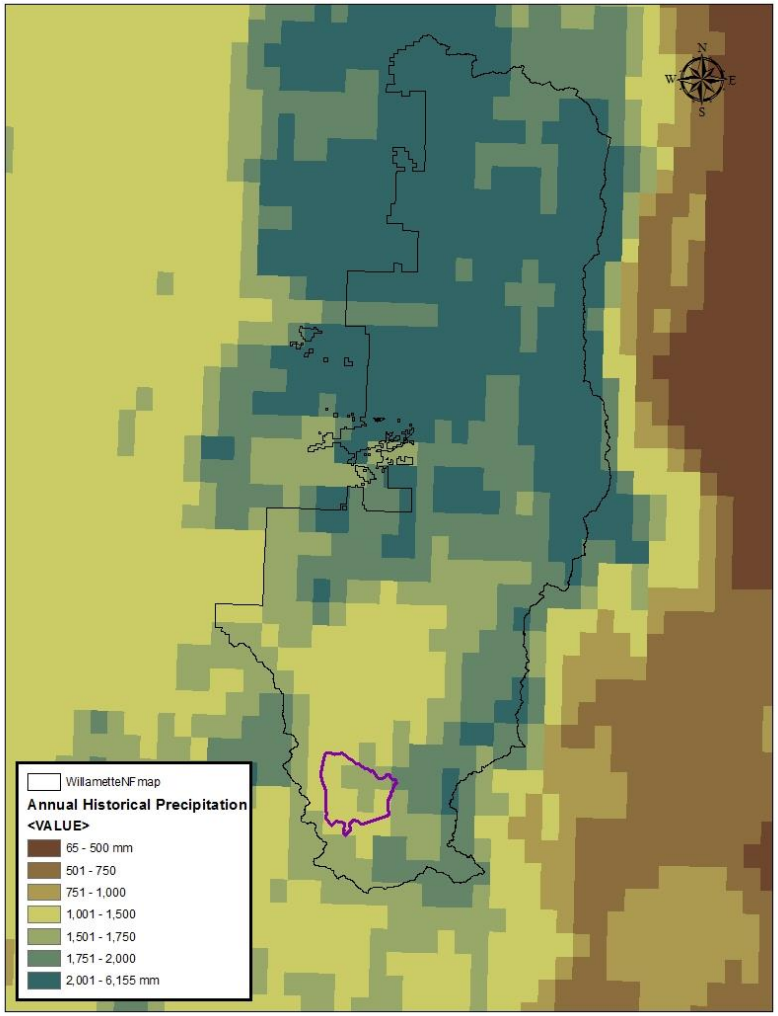


Figure 8 Rigdon historical precipitation amounts

Geologic/Soil Formation Processes

Things that shape the Earth in the Rigdon Landscape

The Willamette National Forest lies within the Western Cascades and High Cascades physiographic regions. The landforms were originally created during an early period of volcanism, from approximately 50 million years ago to 4 million years ago, when the San Juan de Fuca tectonic plate slid beneath the North American plate. A second wave of volcanic activity formed the High Cascades, beginning approximately 4 million years ago, and is still considered to be continuing today. Since about 2 million years ago, all of these landforms have also been altered by glacial activity.

Figure 9 Oregon Landforms

Volcanoes arose as hot magma under extreme pressure from the compression of the tectonic plates rose to the surface, spewing ash into the atmosphere and ultimately cooling into rocks, whose characteristics are determined by the rate at which they cool. Ash settled over the volcanic rocks in the surrounding area, with varying thicknesses, depending on the force of the explosion and the direction of the wind. Over time, some of the ash combined with water to create sedimentary rocks such as tuffs and breccias, coating the underlying basalt, andesite, diorite and rhyolite mountains.

Glaciers formed during an ice age, then melted, broke and moved, carving cirque basins, glacial moraines and u-shaped valleys. Glacial meltwater carried rocks of all shapes and sizes, depositing them at varying elevations, depending on the volume and force of the water. Over time, other erosional processes dominated the landscape. Occasional landslides and debris torrents carried rocks, trees and sediments of all sizes to the valley floor, delivering nutrients, boulders and woody material to the wetlands and other aquatic habitats below. Depending on how easily the surface geology weathered by water, wind and ice, landforms were altered in differing patterns. These patterns have been classified by humans into landform associations (LA) that can be described in terms of common processes occurring on those landforms from water routing and soil formation to vegetation and animal habitat development.

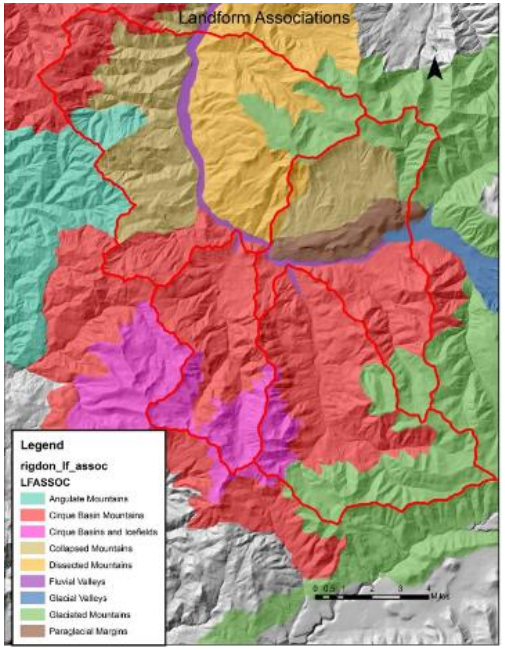


Figure 10 Rigdon landform associations

The majority of the Rigdon landscape is characterized by the "Cirque Basin Mountains" LA. This LA is described as having high-elevation horse-shoe shaped valleys or "cirques" that have a head scarp at one end and a u-shaped outlet at the other end. The second most common LA is "Collapsed Mountains." Landslides, both past and present have greatly altered this landscape so that the original landscape is difficult to discern. Water pathways, soil depths and habitat types are highly variable on these landforms. Another LA in the area is "Dissected Mountains." This LA was formed by extensive erosional processes such as surface erosion and mass wasting that formed v-shaped valleys that continue from ridgetop to valley bottom. Sediments displaced and carried in drainage-ways deposited in valley bottoms, creating deep soils. There is also an area of "Paraglacial Margins," which generally contain materials deposited by glaciers on the edges of mountains. The Upper Middle Fork of the Willamette River flows through a glacial valley to the southern extent and a fluvial valley at the northern end.

Natural landscape processes are largely governed by the local hydrologic cycle. During periods of glaciation, the Rigdon landscape was snow-dominated, but in this warming climate, the majority of the landscape is rain-dominated. This means that rather than being mostly dependent on snow-melt for groundwater and stream recharge, the plants and animals depend on rain. This affects the timing and length of the growing season and the extent to which mass wasting occurs and sediments move throughout the landscape. Stream recharge can be fed directly from rainfall and indirectly from overland flow (runoff) or below surface flow. Overland flow is unusual in forested landscapes, because vegetation cover directs rainfall into the ground, and volcanic soils tend to have rapid infiltration rates. Water is then either transpired through plant roots back to the atmosphere or translocated downslope and into streams.

In areas where soils are exposed, due to fires or human activities, direct contact of raindrops with soil particles can cause them to dislocate, and flow over the surface with enough precipitation. This surface erosion creates rills and gullies on side slopes and redistributes topsoil downhill. Over time, with enough dislocation of soil particles, deep ravines form and seasonally, or even perennially, fill with water. These streams flow downslope to join with other, progressively larger streams.

Aquatics Processes

Aquatics processes refer to all of the naturally occurring physical and biological processes that flow into and through aquatic ecosystems. They operate simultaneously across multiple temporal and spatial scales, supporting aquatic and riparian-dependent species and populations at the habitat and landscape levels

Watersheds

A watershed encompasses an area from ridgetop to valley bottom where all of the water that falls into that "catchment" flows toward a common outlet. Watersheds are shaped and respond to broader vegetation, climate and geologic processes generally over a very long timeframe. When properly functioning, watershed processes maintain diverse distribution, and complexity of aquatic and riparian systems to which native species are uniquely adapted.

Watershed and Reach processes:

- Erosion
- Runoff
- Wood Supply
- Nutrient Supply
- Solar Energy

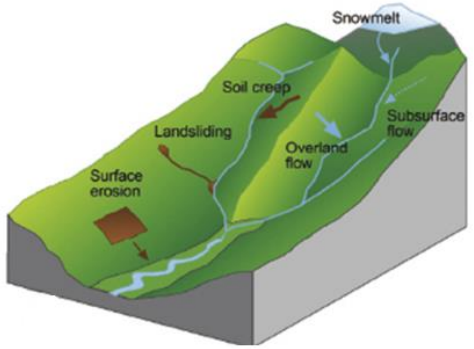


Figure 11 Watershed & Reach processes

Erosional processes respond to local climate, geology and vegetation to create either v-shaped "confined" valleys, or wide and flat "unconfined" valleys as water is carried downstream through the watershed.

Confined valleys have steeper slopes, where water flowing more rapidly gains adequate energy to mobilize bedload and other materials like woody debris, as well as nutrients downstream, and are thus called "transport reaches." Unconfined valleys have more shallow slopes, where water tends to slow down and lose energy as it spreads laterally across the valley bottom. These "depositional" reaches collect and process sediment loads and wood

supply transported from upstream reaches that build and maintain complex riparian areas upon which aquatic dependent species depend.

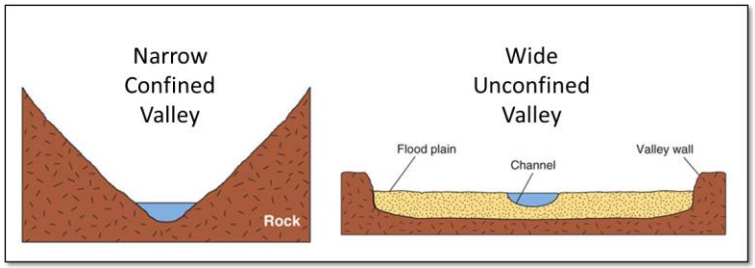


Figure 12 Valley types

Habitat and Biological Response

Habitat complexity and biological diversity vary greatly between narrow, and often simple confined valleys, versus dynamic, wide unconfined valley floors. In general, depositional valleys have greater intrinsic potential for habitat complexity and abundance than transport reaches due to their expanded riparian area. The "Riparian Area" refers to the zone that connects aquatic habitats to the uplands, includes floodplains and wetland habitats, and is directly maintained by watershed processes. All streams, ponds, and lakes are found within Riparian Areas. In the Rigdon landscape, the Upper Middle Fork Willamette River passes through a wide unconfined valley, where there are many opportunities for improving floodplain connectivity and aquatic organism habitat.

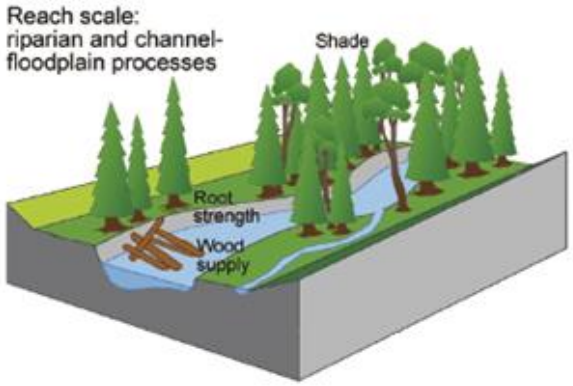


Figure 13 Depiction of a complex riparian system

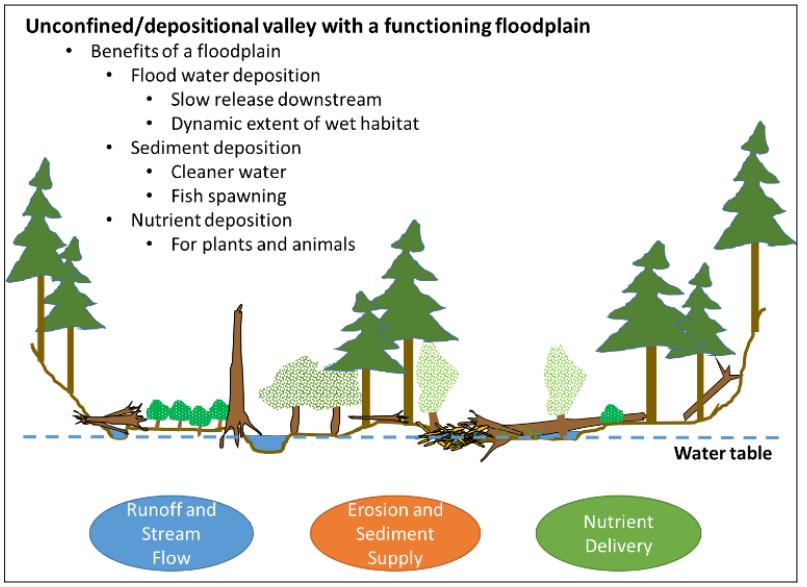


Figure 14 Functioning floodplain in an unconfined valley

Instream physical and biological processes:

- *Physical habitat characteristics*
- *Water quality*
- *Habitat selection*
- *Feeding*
- *Competition*
- *Predation*

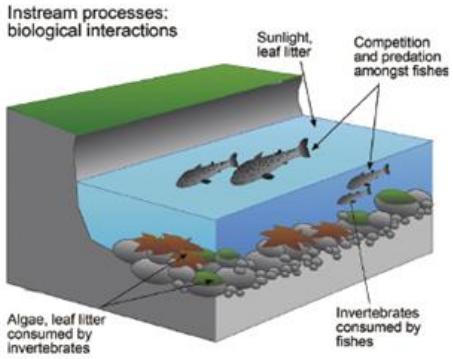


Figure 15 Depiction of instream processes

Properly functioning riparian areas are dynamic and naturally resilient. They buffer against disturbances (floods, wildfire, etc.) through physical and biological adjustments that create a mosaic of habitats across the watershed. Native aquatic organisms have adapted unique life history strategies that allow them to take advantage of the full the range of habitat expressed. Generally speaking, the greater the diversity of habitat the greater the potential for species diversity and life history strategies. Fishes like salmon, bull trout, and lamprey rely on habitats ranging from cold water springs, fast moving rapids, deeps pools, and slow silty patches in floodplain side channels.

Figure 17 A functioning stream can look quite complex

Terrestrial Processes

Natural processes have affected landscape elements, flows and function for centuries in the Rigdon landscape. Climate, geology and the resultant landforms, topography and soils have influenced where plants grow and how plant communities are distributed across the landscape. Processes such as fire, wind, insects and pathogens have interacted with these physical characteristics to affect landscape fabric, patches, corridors, to alter landscape pattern and function. Humans have inhabited the Rigdon landscape for centuries, affecting the vegetation pattern, function and flow.

Biophysical Environments

Interactions of physical and biological factors influence vegetation distribution. Physical attributes such as aspect, elevation, soil, slope position and slope steepness (landform associations) combine with temperature and precipitation to produce biophysical environments that control where plants grow. The distributions of these conditions affect landscape vegetation patterns and vary widely across the Rigdon landscape. These broad

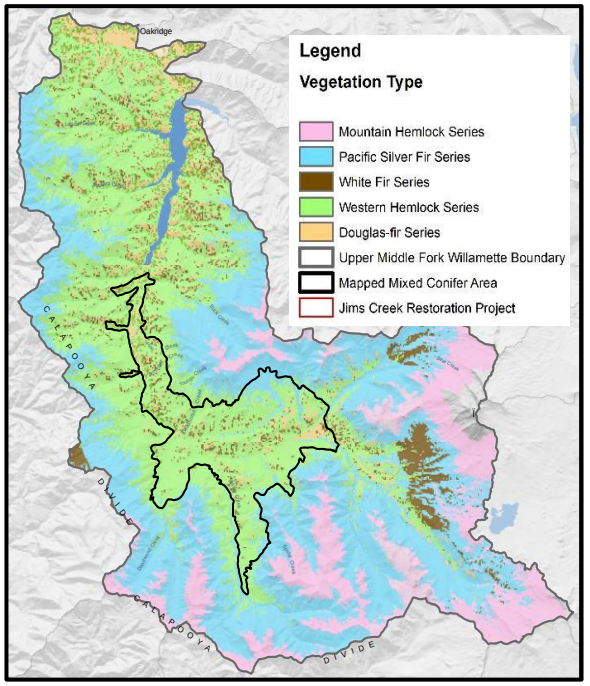


Figure 16 Rigdon plant zones

biophysical environments are named for the dominant tree species that would occupy the site with no disturbance. The Douglas-fir and grand fir zones occupy the warmest and driest, lower elevation sites. These zones have the highest vascular plant diversity in the central western Cascades. Tree species, in addition to the dominant zone species, include ponderosa pine, incense cedar, sugar pine, big-leaf maple, Pacific madrone and Oregon white oak. Understories of poison oak, tall Oregon grape, whipple vine, common and trailing snowberry, California hazel, ocean spray, dwarf Oregon grape and salal are found in these dry locales. These zones were combined to form the **mixed conifer vegetation type** in our analysis.

Figure 19 Ponderosa pine (left) and Oregon white oak (right) in mixed conifer forests

The western hemlock, Pacific silver fir and mountain hemlock zones are referred to as the **moist conifer vegetation type** in the Rigdon landscape analysis. These zones occupy areas with more moisture, more northerly aspects, and usually higher elevations than the mixed conifer vegetation type. Douglas-fir, western redcedar, noble fir, Pacific dogwood, and Pacific yew are found within these zones, in addition to the zonal species. Common understory shrubs and herbs include: Oregon grape, salal, vanilla leaf, vine maple, swordfern, dwarf Oregon grape, rhododendron, queen cup bead lily, big huckleberry, and twinflower

Future climate projections of warmer, drier conditions may lead to an increase in some of the species or plant communities in the **mixed conifer vegetation type**. The warmer, moister vegetation in the **moist forest vegetation type** may shift upward in elevation as well.

Figure 18 Douglas-fir

Figure 20 Example of a moist forest type

Fire and Vegetation Patterns

Fire is the dominant terrestrial process that has affected landscape components. Fire has killed trees and understory plants, provided growing space for new vegetation, snags and down wood, as well as bringing nutrients to soil and aquatic systems. It has created new patches on the landscape, and modified existing patterns. Historical fire frequency, severity and extent have varied across the Rigdon landscape, due to climate, topography and available fuels. Resultant fire regimes have produced varied vegetation patterns.

Evidence of fire is common in the **mixed conifer vegetation type.** Many of the scattered large pines have char on their bark and some have triangular scars with evidence of multiple fires at their base. The presence of Oregon white oak in places hints at a more active fire history. Historically, surface and ground fire moved through these low elevation, dry

environments at a frequency of a few years to decades. Recent fire history information collected at the site indicates average fire return intervals from 5-14 years.

Figure 21 Fire scar on ponderosa pine (left) and example of a surface fire (right)

Grass and herb understories provided fuel for surface fires to burn quickly, with relatively short flames. Many of the established trees would remain unharmed, or scarred if a log happened to lie next to the base, or a "cat face" had been created. Because of the high frequency of fires in this vegetation type, stands were relatively open, as young seedlings were not always able to establish. Trees such as ponderosa pine, sugar pine, Douglas-fir and incense cedar, with thicker bark and higher crowns that could withstand fire's heat and continue to grow in open conditions dominated the overstory. The forest understory was dominated by species that could flourish with frequent fire, by either sprouting or producing abundant seed. Remnant individuals and patches of species such as California fescue can still be found in the current understory.

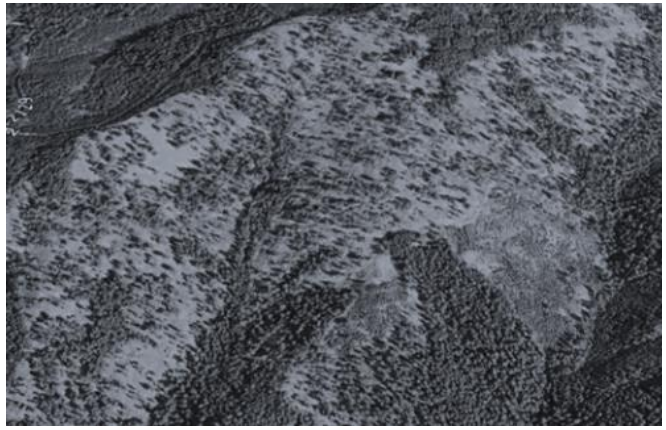


Figure 22 Jims Creek Stewardship Project designed to create more open savanna-like forest structure

There is also evidence of very open areas, called savannas that existed in this vegetation type. The 1851 Government Land Office survey records described around 6,000 acres of "Douglas-fir ponderosa pine" savannas in the Rigdon landscape, with south-facing Jim's Creek being the largest example. These savannas could have been the result of both physical effects (e.g. aspect, soils) and fire in the Rigdon area.

There is a transition as one moves from the dry, southerly aspects to the more protected, northerly aspects and higher elevations in the Rigdon landscape. Fuels become denser, but have higher moisture content, creating a more complex fire regime. The fire environments in the **moist conifer vegetation type** created conditions less conducive to fire start and spread. Recent fire history results in the mesic western hemlock adjacent to the mixed conifer reveal a 50 year fire return interval. That interval likely increases in the cooler Pacific silver fir and mountain hemlock zones.

Fire effects in this vegetation type were quite variable. Patches of stand replacing fire were juxtaposed against areas with lower tree mortality. Areas of underburn were often found within the fire as well. This created a complex pattern across the landscape, as seen by the 2009 Tumblebug complex fire in the Rigdon area.

Finer Scale Processes and Vegetation Pattern Effects

Wind, insects and pathogens have also played a role in influencing vegetation pattern in the Rigdon landscape. They often interacted with each other to create patches and corridors of varying size. These processes served to increase landscape heterogeneity at finer scales than fire.

There is very little evidence on the frequency, severity and size of wind events in the historical record. In the more recent past, wind has operated at finer scales, creating small to moderate sized openings (`acre-20 acres) as seen by the 1964 Columbus Day Storm along Highway 58. An influx of coarse woody debris, as well as potential for shifts in stand composition and structure created variability across the landscape.

Insects and pathogens also operated at finer scales. Douglas-fir beetle could follow wind events, and create single tree to small patch mortality. Pathogens such as laminated root rot affected Douglas-fir, grand fir and mountain hemlock, creating slow growing mortality centers.

Figure 23 Example pattern from trees killed by insects or pathogens

Figure 24 Example patterns from fire

Figure 25 Historical photo showing blowdown of large trees from a wind event

There is evidence that humans have influenced vegetation pattern across the Rigdon landscape for centuries. Historically, this landscape has been important for Native people. Food, such as camas, acorns, deer and elk were plentiful in this area. The presence of "culturally modified" ponderosa pine across the **mixed conifer vegetation type** indicates the importance of this habitat for medicine and food. It is possible that Native people actively managed the landscape to maintain characteristics conducive to their needs, by burning and clearing areas.

European settlers continued to modify vegetation pattern. Burning, grazing, and clearing occurred within the landscape area. Timber management changed patch sizes, corridors, flows and function of the landscape, fragmenting and modifying seral stage distribution. The advent of fire suppression in the 1930s affected the role of fire on the landscape, shifting fire regimes toward stand replacement conditions.

Figure 26 Example of a culturally modified tree

Linkages

FLAD step 5 provided some context for how the Rigdon area fits into the broader landscape. The Rigdon landscape is tied to the greater landscape through flows, transporting water, wildlife, nutrients, fire, humans and vegetation. The Middle Fork of the Willamette River flows from its headwaters in this landscape, north to join the main stem of the Willamette, a major tributary of the Columbia River. The Hills Creek Reservoir impounds water that would otherwise inundate the Willamette Valley, influencing the flow of nutrients and aquatic species to the larger riverine and ocean systems. Migrating bird species flow in and out of the Rigdon landscape, on their way to seasonal nesting or roosting sites. Similarly, humans flow in and out of the area, seeking food, Christmas trees, relaxation and outdoor adventure. Forest products, grown on this landscape, are transported far and wide for market, and vehicles traveling into the landscape bring invasive species that alter the native ecosystem. Air and ocean currents from outside affect the seasonality and intensity of precipitation and fire behavior within the Rigdon landscape.

Chapter IV Landscape Patterns

FLAD Step 6

Chapter Summary

This chapter first summarizes the landscape pattern objectives in the Rigdon planning area as established through the 1990 Willamette Land and Resource Management Plan, as amended by the 1994 Northwest Forest Plan. The Forest Plan provides a framework around which landscape pattern is expected to develop and reflects agreements made between the public and Forest Service.

The chapter then summarizes other relevant management considerations from broader landscape strategies or management direction to further develop the background and provide an essential first step in designing landscape patterns for the area.

Forest Plan Allocations

4 Research Natural Area (RNAs)

Description

RNAs are designated tracts of land or water which support high quality examples of ecosystems, habitats, populations of rare or endangered species or unique geological study of features.

Management Goals

Goals involve preserving naturally occurring physical and biological units where natural conditions are maintained insofar as possible for the purpose of comparison with those lands influenced by humans, provision of educational and research areas for ecological and environmental studies and preservation of gene pools for typical as well as rare and endangered plants and animals.

Desired Future Condition

Provide for naturally occurring physical and biological processes without undue human intervention. Plant and animal communities native to an area will be allowed to evolve unaltered, serving as a gene pool source and as a baseline for measuring long term ecological change.

Rigdon Examples

Rigdon Point RNA was established to protect and perpetuate a population of knobcone pine, which is on the Northern edge of its range. In this 457-acre area, management guidelines involve looking at opportunities to restore knobcone pine which requires fire in order for their cones to open and release seed.

Figure 27 knobcone pine (image from calscape.org)

5a Special Interest Areas (SIAs)

Description

SIAs serve as examples of outstanding or unique physical, cultural, or biological features occurring on the Forest.

Management Goals

Goals in this area are to preserve lands in SIAs containing exceptional scenic, cultural, biological, geological or other unusual characteristics and to foster public use and enjoyment in selected special interest areas.

Desired Future Condition

Plant and animal communities will flourish in a mostly undisturbed environment. No programmed timber harvest will occur. Facilities will be developed in areas to foster the use, study, and enjoyment of important historic and national aspects of our national heritage, especially viewing and interpreting special features.

Where the primary emphasis is recreation, management activities will be directed toward resource protection. Access by trails will be preferred, but roads may also be used where compatible with resource objectives. Use of these lands will still allow the protection and enhancement of the unusual features. VQO is preservation.

Rigdon Examples

Rigdon has many SIAs across the landscape representing unique scenic, botanical, cultural and geological areas and include:

Bulldog Rock, Chuckle Springs, Deadhorse Rockshelter, Horsepasture Cave, Indigo Springs, Moon Point, Rigdon Ranch, Tumblebug Gorge and Vine Rockshelter.

6a Wild and Scenic Rivers – Wild

Description

Areas designated under the Wild and Scenic Rivers Act that have remarkable recreational values. On the Willamette National Forest, this designation applies to eligible river segments until their suitability has been determined.

Management Goals

Goals are to manage to area to preserve its essentially primitive character and outstandingly remarkable values, maintain and improve the quality of water which enters the river, maintain and improve fish and wildlife habitat, and provide opportunities for river-oriented recreation which are dependent on free-flowing river conditions consistent with the primitive character of its surroundings.

Desired Future Condition

The Wild river segments will be free of impoundments and generally inaccessible except by trails, shorelines in essentially primitive condition and unpolluted water, segments appear as wild to the user and have the potential for visitors to experience a high degree of tranquility and solitude with many opportunities to appreciate the natural environment.

Rigdon Examples

The upper section of the Middle Fork Willamette River, from Echo Creek downstream 14 miles is identified as an eligible Wild and Scenic River – Wild. This potential designation is the river segment itself plus a ¼-mile wide corridor on each side of the river segment and shall be protected pending Congressional action on the river designation or until determined to be unsuitable.

6b Wild and Scenic Rivers – Scenic

Description

Areas designated under the Wild and Scenic Rivers Act that have remarkable scenic values. On the Willamette National Forest, this designation applies to eligible river segments until their suitability has been determined.

Management Goals

Goals for wild and scenic rivers include maintaining or enhancing the high quality scenery and the largely undeveloped character of the shoreline, the quality of water entering the river, and fish and wildlife habitat. Additionally, the goals are to facilitate river-oriented recreation opportunities consistent with the undeveloped nature of the segment and dependent on free-flowing conditions; and use resources and permit activities to maintain or enhance the quality of the wildlife habitat, river fisheries, scenic attractions, or recreation values.

Desired Future Condition

The river environment will be maintained in a natural state while providing for recreation opportunities. River segments shall be free of impoundments and generally inaccessible except by trails. Watersheds or shorelines shall be in essentially primitive condition and have unpolluted water. Segments should appear as wild to the user and represent vestiges of primitive America. The potential for visitors to experience a high degree of tranquility and solitude with many opportunities to appreciate the natural environment shall occur. Any actions in the area must protect the eligibility status.

Rigdon Examples

The upper section of the Middle Fork Willamette River, from Echo Creek upstream 16 miles is identified as an eligible Wild and Scenic River – Scenic. This potential designation is the river segment itself plus a ¼-mile wide corridor on each side of the river segment and shall be protected pending Congressional action on the river designation or until determined to be unsuitable.

7 Old Growth Groves

Description

Designated old growth groves are outstanding and highly accessible specimen groves of old growth trees of the western cascades. They are characterized by individual, large, old trees; multi-layered canopies with trees of several age classes and sizes; standing snags and fallen trees in various stages of decomposition; and smaller plants and ground cover.

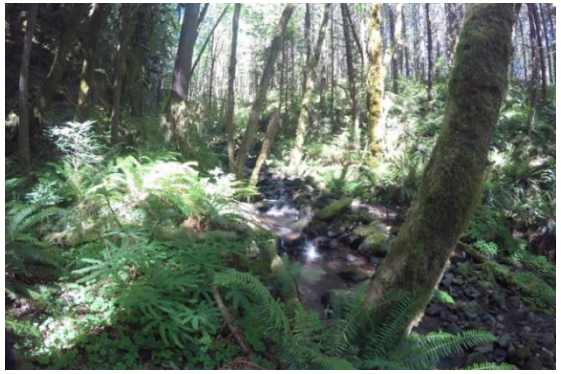


Figure 28 Shady Dell area on field trip with SWFC

Management Goals

Goals for this area are to preserve representative ecosystems of old-growth forests of the Western Cascades and provide opportunities for the public to enjoy the educational, aesthetic, and spiritual values associated with old-growth groves.

Desired Future Condition

Preserve the genetic base of native plant and animal communities in a network of highly accessible old growth timber types in the Western Cascades. No timber harvest will occur except to remove safety hazards. VQO is preservation.

Rigdon Examples

The Rigdon area contains two designated old growth groves: Big Swamp Old Growth Grove and Joe's Prairie.

9d Special Habitat Areas

Description

These areas are unique habitats for wildlife and botanical resources. They include dry meadows, cliffs, caves, talus, mineral springs, mineral licks, wet meadows, marshes, and bogs.

Figure 29 SWFC member approach an upland pond on the Moon Point wildflower tour

Management Goals

The goal for this area is to protect or enhance unique wildlife habitats and botanical sites which are important components of healthy, biologically diverse ecosystems.

Desired Future Condition

The landscape shall be a well-distributed network of high quality habitat throughout the forest landscape. Special wildlife or botanical areas will continue to provide unique characteristics and diversity to the forest landscape. Natural physical and biological processes will prevail without human intervention. Further, plant and animal life inhabiting these unique systems will continue to flourish.

Rigdon Examples

There are twenty designated 9D Special Habitat Areas scattered throughout the Rigdon area averaging 336 acres in size and ranging from 54 to 1,419 acres.

10f Lakeside Areas: Wildlife Habitat & Recreation

Description

These are the areas adjacent to small, nonwilderness lakes.

Management Goals

The goals are to provide roaded natural recreation experiences through the management of user activities and natural resource settings and to maintain the diversity of wildlife habitats.

Desired Future Condition

The desired future condition is a series of natural appearing settings around small, nonwilderness lakes providing fish and wildlife habitat as well as recreation and angling opportunities. Additional development will maintain or enhance the quality and diversity of wildlife habitat as well as the recreation experience.

Rigdon Examples

There are eight lakeside areas in the Rigdon Area surrounding Gertrude, Windfall, Waterdog, Lizard, Loletta and three unnamed lakes. These lakeside areas average 64 acres in size and range from 31 to 157 acres.

Figure 30 Gertrude Lake (courtesy of goingoutside.com)

11 Scenic

Description

11a Scenic – Modification Middleground, 11c Scenic – Partial Retention Middleground and 11d Scenic – Partial Retention Foreground. These prescriptions apply to Forest lands that are in foreground and middleground zones of visually sensitive landscapes. They are the most common public vistas as well as those of moderate importance.

Management Goals

To create and maintain desired visual characteristics of the forest landscape through time and space. Visually sensitive landscapes will be managed for a modest level of scenic quality. Other resource goals include timber production, recreation opportunities, watershed protection and maintenance of wildlife habitats.

Desired Future Condition

11a scenic areas are managed to retain the natural features of the natural landscape while 11c and 11d are managed to maintain a near natural setting to varying degrees.

Rigdon Examples

The scenic areas designated in Rigdon are along Road 21 the major travel route in the area. Immediately adjacent to the road corridor are the 11d corridors in the foreground area. The 11c areas are corridors adjacent to the 11c while 11a are patches beyond the 11c areas.

12a Developed Recreation

Description

These areas include developed recreation sites and proposed development areas listed in the Resource Summary section of the Forest Plan.

Management Goals

Provide a safe, healthful, aesthetic, nonurban atmosphere for the pursuit of natural resource based recreation. Provide facilities and improvements, consistent with resource protection needs and anticipated user demand, where opportunities for meaningful recreation experiences exist.

Desired Future Condition

The desired future condition is a variety of forest settings providing a range of recreation opportunities. Includes campgrounds, picnic areas, scenic overlooks, boat ramps, parking lots, access roads and more. Use and occupancy will be regulated to protect natural resources and to ensure safe, enjoyable recreation experiences. Future development will be based on user demand patterns and specific site suitability. Improvements will be designed to complement existing area developments and to expand the Forest's capacity to accommodate additional use.

Rigdon Examples

Multiple campgrounds in the Rigdon landscape have a classification of 12a Developed Recreation. These include Sand Prairie Campground, Secret Campground, Campers Flat Campground, Sacandaga Campground, and Indigo Springs Campground.

14a General Forest

Description

This management area consists of forested lands, physically suited for growing commercial tree crops and production multiple uses such as timber, wildlife habitats, water quality, soil productivity, recreation, Forest access and cultural sites.

Management Goals

The primary goal is to produce an optimum and sustainable yield of timber based on the growth potential of the land that is compatible with multiple use objectives and meets environmental requirements for soil, water, air and wildlife habitat quality. I addition this area can provide many opportunities for public use and enjoyment.

Desired Future Condition

The landscape will be a patchwork of age classes and species of trees. On lands suitable for timber production, timber will be available for sale on a nondeclining even-flow basis. There will be an orderly transition from the naturally occurring mature forest to a regulated forest with a balance of acres in each age group up to approximately 80 years old. Young stands will be managed to maintain vigor and growth and stands of various conifer species will predominate; although the natural variety of hardwoods, shrubs and forbs will continue to be components of the ecosystems. Managed stands will generally consist of a well-stocked understory with a scattered mix of large snags and green replacement trees with large woody debris left on site to provide habitat and maintain long-term soil productivity.

Rigdon Examples

The majority of the area within this landscape is designated as 14a General Forest.

15 Rivers, Streams, Wetlands, Lakes, & Adjacent Riparian Areas

Description

These management areas includes the bed, banks, and water column of rivers, streams, wetlands, and lakes as well as the adjacent land areas. Of further interest are areas influenced by the stream or lake and the associated high water table. Land directly influencing the shading and input of large and small organic material to the streams is also of concern. (Generally included are ponds, bogs, and wet meadows.)

Figure 31 Middle Fork Willamette River at Camper's Flat Campground

Management Goals

The primary goal in this area is to maintain the role and function of rivers, streams, wetlands and lakes in the landscape ecology. A significant part of this goal is to manage the vegetation in the adjacent riparian areas for protection and rehabilitation of the aquatic and terrestrial riparian habitat, maintenance and improvement of water quality while minimizing risks of downstream flooding, management of riparian areas as corridors to provide dispersal habitat for plant and animal species by maintaining connectivity among mature and old growth stands of trees, management and inventory for sensitive as well as threatened and endangered plants and animals, management for recreation and scenic use compatible with riparian dependent species and monitoring the impacts of upland management activities on the health and function of the riparian ecosystem.

15 Rivers, Streams, Wetlands, Lakes, & Adjacent Riparian Areas

Desired Future Condition

The management area shall provide a continuous and diverse habitat for riparian dependent species and high quality water by protecting and mapping wetlands and floodplains. The water bodies and associated areas shall contribute to the diversity and dispersion of fish, wildlife and plants within each subdrainage and also at the larger watershed level.

This management area shall also provide opportunities for public use and enjoyment through dispersed and developed recreation management. The recreation uses shall be managed to avoid or mitigate adverse effects on riparian dependent resources.

Stream channels shall provide diverse, stable habitat for aquatic species as well as maintaining or enhancing water quality. Vegetation on adjacent lands shall be managed to provide diverse stands of conifer and hardwood vegetation, providing habitat for riparian dependent species. The amount of large woody debris, both down and standing, shall be maintained at or above current levels. In areas where this material has been depleted as a result of past harvesting, the amount shall increase either through rehabilitation projects, as a result of natural mortality of trees, or both.

Along larger rivers and streams, optimal thermal cover for big game shall be provided. The width of the riparian management area shall be identified by an on-site reconnaissance of topographic and biotic features and shall be based on the watershed objectives for fish and wildlife habitats, water quality, and recreation. The VQO for this area is partial retention.

Rigdon Examples

The Rigdon landscape has many areas in this designation ranging from the Middle Fork Willamette River to small intermittent streams to small lakes scattered throughout the area.

Visual Quality Objectives (VQOs)

Description

VQOs are categories embedded within a variety of the Forest Plan management areas. These are categories of acceptable landscape alteration measured in degree of deviation from the natural-appearing landscape. The VQO categories that specifically pertain to Rigdon Project area are as follows: Retention (**R**): Management activities should not be evident to the casual forest observer; Partial Retention (**PR**): Management activities remain visually subordinate to the characteristic landscape; and Modification (**M**): Management activities may dominate the characteristic landscape but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Figure 32 Examples of VQO categories

Visual Quality Objectives (VQOs)

Management Goals & Rigdon Examples

Management Area	Scenic Integrity Levels	Distance Zones	Observation Areas in Rigdon
MA-11a Scenic	M	Middleground	Middle Fork Travel Corridors
MA-11c Scenic	PR	Middleground	Middle Fork Travel Corridors
MA-11d Scenic	PR	Foreground	Middle Fork Travel Corridors
MA-10f Dispersed recreation	R	Foreground	Patches throughout Rigdon landscape
MA12a – Developed recreation	R	Foreground	Sand Prairie, Secret, Campers Flat, Sacandaga & Indigo Springs campgrounds
Trails – Sensitivity Level 1	R	Foreground	Middle Fork National Scenic Trail
Trails – Sensitivity Level 2	PR	Foreground	Youngs Rock Trail
MA6b – Wild & Scenic Rivers	R	Foreground	Upper Middle Fork Willamette River – Scenic eligible

Visual Quality Objectives (VQOs)

Management Goals & Rigdon Examples Continued

Trail Classes - Class 1 trails are to provide at least a physical setting the ROS class of Roaded Natural. This ROS class is characterized by a predominately natural environment with evidence of moderate permanent alterations and resource utilization. Class 2 trails are to provide at least a physical setting for the ROS class of Roaded Natural

Middle Fork National Recreation Trail -Trail Corridor management activities and practices shall be commensurate with the VQO assigned to each trail class. Trail segments identified as National Scenic and National Recreation Trails shall be managed to meet the objectives of the National Trail System Act of 1968. Trails located outside of Wilderness, shall be assigned to trail management class 1.

- Within either Class 1 or 2, this trail follows the VQO of Retention. As a result, timber harvest guidelines are as follows:
- Scheduled even-aged timber management should not exceed the specified amount of suitable and available area within each trails class during the first 10 years following plan implementation.
- The harvest rate percentage, applicable to individual trail segments, for Class 1 trails is 0%.
- Trail corridors will vary in width from 100’ to a maximum of 300’ on each side of the trail. Recreation recommends the 300’ corridor on the Middle Fork National Recreation Trail until logging systems and silviculture treatments are discussed.

Late-Successional Reserves (LSRs)

Description

These are areas designated by the 1994 Northwest Forest Plan that amended the 1990 Willamette Land and Resource Management Plan. LSRs are areas reserved for the protection and enhancement of late-successional/old growth forest ecosystems and habitat for associated species including the northern spotted owl.

Larger LSRs - Areas mapped as part of an interacting reserve system. This designation is of a system of well-distributed reserves to protect large blocks of old-growth forests and provide habitat for species that depend on those forests. The emphasis was on locating LSRs in key watersheds, in order to serve the dual objectives of efficiency and resource protection. These Reserves represent a network of existing old-growth forests that are retained in their natural condition with natural processes, such as fire, allowed to function to the extent possible.

100-acre LSRs - 100-acre areas of the best northern spotted owl habitat as close to a nest site or activity center. The intent is to preserve an intensively used portion of the breeding season home range. Management around these area will be designed to reduce risks of natural disturbances. Because these areas are considered important to meeting objectives for species other than spotted owls, these areas are to be maintained even if they become no longer occupied by spotted owls.

Management Goals

- LSRs are to be managed to protect and enhance a network of old-growth forest ecosystems and serve as habitat for late-successional and old-growth related species including the NSO. They are retained in their natural condition with natural processes, such as fire, allowed to function to the extent possible. The reserves serve a number of purposes:

Figure 33 Older forest in Rigdon (courtesy of Tim Bailey, SWFC member)

Late-Successional Reserves (LSRs)

- They establish a distribution, quantity, and quality of old-growth forest habitat sufficient to avoid foreclosure of future management options.
- They provide habitat for populations of species that are associated with late-successional forests.
- They will help ensure that late-successional species diversity will be conserved.

Desired Future Condition

Stand desired characteristics include multispecies and multilayered assemblages of trees, moderate-to-high accumulations of large logs and snags, moderate-to-high canopy closure, moderate-to-high numbers of trees with physical imperfections such as cavities, broken tops, and large deformed limbs and moderate-to-high accumulations of fungi, lichens, and bryophytes.

Landscape desired characteristics include

- Vegetation structure and pattern are diverse: Patch size, plant species composition, and other late successional characteristics meet the habitat requirements for late successional associated species
- Habitat for early/mid successional species is maintained: Habitat is maintained in these stages when LSR populations of those species are important for viability of the species over a broader geographic area, or if any of those species should be locally endemic to these LSRs.
- Connectivity exists between and within watersheds: Late seral vegetation provides connected and resilient watershed processes within and between watersheds. Within watersheds, the terrestrial, riparian, and aquatic systems are connected.
- Wet area habitats maintain high levels of source populations: Aquatic and terrestrial habitats of native species dependent on wet areas are restored and maintained.
- Managing fire risk: no more than 28 percent of the LSR acres are in high fire risk condition at any one time. Wildfires are low to moderate intensity over about 75% of the area and features of the natural disturbance regime operate at levels that maintain species, habitat diversity, and encompass less than natural levels of stand replacement events.
- Since the goal in LSRs is to protect late seral conditions, management should move in the direction of lowing risk that has increased since the advent of fire control, where possible to be more consistent with natural fuel levels.

Late-Successional Reserves (LSRs)

Rigdon Examples

The Rigdon landscape area contains two patches of a 508,000-acre LSR that covers parts of Eugene BLM, Willamette NF, Umpqua NF, Roseburg BLM, and Rogue River-Siskiyou NF. LSR-222 occupies most of the Coal and Staley Creek subwatersheds as well the the upper portion of the west side of the Buck Creek-Middle Fork Willamette River subwatershed. The two patches are 38,349 acres in size and make up 7.5% of the LSR. In addition, there are twenty-six 100-acre LSRs scattered throughout the area.

Matrix

Description

These are areas designated by the 1994 Northwest Forest Plan that amended the 1990 Willamette Land and Resource Management Plan. These are areas of Federal lands outside of the other reserved allocations identified in the Northwest Forest Plan where most timber harvest and silvicultural activities were expected to occur.

Management Goals

An important objective for matrix lands is to produce timber and other commodities. Forests in the matrix also function as connectivity between Late-Successional Reserves and provide habitat for a variety of organisms associated with both late-successional and younger forests. They also provide for important ecological functions such as dispersal of organisms, carryover of some components such as down logs, snags, and large trees. The matrix also adds ecological diversity by providing early-successional habitat.

Desired Future Condition

Some of the major standards and guidelines for matrix lands that also tie into the forest landscape pattern include

- Provide specified amounts of coarse woody debris in matrix management.
- Emphasize green-tree retention and snag retention in matrix management.
- Provide for retention of old growth fragments in watersheds where little remains.
- Protect known Northern spotted owl activity centers.

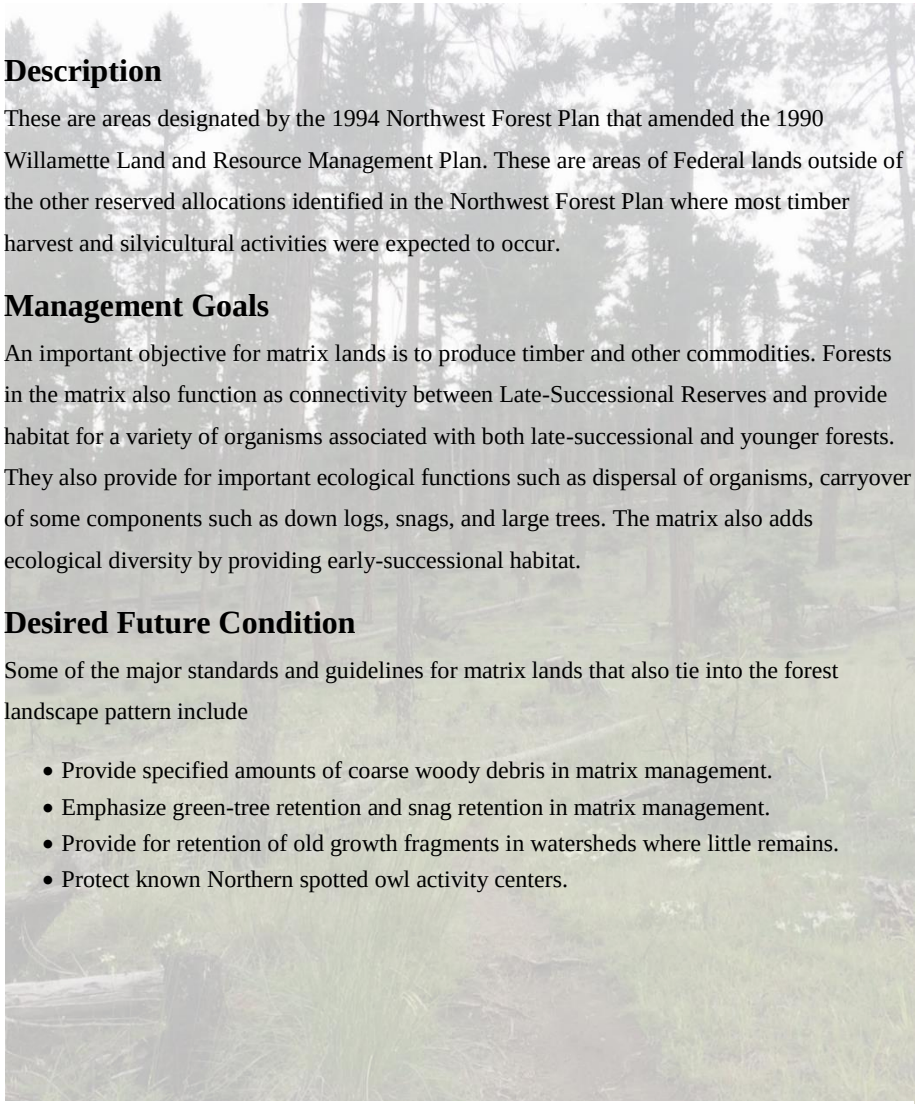


Figure 34 Jims Creek area

Riparian Reserves

Description

These are areas designated by the 1994 Northwest Forest Plan that amended the 1990 Willamette Land and Resource Management Plan. These are areas along streams, lakes, ponds, wetlands, and unstable and potentially unstable areas where riparian dependent resources receive primary emphasis. Initial boundary widths for riparian reserves differ based on the category into which they fall.

Fish Bearing Streams: Riparian Reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the other edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest. CLASS I and II

Permanently flowing non-fish bearing streams: Riparian Reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the other edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest. CLASS III

Constructed ponds and reservoirs, and wetlands greater than 1 acre: Riparian Reserves consist of the body of water or wetland and: the area to the other edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than 1 acre, or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.

Lakes and natural ponds: Riparian Reserves consist of the body of water and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the

extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

Seasonally flowing or intermittent streams, wetlands less than 1 acre, and unstable and unstable areas: This category applies to features with high variability in size and site-specific characteristics. Class IV.

Wetlands less than one acre and unstable and potentially unstable areas: The extent of unstable and potentially unstable areas, and wetlands less than one acre to the outer edges of the riparian vegetation.

Management Goals

The main purpose of the reserves is to protect the health of the aquatic system and its dependent species. The reserves also provide incidental benefits to upland species. They are also important to the terrestrial ecosystem, serving, for example, as dispersal habitat for certain terrestrial species.

Desired Future Condition

Standards and guidelines for Riparian Reserves prohibit or regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives. Watershed analysis and appropriate NEPA compliance is required to change Riparian Reserve boundaries in all watersheds.

Concerning all areas of management, actions shall be taken in line with meeting Aquatic Conservation Strategy (ACS) objectives. Prohibit timber harvest, including fuelwood cutting, in Riparian Reserves, except in situations where actions is needed to attain ACS objectives. Minimal road activities should occur in Riparian Reserves in addition to minimizing disruption of natural hydrologic flow paths, restricting sidecasting, and avoiding wetlands. Some roads may be stabilized after being either closed or obliterated. Design fuel treatment and fire suppression strategies to minimize disturbance of riparian ground cover and

Riparian Reserves

vegetation. Identify instances and act carefully where fire suppression or fuels management activities could be damaging to long-term ecosystem function.

Concerning watershed restoration projects, promote long-term ecological integrity of ecosystems and conserve genetic integrity of native species. Regarding fish and wildlife habitat restoration and enhancement activities, contribute to the attainment of ACS objectives. This includes interpretive and other user- enhancement facilities. Relocate or close facilities as needed.

Figure 35 Middle Fork of the Willamette River near Camper's Flat Campground

Other Management Considerations

Northern Spotted Owl Recovery Plan and Recovery Action 32 (RA32)

Description

The Revised Recovery Plan for the Northern Spotted Owl (USFWS 2011) recommends 33 recovery actions needed to address recovery objectives for the northern spotted owl. "RA32" refers to recovery action 32 which states, "Because spotted owl recovery requires well-distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees." RA32 text identifies these areas as a subset of nesting, roosting, and foraging (NRF) habitat, and are intended to provide spotted owls with high-quality refugia habitat from competitive interactions with barred owls.

Figure 37 Northern spotted owls (image from The Wildlife Society)

Northern Spotted Owl Recovery Plan and Recovery Action 32 (RA32)

Management Goals

Maintain and restore RA32 (high-quality habitat) to provide additional support for reducing key threats to spotted owls. In dry forest areas, actively manage habitat to meet the overlapping goals of spotted owl recovery, restoration of dry forest structure, composition and process including fire, insects, and disease.

Desired Future Condition

Well distributed patches of RA32 (high-quality) habitat across the landscape that have some or all of the following characteristics:

- Older stands (generally greater than or equal to 175 years) or younger stands with sufficient legacy trees.
- Multi-layered vegetative structure with average canopy cover of 60% or greater.
- Decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and down wood.
- Structurally complex including large branches and complex branching structure ("wolfy trees").
- Large diameter trees, greater than or equal to 32" dbh, eight or more per acre.

Red Tree Vole (RTV) Strategy

Description

For the Rigdon area, a landscape strategy for red tree vole persistence has been developed using an interagency tool developed in 2016. Red tree voles (*Arborimus longicaudus*) are a category C survey and manage species under the Northwest Forest Plan and as such, surveys are required for their nests prior to habitat-disturbing activities. Sites needing protection to provide for a reasonable assurance of species persistence are called high-priority sites where as sites not needing protection are called non-high priority sites. Few attempts have been made over time to discriminate between high and non-high priority sites and so most red tree vole sites are currently protected.

Figure 38 Red tree vole (courtesy of oregonconservationstrategy.com)

In 2016, a joint effort between USDA Forest Service Regions 5 and 6 as well as USDI BLM Oregon and Washington was completed to develop high priority site management recommendations. These recommendations outline a process for identifying red tree vole high priority sites to provide for a reasonable assurance of persistence. The management recommendations may be applied to any fifth-field watershed within the range of the red tree vole and shall continue to follow existing management direction until high-priority sites are identified and documented in a NEPA decision. These are the guidelines for identifying high-

Red Tree Vole (RTV) Strategy

priority sites at the fifth-field watershed scale:

- Identify land-use allocations managed consistent with red tree vole conservation, which form the backbone of red tree vole persistence in the watershed.
- Identify high-priority sites outside of these areas (must occur in potential habitat either likely occupied or capable of being occupied).
- Identify connectivity areas providing linkages between all sites (this includes linkages between land- use allocations managed consistent with Red tree vole conservation, high-priority sites, and to adjacent watersheds).
- Identify non-high-priority sites including areas no longer requiring site management or pre- disturbance surveys.
- Identify information gaps that limit identification of these types of sites and what new information would trigger the need to revise selected sites and areas.
- More detailed requirements for the size, distribution, and habitat characteristics of high-priority sites and connectivity (linkage) areas are included in the management recommendations.

Management Goals

Overall goals involve maintaining well-distributed and well-connected areas of suitable habitat for red tree voles to provide a reasonable assurance of species persistence in the two fifth-field watersheds. The RTV high-priority site management recommendations describe management direction for red tree voles to be followed within each type of site designation.

Connectivity areas: Management within land-use allocations identified for connectivity will continue to follow current standards and guidelines. However, within connectivity areas, the need for pre-disturbance surveys is not expected, as land management should be consistent with red tree vole persistence needs, which precludes habitat-disturbing activities. As defined in the rule set, young stand management may occur within some of these areas; however, the age or structure of the stands proposed for treatment should not trigger the need for pre-disturbance surveys.

Red Tree Vole (RTV) Strategy

High-priority sites: Any management that occurs within a habitat area (high-priority site) should not remove or modify nest trees, the canopy structure of the stand, or remove any of the dominant, co-dominant, or intermediate crowns. This includes activities that may isolate nest trees or alter the microclimate within the stand. Some activities may be appropriate if they maintain or improve, and do not degrade (short- or long-term), the habitat condition of the habitat area.

Desired Future Condition

Late-Successional Reserves (LSRs) including 100-acre LSRs make up the majority of the land use allocations currently managed consistent with Red tree vole conservation in the watersheds. High-priority site designations will be made within RA32 habitat and/or Northern spotted owl nest patches when possible, or in the best available habitat that meets the rule set requirements for size, distribution, and habitat characteristics.

Connectivity areas will primarily be identified in riparian reserve corridors that meet minimum width requirements, but may also include other land-use allocations when riparian reserves are not present or habitat-disturbing activities such as extensive vegetation removal associated with aquatic restoration are planned.

Some areas will not be defined as a high-priority or non-high-priority site and will still continue to follow existing management direction including the potential need for pre-disturbance surveys. One such area is within the perimeter of the Tumblebug Fire.

Road Investment Strategy (RIS)

Description

Forest Service regulation at 36 CFR 212.5(b) (1) requires the Forest Service to identify the minimum road system (MRS) needed for safe and efficient travel and for administration, utilization, and protection of National Forest System (NFS) lands. In determining the MRS, the responsible official must incorporate a science-based roads analysis at the appropriate scale.

The Road investment Strategy helps to inform and guide both short-term and long-term decisions about road management and presents an opportunity to strategically and responsibly focus public funds on repairing, protecting, and maintaining the public's most important roads in the face of these changes in order to protect continued access to those places the public values so greatly.

Management Goals

Identify priorities for maintaining motorized access by determining roads and special places important to both the public and for managing the Willamette National Forest. Also recognize opportunities for managing roads differently to restore watershed health and protect the public's infrastructure investment.

Desired Future Condition

In many of the managed areas of the Forest, road construction is prohibited or limited in order to preserve the natural character of the site. Roads are often closed or obliterated, and then stabilized, to protect the ecological health of various management areas. When road construction or maintenance occurs, the surrounding environment shall be considered to minimize impact and preserve established or needed buffers.

Heritage Resources

Description

Assessments of the District's cultural resources in the form of surveys and site evaluations occur for all undertakings using public and federally funded dollars. For the Willamette National Forest, surveys are landscape and landform driven.

Heritage resource specialists follow law as outlined in the National Historic Preservation Act (NHPA) and guidelines known as 36 CFR 800, known as the Section 106 process. Specifically, a "determination of effect" to existing cultural resources of proposed project actions inside project boundaries and conduct cultural resource evaluations called "determination of eligibility" for the National Register of Historic Places evaluating existing and newly discovered cultural resources. Presidential executive orders and other federal laws further support these activities. Specialists then deliver results and recommendations as outlined by the Programmatic Agreement (PA) R6 Section 106 process.

Figure 39 The SWFC learning about culturally modified trees

Heritage Resources

Management Goals

Identify heritage sites through careful and thorough surveys. Respect and preserve all heritage sites as directed under the project Archaeologist. This includes trails, archaeological features such as culturally modified trees (CMT's), historic roads, rare isolates, artifacts, and potentially eligible sites considered for listing on the National Register of Historic Places.

Figure 40 SWFC members learning the history of Rigdon Meadows

Desired Future Condition

All sites require protection measures such as a 20 meter buffer (66 feet). Landscapes will reflect the discovery of new sites and in addition to preserving and updating existing sites. Some of these existing sites are in the form of clusters of known locations, like lithic scatters, CMT's, historic trails, and artifacts of all eras.

Chapter V Target Goals and Patterns

FLAD Step 7

Chapter Summary

This chapter summarizes goals and target landscape patterns derived from knowledge of the landscape as an ecological system, the natural processes in the area, and management considerations. These goals and patterns are the major design elements of the desired future landscape and provide the basis and rationale for project level activities.

Collaborative Participation

The Rigdon Collaboration Committee (RCC) came together to provide recommendations to the Middle Fork Ranger District to help restore biodiversity and resiliency in the Rigdon area.

Following the shared learning phase of the Rigdon landscape analysis, the RCC broke into four subcommittees and drafted landscape level zones of agreements (ZOAs) for desired outcomes for vegetation, wildlife, aquatics and human uses. The ZOAs were then workshopped by the larger committee and presented to the Forest Service Rigdon planning team for consideration while developing their goals and landscape patterns.

Once the Forest Service Rigdon planning team developed interim goals, a workshop was conducted with RCC to compare and discuss draft ZOAs versus goals. The workshop highlighted summarizing similarities, differences, and finding common ground. The Rigdon planning team, along with careful consideration of feedback from the workshop, developed the following goals and target landscape patterns.

Goals

Goals were developed for each of the five categories (human uses, vegetation, fire, wildlife & aquatics) to maintain continuity with the format used during the Rigdon landscape analysis phase. However, to further the systems-thinking approach of this process it is important to recognize that these goals are overlapping and integrated.

Human Use Goals

- Foster human use in the area while minimizing the impacts of that use on the landscape.
- Promote human use that supports economic sustainability or development for local communities.
- Promote education opportunities that share the area's history, recreational areas, natural diversity and natural resource management (i.e. why this landscape is important).
- Identify, maintain, and protect the area's historic and prehistoric travel corridors and features.
- Increase opportunities to maintain and improve areas for cultural tribal use.
- Provide a sustainable road system that 1) maintains access to recreational areas, administrative sites, private land, and forest products, 2) maintains safety corridors and fire evacuation and suppression routes, 3) minimizes resource damage and 4) provides connectivity to key travel routes to adjacent landscapes.
- Provide recreational opportunities in the area that are accessible, sensitive to public demand and/or use and compatible with other resource objectives. Use the USFS Region 6 Sustainable Recreation Strategy as a guiding tool to 1) update directional and information signs, 2) decommission, maintain, or improve trails and trailheads, 3) close, confine or improve dispersed sites and 4) maintain developed campsites and their natural resource settings.
- Collaborate with adjacent private land owners to reduce fire risk and provide a sustainable road system.

Vegetation Goals

- Provide a healthy, diverse forest that promotes resiliency and sustains habitats for native plant, wildlife and aquatic species.
- Allow for natural processes that shape landscape vegetation pattern where possible.
- Restore and promote the composition, structure and distribution of seral stages to reflect natural disturbance patterns. Examples include more open pine, Douglas-fir, and oak conditions in the lower mixed conifer forests, creating early seral patches of varying sizes, providing late seral patch connectivity, reducing fragmentation, and promoting structure-rich forests.
- Promote the genetic flow of vegetation by maintaining species presence and distribution across the landscape. Example species include knobcone pine, ponderosa pine and Oregon white oak.
- Protect and restore unique plant species and communities, such as meadows, from encroachment, invasive threats and resource damage.
- Actively reduce the impacts of invasive weeds on the landscape through prevention, education and eradication.

Fire Goals

- Reduce human ignitions through education, prevention activities, and a minimum road system.
- Use prescribed fire as a tool to restore and promote resilient habitats, such as open forest conditions in mixed conifer.
- Reduce fire risk around key areas such as private land and infrastructure.
- Create opportunities to manage wildfires safely and effectively through strategic fuel reduction and providing fire escape routes.

Wildlife Goals

- Maintain and restore wildlife habitats to promote biological diversity and resiliency.
- Provide habitat needs for a full range of forest associated species by maintaining areas of early, mid and late seral forest across the landscape.
- Ensure habitat connectivity is maintained within and between watersheds by protecting and enhancing critical linkages.
- Promote structurally diverse habitats that include snags and down wood, open and closed forest canopy, and plant species diversity.
- Protect and enhance special habitat areas such as northern spotted owl Recovery Action 32 patches, turtle ponds and nesting sites, pollinator and amphibian rich meadows and bogs, and peregrine falcon nesting sites.

Aquatic Goals

- Maintain and restore the health of aquatic and riparian ecosystems by addressing root causes of habitat and water quality degradation and supporting dynamic hydrologic, geomorphic, ecological processes responsible for creating and sustaining habitats at the landscape level.
- Maintain and restore the timing, variability, and duration of floodplain inundation that is within the natural range of variability.
- Maintain and support natural hydrological and ecological disturbance regimes.
- Maintain and restore connectivity within and between watersheds.
- Maintain and restore habitat and ecological conditions capable of supporting self-sustaining populations of native aquatic and riparian plant and animal species.
- Re-establish and protect populations of ESA listed fishes (spring Chinook salmon and bull trout).
- Restore large woody debris abundance, recruitment, and retention.
- Maintain and restore species composition and structural diversity of native plant communities in riparian areas including lakes, ponds, wetlands, springs, and seeps.
- Reduce or eliminate impacts from human use and management activities on aquatic systems.
- Improve or decommission roads systems that pose a risk to riparian and aquatic ecosystems.
- Develop strategies to help communicate riparian and aquatic ecosystem services to stakeholders.
- Develop and implement aquatic restoration projects with public and private partners.
- Prevent the spread of invasive aquatic organism and noxious aquatic weeds.

Target Landscape Patterns

Landscape patterns differ within broad geographic areas

Mixed conifer forests occupy warmer, dryer lower elevations of the landscape

- Open late seral forest dominates this area, with scattered patches of other seral stages (including closed forest) present. Patch patterns emulate high frequency, mixed to low severity natural disturbance regimes, with fine scale patch diversity present. These may be the result of natural or active management in the area. Pines, oaks and species associated with drier/rockier areas are evident and have a canopy texture different than the moister upland forest.
- Riparian forests form a mosaic of open and closed patches and corridors, consistent with the upland and aquatic disturbance regime. Conifer dominance gives way to hardwoods in some areas, providing for a range of aquatic habitats and function.
- Connectivity occurs in open forest fabric, and late seral corridors and patches. Variety of early seral and open patches provide wildlife habitat.
- Critical habitat corridors exist for ESA listed bull trout and spring Chinook above Hills Creek

Moister upland forest dominates mid to higher elevations

- This area is dominated by closed canopy late seral forest, with scattered patches of other seral stages. Patch patterns emulate lower frequency, mixed to high severity disturbance regimes, with larger patch sizes present. These may be the result of natural or management activities in the area. True firs and species associated with more mesic conditions are evident and their canopy texture is different than the pines and oaks.
- Riparian forest are dominated by closed canopy, with patches of open, hardwoods distributed according to the natural upland and aquatic disturbance regime, providing a range of aquatic habitats and functions.
- Connectivity exists in late seral closed canopy forest fabric, with early seral patches well distributed to provide key wildlife habitat.

Patches of forest types are intermingled

- There is no definite boundary between mixed conifer and moister upland forests and stands are comingled depending upon factors such as aspect and elevation.
- Patches of drier forest, such as those with knobcone pine, occur in the southern area along north/south ridges.

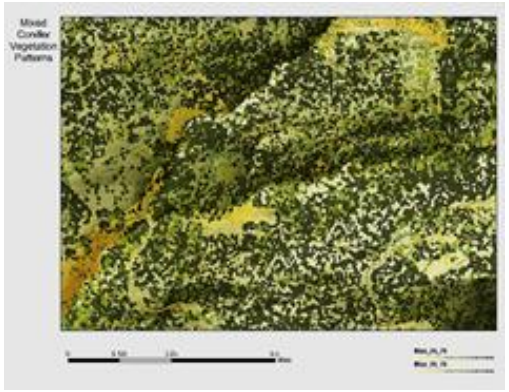


Figure 41 Mixed conifer target pattern

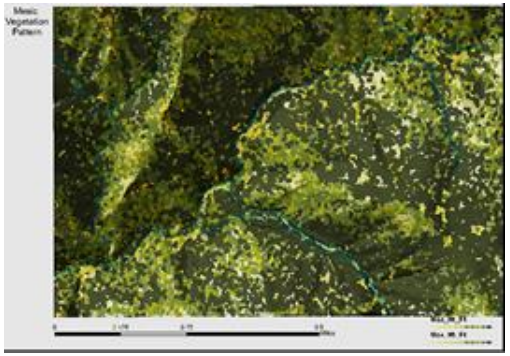


Figure 42 Moister upland forest target pattern

Landscape patterns differ within management areas

Late Successional Reserve Patterns

- Large patches of late seral forest present that favor habitat for wildlife species requiring high degree of connectivity.
- Mixed conifer forests are dominated by open forest.
- Moister upland forests consist of largely closed forest.
- Other seral stages are more scattered throughout the landscape.
- Riparian reserves provide a range of habitats, serve as terrestrial and aquatic connectivity corridors and provide all characteristics listed in the Aquatic Conservation Strategy.

Matrix Land Patterns

- A range of seral stages present across the landscape, with the fabric of late seral prevalent, and early seral habitat distribution providing key habitat for wildlife species.
- Mixed conifer forests maintain fabric of late seral open forest.
- Moister upland forests fabric consists of late seral closed forest.

Other Management Areas Patterns

- The Middle Fork Willamette River corridor is visible as the concentration of human use with a high concentration of the area's developed recreation sites and trailhead portals.
- The smaller campgrounds (Secret and Camper's Flat) blend in with the surrounding landscape. The two larger campgrounds (Sacandaga and Sand Prairie) have a more closed canopy (providing shade) than most of the surrounding area and don't blend in as well.
- Well maintained trails and trailheads occur along the Middle Fork River and other areas such as Young's Rock. Trail buffers are more visible in areas of the mixed conifer forest treated to create more open canopy conditions.
- Areas adjacent to private land have feathered edges that reduce fuels, with patches of all structural and seral stages strategically placed.

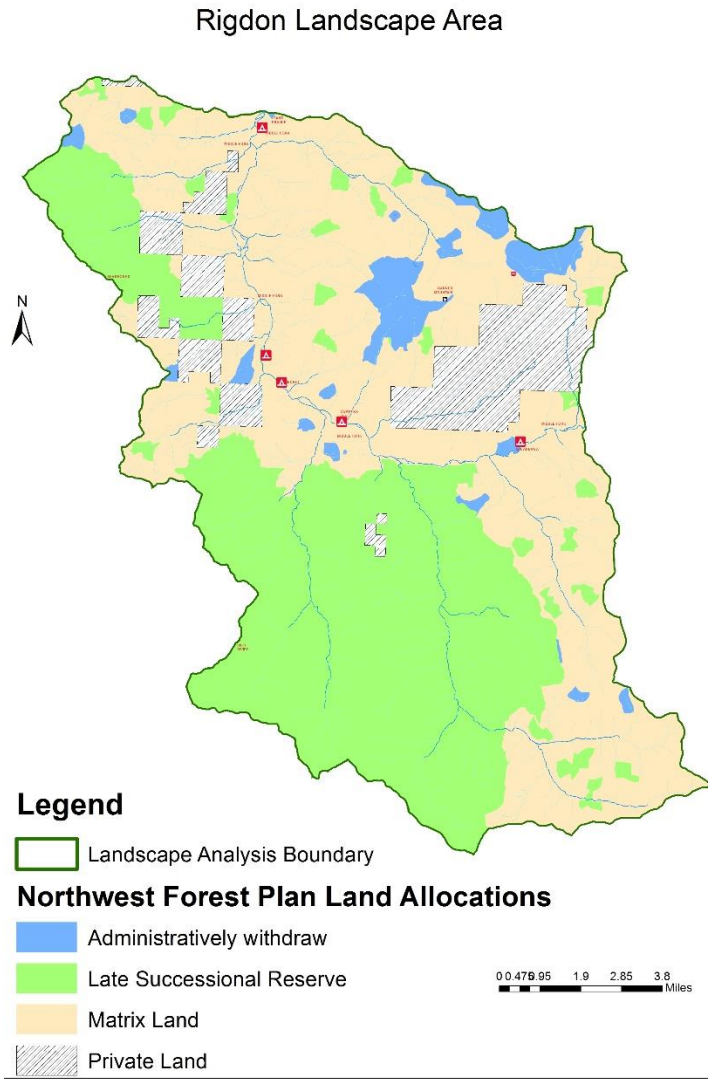


Figure 43 Management Areas in Rigdon

Some patterns are scattered across the landscape:

- Non-forest and special habitats occur in various shapes and sizes across the landscape providing unique habitat niches. Examples include cliffs for peregrine falcons; meadows for pollinators; ponds bogs for amphibians, western pond turtles, and aquatic organisms.

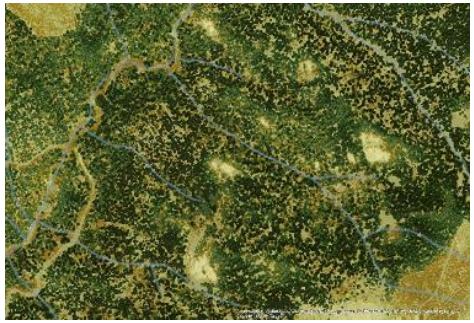


Figure 44 Target landscape pattern showing non-forest and special habitats across the landscape

- Unconfined and confined valleys are a product of geology, climate, and vegetation and direct the stream network. Unconfined valleys, or response reaches, are wide low-gradient segments that are collecting sediment, nutrients, and woody debris that help to build and maintain floodplains. Confined valleys, or transport reaches, are narrow higher-gradient segments that are moving materials down the river system and into unconfined reaches.

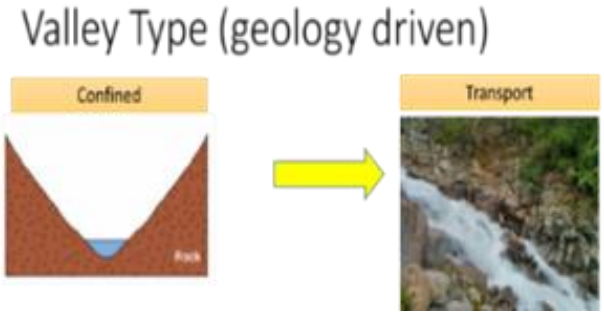


Figure 45 Confined valleys are transport reaches

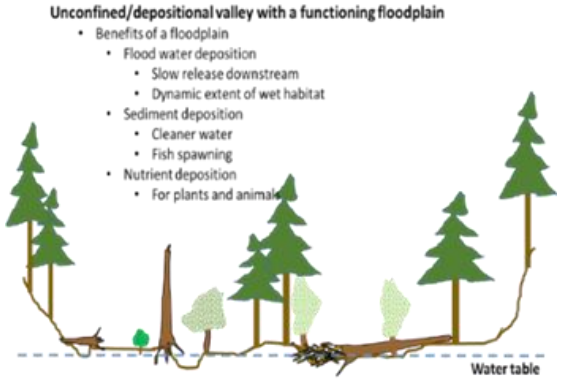


Figure 46 Unconfined valleys are response reaches

- A minimum road analysis has reduced the amount of roads, but they are still a dominant feature on the landscape and there is likely no discernable pattern change. Road system focuses on maintaining access to forest products, recreational opportunities, administrative sites and private land both within and outside the landscape.

- Safety corridors and fire escape routes are well maintained, have signage and adjacent fuel breaks are evident. These corridors and routes are focused on Road 21, ridgeline roads, road 2154 (Diamond Drive), and the road to Timpanogas Lake (including the road that goes to Summit Lake).

- Although reduced, roads continue to disturb the routing and stream flow of water on the landscape, increase sediment delivery, reduce wood transport at crossings, impair movement of aquatic organisms at crossings, and increase slope instability.

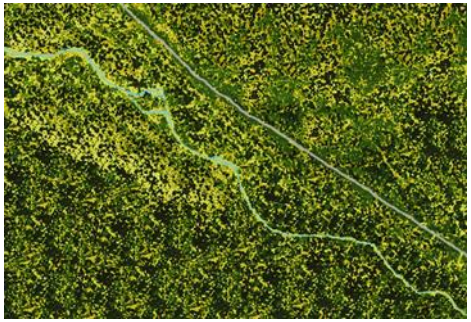


Figure 47 Roads are reduced but continue to exist in landscape target patterns

Chapter VI Project Design

FLAD Step 8

Chapter Summary

This chapter summarizes the efforts to transition from a landscape level analysis into project design. It highlights that Rigdon Landscape Analysis is a living document where future projects will be developed that are tied the larger goals and landscape target patterns established through this analysis

Design Goals

"….the design basically makes manifest in landscape terms what the Desired Future Condition actually is, where it goes, how much there is and the patterns it creates…"

(Diaz and Apostle, 1992)

In the original FLAD process, the goal of Step 8 is forest landscape design where an overall picture of the desired patterns within the entire analysis area is created, setting the stage for more detailed work to follow. By describing target landscape patterns in Step 7, the Rigdon planning team effectively combined this landscape design with the goal development stage. Therefore, Step 8 in the Rigdon Landscape Analysis is the "living" part of this document where project level activities in the area are developed from the larger landscape goals and target patterns.

As described in Chapter 1, the "restoration blueprint" has been established for this area in an integrative and collaborative manner. The design of future projects in the area will be:

- ✓ Informed by a larger, more integrated understanding of the social, ecological, and economic aspects of the landscape.
- ✓ Based on where we can align our restoration opportunities to improve efficiencies and allow better leveraging of funds.
- ✓ Opportunities to integrate restoration goals to increase landscape health and function.

Participants from the RCC will engage in various activities including public outreach and education for Rigdon projects and participating in multi-party monitoring.

Youngs Rock Rigdon Project

The first project utilizing information from the Rigdon Landscape Analysis is focused in the northeast portion of the Rigdon area covering 33,000 acres. This initial project portioned off the landscape to focus on the bulk of the mixed conifer forest areas as well as restoration activities in and near the mainstem of the Upper Middle Fork Willamette River. Currently the purpose and need, as well as proposed actions, are being developed. The SWFC Rigdon Collaboration Committee (RCC) continues to provide input as we move from the left side of the NEPA triangle into the right side and begin to engage a broader public for comment. The "draft" purpose of this project is to:

1. Improve stand and landscape diversity, structure, and resiliency
    a. Increase diversity and structure in mixed conifer forest
    b. Increase diversity and structure in moister forest
    c. Meadow and oak savannah restoration
    d. Floodplain and aquatic restoration
    e. Control stocking and improve structural complexity and diversity of riparian
    f. vegetation and complexity restoration as needed to attain Aquatic Conservation Strategy Objectives
2. Strategically reduce hazardous fuels
3. Sustainably manage existing trail system and dispersed recreation while minimizing impacts to natural resources
4. Identify a sustainable road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System Lands
5. Provide a sustainable supply of forest products

The Rigdon Landscape Analysis is providing the basis and rationale for all project level activities that will be proposed in this project.

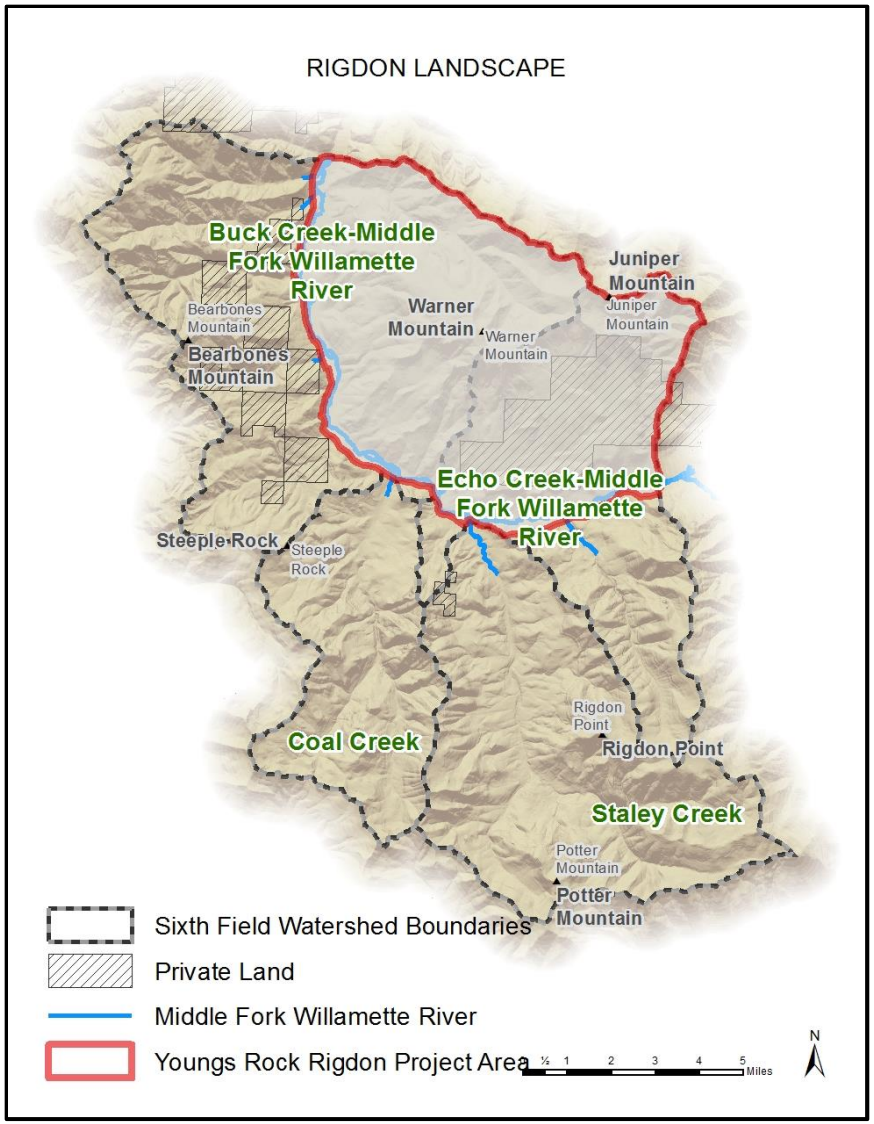


Figure 48 Area of Youngs Rock Rigdon Project

Future Project Areas

Youngs Rock Rigdon is just the beginning of restoration projects in the area, both large and small. It is expected that following the Youngs Rock Rigdon Project NEPA document, another large planning area covering the remaining 71,000 acres of the landscape will continue to build off the restoration blueprint. It is also expected that smaller projects in the area will continue to be developed and implemented in the future to further achieve the landscape level goals and target patterns established through this process.

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Appendix

Appendix Summary

FLAD Step 3 describes how the landscape elements (matrix, patches & corridors) function in relation to landscape flows and is summarized in Chapter 2 for each element as “Effects of ….Flows”. This appendix provides the background for how that information was generated by examining the major types of flow within each of the four flow categories and answering the following questions:

- Where in the landscape does this type of flow occur?
- When or what is the timing of the flow?
- What is the direction of the flow?
- Importance of the flow now & in the future?
- How is the flow affected by human activities?

Flows – Human Uses

Fall Recreation - Hunters

- Where: Along the Middle Fork following early seral towards Tumblebug fire area and Seneca lands.
- Direction: travel both in and out of the area
- Timing: Fall
- Importance now & future: Hunting seems to be slowly declining in general
- Human Impacts: Past timber management, past and present hunting management, administrative site management, and road maintenance.

Summer Recreation -mountain bikers, campers, hikers, horseback riders

- Where: Middle Fork corridor and associated trails; along more decent roads like 2134 (connector roads)
- Direction: both in and out
- Timing: High point is July & August
- Importance now & future: Relative to other parts of the District this is not so popular an area but will increase in use over time. There is interest in expanding the current system.
- Human Impacts: Road and trail maintenance would increase use and fire and timber management practices.

Forest Products - Special Forest Products

- Where: Primarily is Christmas trees up towards Warner Mountain (noble fir).
- Direction: Up to Warner and then back out
- Timing: Fall before the snow gets to deep
- Importance now & future: It's a minor component of the activities in the area
- Human Impacts: Past and present timber management practices and road access.

Forest Products – Timber Harvesting

- Where: Private land and FS land across the area near the roads and in previously managed stands
- Direction: timber flows down to the mainline roads and out
- Timing: Mostly during dry season
- Importance now & future: This flow is important to maintain now and in the future.
- Human Impacts: Vegetation management and early seral inhibits sustained yield, fire management, economics.

Flows – Vegetation

Weeds

- Where: Along waterways, roads, trails, parking lots, disturbed areas (early seral--including recently burned), carried by animals, so flows could mimic wildlife flows
- When: Summer through fall
- Importance now & future: Important now and will increase in the future. Need to reduce and eradicate now to minimize future impacts.
- Human Impact: Any disturbance, especially along key flow paths will increase populations and could impact native species

Knobcone pine

- Where: Near the northern edge of its range; special habitat (RNA), often found in pure stands. Dry, rocky areas of poor soil—currently have scattered stands, Rigdon Point RNA. Flows have been after fire (since the species need fire to open cones) into high severity patches
- When: Summer/fall after disturbance
- Importance now & future: Important species from a biodiversity perspective. Also species distribution may expand due to climate change—need to keep this species on the landscape
- Human Impact: Distribution and health probably affected by fire suppression, past planting post-disturbance, harvesting and not replanting

Alaska yellow cedar

- Where: Found in high elevation Pacific silver fir zone in protected, cool, wet areas
- When: Summer/fall
- Importance now & future: Important to tribes in the past for bow, blankets, robes and capes. Prized by the Japanese for temples. Used for cover by birds and small animals
- Human Impact: Grows in wet boggy areas and is a slow growing tree. It is not prized as a timber tree in Oregon but is in British Colombia. The wood is extremely durable. Some sources say it does not tolerate atmospheric pollution. Loss of wet areas due to climate change, road building, and other factors threaten this species

Flows – Vegetation

Mixed conifer (ponderosa pine, oak, sugar pine)

- Where: Douglas-fir and grand fir and warm/dry western hemlock--dry, lower elevation, south slopes. Flows have been within the drier areas outward after a low to high severity disturbance. There have also been flows due to planting.
- When: Summer/fall after disturbance, or whenever planting took place, flows could also have been affected by grazing in the past—keeping areas open
- Importance now & future: Important species from a biodiversity perspective. Also species distribution may expand due to climate change—need to keep these species on the landscape
- Human Impact: Flows have been disrupted due to fire suppression and planting of other species; climate change

Sensitive species and meadow species

- Where: Limited populations scattered across the landscape. Late seral or special habitats, riparian habitats. Flow will vary by species and is probably pretty low flow
- When: Summer through fall
- Importance now & future: Important species from a biodiversity perspective. Some species distribution may expand due to climate change—need to keep these species on the landscape
- Human Impact: Some species may be affected by human activity. Grazing may have played a role in some meadow types. Weed flows might increase if adjacent areas are disturbed.

Flows – Aquatics

Temperature

- Where: Headwaters to lowlands
- Direction: Downstream
- Timing: From seasonal to diurnal (depends on scale)
- Importance now and in the future: Water quality, plant or animal organisms, ecological driver
- Human Impact: Timber management, thermal loading, climate change, reduced storage.

Turbidity

- Where: Headwaters to lowlands-Flowing downstream-Wherever there are streams interacting with the surface.
- Direction: Downstream increases.
- Timing: Project related or Weather events (snow melt, rain, natural geomorphic events)
- Importance Now and in the future: water quality, plant or animal organisms
- Human Impact: Timber management, Road management or lack thereof, climate change.

Nutrients

- Where: From land and air to water.
- Direction: Downstream increase
- Timing: Seasonal
- Importance now and in future: Water quality, plant or animal organisms
- Human Impact: Timber management, road management or lack thereof, potential sewage from recreationists.

Quantity

- Where: Snow and rain and springs.
- Direction: Flow downhill
- Timing: Seasonal
- Importance now and in the future: Water quality, plant or animal organisms. It sustains life.
- Human impact: Climate change, extraction, timber management, reservoir, roads and road management.

Flows – Aquatics

Overland Sediment

- Where: From ridgelines to streams
- Direction: Down
- Timing: Wet season but snowpack can alter that
- Importance now & future & Human Impact: With more ground disturbance there will be potential for higher sedimentation.

Spring Chinook

- Where: Along Middle Fork, reared in Upper MF, filter to MF, then out to the Reservoir (about 20% make it past the Reservoir)
- Direction: Trucked in by the road and flow out the river
- Timing: Hard to describe since it depends upon the life stage (i.e. complicated life cycle).
- Human Impact: The reservoir & dam are fatal flaws to migrating fish. Entirely dependent on human management and will continue to be that way now and in the future

Bull Trout

- Where: Along Middle Fork, reared in the springs, filter to the Reservoir.
- Direction: Both up and downstream (juveniles down, adults up at the same time).
- Timing: Hard to describe since it depends upon the life stage (i.e. complicated life cycle).
- Importance now & future: Now there is about 20 adults/year; urgency to expand population or they are doomed to failure. Entirely dependent on human management and will continue to be that way now and in the future.

Other Native Fishes

- Where: Class I and II streams, unconfined valleys, flood plains, low gradient rivers and streams
- Direction: Move as a population and as individuals.
- Timing: Seasonal/life history
- Importance Now and In the Future: Water quality and a portion of the food chain
- Human Impact: The Reservoir and dam, Infrastructure, Timber Management

Flows – Aquatics

Macro Invertebrates

- Where: Everywhere there is water (even puddles)
- Direction: Resident-might be broadly distributed but they don't typically move. Move as a population and not individuals.
- Timing: Seasonal/life history
- Importance now and in the future: Water quality and a portion of the food chain
- Human Impact: Timber management, Infrastructure, restoration, etc…

Flows – Wildlife

Elk and Deer

- Where: Most of the landscape (see map), but focused in some key areas (e.g. Jims Creek). Uses early seral habitat for forage, meadows for fawning and later seral for cover. Availability of early-seral habitat may be a limiting factor for populations.
- When/Direction: Elk move seasonally, typically spending summers on higher elevation ridgetops and north slopes, and winters in lower elevation valley bottoms and south slopes. Some deer migrate seasonally, but many do not and may remain in the same area year-round.
- Flows important now and into future: Flows affected by fire suppression, harvest, hunting (can either decrease or increase).

Pollinators: bumblebees, butterflies, hummingbirds

- Where: Wet and dry meadows, early seral patches, understory and edges across the whole landscape where flowering species are present. Host plant presence is important for some species. Disturbance plays an important role in creating habitat.
- When/Direction: Between target patches spring through fall.
- Flows important now and into future.
- Susceptible to pesticides; introduction of non-native bees and plants can disrupt their flow. Fire suppression reduces habitat availability.

Flows – Wildlife

Late Seral Associated Species:

Many species use or are dependent on late-seral habitat including fisher, marten, mollusks, cavity excavators, pileated woodpeckers, red tree voles, and northern spotted owls. Some have very small home ranges (mollusks, red tree voles), some have large home ranges (Northern spotted owl, fisher).

Northern spotted owls

- Where: Late-seral habitat with large trees, high structural diversity, sufficient coarse woody debris, and canopy cover ≥ 60% is typically used for nesting, roosting, and foraging. Less densely stocked mid-seral stands with canopy cover ≥ 40% can be used as dispersal habitat. Home ranges occur 1.2 miles around site activity centers. Typically do not use true fir/mountain hemlock stands for nesting/roosting, but could be used for dispersal.
- When/Direction: Defend home ranges during the breeding season (March 1 – September 30), but become less territorial and more wide-ranging in the winter. Young disperse from natal territories across the landscape until they are able to establish a territory of their own. Movement of dispersing young may occur within and between watersheds. Some adults occasionally leave established territories and pair with new mates. All Flows are important now and into the future.
- Human impact: Susceptible to disturbance from noise during the breeding season (helicopters, blasting, timber operations); Loss of habitat and connectivity due to timber harvest (where canopy cover is taken down below threshold values) and wildfire. Competition with barred owls for resources and territories.

Red tree voles

- Where: Within mid seral to late seral forested stands in the western hemlock and lower Pacific silver fir zone; Dependent on presence of Douglas fir and Western hemlock (only food source) in W. Cascades.
- When/Direction: Average home range size is less than 0.5 acres and has low dispersal capability. Common to only use 1-2 trees. Riparian reserve corridors are currently important for habitat connectivity between patches.
- All Flows are important now and into the future.
- Human Impact: Any activities that remove habitat (Douglas-fir, Western hemlock) can impact them if present.

Cavity Excavators

- Management indicator species for dead and decaying trees included in the Willamette Forest Plan: red-breasted nuthatch, northern flicker, hairy woodpecker, downy woodpecker, red-breasted sapsucker, Lewis' woodpecker, black-backed woodpecker, and northern three-toed woodpecker.
- Where: Can be found in all forested habitat types and seral stages, but dependent on presence of dead and decaying trees. Abundance of snags is a predictor of presence. Lewis' woodpecker only found in open canopy pine-oak, black-backed woodpecker follows disturbance (fire, beetle outbreaks), northern three-toed woodpecker found in higher elevations near the Cascade summit.
- When/Direction: Some species have seasonal movement from nesting to wintering areas, some follow food sources (black-backed woodpecker).
- All Flows are important now and into the future.
- Human impact: Any activities that influence snag and down wood availability, fire suppression, loss of pine-oak habitat.

Beaver

- Where: Associated with floodplains/ perennial streams with abundant food source. Ecosystem engineers that create early-seral habitat and change stream dynamics. Prefer smaller diameter trees, but will also utilize larger trees. Flows are along stream and riparian corridors. Can disperse throughout a watershed if conditions are favorable.
- When: Will utilize an area until woody material becomes limited or conditions degrade and then move on.
- Important now and in the future.
- Human impacts: Long-term trapping, removal and draining of beaver ponds, culvert cleaning, simplification of stream channels and disconnection from floodplains, lack of harvesting and fire suppression reduces available early seral habitat

Bald Eagles

- Where: Hills Creek Reservoir.
- When/Direction: Several active nesting sites around the reservoir (January 1 – August 31). Some pairs are likely year-round residents. May also provide important winter stopover habitat for eagles dispersing or migrating through the area. The availability of late-seral forest with large trees for nesting in close proximity to the reservoir is critical.
- Human Impact: Susceptible to disturbance from noise and human presence (helicopters, recreation, timber operations) causing harassment and potential nest abandonment; Reservoir flow may affect their fishing ability.

Flows – Wildlife

Pond Turtles

- Where: Around ponds/lakes/reservoirs/rivers. Known to occur around Hills Creek Reservoir and Staley Pond.
- When/Direction: Spring – emergence from overwintering areas and movement to aquatic habitats. Summer – Nesting (movement from aquatic to nesting areas and back). Fall – some hatchlings emerge and move to water, foraging for winter fat reserves, and return to hibernation habitats (aquatic or upland) by mid to late fall. Since this all happens in ~1 mile radius around aquatic habitats we thought it might make more sense to call this whole area a patch instead of a flow. Once we hone into a smaller area it might make more sense to display flows
- Very important and into future.
- Human Impact: There is potential for poaching by humans; roads are a source of mortality and can also provide nesting habitat (cut banks), reservoir management (water levels) can change habitat availability; timber harvesting and fire/fuel activities can alter habitat and the flow to areas. Disturbance can be important to create nesting habitat.

Flows – Fire

Ignition: human and natural

- Where: Human flows: roads, recreation sites; lightning: no obvious pattern.
- When: Summer through fall
- Direction: Flows affected by access to fuel.
- Importance now and future: Fire has been a very important flow in this landscape, varying in frequency/severity.
- Human Impact: Fire suppression, harvesting has affected vegetation structure, composition and pattern, also affecting fire flows.