

Forest Resource Stewardship Plan 2021-2030

Benton County Natural Areas & Parks Department

Bezell Memorial Forest
Fitton Green Natural Area
Fort Hoskins Historic Park

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EXECUTIVE SUMMARY

This plan covers three large forested Benton County Natural Area and Parks properties: Bezell Memorial Forest near Kings Valley, Fitton Green Natural Area, on a prominent bald above Philomath, and Fort Hoskins Historic Park near Hoskins. Totalling ±1,034 Geographic Information System (GIS) acres, these properties are among the premier natural areas in the county. This document is an update of earlier plans developed for each site.

Overarching Ownership Objectives

The primary objectives for the ownership are to:

1. Conserve populations and habitats for prairie species
2. Provide opportunities for public enjoyment and appreciation
3. Promote diverse wildlife habitats to support native biodiversity
4. Promote environmental education and research
5. Demonstrate environmentally sensitive forest management and harvest techniques
6. Reverse trends of habitat loss; restore degraded habitats
7. Continue conservative harvesting to provide ongoing park funding
8. Prevent wildfires
9. Plan for climate adaptation and carbon capture

This Stewardship Plan with associated mapping updates provides a framework to guide managers, ensuring a long-term management approach following rigorous standards for sustainable forest management. For all three properties, sustainable timber harvesting has and will continue to support many (if not all) of the primary objectives stated above. Harvest objectives focus on environmentally sensitive logging practices, follow Forest Stewardship Council (FSC) standards and practices, and can be independently verified. FSC certification is widely viewed as the most environmentally rigorous voluntary forest certification program.

New Classifications

For this planning period, a new classification system was developed by Benton County Natural Areas & Parks (NAPD) with guidance and support from the NAPD Citizen Advisory Committee. This classification system converted the previous Timber Management Units into Resource Management Units (RMU's). Each RMU was assigned a Sensitivity Class (SC) based on its biophysical characteristics, with the overall goal of helping to better manage and protect key sensitive features and populations.

Six primary vegetation types with eighteen sub-types were developed based on tree size class and density to better describe the conditions on the ground. Narrative descriptions



including current conditions, management goals, and desired future conditions are all addressed later in this plan.

Resource Inventories

Updated resource inventories and descriptions of forest structure, timber products, biodiversity features, and invasive plants were also developed for the 2021-2030 management period. Additional observations and analysis are provided regarding forest carbon, fuels treatments and wildfire risk, forest health, heritage protection and enhancements, access, aesthetics, routine management actions, and habitat enhancement potential.

Geospatial data were updated to capture the management activities of the past 10-year period, as well as to incorporate newly available data sets. RMU attribute tables were given additional fields to better track past and future management. Custom aerial imagery flown in 2020 was used to help refine RMU boundaries and road layers, and stream adjustment work previously done by the county was merged with existing Oregon Department of Forestry (ODF) stream classifications to help determine stream buffers and additional protections.

This plan also represents a larger effort to integrate restoration work on the upland meadows with the restoration and management activities in the forests. By taking this “whole systems” approach, highlighting the interconnected nature of the species in both habitat types, the county and its partners stand to more efficiently and effectively steward the properties on behalf of Benton County residents.

Current Conditions

Of the approximately ±900 acres of forestland across the three properties, the Douglas-fir vegetative type makes up the majority of acres (39%), followed by Oak/conifer (33%), Conifer/hardwood (15%), Mixed hardwood (11%), and Oak savanna (2%). An additional ±131 acres are classified as non-forest, with the bulk of that being in upland meadow habitat. Douglas-fir is by far the most common tree in terms of timber volume, though Oregon white oak and other hardwoods are widespread, providing important habitat and diversity.

The main forest health concerns on the three properties are oak loss from crowding and fir competition, climate-induced drought stress to primarily conifer species, and the spread of invasive species including False-brome and exotic blackberries. Management actions are prescribed to address these concerns.

Trend Analysis

When viewing stand development over the past decade, a number of trends are evident. Positive trends are that thinned stands are stable and growing well, managed stands are developing more diverse and complex forest structure, and meadow wildlife



is increasing. Adverse trends include high seedling mortality on dry sites, conifer seedling expansion into meadow areas, ongoing fir mortality on marginal sites, an ongoing need to balance age class distribution in conifer areas, and damage and loss of legacy oaks from ice and wind damage.

Climatic changes over the last decade — longer and drier summers, more frequent extreme wind and weather events, sporadic spring rainfall, and several years of drought — have had multiple impacts on these forests. In fact, many of the adverse trends listed above can be linked to our changing climate. It is expected that these changes will continue, requiring monitoring and adaptive management to ensure forests remain resilient to changing climate impacts.

Tract Plans

Detailed findings and recommendations are presented for each property, including a 10-year timeline of specific management actions. Primary actions for the 2021-2030 period include:

- Legacy tree release, tree topping for snags, supplemental species plantings, and woody debris creation across 270 acres
- Oak savanna and oak woodland restoration on over 30 acres
- Fir thinning across 130-160 acres
- Establishing new age classes (cohorts) of conifers through group selections, patch cuts, and variable retention harvests on 50-65 acres
- Road rocking for erosion control and property maintenance
- Culvert upgrade to accommodate fish passage

The authors would like to thank Benton County Natural Areas & Parks staff, the Benton County Natural Areas & Parks Advisory Board, the Institute of Applied Ecology, and Anna Dvorak of the OSU Special Collections and Archives Research Center.

They would also like to acknowledge that Beazell Memorial Forest, Fitton Green Natural Area, and Fort Hoskins Historic Park are located on the traditional lands of the Champinefu (formerly Marys River) bands of the Kalapuya, whose descendants are now affiliated with the Confederated Tribes of Siletz Indians and the Confederated Tribes of Grande Ronde.





A snag and small opening created at Fort Hoskins

BACKGROUND AND OVERVIEW

Introduction

This plan covers three large forested Benton County Natural Areas & Parks properties. Bezell Memorial Forest near Kings Valley, the largest Benton County ownership, was acquired by bequest from Fred Bezell in 2000 as a memorial to his wife Delores, and is the largest ever gift to the county. Fitton Green Natural Area, which sits on a prominent grassy bald above Philomath, was acquired with funding assistance from local land protection leaders Charlie and Elsie Fitton Ross in 1988, and grew with several acquisitions over 10 years. Fort Hoskins Historic Park near Hoskins was acquired in 1991 to protect the site of the historic fort that sat on a promontory above the Luckiamute River where it enters Kings Valley. Together these properties encompass ±1,034 acres, and are some of the premier natural areas in the county.¹

Amassed over 18 years under the foresight of then parks director Jerry Davis, these properties embody a vision of natural area protection, public recreation, habitat protection, restoration, and sustainable forest management. They contain 11.2 miles of hiking trails, picnic areas, interpretive displays, educational facilities, meadows and vistas. They have been the site of numerous tours and class visits, professional meetings, research projects, and weddings.

Located in the foothills of the Oregon Coast Range, the properties contain a mix of forest sites, including productive Douglas-fir clad slopes, lush mixed riparian forests, oak woodlands and savannas, and moss-draped maple groves. Old forest legacies, well-managed conifer stands, young plantations, and open meadows of rare upland meadow create a mosaic of habitats that benefit wildlife and people alike.

The properties provide habitat for regionally significant populations of rare Taylor's checkerspot butterfly (TCB), as well as cougar, elk, woodpeckers, raptors, and many common species such as coyote, a large number of birds, and black-tail deer. Since 2000 the County has engaged professional forestry consultants to manage the forest and help restore meadow and savanna ecosystems alongside botany and ecological specialists. Proceeds from selective timber harvests have contributed funding to parks development, maintenance, and administration. Harvest levels are based on forest health and ecological goals, and are not revenue driven.

¹ This information was taken and updated from the "Benton County Resource Stewardship Plan (2011-2020).



Figure 1. Benton County Natural Areas Vicinity Map

Benton County Natural Areas Vicinity Map



Figure 2. *Bezell Basemap*

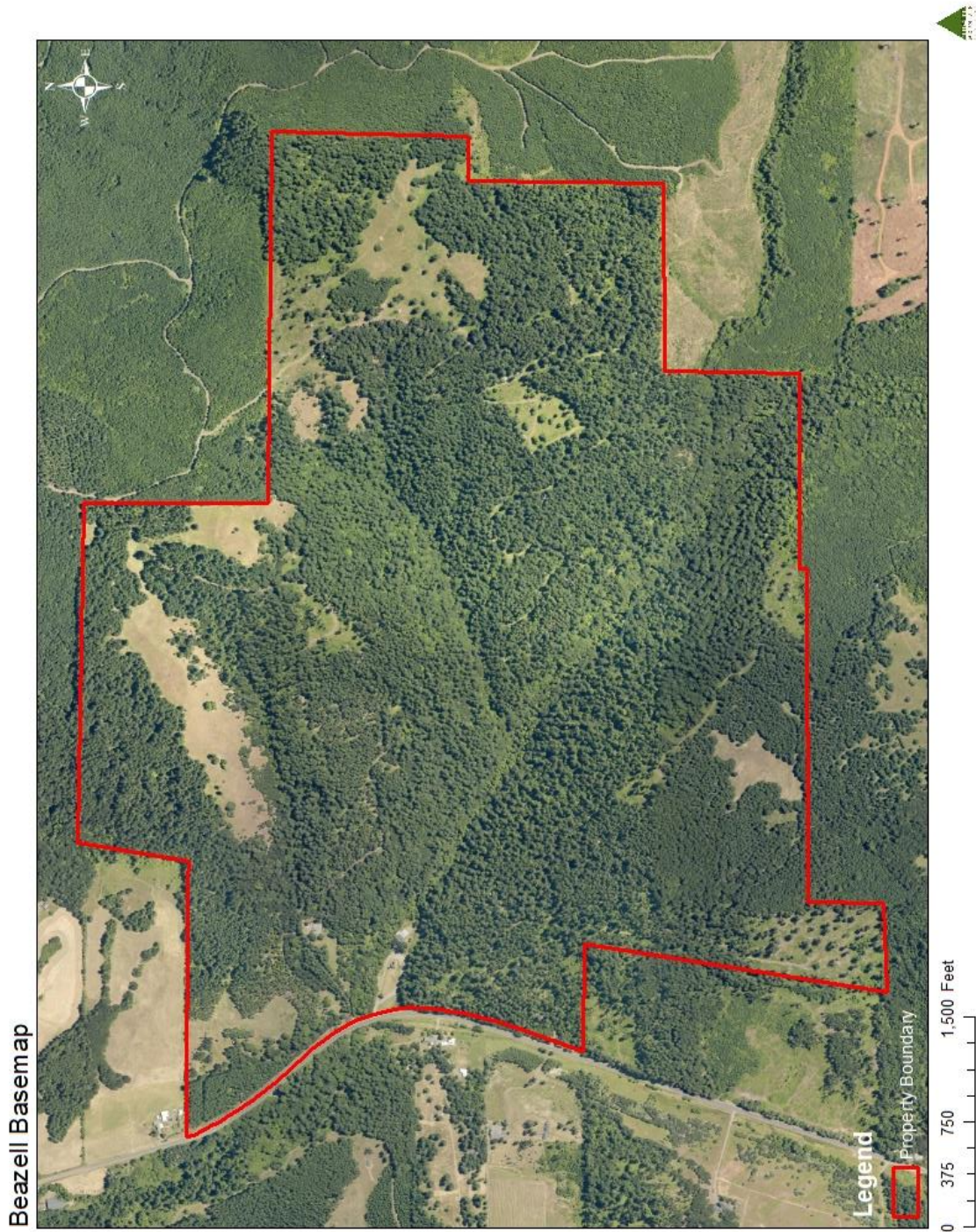


Figure 3. *Fitton Green Basemap*

Fitton Green Basemap



Figure 4. Fort Hoskins Basemap



Relation to Other Plans

Additional background information can be found in the following documents, on file with Benton County. These documents collectively define the Overarching Ownership Objectives referenced in the Executive Summary of this plan².

- Beazell Memorial Forest Stewardship Management Plan (ITS Management, 2001)
- Fitton Green Open Space Natural Area Management Plan (David Reed & Associates, 2000)
- Fort Hoskins Forest Stewardship Management Plan (ITS Management, 2000)
- Benton County Prairie Species Habitat Conservation Plan (2011)
- Benton County Prairie Conservation Strategy (Institute for Applied Ecology, 2010)
- Resource Stewardship Plan for Benton County Natural Areas and Parks Department (Trout Mountain Forestry, 2011)

The Beazell and Fort Hoskins plans were the first resource management plans for those properties. They included detailed property history and a forest resources inventory. The Fitton Green plan lacked a resources inventory, but instead emphasized park development issues. All three plans detailed property management policies and presented a suite of management recommendations.

Most recommendations of these earlier plans have been substantially accomplished. Many of the current park facilities were constructed during the 2000-2010 period. A number of meadow restoration projects were conducted following the discovery of Taylor's checkerspot butterfly (TCB) at Beazell Memorial Forest in 2004. A summary of completed projects from the last 10-year management period is presented in **Appendix A**.

The Benton County Habitat Conservation Plan (HCP) was the culmination of a 4-year planning and public input process focused on protecting high quality native prairie and oak savanna areas for Endangered Species Act (ESA)-listed species. The project allowed the County to provide long-term protection to sensitive species and habitats, comply with Federal ESA requirements, and increase restoration opportunities on County and other private lands. The HCP was adopted by the County and approved by the US Fish and Wildlife Service in 2010.

The Benton County Prairie Conservation Strategy, a companion document to the HCP, was developed in 2010 by Institute for Applied Ecology to provide private landowners a range of voluntary conservation actions which can be taken to increase prairie habitats and recover high priority species in proximity to key opportunity areas throughout the

² These plans can be accessed at: <https://www.co.benton.or.us/parks/page/document-library> and <https://www.co.benton.or.us/parks/page/prairie-species-habitat-conservation-plan>.



County including Beazell Memorial Forest, Fitton Green Natural Area, and Fort Hoskins Historic Park.

The 2011 Resource Stewardship Plan was the first of its kind to attempt to consolidate the various planning documents developed over the prior 10 years for Benton County. It provided both historical context and identified management commonalities at both tract and landscape scales. All of the management objectives identified in the 2011 Resource Stewardship Plan were accomplished with the exception of the last timber harvest that was scheduled for Beazell Memorial Forest.

Indigenous Land Use History

Though differing in geographical locations, all three properties share a similar history and environmental setting. The land encompassing the present-day Benton County Natural Areas is the traditional homeland of the Champinefu³ (formerly Marys River) band of the Kalapuya, whose descendants are now affiliated with the Confederated Tribes of Siletz Indians and the Confederated Tribes of Grande Ronde. Broadly, the Kalapuya were historically differentiated by at least 13 dialects and 3 languages. Each dialect group or band included a collection of villages that occupied the major tributary streams in the Willamette Valley. The Champinefu inhabited the vicinity of present-day Corvallis⁴. Their historical homeland was roughly bounded by Lewisburg to the north, Alesia and Junction City to the south, the Coast Range to the west, and the Willamette River to the east⁵.

According to Aikens et al. in their seminal work *Oregon Archeology*, the Kalapuyans in and around the Willamette Valley strategically managed the landscape through the use of fire. Periodic burning by native peoples here promoted seed-bearing annuals and grasses, camas, hazel, huckleberry and Oregon white oak. This in turn provided staples of the Kalapuyan diet as well as basket-making materials and food for animals such as deer, elk, and small game. Fowl and fish were also opportunistically harvested and all aforementioned resources remain important culturally to this day.

During the warmer food-gathering months, the Kalapuya typically camped in the open or in simple brush shelters. By contrast, a typical winter dwelling described by a member of the Champinefu consisted of a pole frame with grass walls, and an almost flat roof with bark-slabbed shingles. These dwellings could be up to 60' in length and were partitioned inside to accommodate up to 10 families. Beds were arranged along the walls, tule grass mats covered the earthen floor, and the rafters were hung with baskets and bags which served to store preserved food staples (Aikens et al. 2011).

³ Native Land Digital. 2021. Native Land Map. <https://native-land.ca/> Accessed 12/4/20.

⁴ C. Melvin Aikens, Thomas J. Connolly, and Dennis L. Jenkins, *Oregon Archeology*. (Corvallis: Oregon State University Press, 2011), 284-89.

⁵ Thomas C. Hogg et al. *Cultural Resource Inventory: Benton County, Oregon*. (Corvallis: Oregon State University, 1980), Volume I; 25.



One of the most important staples to the Kalapuya is the camas root. It is annually gathered from the wet meadows of the valley during the summer months. Since camas is an indigestible complex starch, it needs to be converted to a more easily digestible simple sugar through baking. Large baking pits are dug to contain fires, to which river rocks are then added. When the rocks are hot enough, the fire is raked away and the camas bulbs are added before being covered with earth. The camas is then baked for 2-3 days before being removed and pounded into cakes for winter storage. While much of the archeological record of the Kalapuya has gone missing over time, remnant camas ovens have been found throughout the valley (Aikens et al. 2011).

From the late 1770s through the early to mid-1800s, successive waves of diseases wiped out as much as 95% of the indigenous population in the Willamette Valley. The remaining Kalapuya were forcibly removed to the Grand Ronde Indian Reservation after signing a series of treaties in 1851, 1854, and 1855 (Aikens et al. 2011).

Anglo-European Land Use History

When white settlers traveled to the Willamette Valley starting in the 1840s, they found a highly managed landscape of open oak woodlands and savanna-like conditions, the result of years of native peoples' burning practices. The Kings Valley area was settled by several members of the King family, who arrived from Missouri in 1846. The Beazell Memorial Forest site is part of the original Hayworth Donation Land Claim, settled in 1849. Cardwell Hill Road, a main wagon road between Kings Valley and Corvallis was constructed in 1854, and served as the primary supply route for Fort Hoskins.

Early farms of the area were primarily sheep and cattle operations, with wheat and oats grown on tillable valley bottoms and middle slopes. Farms often included a variety of vegetables and fruit and nut trees for subsistence use, as well as for sale. Haying, grain growing, and livestock ranching were widespread in the area into the 1950s, but declined through the 1960s. Wine grape growing was introduced in the northern Willamette Valley in the 1980s, and expanded to suitable foothills soils in mid valley in the 1990s and 2000s.

Historical Forest Types

Even in the mid to late 1800s, the landscape of the valley foothills was strikingly different than that seen today. The major vegetation types included prairie, riparian forest, upland forest, and open woodland. Settlers were most attracted to the prairie — open grasslands found from the floodplain margins to the hillsides of most valleys in the area. Isolated groves of trees were primarily white oak and Douglas-fir.

Riparian forests covered the floodplains of most rivers and major streams, where moist soils resisted indigenous burning practices. These sites contained a dense mix of ash, cottonwood, bigleaf maple, Douglas-fir, and various shrubs.



Upland forests of large Douglas-fir, hemlock, red cedar, and maple were found on the slopes of the Coast and Cascade Ranges, and on moist north aspects at lower elevations. In mountainous areas forests were extensive, dense and often contained large trees. Forests nearer the valley were more open and diverse, influenced by frequent fire.

A transition forest called “open woodland” was located between the prairie and the upland forest — open stands of white oak and Douglas-fir, with either a grass or shrub understory. Groves varied from a few trees to several square miles in extent, with Douglas-fir more common near hilltops and floodplain margins, and oak on both drier or wetter sites. Early survey records show this vegetation type was common in the area.

Forest Management History

Original native forests of the valley bottoms and foothills were largely cleared for agriculture and settlement by the 1850s. Trees of all species were cut at this time to not only clear land, but also to provide for farm lumber and fuel needs. As the logging and lumbering industry grew, it shifted to harvesting the extensive conifer forests of the Coast Range. There were numerous sawmills in the area, including an early mill established by Rex Clemens on Plunkett Creek, although its exact location is unknown.



An unidentified sawmill in the woods (photo courtesy of The Siuslaw National Forest Collection)

In the valley, new forests reclaimed abandoned pastures, beginning on steep slopes and poor soils first, in some areas as early as the 1880s. Cutting of these “second-growth” foothills stands resumed by the mid-1900s, especially during the post-war building boom of the 1950s and 1960s. Tree planting for reforestation after logging began in the 1960s on forest industry lands, and became mandated by state forest practice rules in the 1970s.

Commercial logging cut most marketable Douglas-fir at the Beazell property in the early 1950s and 1960s, and similarly at Fort Hoskins in the early 1970s and 1980s. New trees became established at both sites largely by natural reseeding. Logging at the various tracts making up Fitton Green was largely widespread clearcutting of conifers in the 1990s, followed by hand planting the more open areas.

Following acquisition by Benton County in the late 1990s, management emphasis shifted from commercial timber extraction to selective management for forest diversity and habitat restoration. Most conifer stands were thinned to improve stand structure, enhance species composition, and improve tree quality. Competing conifers were

removed from around oaks and other minor species, and select trees cut to create snags and woody debris. Conifers and invasive weeds were cleared from prairie and meadow areas, and native grasses and forbs re-established. Rare and Endangered Species such as Taylor's checkerspot butterfly were discovered at Beazell in 2004 and have been the focus of a suite of restoration initiatives undertaken by the county, and detailed in **Appendix B**.

Management History 2011–2020

Over the past 10 years most plan recommendations have been accomplished. Notable actions have included:

- Fir thinning across 156 acres, with harvests of 1,435 thousand board feet
- Oak release and meadow/savanna restoration
- Over 29 acres of new mixed species forest plantations
- Tree topping for snag and woody debris creation
- Road rocking to provide year-round light-truck access
- Continued invasive weed control and periodic meadow burns

Environmentally sensitive management and harvest techniques have been used to restore habitats, maintain forest health, improve future tree quality, and provide ongoing funding for park management. Thinning harvests have reduced crowding in dense stands and increased tree species and age diversity, while protecting environmental quality and providing high quality visitor experiences.

A variety of silvicultural approaches have been demonstrated, including even-aged, uneven-aged, and multi-species management.

A range of thinning techniques and harvesting equipment has been used. Operations have been scheduled to enable returning for subsequent thinning harvests every 10-15 years. The majority of thinned stands have been entered at least once. Some stands that have been thinned twice are potentially available for another thinning (depending on site) or a regeneration treatment. All timed reentries and treatments are dependent upon overall stand response from the last entry, and how each treatment fits with other management priorities across the ownership.

Regeneration efforts to date have been primarily focused at Beazell, and have totaled 29 acres of variable retention and patch cut harvests over the last 10 years. Retained features by design have included the largest and oldest trees, uncommon species, and trees with high value for wildlife and snags. Downed wood additions were also contributed through the course of the harvests. Reforestation proved to be challenging due to unpredicted drought conditions and site limitations. Brush control and seedling



selection during a drought cycle (both species and stock size) are paramount to success. All plantations are now currently stocked and free to grow.

The forestland has been certified under the Forest Stewardship Council (FSC) program since 1998, utilizing the group certification program of the County’s consulting forester (often referred to in certification parlance as the Resource Manager). All operations supervised by the Resource Manager have therefore followed FSC certification standards. Benton County properties were included in multiple certification audits over the past decade and found in compliance.

Landscape Scale Conservation

In 2006, the Oregon Department of Fish and Wildlife (ODFW) created the Oregon Conservation Strategy (OCS) as a blueprint for landscape scale conservation in Oregon⁶. This comprehensive strategy identified Key Conservation Issues, Ecoregions, Conservation Opportunity Areas (COA’s), Strategy Habitats and Species, as well as other tools for achieving conservation goals. Updated in 2016, it remains the definitive plan for state-level conservation.

The Benton County tracts are located in the Willamette Valley and Coast Range Ecoregions, as identified by ODFW. Of the three properties, Fort Hoskins is located in the Luckiamute River and Tributaries COA (#075), Beazell is located within the Kings Valley-Woods Creek Oak Woodlands COA (#080), and Fitton Green is located in the Corvallis Area Forests and Balds COA (#081). Collectively, the properties encompass four of the eleven “Strategy Habitats” identified by ODFW in their conservation priorities for the state. Two of these Strategy Habitats are specifically related to oak habitats (**Table 1**). The fact that these properties contain four of the statewide Strategy Habitats is a testament to the ecological significance of these parcels.

Table 1. Strategy Habitats on the Subject Benton County Natural Areas

OCS “Strategy Habitats”	Relevance to Benton County Properties
Flowing Water and Riparian Habitats	Naturally occurring flowing freshwater streams as well as the adjacent riparian habitat, found on each tract. Plunkett Creek at Beazell is a notable example.
Grasslands	Relict oak savanna and grassy balds on each tract
Oak woodlands	Oak stands and mixed oak woodlands on each tract
Wetlands	Wet prairie at Fitton Green; seeps and springs at each tract

⁶ Oregon Conservation Strategy. 2016. Oregon Department of Fish and Wildlife, Salem, Oregon.



For information on key indicator species associated with each of the 3 COA's, please refer to **Appendix C**.



The Summit Meadow at Bezell, a Strategy Habitat Type for the State of Oregon

MANAGEMENT OBJECTIVES AND POLICIES

Ownership Objectives

General objectives for the ownership include:

1. Conserve populations and habitats for prairie species
2. Provide opportunities for public enjoyment and appreciation
3. Promote diverse wildlife habitats to support native biodiversity
4. Promote environmental education and research
5. Demonstrate environmentally sensitive forest management and harvest techniques
6. Reverse trends of habitat loss; restore degraded habitats
7. Continue conservative harvesting to provide ongoing park funding
8. Prevent wildfires
9. Plan for climate adaptation and carbon capture

While all three properties share these overarching Ownership Objectives, they each have specific focuses that make them unique.

Bezell is managed in trust to provide both environmental education and daily recreation opportunities for county residents, funded by sustainable timber harvests in perpetuity.

Management of the site at *Fort Hoskins* (particularly around the historical interpretive areas) is focused on recreating conditions that would have been present before and during the site's time as a Civil War era fort.

Fitton Green, by contrast, is focused on landscape-level habitat enhancement, and on wildfire prevention, as well as cross-jurisdiction recreational development.

Management Policy Overview

A policy framework guides future managers, and ensures a consistent long-term management approach, and follows standards for FSC certification⁷.

1. Recreation and Visual Resource Management

Benton County Natural Areas and Park properties emphasize dispersed, day-use opportunities, with a focus on hiking and nature appreciation. Recreational use minimizes impacting sensitive areas, wildlife and fish habitats, cultural sites, or other resources. Horses and mountain bikes are allowed only on specified trails. Opportunities for public education are actively promoted. Impacts to neighbors are minimized.

⁷ Forest Stewardship Council. 2010. FSC-US National Standard. Accessed at: <https://us.fsc.org/download.fsc-us-forest-management-standard-v1-0.95.htm>.



2. Wildlife Resource Management

Active management improves habitat conditions and protects biological resources. Sensitive sites are protected from incompatible uses. Degraded sites are actively restored. Wildlife and fish habitat improvements promote species diversity and endangered species.

3. Vegetation and Botanical Resources

Maintaining biological richness and native diversity is a top priority, and involves active and diligent management. Oak savanna and woodlands are restored or rehabilitated by controlling conifer encroachment and invasive weeds. Degraded habitats are improved to create a species mix indigenous to native Oregon oak, Douglas-fir, and mixed woodland communities.

4. Timber Management

All properties are managed for the sustainable harvest of forest products. All forests are managed following FSC standards. Management emphasizes protecting long-term productivity and improving the biological integrity of the entire forest ecosystem. The desired future forest features mixed species stands of older, larger trees, with sufficient harvesting and regeneration to provide early successional habitat and balance the ages of the stands. Timber harvests use a variety of silvicultural systems to create structures that benefit wildlife and native biodiversity. Uneven-aged stand structures are favored where possible. Lands on which other resource values exceed timber values are removed from the timber management base, or receive substantially modified practices under the developed Sensitivity Classification. Light-touch, environmentally sensitive logging practices are used.

5. Monitoring and Assessment

Management activities and subsequent conditions are monitored regularly to assure ownership objectives are being achieved. Monitoring results are the basis for evaluating and modifying the management plan. This may include how the forest changes in response to public use, shifting climatic or weather impacts, changing wildlife populations and their needs, invasive species pressures, as well as myriad other considerations common to the dynamic and complex nature of public forests in Western Oregon. While monitoring and assessment should take place routinely by the FSC Resource Manager each year (to maintain FSC certification), ownership-wide resource conditions are inventoried every ten years.

6. Revenue

Park operations are intended to be self-sustaining whenever possible. Funds for facility development, restoration, and maintenance are derived from timber sales associated with forest resource improvements, supplemented by grant funding opportunities if and when appropriate. Any income produced from the properties is used exclusively to sustain park development, operation, and administration. Both Beazell Memorial Forest



and Fort Hoskins have established trust funds for their management. Beazell is unique in that revenue from sustainable timber harvesting activities are required to only be used on the property.

Sensitivity Classification

A key to the reevaluation of the Benton County forestlands for additional planning and protection purposes is the new Sensitivity Class rating system. Developed by Benton County Natural Areas & Parks, this new system converted the previous Timber Management Units into Resource Management Units (RMUs). Each RMU was assigned a Sensitivity Class (SC) based on its biophysical characteristics to better manage and protect key sensitive features and populations. While the classification was meant to only be applied to the forested areas of the property, Trout Mountain Forestry has adapted the system for use in the various non-forested RMUs across the properties with key input from the Institute for Applied Ecology and Benton County staff. By extending the ratings to non-forestlands, managers will be able to better protect the most sensitive RMUs as well as adapt their management practices in RMUs adjacent to highly sensitive areas for better overall resource protection.

Sensitivity Class 1- Very sensitive. Typical of known historical/cultural sites, riparian areas and endangered species habitat. These units will be managed for no disturbance from forest management, except for careful enhancement of desirable features.

Sensitivity Class 2- Sensitive. Typical of “Old Forest” stands. Management in these units will be limited to well-planned and carefully conducted activities such trail building, fire resiliency improvement, and invasive species removal.

Sensitivity Class 3- Moderate. Typical of areas in need of prescriptive management to improve stand resiliency and structure, such as conifer thinning and oak release. Minimal road building and low-impact mechanized logging equipment will be allowed in these units.

Sensitivity Class 4- Commercial. Typical of conifer stands managed primarily for commercial harvest or thinning for future commercial harvest. Road building and low impact mechanized logging will be allowed.

Sensitivity Class 5- Development. Typical of public entrance areas where parking and services are provided. Structural enhancements will be allowed.



Figure 5. Beazell Sensitivity Classes Map

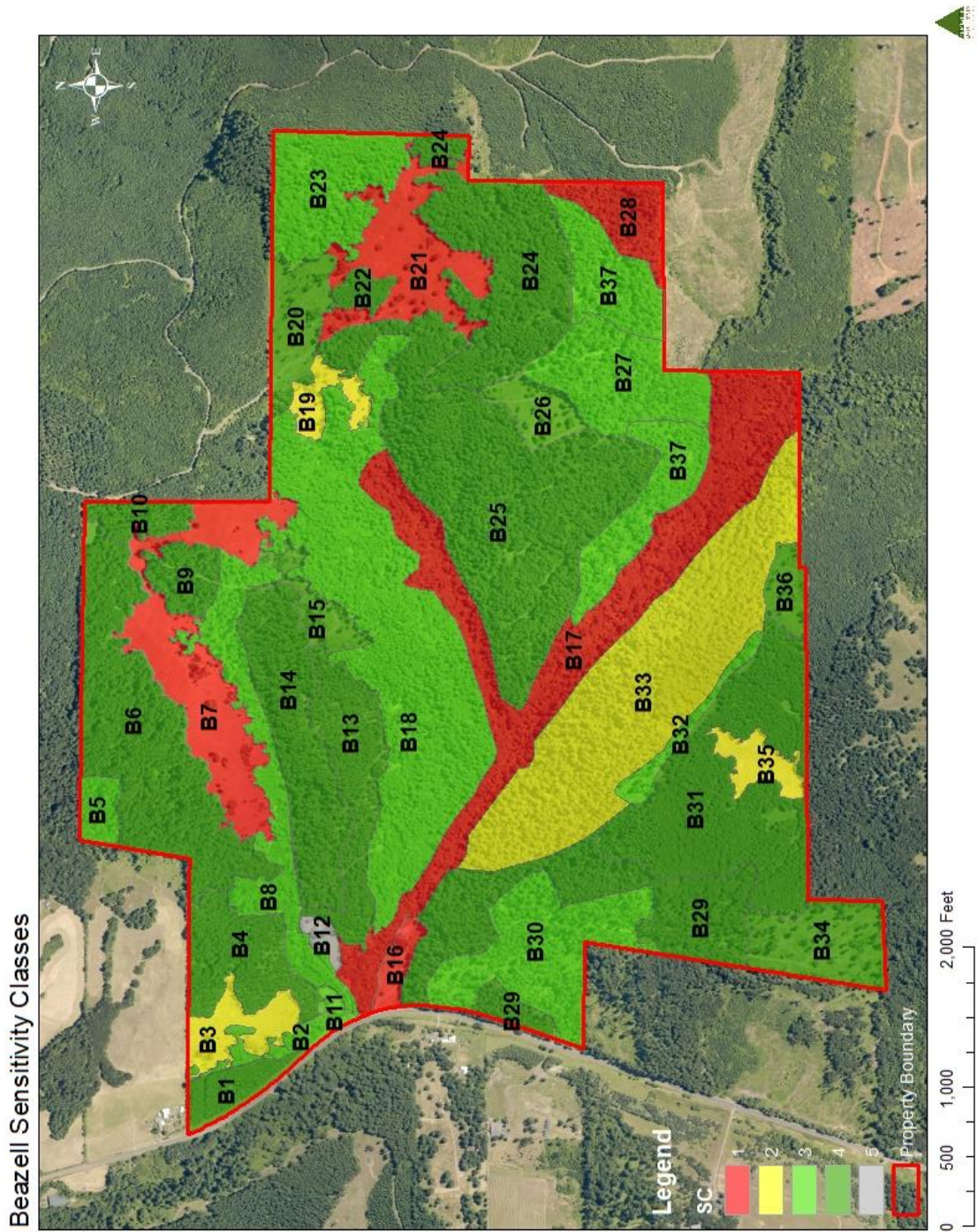


Figure 6. Fitton Green Sensitivity Classes Map

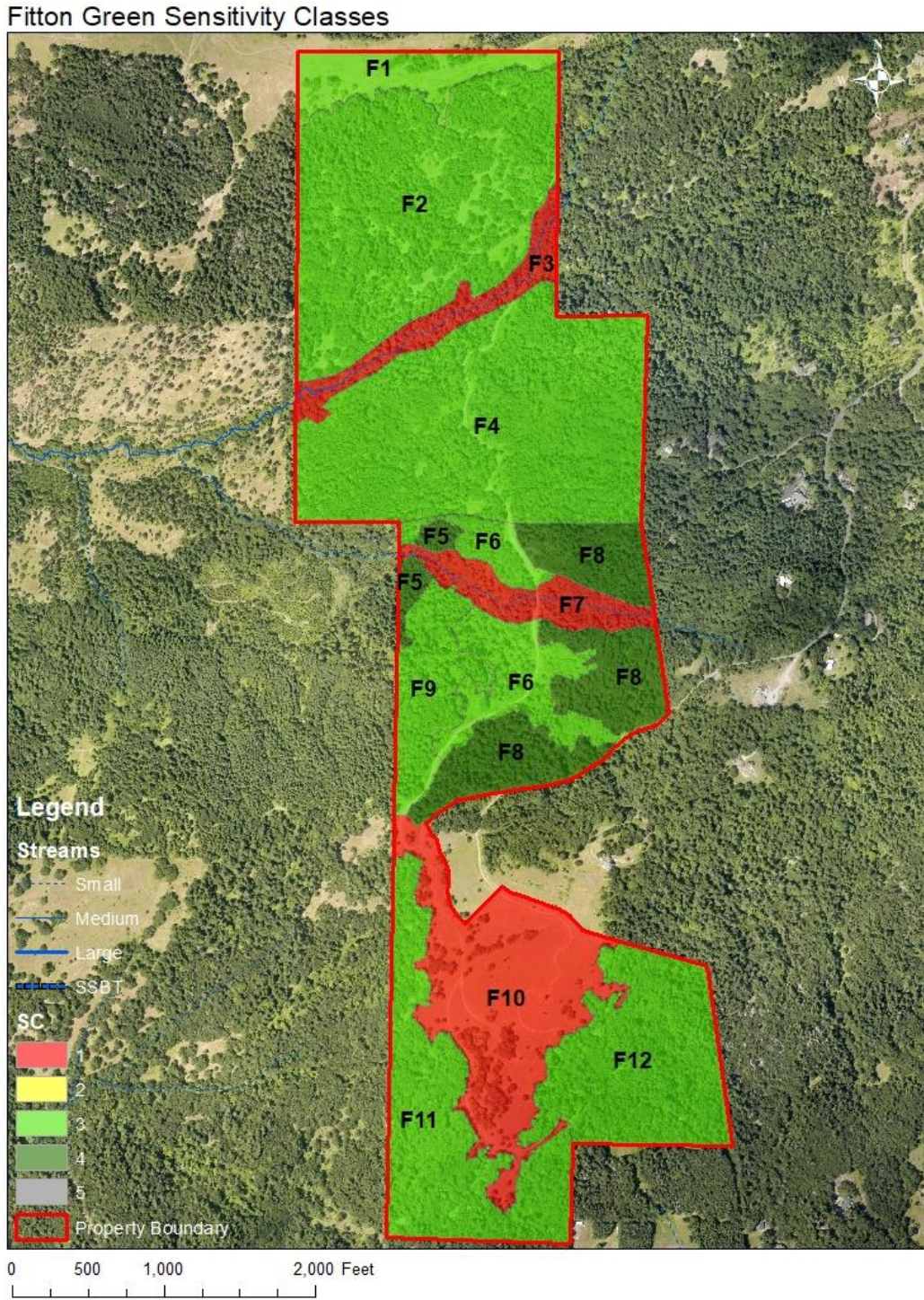
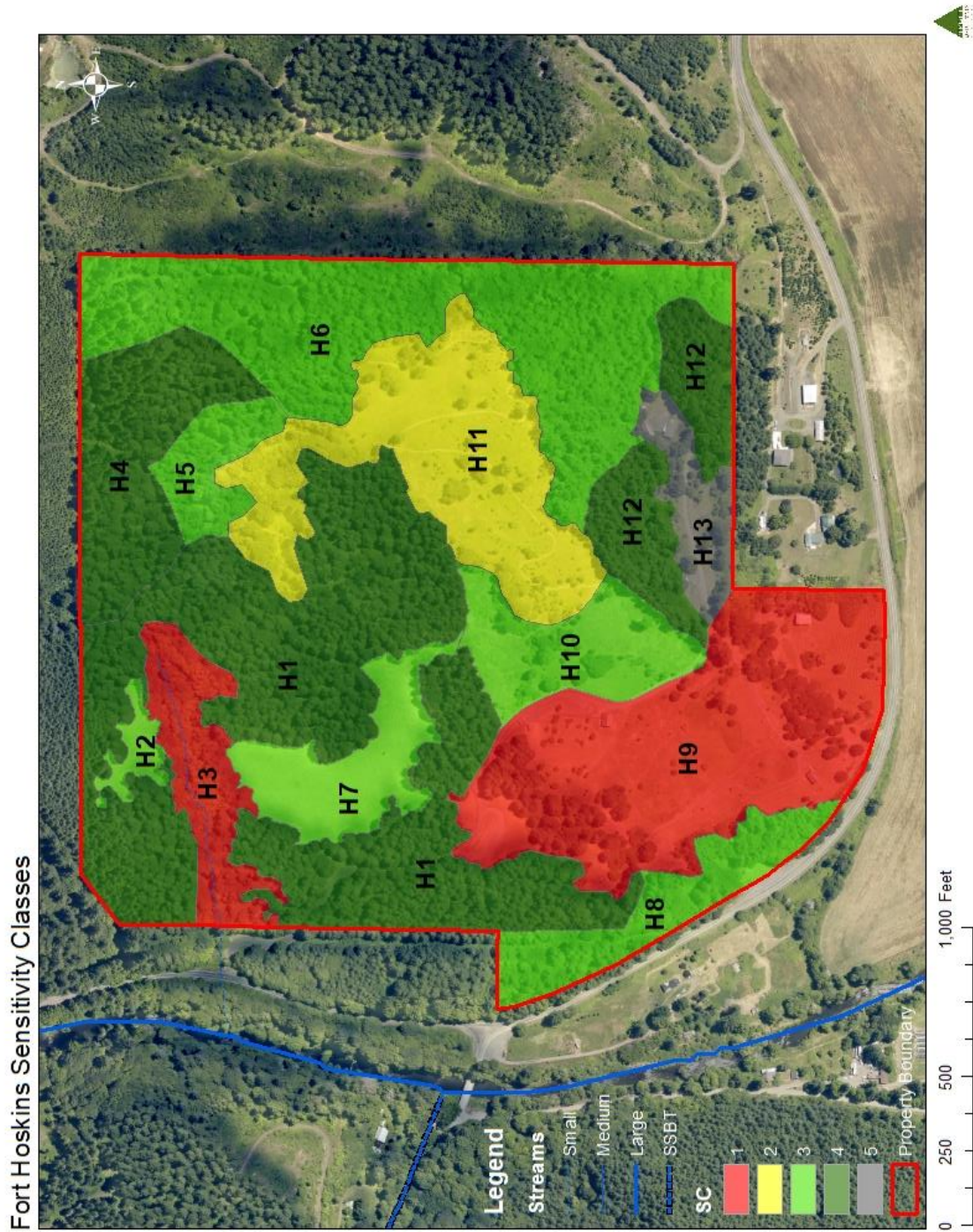


Figure 7. Fort Hoskins Sensitivity Classes Map



RESOURCES ASSESSMENT

Soil Types

The following descriptions are summarized from the USDA Web Soil Survey of Benton County Area, Oregon. Complete Soil Maps and Tree Site Index Maps as well as related information are found in **Appendix D** and **Appendix E**, respectively.

Bezell Memorial Forest, Fort Hoskins Historical Park, and Fitton Green Natural Area are located in the foothills of the Coast Range on the margin of the Willamette Valley. Soils are generally colluvium and residuum derived from igneous or sedimentary parent material. Most soils are finely textured silty clay loams, silty clays or their gravelly variants (See **Tables 2, 3, 4** below). Most are at moderate or high risk for erosion, with increasing hazard on steeper slopes.

Foothills soils vary in depth and productivity, associated with aspect and landform position. Soils on south and west facing slopes and ridge tops tend to be shallow (10-40") and droughty, with lower productivity for tree growth. Soils of north and east facing slopes tend to be deep, moist, well drained, and the most productive.

Table 2. Bezell Memorial Forest Soils Summary

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
58	Dixonville-Gellatly complex, 12 to 30 percent slopes	86.2	14.2%
59	Dixonville-Gellatly complex, 30 to 60 percent slopes	76.3	12.6%
60	Dixonville-Gellatly-Witham complex, 2 to 12 percent slopes	10.3	1.7%
98	Jory-Gelderman complex, 12 to 30 percent slopes	3.0	0.5%
109	MacDunn-Price-Ritner complex, 60 to 90 percent slopes	23.1	3.8%
113	McAlpin silty clay loam, 0 to 3 percent slopes	4.6	0.8%
137	Price-MacDunn-Ritner complex, 30 to 60 percent slopes	231.7	38.1%
175	Witzel-Ritner complex, 12 to 30 percent slopes	111.6	18.4%
176	Witzel-Ritner complex, 30 to 60 percent slopes	61.4	10.1%
Totals for Area of Interest		608.1	100.0%



Table 3. Fitton Green Natural Area Forest Soils Summary

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
58	Dixonville-Gellatly complex, 12 to 30 percent slopes	105.8	34.9%
59	Dixonville-Gellatly complex, 30 to 60 percent slopes	80.9	26.7%
60	Dixonville-Gellatly-Witham complex, 2 to 12 percent slopes	13.7	4.5%
98	Jory-Gelderman complex, 12 to 30 percent slopes	4.8	1.6%
137	Price-MacDunn-Ritner complex, 30 to 60 percent slopes	97.7	32.2%
Totals for Area of Interest		302.8	100.0%

Table 4. Fort Hoskins Historical Park Forest Soils Summary

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
18	Bellpine-Jory complex, 12 to 20 percent slopes	11.8	9.5%
19	Bellpine-Jory complex, 20 to 30 percent slopes	54.8	44.1%
20	Bellpine-Jory complex, 30 to 60 percent slopes	33.8	27.2%
94	Jory silty clay loam, sedimentary bedrock, 2 to 12 percent slopes	23.7	19.1%
Totals for Area of Interest		124.2	100.0%

Valley bottoms are underlain with deep (>80 inches), productive soils, with good to somewhat poor drainage. In some areas tree growth is restricted by excessive wetness.

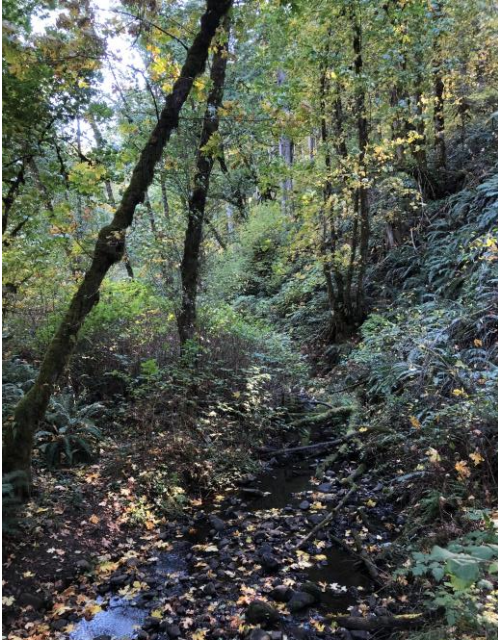
Many soils types are compactable and should not be operated on when wet. Compaction destroys site productivity by squeezing air out of the soil and reducing the ability of roots to penetrate, grow and breathe. Erosion is a concern on sloping sites. Roads should be designed with side drainage and grade breaks, and disturbed surfaces seeded after operations.

Streams

Streams in Oregon are classified by the Oregon Department of Forestry (ODF) by their type (F, D, or N) and size (small, medium, large). Type F streams have fish and may also be used for domestic water. Type D streams are used for domestic water and have no fish. Type N refers to all other types of streams. An additional classification exists for Salmon, Steelhead, and Bulltrout (SSBT) streams, which require greater riparian buffers



than Type F streams. These stream classifications are used in Oregon’s forest protection laws to regulate management activities along streams.



Plunkett Creek, a small and medium Type F Stream

Of the three properties, only Beazell contains a fish-bearing stream. Plunkett Creek, which is a tributary of the Luckiamute River, is classified as both a small and medium type F stream (on different reaches). Approximately 1.3 miles of the upper main stem of Plunkett Creek is located on the property.

Downstream of Beazell, Plunkett Creek is listed as a medium Salmon, Steelhead, and Bull Trout stream. Besides Plunkett Creek, the Beazell property includes an additional 1.5 miles of several unnamed tributaries for which fish presence is unknown.

Previous fish surveys in Plunkett Creek have found native cutthroat trout, two species of sculpin, and juvenile steelhead. Although none were found in Plunkett Creek during surveys,

lamprey may also be present seasonally if they migrate up from the Luckiamute River. The other properties contain only small streams with no known fish presence.

More information on ODF Forest Practice Rules, including riparian regulations, can be found in **Appendix F**.

Figure 8. Beazell Topography and Hydrology Map

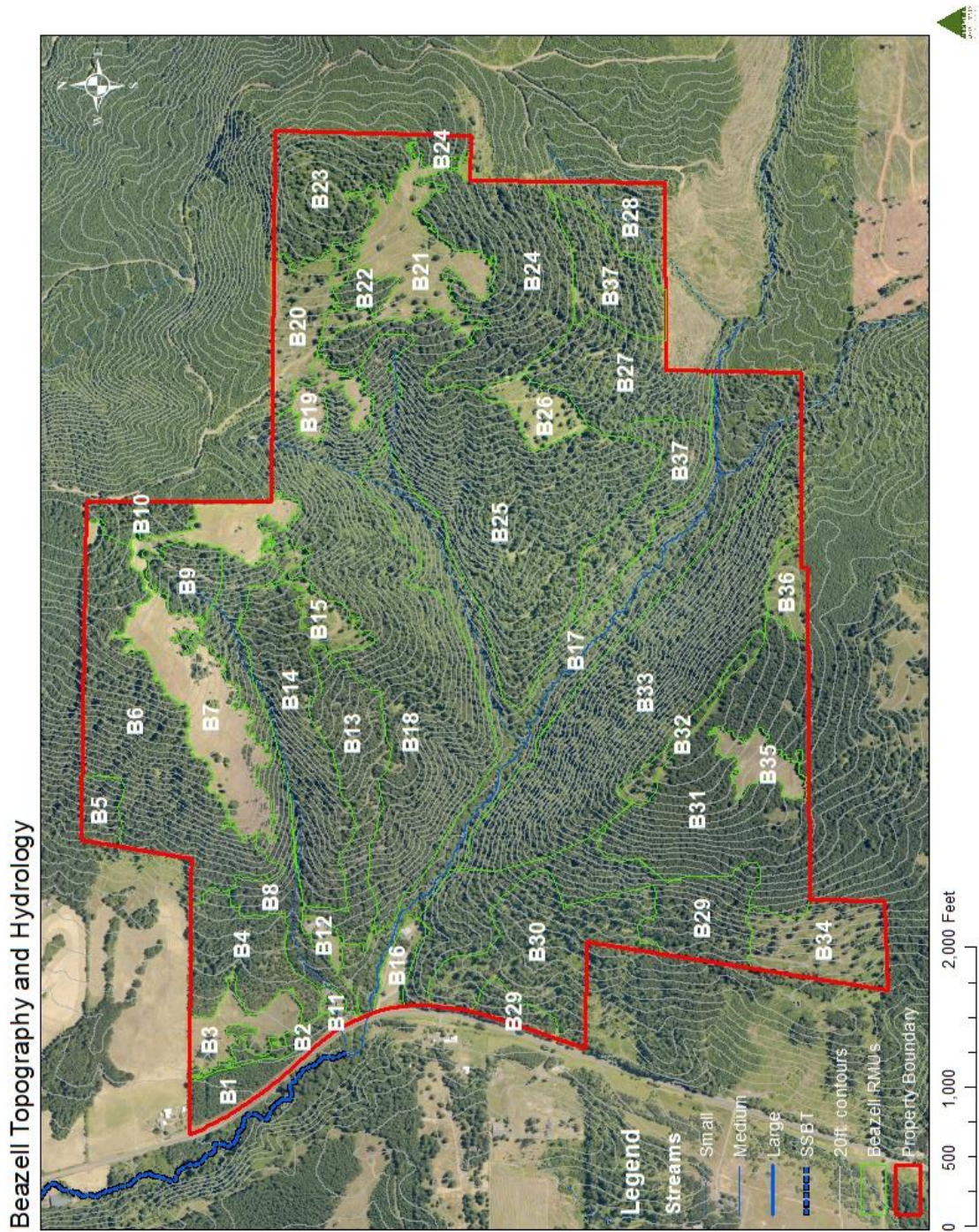


Figure 9. Fitton Green Topography and Hydrology Map

Fitton Green Topography and Hydrology

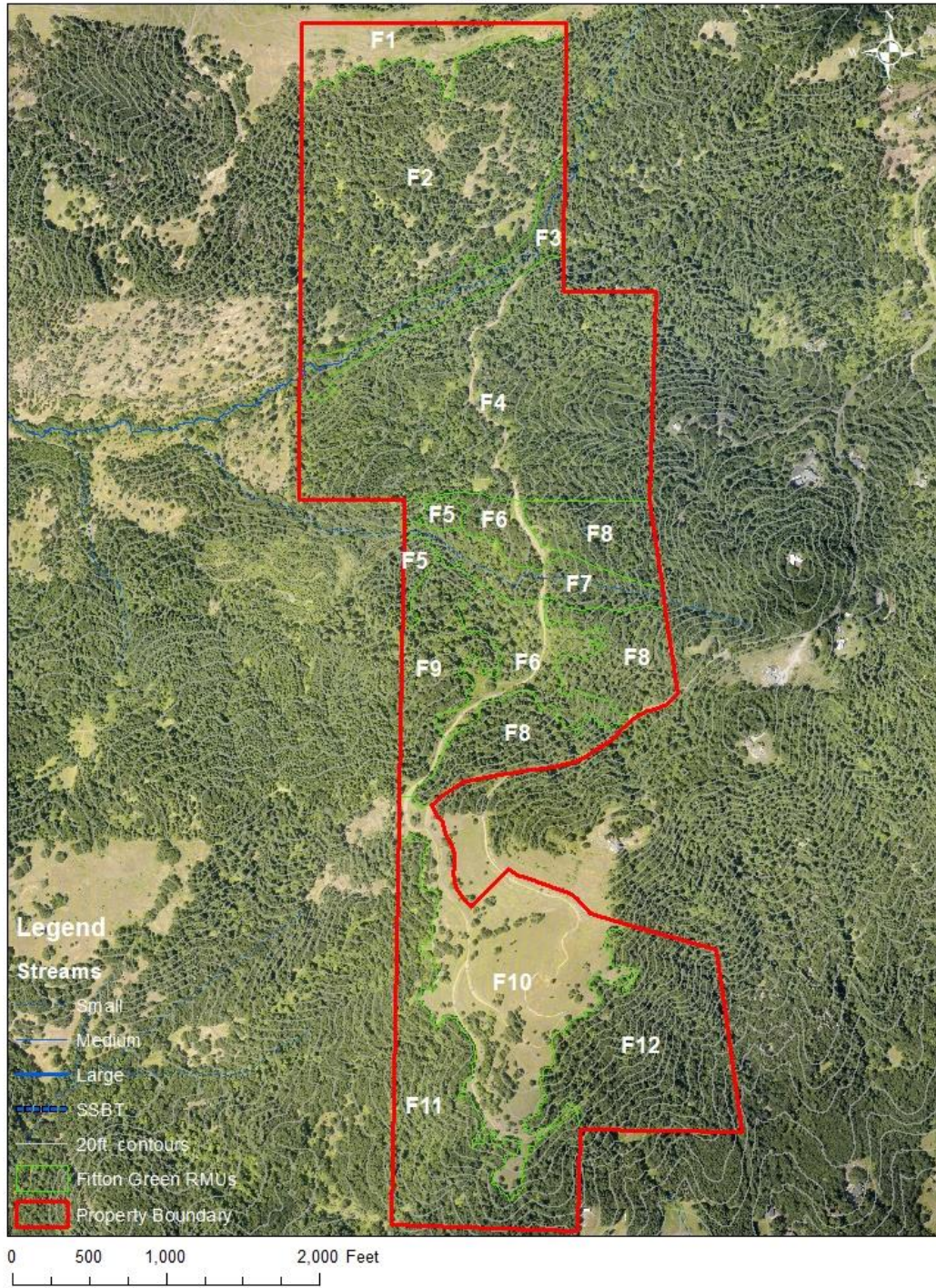
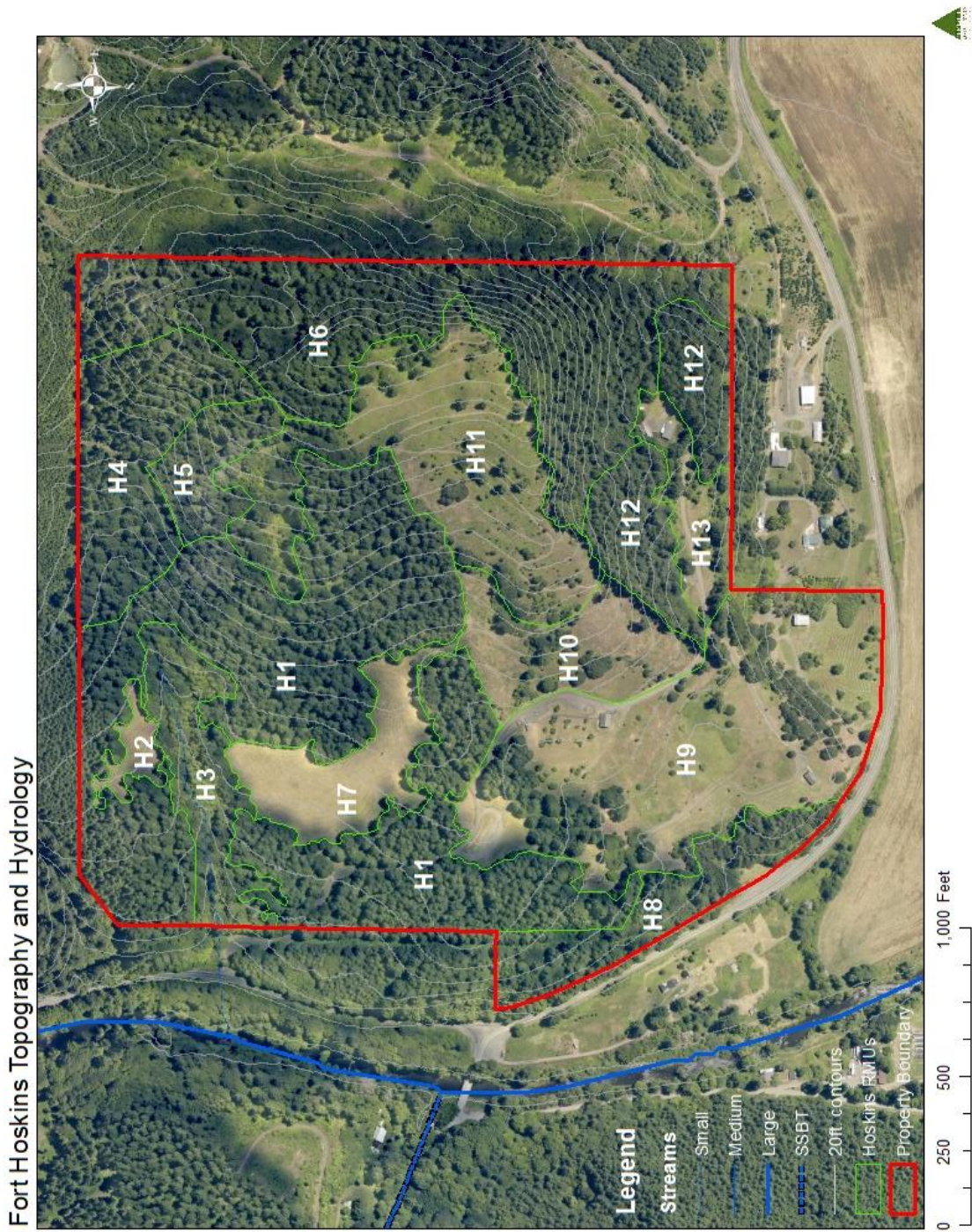


Figure 10. Fort Hoskins Topography and Hydrology Map



Fish and Wildlife Habitat

The properties contain a diverse mix of forested and open habitats that support a rich array of wildlife species. It also contains more than three miles of perennial and seasonal streams. Several habitat types are of particular interest:

- Native prairie remnants are found at each site. A once-dominant community type, most remnants are now highly fragmented and degraded across the Willamette Valley. Associated rare and endangered species and their food sources include Taylor’s checkerspot butterfly (*Euphydryas editha taylori*, endangered), Kincaid’s lupine (*Lupinus sulphureus ssp. Kincaidii*, threatened), Willamette daisy (*Erigeron decumbens*, endangered), (*Cimicifuga elata*, Species of Concern), thin-leaved peavine (*Lathyrus holochlorus*, Species of Concern), and Golden paintbrush (*Castilleja levisecta*, threatened)⁸. The Beazell site is one of only two known locations in Oregon with Taylor’s checkerspot butterfly. Populations have been introduced at Fitton Green, but it is unclear whether they’ve been able to establish yet.
- Wetland/riparian areas on each property are current and potential habitat for a number of species (frogs, turtles, and birds)
- Oak woodland and savanna areas are present at each property, and currently providing habitat for a wide variety of species including Western gray squirrel (*Sciurus griseus*) and acorn woodpeckers (*Melanerpes formicivorus*). While invasive species have been targeted and encroaching Douglas-fir have been removed or girdled during the last management period, there are still opportunities at each property to create more open conditions for oaks
- The mixed species forests at each site provide abundant habitat for neo-tropical migratory songbirds
- Each property provides good habitat for black-tailed deer and elk
- Snags provide necessary nesting, caching, roosting, and hiding sites for a variety of birds, mammals, and amphibians. Significant snag recruitment (both natural and man-made) has been undertaken in the last ten years, but opportunities still exist
- Down logs are also important habitat elements for a range of species. Down wood levels can still be improved on all three properties, especially in plantation and conifer stands.

Management goals

Wildlife management will be a primary consideration in managing forests and meadows. Restoration and enhancement practices will be implemented as funding is available, and when possible in conjunction with other forest management operations.

⁸ Oregon Department of Fish and Wildlife. N.D. Oregon’s Endangered Species. <https://www.fws.gov/oregonfwo/promo.cfm?id=177175701> Accessed 11/17/20.



Desired Future Conditions

These areas will provide diverse and productive habitat for a wide variety of native wildlife, with particular emphasis on enhanced native prairie, oak woodlands, and savannas.

- Meadows, prairies, and savannas habitats are protected, kept free of invasive weeds and conifer seedlings, and contain native grass and nectar species. Taylor’s checkerspot butterfly areas are sheltered by edge trees and shrubs for temperature and wind amelioration, and protected from soil compaction
- Oak in hardwood and mixed stands are kept free of competing conifers; oaks have large, spreading crowns for enhanced acorn production
- Additional legacy trees (maple, madrone, Douglas-fir, and grand fir) are promoted for biodiversity, climate resiliency, and the habitat they afford different species of wildlife
- All forest stands contain large numbers of snags and woody debris, and productive understory plant communities dominated by native species.
- Invasive weeds are monitored and carefully controlled
- Streams are protected from erosion and down-cutting, with stable flows and high-water quality for aquatic species
- Properties provide feeding and cover habitat for deer and elk, and a link to other protected lands nearby, where possible

Plant Communities

Native species commonly found in the understory include snowberry (*Symphoricarpos*), ocean spray (*Holodiscus discolor*), salal (*Gaultheria shallon*), poison oak (*Toxicodendron diversilobum*), Western sword fern (*Polystichum munitum*), Beaked hazelnut (*Corylus cornuta*), Indian plum (*Oemleria cerasiformis*), Oregon grape (*Mahonia aquifolium*), trailing blackberry (*Rubus ursinus*), Pacific serviceberry (*Amelanchier alnifolia*), vine maple (*Acer circinatum*), salmonberry (*Rubus spectabilis*), and thimbleberry (*Rubus parviflorus*). The 2000 management plan for Beazell Memorial Forest included a plant species list with a total of 246 plant species encountered, of which 185 species (75%) were native species. A 2000 plant inventory at Fort Hoskins found 75 species, of which 47 (37%) were native.

Rare and uncommon plant species encountered at Beazell include Kincaid’s lupine, Willamette Daisy, Golden paintbrush, tall bugbane and thin-leaved peavine. Golden paintbrush is located at Fitton Green. The golden paintbrush populations at Beazell and Fitton Green have been successfully reintroduced there after being extirpated from Oregon.

The particular mix of species present varies at each site based on soils, exposure, slope, available moisture, and other factors. Plant Associations are described for common



communities to indicate common ecological characteristics (McCain and Diaz, 2002. McCain and Christy, 2005). A wide variety of plant associations are present at each property, but a complete understory vegetation inventory was beyond the scope of this project. **Table 5** indicates some of the more common upland plant associations present on the ownership.

Table 5. Select Upland Plant Associations, Benton County Natural Areas

Plant Association	Tracts	Location/notes
ABGR/HODI/POMU Grand Fir/Oceanspray/Sword Fern	BMF, FG, FH	Mostly on dry, warm, southerly aspects
ABGR/HODI/POMU - OAK ⁹ Grand Fir/Oceanspray/Sword Fern	BMF, FG, FH	Widespread at low elevations; a combination of the two plant associations
ABGR/COCO6/VAHE Grand Fir/California Hazel/Inside-out Flower	FG, FH	On dry, warm, southerly aspects
ABGR/MANE2-GASH Grand Fir/Cascade Oregon Grape-Salal	FG, FH	Dry to mesic sites
ABGR/ACCI/POMU Grand Fir/Vine Maple/Sword Fern	BMF, FG, FH	Mesic to moist sites adjacent to riparian areas and scattered elsewhere. More common at low elevations.
TSHE/ACCI-GASH/POMU Western Hemlock/Vine Maple-Salal/Sword Fern	BMF	Dry-mesic sites at higher elevations
TSHE/MANE2-GASH Western Hemlock/Cascade Oregon Grape-Salal	BMF, FH	Mesic sites on northerly aspects
TSHE/ACCI/POMU Western Hemlock/ Vine Maple /Sword Fern	BMF, FH	Mesic sites on northerly aspects at higher elevations
COCO6-ACCI/OXALI California Hazel-Vine Maple/Sorrel	BMF, FG	Occurs in drier parts of the riparian zone. Overstory mostly Bigleaf Maple, mixed with Red Alder and Douglas Fir.
RUSP-ACCI Salmonberry-Vine Maple	BMF, FG, FH	Occurs in riparian-upland transition zone mixed with Salmonberry/Sword Fern community and Grand Fir/Vine Maple/Sword Fern plant association.
RUSP/TOME-OXALI group Salmonberry/Piggyback Plant-Sorrel group	BMF, FH	On active flood plains, stream banks and low terraces, usually with an overstory of Red Alder.

⁹ Oak is an undefined plant association occurring on low elevation sites in and at the edges of the Willamette Valley.



Roads and Trails

A network of rocked and dirt roads at each property provide access for recreation, forest management, firefighting access, and ecological restoration activities. Rocked roads provide year-round access for restoration and monitoring, reduced erosion, and allow logging to avoid high wildfire-risk periods. The cost of rocking can often be recovered in a single harvest based on seasonal log price premiums.

Trails are an important part of the parks' infrastructure. Currently all three properties have a variety of recreational and interpretive opportunities for visitors. User groups allowed on the trails include hikers, trail runners, equestrians, and mountain bikers, except for Fort Hoskins where mountain bikers and equestrians are not allowed.



One of the rocked roads accessing the North and East divisions at Bezell



A failed culvert at Fort Hoskins to replace

A variety of stream crossing culverts are found throughout the road system. Most are effective and in good condition. Annual inspection and inventorying of culverts by county staff will ensure proper drainage and minimize damage to road surfaces by overland flow of water resulting from blockage. This maintenance activity becomes increasingly more important as our region is modeled to experience more precipitation caused by warmer winters in the future.

Figure 11. Beazell Access Map

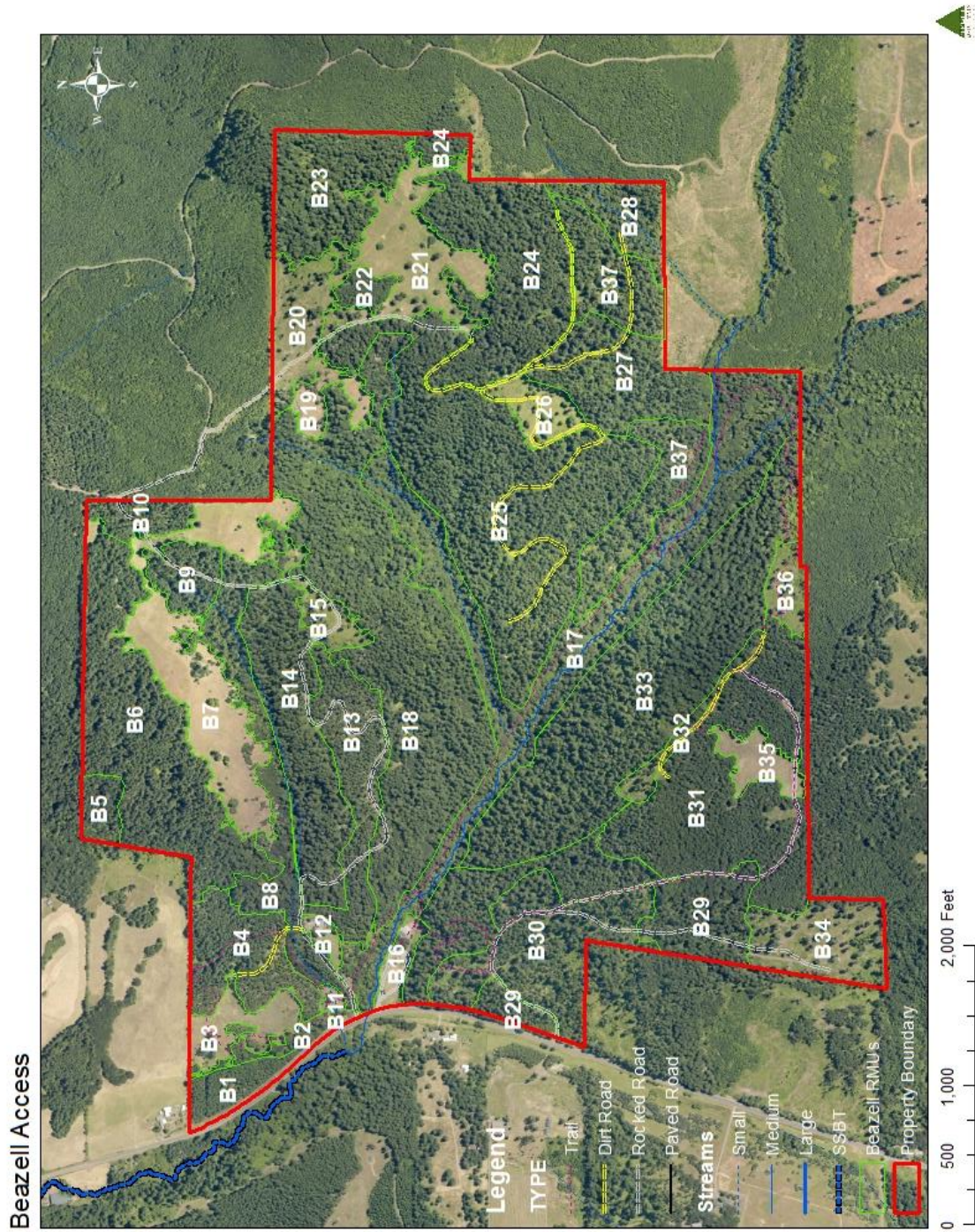


Figure 12. Fitton Green Access Map

Fitton Green Access

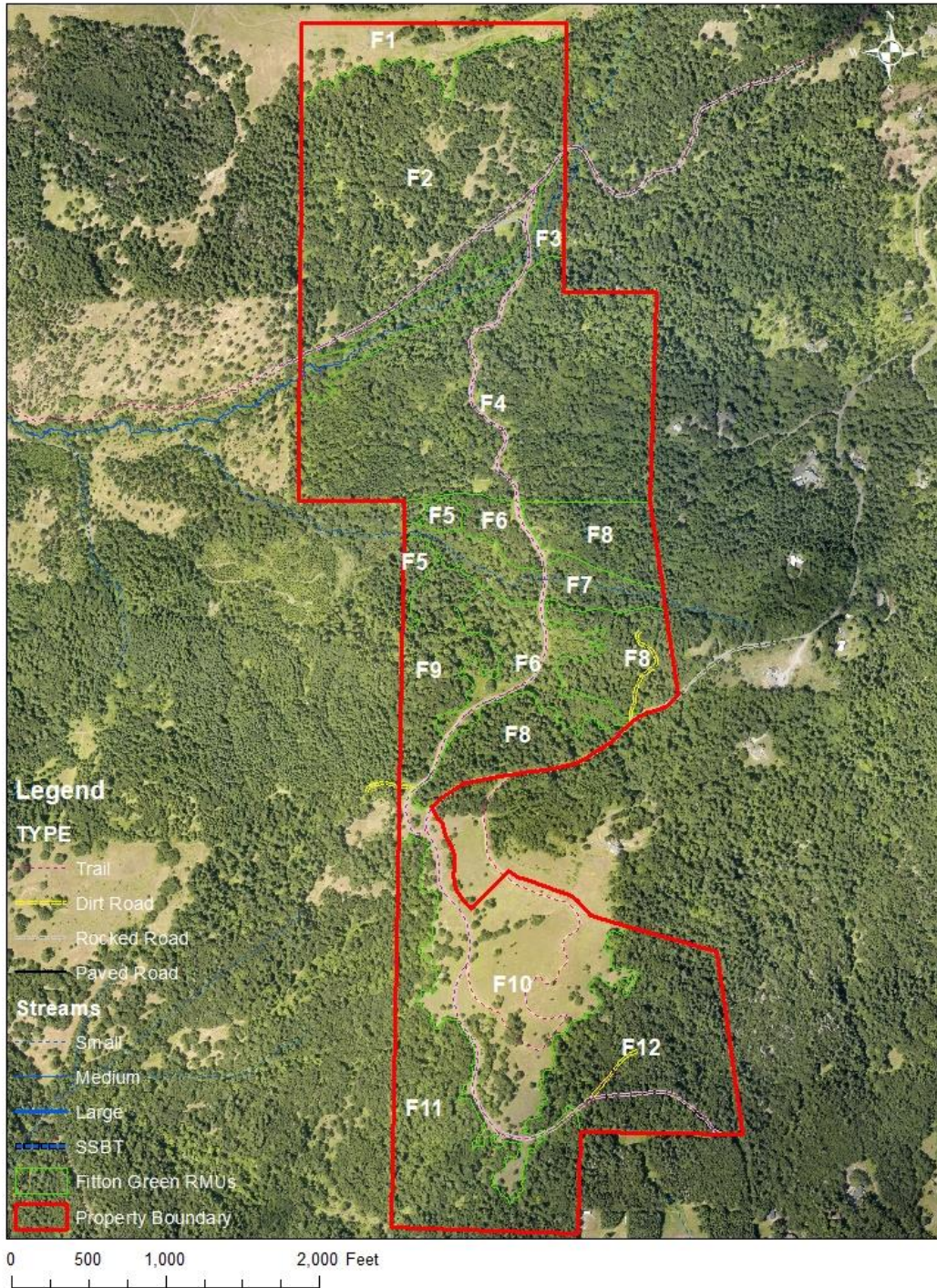
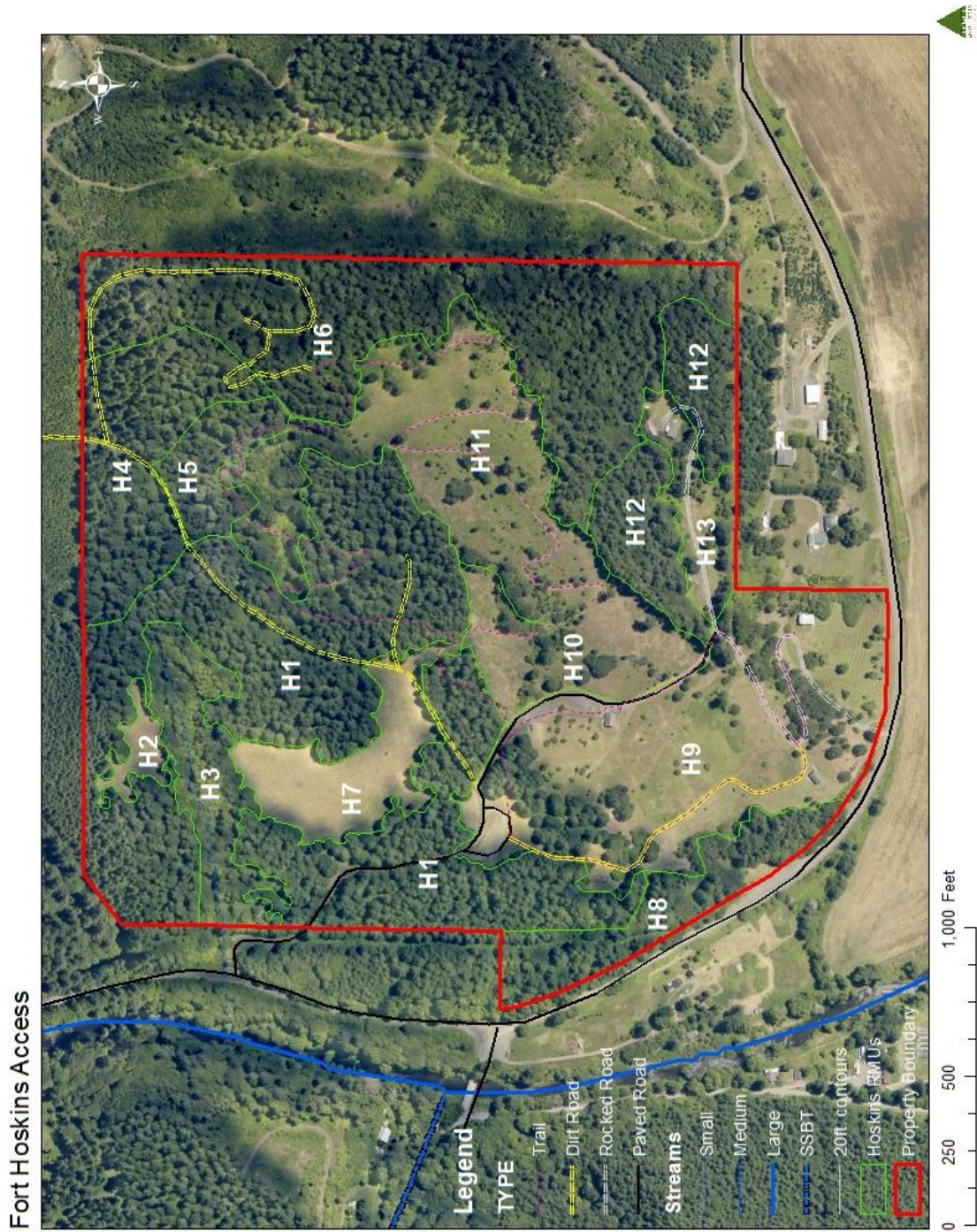
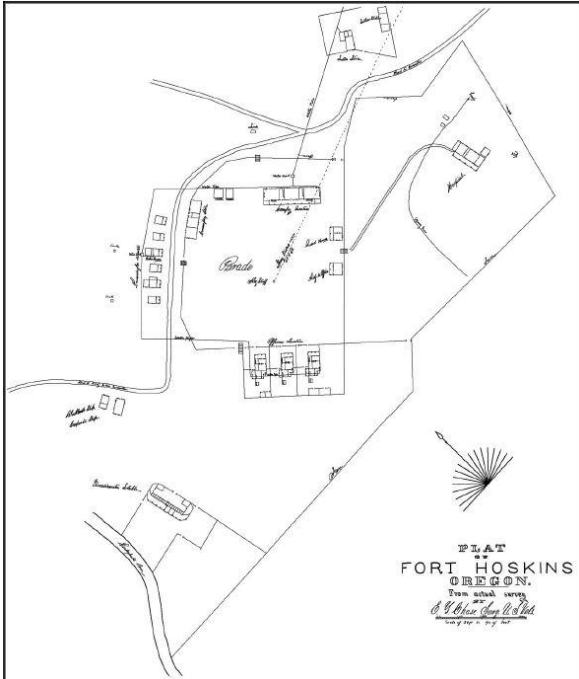


Figure 13. Fort Hoskins Access Map



Archeological and Cultural Resources



Historical Plat of Fort Hoskins, circa 1856 (courtesy of Phil Hayes)

Fort Hoskins listed on the National Register of Historic Places in 1974. The property contains the historic and cultural resources of greatest significance on the ownership, including the historic fort grounds, the Commander's House (returned from nearby Pedee, Oregon), the fort orchard, the foundation of the old Hoskins School, and the historic Frantz-Dunn House.

Oregon State University archeology classes led by Dr. Dave Brauner have excavated sites at Fort Hoskins in 1976, 1993, 1996, 2010, and 2012¹⁰.

The history of Fort Hoskins is thoroughly detailed in a cultural resources inventory of the fort and surrounding area by Brauner and Stricker. Fort Hoskins was a small military garrison, used for a brief

period between 1856 and 1865. It served a dual purpose — to keep Indians on the recently established Coastal Indian Reservation at Siletz, and to protect Indians from incursions by settlers. The fort contained some 15 buildings, including officer quarters, soldier barracks, munitions and supply storage, a bakery, hospital, barns, corrals, and gardens. Following a short and uneventful history the fort became less strategic, was closed in 1864, its buildings and goods sold at auction, and it reverted to its former use as a private farm.

Bezell Memorial Forest contains a historic farmhouse that is one of the oldest surviving structures in Kings Valley. James Plunkett, a former drummer at Fort Hoskins, built the house on the property in 1875¹¹. The historic farmhouse near the Bezell Memorial Forest parking area is the most significant cultural resource on that property. This gothic vernacular farmhouse was the second farmhouse built on the property, located just downstream from the site of an earlier structure. Nearby walnut trees and a large lilac probably date from the mid to late 1800s. The barn that houses the Bezell Forest Education Center was built in the 1930s and renovated in 2006.

The Fitton Green tract contains no known cultural resources apart from Cardwell Hill Road, a historic early travel route.

¹⁰ Hayes, Phillip. 2020. Draft Benton County Park Histories, p77-83.

¹¹ Hayes, Phillip. 2020. Draft Benton County Park Histories, p39.

Historic artifacts at Fort Hoskins were examined and inventoried by Brauner in 1976-77. None of the other tracts contain any archeological artifacts. If any sites or artifacts are discovered, activities will be delayed until the significance of the site can be ascertained. As part of its Forest Stewardship Council (FSC) certification, Trout Mountain Forestry is required to have procedures in place for consultation with local and regional Tribes in case of inadvertent discovery of cultural resources or materials. This inadvertent discovery plan outlines protocols for halting work activities and for notifying agencies such as the State Historic Preservation Office and relevant Tribes.

Finally, although no pre-contact sites have been documented to-date along the ridge tops of Beazell, Fort Hoskins, and Fitton Green, property locations that provide clear vantage points of Marys Peak should be considered as potentially historically and culturally significant places to the Kalapuya¹².

Recreation and Aesthetic Considerations

Dispersed and organized public recreation use is an intended use at each site. Individual and group use occurs at Beazell Memorial Forest and Fort Hoskins, while use of Fitton Green is limited to hiking and nature appreciation. Each tract includes extensive trail networks, trailhead facilities, parking, and interpretive and informational displays. Primary recreation uses at each site include hiking, wildlife viewing, and nature appreciation. Other uses include picnicking, geocaching (Fitton Green), mountain biking, horseback riding, and historic reenactment (Fort Hoskins). The properties have seen an increase in users over the last 10-year management period.



The trailhead kiosk at Fitton Green

From the inception, a guiding intention of park development has been to integrate public recreation, habitat restoration, and sustainable forest management. Rather than segregating activities, uses are integrated – land management roads serve

¹² Dr. Daniel J. Snyder, Cultural Resources Specialist/Archaeologist, USDA-Natural Resources Conservation Service, personal communications March 18 2020.

dual duty as hiking trails, and forest harvest areas are used as opportunities for education and interpretation. The light-touch silvicultural and logging methods used have minor or temporary impacts on visual resources. Management practices are designed to protect scenic beauty as well as sensitive resource values. Aesthetic consideration is given to operations during all phases of project planning and implementation.

Public use is prohibited in sensitive resource areas, or in the vicinity of active logging or land management operations, using signage and temporary trail closures.

Carbon Sequestration

While forests have long been recognized for their ability to provide important environmental values such as clean water, wildlife habitat, and open space, their role in mitigating climate change and providing key biological benefits have gained greater public appreciation and understanding in recent years. Markets have emerged to allow landowners to be rewarded for management that exceeds norms for amounts of carbon sequestered in the forest, water quality remediation, and endangered habitat restoration.

Forests can sequester large amounts of carbon for extended time periods. Pacific Northwest forests are among the highest accumulators of carbon globally. Forests such as Benton County's, which are managed for long rotations, large trees, areas reserved from management, as well as woody debris and snag retention, contain significantly more carbon than short rotation plantation forestry.

Carbon calculations were performed for all stands with valid inventory data. Methodology for calculations performed is provided in **Appendix G** and carbon inventory data is located in **Appendix H**.

Carbon Markets

Forest carbon markets are premised on the concept that forest management that exceeds "business as usual" methods is accruing and storing additional carbon in the form of woody biomass. This additional carbon can be quantified under one of a number of different offset protocols and sold either into a regulatory/compliance market or a voluntary market to offset carbon emissions occurring elsewhere. For those interested in selling carbon credits from their property, options include the California Air Resources Board (ARB) Compliance Offset Protocol, and the American Carbon Registry (ACR). These protocols detail methods to quantify the amount of carbon in a forest, the extent to which that exceeds a "baseline" condition (known as additionality) and how much carbon is available for "sale." The baseline in a carbon project represents the normal management practices for a forest, and the Emission Reductions (ERs) result from exceeding the baseline management practices, which are then used to compensate for emissions that are produced elsewhere. It should be noted that generally it is very



difficult for public entities to participate in carbon offset markets since demonstration of additionality (proving that something different than would typically be done on the property is occurring) can be challenging. The following table illustrates the benefits and drawbacks of each carbon market.

Table 6. Carbon Markets Comparison

Protocol	CA Air Resources Board US Forest Protocol (ARB)	American Carbon Registry (ACR)
Voluntary or Compliance	Compliance	Voluntary
Term	100 years	40 years
Allowable Error %	5%	10%
Municipal Lands Baseline	Historic activity	Legal/Financial Test
Required Pools	Live, standing dead, HWP* in-use and landfill	Live, HWP*
Natural Forest Management	Required	Not required
Verification	Every 5 years	Every 5 years

*harvested wood products

A carbon project requires a high tolerance of risk on the part of the participating landowner. Stable ownership (such as a municipal property like Benton County) is extremely important. Perhaps the most prohibitive aspect of any carbon project is the significant up-front investment. Sophisticated financial and technical systems are required to assess and verify the carbon stocks that are proposed for sale, down to a fine level of detail. Well stocked and highly productive sites are also necessary, perhaps prohibiting some of the dry/oak dominated sites on the property.

Above and beyond these challenges, arguably the largest hurdle for landowners is scale. While this varies by site productivity, it is difficult to put forward a successful project that is less than 1,000 acres. Given these challenges, as well as the fact that proving additionality on public lands can be difficult, Benton County lands are not suitable for establishing a carbon offset project at this time. It is worth noting, however, that conservative harvest levels, responsible management of forest health issues, the inclusion of set-aside/reserve areas and long-term stable ownership ensure that the Benton County lands will continue to accrue and store atmospheric carbon for the benefit of the climate.





An oak/conifer RMU at Bezell

FOREST RESOURCES

2020 Forest Inventory

Inventory Design

The 2020 forest inventory was focused on merchantable stands with Sensitivity Class 3 and 4 designations. The inventory is strata based, meaning the forest is broken up into different vegetation types or “strata” that have similar features in terms of age, species composition, tree diameter and density. Vegetation labels are assigned to each stratum to indicate discrete areas which are comprised of similar vegetation types. In most cases, the vegetation types are further broken down into RMUs or “stands”, which are used interchangeably here. Stands are generally bounded by topographical features, streams, or roads, or otherwise have a different origin than adjacent areas due to past logging, disturbance, etc. For classification purposes as well as ease of management, stands are at least 1 acre in size. Different vegetation communities within a stand below this 1-acre threshold (such as a pocket of oak within a conifer plantation) becomes a “feature” within the stand. All stands are assigned a unique identifier (Stand ID) to allow individual stands to be tracked in the inventory.

An advantage of a strata-based inventory is that individual stands within any stratum contain very similar features in terms of species composition, structure and volume. This means when stands within any particular stratum are sub-sampled, the results can be averaged to derive a strata average. Stands within the strata that are not sampled due to budgetary or other constraints can then be assigned the stratum average (volume, average diameter, density) and there will be a reasonable level of confidence that the stratum average is representative of the unsampled stand.

Vegetation Typing

Vegetation polygons that have 5% or more of their area covered by tree crowns are classified as forest and assigned vegetation labels. The labels are based on species (primary and secondary alpha-code), *size class* and *density*. An example is “OC34” where white oak (O) and mixed conifer (C) are primary and secondary species, size class=3 and density class=4.

Size classes are based on the mean diameter of the largest 200 trees per acre of the stand as well as knowledge of the RMU. A size class 1-6 is assigned to each stand.

Density classes are based on total canopy cover. Canopy cover is based on percent area of the type with some form of canopy closure due to trees. This is based on optical assessment of aerial imagery and/or field reconnaissance.



Table 8: Size

Stand Mean DBH	Size Class Code
<6	1
6-12	2
12-18	3
18-24	4
24+	5

Table 9: Density Class Codes

Canopy Cover %	Density Class Code
5-20	0
20-40	1
40-60	2
60-80	3
80-100	4

Species composition is based on the principal species in the stand as a percentage of total basal area, or, for seedlings or saplings, the species with the most trees per acre.

Non-forested areas receive labels to distinguish them from forested areas.

Vegetation labels for stands that were not harvested or otherwise subject to significant alterations in structure and stocking should be updated at a minimum of every ten years as part of routine forest inventory.

Table 7. Cruised Stands

STAND	ID	VEG. TYPE	TRACT	Acres
B1/B4	101	DF24	Bezell	17.1
B2/B5/B8	102	OC24	Bezell	22.4
B6	103	DF34	Bezell	33.5
B9/B10	104	DF34	Bezell	9
B13	106	DF34	Bezell	14.2
B14	105	DF24	Bezell	20.5
B18	107	OC24	Bezell	59
B23	110	CH24	Bezell	15.7
B24	111	DF24	Bezell	26.9
B25	108	DF24	Bezell	55.7
B27	112	CH23	Bezell	15.4
B29	199	DF24	Bezell	26.9
B30	113	OC23	Bezell	20.8
B31	133	DF34	Bezell	35.5
B37	166	CH23	Bezell	20.9
F5/F8	201	DF24	Fitton Green	29.5
F9	202	CH24	Fitton Green	12
F11/F12	203	OC24	Fitton Green	57.9
H1	301	DF34	Fort Hoskins	30.2
H4	302	DF24	Fort Hoskins	7.3
H5/H8	303	OC24	Fort Hoskins	7.4
H6	304	CH24	Fort Hoskins	18.9
H11/H12	305	DF24	Fort Hoskins	5.6
				562.3



Sampling Intensity and Frequency

Sampling on the Benton County lands uses temporary plots or sample points, meaning plots are measured and maintained within the inventory system for the duration of their life span and then replaced by a new set of plots.

In total, 31 RMUs and 562.3 acres, or 64% of the net forested acres on the property, were sampled in 2020. 328 total plots were installed, equating to approximately one plot for every 1.75 acres on average. Sampled acres by stratum and current sampling intensity are summarized in **Appendix I**.

Plots generally have a life span of ten years before they are no longer valid due to over-reliance on growth projections for current estimates. Other reasons for plots being invalidated would be harvest operations or natural disturbances (such as blowdown events) that remove trees from the sampled areas or materially change the stand conditions such that the vegetation type has been altered.

Inventory Management System and Maintenance

Inventory data is housed in a Forest Projection and Planning (FPS) database which is stored by Benton County NAPD and available upon public request. FPS is a Microsoft Access database application developed by the Forest Biometrics Research Institute (www.FBRInstitute.org) containing both inventory management utilities and a growth model.

Plot data collected in the field is input into FPS which compiles plot data to generate stand-level averages. Stand and ownership values for various metrics can be extracted from this compiled data to inform management decision-making and for purposes of monitoring and reporting.

The FPS database is linked to a GIS “RMU” shapefile that contains stand gross and net acres. This will allow direct linkage between the RMU acres and the inventory database acres and also allows ease of analysis and mapping when RMU polygons are attributed with inventory data from the FPS database.

Forest inventory is not static and as such it is prudent to conduct regular inventory maintenance and updates reflecting growth, mortality, harvest and changes in vegetation cover that occurs over time. Annual or periodic updates may be made, depending on budgetary considerations and need.

For RMUs where no harvesting or other disturbance occurs, growth and mortality that occurred since the date of plot measurement can be derived by growing the plots from the most recent measurement year to the current reporting year using the FPS growth model. The FPS growth model is based on a regional data set (referred to as a “species library”) of quantitative parameters by species for site capacity, taper and volume



determination, growth and mortality rates. The result will be updated values for each RMU that reflects growth and mortality projected to have occurred in the period.

For RMUs that are subjected to a disturbance that alters the vegetation type, such as harvest, fire, or extreme blowdown event, the RMU may be assigned a new vegetation label that is appropriate for the new conditions. RMU boundaries may be updated to reflect extent of the harvest or disturbance using aerial imagery and/or field reconnaissance. The inventory for the RMU can be updated in one of two ways; if the vegetation type is currently well represented in the inventory and there is valid cruise data, the stratum average can be assigned to the RMU. If the vegetation type is not well represented, is not cruised, or the plots for the stratum are nearing the end of their life due to age of plots, the RMU may be cruised and old plots could then be removed from the database. All strata must have valid plots at all times to provide a basis for calculation of inventory metrics.

Sampling Design

The inventory sampling design developed for Benton County will follow the general procedures outlined in **Appendix I**. These procedures are established to ensure a robust data collection and consistency in sampling over time. Minor modifications and improvements may occur as they are identified.

GIS/Forest Inventory Linkage

All shapefiles delineating RMU boundaries and attributes are housed at Benton County NADP's databases. This shapefile can be maintained and updated as needed to reflect impacts of harvest operations and any changes to vegetation type boundaries. The RMUs shapefile is populated with a unique stand identification code (Stand ID), size in acres, and other attributes that are unique to the RMU, including recent management history. The shapefile is linked to the FPS inventory database via the Stand ID, which allows information to flow between the two databases for use in maintaining records, planning treatments, and analysis of tract and ownership level information.

Inventory Reporting and Applications

A robust inventory makes possible a range of output "products" that can inform annual and long-term management planning, support operational layout, provide baseline data and allow monitoring of resource conditions. The following is a list of some sample outputs that are useful for these purposes:

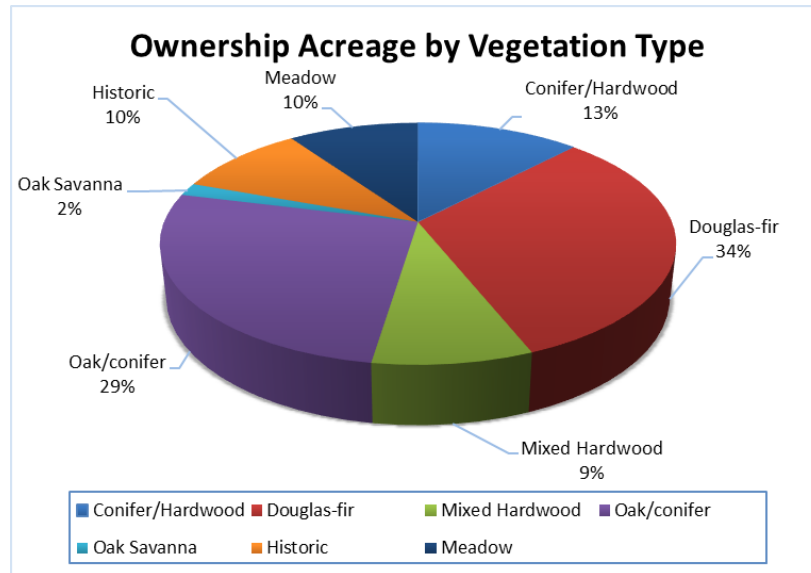
- Total timber volume by RMU and ownership
- Actual and projected growth
- Diameter distribution by species
- Volume by species
- Relative density and clumpiness at the stand level



Overview of Forest Composition

The ownership has maintained a diversity of forest types, with most forest types present on each property (see **Figure 14** below). Of the forested acres, Douglas-fir types are most prevalent, followed by oak/conifer, mixed conifer/hardwood and mixed hardwood forest. A growing category of restored oak savanna is also present. Hardwood dominated forests are generally limited to streamside zones. Fitton Green is the only property where mixed and hardwood forests continue to dominate.

Figure 14. Ownership Acreage by Vegetation Type



Current Inventory Status

At the ownership level, there are 62 RMUs, of which 48 are forested. These forested RMUs equates to 881.7 total net acres. Five main vegetation types were identified on the properties, excluding non-forested types. Acres and number of stands by vegetation type are shown in **Table 8**. Non-forested areas total 130.8 total acres and include developed, historic, and meadow types, as shown in **Table 9** below.

Vegetation Type	Description	Acres
DF	Douglas-fir	347.1
OC	Oak/Conifer	289.3
CH	Conifer/Hardwood	133.2
MH	Mixed Hardwood	93.2
WO	Oak Savanna	18.9
Total		881.7

Non-Forest Type	Description	Acres
XD	Developed	2.8
XH	Historic	22.8
XM	Meadow	105.2
Total		130.8

Table 8. Net forested acres by vegetation type

Table 9. Non-Forested acres by type





Figure 15. Beazell RMUs Map

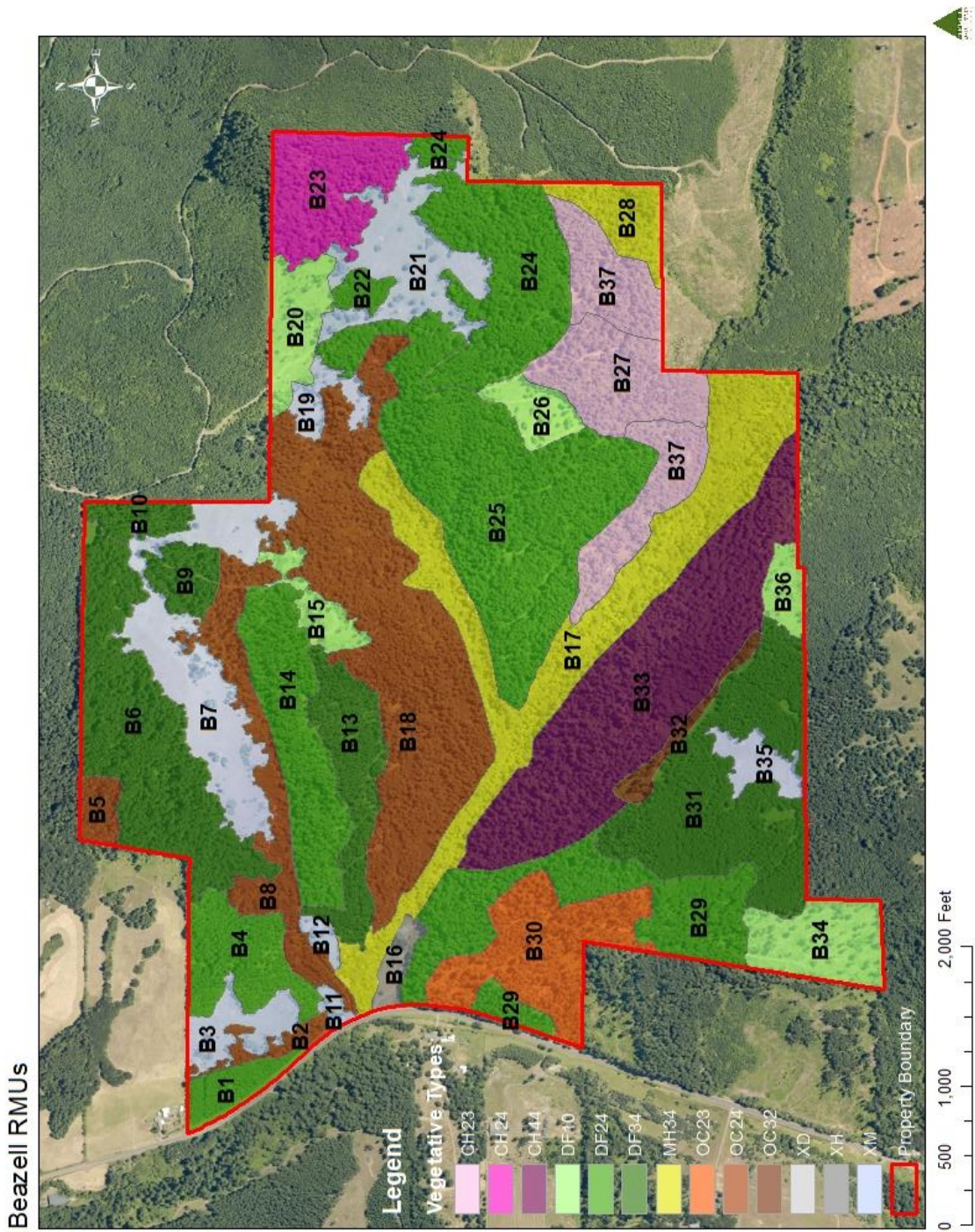


Figure 16. Fitton Green RMUs Map

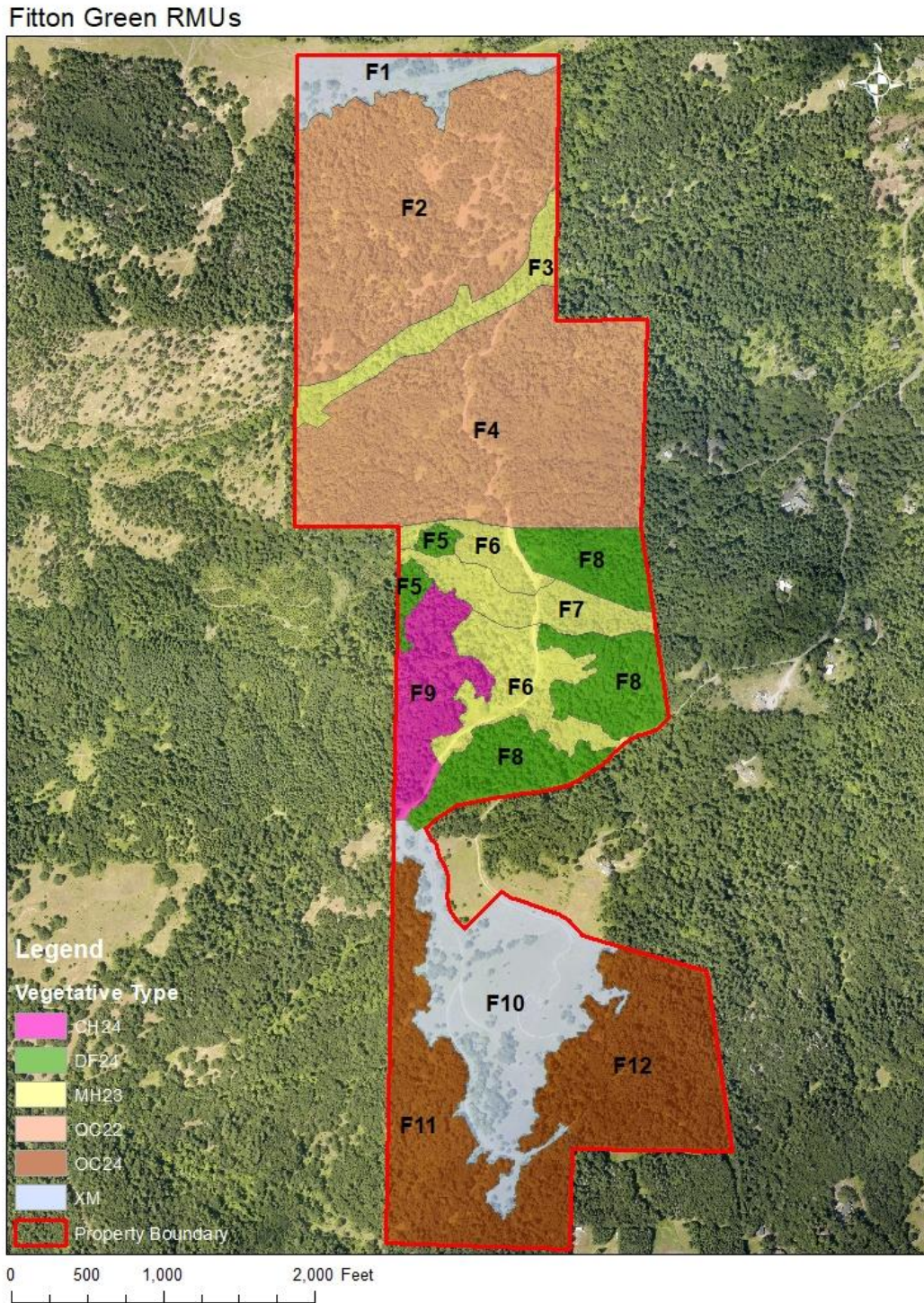
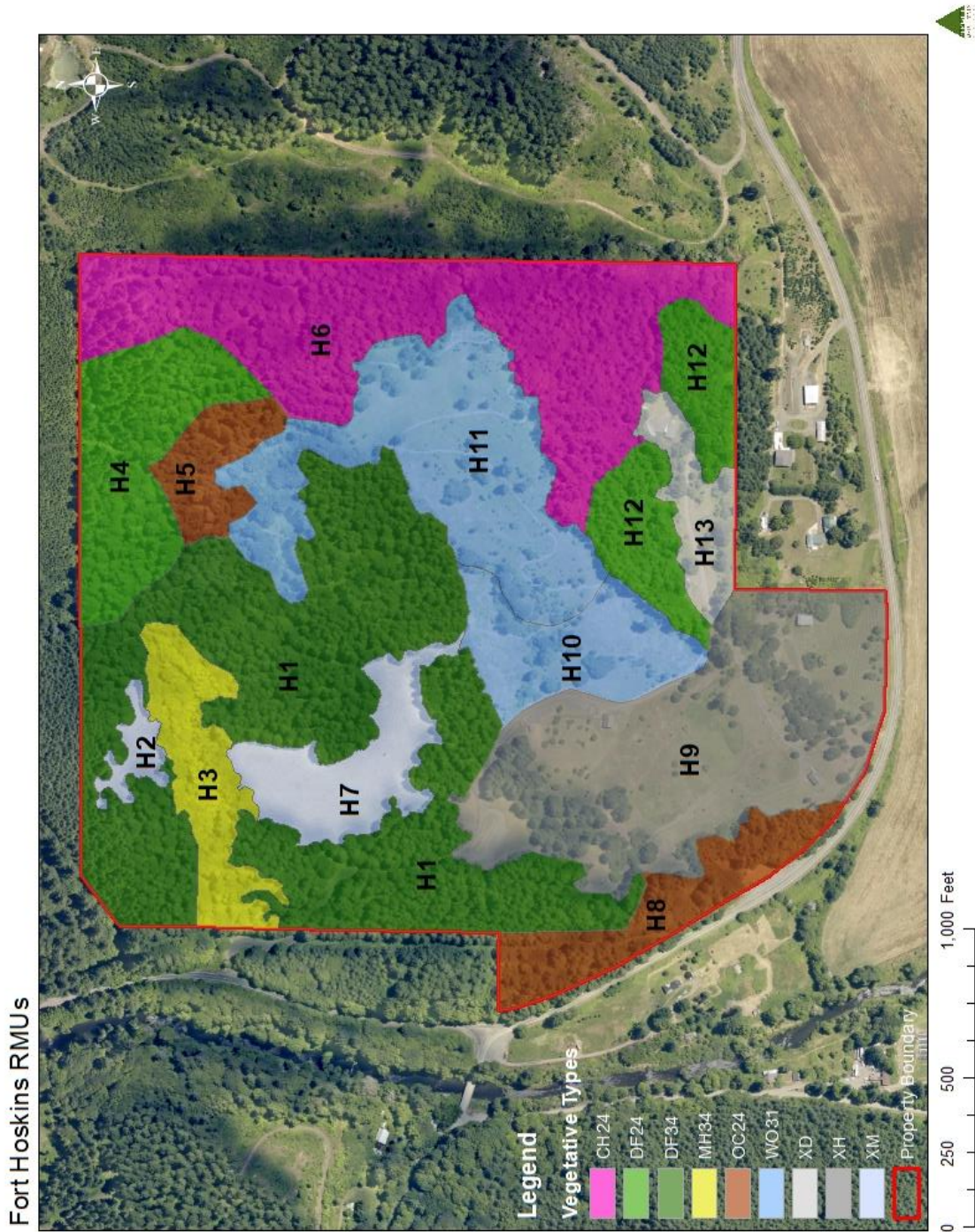
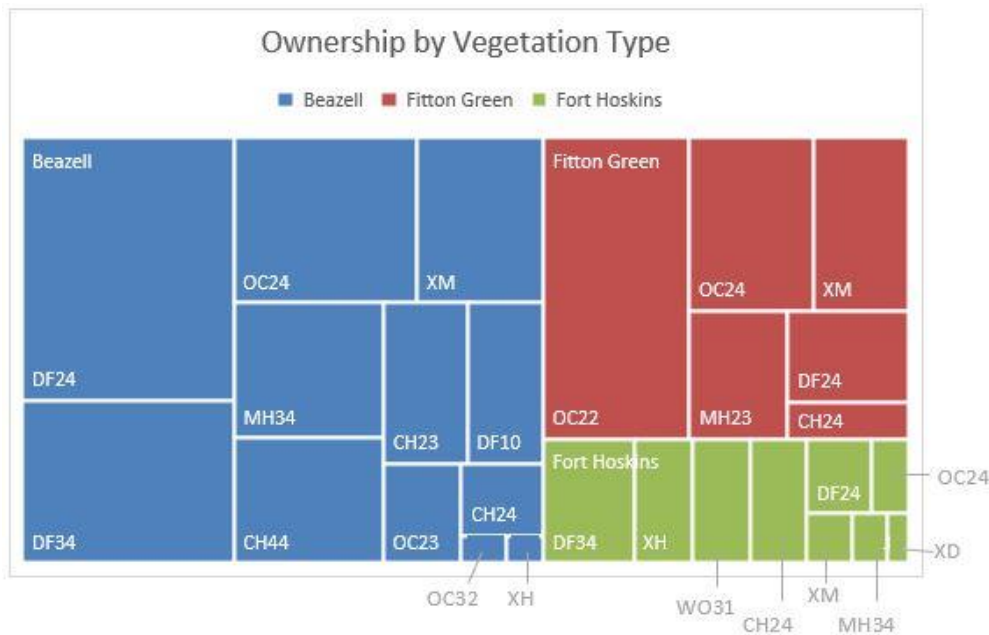


Figure 17. Fort Hoskins RMUs Map



Most RMUs are 45-65 years old, corresponding with the timber harvesting that occurred at Fort Hoskins and Beazell during the mid-1950s-1970s. Fitton Green, which is an aggregate of 4 separate previous ownerships, had seen more frequent harvesting later on, in the 1990s. Despite the widespread harvesting during these two time periods, there remain today numerous individual trees, both conifer and hardwood, that are much older. These individuals, although not widespread, provide myriad ecological benefits to the properties. Further discussion of their identifying characteristics and protection during timber harvesting can be found in the **Forest Management Approach** section of this plan. The only RMU on the ownership with significant residual old forest structure is found at Beazell Memorial Forest.

Figure 18. Vegetative Type by Tract and Acres

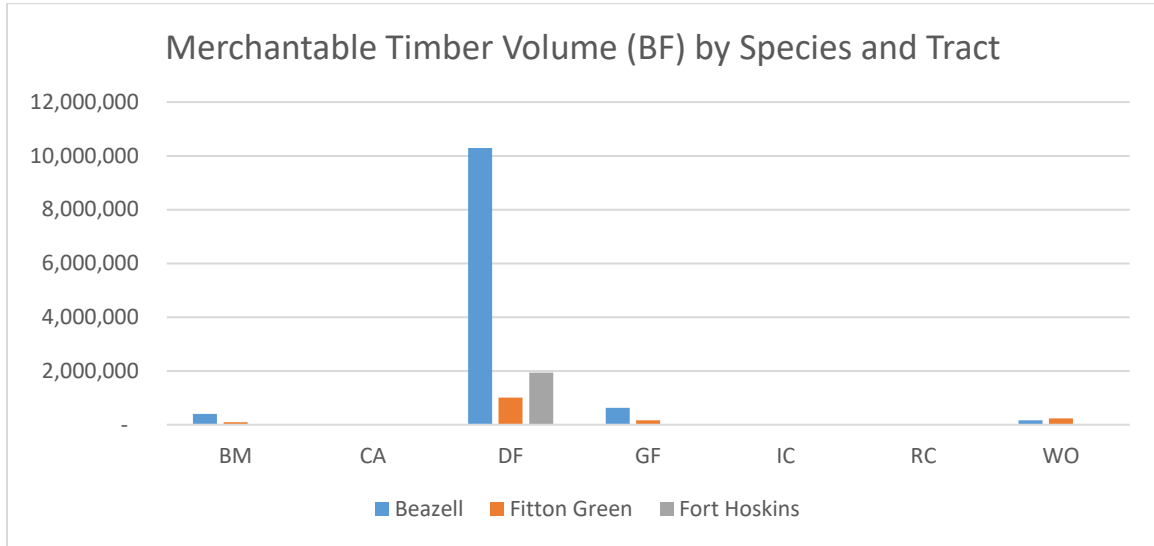


Most RMUs are dominated by a single age of trees, and are considered even-aged. Exceptions are oak/conifer stands, where oaks are typically much older than the fir, which may be of multiple ages. Conifer stands at Fort Hoskins reclaimed old pasture over time and some areas contain trees of a range of ages. Similarly, several planted and natural stands overlap at Beazell (notably B31) in which there may be slight variations in age.

Forests on each property are well stocked with commercial timber species, primarily Douglas-fir (Figure 3). The management strategy has been to grow the highest quality sawtimber of a variety of species, including Douglas-fir, grand fir, and Oregon white oak. Other species present on the property include western redcedar and bigleaf maple. Each forest was inventoried in 2010, and again in 2020.

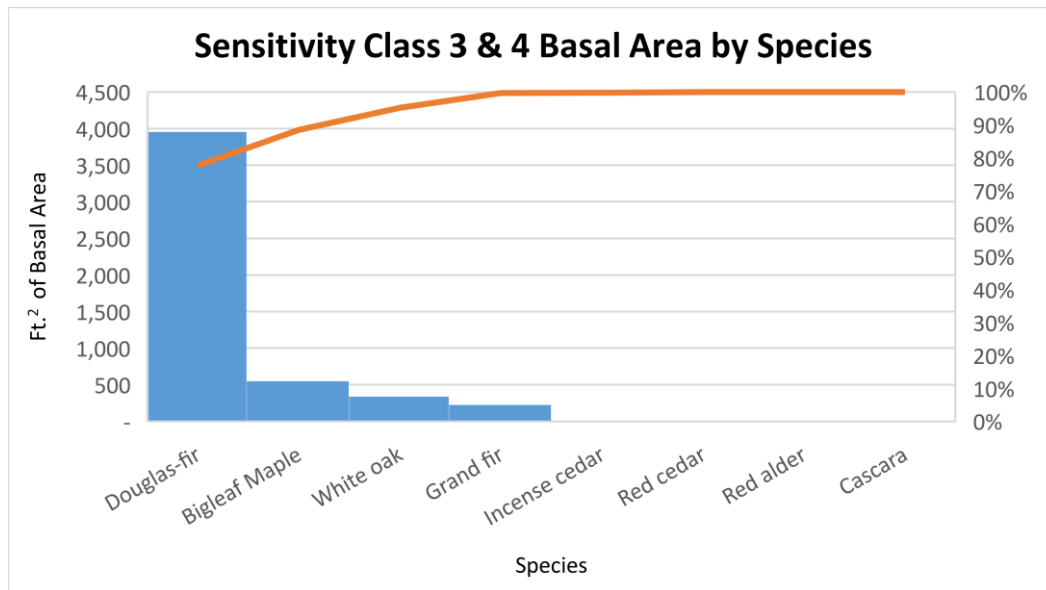
The forest inventory data of all merchantable Sensitivity Class 3&4 RMUs – those with the lowest sensitivity rating - indicates a total of 14,970 thousand board feet (MBF) of net merchantable timber on approximately 562.3 net cruised acres. Net conifer timber volume totals 14,041 MBF, or 94% of the total merchantable volume.

Figure 19. Merchantable Timber Volume by Species and Tract



Although the majority of merchantable timber is in Douglas-fir and grand fir, multiple species were identified and measured during sampling. Their presence is best represented by estimated basal area (the cross-sectional area of tree stems), a metric for describing RMU occupancy based on tree size.

Figure 20. Sensitivity Class 3 & 4 Basal Area by Species



Forest Vegetation Types

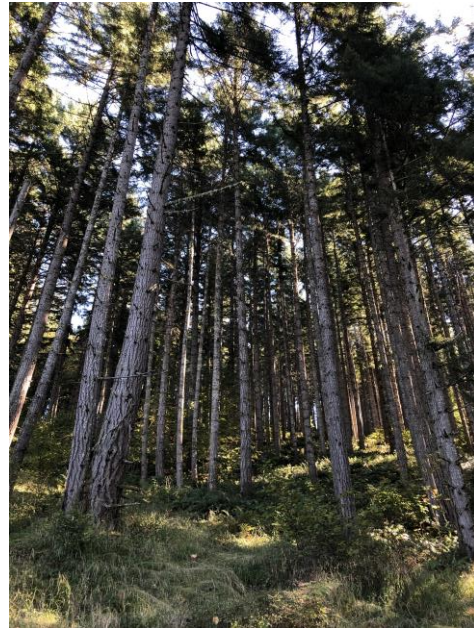
The strata used for the forest inventory correspond with distinct vegetation types as illustrated in **Table 8** and **Figure 18** above. The following sections describe these forest types on the ownership, along with the desired future conditions, and proposed management approach for the next ten-year period.

Douglas-fir Type

Current conditions

The Douglas-fir type is the most common vegetation type on the ownership. It ranges in age from newly established plantations to RMUs that are approximately ± 65 -years of age. 80% of the total type is aged 35-65 years. Although timber revenue is not the top priority for Benton County Natural Areas & Parks, the Douglas-fir vegetation type represents the most valuable economic asset on the ownership.

There are 220 acres of naturally seeded Douglas-fir stands approximately 45-65+ years old across the three properties. These stands originated following harvest, cessation of agriculture or grazing, creating a slight range of age classes. Soils are generally deep, well drained, and productive, with small areas of wet or droughty soils. Topography is moderately to steeply sloping. Douglas-fir is the dominant tree, often accounting for >90% of overstory tree stocking. Grand fir and bigleaf maple are often scattered throughout these stands, as well as the occasional oak tree. Many of these conifer stands have been thinned 1-2 times over the past two management periods, particularly those accessible by ground logging.



A naturally seeded 45-65-year-old DF RMU at Bezell that has been thinned twice



A thinned 35-45-year-old DF RMU at Fort Hoskins. Small gap and created snag pictured.

There are an additional 101 acres of younger Douglas-fir stands located at both Beazell and Fort Hoskins. Beazell stands range from ~30-45 years old, with some past pre-commercial thinning as well as commercial thinning undertaken. Stands B1, B4, B13, and parts of B31 were all established by Fred Beazell through planting. Fort Hoskins stands are naturally seeded, slightly older at 35-45 years old, and all have been commercially thinned. Topography is gentle to moderately sloping. Douglas-fir is the most common tree, but grand fir and cedar are also present. Most areas are fully stocked with a good rate of growth, which will eventually slow as the trees age and crown closure is achieved again.

A final component of the Douglas-fir forest type is a collection of small plantations at Beazell that were established during the last management period. They range in size from 3.5-12 acres for a total of 33.7 acres, approximately 12% of the total Douglas-fir forest type. While some challenges existed in getting them established (namely more xeric site conditions and competing vegetation), all plantations have been surveyed within the last two years. Survey results showed that both natural and planted seedlings exceeded the minimum requirements of the state for reforestation.



A fir/pine plantation established at Beazell during the last management period.

Management goals

The conifer stands represent an important part of the overall forest heterogeneity of the Benton County forestlands, as well as a critical economic driver of the trust funding for the properties. They contain a substantial proportion of the merchantable volume and will continue to be an important part of future commercial harvests. Visually sensitive areas will continue to be managed less intensively. Stand B6, the oldest of these RMUs should be put on a trajectory that would make it more similar in structure

and ecological function to the only mature mixed forest on any Benton County forestlands (Stand B33, discussed below), potentially almost doubling that unique vegetation type over time. Stands B24 and B25 were the only RMUs that weren't treated in the last management cycle, making their entry a top priority for this management period.

Most of the younger conifer forests are on productive soils, but are the least diverse forest type in the county's ownership. Management here is still focused on timber growth and future harvest potential. As the stands continue to mature, more options for mimicking natural stand conditions will become available. Management will continue to focus on building uneven age stand structure, recruiting snags, and releasing hardwoods.

A more complete synopsis of management objectives across all RMUs is provided in the **Forest Management Approach** section of this plan.

Desired future conditions

This forest type more than any other represents the sustainable economic future of the parks. Achieving a balance of age classes will be an important part of ensuring sustainability. Future planning should consider other forest types in relation to the pool of commercially managed RMUs, particularly as Sensitivity Class 3 forestland is moved into more stringent protective classes through management activities such as oak savanna restoration or old forest reserve creation.

These stands should continue to be balanced for growing valuable timber to create revenue for achieving overall park management objectives while also continuing to provide ecological and social benefits. They should be thinned for either a first or second time to produce revenue and develop more complex forest structure with multiple age classes, snags, and downed wood for wildlife. Certain stands will be regenerated to add additional age classes and seral types to the properties.

Silvicultural techniques to achieve these future desired conditions will include conventional and variable density thinning, single tree and group tree selections, and small patch cuts or variable retention harvests. Regeneration harvests will only occur where stands have been thinned at least twice already, or are facing some other challenge to their growth or management (environmental, accessibility, etc.).

Some of the older, more structurally complex stands (with large crowned remnant individual legacy trees) present opportunities to achieve future old forest conditions and will be managed to promote this type of habitat. Emulating this forest type will include the identification of widely spaced legacy trees for release, snag recruitment, downed woody debris additions, and the promotion of native understory plants and additional tree species through natural regeneration or plantings in small openings and gaps.

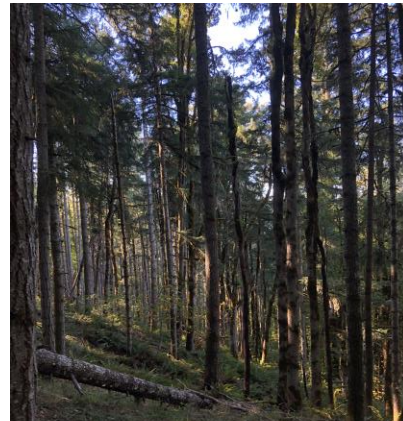


Oak/Conifer Type

Current conditions

The Oak/Conifer type is the second most common forest type across the ownership. It represents some of the most interesting habitat as well as some of the greatest potential for restoration projects found within the parks system.

There are 295 acres of mixed Oregon white oak and Douglas-fir stands across the three properties, including 121 acres of a younger oak/conifer plantation component at Fitton Green (discussed below). Overall, the majority of this vegetation type is the result of Douglas-fir seeding into oak savannas and woodlands in the early-to-mid twentieth century or earlier, following harvest, and/or cessation of grazing. This type is primarily on upland south and west-facing slopes. Some areas contain large fir stumps, indicating these stands may have been mixed stands of large, open-grown trees for some time. Douglas-fir ages vary widely, as natural regeneration has invaded these stands throughout the past century. Large oaks range in age from 60 to over 200 years old. Other areas have been thinned. Harvests typically removed only conifers, releasing oak. Growth of conifers is moderate to slow, with many defective trees where growing within oak crowns. Ice storm damage from 2014 on oak crowns has been considerable in spots. Oak is growing slowly, and in some cases is being out-competed by fir. Invasive hawthorn, blackberry, and false brome continue to be pervasive in the understory of many areas.



An isolated oak/conifer RMU that was impacted by the 2014 ice storm.

At Fitton Green a 121-acre area was harvested in the early 1990s, and now consists of widely spaced oak and 25-year-old planted fir and pine. The harvest removed only conifers, effectively releasing oak. The area has a similar history and habitat potential as the rest of the oak-conifer vegetation type, but is younger. Unique to this type are areas of open savanna and pockets of wet prairie and ash woodland. Young conifer is not currently impacting hardwoods, but will begin to compete more in the next 10 or so years. False brome is ubiquitous, especially along roads and skid trails on this part of the property.

An effort was made by the county during the last management period to create openings for butterfly habitat that connected the Taylor's checkerspot habitat west and east of Fitton Green with the large meadow in the south. Unfortunately, rapid regrowth

and poor proximity to high quality habitat resulted in limited/single season habitat gains for non-present target species¹³.

Management goals



Competing fir and oak at Fitton Green

Maintenance of legacy oak trees and enhancement of wildlife habitat should be the primary management focus in these stands. Conifer cover should continue to be maintained where it is successfully controlling invasive weeds and is not negatively impacting residual oak. Commercial timber harvests will be used as a tool to remove fir where it threatens to overtop vigorous oaks with healthy crowns and/or desirable habitat features. Non-commercial snag creation may also be employed to release oaks from fir competition and to create additional wildlife habitat. Many of the larger diameter fir will provide possible options for snag recruitment. Any conifer removal in these areas should consider the fact that oak savannas were not completely devoid of Douglas-fir.

Individual large fir trees historically had a place on the landscape. These trees were typically large, with deep furrowed bark that helped them to withstand periodic burning. They were typically found in drainages or other slightly moister sites. Management of these stands, especially if converting them to more historic oak savanna or oak woodland conditions should consider a small amount of conifer retention.

In the younger RMUs located at Fitton Green, maintenance of openings and legacy hardwoods, invasive species control, and enhancement of wildlife habitat should still be the primary management focus. Conifer cover will be maintained to help control invasive weeds in some areas. Non-commercial tree felling will remove fir where it threatens to overtop vigorous hardwoods. Snag creation may also be employed to release hardwoods and to create additional wildlife habitat. Both F2 and F4 should be assessed in the later part of this management period for the possibility of a commercial thinning.

Desired future conditions

These RMUs should continue to be thinned to maintain oak vigor and produce revenue, where appropriate. Oak/conifer RMUs Present (F11, F12) should be restored to oak woodland and oak savanna habitat types. Future management periods may include

¹³ Adam Stebbins, Benton County Natural Areas & Parks Natural Resources Coordinator, personal communication, 12/17/2020.

other areas (F2, F4) when the conifer there has matured enough to offset the cost of any oak restoration work. If thinning is not an option, girdling competing trees has proven to be an effective low-cost alternative during the last two management cycles. Openings will be expanded and enhanced with native planting. Invasive species will be controlled, with priority given to roads, trails, wet meadows, and savanna openings. Conifer-dominated areas within the oak/conifer type will be managed to improve RMU resiliency and structure.

Oaks with severely ice-damaged or otherwise reduced crowns should not be targeted for release from conifers, since they may not recover. Poorly growing or low-quality conifer that is overtopping oak should continue to be harvested. In areas where both poor-quality oak and conifer exist, small group selections, patch cuts, or variable retention harvests can introduce planted oaks, or combinations of conifer which are better suited for climate change on marginal sites, such as incense cedar and/or ponderosa pine. It should be noted that in these situations, oak should not be harvested due to its low merchantability. Instead, it should be allowed to either recover or transition to snags while the next age class is establishing. Grand fir on south-facing slopes should be removed throughout these stands as it is extremely sensitive to dry conditions and seeds prolifically.

Where oaks have been released during the last management cycle, weed and conifer seedling control underneath them is a necessary maintenance activity. Weed treatment may need to be supplemented with additional native understory plantings.

Overall, these stands will continue to be maintained in a relatively open condition. Conifers will generally be allowed to regenerate naturally, but large gaps may be planted where needed to control weeds. Snags and woody debris of a wide range of diameters and stages of decay should continue to be recruited.



Conifer/Hardwood Type

Current conditions

There are approximately 136 acres of conifer/hardwood forest across the three parcels. These tend to be older, highly variable stands of Douglas-fir, grand fir, Oregon white oak and bigleaf maple. They likely originated after high-grade harvesting, the cessation of indigenous burning, and/or the cessation of agriculture or grazing. This forest type typically occupies lower productivity south and west facing slopes, where conifer regeneration did not fully occupy the site or where conifers invaded areas previously dominated by oak. Soils may also be more xeric. While these stands may be less commercially productive, they provide valuable wildlife habitat due to their large component of hardwoods and diverse stand structures.



An example of a mixed mature conifer/hardwood forest type at Beazell

Notable in this forest type is Stand B33, a mature mixed species RMU (pictured) that is only present at Beazell Memorial Forest. Covering 55 acres on a steep northeast-facing slope that extends from Plunkett Creek up to the ridgeline, components of it are the oldest and best example of mature forest on the Benton County tracts. The stand structure is variable, with large residual Douglas-fir, brushy gaps, and hardwoods scattered throughout.



A large Douglas-fir “old forest” individual in B33

Management goals

Timber values in these stands are moderate, but habitat values are very high. Management activities in these stands will be focused on wildlife habitat enhancement, the preservation of legacy oak trees, and a minor amount of timber production through conifer harvests (usually in conjunction with adjacent RMUs). Invasive plant species tend to be a greater problem in these stands due to their more open canopy conditions and should be addressed strategically at each property.

Stand B33 at Bezell will continue to be managed as a reserve area for scenic and wildlife values. Some non-commercial activities may include viewshed enhancement as well as snag and down wood creation.

Desired future condition

These stands will be maintained as uneven-aged conifer-hardwood forests, with hardwoods comprising a greater percentage of the mix over time. Harvesting conifers over time by individual tree selection, group tree selection, small patch cuts, or variable retention harvest will maintain this mix and initiate younger age classes. Large, residual conifers and hardwoods will be common throughout, as will snags and down wood. As a reserve area, stand B33 will continue to develop the complexity associated with old forests, such as large canopy gaps, large trees with long, full crowns, large snags and down wood, and a well-developed mid- and understory of more shade-tolerant tree species and woody shrubs.

Mixed Hardwood Type

Current conditions

Hardwood forests cover 95 acres across the three properties, primarily occurring in riparian areas or associated areas of wet soils. Red alder, bigleaf maple and Oregon ash are the most common species found in these stands with a minor component of grand fir and Douglas-fir. Although no harvesting has occurred in recent times, old-growth fir stumps are common, indicating these stands were high-graded in the early to mid-twentieth century and historically had a component of conifers.

Management goals

These stands will be maintained as riparian reserves with little to no commercial harvesting taking place. Control of invasive species such as English hawthorn, Himalayan blackberry, and false brome will be the top priority, with some additional enhancements taking place such as snag creation, down wood placement, and conifer planting along streams. Stand H3 at Fort Hoskins represents an opportunity to replace a failed culvert and remove a trash heap in the RMA. Plantings of shade tolerant conifer species such as western red cedar with protective tubing can help to shade associated streams. Supplemental plantings can also provide more blackberry control and forest cover to areas where shorter-lived red alder dominate, or where the alder crowns were impacted by ice storm damage such as stand B17 at Bezell.



A mixed hardwood stand dominated by large maples at Fort Hoskins

Desired future condition

Over time, these RMUs will become dominated by maple or ash, with a greater component of conifers to provide in-stream wood recruitment. Alder recruitment will occur sporadically in areas disturbed by flooding or blowdown. Healthy riparian forests are vital to a wide variety of fish and wildlife species and they provide clean, cool water to the greater watershed and its users. Maintenance and enhancement of these RMUs through plantings of native shade-tolerant trees and shrubs will ensure these functions are provided into the future. Invasive species control is necessary to ensure the success of any plantings.



The view across the restored oak savanna at Fort Hoskins

Oak Savanna Type

Current conditions

Restored oak savanna currently makes up 19 acres of the total ownership, and is currently limited to Fort Hoskins. This restoration work was completed in the 2000-2010 management cycle. Typically, these areas contain widely spaced open-grown oak trees, with mushroom shaped crowns and sweeping

branches. Younger cohorts of oak have seeded in or are planted and are slowly growing over native and non-native grasses and plant species.

Management goals

The most important aspect of this forest type is maintaining the restored open condition through either manual or mechanical means, or potentially prescribed fire. Invasive species and naturally seeding conifer from adjacent RMUs should be controlled with fire, mowing, or via hand crews with backpack sprayers or hand tools. This should occur on 3-5-year cycles, with an acknowledgement that the invasive species control in the beginning will likely need even more frequent treatments.

Desired future condition

Currently established oak restoration areas will include open-grown oaks with full crowns and high acorn production potential, overtopping a host of native understory species. While this forest type represents the smallest by acreage across the three properties, it also represents the type with the highest potential for increasing in size. Since oak restoration can easily cost ±\$3,000-\$5,000 per acre, an important component of a viable project is either grant funding and/or the ability to leverage the value of the conifer being removed from the site. The best opportunities for the county to remove conifer and release legacy oak trees at scale exist in stands B8 (if treating adjacent B6) and F12. Additional individual or group release through girdling or individual/group selection in conjunction with planned harvests in adjacent stands include B18, B32, F11, and H8. As stands F2 and F4 grow in value, their position between known and potential



Taylor's checkerspot meadows at Fitton Green and on adjacent properties makes them good candidates for oak savanna and oak woodland restoration.

Treating these stands could increase the overall forest type by upwards of 266 acres.

Meadows

The meadows across the ownership represent some of the most sensitive and rare habitat on the properties. Threatened and endangered species here are related to two butterfly species (one of which is known to exist at Bezell) and their associated host and nectar plants. A synopsis of recent restoration activities by the county and the Institute for Applied Ecology was compiled by IAE Restoration Ecologist Andy Neill. It describes past efforts, current conditions, and desired future conditions for each of the meadows on the properties. Furthermore, it serves as a companion piece to this plan, to help guide forest management decisions in adjacent RMUs. Detailed meadow descriptions can be found in **Appendix B**.

Historic/Developed

All the properties have some degree of developed infrastructure (trailheads, bathrooms, shelters, etc.), but only Bezell and Fort Hoskins have historically significant infrastructure. This infrastructure in turn constrains management of the adjacent RMUs. At Fort Hoskins and the Forest Education Center at Bezell, much consideration is given to aesthetics. Fort Hoskins management of adjacent stands represents a return to a historical baseline that one may have seen when visiting the fort in the mid to late 1800s. For Bezell, the restored barn/Forest Education Center is available for rent to the public, and maintaining a bucolic setting around it is an important consideration for any adjacent management activities.





The Forest Education Center at Bezell Memorial Forest

FOREST HEALTH AND PROTECTION

Insects and Disease

Generally, the forest is relatively healthy. Since the acquisition of these properties, management practices have increased species diversity and thinned stands for optimal stocking.

The major forest health concerns on these properties are:

Drought-induced conifer mortality: Changing climatic conditions on marginal sites throughout the ownership have created small areas of Douglas-fir and grand fir die-off. The most dramatic is at Beazell, where individual trees on the western edge of Stand B4 continue to senesce. Another notable example is a pocket of trees at the start of the switchback in Stand B13. While some recovery of value may be available in B4 (if timed with a first entry thinning in Stand B2, for example), other examples across the properties are so small that it would be best to let the affected trees become snags for wildlife and eventual downed woody debris.

Oak crowding, dieback, and mortality from fir competition: This issue is discussed in detail in the **Forest Management Approach** section. In some stands, established oak trees are losing their crowns and dying due to lack of light, as surrounding Douglas-fir trees have overtopped them. Older oak became established in an open savanna condition that were maintained in part from indigenous burning practices. Any crowding currently found in current oak/conifer RMUs is resulting in crown loss and decreased vigor, especially in legacy trees. It should be noted that many steps have been taken over the last two management periods to release high ecological value oak trees through harvesting or girdling of competing fir, but additional opportunities do still exist.

2014 Ice Storm fallout: The 2014 ice storm wreaked havoc on the area's forestlands. The effect, which primarily broke tops and diminished crowns, can still be seen at parts of Beazell today despite successful salvage harvesting in 2015. Stands showing residual impacts should continue to be assessed for things like fuel loading and potential pest outbreaks, as well as signs of decreased vigor on marginal sites. Maintaining the viability of some habitat values (such as oak mast production) may require active restoration.

Invasive species: This issue is addressed in detail below. Reducing the levels of invasive species on the property continues to be a high management priority. Given the aggressiveness of species such as false brome and Himalayan blackberry as well as their prevalence across the properties, control of future outbreaks in RMUs that are relatively weed free is probably more feasible than overall eradication across the ownership.



Insect damage: There are no significant insect infestations on the three properties. Maintaining hardwoods in conifer stands and ensuring a diversity of wildlife habitats can help prevent insect outbreaks by, for example, supporting diverse bird populations.

Incense Cedar Rust: A small amount of planted incense cedar near the B4/B8 stand boundary are being affected by a fungal pathogen, either Incense Broom Rust (*Gymnosporangium libocedri*) or Cedar Apple Rust (*Gymnosporangium juniperi-virginianae* Schwein). Orange globs, the telltale indicator, were seen at a site visit earlier in the year. Flagging of needles in branches can currently be seen on the trees. It is unclear whether the rust is a primary or opportunistic infection. The infection can be lethal to the trees, and treatment can involve either removing the impacted branches or potentially by chemical control.¹⁴

Invasive Species

Several invasive plants are widespread across the three parcels, threatening native vegetation communities, reducing browse for wildlife, and impacting stream hydrology. The relative abundance of these non-native plants is likely due to the long history of grazing, farming and logging on the properties, which created disturbed soil conditions ideal for establishment of invasive plants.

Current status of key invasive weeds:

- Bull thistle, Canada thistle (*Cirsium vulgare*, *Cirsium arvense*) – present in meadows, recently harvested areas, and along road sides
- English hawthorn (*Crataegus monogyna*) – present in oak/conifer and conifer/hardwood stands at Fitton Green, where it creates dense thickets
- False brome (*Brachypodium sylvaticum*) – ubiquitous at Fitton Green, present in smaller amounts at Beazell, least common at Fort Hoskins. False brome poses a particular threat due to its shade tolerance, prolific seeding, and ability to colonize the understory of conifer stands
- Himalayan (exotic) blackberry (*Rubus armeniacus*, *R. laciniatus*) – infestations in many forest types, in disturbed sites, and at edges of riparian forests
- Scotch broom (*Cytisus scoparium*) – present along some skid trails, meadows, and in understories on some drier sites
- Meadow knapweed (*Centaurea x moncktonii*) – present on the south end of the Steep Meadow (B21)
- Poison-oak – though a native species, it can be a nuisance; found mainly in drier oak, oak/conifer, and conifer/hardwood stands

Management Goals

¹⁴ Oregon State University. N.D. Cedar, Incense Broom Rust. Pacific Northwest Pest Management Handbooks. <https://pnwhandbooks.org/plantdisease/host-disease/cedar-incense-broom-rust> Accessed 11/23/2020.



The overarching goal is to significantly reduce the prevalence of invasive species throughout the three properties. This will be accomplished by: 1) applying carefully selected treatments to eliminate the target plants, and 2) systematically monitoring disturbed areas (i.e., recent harvest areas) to detect infestations early.

Weeds must be aggressively controlled, particularly in active treatment areas, to prevent reestablishment. Monitoring and timely treatment will be critical. In some cases, pre-treatment by injection or foliar spray may be advantageous. As active management oftentimes emulates a disturbance, and many of the aforementioned species are adapted to take advantage of new disturbances through colonization, pre- and post-treatments should be considered standard practice.

The preferred method is to assess an operation area, apply a carefully selected and site/pest appropriate herbicide at least 30 days prior to the operation. Reseeding any disturbed soil areas in September immediately after logging with (preferably) native grasses should be followed with targeted foliar spray of stump sprouts or new plants the following summer, as needed. Subsequent backpack spray treatments may be needed for 1-3 years.

Total eradication of all invasive weeds is usually not practical. The following can serve as a guide for the relative risks and potential for control for each of the key species identified. This should be revised and updated as new information regarding treatment approaches becomes available, and if/when new invasive species are identified on the property.

- Thistles – Foliar spray with glyphosate or clopyralid. June application is most effective, with multi-year treatments often required
- English hawthorn – Dense thickets requires mechanical removal, followed by foliar spray of resprouts; hack and squirt or cut stumps treatments provide excellent control using imazapyr
- False brome – A number of treatment strategies exist for controlling false brome. For example, combination of foliar application of glyphosate in the late summer/early fall with a pre-emergent such as Surflan will reduce damage to native species and prevent germination of new plants the following spring
- Himalayan blackberry – This weed can be nearly eradicated with regular monitoring and several years of foliar herbicide application to affected areas (glyphosate or triclopyr). A combination of manual or mechanical removal followed by subsequent herbicide applications can be extremely effective
- Scotch broom – Large plants (≥ 1 " stem diameter) can be manually or mechanically treated; smaller plants can be controlled with thorough foliar spray of triclopyr or glyphosate. Seed stays dormant for decades in soil, so limiting soil disturbance is important to limit new populations



- Spotted knapweed – a number of herbicides can be effective against knapweed. Their use should be carefully considered, especially with regards to other desirable vegetation growing near the knapweed
- Poison-oak – Alongside roads and trails, poison-oak should be controlled in conjunction with other weed treatments

Given the extent of invasive species on parts of the properties, Benton County should focus their efforts where they can make the most impact. All weeds in SC 1 and 2 RMUs should be aggressively targeted given these sites' high conservation value. False brome should be targeted first and foremost along roads and trails, or other high traffic areas where unassuming visitors spread the seed. Invasive species with lower prevalence on the property such as the thistles, hawthorn, knapweed, and scotch broom should be aggressively targeted when seen, as controlling their seed source and reach will yield better results. False brome should be contained where it is ubiquitous and removed as soon as it is seen in RMUs with lower to scant concentrations. Any management activity should continue to incorporate aggressive pre- and post-treatments that are conducive to adaptive management principles (please refer to the **Forest Management Approach** section for further discussion of Adaptive Management). Finally, all operators and equipment should continue to be required to clean any equipment before they enter any of the properties.

As Benton County seeks to apply more herbicide treatments in-house or in coordination with partners, an easily accessible and detailed (preferably geospatially-linked) database should be created. This database can be used to fulfill the reporting requirements for the Oregon Department of Agriculture for herbicide applications, for the FSC requirements under Benton County's forest certification, as well as be used to coordinate the treatments between operators in the meadows and forestlands. Due to the county's desire to manage herbicide applications in meadow areas, Trout Mountain Forestry removed the meadows from the FSC-certified acreage in 2019.

Wildfire Protection

Fire weather

In 2020, western Oregon saw some of the worst wildfires in over a century. For the Willamette Valley and vicinity, wildfire season is generally in the hot summer months. However, unusually dry weather can occasionally create favorable conditions for the spread of wildfire as early as May and as late as October. Prior to the onset of the rainy season (particularly in the fall), windy, dry conditions can create an opportunity for wildfire. Fire ignition is typically human-caused, but can also be sparked by lightning strikes.

Fire risk is highest during late summer/early fall east-wind events, when hot, dry air descends into western Oregon from the high desert east of the Cascade Mountains. During these periods, daytime high temperatures reach the upper 90s and into the 100s,



with night-time temperatures remaining higher than normal and the relative humidity staying lower.

Fuel types

The primary fuel types of concern on the property are:

- *Grasses*. In late summer if allowed to go to seed and cure, grass can be highly flammable. Unmanaged, grass can develop a flammable thatch over time. Grass fires ignite easily, move quickly, and can spread into adjacent forest stands. Grazing and/or mowing keeps grassy fuels from accumulating, although mowed grass allowed to accumulate can cure and pose risk additional ignition risks. Prescribed fire on 4-year intervals can reduce fuel loading
- *Flammable invasive weeds*. Some exotic species can be highly flammable, especially non-native blackberries, which accumulate dead canes beneath new growth. Such conditions are present in some older blackberry thickets across the property. Weed control measures, potentially including mulching, will help reduce this fuel type
- *Conifer plantations*. Young conifer plantations can be highly flammable in hot and dry conditions due to a variety of factors. These can include a concentration of fine fuels in branches and needles, high tree densities, and branches that often extend to the forest floor which can create fuel ladders that allow a ground fire to “climb” into the canopy. Early thinning and pruning edge trees can help reduce the fire risk. Management of the resulting slash is important to consider.

Factors mitigating against fire risk are the abundance of hardwoods, particularly oak, which are relatively inflammable except under extreme conditions, and the relative absence of down wood in the forest understories. Fire trails are maintained at the margins of some meadows, but additional infrastructure planning could be beneficial. This is especially true when thinking of the management of meadows with prescribed fire, and how it relates to forest management, fire protection, and access of adjacent RMUs. Overall, reducing fuel loading through forest management activities can help reduce wildfire risk

Fire history

The ecosystems of the Willamette Valley have a long history of fire disturbance and adaptation. Lightning strikes are uncommon in the region; however, Native Americans used fire extensively prior to European settlement in the mid-1800s. Many of the Willamette Valley’s plant communities were defined by frequent, low-intensity fires that prevented tree encroachment into the region’s once vast meadows, savannas, and woodlands.

While most contemporary human-caused fires are unintentional, prescribed fire is increasingly being utilized as a restoration and vegetation management tool, including a number of treatments in upland meadow sites at Beazell, Fitton Green, and Fort



Hoskins. Benton County is managing these meadows on 3-5-year burn intervals, and most of the large meadows have been burned at least once. Burning can take place in occupied habitat of Taylor's checkerspot butterfly, but only 1/3 of the overall habitat can be burned each year. Currently, the county participates in the burns by providing some initial fire line mowing and contracting the burn crews.

Recently, Oregon State University Extension established a Fire Program staffed with experts in fire ecology and prescribed burning. This program represents a potential resource as the county continues to develop its fire program.

Water Availability

In the event of a wildfire, water is available at, or adjacent to all three properties.

- Bezell: Plunkett Creek is available in many locations and flows dependably year-round. It crosses beneath the Kings Valley highway just north of the public entrance to Bezell and is also accessible to brush rigs along the Plunkett Creek trail. A 2,000-gallon potable water holding tank was installed south (uphill) from the Bezell Forest Education Center¹⁵
- Fitton Green: A small, perennial stream flows along Cardwell Hill Road and provides the only pump chance on the property. A better pump chance is along Cardwell Hill Road where it borders the Marys River 0.5 miles west of the property
- Fort Hoskins: The Luckiamute River flows adjacent to the Fort Hoskins property and is easily accessible both west and southeast of the park where Hoskins Road crosses the river

Access considerations

Each property contains a good network of roads. Remote areas of each property would be accessible by a brush rig. Only main park roads would be passable by fire engines. ODF fire vehicles can access many upland prairie sites. The road network should continue to be both thoughtfully and conservatively developed or upgraded for both wildfire mitigation and forest management purposes. A major opportunity to upgrade existing road infrastructure by rocking exists at Bezell in stands B24, B25, and B26.

Firefighting resources

Bezell Memorial Forest and Fort Hoskins Park are both located within one to two miles of the Hoskins-Kings Valley Rural Fire station, at the intersection of Kings Valley Highway (Rte. 223) and Hoskins Road. Fitton Green Natural Area is located outside the Corvallis and Philomath urban growth boundaries, near the fire departments of both cities.

¹⁵ Hayes, Phillip. 2020. Draft Benton County Park Histories, p40.



Prescribed Fire

As mentioned above, Benton County maintains an active prescribed fire program for habitat conservation across 5 properties (Beazell, Fort Hoskins, Fitton Green, Lumos, and Pearcey-Schoener). A burn is initiated on approximately 3-5-year intervals at each participating site. Due to cost factors and the HCP allowance for prescribed fire in occupied habitat, this equates to 20 acres maximum each year across the 5 properties. Only 1/3 of Taylor's Checkerspot Butterfly occupied habitat is allowed to be burned each year under the HCP. Of the 20 acres, the county tries to split that allowance by half between two properties each year. Benton County relies completely on contractors to accomplish the prescribed burns, which usually occur at the end of September/early October each year. Prescribed fire is used at the North (B7), Middle (B7), and South Meadows (B35) at Beazell, as well as the North Prairie (H10/H11) at Fort Hoskins, and the South Meadow at Fitton Green (F10)¹⁶.

Climate Change and Benton County Forests

Anthropogenic climate change is resulting in several shifts in our environment and will continue to impact vegetation over the coming decades. Winter low temperatures are expected to increase and summertime heat waves to become more extreme, leading to longer periods of severe moisture stress. Our current droughty period will persist. Reductions in summer water



Drought-induced fir mortality at Beazell. We can expect to see increased mortality on marginal sites due to climate change

availability can be expected to negatively impact drought-sensitive species (grand fir and Douglas-fir on marginal or drier sites for example), seedling establishment and survival, capacity of forests to resist pathogens and insects, proliferation of those pests and pathogens, and potentially lead to further spread of invasive weed species. Heavy rainfall events of increasing intensity and duration in the winter may lead to the failure of key infrastructure such as culverts and roads. Increased temperatures and decreased soil moisture also increase the susceptibility of vegetation to fire.¹⁷

Climate models project that some Douglas-fir and mixed fir/oak stands could shift to grass and forb communities, including oak savanna and camas prairies. Changes will be less pronounced at higher elevations and on cooler north and east aspects.

¹⁶ Adam Stebbins, Benton County Natural Areas & Parks Natural Resources Coordinator, personal communication, 11/5/2020

¹⁷ Mote, P.W., J. Abatzoglou, K.D. Dello, K. Hegewisch, and D.E. Rupp. 2019. Fourth Oregon Climate Assessment Report. Oregon https://www.oregon.gov/lcd/NH/Documents/Apx_9.1.21_OR_ClimateAssmtRpt4_2019_OPT.pdf Accessed 11/18/20



Useful practices to mitigate against climate change impacts in forested settings include thinning to maintain tree vigor and reduce moisture stress, favoring drought tolerant species on dry sites (incense cedar, ponderosa pine, oak), using planting stock from more southern climate zones, planting at wider spacing to increase available site moisture, and reducing invasive weeds. Grand fir and Douglas-fir should be transitioned out of dry/marginal sites. Grand fir in particular is a prolific seeding tree, and advanced regeneration can outcompete other species in the understory or serve as a potential fuel source.

Culverts could be inventoried for function and size, and replaced or upgraded as needed. Similarly, road systems should be inspected after heavy rain events to assess performance. Gathered information could be retained at the county in a specific forest infrastructure database. Regular monitoring and adaptive management are important to ensure healthy forest conditions as conditions change.

Habitat Conservation Plan

In 2006, Benton County began development of a Prairie Species Habitat Conservation Plan (HCP) in order to bring Benton County's activities on its lands into compliance with the Federal Endangered Species Act, as well as State statutes. Without an HCP, the County would be hindered in its routine responsibilities (i.e., park/natural area maintenance and development and road maintenance) with delays and added costs of habitat surveys and regulatory agency consultations. Through the HCP, which was completed in 2010, the County will avoid and minimize impacts to threatened and endangered species of prairie habitats. Where impacts are unavoidable, the County will mitigate (complete habitat restoration to offset habitat damage) as required.



Taylor's checkerspot butterfly nectaring on rosy plectritis in the North meadow of Beazell Memorial Forest, May 2019. (Photo and caption courtesy of Andy Neill, IAE)

The County also recognized the liability and added burden faced by rural landowners residing in endangered butterfly habitat who wish to complete a home, outbuilding, or farm or forest structure on their property. Consequently, the County Board of Commissioners offers HCP coverage as an option to rural private landowners in endangered butterfly habitat. The overarching vision of the HCP is to achieve long term viability of rare species populations that is compatible with essential public services, public conservation and land management, and construction on private lands.

Eight species are currently included in the HCP: two butterflies (Fender's blue and Taylor's checkerspot), one bird (Streaked horned lark), and five plants (Willamette daisy, Bradshaw's Lomatium, Kincaid's lupine, Nelson's checkermallow, and the Peacock larkspur). All are federally listed as Threatened, Endangered, or Species of Concern.

The HCP will continue to be woven into the management goals and actions associated with this Resource Stewardship Plan because some of the species covered under the HCP are located on the three subject properties, specifically:

- Beazell Memorial Forest, which contains a significant population of Taylor's checkerspot butterfly. Kincaid's lupine and Willamette daisy have been planted on the property.
- Fitton Green Natural Area, which may contain a very small population of Taylor's checkerspot butterfly (introduced, establishment not yet confirmed). Kincaid's lupine has been planted on the property.
- Fort Hoskins Historic Park, which may contain a very small population of Taylor's checkerspot butterfly.

All three properties have been designated as Prairie Conservation Areas under the HCP because they each contain valuable prairie habitats. As such, the HCP sets forth that each will be managed specifically for prairie species conservation, and as locations where habitat restoration and enhancement activities may occur. Management goals and actions prescribed under this Stewardship Plan must not conflict with the Conservation Objectives and Measures stipulated within the HCP.

The three broad Conservation Objectives established in the HCP are:

1. Conserve Covered species populations and habitat
2. Enhance Covered species populations and habitat
3. Increase the distribution and connectivity of Covered species populations

Other specific conservation measures and actions are listed in the HCP for each of the above three objectives. Several have relevance to the subject properties, and provide opportunities to ensure compatibility between this Resource Stewardship Plan and the HCP.

The HCP not only provides the County a conservation framework and legal protection, it can also serve as a fundraising tool for restoration activities in Benton County that benefit the eight species of concern. Having a clear, publicly-reviewed strategy for habitat conservation and an established relationship with the U.S. Fish and Wildlife Service will increase confidence among funding agencies that Benton County will continue to deliver on its promises to enhance and maintain habitat for these threatened and endangered species.





A thinned conifer RMU at Fort Hoskins

FOREST MANAGEMENT APPROACH

As complexity has been built into the forests at Beazell, Fitton Green, and Fort Hoskins over the past twenty years through silvicultural treatments, a sophisticated and dynamic approach is needed to further forest management across the ownership in order for the county to achieve its' goals and objectives. What follows is a systematic approach to forest management for the next 10-year period on the properties. Additional guidance and specifications can be found in **Appendix J**¹⁸.

Habitat Preservation and Enhancement

One of the most important management objectives for the three properties is to protect sensitive or unique habitat features where they persist, and restore them where they don't. This will ultimately support the preservation and enhancement of the sensitive plants, insects, and animals found on the properties, as well as other less sensitive species. To this end, the new Sensitivity Classification system rates each RMU in terms of habitat features. The highest rated (SC 1) RMUs are all pure hardwood stands associated with streams. Examples are found on each property (B17, B28, F3, F7, and H3). The second highest rating (SC 2), indicative of "Old Forest" habitat types is found on two RMUs, at Beazell and Fort Hoskins, respectively (B33 and H11). Finally, 18 RMUs fall into the Moderate (SC 3) classification. Specific recommendations for how to support structure and habitat objectives within all of these RMUs are located in the **Tract Findings and Recommendations** section of this plan. Opportunities include additional snag creation and downed woody debris recruitment, supplemental plantings with climate-friendly/site appropriate species, non-commercial legacy tree release (oak, maple, madrone, Douglas-fir, grand fir), oak savanna and woodland restoration, age class and species diversification, invasive species removal, and butterfly corridor enhancement.

Oak Management

Benton County oak savanna and oak woodland RMUs contain many rare species and sensitive habitats. Ownership goals include promoting diverse wildlife habitats to support a wide range of native biodiversity, reversing trends of habitat loss, and actively restoring degraded habitats.

¹⁸ Since the addition of the Benton County NAPD Natural Resources Coordinator and Landscape/Natural Resources specialist staff positions in 2015, county led oversight of plan development and implementation has occurred. The result has been an enhancement of achieving multiple natural resources goals (Habitat Conservation Plan, Forest Stewardship, Trail Management & Maintenance, and Public Outreach & Education) within these plan areas. During the current plan period, Benton County NAPD will build on this implementation approach primarily, through: 1. Increasing the diversity of private sector contractors through multiple requests for proposals during the plan implementation period, and 2. Continuing to take a lead role in project planning and approval, along with post project evaluation. The result is a continuity of efficient and effective integration of the wide range of forest management projects, and the adjacent prairie habitat conservation/restoration projects- all of which Benton County NAPD staff will coordinate for long term public benefit.



Restoration activities over the past 10 years have reduced conifer encroachment into meadow and savanna areas, reduced conifer overtopping of legacy oaks, fought invasive species populations, and enhanced native prairie plant populations.

Oak savanna and woodland stands will be managed using the follow approach:

- Reduce stem density to enhance oak vigor. For oak savanna thin to 10-50 trees per acre (or 5-30% canopy cover); for oak woodland thin to 100-200 trees per acre (or 40-90% canopy cover); vary stocking depending on site quality, tree size and condition; leave higher tree density in riparian areas or on steep slopes
- Favor vigorous oaks with well-formed mushroom-shaped crowns (no matter their DBH); discriminate against smaller, suppressed trees with vase-shaped crowns
- Protect legacy oaks, heavy mast producers, cavity trees, and uncommon species (madrone, dogwood, ash, etc.)
- Reduce Douglas-fir by 60-90%, especially where competing with legacy oaks; leave some fir for snag creation, cavity or perch trees, and as legacies. Maintain some fir groups for diversity where presence does not compromise legacy oak
- Use logging method and equipment best suited to the site and timber condition; preferred equipment for mature stands is a mechanical feller since directional falling generally protects residual tree crowns better than hand falling
- Top or girdle firs growing within oak canopies if felling would damage oak crowns
- Manage slash to prevent blackberry invasion: whole tree harvesting (preferred method for stands >8" avg. dbh), pile/burn, or lop/scatter
- Reduce (or eliminate) invasive false brome, hawthorn, blackberry, and scotch broom, as well as other invasive species (see below)
- Seed disturbed sites with native grass or pollinator mixes before October 15 for soil stabilization and weed prevention
- Consider maintenance methods (fire/mow/chemical) and species suitability in treatment design
- Prioritize stands for treatment based on access, weed presence, and oak condition
- Treat as cost share/incentive funding is available and markets allow

“Old Forest” Individuals within RMUs

While no true old growth stands exist on the property (based on FSC or other recognized definitions), individual older trees are sprinkled across multiple RMUs. These trees are artifacts of past logging practices. Sometimes individual trees were skipped over by loggers due to their lack of merchantability or difficulty of access. Despite their low commercial value, these individuals have high ecological value and warrant



protection. Furthermore, protecting them and promoting others into their ranks is an important management objective. These trees will be clearly marked and protected during harvests or other management activities.

For management purposes on Benton County lands, these special trees will be defined as anything older than 80 years. For trees that are either older individuals or would make good future older residuals, we have found that 32" DBH or greater is a good proxy for age. The following characteristics help to further identify these trees for protection in the field:

- *Diameters*: Generally in the largest diameter classes in the stand though some suppressed individuals may exist
- *Bark*: Deeply fissured, thick, dense bark
- *Crowns*: Large diameter branches (>~6"), flat or irregular crowns, reiterative tops, crown debris accumulation, platforms, high frequency of complex lichens or moss, complex structure
- *Damage*: Cat facing, burn scars or 'goose pens' (basal burn cavities)

Older maple, madrone, and oak also will be protected. Individuals can be easily identified as they may be noticeably larger in height or diameter than their neighbors. Additional identifying characteristics may include mushroom shaped crowns or sweeping, thick branching indicative of open-grown conditions.

In addition to protecting scattered individual older trees, some stands, such as B33, may be designated as reserves where late-successional forest characteristics are desired and management activities are limited.

Landscape Level Considerations

These Benton County parcels contribute to the surrounding landscape in unique and significant ways, especially for rare oak and prairie habitats. Additionally, they serve as an example of how forest management can achieve a balanced approach – for wildlife habitat, aesthetics, recreation, water quality, and sustainable timber production. Management will attempt to complement regional conservation efforts whenever possible. Other nearby conservation efforts include:

- Several restored oak savanna areas in the immediate vicinity of Fitton Green. Best examples are at Bald Hill Farm and Chip Ross City Park
- Taylor's checkerspot habitat enhancement partnerships on several private tracts in the vicinity of Fitton Green such as the Crestmont Land Trust
- Several protected properties nearby (Greenbelt Land Trust, City of Corvallis, Crestmont Land Trust)
- Few older forests nearby. Best examples are 5+ miles away on the Siuslaw National Forest, City of Corvallis, and OSU lands



Given the location and surroundings of the ownerships there are excellent opportunities to continue coordinating management with regional conservation efforts, especially for oak savanna, native prairie, and stream restoration. There are numerous partners whose interests in restoration coincides with that of Benton County, such as Natural Resources Conservation Service (NRCS), Benton Soil and Water Conservation District (SWCD), Luckiamute and Marys River Watershed Councils, Greenbelt Land Trust, Crestmont Land Trust, Confederated Tribes of Siletz Indians, and the Confederated Tribes of Grande Ronde.

Allowable Timber Harvest

A scientific basis for setting harvest levels is necessary to ensure long-term forest sustainability. While comparing timber inventories over time can allow for estimates of forest growth, the new sensitivity classification (SC) system has established a fresh baseline by redefining how and where certain management activities can occur. Active timber management is most likely going forward in RMUs that are rated 3 and 4 for sensitivity. These RMUs total ±741 net acres¹⁹ out of 881.7 total net forested acres across the three properties.

A forest resources inventory was conducted during the fall of 2020 in all merchantable SC 3&4 RMUs to evaluate forest composition, assess snag and downed woody debris recruitment, evaluate the quantity and quality of the timber resource, and stocking. Highlights of that inventory are presented throughout this report; summary reports are found in **Appendix H**. Inventory data reside in the offices of Benton County.

A summary of total growth, volume, and recommended allowable harvest at the property level is located in **Table 10**. Harvests during 2001-2010 removed 2,418 MBF, or approximately 77 percent of accumulated growth during that period. During the 2011-2020 period, 2,059 MBF was harvested. Recommended harvest levels for the 2021-2030 period are ±3,015 MBF, or 85% of overall periodic growth.

Anticipated growth for the 2021-2030 management period was estimated using the FPS growth model. Each cruised stand was projected forward from the date of cruise to the end of the subject period under a “grow only” regime, meaning no silvicultural treatments were assumed or modeled for the period. The FPS growth model is based on a regional data set (referred to as a “species library”) of quantitative parameters by species for site capacity, taper and volume determination, growth and mortality rates. The growth model is calibrated by applying the parameters contained within this library.

The new Sensitivity Classifications redefined actively managed acres across the ownership. This management period may see some changes in SC designations as mixed

¹⁹ 393.9 SC 3 acres and 347.1 SC 4 acres, including plantations



stands, oak stands, or older conifer stands are treated. Additional conifer volume will be generated by one-time conifer removal in oak restoration areas or RMUs that are being transitioned into reserves. These activities will likely redefine the Sensitivity Classifications for some RMUs in subsequent planning periods.

Harvest levels are established to allow the county to move the managed lands into a greater balance of young, intermediate, and older-aged RMUs, increase the amount of uneven-aged structure and new cohorts across the ownership, and to facilitate achieving the desired level of oak restoration treatments. The proposed harvest levels provide a buffer for the unforeseen, such as weather events, insects or disease, or other impacts due to climate change.

Estimated harvest levels remain within the total estimated growth for the management period, but are higher than in years past for several reasons. Operations in SC 3 RMUs are primarily intended to be one-time conifer removals which may restore oak savanna and oak woodland conditions, introduce new cohorts of mixed species, promote residual hardwoods, and increase RMU resiliency to climate change. These restoration projects will create a larger harvest volume due to the competing conifer being removed to achieve restoration objectives. Similarly, as the SC 4 Douglas-fir type is brought back into balanced age classes across the ownership, more volume will be generated (as discussed in the **Forest Management Approach, Silvicultural Approach, and Recommendations** sections of this plan).

Table 10. Growth, Volume, and Recommended Allowable Harvest by Tract²⁰

Growth, Volume, and Recommended Allowable Harvest by Tract				
	Bezell	Fitton Green	Fort Hoskins	Total
Net forested acres [^]	393.5	99.4	69.4	562.3
Total net mbf volume 2020	11,482	1,496	1,992	14,970
Projected net mbf volume 2030	13,820	2,203	2,475	18,499
Total growth mbf, 2020-2030	2,338	708	483	3,529
Estimated SC 3 volumes (mbf)*	±355	±175	±150	±680
Estimated SC 4 harvest volumes (mbf)	±1,900	±260	±175	±2,335
Estimated total harvest volumes (mbf)	±2,255	±435	±325	±3,015
Recommended harvest % of growth	96%	61%	67%	85%

*Designed primarily as 1x harvests which change the vegetation type away from conifer

²⁰ ^net cruised acres

* using compounding formula to solve for growth rate: $i = (V_n/V_o)^{1/n} - 1$

i=% growth; V_n=future value; V_o= current value; n=# years



Silvicultural Approach

Among the stated ownership objectives are to use and demonstrate environmentally sensitive management and harvest techniques to restore habitats, maintain forest health, to improve tree quality, and to provide ongoing funding for park management. Silviculture is both an art and a science. Forestry can be perplexing to those who would simply like to distill the profession down to a series of charts or manuals that dictate what to do, when to do it, and where to do it. The reality on the ground is that factors determining forest operations are dynamic, and prescriptions need to give the forest manager enough flexibility to adapt to myriad conditions in real-time. These changing conditions may include shifting markets, operator and equipment availability, or extreme weather impacts, just to name a few. The goal of this section is to define an operating framework for the next 10-year management period that is in line with both past management and County objectives, while simultaneously not being so overly prescriptive that the aforementioned factors cannot be evaluated under the most accurate of conditions.

Silvicultural Treatments Types

Silvicultural treatments on SC 3&4 lands will correspond with 7 different treatment types. These treatments will vary from site to site and acre to acre, depending on age, stocking, species composition and operability of the site. Site specific prescriptions will be designed prior to the harvest to meet County objectives with regards to promoting forest health, biodiversity, habitat features, aesthetics, educational/demonstration/research opportunities, wildfire prevention, climate mitigation, and improved timber quality. Intensity and scale of treatments will depend on individual RMU and market conditions. Any treatments will be assessed for resource impacts before and after their undertaking by NAPD staff and forestry consultants.

Precommercial Thinning (PCT): PCT involves the thinning of non-merchantable trees to reduce stocking by slashing and leaving the tree on site rather than removing it for commercial product. PCT is generally focused on stands between 15 and 20 years old. Since most of the opportunities for PCT will be limited during this planning period due to plantation ages, no activities are scheduled. The goals of PCT operations are to maintain a deep and vigorous crown; provide opportunities for early differentiation in crown structure; shift species composition; maintain consistent growth rates to ensure commercial viability of the next entry; and provide openings in the canopy for recruitment of understory.

Conventional Thinning: Thinning removes a portion of the trees to benefit species composition, growth rates, and timber quality of the remaining trees. Thinning from below removes trees from the lower diameter or crown classes, while thinning from above removes trees from upper diameter/crown classes to “release” sub-dominant trees, and free thinning refers to multiple thinning approaches (from below, above, selection or spacing) across a single RMU. Thinning from below or free thinning will



most typically be used. Consideration will also be given to retaining legacy and “defective” trees to maintain and enhance structural variability.

Variable Density Thinning (VDT): This method involves varying thinning intensity across small scales to create a complex forest structure. Wider spacing may accommodate natural or planted regeneration of shade tolerant species, thus allowing for the recruitment of additional age classes and/or species. The goal of variable density thinning is to promote complexity and variability in crown and canopy structure on sites where it has been lost due to even-aged management. Other benefits include development of understory structure with varying light intensities. Variable density thinning is typically applied as a thinning from below or a free thinning.

Group Selection: Group selections typically involve removal of small (<0.5 acre) groups of trees within a stand. This will generally be applied in conjunction with a thinning operation to provide opportunities for crown development at the edge of the group opening and establishment of an additional age class. Whether or not a group selection is planted or left to regenerate naturally will depend on presence of shade tolerant seed sources, size of the opening, and frequency of the openings.

Patch Cut: Openings between 0.5 and 2.5 acres created by removal of all stems are classified as patch cuts. This harvest method provides larger openings for regeneration and establishment of early seral conditions. Patch cuts will be regenerated primarily through planting of native conifer species. Patch cutting will be integrated with thinning operations and provide a primary method of introducing new age classes and species diversity to the forest.

Variable Retention (VR): Variable retention harvest is a modification to traditional clearcutting which involves removal of most of the trees in a 2.5 to 20-acre unit with at least 10-30% retention of the original stand. The retained portion of the stand may be grouped or dispersed throughout the harvest area. VR provides more volume and value than thinning entries while maintaining a structural legacy on the site through the current rotation to the next VR entry. VR may be used when stand conditions indicate thinning may not be effective in promoting desired structural or compositional conditions, when forest pathogens are severely impacting the viability of a stand, or when operational limits prohibit thinning.

Silvicultural Guidelines

Based on the preceding silvicultural treatment types, sustainable forest management on Benton County lands will be accomplished using the follow approach:



- Schedule harvests based on 5 operating units²¹, treating one unit every 2-3 years. Reenter RMUs on average every 10-15 years, depending on site. Within each operating unit skip over stands lacking current needs
- Use a variety of silvicultural approaches (even-aged, uneven-aged, multi-species)
- Emphasize thinning harvests for stands less than 50 years old; increase emphasis on regeneration harvests as stands mature with 80 years being the target rotation age for SC 4 RMUs
- Use a range of thinning techniques as suited to stand condition (variable density or conventional)
- Promote understory species diversity by release or avoidance
- Regenerate on average 10-15 acres per entry²² by advanced regeneration release or tree planting, primarily using patch cuts, and variable retention harvest techniques; look to establish species best suited for the site under a changing climate
- Designate areas for growing older trees where site and tree conditions allow; maintain biological legacies throughout the property through release/tree topping/tree girdling; do not cut trees ≥ 32 " DBH
- Include habitat enhancement practices during harvests, i.e. snag/woody debris creation
- Schedule harvests to take advantage of log market opportunities

Invasive Species Control

Invasive weed populations continue to present the greatest forest health risk to the ownership, and controlling invasive weeds is one of the first steps in accomplishing the stated ownership objective of actively restoring degraded habitats. Awareness of invasive weeds threats have become more pronounced over the previous two management periods, and knowledge of control techniques has continued to grow. Benton County and hired contractors have all targeted weeds on the properties in the past, to varying degrees of success.

The weeds on the property represent some of the most aggressive and pervasive that exist, and unfortunately, despite much effort from multiple parties they continue to persist. Since several groups are involved with the management of controlling invasive species, a coordinated approach and centralized database of needs and treatments is recommended. Any herbicide application to Benton County forestlands needs to be documented and reported as part of FSC certification requirements.

Due to the current populations of the invasive species located on the properties, regular applications to high traffic areas such as roads and trails should be continued to help limit their spread. RMUs with highly sensitive SC ratings as well as their adjacent stands

²¹ Three units at Beazell, one at Fort Hoskins and one at Fitton Green; commercial harvesting options at Fitton Green are limited and occur mainly in conjunction with habitat management activities.

²² To balance age classes across the 347 total SC 4 acres for an 80-year rotation, the county would have to regenerate ~4 acres every year, or approximately 40 acres during the 10-year management period. Since the younger cohort only makes up ~10% of the total acreage, accelerating the process by a factor of 1.5 would bring the total to 65 acres. Recommendations for this management period are therefore to treat 50-65 acres.



should be prioritized for treatments as they have generally been treated in the past and have higher conservation or habitat value. In addition to these priorities, RMUs that are being actively operated in should continue to be treated for weeds before and after a harvest since the disturbance of the equipment on site could cause a proliferation response.

As part of the specific silvicultural prescription development of an operation, the following practices should be included:

- A treatment plan for the RMU, considering target species, native understory condition, site condition, etc. is developed by the Forester as part of the Harvest Plan
- Design treatment methods and timing to protect native plants
- Use a well-timed and concerted approach, including pre-op, post-op, chemical and mechanical treatments
- Clean logging equipment before transport to site
- Monitor treated stands annually and schedule timely follow-up practices
- Record findings in a centralized database
- Integrate treatment schedule with cost sharing/incentive program timetables for best economy

BMP's Around Sensitive Meadows

The upland meadows at Bezell, Fitton Green, and Fort Hoskins represent some of the most valuable ecological habitat features on the ownership. Extremely sensitive and rare occupied habitat host Taylor's checkerspot butterfly at Bezell and Fitton Green; Kincaid's lupine, Willamette Daisy, and Golden paintbrush at Bezell; and golden paintbrush at Fitton Green. Past and ongoing work from Benton County, the Institute for Applied Ecology, Trout Mountain Forestry, and others continues to restore and protect this habitat. To aid in this effort, the following Best Management Practices (BMP's) are offered to ensure that forest management activities do no unnecessary harm while operating nearby. They are derived from the Final PROJECTS Biological Opinion prepared by the U.S. Fish and Wildlife Service. The recommendations, with input from the Institute for Applied Ecology are adapted from recommendations designed to address working within occupied habitat²³, not adjacent to it. The PROJECTS report should be consulted for additional background information and guidance.

- Forest management activities (including but not limited to moving equipment or felling trees) adjacent to occupied SC 2 or greater habitat will be avoided during the Taylor's checkerspot flight season, April 15-June 15
- Tree felling adjacent to occupied habitat will occur away from said habitat

²³ Henson, Paul. 2015. Final PROJECTS Biological Opinion. U.S. Fish and Wildlife Service Portland, Oregon. 364-365.



- Large trees along occupied meadow edges should be retained, when possible, to provide windbreaks or additional shelter for Taylor’s checkerspot butterflies. Potential future meadow expansions will consider this when determining restoration unit edges
- Logs or slash will never be piled, dragged through, or staged in occupied meadows; landing areas will only be established within operational RMUs
- Logging equipment will never be driven through or parked in occupied habitat
- All vehicles, equipment, and supplies (e.g., boots, clothing, hand tools, heavy equipment, utility all-terrain vehicles, etc.), before being used in and around occupied habitat, will be disinfected and/or cleaned of mud, dirt, debris, and vegetative matter, as appropriate, to prevent the potential introduction of nonnative/invasive plant, plant/animal pathogens, and wildlife species into the habitat
- Foot traffic by contractors shall be minimized in occupied habitat

Independent Certification and Monitoring

FSC Certification, Standards, and Guidelines

These three Benton County sites have been independently certified as being managed according to Forest Stewardship Council (FSC) standards since 1998²⁴ under a group certificate held by Trout Mountain Forestry (SCS-FM/COC-00062G). Benton County will continue with FSC group certification, ideally by establishing an agreement and membership with an independent non-profit organization that certifies FSC lands in Oregon. The FSC group certification approach was voted and approved by the Benton County Natural Areas & Parks Advisory Board, and completion of the new certificate will occur immediately after plan adoption. The FSC standards address environmental, social, and economic issues, and FSC certification is widely recognized as the most credible forest certification system by non-governmental organizations around the world.

The goals and objectives for these Benton County properties are consistent with the FSC US Standard. Ongoing participation in the FSC program will ensure a system of independent auditing to verify compliance with these standards. The standards of this plan meet or exceed the minimum requirements of the FSC standard.

²⁴ Trout Mountain Forestry is an FSC-certified resource manager, and administers a group of approximately 25 landowners on 36 properties throughout western Oregon, of which Benton County is a member. Members collectively endorse and abide by the standards of the FSC. Annual audits are conducted by Scientific Certification Systems (SCS), an FSC-accredited certifier based in Emeryville, CA, to ensure that members of the Trout Mountain Forestry landowner group comply with the FSC standard.



The FSC Standard contains more than 50 pages of specific Principles, Criteria, and Indicators that are used during audits to verify compliance. It is available online at www.fscus.org. The ten principles are included in **Appendix K**.

Adaptive Management

This plan should be periodically re-assessed. Typically, forest management plans have a ten-year life span. At the end of that period, most inventory information upon which the plan was based are becoming outdated, and it is time for a reappraisal of the total property, ownership objectives, and implementation successes and challenges.

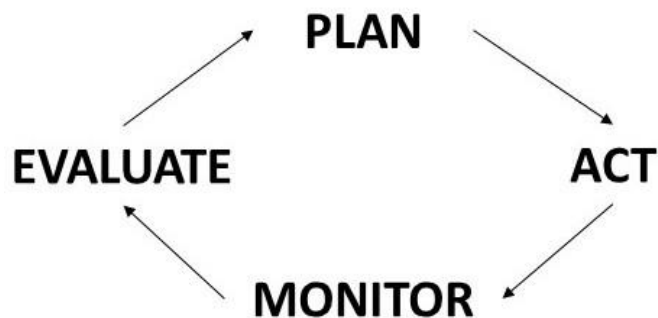
A stewardship plan review should involve the following:

- Assess the implementation of the plan and strategies
- Evaluate the effectiveness of the strategies in achieving the expected results
- Assess the assumptions built into the plan
- Evaluate the extent to which goals are being met
- Practice adaptive management

Monitoring is an essential part of an adaptive management loop — a framework for continually improving the state of our knowledge about the forest, and acting on new information. This adaptive management process is shown in **Figure 21**.

From time to time the stewardship plan may be amended or updated particularly to respond to any changes in the FSC standards. FSC US initiated a review and update of their standards in 2018. An amended version is expected by 2022. This plan should be reviewed at that time to ensure that it reflects the most current FSC standards.

Figure 21. *Adaptive management*







A released legacy oak tree at Fort Hoskins

RECOMMENDATIONS

Ownership Recommendations

The following are general guiding recommendations that should be applied across the ownership. For more detailed Ownership Recommendation Notes, please refer to **Appendix L**. RMU-level recommendations are located in the **Tract Findings and Recommendations** section below.

1. Treat invasive weeds regularly along all major roads and trails to limit spread by visitors or partnering organizations. Focus additional invasive treatments on highly sensitive habitat types, or areas that have not yet seen full-blown establishment.
2. Establish access trails or roads adjacent to high value habitat meadows that receive periodic prescribed fire treatments. Special attention should be given to ridgelines where fires would advance more quickly.
3. Increase public engagement and education to match increases in park usage. Utilize example harvests and treatments for forestry education.
4. Continue to add to the habitat features on the property by recruiting additional snags, felling and leaving trees for downed woody debris, and releasing legacy trees of all species types. Special emphasis should still be placed on oak trees, but legacy maple, madrone, Douglas-fir, and grand fir should also be promoted on the appropriate sites.
5. Conduct regular harvesting (every ~2-3 years) to keep up with RMU needs and to demonstrate to the public sustainable harvest techniques.
6. Balance “commercial” (SC 4) RMUs between early, middle, and late ages.
7. Maintain infrastructure regularly to account for fire equipment access. Reduce fuel loading through additional thinning. Promote hardwoods as natural fire breaks. Develop and implement a protocol for shutting down the parks or restricting access during red flag weather events in fire season.
8. Maintain FSC certification to provide both transparency and accountability to the public.
9. Continue to monitor changes in carbon market participation that would benefit future enrollment of portions of the properties.



Tract Findings and Recommendations

Bezell Memorial Forest

Tract location:

37283 Kings Valley Highway (Hwy. 223), Philomath, OR

Management emphasis:

Meadow habitat restoration, rare and endangered species management, education/demonstration, group and dispersed public recreation (hiking, nature appreciation, facility rental), sustainable silvicultural management.

Acquired: 2000

Total acreage: 607.4 acres²⁵

Forest: 547.6 acres

Meadows, non-forest: 59.8 acres

Tract legal description:

Sections 33 & 34, T10S, R6W., W.M. and Sections 3 & 4, T11S, R6W, W.M.

Latitude and longitude:

Northing: 44.6503789, Easting: -123.416271

Facilities:

Bezell Forest Education Center
Interpretive kiosks, 2 trail shelters
4.0 miles of trails
Day-use restrooms
Historic Plunkett house
Rental home
Barn

Natural Features:

Douglas-fir, conifer/hardwood, mixed hardwood, and oak/conifer forests
Restored meadows; rare and endangered species, Plunkett Creek and tributary streams; riparian forests, Ridge top views

Watershed in which tract is located:

Luckiamute River Watershed within the Upper Willamette River Watershed

Seed zone:

Douglas-fir 252, grand fir 4, western hemlock 3, western red cedar 1, red alder 3, Other 4

Elevation: 600-1,700'

²⁵ Benton County ownership records indicate 586.1 total acres.



Bezell Memorial Forest

Findings

- Most RMUs have been thinned 2x now, growth response to past thinning harvests is positive
- Newly established plantations have achieved “free to grow” status
- Commercial RMUs still in need of younger DF age classes (they currently account for 10% of the total DF veg type by acres)
- Forest structure enhanced with snag/down wood creation, gap creation
- RMUs have stabilized following the 2014 ice storm damage. Impact to remaining untreated stands was light but widespread, especially among legacy oaks and younger conifers.
- Drought induced conifer mortality continues to be problematic at smaller scales, Grand fir showing stress signs property-wide.
- New conifer seedlings beginning to encroach in some meadows
- Oak release and supplemental planting opportunities still exist
- All season light truck access is missing in East Division
- Invasive weeds are pervasive
- New opportunities have appeared for education around sustainable forestry

Trends

- Stands are maturing
- Impacts from climate change are becoming more visible
- Early seral forest habitat is still lacking
- Public use and property interest have increased

Management Recommendations²⁶

1. Expand meadow edges where applicable and in conjunction w/ adjacent harvests; consider habitat quality, possible butterfly connection corridors
2. Establish access adjacent to applicable burn units for fire breaks and equipment access of both meadows and adjacent stands in conjunction w/ #1 above.
3. Rock access road to East Division, upgrading existing road surface (B24, B25, B26).
4. Reduce or eliminate invasive species in all operational areas by instituting pre- and post-weed treatments following Benton County HCP, Prairie Management Plans, and Forest Resource Stewardship plan guidelines.
5. Thin untreated RMUs from last management cycle in East Division (B24/B25). Regenerate <15acre portion of B27 to add to age class diversity.
6. Design and implement trailside demonstration harvests of alternative regeneration methods, including heavy thinning, group selections, patch cuts,

²⁶ More detailed Management Recommendation Notes for Bezell can be found in **Appendix L**.



- and a variable retention harvest (B29/B30). Create snags, release legacy trees, and contribute dwd throughout.
7. Establish forestry interpretation site in South Division (B29/B30) showcasing work in #6 above with associated signage and educational materials, and engage additional interest groups beyond recreational users.
 8. Continue non-commercial habitat enhancements such as oak release, snag creation, dwd contributions, oak seedling plantings, and shade-tolerant conifer riparian plantings.
 9. Viewshed creation for recreational visitors in South Division (B32).
 10. Create future Old Forest Reserve conditions (B6) through suite of silvicultural measures by promoting legacy trees, releasing minor species, creating gaps, and supplemental plantings.
 11. Restore white oak stand (B5) while operating in B6.
 12. Heavily thin and regenerate portions of B14 due to difficult access and residual ice storm damage following the previously outlined silvicultural parameters.



Table 11. *Management Opportunities Matrix, Beazell Memorial Forest 2021-2040*



	Invasive Tx	Variable Density Thinning	Group Selection	Patch Cut	Variable Retention	Drought Mortality Capture	Legacy Tree Creation/Release	Snag Creation	Downed Wood Additions	Oak Restoration/Meadow Expansion	Native Grass Seeding	Add. Plantings	Reserve/Future Reserve	Education Interpret.	Access Improvements	Viewshed Enhancements	Assess at Term End	Grow
B1	X	X						X	X									
B2	X					X	X	X	X						X			
B3	X												X				X	
B4	X	X				X		X	X									
B5	X						X	X	X	X	X	X	X					
B6	X	X	X	X	X		X	X	X	X	X	X	X					
B7	X						X	X	X	X	X	X	X					
B8	X	X					X	X	X	X					X		X	
B9	X						X	X	X	X					X		X	
B10	X				X		X	X	X	X					X		X	
B11	X																	
B12	X																	
B13	X	X	X			X	X	X	X			X					X	
B14	X	X	X	X	X		X	X	X		X	X			X			
B15	X																	X
B16	X																	
B17	X						X	X	X			X	X					
B18	X	X	X				X	X	X		X	X	X		X			
B19	X									X								
B20	X									X					X			X
B21	X	X					X	X	X									
B22	X						X	X	X						X			
B23	X						X	X	X						X			
B24	X	X	X				X	X	X						X			
B25	X	X	X	X			X	X	X						X			X
B26	X																	
B27	X				X		X	X	X		X	X						
B28	X						X	X	X			X	X					
B29	X	X	X	X	X		X	X	X		X	X		X				
B30	X	X	X				X	X	X					X				
B31	X	X	X				X	X	X			X	X				X	
B32	X						X	X	X		X	X				X		
B33	X																	
B34	X									X								X
B35	X																	
B36	X																	X
B37	X						X	X	X			X						X



Table 12. Forest Management Schedule 2021-2030, Beazell Memorial Forest

Year	Stand	Activity	Units	MBF
2021	B24, B25, B27	Complete Design/Build Estimates for upgrading existing road	0.9 miles	
	B5, B6, B14	2022 pre-harvest weed treatments	TBD	
2022	B5	Oak Restoration harvest	±3ac (T)	±30
	B6	Thinning/regeneration combo harvest	±29 ac (T) ±5 ac (R)	±350-400 ±150-175
	B14	Thinning/regeneration combo harvest	±7 ac (T) ±14 ac (R)	±50-100 ±325-375
	B6, B14	Native seeding/tree planting	±19ac	
	B24, B25, B27	2023 pre-harvest weed treatments	TBD	
	B8, B17, B18, B23, B32, B33, B37	Habitat enhancements grant research	TBD	
	B24, B25, B27	Road rocking (upgrading existing road)	0.9 miles	
2023	B24, B25	Thinning harvest	±60ac (T)	±525-575
	B27	Regeneration harvest	<15ac (R)	±275-325
	B27	Native seeding/tree planting	<15ac	
	B5, B6, B14	2027 post-harvest weed treatments	TBD	
	B5, B6, B14	Release spray (if needed)	±58 ac	
	B6, B14	Stocking surveys	TBD	
2024	B29	2025 pre-harvest weed treatments	<10ac	
	B29	Regeneration Trail Planning/Layout	TBD	
	B27	Stocking surveys	<15ac	
	B27	Release spray (if needed)	<15ac	
	B24, B25, B27	2023 post-harvest weed treatments	TBD	
	B5, B6, B14	Release spray (if needed)	±58 ac	
2025	B29	Evaluate Educational (R) harvests and signage	<10ac (R)	±200-250
	B29	Native seeding/tree planting	<10ac	
	B27	Release spray (if needed)	<15ac	
	B8, B18, B23, B32	2025-2026 pre-habitat enhancement weed treatments	TBD	
2026	B29	2025 post-harvest weed treatments	<10ac	
	B29	Stocking surveys	<10ac	
	B29	Regeneration Trail signage installations	TBD	
	B8, B17, B18, B23, B32, B33, B37	Habitat Enhancements (snags, L creation, dwd creation, oak release), plantings, viewshed clearing	TBD	
	B29	Release spray (if needed)	<10ac	
	B8, B18, B23, B32, B37	Native seeding/tree planting	TBD	
	B8, B18, B23, B32	2026 post-habitat enhancement weed treatments	TBD	
	B29	Release spray (if needed)	<10ac	
	B8, B18, B23, B32	Release spray (if needed)	TBD	
	B8, B18, B23, B32	Stocking surveys	TBD	
2030		Update management plan		



FITTON GREEN NATURAL AREA

Tract location: NW Panorama Drive, off Cardwell Hill Rd., approximately 4 miles west of 53rd and Oak Creek Dr., Corvallis, OR

Management emphasis:

Meadow habitat restoration, endangered species management, oak restoration, public recreation (hiking, nature appreciation), sustainable silvicultural management

Acquired: 1988, 1995, 1998

Total acreage: 302.6²⁷ acres

Forest: 257.2 acres

Meadows, non-forest: 45.4 acres

Tract legal description:

Sections 25, 26, 35, 36 T11S, R6W., W.M.

Latitude and longitude:

Northing: 44.5783619189, Easting: -123.374140009

Facilities:

Trailhead kiosk

5.4 miles of trails (including 0.1-mile trail easement on neighboring property)

Natural Features:

Ridge-top meadows with restored prairie vegetation; rare and endangered species

Ridge top views

Oak woodland

Conifer and mixed forests

Intermittent tributary streams of Marys River, riparian forest

Watershed in which tract is located:

Marys River Watershed within the Upper Willamette River Watershed

Seed zone:

Douglas-fir 262, grand fir 6, western hemlock 5, western red cedar 1, red alder 5, Other 6

Elevation: 500-1000'

²⁷ Benton County ownership records indicate 308 total acres



FITTON GREEN NATURAL AREA

Findings

- Meadow encroachment largely reversed; DF seedling control still needed
- Thinning and viewshed enhancement opportunities exist in conifer stands
- Invasive species continue to be challenging, false-brome ubiquitous
- Opportunity to expand oak savanna/potential TCB habitat in the south
- Oak/conifer plantations should be left to grow for eventual restoration work
- Access for fire suppression and forest management generally good
- Recreation use has increased, as well as public interest in management
- Grant funding opportunities potentially higher here

Trends

- Opportunities for reserve creations are greater here
- Plantation stands are growing
- Invasive species remain problematic
- Early seral/prairie remnant habitat has decreased in butterfly fly-ways
- Public use and property interest have increased
- Property continues to be best positioned for landscape-scale partnerships

Management Recommendations²⁸

1. Continue to treat false brome along main roads and trails to limit transport by park visitors, as well as high SC rated RMUs.
2. Continue non-commercial habitat enhancements by releasing legacy oaks advantageously (throughout). Create snags (base girdle, top girdle, green top, full top), release legacy trees, and contribute dwd by felling, plant alternative species where additional cohorts are needed (F3, F6, F7, and F9).
3. Restore oak in F12. Remove competing conifer around oaks and meadow edges.
4. Thin F5 and F8 for forest structure enhancement and wildfire risk reduction.

²⁸ More detailed Management Recommendation Notes for Fitton Green can be found in **Appendix L**.



Table 13. Management Opportunities Matrix, Fitton Green Natural Area 2021-2040

	Invasive Tx	Variable Density Thinning	Group Selection	Patch Cut	Variable Retention	Drought Mortality Capture	Legacy Tree Creation/Release	Snag Creation	Downed Wood Additions
F1	X								
F2	X						X	X	X
F3	X						X	X	X
F4	X						X	X	X
F5	X	X	X				X	X	X
F6	X						X	X	X
F7	X						X	X	X
F8	X	X	X				X	X	X
F9	X						X	X	X
F10	X								
F11	X						X	X	X
F12	X						X	X	X
	Oak Restoration /Meadow Expansion	Native Grass Seeding	Add. Plantings	Reserve/ Future Reserve	Education Interpret.	Access Improve ments	Viewshed Enhancements	Assess at Term End	Grow
F1		X		X					
F2	X	X	X	X		X	X	X	X
F3			X	X					
F4	X	X	X	X		X	X	X	X
F5			X			X			
F6		X	X				X		
F7		X	X	X			X		
F8			X				X		
F9		X	X						
F10	X	X		X		X	X		
F11		X	X	X			X	X	
F12	X	X	X	X		X	X		



Table 14. Forest Management Schedule 2011-2020, Fitton Green Natural Area

Year	Stand	Activity	Units	MBF
2021	F12	Research/pursue grant funding for oak restoration harvest; habitat enhancements. Design project; consider including F11 in oak restoration.	TBD	
2021	F5, F8, F12	2021 pre-harvest weed treatments	TBD	
	F11 ²⁹ , F12	Oak restoration harvest	±29ac	±175
	F5, F8	Thinning harvest, viewshed enhancement	±30ac (T)	±220-300
	F12	Native seeding/tree planting	TBD	
2022	F5, F8, F12	2021 post-harvest weed treatments	TBD	
	F12	Seedling surveys, if needed	TBD	
2023	F5, F8, F12	2 nd 2021 post-harvest weed treatments	TBD	
2027	F3, F6, F7, F9	Habitat Enhancements (snags, L creation, dwd creation, oak release), plantings,	TBD	
2029	F2, F4	Reassess growth and condition for future oak restoration project	±121ac	
2030	All	Update management plan		

²⁹ F11 acreage and volume not included in Units/MBF columns due to variable nature of RMU and previous conifer reduction work in past management cycles



FORT HOSKINS HISTORIC PARK

Tract location:

38150 Hoskins Road, 1.5 miles west of Kings Valley Highway (Hwy. 223), Philomath, OR

Management emphasis:

Group and dispersed public recreation (hiking, nature appreciation, picnic), research, historic education/demonstration, sustainable silvicultural management

Acquired: 1991

Total acreage: 124 acres³⁰

Forest: 95.1 acres

Meadows, non-forest: 28.9 acres

Tract legal description:

Sections 29 & 30, T10S, R6W., W.M.

Latitude and longitude:

Northing: 44.6768543193, Easting: -123.461943669

Facilities:

Day-use restrooms

Covered group picnic shelter

1.8 miles of trails with interpretive panels

Historic Frantz-Dunn house

Caretaker residence

Lean-to/crew camping area

Natural Features:

Oak woodland/savanna; upland prairies; conifer forest; riparian forest and streams; ridgetop views

Watershed in which tract is located:

Luckiamute River Watershed within the Upper Willamette River Watershed

Seed zone:

Douglas-fir 252, grand fir 4, western hemlock 3, western red cedar 1, red alder 3, Other 4

Elevation: 400-800'

³⁰ Benton County ownership records indicate 128 acres



FORT HOSKINS HISTORIC PARK

Findings

- Thinned stands continue to progress well; H6 and H12 remain untreated
- Opportunities for non-commercial oak release and legacy tree promotion in H3, H6, H8, among other RMUs
- Young DF seeding into oak savanna
- Meadow habitats are partially restored, maintenance still needed
- Invasive species pressure lighter than other properties but still existent, making control more critical
- Opportunity to replace failed culvert to promote fish passage
- Access for fire and forest management generally good throughout
- Recreation use has increased, although least pressure of three properties

Trends

- *Stands are maturing*
- *Oak and meadows are moving closer to restoration goals*
- *Scotch broom appears to be more prevalent*
- *Increased public use/interest, though less pressure than others*

Management Recommendations³¹

1. Replace culvert and remove old trash dump in RMA of H3.
2. Treat scotch broom in H1 before seed builds up more in soil.
3. Continue non-commercial habitat enhancements by releasing legacy oaks advantageously (throughout). Create snags (base girdle, top girdle, green top, full top), release legacy trees, and contribute dwd by felling, plant alternative species where additional cohorts are needed (H3, H6, and H8).
4. Thin H4, H6 (where appropriate), and H12 for forest structure enhancement. Expand uneven-aged structure.

³¹ More detailed Management Recommendation Notes for Bezell can be found in **Appendix L**.



Table 15. Management Opportunities Matrix, Fort Hoskins Historic Park 2021-2040

	Invasive Tx	Variable Density Thinning	Group Selection	Patch Cut	Variable Retention	Drought Mortality Capture	Legacy Tree Creation/Release	Snag Creation	Downed Wood Additions	
H1	X	X	X				X	X	X	
H2	X									
H3	X						X	X	X	
H4	X	X	X				X	X	X	
H5	X						X	X	X	
H6	X	X	X	X	X		X	X	X	
H7	X									
H8	X						X	X	X	
H9	X									
H10	X									
H11	X									
H12	X	X	X				X	X	X	
H13	X									
	Oak Restoration /Meadow Expansion	Native Grass Seeding	Add. Plantings	Reserve/ Future Reserve	Education Interpret.	Access Improvements	Viewshed Enhancements	Assess at Term End	Replace Culvert	Grow
H1			X					X		X
H2		X		X						X
H3			X						X	
H4			X					X		X
H5										X
H6		X	X				X	X		
H7	X	X		X						X
H8		X	X							X
H9										
H10	X	X	X	X						
H11	X	X	X	X			X			
H12			X					X		
H13										



Table 16. Forest Management Schedule 2021-2030, Fort Hoskins Historic Park

Year	Stand	Activity	Acres	MBF
2021	H3	Fish-friendly culvert replacement and habitat improvements grant research	N/A	
	H1	Scotch broom treatments	TBD	
2022	H3	Replace culvert	N/A	
2023	H3, H6, H8	Habitat Enhancements (snags, L creation, dwd creation, oak release),	TBD	
	H3, H6, H8	Tree plantings	TBD	
2024	H3, H6, H8	Stocking surveys	TBD	
2026	H1, H4	Assess stands for 3 rd entry thinning	±38ac	
2028	H4, H6, H12	2029 pre-harvest weed treatments	TBD	
2029	H6	Thinning/regeneration harvest combo	±6ac (T) ±4ac (R)	±50-75 ±75- 100
	H4, H12	Thinning harvest	±12ac	±150- 200
	H6	Tree planting	±4ac	
2030		2029 post-harvest weed treatments	TBD	
		Stocking surveys	±4ac	
	All	Update management plan		



Glossary

biodiversity The entire spectrum of plants, animals and other life forms, and their associated environments

clearcut Most or all trees in a harvest area are removed: opening size greater than 2 acres

commercial harvest A timber stand improvement or harvest operation that results in a net landowner income

DBH Tree measurement; diameter at breast height (4.5 feet above ground)

even-aged All trees within a forest stand are of the same age

FSC Forest Stewardship Council; an independent, forest certification body that sets international standards for sustainable forest management

group selection Trees to selected to harvest are in groups; opening size is from several tree crown widths up to 2 acres

individual tree selection Trees to harvest are selected individually; opening size is one tree crown width

Late Successional Reserve Land within US Forest Service ownership designated under the Northwest Forest Plan to be managed for the creation of old growth forest conditions

mature Condition of optimal tree value, after tree vigor and growth have slowed, yet before the onset of decay

MBF Log measurement statistic; one thousand board feet. One board foot equals a board one inch thick by 12 inches square

MMBF Million board feet

merchantable Trees of sufficient size and quality to be commercially marketable.

operability Ease with which logging machinery could work a site; often limited by rockiness, steep slopes, wetness, etc.

patch cut A harvest where small areas (0.5-2 acres) are cut, taking most of the standing trees with the exception of clumps of younger conifers and older residual wildlife trees



pre-commercial Trees of insufficient size and quality to comprise a commercially viable harvest operation.

regenerate To establish a new stand of tree seedlings

regeneration Seedlings of commercial tree species

riparian zone Areas next streams, lakes, estuaries and wetlands consisting of wet soils and the transitional habitat between wetland and upland; practices are typically regulated by law.

savanna A plant community characterized by primarily grasses, with shrubs and widely scattered and open trees.

seedling Tree greater than six inches tall but less than one inch DBH

snag Standing dead and/or dying tree. Important habitat element for numerous wildlife species

understory Trees, shrubs, and herbs growing under a canopy of larger trees.

uneven-aged Trees within a forest stand are of two (or more) distinct age groups

variable density thinning Trees to harvest are selected at varied intensities across small scales to create complex forest structure; wider spacing between residual trees allows recruitment of additional age classes and development of understory plants

variable retention harvest A harvest method that retains significant portions of the original stand, and establish a new age cohort; retained trees may be grouped or dispersed throughout the harvest area

vegetation type A generally homogeneous unit of forest, delineated because it supports trees of common species, age, potential, etc.

woody debris Down woody material on the forest floor, ie. fallen and rotting logs and limbs. An important source of organic matter and soil nutrition



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Appendix A: Management Activities 2010-2020

Bezell Memorial Forest				
Year	Action	Stands	Units	Volume
2011	Tree planting	B26	1100 trees	
2011	Prescribed burn	B7	1.5 ac	
2011	Prescribed burn	B35	5 ac	
2013	Variable retention harvest	B34	14 ac	180 MBF
2014	Road rocking	North Division	7000 ft	
2014	Thinning harvest	B29, B30	40 ac	470 MBF
2014	Tree planting	B30 (part), B36	900 trees	
2014	Snag creation	B29, B30, B32, B34	55 trees	
2014	Invasive removal, tree removal, native seeding (IAE)	B7		
2015	Plantation thinning	B4, B13, B31 (part)	58 ac	495 MBF
2015	Meadow expansion	B3	3 ac	
2015	Ice storm salvage	B10, B14 (part), B20	20 ac	479 MBF
2015	Snag creation	B4, B13, B31	100 snags	
2015	Tree planting	B34	4500 trees	
2015	Tree removal, native grass seeding, photo points (IAE)	B7, B21		
2016	Tree planting	B20, F14 (part)	3000 trees	
2016	Tree removal, weed surveys, site assessments, weed treatments, seed collection, outplantings (IAE/BC)	B7, B21		
2017	Site assessments, weed treatments, seed collection, trail clearing, planting, seeding (IAE)	B7, B21		
2017/18	Fill-in planting	B34	3500 trees	
2018	Weed treatments, site assessments, mowing, planting, seeding (IAE)	B7, B21		
2019	Prescribed burn	B7	12 ac	
2019	Tree removal, mowing, weed treatments, photo points, prescribed burn, planting, seeding (IAE, BC)	B7, B21		



Fitton Green			
Year	Action	Stands	Units
2012-2015	Savanna restoration/butterfly flyways	parts of F2, F4, F6	5 ac
2015	Prescribed burn	F10	20 ac

Fort Hoskins				
Year	Action	Stands	Units	Volume
2010	Prescribed burn	H10, H11	3 ac	
2015	Thinning harvest	H1, H4	58 ac	290 MBF
2015	Savanna restoration	H10 (part)	5 ac	145 MBF
2017	Prescribed burn	H10, H11	3 ac	



Appendix B: Meadow Descriptions

Brief summaries of meadow habitat units at Fitton Green Natural Area, Bezell Memorial Forest, and Fort Hoskins Historical Park.

Prepared by Andy Neill, Restoration Ecologist, Institute for Applied Ecology

Bezell Memorial Forest

B3 –

The County has removed Douglas-fir to expand this meadow at Bezell Memorial Forest (Bezell) and release oaks, and implemented extensive weed control via herbicides and hand pulling of Scotch broom (*Cytisus scoparius*). Other restoration actions have included seeding burn scars with native plant species and mowing of the meadow. Additional weeds present in the meadow include thistles, false brome, and the usual array of other non-native grasses.

B7 – North and Middle Meadows

The North and Middle Meadows at Bezell have the largest population of TCB in Oregon. The population tends to occupy the highest parts of each meadow where food resources are most abundant and the butterflies are more protected from westerly winds. The native plant species diversity, including TCB nectar and host plants, contribute to the high-quality upland prairie habitat found in these units. Native species common in this unit include Roemer's fescue (*Festuca roemerii*), woolly sunflower, Virginia strawberry (*Fragaria virginiana*), western buttercup (*Ranunculus occidentalis*), rosy seablush (*Plectritis congesta*), showy tarweed (*Madia elegans*), spring gold (*Lomatium utriculatum*), Menzies' larkspur (*Delphinium menziesii*) and Hooker's silene (*Silene hookeri*).

Restoration in this unit has targeted improving TCB habitat and connectivity between meadows at Bezell. Restoration actions have included mowing, prescribed burns, herbicide treatments to control non-native forbs, grasses and shrubs, and Douglas-fir removal. Most restoration actions were followed with seeding and planting of native species to increase native plant abundance and diversity. Kincaid's lupine (*Lupinus oreganus*), a federally listed endangered species, was introduced and has become established in this unit. Kincaid's lupine is a host plant for another federally listed and endangered species, the Fender's blue butterfly (*Icaricia icarioides fenderi*). Starting in 2016, twelve TCB habitat patches prepared with herbicide were seeded and planted with a high density of TCB nectar and host species, including golden paintbrush. Scotch broom is an ongoing problem in these meadows due to the longevity of the soil seed bank of this species. Regular management actions are necessary to prevent this species from becoming dominant in the unit.

Other threats to this upland prairie habitat unit include encroachment by Douglas-fir and native shrubs, non-native grasses, such as false brome, tall oatgrass, tall fescue and



velvet grass (*Holcus lanatus*), and thistles. Although knapweed has not been found in this unit yet, it has been observed in the Summit meadow (B21) at Beazell and should be eradicated if it is found in or near these meadows.

B11 –

I don't know anything about this unit.

B12 –

This unit is dominated by non-native grasses and is mowed regularly. TCB were last observed in this meadow in 2005.

B15 –

False brome and Canada thistle (*Cirsium arvense*) invaded the southern, lower elevation portion of this unit after Douglas-fir were removed to release the oaks (*Quercus garryana*) in 2004.

B16 –

This is the historic area and is maintained by mowing. Himalayan blackberry is common along the forest edges and is targeted periodically by the County.

B19 – Steep Meadow

This unit is not currently occupied by TCB but butterflies have been observed moving through this unit from B7 to B21. This unit has received few restoration actions in the last several years. The County periodically targets false brome in the unit with spot spray herbicide applications. (I seem to recall a small rock outcrop there, but I have not been in the unit for a few years and can't recall confidently).

B21 – Summit Meadow

This is a large meadow that is occupied by TCB. The population is located near the top of the meadow and along the ridge heading downslope to the west. The County removed many large Douglas-fir to expand the meadow in 2004. Other trees in the eastern end of the unit have been removed by IAE in 2015 and 2016 to expand the meadow even further. In 2019, many Douglas-fir saplings were removed from the meadow to prevent encroachment which will be an ongoing problem. Non-native grasses dominate the meadow with false brome encroaching from the forest edges. Scotch broom is not a problem in this meadow unit.

Three small habitat patches were created in 2016 and 2017 by first treating a small area with herbicide then planting and seeding with a high density of TCB nectar and host. Other areas in this unit have been planted with upland prairie species in 2016, 2017 and 2018. Dwarf checkermallow (*Sidalcea malviflora* ssp. *virgata*) is abundant in this unit but is browsed heavily by ungulates and rarely flowers. Other native plant species that are common in this meadow include western buttercup, Tolmie's star-tulip, and Virginia



strawberry, which are all important TCB nectar species. Golden paintbrush was included in seed mixes broadcast to prepared areas in 2017.

Threats to this meadow include encroachment of snowberry (*Symphoricarpos albus*) through the meadow and natural regeneration of Douglas-fir. As with all upland prairie habitats, non-native grasses are a problem in this unit. False brome is present in the unit but is not yet wide spread. Knapweed was likely brought in by logging equipment and should be targeted with herbicide spot applications annually to prevent its spread in the meadow and throughout Beazell.

B35 – South Meadow

There have been no TCB seen in this meadow unit since 2013. The meadow is dominated by non-native grasses and false brome can be found as isolated plants throughout the unit. The County removed mature Douglas-fir in two parts of the meadow in 2015 that effectively expanded the meadow.

The County has funded restoration of this meadow unit in 2020. Additional trees have been removed and stumps left from the 2015 tree removal were ground to below the soil surface. Lower limbs of Douglas-fir surrounding the meadow were removed and piled. Multiple herbicide treatments were followed with planting and seeding of native species with the goal of attracting or reintroducing TCB to the meadow unit in the future.

Non-native grasses dominate the meadow. Thistles are common but do not form large patches. Native shrubs, including snowberry and trailing blackberry are encroaching into the meadow and reducing the quality of potential TCB habitat.

Fitton Green Natural Area

F1 – Powerline

This upland prairie habitat at Fitton Green is maintained open of trees and shrubs through regular maintenance to the power line right-of-way that crosses from east to west. Although this unit is dominated by non-native forbs and grasses, including false brome (*Brachypodium sylvaticum*), tall fescue (*Schedonorus arundinaceus*), tall oatgrass (*Arrhenatherum elatius*), knapweed (*Centaurea* sp.) and thistles (*Cirsium* sp.), the powerline corridor has the potential to be habitat for Taylor's checkerspot butterfly (TCB, *Euphydryas editha taylori*). This unit is centrally located between the existing TCB population less than a mile away to the east at Cardwell Hill and the large meadow at Fitton Green where TCB have been reintroduced starting in 2017. These factors make the upland prairie habitat in this unit an important locality for TCB colonization and migration if butterfly resources are enhanced.



F10 – Fitton Meadow

The large meadow at Fitton Green a has been managed by the County as high-quality upland prairie habitat. Past restoration efforts include Douglas-fir (*Pseudotsuga menziesii*) removal, prescribed burns, mowing, herbicide treatments, and seeding and planting of native upland prairie species to enhance the diversity of the prairie unit. There are many native plant species present in the prairie including woolly sunflower (*Eriophyllum lanatum*), spring gold (*Lomatium utriculatum*), slender cinquefoil (*Potentilla gracilis*), ookow (*Dichelostemma congesta*), Tolmie’s star-tulip (*Calochortus tolmiei*), and California oatgrass (*Danthonia californica*). Many species that are considered food resources to TCB are present in the meadow. Golden paintbrush (*Castilleja levisecta*) was extirpated from Oregon but has been introduced to prairie habitats in Oregon including this unit at Fitton Green. This species, listed as endangered by the state of Oregon and federally listed as threatened, is a host plant for TCB. Starting in 2017 the United States Fish and Wildlife Service (USFWS) has released TCB larvae and butterflies to parts of the unit, but it is still unknown whether a population of TCB has established in the unit. Risks to this unit include increased abundance of non-native forbs and grasses and encroachment of native and non-native shrubs and trees.

Fort Hoskins Historical Park

H2

Although this is a small meadow it does have remnant prairie that should be conserved. Major threats to the quality of the meadow include non-native grasses that dominate the meadow and woody encroachment by trees and shrubs. (I have not visited the meadow since ~2004)

H7 – North Meadow

This meadow has the highest quality of prairie habitat and is considered a possible location for TCB reintroduction. TCB have not been observed here since 2005. The abundance of TCB nectar and host species including strawberry and English plantain have made this meadow a target for restoration. In 2017, the County funded restoration efforts of the meadow unit that included a prescribed burn, herbicide applications to control non-native grasses, and planting and seeding of native prairie species. The meadow unit is periodically mowed to reduce thatch and encroachment of woody plants.

H9 – Historic Area

This unit has heirloom fruit trees and is mowed to maintain a park-like setting.

H10 – Lower meadow

This unit is being maintained as upland prairie/oak savanna. There is a high diversity of native shrubs and several large oak trees. The County has removed a number of mature Douglas-fir on the north and south sides of the unit in 2015 that significantly increased



the size of the meadow unit. The areas where the trees were removed have been invaded by velvet grass and mullein (*Verbascum thapsus*). However, Roemer's fescue that was seeded into the burn scars has become established.

H11 – Hoskins Upland

This meadow unit has many native forbs, grasses and shrubs. The County has implemented several herbicide spot spray applications and completed a prescribed burn of the unit in the early 2000's. The County removed Douglas-fir from the north and south sides of the unit in 2015. The County had planned to burn the unit in 2019. To prepare for the fire small Douglas-fir and native shrubs were cut, piled and burned. The planned burn was canceled and native seed was broadcast to the burn scars.

Non-native grasses, including velvet grass and tall oatgrass dominate the open areas. Trees and shrubs, including Himalayan blackberry (*Rubus bifrons*) are encroaching into the meadow.



Appendix C: Conservation Opportunity Area Indicator Species

The following species were identified through Oregon Fish and Wildlife's Conservation Opportunity Areas within the Oregon Conservation Strategy. They will serve as an additional benchmark for management and restoration activities that will benefit wildlife.

Bezell: Kings Valley-Woods Creek Oak Woodlands COA (#080)

Common Name	Scientific Name	Federal Status	State Status	Presence
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	Species of Concern	Sensitive	Observed
California Myotis	<i>Myotis californicus</i>		Sensitive	Modeled
Chipping Sparrow	<i>Spizella passerina</i>		Sensitive	Observed
Clouded Salamander	<i>Aneides ferreus</i>		Sensitive	Modeled
Coastal Cutthroat Trout	<i>Oncorhynchus clarki clarki</i>	Species of Concern	Sensitive	Documented
Common Nighthawk	<i>Chordeiles minor</i>		Sensitive	Observed
Fringed Myotis	<i>Myotis thysanodes</i>	Species of Concern	Sensitive	Modeled
Grasshopper Sparrow	<i>Ammodramus savannarum perpallidus</i>		Sensitive	Modeled
Hoary Bat	<i>Lasiurus cinereus</i>	Species of Concern	Threatened	Modeled
Northern Spotted Owl	<i>Strix occidentalis caurina</i>	Threatened	Threatened	Modeled
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Species of Concern	Sensitive	Observed
Oregon Vesper Sparrow	<i>Poocetes gramineus affinis</i>	Species of Concern	Sensitive	Observed
Short-eared Owl	<i>Asio flammeus flammeus</i>		Sensitive	Modeled
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	Species of Concern	Sensitive	Modeled
Southern Torrent Salamander	<i>Rhyacotriton variegatus</i>	Species of Concern	Sensitive	Modeled
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Species of Concern	Sensitive	Modeled
Western Bluebird	<i>Sialia mexicana</i>		Sensitive	Observed
Western Gray Squirrel	<i>Sciurus griseus</i>		Sensitive	Modeled
Western Meadowlark	<i>Sturnella neglecta</i>		Sensitive	Observed
Western Painted Turtle	<i>Chrysemys picta bellii</i>		Sensitive	Modeled
Western Pond Turtle	<i>Actinemys marmorata</i>	Species of Concern	Sensitive	Modeled
Purple Martin (Western)	<i>Progne subis arboricola</i>	Species of Concern	Sensitive	Observed
Willow Flycatcher	<i>Empidonax traillii</i>	Species of Concern	Sensitive	Observed
Yellow-breasted Chat	<i>Icteria virens auricollis</i>	Species of Concern	Sensitive	Observed



Fort Hoskins: Luckiamute River and Tributaries COA (#075)

Common Name	Scientific Name	Federal Status	State Status	Presence
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	Species of Concern	Sensitive	Observed
California Myotis	<i>Myotis californicus</i>		Sensitive	Modeled
Chipping Sparrow	<i>Spizella passerina</i>		Sensitive	Observed
Clouded Salamander	<i>Aneides ferreus</i>		Sensitive	Modeled
Coastal Cutthroat Trout	<i>Oncorhynchus clarki clarki</i>	Species of Concern	Sensitive	Documented
Coastal Tailed Frog	<i>Ascaphus truei</i>	Species of Concern	Sensitive	Modeled
Common Nighthawk	<i>Chordeiles minor</i>		Sensitive	Observed
Fringed Myotis	<i>Myotis thysanodes</i>	Species of Concern	Sensitive	Modeled
Grasshopper Sparrow	<i>Ammodramus savannarum perpallidus</i>		Sensitive	Modeled
Hoary Bat	<i>Lasiurus cinereus</i>	Species of Concern	Threatened	Modeled
Long-Legged Myotis	<i>Myotis volans</i>	Species of Concern	Sensitive	Modeled
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	Threatened	Threatened	Modeled
Northern Spotted Owl	<i>Strix occidentalis caurina</i>	Threatened	Threatened	Modeled
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Species of Concern	Sensitive	Observed
Oregon Chub	<i>Oregonichthys crameri</i>		Sensitive	Documented
Oregon Vesper Sparrow	<i>Poocetes gramineus affinis</i>	Species of Concern	Sensitive	Observed
Red Tree Vole	<i>Arborimus longicaudus</i>	Candidate for Listing (N. OR Coast)	Sensitive	Observed
Short-eared Owl	<i>Asio flammeus flammeus</i>		Sensitive	Modeled
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	Species of Concern	Sensitive	Modeled
Southern Torrent Salamander	<i>Rhyacotriton variegatus</i>	Species of Concern	Sensitive	Modeled
Steelhead/Rainbow/Redband Trout	<i>Oncorhynchus mykiss ssp</i>			Documented
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Species of Concern	Sensitive	Modeled
Western Bluebird	<i>Sialia mexicana</i>		Sensitive	Observed
Western Gray Squirrel	<i>Sciurus griseus</i>		Sensitive	Modeled
Western Meadowlark	<i>Sturnella neglecta</i>		Sensitive	Observed
Western Painted Turtle	<i>Chrysemys picta bellii</i>		Sensitive	Modeled
Western Pond Turtle	<i>Actinemys marmorata</i>	Species of Concern	Sensitive	Modeled
Purple Martin (Western)	<i>Progne subis arboricola</i>	Species of Concern	Sensitive	Observed
Western Toad	<i>Anaxyrus boreas</i>		Sensitive	Modeled
Willow Flycatcher	<i>Empidonax traillii</i>	Species of Concern	Sensitive	Observed
Yellow-breasted Chat	<i>Icteria virens auricollis</i>	Species of Concern	Sensitive	Observed

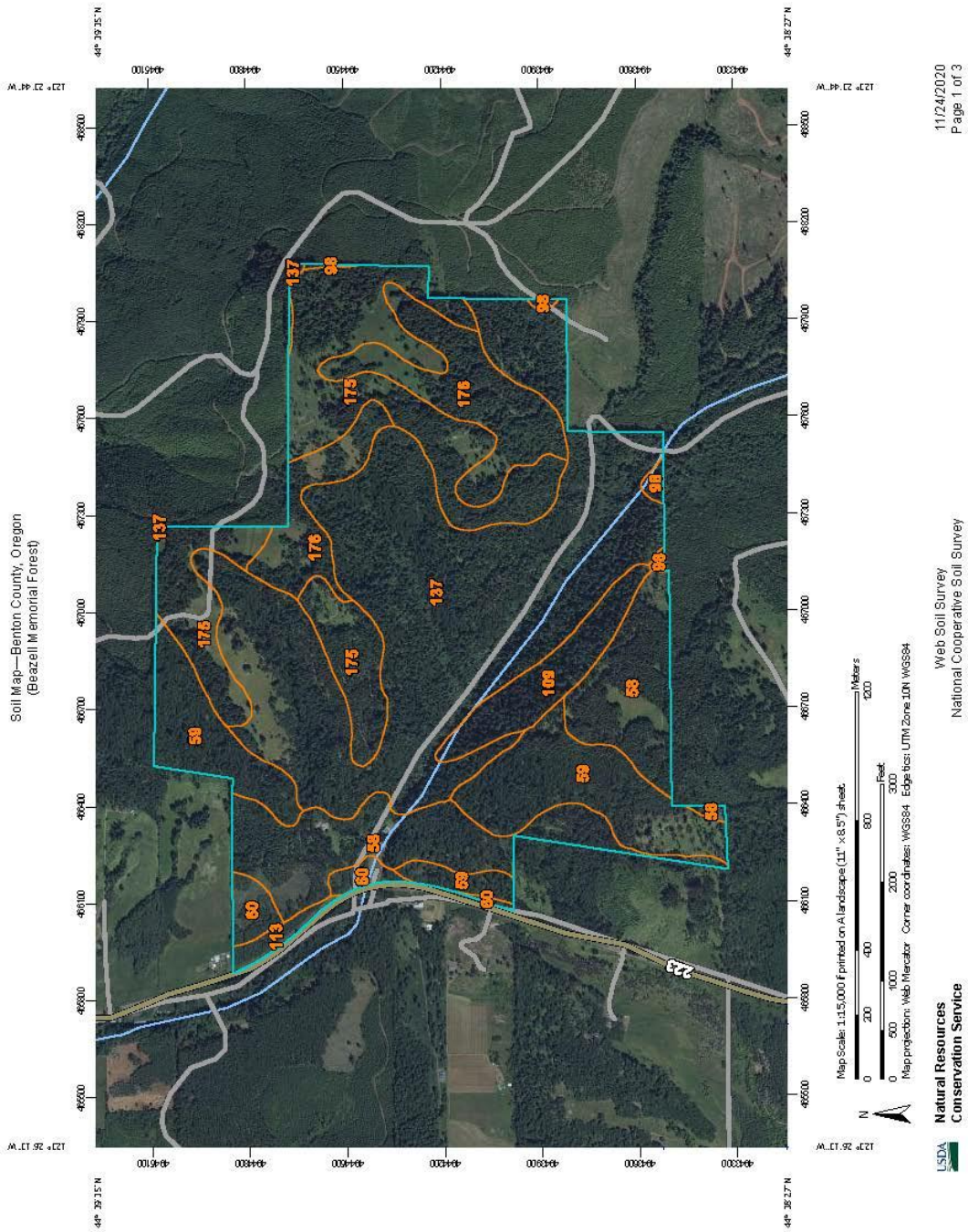


Fitton Green: Corvallis Area Forests and Balds COA (#081)

Common Name	Scientific Name	Federal Status	State Status	Presence
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	Species of Concern	Sensitive	Observed
California Myotis	<i>Myotis californicus</i>		Sensitive	Modeled
Chipping Sparrow	<i>Spizella passerina</i>		Sensitive	Observed
Clouded Salamander	<i>Aneides ferreus</i>		Sensitive	Modeled
Coastal Cutthroat Trout	<i>Oncorhynchus clarki clarki</i>	Species of Concern	Sensitive	Documented
Common Nighthawk	<i>Chordeiles minor</i>		Sensitive	Observed
Fringed Myotis	<i>Myotis thysanodes</i>	Species of Concern	Sensitive	Modeled
Grasshopper Sparrow	<i>Ammodramus savannarum perpallidus</i>		Sensitive	Modeled
Hoary Bat	<i>Lasiurus cinereus</i>	Species of Concern	Threatened	Modeled
Northern Spotted Owl	<i>Strix occidentalis caurina</i>	Threatened	Threatened	Modeled
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Species of Concern	Sensitive	Observed
Oregon Vesper Sparrow	<i>Poocetes gramineus affinis</i>	Species of Concern	Sensitive	Observed
Short-eared Owl	<i>Asio flammeus flammeus</i>		Sensitive	Modeled
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	Species of Concern	Sensitive	Modeled
Southern Torrent Salamander	<i>Rhyacotriton variegatus</i>	Species of Concern	Sensitive	Modeled
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Species of Concern	Sensitive	Modeled
Western Bluebird	<i>Sialia mexicana</i>		Sensitive	Observed
Western Gray Squirrel	<i>Sciurus griseus</i>		Sensitive	Modeled
Western Meadowlark	<i>Sturnella neglecta</i>		Sensitive	Observed
Western Painted Turtle	<i>Chrysemys picta bellii</i>		Sensitive	Modeled
Western Pond Turtle	<i>Actinemys marmorata</i>	Species of Concern	Sensitive	Modeled
Purple Martin (Western)	<i>Progne subis arboricola</i>	Species of Concern	Sensitive	Observed
Willow Flycatcher	<i>Empidonax traillii</i>	Species of Concern	Sensitive	Observed
Yellow-breasted Chat	<i>Icteria virens auricollis</i>	Species of Concern	Sensitive	Observed
Kincaid's Lupine	<i>Lupinus oregonus</i>	Threatened	Threatened	Observed
Nelson's checkermallow	<i>Sidalcea nelsoniana</i>	Threatened	Threatened	Observed
Willamette Daisy	<i>Erigeron decumbens</i>	Endangered	Endangered	Observed



Appendix D: Soils Maps

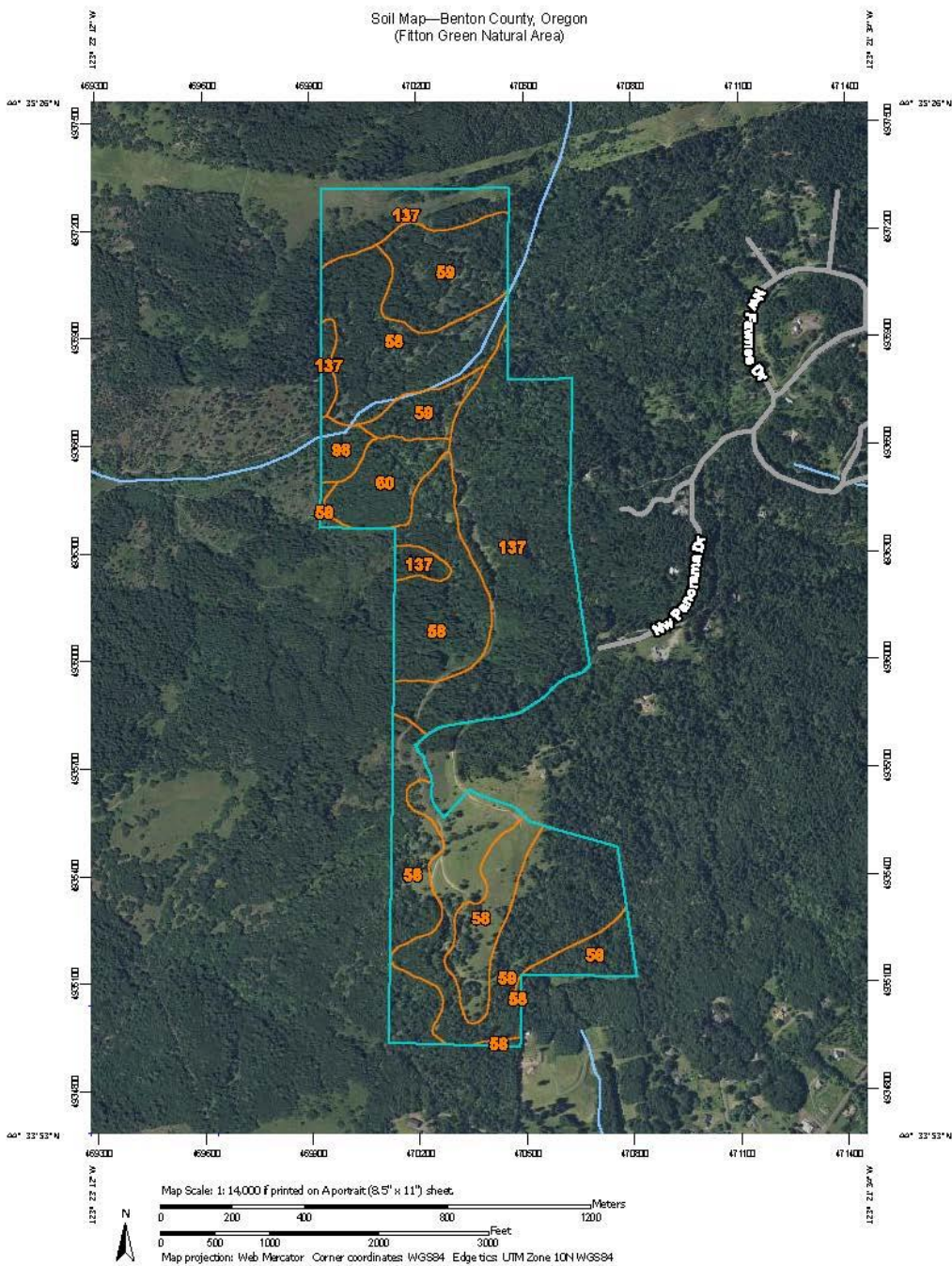


Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
58	Dixonville-Gellatly complex, 12 to 30 percent slopes	86.2	14.2%
59	Dixonville-Gellatly complex, 30 to 60 percent slopes	76.3	12.6%
60	Dixonville-Gellatly-Witham complex, 2 to 12 percent slopes	10.3	1.7%
98	Jory-Gelderman complex, 12 to 30 percent slopes	3.0	0.5%
109	MacDunn-Price-Ritner complex, 60 to 90 percent slopes	23.1	3.8%
113	McAlpin silty clay loam, 0 to 3 percent slopes	4.6	0.8%
137	Price-MacDunn-Ritner complex, 30 to 60 percent slopes	231.7	38.1%
175	Witzel-Ritner complex, 12 to 30 percent slopes	111.6	18.4%
176	Witzel-Ritner complex, 30 to 60 percent slopes	61.4	10.1%
Totals for Area of Interest		608.1	100.0%



Soil Map—Benton County, Oregon
(Fitton Green Natural Area)



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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
58	Dixonville-Gellatly complex, 12 to 30 percent slopes	105.8	34.9%
59	Dixonville-Gellatly complex, 30 to 60 percent slopes	80.9	26.7%
60	Dixonville-Gellatly-Witham complex, 2 to 12 percent slopes	13.7	4.5%
98	Jory-Gelderman complex, 12 to 30 percent slopes	4.8	1.6%
137	Price-MacDunn-Ritner complex, 30 to 60 percent slopes	97.7	32.2%
Totals for Area of Interest		302.8	100.0%



Soil Map—Benton County, Oregon
(Fort Hoskins Historic Park)



USDA Natural Resources Conservation Service

Web Soil Survey National Cooperative Soil Survey

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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
18	Bellpine-Jory complex, 12 to 20 percent slopes	11.8	9.5%
19	Bellpine-Jory complex, 20 to 30 percent slopes	54.8	44.1%
20	Bellpine-Jory complex, 30 to 60 percent slopes	33.8	27.2%
94	Jory silty clay loam, sedimentary bedrock, 2 to 12 percent slopes	23.7	19.1%
Totals for Area of Interest		124.2	100.0%





Soil Map—Benton County, Oregon
(Bezell Memorial Forest)

MAP LEGEND

	Area of Interest (AOI)
	Soils
	Soil Map Unit Polygons
	Soil Map Unit Lines
	Soil Map Unit Points
	Blowout
	Borrow Pit
	Clay Spot
	Closed Depression
	Gravel Pit
	Gravelly Spot
	Landfill
	Lava Flow
	Marsh or swamp
	Mine or Quarry
	Miscellaneous Water
	Perennial Water
	Rock Outcrop
	Saline Spot
	Sandy Spot
	Severely Eroded Spot
	Sinkhole
	Slide or Slip
	Sodic Spot

MAP LEGEND

	Spoil Area
	Stony Spot
	Very Stony Spot
	Wet Spot
	Other
	Special Line Features
	Streams and Canals
	Transportation
	Rails
	Interstate Highways
	US Routes
	Major Roads
	Local Roads
	Background
	Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: www.nrcs.usda.gov/wss
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

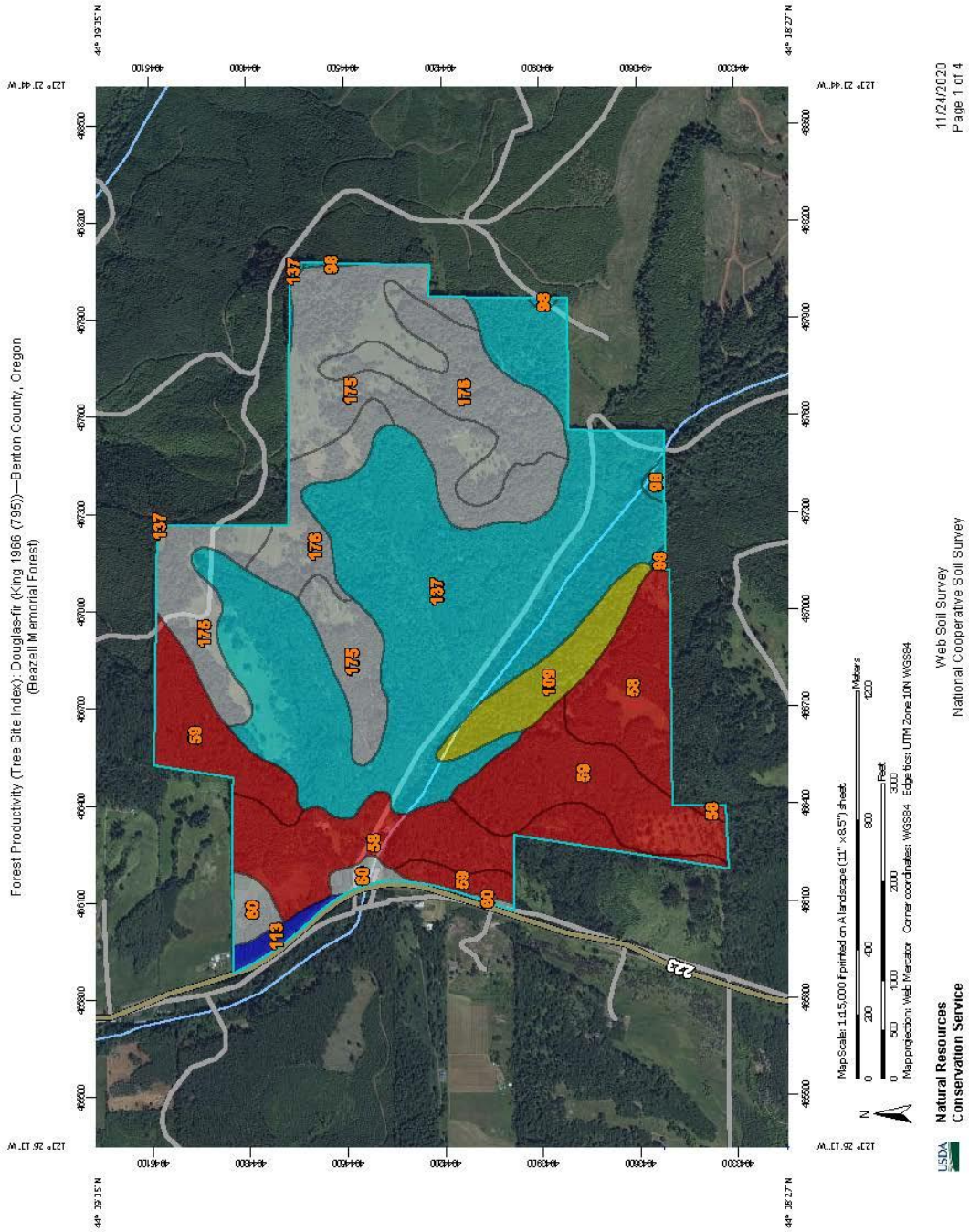
Soil Survey Area: Benton County, Oregon
Survey Area Data: Version 18, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 23, 2020—May 28, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Appendix E: Tree Site Index Maps





MAP LEGEND

Area of Interest (AOI)
Area of Interest (AOI)

Soils
Soil Rating Polygons

- <= 99
- > 99 and <= 105
- > 105 and <= 122
- > 122 and <= 144
- Not rated or not available

Soil Rating Lines

- <= 99
- > 99 and <= 105
- > 105 and <= 122
- > 122 and <= 144
- Not rated or not available

Soil Rating Points

- <= 99
- > 99 and <= 105
- > 105 and <= 122
- > 122 and <= 144
- Not rated or not available

Water Features
Streams and Canals

Transportation
Rails
Interstate Highways

Background
Aerial Photography

US Routes
Major Roads
Local Roads

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: Web Mercator (EPSG:3857)
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Benton County, Oregon
Survey Area Data: Version 18, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 23, 2020—May 28, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Forest Productivity (Tree Site Index): Douglas-fir (King 1966 (795))

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
58	Dixonville-Gellatly complex, 12 to 30 percent slopes	99	86.2	14.2%
59	Dixonville-Gellatly complex, 30 to 60 percent slopes	99	76.3	12.6%
60	Dixonville-Gellatly-Witham complex, 2 to 12 percent slopes		10.3	1.7%
98	Jory-Gelderman complex, 12 to 30 percent slopes	122	3.0	0.5%
109	MacDunn-Price-Ritner complex, 60 to 90 percent slopes	105	23.1	3.8%
113	McAlpin silty clay loam, 0 to 3 percent slopes	144	4.6	0.8%
137	Price-MacDunn-Ritner complex, 30 to 60 percent slopes	122	231.7	38.1%
175	Witzel-Ritner complex, 12 to 30 percent slopes		111.6	18.4%
176	Witzel-Ritner complex, 30 to 60 percent slopes		61.4	10.1%
Totals for Area of Interest			608.1	100.0%

Description

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

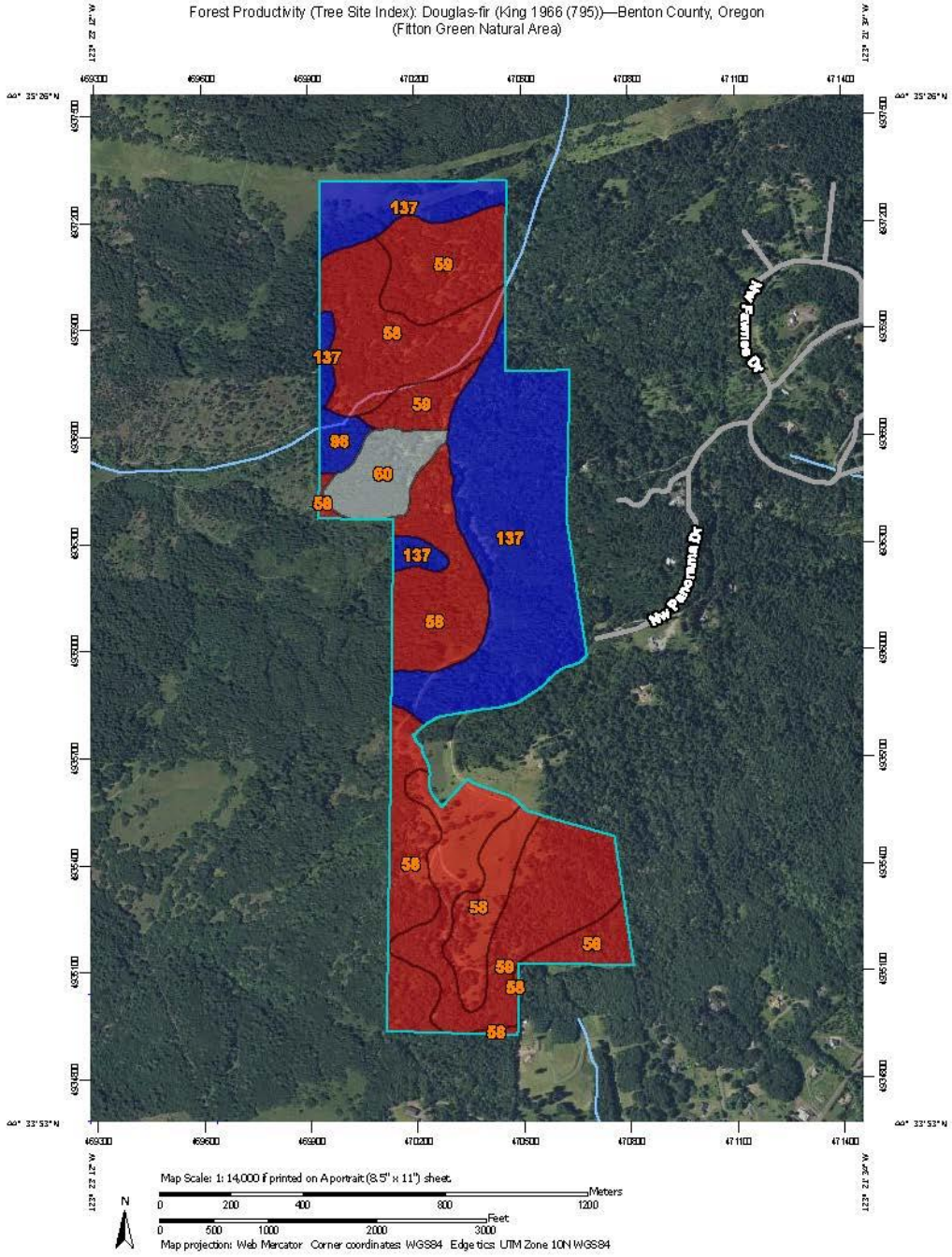
This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Rating Options

Units of Measure: feet



Forest Productivity (Tree Site Index): Douglas-fir (King 1966 (795))—Benton County, Oregon
(Fitton Green Natural Area)



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MAP LEGEND

Area of Interest (AOI)
 Area of Interest (AOI)

Soils
 <= 99
 > 99 and <= 122
 Not rated or not available

Soil Rating Lines
 <= 99
 > 99 and <= 122
 Not rated or not available

Soil Rating Points
 <= 99
 > 99 and <= 122
 Not rated or not available

Water Features
 Streams and Canals

Transportation
 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background
 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.sc.egov.usda.gov>
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Benton County, Oregon
 Survey Area Data: Version 18, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 23, 2020—May 28, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Forest Productivity (Tree Site Index): Douglas-fir (King 1966 (795))

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
58	Dixonville-Gellatly complex, 12 to 30 percent slopes	99	105.8	34.9%
59	Dixonville-Gellatly complex, 30 to 60 percent slopes	99	80.9	26.7%
60	Dixonville-Gellatly-Witham complex, 2 to 12 percent slopes		13.7	4.5%
98	Jory-Gelderman complex, 12 to 30 percent slopes	122	4.8	1.6%
137	Price-MacDunn-Ritner complex, 30 to 60 percent slopes	122	97.7	32.2%
Totals for Area of Interest			302.8	100.0%

Description

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Rating Options

Units of Measure: feet

Tree: Douglas-fir

Site Index Base: King 1966 (795)

Aggregation Method: Dominant Component

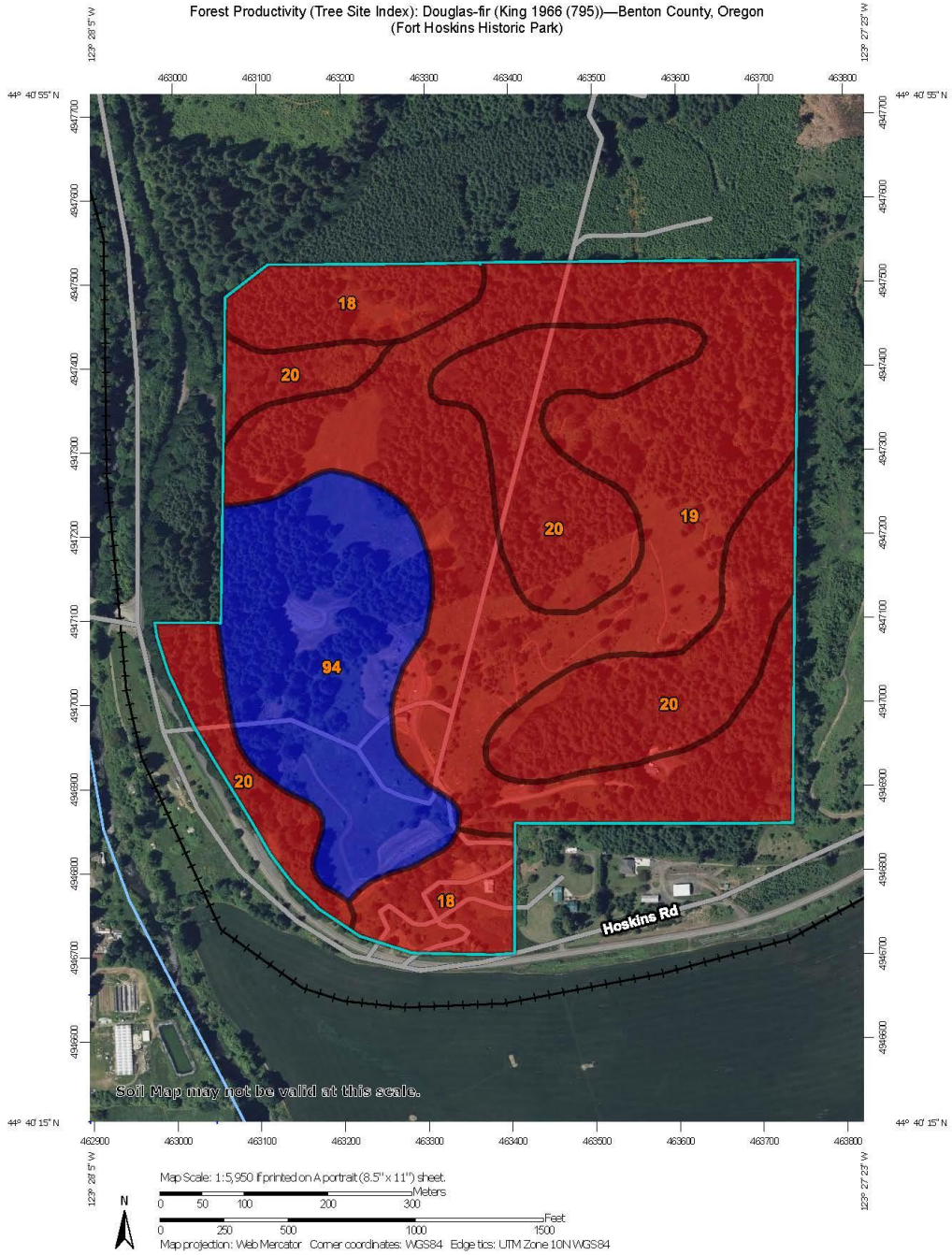
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No



Forest Productivity (Tree Site Index): Douglas-fir (King 1966 (795))—Benton County, Oregon
(Fort Hoskins Historic Park)



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Web Soil Survey National Cooperative Soil Survey

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MAP LEGEND

Area of Interest (AOI)
Area of Interest (AOI)

Soils

Soil Rating Polygons

- <= 115
- > 115 and <= 122
- Not rated or not available

Soil Rating Lines

- <= 115
- > 115 and <= 122
- Not rated or not available

Soil Rating Points

- <= 115
- > 115 and <= 122
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.
Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Benton County, Oregon
Survey Area Data: Version 18, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 23, 2020—May 28, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Forest Productivity (Tree Site Index): Douglas-fir (King 1966 (795))

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
18	Bellpine-Jory complex, 12 to 20 percent slopes	115	11.8	9.5%
19	Bellpine-Jory complex, 20 to 30 percent slopes	115	54.8	44.1%
20	Bellpine-Jory complex, 30 to 60 percent slopes	115	33.8	27.2%
94	Jory silty clay loam, sedimentary bedrock, 2 to 12 percent slopes	122	23.7	19.1%
Totals for Area of Interest			124.2	100.0%

Description

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Rating Options

Units of Measure: feet

Tree: Douglas-fir

Site Index Base: King 1966 (795)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No



Appendix F: Oregon Forest Practice Rules

This plan and all management recommendations must comply with the Oregon Forest Practices Act as administered by the Oregon Department of Forestry. Most forest operations require filing of Notifications of Operations and a 15-day waiting period. The regulations primarily address reforestation requirements after clearcutting and restrictions on harvesting near fish-bearing streams. Oregon's forest protection laws are summarized in Logan (2002). Laws are found in the Oregon Revised Statutes (ORS) Chapter 527. The Oregon Administrative Rules (OAR) contain rules for implementing the laws, found mainly in Chapter 29, Division 600 series.

Highlights:

- Notification is required for road construction, pre-commercial thinning, harvesting, chemical application, site preparation, and slash disposal. Notification is not required for tree planting, road maintenance, and most wildlife habitat enhancements.
- A Written Plan is required for operations within 100' of a Type F or Type D stream, certain harvesting in riparian management areas (RMAs), operations in critical wildlife habitat, and "alternate practices" that deviate from ODF rules.
- RMAs of various widths are prescribed for various streams. Rules require retention of trees and/or shrubs based on stream size, fish presence, and location.
- Clearcuts greater than 25 acres require retention of at least two green trees per acre ($\geq 30'$ tall or $> 11"$ dbh, $> 50\%$ conifer) and two down logs per acre ($\geq 6'$ long and ≥ 10 cu.ft., $> 50\%$ conifer). Clearcuts less than 25 acres have no retention requirement.
- Reforestation is required whenever harvesting reduces stocking below 80 sq.ft. of basal area, or when less than 200 seedlings per acre are present. Reforestation must begin within 12 months of harvest. Trees must be free to grow in 6 years.
- Erosion prevention measures must be taken to assure that road use or harvest operations do not impact "waters of the state".
- Special rules govern road building across or operations in or adjacent to fish-bearing streams.



Appendix G: Carbon Calculations Methodology

Forest carbon generally refers to the total carbon stored in both living and dead components of standing and down trees, including bark, branches, roots, and forest floor detritus. Carbon stocks associated with tree biomass were calculated for the Benton County properties based on inventory data collected in 2020. Species, diameter, height and tree frequency are the primary values used in establishing biomass and carbon values for the inventory year. Total above-ground live and below-ground live stocks were calculated using the methods outlined in the California Air Resources Board (ARB) Compliance Offset Protocol, an agreed-upon standard for compliance-grade carbon quantification.

The process involves calculating cubic foot volumes of the bole of the tree then applying published wood density factors to establish bole biomass. Bark and live branch biomass are then calculated using established equations for total above-ground live biomass. Above-ground live biomass in metric tons per hectare is then applied to the below ground live biomass equation prescribed by ARB (Cairns et al 1997) to estimate below-ground biomass density. Total live biomass (mT/ha) is established by summing above- and below-ground biomass. Total biomass is then multiplied by 0.5 to get carbon and then by 3.664 to convert carbon to CO₂ equivalent for each cruised stand.

Estimates of future carbon stocks can be derived by applying the same method for calculating carbon to inventory data grown to a future date using growth model projections.

ARB's biomass equations and methodology are located at:

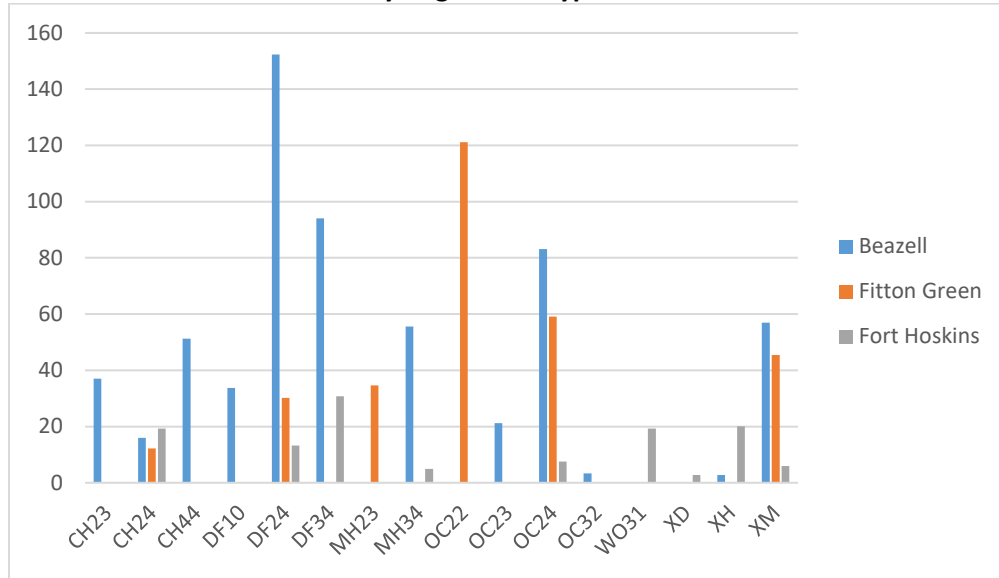
<https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/compliance-offset-protocols/us-forest-projects/2015/instr-ak-ca-or-wa>

Snags and lying dead wood are highly variable and generally do not contribute significantly to forest carbon stocks in managed forests. The process for quantifying carbon stocks in dead pools generally involves calculating cubic volume of snags and lying dead wood and then converting that volume to metric tons of biomass by applying a density factor by species and decay class as shown in Harmon et al 2008. Biomass is then converted to carbon and CO₂e using the same factors described above. If there is interest or need for understanding carbon stocks in snags and lying dead wood, a more intensive, focused sampling protocol could be designed to allow quantification of carbon in these components of the forest.



Appendix H: Forest Inventory Reports

Acres by Vegetation Type and Tract



Acres by Vegetative Type and Tract			Gross Acres
Tract	VEG Type	Net Acres	
Beazell	CH23	36.3	37.0
Beazell	CH24	15.7	16.0
Beazell	CH44	50.3	51.3
Beazell	DF10	33	33.7
Beazell	DF24	149.3	152.3
Beazell	DF34	92.2	94.1
Beazell	MH34	54.5	55.6
Beazell	OC23	20.8	21.2
Beazell	OC24	81.4	83.1
Beazell	OC32	3.2	3.3
Beazell	XH	2.7	2.8
Beazell	XM	54.8	57.0
Fitton Green	CH24	12	12.2
Fitton Green	DF24	29.5	30.2
Fitton Green	MH23	33.9	34.6
Fitton Green	OC22	118.6	121.1
Fitton Green	OC24	57.9	59.1
Fitton Green	XM	44.5	45.4
Fort Hoskins	CH24	18.9	19.3
Fort Hoskins	DF24	12.9	13.2
Fort Hoskins	DF34	30.2	30.8
Fort Hoskins	MH34	4.8	4.9
Fort Hoskins	OC24	7.4	7.6
Fort Hoskins	WO31	18.9	19.3
Fort Hoskins	XD	2.8	2.8
Fort Hoskins	XH	20.1	20.1
Fort Hoskins	XM	5.9	6.0



Total Ownership Volume by Species		
SPECIES	Total Net BF	Total Gross BF
BM	515,283	1,223,911
CA	2,095	2,793
CH	-	-
DF	13,234,598	14,842,728
GF	806,271	889,331
IC	4,219	5,444
OA	-	-
RA	-	2,909
RC	7,905	8,321
WO	399,147	1,030,258
	14,969,516	18,005,693

Total Volume by Species and Tract					
SPECIES	Beazell	Fitton Green	Fort Hoskins	Total Net BF	Total Gross BF
BM	399,760	89,912	25,611	515,283	1,223,911
CA	-	2,095	-	2,095	2,793
CH			-	-	-
DF	10,289,502	1,006,851	1,938,244	13,234,598	14,842,728
GF	622,667	162,073	21,531	806,271	889,331
IC	4,219			4,219	5,444
OA	-		-	-	-
RA		-		-	2,909
RC	7,905			7,905	8,321
WO	158,174	234,649	6,324	399,147	1,030,258
	11,482,227	1,495,579	1,991,710	14,969,516	18,005,693

Net BF/Ac by Species and RMU													
STAND	STD ID	VEG TYPE	BM	CA	CH	DF	GF	IC	OA	RA	RC	WO	Total net bf/ac
B1/B4	101	DF24				10,694		247					10,941
B2/B5/B8	102	OC24	899			14,290	-					1,539	16,728
B6	103	DF34	664			41,394	-					372	42,430
B9/B10	104	DF34	-			34,574	-					275	34,848
B13	106	DF34	-			15,129	-					653	15,782
B14	105	DF24	626			32,623	-					1,161	34,410
B18	107	OC24	767			28,479	3,186					569	33,001
B23	110	CH24	731			16,507	4,752						21,990
B24	111	DF24	668			37,680	2,157					104	40,609
B25	108	DF24	2,072			25,801	3,357					-	31,230
B27	112	CH23	2,827			28,087	-						30,914
B29	199	DF24	-	-		28,920	-		-			199	29,120
B30	113	OC23	460	-		20,423	-				380	1,631	22,894
B31	133	DF34	-			23,452	-						23,452
B37	166	CH23	4,847	-		16,608	5,507						26,962
F5/F8	201	DF24	1,636			18,561	4,237			-		352	24,787
F9	202	CH24	1,878			7,262	3,089					3,316	15,544
F11/F12	203	OC24	330	36		6,427	-			-		3,186	9,980
H1	301	DF34	-	-		24,667	-					-	24,667
H4	302	DF24	464	-		30,821	-					-	31,285
H5/H8	303	OC24	1,205		-	29,991	-						31,196
H6	304	CH24	219	-		26,681	1,139			-		335	28,324
H11/H12	305	DF24	1,636	-		43,400	-						45,037



RMU Summary (>=6" dbh)																
Tract	RMU	STD ID	SC	Veg Type	Acres	Plots	TPA	Merch Stems	QDBH	Merch DBH	Basal Area	Merch. BA	Relative Density	Gross BF	Net BF	Site Index
Beazell B1/B4		101	4	DF24	17.1	10	167.18	167.18	12.34	12.34	138.90	138.90	37.30	12,145.44	10,941.02	109.69
Beazell B2/B5/B8		102	3	OC24	22.4	12	251.76	172.60	11.36	13.67	177.17	175.94	46.45	20,634.95	16,728.18	105.21
Beazell B6		103	4	DF34	33.5	22	218.42	116.15	14.83	20.33	261.95	261.82	58.59	47,905.79	42,429.84	112.25
Beazell B9/B10		104	4	DF34	9.0	5	197.34	147.34	14.77	17.04	234.88	233.35	54.67	40,451.20	34,848.36	112.19
Beazell B13		106	4	DF34	14.2	8	195.25	114.00	13.03	17.05	180.76	180.65	43.88	20,499.42	15,782.34	120.31
Beazell B14		105	4	DF24	20.5	11	294.21	89.66	12.45	22.50	248.77	247.50	56.28	41,477.77	34,410.39	108.13
Beazell B18		107	3	OC24	59.0	35	463.90	165.50	9.99	16.62	252.33	249.45	57.58	38,489.45	33,001.07	120.00
Beazell B23		110	3	CH24	15.7	6	289.87	73.21	11.44	22.75	206.89	206.67	51.77	27,620.73	21,990.23	110.31
Beazell B24		111	4	DF24	26.9	13	512.04	165.95	10.11	17.61	285.73	280.58	63.71	45,179.57	40,608.95	120.42
Beazell B25		108	4	DF24	55.7	34	376.27	139.13	10.82	17.73	240.47	238.52	54.89	38,212.43	31,230.19	113.13
Beazell B27		112	3	CH23	15.4	8	418.07	99.32	9.92	20.29	224.40	222.97	51.43	37,795.94	30,914.08	110.63
Beazell B29		199	4	DF24	26.9	18	298.80	68.25	10.61	22.13	183.31	182.22	48.18	32,504.41	29,119.66	118.33
Beazell B30		113	3	OC23	20.8	11	236.34	77.25	11.22	19.49	162.18	160.00	43.16	28,633.23	22,893.81	118.00
Beazell B31		133	4	DF34	35.5	22	163.26	124.63	15.26	17.46	207.28	207.27	48.93	27,084.65	23,452.40	77.41
Beazell B37		166	3	CH23	20.9	13	660.55	256.76	8.67	13.73	270.82	263.82	63.52	32,936.38	26,962.07	102.75
Fitton Green F5/F8		201	4	DF24	29.5	17	432.73	159.98	9.63	15.58	218.81	211.76	51.96	30,786.76	24,787.32	123.33
Fitton Green F9		202	3	CH24	12.0	5	301.49	201.49	12.32	15.02	249.53	248.00	57.89	25,726.54	15,544.32	103.75
Fitton Green F11/F12		203	3	OC24	57.9	33	382.01	147.95	8.84	13.77	162.82	152.98	41.94	16,127.52	9,979.65	108.25
Fort Hoskins H1		301	4	DF34	30.2	13	204.53	158.38	13.57	15.38	205.29	204.25	49.56	28,745.03	24,667.13	81.25
Fort Hoskins H4		302	4	DF24	7.3	5	339.94	129.94	10.82	17.46	217.20	216.00	51.53	34,160.47	31,285.22	122.25
Fort Hoskins H5/H8		303	3	OC24	7.4	4	377.90	165.40	10.79	16.31	240.07	240.00	55.34	35,408.49	31,195.81	120.83
Fort Hoskins H6		304	3	CH24	18.9	11	375.42	152.69	10.04	15.64	206.44	203.64	50.46	34,487.07	28,324.17	129.58
Fort Hoskins H11/H12		305	4	DF24	5.6	5	657.69	147.69	9.33	19.68	312.33	312.00	67.75	52,379.07	45,036.66	140.00



Total mbf by stand/tract; 2020-2040					
RMU	STD ID	2020	2030	2040	
B1/B4	101	187,091	370,062	533,767	
B2/B5/B8	102	374,711	536,260	747,564	
B6	103	1,421,400	1,567,170	1,720,008	
B9/B10	104	313,635	361,938	426,528	
B14	105	705,413	788,875	949,028	
B13	106	224,109	343,202	465,282	
B18	107	1,947,063	2,350,936	3,144,509	
B25	108	1,739,521	1,993,171	2,470,394	
B23	110	345,247	461,467	586,271	
B24	111	1,092,381	1,282,053	1,681,735	
B27	112	476,077	547,789	699,752	
B30	113	476,191	548,474	678,238	
B31	133	832,560	1,020,942	1,221,082	
B37	166	563,507	765,332	996,991	
B29	199	783,319	882,751	1,093,427	
	<i>Subtotal Beazell</i>	11,482,226	13,820,422	17,414,575	
F5/F8	201	731,226	950,871	1,293,287	
F9	202	186,532	290,594	402,689	
F11/F12	203	577,822	961,861	1,421,659	
	<i>Subtotal Fitton Green</i>	1,495,579	2,203,326	3,117,635	
H1	301	744,947	959,752	1,158,404	
H4	302	228,382	274,230	368,660	
H5/H8	303	230,849	293,636	367,030	
H6	304	535,327	648,174	855,672	
H11/H12	305	252,205	298,976	372,871	
	<i>Subtotal Fort Hoskins</i>	1,991,710	2,474,770	3,122,636	
	Total	14,969,516	18,498,518	23,654,846	



Snags per Acre by Species and RMU*						
RMU	Veg Type	BM	DF	GF	WO	Total Of TPA
B2/B5/B8	OC24	0.44			34.93	35.37
B6	DF34		8.87		2.41	11.27
B13	DF24		7.66		2.71	10.37
B14	DF34		12.04			12.04
B18	OC24		13.85	2.01	0.46	16.33
B23	DF24		5.19		5.99	11.19
B24	CH24		0.39			0.39
B27	CH23		2.69			2.69
B29	OC23		0.38			0.38
B30	DF34		5.28			5.28
B31	CH23	7.68	6.91			14.59
B37	DF24		7.21	0.92		8.13
F5/F8	DF24		0.30	1.12		1.42
F11/F12	OC24		7.77		2.89	10.66
H1	DF34		18.96			18.96
H5/H8	OC24				18.33	18.33
H6	CH24				5.25	5.25

Lying Dead Wood cu. ft. vol. per Acre by RMU*			
RMU	Veg Type	DD Cu. Ft. Per Ac.	Acres
B2/B5/B8	OC24	464.3	22.4
B6	DF34	151.2	33.5
B13	DF24	548.1	20.5
B14	DF34	186.7	14.2
B18	OC24	347.9	59
B23	DF24	423.9	55.7
B24	CH24	33.9	15.7
B25	DF24	141.4	26.9
B29	OC23	336.8	20.8
B30	DF34	347.8	35.5
B31	CH23	261.9	20.9
B37	DF24	517.2	26.9
F5/F8	DF24	910.0	29.5
F9	CH24	250.0	12
F11/F12	OC24	310.6	57.9
H1	DF34	35.2	30.2
H4	DF24	122.2	7.3
H5/H8	OC24	141.4	7.4
H6	CH24	219.6	18.9

* Extremely high variability in distribution and occurrence of dead wood is very typical of western forests and generally leads to unreliable estimates of snag volumes at the stand and ownership level. Values shown here provide some benchmark levels and indication of location, size and species of dead wood stocks.



Total Above-ground + Below-ground live CO2 equivalent and Metric Tons/Ac. for 2020 Cruised Stands					
RMU	STD ID	Veg Type	Net Acres	mT per Ha	mT per Ac of CO2e
B1/B4	101	DF24	17.1	213.8	158.5
B2/B5/B8	102	OC24	22.4	242.1	179.5
B6	103	DF34	33.5	545.1	404.1
B9/B10	104	DF34	9.0	471.6	349.6
B14	105	DF24	20.5	479.1	355.2
B13	106	DF34	14.2	278.7	206.6
B18	107	OC24	59.0	463.1	343.3
B25	108	DF24	55.7	482.0	357.4
B23	110	CH24	15.7	385.7	286.0
B24	111	DF24	26.9	562.4	417.0
B27	112	CH23	15.4	469.8	348.3
B30	113	OC23	20.8	279.2	207.0
B31	133	DF34	35.5	388.9	288.4
B37	166	CH23	20.9	472.2	350.1
B29	199	DF24	26.9	376.0	278.8
Bezell			393.5	6,109.8	4,529.8
F5/F8	201	DF24	29.5	406.4	301.3
F9	202	CH24	12.0	269.3	199.7
F11/F12	203	OC24	57.9	138.0	102.3
Fitton Green			99.4	813.7	603.2
H1	301	DF34	30.2	390.0	289.2
H4	302	DF24	7.3	422.7	313.4
H5/H8	303	OC24	7.4	466.6	346.0
H6	304	CH24	18.9	410.7	304.5
H11/H12	305	DF24	5.6	640.2	474.6
Fort Hoskins			69.4	2,330.3	1,727.7
Subtotal			562.3	9,253.7	6,860.7
Total Cruised RMUs mT CO2e					3,857,788.4



Appendix I: Forest Inventory Sampling Design

2020 Inventory Sampling Summary Benton County forestlands Bezell Memorial Forest, Fitton Green Natural Area, and Fort Hoskins Historic Park Fall 2020

Inventory sampling has multiple goals on Benton County forestlands. Beyond tracking inventory changes over time, specific objectives include:

- Establishing required confidence in inventory sample
- Validating modeling assumptions
- Updating inventory for increased confidence prior to management

Sampling Procedure

Sample points (plot centers) are established on a fixed grid pattern evenly spaced along cardinal bearings. Number of plots and plot spacing will be pre-determined for each stand and landowner will provide mapped plot locations prior to beginning the field data collection.

Once in the field, an entry point to the first plot is determined. Common entry points are landmarks such as landings, watercourse crossings or other identifiable stand boundaries. This point will be the anchor point from which all cruise lines will be established. A GPS coordinate is taken and directions to the first plot are written on flagging displayed at the entry point.

Plot numbers are established on the GIS plots layer. The cruiser shall locate points (plot centers) using pacing or GPS. Plot locations will be referenced by flagging. Plot centers shall be marked using a stick in the ground with flagging. Flagging shall also be hung at eye level and include plot number, the initials of the cruiser(s) and the date of the sample.

The cruiser will be provided with both contour maps and aerial imagery of each stand designated for sampling along with relevant stand information. Stand acres, plot spacing, and number of plots per stand are detailed in **Appendix A**. Stand maps are in **Appendix E**.

Data Collection at Plots

1. Trees:

1. *Merchantable Stands- Avg DBH $\geq 8''$:* Trees greater than or equal to 4.6 inches are measured if they fall in the variable radius plot. The basal area factor (BAF) selected for the stand is based on averaging 5-8 'in' trees per plot. Trees will be tallied and measured beginning from a north line and proceeding in a clockwise direction. Record NT in species column if no live trees are recorded on the



plot. Trees that are borderline or not visible due to obstructions must have distance from sample point center to the pith of the tree measured. Limiting distance will be based on measured diameter of the tree.

1. **Regeneration:** Trees >1' in height and less than 4.6" DBH are tallied on every plot. The sample area measured for regeneration is a fixed 1/50th acre plot (16.7 feet radius) nested within the variable radius plot. Record species, height (to the nearest foot) and diameter (by 1" class). All regeneration recorded must be, in cruiser's opinion, vigorous enough to survive for one year following measurement. Record the ten most dominant stems in the case of heavy natural regeneration
 - b. *Pre-merchantable Stands- Avg DBH < 8"*: All trees >1' in height are tallied on a 1/50th acre plot (16.7' radius). Record species, height (to the nearest foot) and diameter (by 1" class). Record the ten most dominant stems in the case of heavy natural regeneration
2. **Species:** Record species using codes in **Appendix B**.
3. **Species Group:** For fixed and variable radius plots assign a group code for live trees, snags and lying dead wood. Group codes are shown in **Appendix B**.
4. **Diameter at Breast Height (DBH):** For all 'in' trees, record diameters to the nearest inch at a point 4.5 feet above the ground level or root collar on the uphill side of the tree. In the case of irregularities in DBH, such as swelling, bumps, depressions, branches, etc., diameters are measured immediately above the irregularity at the place where it ceases to affect the normal stem form.
5. **Height:** Select 50% of trees > 4.6" DBH on all plots for total height measurement. Cruiser will select trees from all diameter and height classes in an effort to sample across all crown classes and canopy positions. If a height sample tree has top damage (broken, forked, bear damage etc.) or is fused enter a HT CODE = 2 so it is not included in HT:DBH regression. Record HT CODE=2 for snags. If tree is free of damage, record HT CODE =1 to include in the regression. Underrepresented species (such as western redcedar) shall have heights measured at each occurrence to ensure a significant sample of heights is collected for the species.
6. **Live Crown Ratio:** This is the ratio of total height of the crown divided by total height of the tree. Irregular crowns must be visually balanced. The measurement is taken on every tree that is measured for height and recorded as a decimal value (eg: 0.75).
7. **Damage:** Record damage for each tree based on codes in **Appendix B**
8. **Defect:** Record defect as a percentage of standing volume for each 1/3 of the total height (butt, mid and top-third). Record defect as a decimal value (eg: 0.20)



9. Snags: Snags greater than or equal to 4.6" DBH are measured on the variable radius plot using the same BAF as is used for live trees and on the fixed radius plot for pre-merchantable stands. Record Species, DBH, Height to break (recorded in Taper Height column), top diameter (recorded in Taper Diameter column), and decay class (in Status column). If top is intact, record total height in HT column. Record a group code of "SN" for all snags. Decay class codes (recorded in Status column of PLOTS table) are detailed in **Appendix B**.

Top diameter (0 if top is not missing) is based on an ocular estimate. If splitting, hollow cores, burned portions or other physical defects have resulted in a significant reduction in bole volume (>5%) at DBH such that the original bole dimensions cannot be accurately measured (e.g.: bole is a 'semi-circle') then estimate and record original DBH prior to damage and record percent defect for total bole. For borderline snags on variable radius plots with defect at DBH, use estimated original DBH for establishing limiting distance. If damage affects bole above DBH, record percent defect based on percent of bole material missing for the total height of the snag. Minimum height for snag measurement is =10'

10. Down Wood: Use three transects of 22' each radiating from plot center at 360°, 120° and 240°. Record species, diameter at intersection and decay class. Do not tally pieces for classes 4 or 5. Record pieces down to 6" diameter where transect crosses. Record a group code of "DD" for all down wood. Do not record stumps. Decay classes are defined in **Appendix C**.

11. Site Tree: Record breast height ages for at least 3-4 Site Trees per stand. Site trees must be well formed, dominant or co-dominant conifers. Assign a status code = 8 to Site Trees. Off plot site trees may be used but must be assigned a group code of 'F'.

12. Old Growth: When encountering an individual old growth tree on the plot, record a status code = 99. Features and characteristics defining an old growth tree are shown in **Appendix D**.

13. Road Plots: Area of stands in the inventory is net of mapped road acreage. Any plot center that falls on a mapped haul road should be recorded as a 'road plot' in Comments column and skipped. Plots that fall on secondary, unmapped roads, landings and skid trails should be installed where they fall.

14. Edge Trees: Sample points located near stand edges, typed out roads or property lines will employ the "Walkthrough Method" for sampling features near boundaries. This is used for both fixed and variable radius plots.



- a. For any plot that falls near a stand, road or property boundary, measure the distance from the sample point to the measured object (distance x), then measure the distance from the object to the boundary (distance y) following the same bearing.
 - b. If the distance to the boundary from the object (distance y) is less than the distance from the sample point to the object (distance x) then tally the object twice.
 - c. Assign the object a Status code of 22 if it is tallied twice.
15. Offsets: Plots that fall in unmapped water features or other areas that are inaccessible or hazardous may be offset by $\frac{1}{2}$ chain in the direction of the next plot. Measure distance to the next plot from the original location of the plot, not the offset location.



Appendix A: Cruise Stands

<i>Tract</i>	<i>Stand</i>	<i>Cover Type</i>	<i>gross acres</i>	<i># Plots</i>	<i>Spacing (ft)</i>
Hoskins	H1	Conifer, 35-45 yrs	30.8	15	260'
	H4	Conifer 46-55 yrs	7.5	5	260'
	H5/H8	Oak/conifer	7.6	5	260'
	H6	Conifer/hardwood	19.3	12	260'
	H12	Conifer, 46-55 yrs	5.7	5	260'
<i>Hoskins subtotal</i>			70.9	42	
Fitton Green	F5/F8	Conifer, 46-65 yrs	30.2	17	245'
	F9	Conifer/hardwood	12.2	6	245'
	F11/F11	Oak/conifer	59.1	33	245'
<i>Fitton Green subtotal</i>			101.5	56	

Beazell	B1/B4	Conifer, <35 yrs	17.4	11	264'
	B2/B5/B8	Oak/conifer	22.9	12	264'
	B6	Conifer, >65 yrs	34.2	23	264'
	B9/B10	Conifer, 46-65 yrs	9.2	5	264'
	B14	Conifer, 46-65 yrs	20.9	11	264'
	B13	Conifer, 35-45 yrs	14.5	7	264'
	B18	Oak/conifer	60.2	36	264'
	B25	Conifer, 46-65 yrs	56.8	32	264'
	B23	Conifer/hardwood	16.0	6	264'
	B24	Conifer, 46-65 yrs	27.5	15	264'
	B27	Conifer/hardwood	15.7	8	264'
	B29	Conifer, 45-65 yrs	27.5	18	264'
	B30	Oak/conifer	21.2	11	264'
	B31	Conifer, 35-45 yrs	36.2	22	264'
	B37	Conifer/hardwood	21.3	14	264'
<i>Beazell subtotal</i>			403.7	231	
<i>Total</i>			576.1	329	



Appendix B: Codes

(All codes are entered in PLOTS Table)

<i>Key to Species Codes</i>	
Species Code	Common Name
BC	Black Cottonwood
BM	Big Leaf Maple
CH	Cherry
DF	Douglas-fir
GC	Golden chinquapin
GF	Grand fir
MD	Pacific Madrone
OA	Oregon Ash
PD	Pacific Dogwood
PY	Pacific yew
RA	Red Alder
RC	Western redcedar
SS	Sitka spruce
WH	Western Hemlock
WI	Willow
CX	Other Conifer
HX	Other Hardwood
XX	Unknown
NT	No trees- blank plot

<i>Group Codes</i>	
Code	Group
..	Default- Live tree with normal form
SN	Snag
DD	Down/Dead Wood
.F	Off plot site tree



<i>Damage Codes</i>	
Code	Damage
100	Unspecified Damage
200	Mechanical- Logging, etc.
400	Disease- Root rot, etc.
600	Animal- Bear, elk, beaver etc.
900	Physical- Broken top, forked, dead top, leaning etc.

<i>Status Codes</i>	
Code	Description
1	Decay Class 1
2	Decay Class 2
3	Decay Class 3
4	Decay Class 4
5	Decay Class 5
8	Site Tree
22	Walkthrough record
99	Old growth tree



Appendix C: Decay Classes

Snag Decay Classes	
Decay Class (Recorded in Status Code Column of PLOTS table)	Description
1	All limbs and branches are present; the top of the crown is still present; all bark remains; sapwood is intact, with minimal decay; heartwood is sound and hard
2	There are few limbs and no fine branches; the top may be broken; a variable amount of bark remains; sapwood is sloughing with advanced decay; heartwood is sound at base but beginning to decay in the outer part of the upper bole
3	Only limb stubs exist; the top is broken; a variable amount of bark remains; sapwood is sloughing; heartwood has advanced decay in upper bole and is beginning at the base
4	Few or no limb stubs remain; the top is broken; a variable amount of bark remains; sapwood is sloughing; heartwood has advanced decay at the base and is sloughing in the upper bole
5	No evidence of branches remains; the top is broken; less than 20% of the bark remains; sapwood is gone; heartwood is sloughing throughout

Log Decay Class*					
Characteristic	1	2	3	4	5
Bark	intact	intact	trace	absent	absent
Twigs (<3cm)	present	absent	absent	absent	absent
Texture	intact	intact to partly soft	hard, large pieces	small, soft blocky pieces	soft and powdery
Shape	round	round	round	round to oval	oval
Color	original color	original color	original to faded	light to faded brown or yellow	faded to light yellow or gray
Portion of Log on Ground	log elevated on support points	log elevated but sagging slightly	log is sagging near ground	all of log on ground	all of log on ground

*As adapted by Maser et al 1979



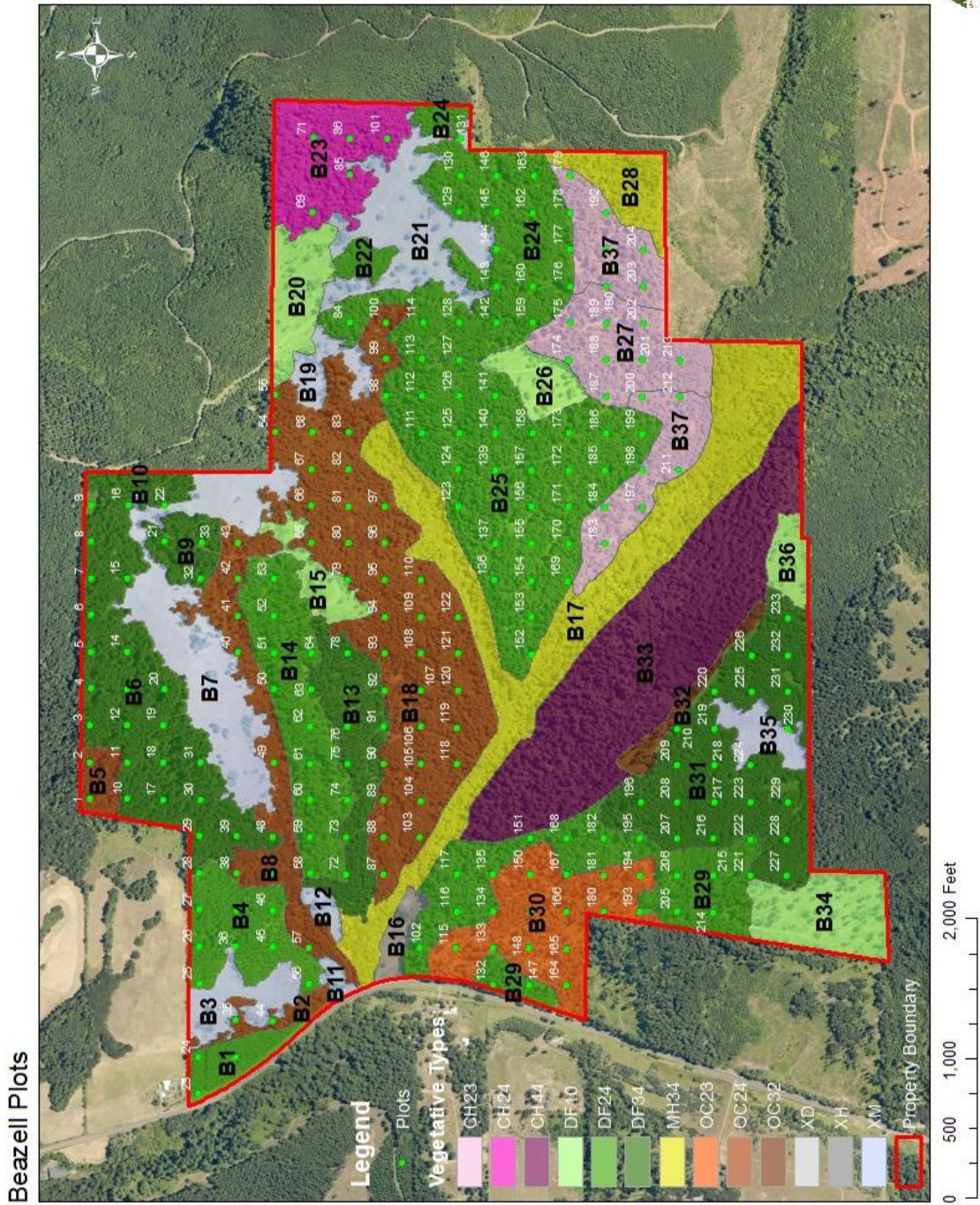
Appendix D: “Old Forest” Tree Characteristic

Old growth trees will generally exhibit a combination of the following characteristics:

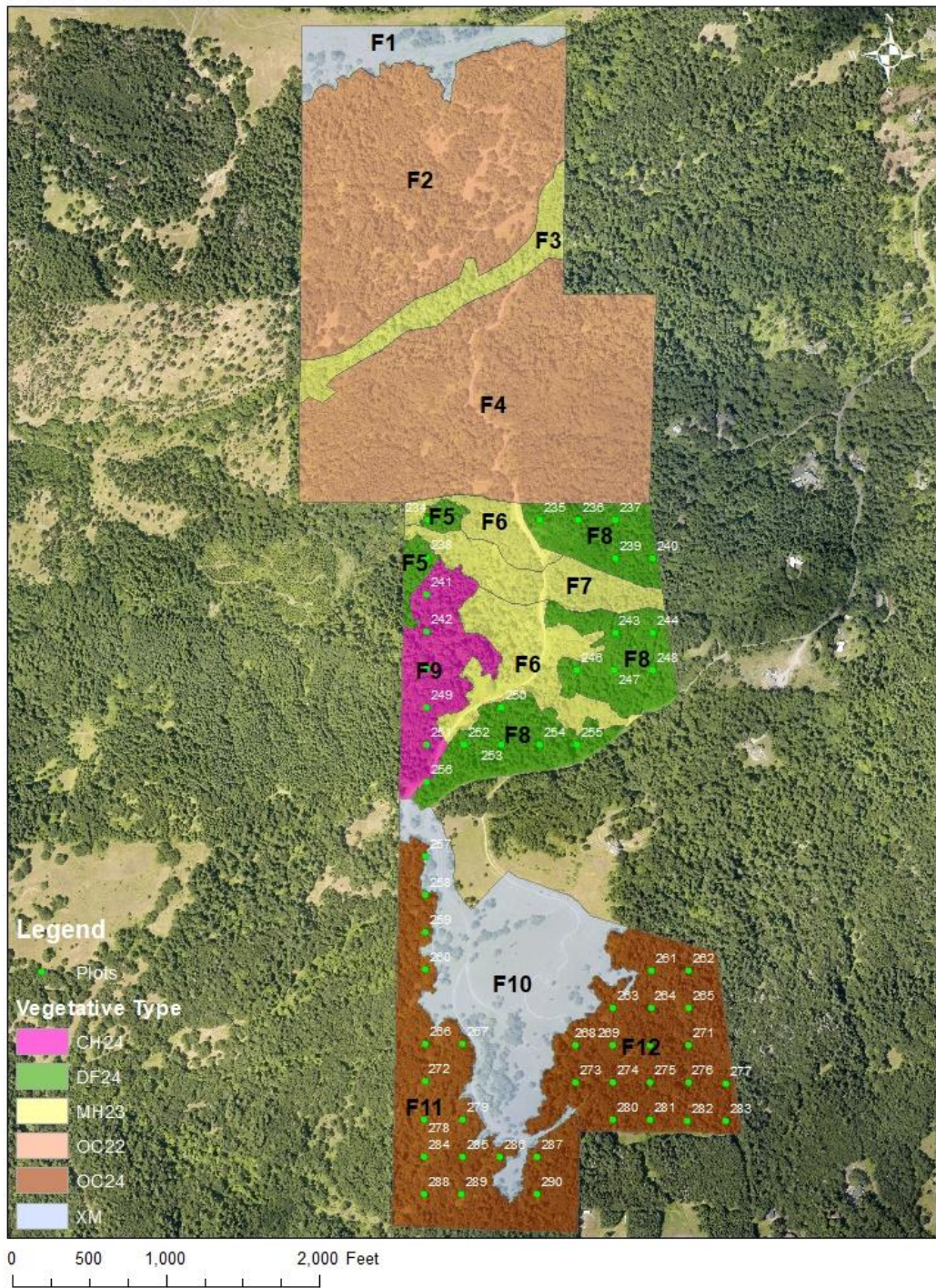
1. **Diameters:** Generally in the largest diameter classes in the stand though some suppressed individuals may exist
2. **Bark:** Deeply fissured, thick, dense bark
3. **Crowns:** Large diameter branches (>~6”), flat or irregular crowns, reiterative tops, crown debris accumulation, platforms, high frequency of complex lichens or moss, complex structure
4. **Damage:** Cat facing, burn scars or ‘goose pens’ (basal burn cavities)



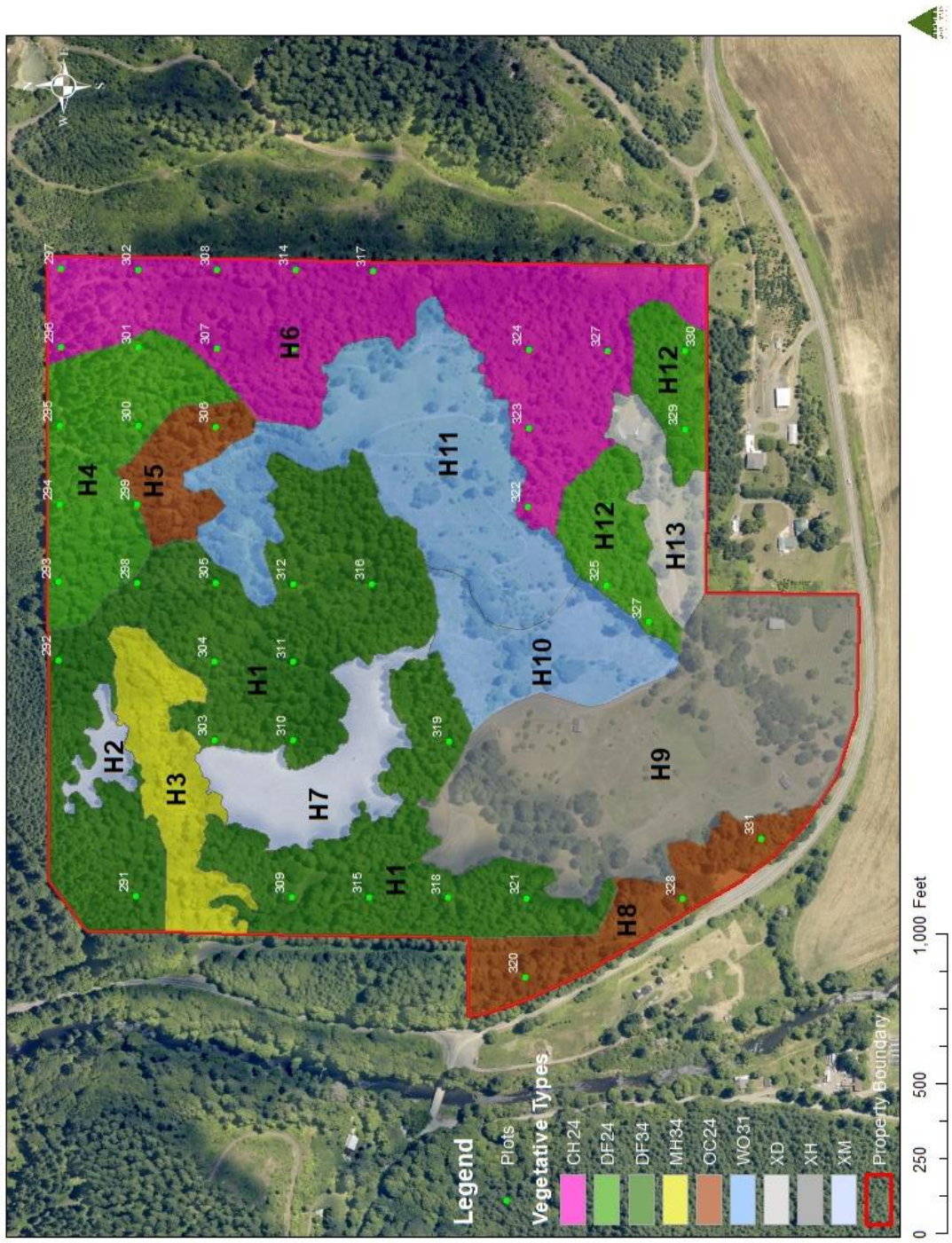
Appendix E: Stand Maps



Fitton Green Plots



Fort Hoskins Plots



Appendix J: Forestry Standards and Guidelines

This section provides more specific guidance on silvicultural practices, vegetation management, and site-specific management strategies. It reflects FSC standards, and is intended to provide significant detail to assist managers in implementing management activities to achieve the goals and objectives for the property. Additional annual or project-specific operating plans are recommended during implementation to provide further site-specific guidance.

Conifer forest

- Trees will generally be grown on rotations that approach culmination of mean annual increment³³. Although this can vary among sites and species, for Douglas-fir, it is typically 70 years or more
- Harvest openings greater than 2.5 acres in size must retain at least 10-30% of pre-harvest stand to serve as biological legacies for the future stand.
- A buffer of at least 100' of intact forest must be preserved between harvest openings greater than 2 acres. Preserved buffers cannot be harvested for at least 10 years
- In thinning mature stands (> 40 years) as well as patch cuts greater than 3 acres, at least two trees per acre will be designated as snags and retained during harvesting. These trees will ideally have characteristics that will lead to snag development, i.e., broken top, thinning crown, conk rot, or other indication of decline. These trees must be of average RMU diameter or bigger
- In thinning mature stands (> 40 years) as well as patch cuts, at least 5 logs per acre shall be left to contribute to large woody debris for wildlife habitat and soil development. The logs will ideally be culls of average diameter or larger for the stand. If no cull logs are available, pulp logs will be left. Pulp logs should be a minimum of 12 feet in length and should be left in bundles of 10-20 to simulate old growth downed woody debris, at a rate of 1-2 piles per acre.
- Existing skid trails should be used during operations as much as possible
- Timber species planted and managed must be species native to northwestern Oregon. The only exceptions would be naturalized cherry or species currently limited to southern Oregon such as incense cedar that may, in the future, grow well in a changing climate

Oak savanna

- Protect and/or restore all potentially high-quality areas of oak savanna
- Competing Douglas-fir will be removed in commercial logging operations. Protection of residual oaks and minimizing soil disturbance in areas with native forbs and grasses will be emphasized

³³ Culmination of mean annual increment is defined as the age at which mean annual increment is at a maximum; mean annual increment is the total increment divided by stand age (Helms 1998).



- Douglas-fir trees growing within oak canopies may be girdled to create snags for wildlife habitat and to prevent excessive damage to oaks during harvest.
- All non-native trees such as cherry or hawthorn will be cut
- Other tree species, such as bigleaf maple and Oregon ash, will be evaluated on a case-by-case basis for removal. Generally, if these trees are competing with oaks of any age class, they should be girdled or removed
- Hardwood trees that are cut should be treated with herbicide on the stump to prevent sprouting
- In areas of dense young oak trees, thin to a target density of 40 to 50 trees per acre, retaining the trees with the largest and healthiest looking crowns
- Non-native species such as Himalayan blackberry, Scotch broom, and English hawthorn will be treated by a combination of herbicide application and mechanical mastication, with monitoring and reevaluation of treatments post application
- Native woody shrubs such as hazelnut will be evaluated on a case-by-case basis for removal to restore grassland conditions
- Mechanical mowing or mastication should be used to reduce fuel loading and prepare the site for the possible use of prescribed burning
- If practical, prescribed burning should be used as a cost-effective way to eliminate slash from the removal of unwanted trees and weeds; prescribed burning should be planned and executed in cooperation with experienced contractors and/or government agencies
- Following burning, seed with native grasses or pollinator mixes
- Consult existing reference material on oak savanna restoration for additional guidance (Boyer 2006; Vesely and Tucker 2004; Hosten et al. 2006)
- Oak savanna restoration areas must be monitored at least annually and follow-up vegetation management work, mainly herbicide application, may be necessary to prevent re-establishment of undesirable species

Oak woodland

These are complex areas with a variety of current conditions. Most areas will be managed for mixed species including Douglas-fir, Oregon white oak, and bigleaf maple, but it is paramount that over the long-term, the oak component must be maintained and not lost to succession. The following general standards will apply:

- Thinning will generally remove Douglas-fir and maple in order to release oak. In areas of dense oak, less vigorous oak can be removed to promote large crown development on remaining oak. Target density for residual varies from 100 to 200 trees per acre, based on tree size and site quality
- At least two oaks per acre will be designated as legacy trees and will be protected from any encroachment of Douglas-fir, maple, and cherry by tree removal. The purpose of this designation is to allow the development of some very large-crowned trees within the woodland matrix



- At least two trees per acre will be designated as snags and retained during thinning. These trees will ideally have characteristics that will lead to snag development, i.e., broken top, thinning crown, conk rot, or other indication of decline. These trees must be of average diameter or bigger
- During thinning, at least 3 logs per acre shall be left to contribute to large woody debris for wildlife habitat and soil development. The logs will ideally be culls of average diameter or larger for the stand. If no cull logs are available, lower quality merchantable logs will be left. Logs should be a minimum of 12 feet in length and at least 10 inches in diameter on the small end
- Existing skid trails should be used to the extent possible for all harvest operations

Older forest

Although much of the forest will be managed to ages of 70 years or older, there is a need for additional protections in areas where old forest conditions are the goal. Within such areas:

- No new roads or permanent skid trails will be established
- Management activities will be limited to those that promote or enhance late-successional characteristics, including large old trees, snags, and down wood.

Examples could include:

- Snag creation in areas with few snags
- Invasive species removal
- Thinning to favor development of large trees

Riparian areas

Management in riparian areas will be conservative, with consideration for expanding the designated riparian zone where needed to provide additional buffering of small stream systems. The following standards will guide stewardship of these resources:

- Tree cutting will be limited to projects that have restoration objectives, such as removing non-native trees, or possibly thinning to promote large crown development
- No ground skidding will take place within this zone, except for purposes of placing logs in streams for restoration purposes. Cable yarding is allowed
- Restoration work will be coordinated with state and federal conservation agencies such as the Oregon Department of Fish and Wildlife and the U.S. Fish and Wildlife Service. Restoration work may include:
 - Planting native trees, shrubs, and herbaceous plants
 - Stream channel work to enhance habitat for target species, including fish habitat and passage
 - Removal of non-native invasive plants



Appendix K: Forest Stewardship Council (FSC) Principles

PRINCIPLE #1: COMPLIANCE WITH LAWS AND FSC PRINCIPLES

Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.

PRINCIPLE #2: TENURE AND USE RIGHTS AND RESPONSIBILITIES

Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established.

PRINCIPLE #3: INDIGENOUS PEOPLES' RIGHTS

The legal and customary rights of indigenous peoples to own, use and manage their lands, territories, and resources shall be recognized and respected.

PRINCIPLE #4: COMMUNITY RELATIONS AND WORKER'S RIGHTS

Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities.

PRINCIPLE # 5: BENEFITS FROM THE FOREST

Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.

PRINCIPLE #6: ENVIRONMENTAL IMPACT

Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest.

PRINCIPLE #7: MANAGEMENT PLAN

A management plan -- appropriate to the scale and intensity of the operations -- shall be written, implemented, and kept up to date. The long-term objectives of management, and the means of achieving them, shall be clearly stated.

PRINCIPLE #8: MONITORING AND ASSESSMENT

Monitoring shall be conducted -- appropriate to the scale and intensity of forest management -- to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.

PRINCIPLE # 9: MAINTENANCE OF HIGH CONSERVATION VALUE FORESTS

Management activities in high conservation value forests shall maintain or enhance the



attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

PRINCIPLE # 10: PLANTATIONS

Plantations shall be planned and managed in accordance with Principles and Criteria 1 - 9, and Principle 10 and its Criteria. While plantations can provide an array of social and economic benefits, and can contribute to satisfying the world's needs for forest products, they should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.



Appendix L: Management Recommendation Notes

Ownership Recommendation Notes

1. Treat invasive weeds regularly along all major roads and trails to limit spread by visitors or partnering organizations. Focus additional invasive treatments on highly sensitive habitat types, or areas that have not yet seen full-blown establishment. Assess and treat RMUs with herbicide applications before and after any entry, monitoring for effectiveness. Determine which organizations will be responsible for which treatments. Develop a central database for reporting and assessing past treatments to better coordinate treatments between forest and non-forest applications, as well as different entities.
2. Establish access trails or roads adjacent to high value habitat meadows that receive periodic prescribed fire treatments. Special attention should be given to ridgelines where fires would advance more quickly. These trails can serve as physical fire breaks, equipment access for suppression, access for county staff or partners performing work in the meadows, TCB flyways, as well as access to better manage adjacent RMUs. Candidate areas to consider improvements would include B6, B23, B24, F12, and H1. Trails should not be installed in occupied habitat. Sustainable forest management and maintenance of regular access routes continue to be the best tools for wildfire prevention.
3. As park users have increased exponentially, public engagement and education should be increased to match this new audience. County funds from harvesting activities (in particular at Beazell, where the funds must stay) could be spent to fund the following initiatives:
 - Facilitate tours with experts focused on sustainable forestry hikes or rare and endangered species habitat. Groups to outreach could be the general public, local students, local small woodland owners or professional forestry groups, visiting students and scholars in tandem with university conferences, other professional groups (architects, builders, artists, interior designers), etc.
 - Provide tours during active forestry operations to help explain county management objectives and elucidate the consideration that goes into conducting a harvest
 - Installation of updated/additional signage describing new silvicultural techniques during the next management period, or even the establishment of a trail illustrating different forestry techniques within a relatively consolidated area
 - Hosting indigenous leaders to educate the public about historic uses of traditional plants and animals found on the property, or the historical or cultural significance of the properties to the tribes
 - Hosting citizen science groups such as bird enthusiasts to visit and record species on site during migratory periods for the county



4. The county should continue to add to the habitat features on the property by recruiting additional snags, felling and leaving trees for downed woody debris, and releasing legacy trees of all species types. Special emphasis should still be placed on oak trees, but legacy maple, madrone, Douglas-fir, and grand fir should also be promoted on the appropriate sites. Girdling can be more sophisticated by employing techniques such as base girdles, top girdles, green topping (topping a tree but retaining a percentage of green branches), or full topping. Supplemental planting of shade-tolerant conifer such as western red cedar in riparian mixed hardwood RMUs can add to species diversity, and take the place of shorter-lived species such as red alder over time. This will in turn serve to help keep stream temperatures cooler for aquatic life. Many of these activities are non-commercial in nature. Beazell is poised to take on some of these projects due to the trust fund associated with the property. Activities on the other properties may need to be partially funded by grants.
5. Regular harvesting (every ~2 years) needs to be maintained across the 5 ownership divisions to keep up with the needs of the RMUs and to demonstrate to the public what a working forest looks like. The order of divisions by timing and RMU need for this management period are Beazell East, Beazell South, Fitton Green, Beazell North, and Fort Hoskins. The Beazell divisions are divided north and south by Plunkett Creek, and north and east by the major Plunkett Creek tributary. Treatments should continue to focus on habitat conservation, stand resiliency, forest structure and health, and sustainable timber production, as well as providing opportunities for public outreach, education, and research. A variety of alternative silvicultural techniques should continue to be employed across all three properties, and a strong emphasis should continue to be on thinning and uneven-aged management.
6. As the timber on the properties gets older, it is increasingly important to strike a balance between RMUs of early, middle, and late ages. Currently 10% within the total SC 4 (Commercial) acreage is less than 35 years old or greater than 65 years old. With 80% of the acres aged 35-65 approaching the older age class rotations (and almost twice the balance within this age class being 45-65 years old), the concern is that there still remains a deficit of young plantations on the property. The county should increase younger age classes on the DF vegetation type over the next two management periods from 35 acres to 115 acres out of a total of 347 total net acres currently found on the property. This will help buffer the parks against unforeseen circumstances such as natural disturbances or future economic uncertainty. Overall, plantations should be established on sites that are not currently growing well, have been thinned at least twice, have experienced past ice storm damage, or are otherwise difficult to manage due to operational challenges.
7. Infrastructure should be maintained to account for fire equipment access. Acknowledging that both managed and unmanaged forests could not have



stopped the wildfires of 2020, reducing fuel loading through thinning and treating slash have been proven efforts to help buffer less unprecedented fires. In protecting hardwood RMUs and promoting hardwoods throughout, the county is building in natural fire resiliency on the property. Due to the fact that many wildfires are human-caused and that the parks are open to the public, the county should develop a protocol for shutting down the parks or restricting access during red flag weather events in fire season.

8. Maintain FSC certification to provide both transparency and accountability to the public. Increased public interest in parks management can benefit from the extra assurance that the public trust is being managed to the highest standards.
9. Continue to monitor changes in carbon market participation that would benefit future enrollment of portions of the properties.

Beazell Recommendation Notes

1. Expand meadow edges where applicable and in conjunction w/ adjacent harvests; consider habitat quality, possible butterfly connection corridors
2. Establish access adjacent to applicable burn units for fire breaks and equipment access of both meadows and adjacent stands in conjunction w/ #3 above.
3. Rock access road to East Division, upgrading existing road surface (B24, B25, B26). Rock road for 4-season light-duty access. Grade roadbed with broad dips and/or out-sloping to assure drainage. Top with 3-4" layer of 1.5" minus gravel. Add 6-9" of 3" minus base rock if winter hauling is desired.
4. Reduce or eliminate invasive species in all operational areas by instituting pre- and post-weed treatments. Monitor and reassess treatment strategies as needed. Survey for invasive weeds during pre-harvest planning. Treat by targeted backpack spray preceding harvest; extent, chemicals, and timing to be determined by prior survey findings. Treat false-brome in May or June, blackberry September-December. Record results in database.
5. Thin untreated RMUs from last management cycle in East Division (B24/B25). Regenerate <15acre portion of B27 to add to age class diversity. Mark trees for harvest, designate skid trails and log landings. Use a combination of thinning techniques, as suited to stand condition. Release oaks, minor species, and young conifers. Mark 1-2 legacy trees per acre. Designate trees for topping where snag numbers are lacking. Contribute to dwd stocks by leaving bundled pulp logs or larger unmerchantable chunks, at least 2 per acre. Time harvest for favorable markets.
6. Design and implement trailside demonstration harvests of alternative regeneration methods, including heavy thinning, group selections, patch cuts, and a variable retention harvest (B29/B30). Create snags, release legacy trees, and contribute dwd throughout, following guidelines set forth in this plan. Benton County NAPD, with NAPD Advisory Board review, will evaluate use of signage with forest management. Ongoing maintenance combined with vandalism concerns will be considered. In addition, tours should continue for



- select public outreach with development of audio book tours similar to currently available for Fort Hoskins Historic Park.
7. Establish forestry interpretation site in South Division (B29/B30) showcasing work in #6 above with associated signage and educational materials, and engage additional interest groups beyond recreational users.
 8. Continue non-commercial habitat enhancements by releasing legacy oaks advantageously (throughout). Create snags (base girdle, top girdle, green top, full top), release legacy trees, and contribute dwd by felling, plant oak seedlings on ice storm damaged oak sites (B6, B8, B17, B18, B23, B30, B32, B37). Plant native shade tolerant conifers streamside in B17 to replace storm damaged red alder.
 9. Viewshed creation for recreational visitors in South Division (B32).
 10. Create future Old Forest Reserve conditions (B6) through suite of silvicultural measures by promoting legacy trees, releasing minor species, creating gaps, and supplemental plantings. No trees >31" dbh cut. Create snags, release legacy trees, and contribute dwd throughout. Eastern 5 acres should be regenerated due to poor growth on site and residual ice storm damage.
 11. Restore white oak stand (B5) while operating in B6.
 12. Heavily thin and regenerate portions of B14 due to difficult access and residual ice storm damage following the previously outlined silvicultural parameters.

Fitton Green Recommendation Notes

1. Control invasive species. Treat false brome along main roads and trails to limit transport by park visitors, as well as high SC rated RMUs. Treat by targeted backpack spray before and after any major management activities. Treat false-brome in May or June, blackberry September-December. Record treatments in central database and monitor/assess results for effectiveness. Multi-year weed treatments will likely be needed.
2. Continue non-commercial habitat enhancements by releasing legacy oaks advantageously (throughout). Create snags (base girdle, top girdle, green top, full top), release legacy trees, and contribute dwd by felling, plant alternative species where additional cohorts are needed (F3, F6, F7, and F9).
3. Restore oak in F12. Remove competing conifer around oaks and meadow edges. Top or fall/slash larger candidate trees for snag /woody debris creation. Seed/plant native grasses and nectar plants, extent and species to be determined. Research for grant funding possibilities needed. Access and equipment must be determined with regards to topography and proximity of SC 1 meadow. Potential to convert skid trails into future hiking trails to create more recreational access.
4. Thin F5 and F8 for forest structure enhancement. Evaluate conifer stands for thinning and implement as appropriate, taking into consideration stand development as well as enhancement opportunities for wildlife habitat. Consider viewshed enhancements and legacy conifer and maple release in F8, especially in



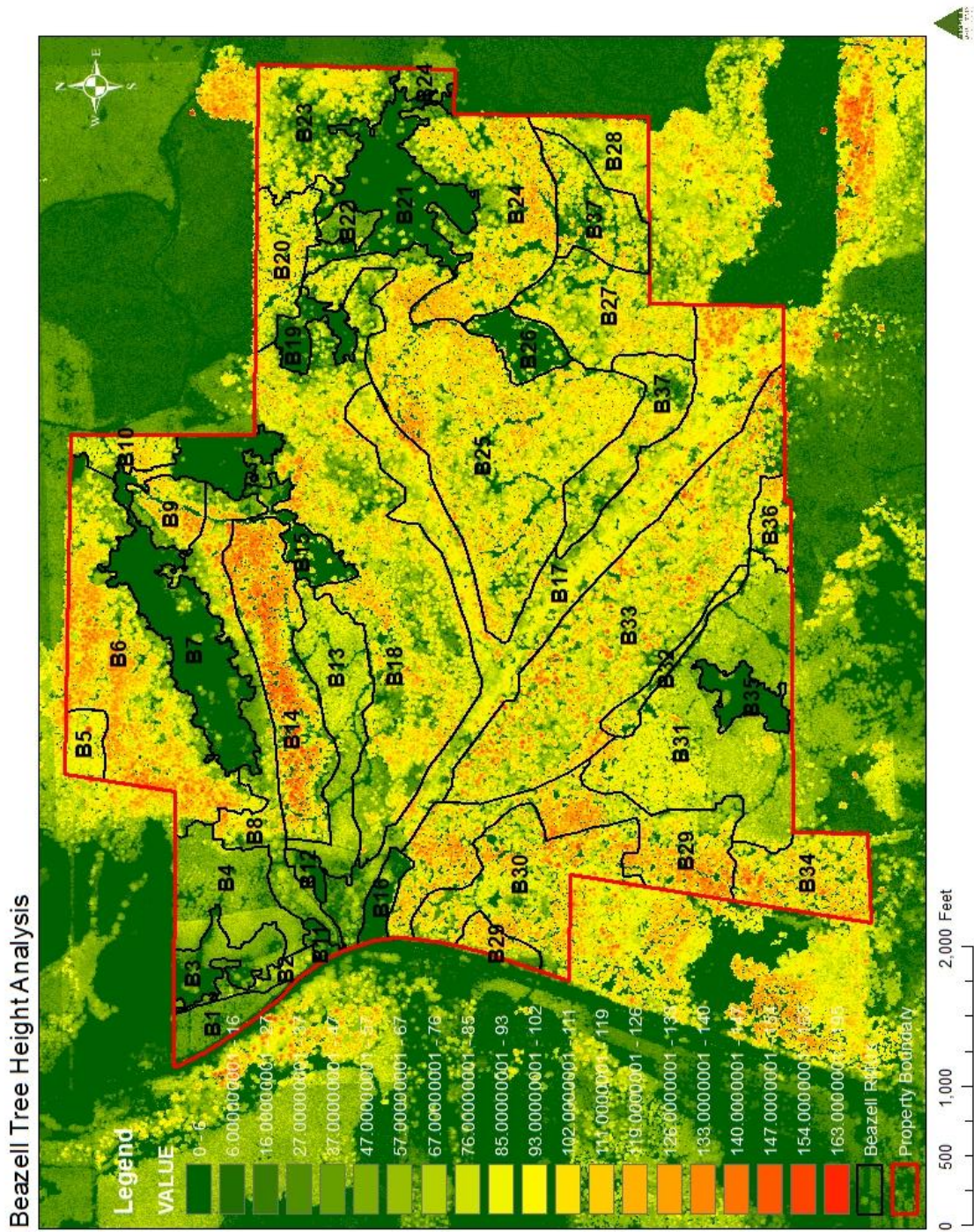
central and southern sections. Time to accommodate log market conditions. Mark trees for harvest, designate skid trails and log landings. Use a combination of thinning techniques, as suited to stand condition. Release oaks, minor species, and young conifers where found to promote biodiversity. Consider group selections and/or small patch cuts to build age diversity. Mark 1-2 legacy trees per acre. Designate trees for topping where snag numbers are lacking.

Fort Hoskins Recommendation Notes

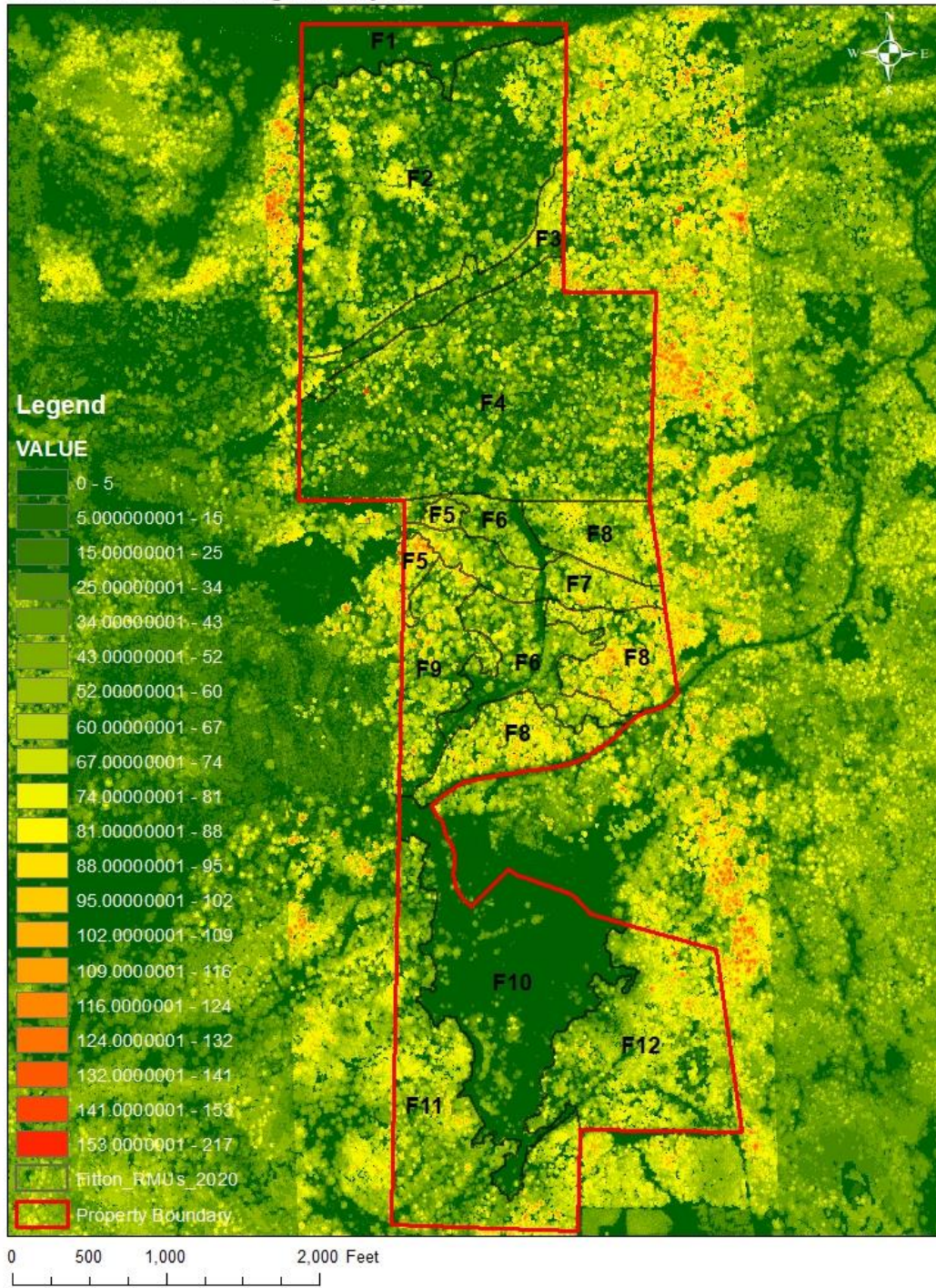
1. Examine barriers to fish passage in Luckiamute tributary (H3), research grant funding for fish-friendly culvert installation. Replace culvert and remove old trash dump in RMA.
2. Treat scotch broom in H1 before seed builds up more in soil. Seed is extremely viable for many years after seeding.
3. Continue non-commercial habitat enhancements by releasing legacy oaks advantageously (throughout). Create snags (base girdle, top girdle, green top, full top), release legacy trees, and contribute dwd by felling, plant alternative species where additional cohorts are needed (H3, H6, and H8).
4. Thin H4, H6 (where appropriate), and H12 for forest structure enhancement. Evaluate conifer stands for thinning and implement as appropriate, taking into consideration stand development as well as enhancement opportunities for wildlife habitat. Time to accommodate log market conditions. Mark trees for harvest, designate skid trails and log landings. Use a combination of thinning techniques, as suited to stand condition. Release oaks, minor species, and young conifers where found to promote biodiversity. Consider group selections and/or small patch cuts to build age diversity (H6). Mark 1-2 legacy trees per acre. Designate trees for topping where snag numbers are lacking. Expand uneven-aged structure.



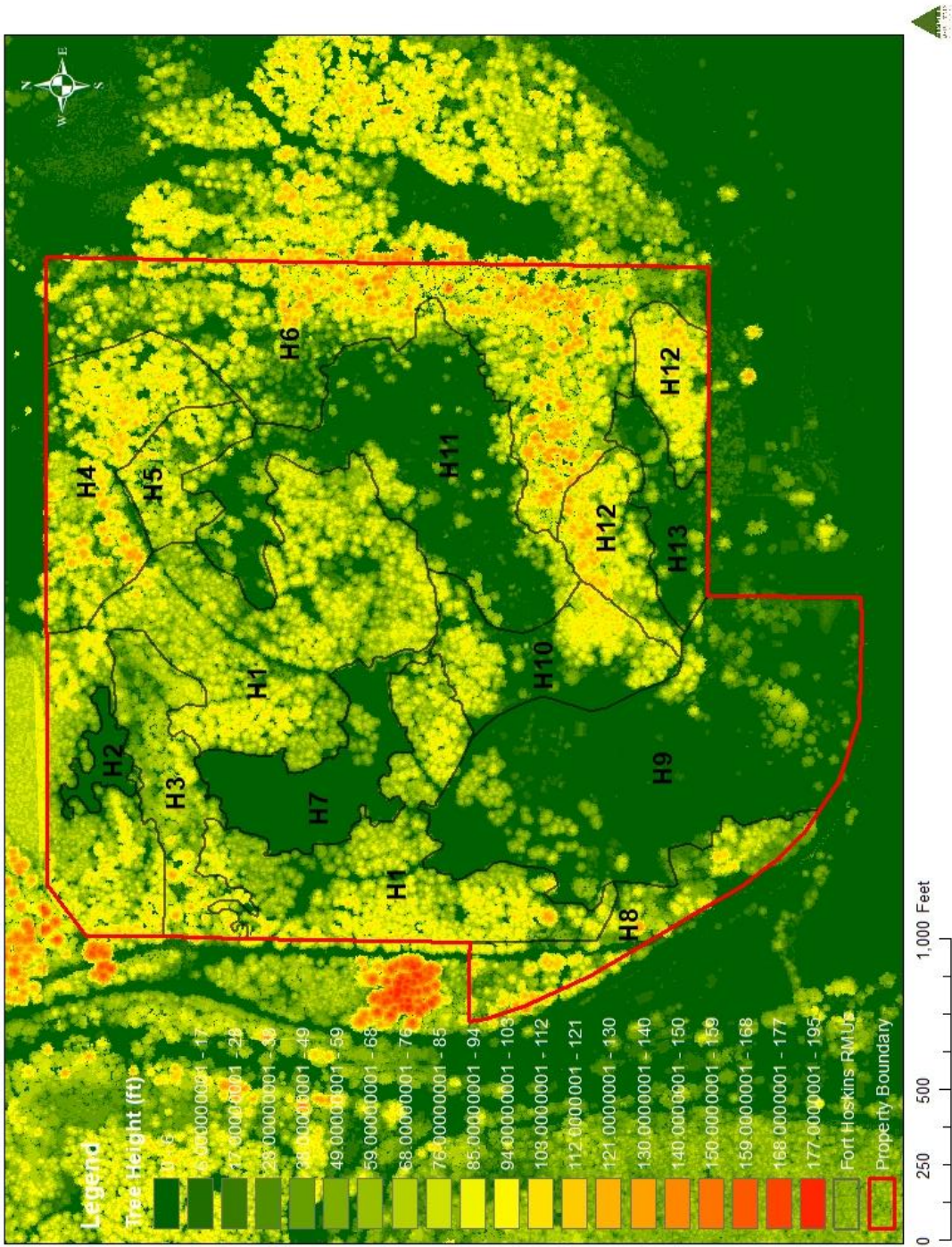
Appendix M: Tree Height Maps



Fitton Green Tree Height Analysis



Fort Hoskins Tree Height Analysis



Appendix N: Preliminary Harvest Schedule, 2020-2030*

Year	Property	Stand	Activity	Units	MBF
2021	Fitton Green	F12	Oak restoration harvest	±29ac	±175
	Fitton Green	F5, F8	Thinning harvest, viewshed enhancement	±30ac (T)	±220-300
2022	Beazell North	B5	Oak Restoration harvest	±3ac (T)	±30
	Beazell North	B6	Thinning/regeneration combo harvest	±29 ac (T) ±5 ac (R)	±350-400 ±150-175
	Beazell North	B14	Thinning/regeneration combo harvest	±7 ac (T) ±14 ac (R)	±50-100 ±325-375
2023	Beazell East	B24, B25	Thinning harvest	±60ac (T)	±525-575
	Beazell East	B27	Regeneration harvest	<15ac (R)	±275-325
2025	Beazell South	B29	Educational (R) harvests along trail	<10ac (R)	±200-250
2029	Fort Hoskins	H6	Thinning/regeneration harvest combo	±6ac (T) ±4ac (R)	±50-75 ±75-100
	Fort Hoskins	H4, H12	Thinning harvest	±12ac	±150-200

*The volumes provided here are to serve only as estimates. Actual harvest volumes should be determined by a trained forester at the time of harvest and consider variables such as additional silvicultural needs, operability of the RMU, relation of the harvest to past and future annual allowable harvest volume levels, etc.

