FORT HOSKINS HISTORIC PARK

Forest Stewardship Management Plan

Benton County, Oregon
Sections 29 & 30, T10S., R6W, W.M.

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INTRODUCTION

The Fort Hoskins property has unique scenic and historic values, with excellent potential for historic and cultural interpretation. Gentle slopes, productive soils, and a diversity of forest and plant communities provide good opportunities for public recreation, open space protection, and sustainable forest management. The County seeks to manage this unique site to enhance its recreational and historical assets, and protect its sensitive resources.

On a portion of the property active restoration will strive to recreate the forest conditions present at the time of the Fort's operations — the native oak savanna forest and upland prairie plant communities. In managing the property the County wishes to utilize and demonstrate current best practices in sustainable forestry. The desired future forest will feature stands of large trees of mixed species and age, actively managed to provide diverse wildlife habitats and support a wide range of native biodiversity. Environmentally-sensitive harvest techniques will serve to maintain forest health, improve tree quality, and help support park management. It is hoped this unique marriage of public park and managed forest can be used as a model for other properties within and beyond Benton County.

The purpose of this Stewardship Management Plan is to provide Benton County, and the Benton County Parks Department staff, with a better understanding of the natural resources of the Fort Hoskins County Park site, and the tools to make informed decisions about its future management. This plan describes the current state of the forest, open meadows and streams, and helps to identify forest management opportunities and restoration strategies to reach the ambitious goals above.

As an important historical and environmental resource, Fort Hoskins has acquired an impassioned group of people who are committed to moving ahead with their vision for this place. This plan is dedicated to the Indian Tribes whose culture and history are at the heart of our inspiration, and the diverse community that is currently involved as members of the Fort Hoskins advisory board, Benton County Parks staff, and interested local citizens.

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EXECUTIVE SUMMARY

The 126 acre Fort Hoskins Park property is located west of the community of Kings Valley in the upper Luckiamute River Valley. Originally the site of historic Fort Hoskins (1856–1865), the property is now largely wooded and undeveloped, with an old farmhouse (circa 1870) and the ruins of several farm buildings and a schoolhouse. Benton County purchased the property for a park site in 1991.

The detailed plan that follows seeks to: (1) define management objectives for the property, (2) evaluate current resource conditions, (3) describe a policy that will guide future management, and (4) outline the activities necessary for resource enhancement and sustainable forestry.

Management Objectives

Benton County's goals for the property are: (1) to protect historic and cultural resources, (2) to provide for public education, (3) to provide public recreation opportunities, and (4) to demonstrate long-term forest stewardship through (5) a program of active forest management.

The County's vision for various portions of the property include: (1) active restoration of pre-settlement native oak savanna, (2) sustainable forest management using environmentally sensitive techniques, (3) promoting native biological diversity, including reserve areas to protect unique resources, (4) effective and appropriate practices for field maintenance, and (5) activities to facilitate initial park development.

Resource Conditions

The property includes naturally established forest from 20–30 years old, previously harvested 50 year old stands, remnants of older forest, and several sparsely treed clearings — old fields or unplanted clearcuts. Much of the property was heavily harvested in the 1980s. A current forest inventory measured 850,000 of merchantable timber. Douglas-fir predominates, though hardwoods dominate the two streamside areas, as well as some steeper slopes. A mix of native and exotic grasses, shrubs, and forbs occupy openings. Oak seedlings are found along several field edges, though healthy mature oaks are rare.

Policy and Standards

A detailed forest policy emphasizes a balanced approach, addressing community relations, management planning, silvicultural systems, environmental protection, and monitoring and assessment. Policies call for periodic harvests at levels well less than growth, to be conducted under a detailed set of environmental protection standards. Problems identified include the decline of centuries-old oak overtaken by fast-growing fir, the loss of open fields to encroaching fir seedlings, slow growth in overcrowded young stands, and the invasion of exotic weeds (primarily blackberry and scotch broom).

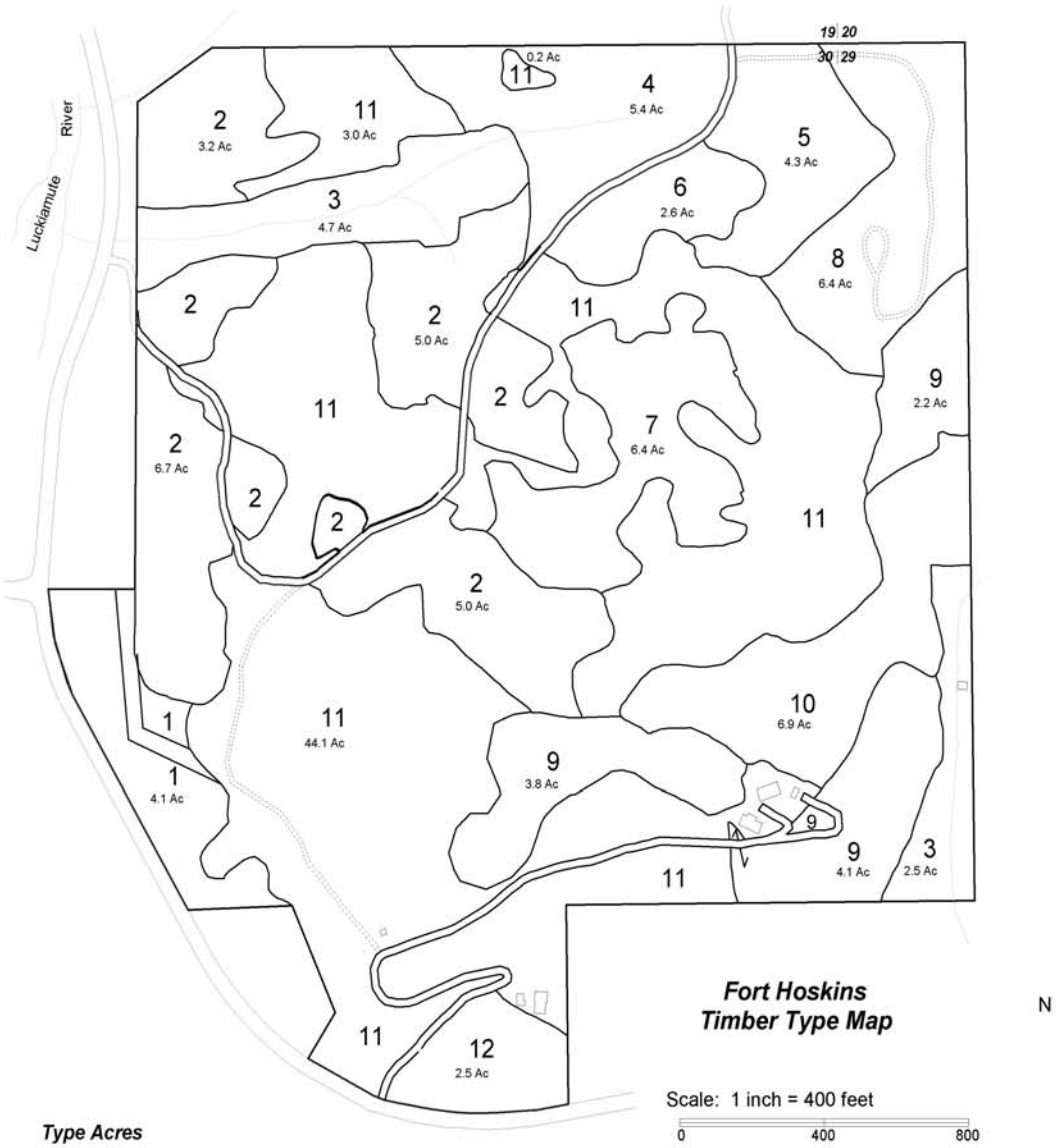
The preferred harvest systems will be individual tree selection and group selection thinnings. Protecting forest health and maintaining the diversity of tree species and wildlife habitat are priorities. Legacy and wildlife trees will be identified and marked. Native understory shrubs and ground cover will be promoted. Monitoring and record keeping will be ongoing activities.

Management Actions Planned

Six management needs are identified: (1) Conduct baseline inventories of wildlife and plant communities, (2) Begin a program of selective harvests, starting with overcrowded oak and young fir, (3) Initiate savanna restoration by clearing fir seedlings and beginning annual prescribed burns, (4) Mark snags, wildlife and legacy trees, (5) Develop forestry demonstration materials, and (6) Maintain boundary lines. The forest should be inventoried and this plan revised every 10 years.

In scheduling harvests frequent thinnings will maintain forest health and tree vigor, promote seedling development, and lead to an uneven-aged forest structure. Harvests are scheduled every 4–6 years, to be planned and supervised by a professional forester, with trees harvested by a contract logger.

An appendix includes a timber cruise summary, detailed forest policy standards, and other supporting information. A glossary defines common forestry terms.



Type	Acres	
1	4.1	Mixed conifer/hardwood
2	19.9	Young Douglas-fir
3	7.2	Riparian hardwoods
4	5.4	Mixed age Douglas-fir sawtimber
5	4.3	Dense Douglas-fir sawtimber
6	2.6	Oak and emerging Douglas-fir
7	6.4	Oak and emerging Douglas-fir
8	6.4	High-graded mixed conifer/hardwood
9	10.1	Maturing Douglas-fir
10	6.9	Mixed conifer/hardwood, steep
11	47.3	Meadow/oak savanna
12	2.5	Wetland/brush
	2.85	Roads/power line right-of-way

road
trail
stream
timber type boundary
power line right-of-way
building


11
4
2
11
5
3
6
8
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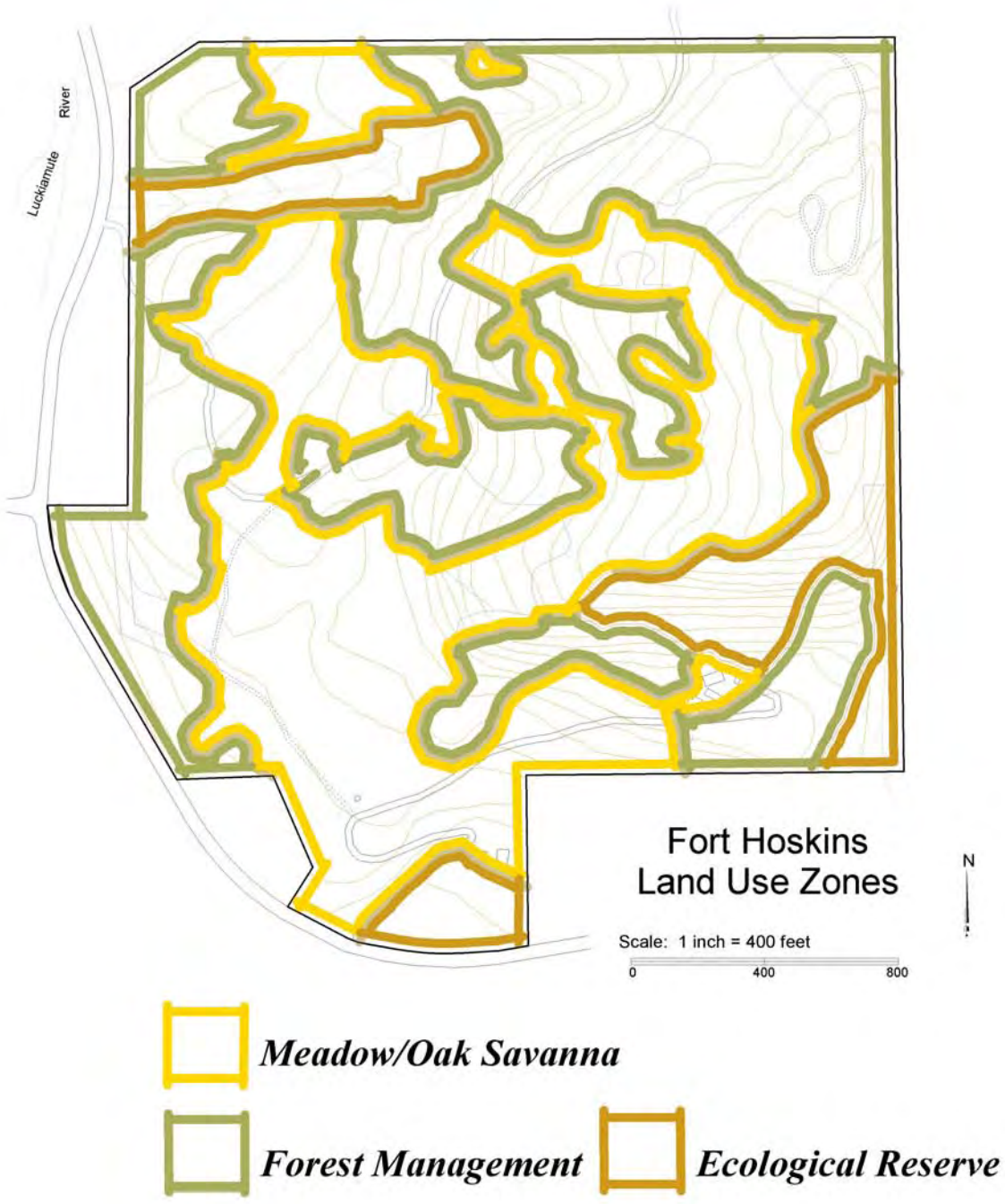

Luckiamute River
Fort Hoskins
Land Use Zones
N
Scale: 1 inch = 400 feet
0
400
800
Meadow/Oak Savanna
Forest Management
Ecological Reserve

BACKGROUND & HISTORY

Fort Hoskins Park is situated at the historic site of Fort Hoskins, in northwestern Benton County. The site is one mile west of State Highway 223, in the upper reaches of Kings Valley at the site of the previous settlement of Hoskins. The property occupies a low ridge at the "big bend" of the Luckiamute River, which flows south and west of the property. Benton County acquired the property in 1992, as the site of an interpretive park. Currently, the site is predominately forestland, though also includes a historic farmhouse, a few remnant outbuildings, several acres of abandoned pasture, and an old orchard. A caretakers mobile home and the park water treatment facility are also located on the site.

Prior to purchase the property had been managed for over 100 years as a family farm. The property was last actively farmed by Dick Dunn in the early 1970s. By the 1990s the farmstead was rapidly deteriorating. Open pastures were filling in with fir and blackberries. Most commercial timber was harvested in 1985. With the exception of the Franz-Dunn house, the farm buildings were in a state of rapid decay.

The site of Fort Hoskins was "rediscovered" in the early 1920s, though to local residents it was never fully "lost". During the late 1960s the property was briefly considered as a location for a new State Park. Archeological examinations in 1976 and 1977 allowed for re-creation of much of what is now known about the fort and its history. Recognizing the significance to local history, and interested in developing a new park in this region, Benton County acquired an option to purchase the site in 1991.

Fort Hoskins History

The history of Fort Hoskins is thoroughly detailed in a cultural resources overview of the fort and surrounding area by David Brauner and Nahani Stricker (1994). That history is summarized below.

Fort Hoskins was a small military garrison, used for a relatively brief period from 1856 to 1865. It was, however, a time of rapid change and development in the Willamette Valley, years that marked the end of Indian occupation, and the beginning of settlement and community establishment. Fort Hoskins was initially established to oversee the resettlement of western Oregon native tribes to the newly established Coastal Indian Reservation. The fort was to serve a dual purpose — to keep Indians on the reservation, and to protect Indians from incursions by settlers.

The location for Fort Hoskins was selected based on its strategic position close to the soon-to-be established Siletz Agency, 18 miles to the west near the present town of Logsden (the Agency was instead sited further west at present day Siletz). At the time, the only known trail through the central Coast Range began near the fort site and ran up the Luckiamute River to the Siletz Valley. Anyone passing to or from the Agency would have to pass directly in view of the fort (though several other trails from the Willamette Valley to the Coast were soon established). This location also offered close proximity to the newly settled community of Kings Valley, for readily available building materials and supplies.

Fort Hoskins contained some 15 buildings, including officer quarters and soldier barracks, munitions and supply storage, a bakery, hospital, barns and corral, gardens, and housing for the laundry workers. The fort had no defensive structures, only a simple fence around the quarters and central parade grounds. A gravity feed water system was developed for the fort, as was an improved "wagon road" to Siletz Agency (so rough that only one wagon ever made the trip).

A force of up to 150 men were based at Fort Hoskins, though many were stationed at the blockhouse at Siletz Agency or elsewhere. During much of its history, life at the fort was uneventful. Men were infrequently dispatched to round up escaped Indians. Several threats of attack (from both Indians and whites) proved to be ungrounded.

By the outbreak of the Civil War, Fort Hoskins had about outlived its usefulness. Several new routes had been established through the Coast Range Mountains, rendering the fort's location less strategic. Reservation lands were shrinking, with more Indians gaining permits to work off the

Reservation. By 1864 it was decided to close the fort, and consolidate functions at Fort Yamhill. Staffing at Fort Hoskins was reduced to a skeleton force. The fort then served briefly as a training base for the Oregon Volunteer Infantry. At the conclusion of the Civil War, Fort Hoskins was closed, and all remaining goods, structures, and facilities were sold at auction. The property reverted to its lessor, Henry VanPeer.

Early Vegetation Patterns

Early conditions at Kings Valley mirrored what occurred throughout the Willamette Valley and other parts of western Oregon. At the time, four major vegetation types occurred in the area.

The characteristic vegetation of the area, and that which attracted most settlers to the area, was the Prairie. These open grasslands occurred from the floodplain margins, up into the bordering hillsides of the numerous valleys. Isolated groves of trees included primarily white oak and Douglas-fir, though bigleaf maple and ash were also found. This prairie condition had been intentionally cultivated by the local Luckiamute Indian tribes, who routinely burned the valley grasses to support their hunter-gatherer culture. Burning maintained camas meadows and other berry, root, nut and fiber crops. It also encouraged lush grass growth for game, and made travel easier. These soils were easily farmed by the new settlers, suited to pasture, small grains and other cultivated crops.

A Riparian Forest covered most of the floodplain of the Luckiamute, as well as other rivers and major streams. With moist soils, these areas resisted periodic burning. Riparian forests contained a dense mix of Oregon ash, black cottonwood, bigleaf maple, and Douglas-fir, often with heavy underbrush. Much of this forest was cleared by early settlers to provide farmstead building materials, and increased pasture and crop land.

Upland Forests were located on the steeper, higher slopes of the Coast and Cascade Ranges. Extensive, dense forests dominated most mountainous areas, comprised primarily of large Douglas-fir, along with western hemlock, western red cedar, and bigleaf maple. At lower elevations and valley margins this forest was restricted to only those moist north-facing slopes which escaped routine burning. Valley fires frequently escaped into this dense forest, creating extensive wildfires. When building the Hoskins-Siletz Wagon Road in 1856 it was noted that work was tedious, owing to a “mat of huge logs from five to eight feet in diameter” that had fallen, the result of an earlier fire.

Between the prairie and the upland forest, a transition forest existed, called “Open Woodland” by earlier surveyors. These savanna-like areas were dominated by groves of white oak and Douglas-fir, often in park-like settings with an open grass and sparse 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 either the drier or wetter sites. Within groves, tree density varied, as did the presence or absence of understory vegetation, a result of differences in burn frequency and intensity. Early survey records show this vegetation type common in the hills surrounding Kings Valley.

Though no precise descriptions of early vegetation at Fort Hoskins exist, the site likely included all of these types except mature upland forest. The site was selected for its commanding views of the Kings Valley and up the Luckiamute River, so we can expect that open prairie covered much of the valley and lower slopes of the fort site. Open woodland groves were likely present on upper ridges and north slopes. Riparian forest initially bordered much of the Luckiamute, extending up several smaller streams near the fort. Mature upland forest would have been found on nearby Coast Range ridges, though not at the fort itself.

Changing Vegetation Patterns

Between 1780 and 1830 several rapidly spreading disease epidemics reduced native Indian populations by nearly 75 percent. At the time the first settlers arrived in the Willamette Valley, the native cultural system was no longer able to sustain itself, leaving little to stand in the way of pioneer settlement.

Vegetation patterns changed quickly as a result of the cessation of native burning, and the practices of early settlers.

Open prairie was the site of most early agricultural activity, as these areas were readily grazed and easily plowed. This prairie was so thoroughly exploited that no areas of truly native valley prairie exist today. Riparian forests were also quickly exploited. Surveys of the mid-1850s suggest much of this forest around Kings Valley was already cleared for farming. At Fort Hoskins nearby forests would have been harvested to feed the voracious appetite of the fort for firewood — up to two cords per day!

Widespread burning had diminished by the 1830s. At the time of Fort Hoskins' establishment, fir and oak seedlings would have started to invade the uplands, along with denser brush. It was noted as early as 1870 that throughout the region the invasion of trees was threatening much land used previously for agriculture. By the 1970s the open woodland forest type had virtually disappeared from the Willamette Valley, having been cleared for field or pasture, or having succeeded into closed fir forest.

The Fort Hoskins Site Today

Fort Hoskins County Park encompasses 126 acres of the original 185-acre Fort Hoskins lease holding, including the site of most structures and the area of greatest fort activity. The fort's barn, corrals, and gardens were located across present-day Hoskins Road on flats near the River. Boundary lines are generally easy to follow, with sections of old fence line to the south, east, west and north, and sparse old blazes.

Luckiamute Road, a county maintained highway, passes to the south and west of the property. A deeded right-of-way from the northwest provides the best access to the center of the property, and will be developed as the main property access. Boise Cascade has deeded rights to use this road to access timber on their abutting property to the north. The original farm access road to the southwest is narrow, winding, and has poor sight lines to the highway. It will be used as a minor secondary access. Dirt roads access most portions of the forest.

The property can be divided into three geographic areas:

- very productive west-facing slopes — deep and well-drained soils, well suited for Douglas-fir and grand fir, but easily compacted, with moderate erosion hazard and seedling plant competition, though few other management constraints. Timber productivity is low Site II to high Site III;
- steep slopes — moderately deep and well-drained, but somewhat dry and rocky soils, well suited to Douglas-fir and bigleaf maple. With moderate to severe erosion risks, operability constraints, and seedling plant competition. High Site III;
- riparian areas — deep and moist streamsides, host to a spectrum of species, from Douglas-fir to bigleaf maple, ash and alder. With areas of severe equipment limitation, windthrow risk and seedling mortality. High Site II. Poorly-drained flats to the extreme south are suited only to willow, sedge and grass.

MANAGEMENT OBJECTIVES

Benton County acquired this property with several goals in mind:

1. To protect the important historic cultural resources of the Fort Hoskins site.

2. To provide for public education and appreciation of this history.

3. To provide public recreation opportunities in northwestern Benton County.

4. To demonstrate long-term stewardship of the forestry resource.

5. To create a program of timber harvests to maintain forest health, facilitate forestry demonstrations, and help support the property and the local economy.

The large forested acreage surrounding the fort site provides a number of opportunities, including recreational trails development, active demonstration of sustainable forestry, and periodic income (through selective timber harvests) to support park development and maintenance. The County hopes to develop the park facility over the next 24–36 months, given available funding. For economy, and to minimize user conflicts, initial forest management work will precede park development. Future timber harvests will be used as opportunities for public education and demonstration. As the County plans to keep the property as a park in perpetuity, they enjoy a unique opportunity to demonstrate the benefits of long-term forest stewardship.

The vision for the Fort Hoskins Forest:

1. Within historic interpretation areas, native pre-settlement forest conditions will be actively restored. Existing oaks will be preserved, and over time oak and fir of significant stature will be perpetuated. Plants used by indigenous peoples will be considered for reintroduction.

2. Within other areas, forest stewardship will be practiced and actively demonstrated. Management planning and all harvesting operations will be performed in an ecologically sensitive manner, encouraging a mix of native species (trees, understory, and ground cover), uneven-aged stand structure, and long rotations. Conservative harvest levels will allow a portion of the forest to become more mature, and assure sustainability. Visual impacts will be minimized, especially in high use recreation areas. Forest management will meet standards for Forest Certification.

3. Management will attempt to promote a full range of native plants and animals. Reserves will be established to protect sensitive biological resources such as steep slopes, riparian areas and other special resources.

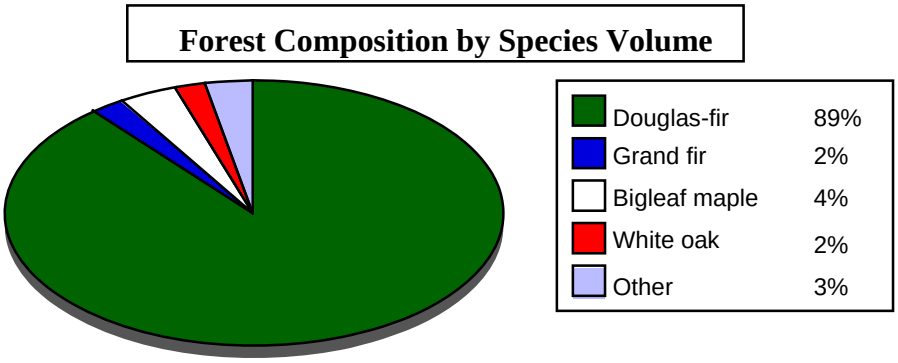
4. Cost-effective and environmentally-appropriate strategies will be used when maintaining fields and openings. Invasive exotic weeds will be controlled to the greatest extent practicable.

5. Forest management operations will facilitate initial Park development, as in removing trees in construction areas.

FOREST RESOURCE

Fields, building areas, roads and sparsely treed openings account for 52.65 acres, with the remaining 73.3 acres forested. Elevations range from approximately 440 feet at Luckiamute Road, to 860 feet at the southeast ridgetop. The terrain is generally favorable for forest management, though some slopes approach 90 percent. A network of old haul roads and skid trails accesses most forest stands.

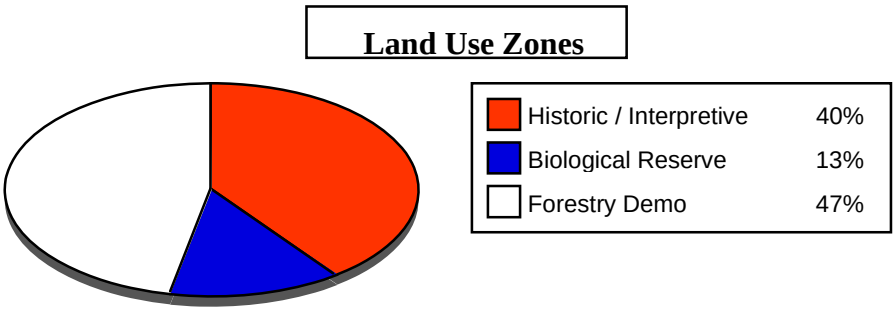
A timber cruise conducted March 2000 by Northwest Forestry Services found a net timber volume of 850,000 board feet on 73.3 timbered acres. A summary is found in the appendix. Douglas-fir accounted for 89% of total volume, with bigleaf maple 4%, grand fir 2% and Oregon white oak 2%. Red alder, cottonwood, cherry and Oregon ash were minor species. The figure below displays net timber volume by species groups:



Douglas-fir timber quality is generally low, with only 16% of volume meeting export grade standards, most trees being too young to contain export quality logs. Hardwood is primarily pulp quality, with only 27% of net volume meeting sawlog grades. Numerous young (pre-merchantable) trees are present as well, providing opportunities for mixed-age management.

Tree vigor and growth rates vary widely across the property. Measured basal area growth across the entire forest averages 7.3 percent. Types with the highest Douglas-fir stocking are adding the most volume, with hardwoods growing at one-half to one-quarter average rates. When considering height growth and ingrowth, Douglas-fir volume is increasing at 8–10% annually.

The property is divided into three general Land Use Zones: Historical Interpretation / Savanna, Sustainable Forestry Demonstration, and Biological Reserve (see Land Use map page 2). The Historical Interpretation zone (50± acres) includes all open lands (type 11), including roads. Biological Reserves (17± acres) include riparian areas and wetlands (type 3,12), and areas of steep slope (type 10). All other areas are included in the Sustainable Forestry Demonstration zone (59± acres).



For management purposes, the property can be divided into twelve general types (See timber type map, page 3):

1 - Mixed conifer/hardwood (D4 – 1900,wo,gf - 4.1 acres)[1] -- Groups of Douglas-fir with brushy openings create a poorly stocked stand, on productive moderate to steep slopes. These natural stands originated from pasture abandonment before 1900, and past heavy timber harvesting. This type includes some of the oldest trees on the property, although younger trees are present also. Most areas are visible from either Luckiamute Road or the parade grounds.

Large trees should be perpetuated (especially along Luckiamute Road), except where blocking desirable views. Multi-age structure should be maintained.

2 - Young Douglas-fir (D3 = 1970 - 19.9 acres) -- Natural reseeding of abandoned pasture and fields has led to well-stocked fir stands. Dense growth often excludes any understory or ground cover. Younger trees are found at stand margins. Current tree quality is variable, but potential quality is high. Surrounding the open fields, this type will have relatively high future use, and have good potential for demonstration.

Most areas should be thinned soon to maintain vigor and improve timber quality.

3 - Riparian hardwoods (BM3 = 1950,ra,df - 7.2 acres) -- Variable stands of hardwood surround two streams flowing through the property. Of natural origin, these areas have had little past harvesting. Two farm roads cross the northwest stream, with the east crossing forming a vernal pool. An old trash dump is found by the west crossing. The southeast stream is the park water supply. This type has the lowest timber volume on the property, but contains the greatest range of biodiversity.

To protect water quality and biodiversity values these areas should be reserved from timber management.

4 - Two-age Douglas-fir (D3 = 1970, scat D4 - 5.4 acres) -- Moderate slopes to the north contain a variable growth of scattered 80- to 120-year old fir, 30-year old natural regeneration, and 25-year old plantings. Overstory trees frequently have poor timber quality, and are shading nearby younger trees.

Select overstory trees should be retained for wildlife and legacy trees, others should be harvested to release and thin understory fir. Desirable two-age structure should be maintained.

5 - Douglas-fir sawtimber (D3 = 1950 - 4.3 acres) -- Moderate slopes to the northeast contain a dense stand of high quality fir, which was thinned in 1990. Windthrow and thinning shock initially effected up slope portions, though conditions now appear stable. This type contains the highest per acre timber volume and value on the property. Fir regeneration is common.

Most areas should be thinned to maintain vigor and encourage new seedlings.

6 - Oak and emerging fir (WO – 1900,df - 2.6 acres) -- This type includes the greatest number of large oak on the property, though invading fir is present throughout. Located near the road and at the edge of open fields, demonstration potential is excellent. Slopes are moderate.

Fir competing with oak should be cut to maintain oak vigor; other areas should be thinned to promote a mixed stand. Unique native understory vegetation should be protected.

7 - Young fir with oak (D3 = 1970,wo - 6.4 acres) -- This type has more fir and fewer oak than adjacent Type 6. Stocking is patchy, with some areas well-stocked with fir, and open grassy patches in between. Several oaks of good vigor are experiencing increasing competition from fir. Timber volumes are low, with most fir just below merchantable size, though growing rapidly. Commercial thinning will be possible soon. Conifers located at upslope margins will begin to block views from the ridgetop in 10 years.

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[1] The following symbols describe species, size, stocking and date of origin:
species: D = Douglas-fir, GF = grand fir, BM = bigleaf maple, WO = white oak, RA = red alder; lower case = minor species
size: 4 = 21"+ average stand dbh, 3 = 12-20" avg. dbh, 2 = 7-11" dbh, 1 = <7" dbh
stocking: – low stocking, = medium stocking, ≡ full stocking date: 1950 = year of stand origin

Competing fir should be cut to maintain oak vigor, 2002–2004. Upslope fir should be cut to maintain views.

8 - Mixed conifer/hardwood regeneration (D,BM1 = 1990,bm,df - 6.4 acres) -- Heavy cutting around 1990 removed all trees of value, leaving scattered poor quality maple and stunted fir. Young Douglas-fir, grand fir, maple and cherry are restocking the site.

This type has no current needs.

9 - Maturing Douglas-fir (D3 = 1950 - 10.1 acres) -- Similar to Type 5, these several stands are more variable in age and stocking. Many trees are open grown, with heavy limbs and high taper. Heavy brush (N) or high fir density (W,S) has generally precluded fir regeneration. Western portions border the historic interpretation area, and include young oak at type margins.

Clear west portions to connect upslope and lower slope savanna areas. Thin remaining areas to improve timber quality. Attempt to establish fir regeneration in future harvests.

10 - Mixed conifer/hardwood, steep (D,BM3 = 1900,1950 - 6.9 acres) -- Steep slopes south and east of the ridgetop support a fully-stocked mix of Douglas-fir and bigleaf maple, with scattered oak. Tree quality varies from tall high-grade maple and fir, to large decaying veterans along the ridgetop.

Reserve from timber management. Develop views south of the ridgetop with 2–3 small patch cuts.

11 - Meadow/oak savanna (D1 – 1990 - 47.3 acres) -- Open fields and a past clearcut are filling with brush and conifer seedlings. Upslope areas contained 30- to 50-year old fir which was clearcut around 1990. Lower slopes remained open due to past agricultural uses. Southern areas contain an old orchard, and the sites of the Fort Hoskins parade grounds and several structures from that era and later.

An active program of savanna restoration should check the invasion of exotic species, and encourage the reestablishment of native oaks, shrubs, forbs and grasses of savanna communities .

12 - Brushy wetland (2.5 acres) -- A small area along Luckiamute road to the south consists of poorly drained soils generally unsuited to tree growth. It is currently occupied by exotic blackberry and other brush. This highly visible area could be managed for native vegetation and/or wildlife habitat.

Consider native vegetation restoration.

Other Non-forest (2.85 acres) -- Roads, power line right-of-way through timber

In summary, the current forest is healthy and productive, although fir is encroaching on oak in several areas. Tree quality varies from fair to good, with an excellent potential for improvement under proper management. Past harvesting has unintentionally provided openings for savanna restoration, bypassed stands with high biodiversity value, and created a wide variety of stand types for forestry demonstration.

BIODIVERSITY

The property's most important feature from a biodiversity perspective is the rich mix of tree species and ages present. Management should strive to maintain and augment this diversity with an understory plant community of native shrubs, forbs, and grasses. Of special interest are the few surviving oak and madrone on the south-facing slopes. The goal of oak savanna restoration presents a unique opportunity to supplement existing diversity.

The riparian features present are important wildlife habitats; all are worthy of protection. A small pond and headwater springs are associated with the small year-round stream originating in the northern center of the property. These provide year-round freshwater, and benefit resident amphibians and other wandering wildlife. The eastern spring and stream serve as the water supply for the park. Both streams

support a mix of vegetation found few other places on the property, and should be reserved from active management. Both flow immediately into the Luckiamute River, an important fish-bearing stream, and should receive special protection when harvesting nearby.

There are numerous living or dead snags on the property, though most are small trees that died recently. Trees older than 50 years of age are rare. A few very large fir and hardwood are found along the southeast ridgeline, typically deformed and damaged from wind, lightning strikes and old age. These provide aesthetic appeal, and add vertical stand structure and wildlife perch, den and nest sites. These should be given the greatest level of protection during management. Coarse woody debris levels are very low (40% of target minimum), with larger well-rotted logs generally absent.

Steep slopes south and east of the ridgeline have rocky soils, a high erosion hazard, and support unique vegetative communities. These areas contain tall maple and scattered fir, and include some of the oldest trees on the property. Steepest slopes should be reserved from timber management. Other hillside areas have gentler slopes, support younger trees (were previously harvested), and are appropriate for forest management. Careful placement and proper maintenance of skid trails can minimize erosion hazards.

Table 1: Biodiversity Goals for Fort Hoskins

Elements of Biodiversity within the Managed Forest	
Species diversity	A range of species native to the site are perpetuated, especially hardwoods.
Age/size diversity	Trees of various ages or sizes are maintained, either within or among stands, especially old trees.
Disturbances	Management attempts to incorporate or mimic natural stand disturbance processes.
Productivity	Soil productivity is protected by minimizing erosion and compaction, and preventing organic matter losses.
Special features	Unique and sensitive sites are identified and protected, especially rare/endangered species and habitats.
Wildlife habitat	Snags, perches, cavity trees and mast are provided. Riparian resources are protected.
Legacies	Old trees, snags and large woody debris are retained as linkages through time.
Landscape level	Management considers the significance of the property within the larger landscape.

FOREST POLICY

The underlying goal for the management of Fort Hoskins Historic Park is to protect and restore the site to a more diverse state, while maintaining an ongoing harvest program that supports the property and the local economy. A comprehensive set of sustainable forest management policies will guide planning efforts. Field operations will be performed under a strict set of performance standards. These policies and standards are found in their entirety in the appendix, but are summarized below.

1. A Balanced Approach

   Management will emphasize historic protection and interpretation on select portions of the property, and sustainable forest stewardship the focus on remaining areas. Sustainable harvest levels, ecosystem protection, and community and social benefits receive balanced consideration.

2. Community Relations

   Public education opportunities are effectively realized. Good community relations are intentionally fostered. Loggers and contractors are viewed as important partners in management.

3. Management Planning

   Planning for sustainable forest management will use an adaptive approach, with information collected on a full array of forest biological resources. Ongoing monitoring will insure that management activities both satisfy ownership goals and maintain the biological diversity of the forest and savanna plant communities.

4. Silviculture

   The silvicultural systems used will be suited to the forest condition, and based on the best forest science available. Extended rotations, low impact methods, and good stewardship will be emphasized. Selective thinnings will promote uneven-aged stand structures. Management will seek to maintain and restore native biodiversity, using natural disturbance regimes as a guide. On portions of the property, restoration will seek to recreate pre-settlement forest conditions. Trees will be harvested at levels substantially below growth. Management will meet SmartWood standards for Forest Certification.

5. Environmental Protection

   The protection of biological resources will be implicit in all phases of planning and management. Soils will be protected from adverse harvest impacts. Water quality and riparian function will be maintained or improved. Unique plant communities, biological legacies, coarse woody debris, and wildlife habitat will be inventoried, permanently designated in the field, and protected.

6. Monitoring and Assessment

   Setting specific performance goals, assessing progress towards them, and adapting the management approach when necessary are essential if management is to be sustainable over the long-term. The success of stand structure and regeneration goals, coarse woody debris and snag recruitment policies, and timber growth projections all rest on careful and ongoing monitoring.

GENERAL RECOMMENDATIONS

The prospects for achieving Benton County's objectives for the Fort Hoskins Park are excellent. Active management, in the near future, is necessary to reverse several trends that run counter to those objectives.

First Priority -- Centuries-old Oregon white oak are dying each year as they are crowded out by faster growing fir. Removing fir competition by thinning in these stands will stop this process and reverse the decline of irreplaceable oak.

Second Priority -- Loss of open meadows to rapidly encroaching Douglas-fir regeneration must be stopped. With each year that passes, this will become more difficult and costly, as young fir continue to grow rapidly.

Third Priority -- Thinning young, overstocked Douglas-fir stands will promote growth and vigor within the forest.

Fourth Priority -- Control of evergreen blackberry and scotch broom invasion is the first step in promoting native vegetation and reducing the abundance of non-native species. By attacking localized clumps of blackberry and scotch broom now, seed dispersal will be limited, and future control less costly.

To address these needs six specific management actions are recommended. Operational considerations follow:

1. Conduct property baseline inventories on wildlife and plant communities. This should be done before harvests begin.
2. Begin a program of selective harvests. Releasing at-risk oak and overcrowded fir are the first priority. Tree clearing for oak savanna restoration and other park development will be done in conjunction with initial harvesting.
3. Savanna restoration and maintenance. Cut young fir within meadow areas and begin a program of prescribed burning. Effects will be monitored.
4. Mark snags, wildlife and legacy trees. Create additional snags.
5. Develop forestry demonstrations and educational materials.
6. Maintain boundary lines.

If this active management approach is undertaken, several trends can be expected: (1) The restoration of open space/oak savanna will be initiated (by cutting young fir), which for success must be followed by annual field maintenance work; (2) thinning Douglas-fir stands will enhance the growth diversity of the forest, as hardwoods and "minor" conifer species are provided with more growing space; (3) as important biological resources are identified and protected in the field (snags, legacy trees, coarse woody debris, reserve areas), the forest will become a richer, more natural forest ecosystem with time, and; (4) as the total conifer volume slowly rises, the sustainable annual harvest will rise also, giving the County more financial return.

Continuing this approach requires flexibility and adaptability in the management approach to avoid some potential future problems, such as:

- Sustainable harvest levels at the forest level do not assure that individual stand thinnings are sustainable. Care must be taken to not over-thin individual stands. Some stands will not support thinnings on a regular cycle and may be passed over.
- New disturbance from meadow clearing will provide space for re-invasion by both native plants and non-natives. Maintenance activities will have to adapt and evolve as these changes are monitored and the success of various strategies is evaluated.

- Rapid growth of young Douglas-fir will gradually restrict some of the desirable views from the ridgetop trail and newly opened view corridors. At the time of each thinning cycle, these critical views should be renewed by the harvest of selected trees, if necessary.

OPERATIONAL DETAILS

Recommended activities are detailed below. The specific timing, revenues and costs from proposed activities are found in the Management Priorities outline which follows.

Silvicultural principles

The desired future forest will feature stands characterized by large trees, a mix of species and ages, diverse wildlife habitats and a wide range of native biodiversity. However, it may take several harvest entries and decades to attain these conditions. Uneven-aged structure will be evident between stands before it is realized within stands. Trees exceeding 24" dbh and 100 years old will be cultured, though in many locations only 2–4 such trees per acre will be retained long-term.

Regeneration attempts may be delayed for several entries when stands are fully stocked and growing well. Group selection harvesting and natural regeneration will be preferred, though planting will be used when advance regeneration is absent. To maintain a balance of age classes, active regeneration will be encouraged in understocked or poor quality stands of any age.

Conservative harvest levels are necessary over the first two decades, to allow a portion of the forest to become more mature. Sustainable harvest levels will increase during the second and third decade.

Plant and Wildlife Inventories

Baseline data collection to date has focused on the forest resource. With the County's planned long-term ownership and extensive management plans, additional property baseline information is needed. Plant community and wildlife inventories are recommended. Ideally these should be completed before timber harvesting. Specifications for a plant inventory protocol are being developed (final report expected 4/15), with bids to be solicited later this spring. The inventory will cost from $2,000–4,000, depending on the intensity of sampling desired.

Also recommended is a baseline wildlife inventory, to evaluate wildlife use of the property and assess habitat structure and quality. Base-level assessment would provide a qualitative assessment of habitats present, a census of species encountered and, and a list of likely inhabitants. More detailed investigation would provide quantitative measures of actual wildlife use. Expected costs range from $800 (qualitative, recommended) to $2,000 or more (quantitative, optional).

Results of plant and wildlife inventories should be attached to this plan.

Timber harvesting

Of the 76± forested acres, 17 acres are reserved from management (types 3,10,12), leaving 59 manageable acres. These manageable acres include 8 forest types, two of which (types 1 & 8) do not currently need thinning. Of the remaining 48± acres, most would benefit from light thinning to reduce crown competition, favor better trees, and in some stands, open space for declining oak trees. The first cycle of proposed periodic thinnings through the forest stands will provide net income of approximately $35,000 to Benton County for park development and maintenance.

A second harvest should be needed in young fast-growing stands by 2006, with successive harvests alternating between two operating units on roughly an 8-year cutting cycle, with cutting somewhere on the property every 4 years.

Savanna restoration and maintenance

Initial clearing of Douglas-fir from the meadows is not expected to produce net revenue. For economy this should be combined with commercial thinning in adjacent type 2 (stumpage from type 2 subsidizing field clearing, piling and burning in type 11). For increased demonstration value this harvest should use a different contractor and/or equipment set than used elsewhere on the property. Ongoing maintenance will involve annual burning, rotating between 4 operating units (each burned once every 4 years). Recommended practices are discussed under Savanna Restoration.

Wildlife tree marking

When planning initial harvests, wildlife and legacy trees and other resources of unique value for preservation will be identified and marked, on a forest-wide basis. It is particularly important to mark these in harvest areas before any cutting begins. The wildlife habitat most lacking in the forest is large woody debris (rotten logs). In addition, large snags are below target levels. Active snag creation is recommended to increase wildlife habitat and, over time, coarse woody debris levels. Large trees that have heavy limbs or other defects (and that are in safe locations) should be marked and girdled (1 tree/acre, with half >20" dbh).

Forestry demonstration

To effectively realize forestry demonstration opportunities a forestry education program should be initiated. In planning initial harvest(s) forestry demonstrations opportunities should be noted. Photos should document each phase of park development, especially restoration efforts. Following the initial harvest, education and interpretive materials should be developed. A range of approaches are possible, from a central kiosk with explanatory materials, to a self-guided interpretive trail, to periodic forestry field days or guided tours.

As the County does not have in-house capability to develop a forestry education program, partnerships with OSU Department of Forestry, OSU Cooperative Extension Service, or Oregon Small Woodland Owners Association should be considered. ITS Management can also provide assistance.

Boundary line maintenance

Property lines in many locations are difficult to follow, and should be maintained. Lines that are blazed and painted are highly visible, and act to preserve survey evidence and discourage timber trespass. Boundaries should be maintained at no less than 10-year intervals.

Recordkeeping

Record keeping is an important part of the planning process. Harvest summaries and marking tallies prepared by the forester should be supplemented with non-timber resource information. Each planting should be recorded, along with information including number and species of seedlings, planting date and location. A sample Forest Monitoring form is included in the appendix.

The property base map should be updated regularly to reflect changes. The forest should be re-inventoried and the management plan updated at 10 year intervals, or as necessary.

Table 2
MANAGEMENT PRIORITIES
2000-2020

year	type	activity	acres	mbf	income/ cost[1]
annually	11	Prescribed burn	10-15	- -	($0-1,000)[2]
	11	Monitor[3]	46	- -	???
2000	all	Plant inventory	- -	- -	($2-4,000)
	all	Wildlife inventory	- -	- -	($800)
	2,11	Development cut and thinning	30	70	$5,000[4,5]
	4,5,6,7,9	Thin	29	90	$30,000[5]
	all	Mark legacy and wildlife trees	76	- -	$0
	all (esp. 3,10)	Create snags (girdle 75 trees)	76	- -	($0-200)[6]
	all	Maintain boundary lines	- -	- -	($500)
2001	all	Develop forestry interpretations	- -	- -	($5-10,000)
2006	2,7	Thin	26	90	$30,000[5]
2010	all	Re-inventory timber	76	- -	($2,500)
	1,4,5,6,9	Thin	26	90	$30,000[5]
	all	Maintain boundary lines	- -	- -	($300)
2014	2,7	Thin	26	100	$35,000[5]
2019	1,4,5,6,8,9	Thin	32	110	$40,000[5]
2020 +	all	Re-inventory, update management plan	- -	- -	($4-6,000)
		Continue sustainable harvests			???
		Mark biological resources in field			$0
		Maintain boundary lines	- -	- -	($300)

Notes:

[1] Based on 2000 average stumpage values and management costs. Future log prices (inflation adjusted) will likely be higher.

[2] Using Oregon Department of Forestry trainees and volunteer labor. Some oversight by Benton County and ITS forester will be required. Site preparation will be required for each initial burn (first 4 years).

[3] Monitoring schedule may be adjusted to less frequent intervals after initial 3-5 years.

[4] Stumpage value of merchantable timber in type 2 subsidizes clearing for development and restoration in type 11.

[5] Net stumpage income after forester fees (average 8%).

[6] Marking during timber harvest at no extra cost. Girdling by logging contractor corrections work crew.

GROWTH & YIELD

Table 3 below illustrates the way the forest will develop if recommended harvest levels are followed. This schedule will meet County goals of promoting forest health, minimizing harvest impacts, and yield frequent periodic income. Sustainability will be insured as harvest levels are well below growth. While forecasting the forest growth and harvest levels beyond the first 10- year period is more speculative, it is important to look further ahead, towards what the forest will look like in a more mature state.

This schedule would: (1) Build timber volume over time by cutting only 30–40% of annual growth (letting the forest become more mature), and (2) allow increased harvest levels over time, more closely matching annual growth. Annual harvest could eventually reach 30 MBF on a sustainable conifer volume of about 1,500 MBF. The value of annual conifer growth increases from $320 per acre in 2000 to $630 per acre by 2020 (in year 2000 dollars).

Assumptions: For growth and yield purposes, volumes are based on the March 2000 cruise estimate of conifer volume of 10,607 bd.ft. per acre, on a 59.2 acre current management base (types 3,10,11,12 are excluded), or 628,000 bd.ft.. Hardwood volumes were not considered (most hardwood will be reserved from harvest for the first decade or more).

The cruise estimated basal area growth at 7.3 percent. For the growth and harvest estimates between 2000-2009 we used a 9% growth rate, which we consider conservative for stands of this composition and productivity.[2] A rate of 7% was used after 2009, reflecting slower growth as the forest ages.

Table 3: Growth and Yield Projection (MBF)

Year	Starting Volume	Harvest Volume	Growth	Year-end Volume
2000	628	-160	57	525
2001	525	0	47	572
2002	572	0	51	623
2003	623	0	56	679
2004	679	0	61	740
2005	740	0	67	807
2006	807	-90	73	790
2007	790	0	71	861
2008	861	0	77	938
2009	938	0	84	1,023
2010	1,023	-90	72	1,004
2011	1,004	0	70	1,075
2012	1,075	0	75	1,150
2013	1,150	0	80	1,230
2014	1,230	-100	86	1,216
2015	1,216	0	85	1,301
2016	1,301	0	91	1,393
2017	1,393	0	97	1,490
2018	1,490	0	104	1,594
2019	1,594	-110	112	1,596

[2] Basal area growth measured stem radial increment, and does not include height growth. Board foot volume growth incorporates height growth, ingrowth and log scale effects, with a resulting growth rate 2–4% greater than basal area growth. See Economic Analysis in Findings section, and appendix.

SAVANNA RESTORATION

Most of the open fields and the previously clearcut ridgetop will be managed as savanna — groves of oak and fir interspersed with extensive openings of grass and young shrubs. This will require active manipulation of the existing vegetation, as most areas, if left untreated, would naturally succeed to a closed Douglas-fir forest in only a few years time.

Recreating a forest similar to that found at Fort Hoskins in the mid-1800s will require a dual strategy — active restoration and maintenance. While interest in protecting and restoring native Oregon oak savanna has increased in recent years, few proven methods of creating and maintaining these forests exist. As such, to be successful any approach must be adaptive. Small scale efforts which minimize disturbances will offer the greatest chances of success, as the remaining native vegetation is often under considerable stress. Trials of various approaches will determine what works best at this particular site. Monitoring will be critical in tailoring the treatment to the site as knowledge evolves. Larger scale treatments can then be effectively applied.

Tree removal

Of immediate concern is to stop fir from encroaching into pasture and meadow areas. Seedlings (up to 6' tall) can be merely cut and left. Conifers cut below the lowest live branches will not regrow, and should rot quickly. Large trees can be harvested and sold. Trees that are too small or poor quality to make sawlog grade may be sold as pulp, though at reduced returns. Trees below marketable size (under 8" stump diameter) present the greatest challenge, since they have considerable biomass but no marketable wood, and will not rot quickly. Often with heavy limbs extending to the ground, they are difficult to fall with a chainsaw. Bulldozing is not recommended, as exposed soil would encourage the spread of scotch broom and blackberry.

Several options exist:

1. Chainsaw harvest of all trees. Utilize large sawlogs and large pulp. Pile tops, branches, and undersize trees by dozer-mounted rake or excavator[3]. Cover and burn in fall. This option has the least logging cost, but reduces gross income and has the largest slash volume and soil impact.

2. Mechanical harvest of all trees (recommended). Harvest with single-grip processor. Utilize all saleable sawlogs and pulp. Pile branches and undersize trees by excavator with rake. Cover and burn. This option has the greatest logging costs, greatest gross income, and least slash volume and soil impact.

3. Chip piled slash. Replaces the pile and burn portion of option 1 or 2. This would add cost but eliminate delays, impacts and costs of burning. Chips could be sold as hog fuel, or retained on site for park development.

Table 4: Estimated costs for land clearing options (entire type 11):

Harvesting	Logging cost	Timber income	Pile/burn cost	Net income/cost
Chainsaw / burn	($4000)	$1500	($500)*	($3000)
Processor / burn	($6000)	$6000	($4000)	($4000)
Chipping	**Chipping cost**	**Chip income**	**Trucking**	**Net income/cost**
Hog Fuel	($4000)	$2000	($2000)	($4000)
Landscape chip	($4000)	- - -	- - -	($4000)**

* Burning cost only, piling included in logging operation.

** Chips left in several piles on site.

Note: All costs are approximate, and intended only for general comparison of alternatives.

[3] Broadcast burning would eliminate piling costs, but resulting burn would be variable — incomplete in many areas.

Initial clearing should occur as soon as possible. To limit site impacts, harvesting should be scheduled for summer or early fall 2000. Log landings and burn piles should be located in road rights-of-way or other development areas. Beyond development areas mineral soil exposure should be minimized to prevent the spread of exotics. Tree clearing in development areas should occur in conjunction with savanna restoration. For economy, land clearing should be combined with commercial thinning in adjacent stands.

Maintenance of openings

Once cleared of trees, openings will need regular maintenance to prevent future encroachment of both trees and invasive exotics. Several options exist:

1. Broadcast burning (recommended). Regular prescribed fire in small units at 4–6 year intervals. Prepare each unit before burning to limit risk of wildfire and protect young oak. Burn in early fall. Reseed or allow natural recovery.

2. Mowing. Annual or biannual treatment by tractor (bush-hog), hand mower, or weed-whacker (brush blade) as terrain permits. Correction work crews could be used in some areas. Early summer (June) mowing would best control scotch broom and blackberry.

3. Herbicide/mowing combination. Frequent mowing in high use areas, with hand cutting or herbicide treatment in other areas as required to control undesirable brush.

Burning is economical, most compatible with other ownership objectives, and is the preferred method. Fall burning was used by Indians to preserve an open landscape. Fires set after the first rains of the season (late September) will kill fir seedlings, woody shrubs and weeds without damaging grass crowns or larger trees. Oak, hazel, camas, and other vegetation important to native culture are well adapted to this regime.

Field areas divide readily into four treatment units of 10–15 acres each: parade ground and environs, south hillside, north hillside, and northwest meadows. Further divisions could be made if smaller treatment blocks are desired. Due to the advance build-up of fuels, initial treatments will require preparing the site before burning. Any trees to be protected should have fuels pulled back from the base (within 2 ft.), and lower branches pruned (to a height of 5 ft.). Fuels within 3–5 feet of small trees (under 5 ft. tall) should be close-mowed. For better combustion, tall blackberry or broom should be hand-slashed or crushed by machine before burning. Immediately before ignition, firelines should be established by close-mowing a 2–4 foot-wide edge, followed by back-burning. Edge trees not will need pruning if a fireline is established 3–5 feet away from the drip-line of tree crowns. At most field edges a natural look is preferred (compared to bare tree trunks).

Seeding for reintroduction of native species, if desired, should occur as soon after burning as practical. Specific seed mixtures, seeding rates, and seed sources will be based on the findings of the plant inventory.

Maintenance costs

Labor requirements for maintenance are speculative, as few projects of this scale have been attempted locally. Young fir could be slashed, and oaks pruned and bases protected by prison work crews, at an estimated 2 crew-days per treatment unit. Tall blackberry and scotch broom could be machine-crushed by logging contractors as a negotiated part of any scheduled harvesting. Prescribed burning can be done at no cost by Oregon Department of Forestry, as a crew training exercise (Steve Elefant, personal communication). Treatment units of 10–15 acres could be burned in 1–3 days, depending on weather. Seed costs will vary based on species and seeding rate recommendations.

Additional considerations

While burning is an economical and ecologically-suitable means of creating and maintaining desired certain forest and plant communities, it is a politically-sensitive practice, and one which requires careful oversight and timing to be successful. Neighbors and the general public are extremely sensitive about smoke management and the risk of wildfire. Positive public relations will be key in any successful burn program.

Skillful planning and management of prescribed burning greatly reduce, but do not eliminate the risk of escaped burns. Control costs of any escaped fires would become the liability of the County. To be effective, burning must be done within a narrow window of ideal conditions. State smoke management restrictions may limit days available for burning, but when burning is done by ODF crews as training exercises these rules are waived.

Skilled oversight and a properly equipped and trained work crew are essential. While technical assistance can be provided by ODF (Steve Elefant) and ITS Management, the County should seek to develop burning expertise in-house[4] . This will ensure continuity of the burning program in the event ODF labor becomes unavailable in the future. A volunteer crew of 10–12 could assist ODF workers, and gain valuable training. Prescribed burning could become a valuable tool for other County park sites.

VIEWSHED MANAGEMENT

The Fort Hoskins site was chosen for its commanding overlook of Kings Valley and the Luckiamute drainage. In ensuing years the heavy growth of conifers blocked many of these views. While recent timber harvesting and open fields have helped retain some vistas, conifers are again rapidly encroaching, limiting views available to park visitors. Active and ongoing management will be required to maintain desired views. A map is found in the appendix.

Viewshed management should entail two steps, development and maintenance. First, important views should be identified (both desirable and undesirable). Most appealing are distant views to the south and northwest from the ridgetop, and south and west of the parade grounds. Initial clearing for park development should remove trees in these viewsheds. Clearings should have edges that are “soft” and natural, rather than abrupt and linear. Windfirmness of edge trees is critical. Undesirable views are primarily near views to the west of the parade grounds (the tavern and nearby buildings), where vegetative screens should be retained.

Maintaining viewsheds will require periodic cutting of fast-growing conifers as they interfere with views. This is best done as a part of routine cutting elsewhere on the property. Each clearing should anticipate height growth of residual trees over the next 10 years. Of particular concern are upslope portions of type 7, where fast-growing young conifers on gentle slopes will disrupt views northwest from the ridgetop in the coming decades. Conversion to oak savanna, high thinning and short rotations are possible strategies here.

MONITORING

Regular monitoring of management practices and their results is necessary to best achieve ownership objectives. This is especially critical in savanna restoration efforts, where aggressive exotic grass and shrub species will compete heavily following disturbances. An effective monitoring program allows management practices to adapt to site-specific conditions, and in response to evolving knowledge.

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4 Training for County personnel and volunteers can be provided by ODF at no cost.

For monitoring to be effective it must be easy to implement and be made a routine part of operations. Concise and measurable indicators will help ensure consistent results when monitoring over extended time periods, and as management is evaluated by various personnel. Key indicators are specified in the detailed Forest Policy (see appendix) and are summarized below.

Table 5: Monitoring Indicators

Indicator	Standard	When monitored
regeneration	200 trees/ac planted or naturally reseeded if overstocking <80 sq.ft. BA	Harvest planning
woody debris	A target of 20 tons/ac is maintained	Harvest planning, 10-year timber inventory
reserve trees	Stand averages of 2 wildlife trees, 4 snags and 4 legacy trees are achieved over time	Harvest planning
skid trails	Skid trails, roads and landings cover <10% of the forest	During harvesting
erosion control	Erosion control devices are correctly installed and effectively shed water	Post-harvest
growth rates	Timber volume growth averages 8% for young stands, 4-6% as stands mature	10-year timber inventory
understory vegetation	Native species predominate, exotics are reduced in numbers	10-year timber inventory, annual photopoints

Additional indicators for savanna restoration will be developed as a part of the baseline plant survey. The results of this survey[5] will include a map and assessment of existing savanna plant communities, a current species list, and identification of desired future (target) conditions. The survey will be qualitative in nature, describing species richness, relative quantities, plant vigor, and the presence of exotics or external threats. This survey is scheduled to be conducted at 10-year intervals to coincide with the timber inventory and management plan update.

Annual photo monitoring will be used to assess plant community changes between 10-year surveys. A set of 6–8 permanent points should be established at representative locations (4 points in type 11; one each in types 2, 5, 6 and 7). At each point 4 photos[6] will be taken annually during August or September, with care taken for consistency between observations (same camera, lens, vertical angle, etc). Photos will be analyzed for presence of exotics and relative changes in understory and ground cover conditions. Observations will be recorded and photos cataloged for future reference.

Standardized monitoring forms will allow consistent collection and recording of monitoring data, with suggested examples found in the appendix. Observations should be recorded during routine operations whenever possible.

A thorough assessment of monitoring results should be a part of the 10-year management plan update process. This review of practices, results and ownership objectives is key to the adaptive management cycle.

[5] To be conducted prior to timber harvesting

[6] In cardinal directions (north, south, east, west). A 5th photo will be taken in forested stands (pointing up) to document overhead shade conditions.

PROPERTY FINDINGS

Economic Analysis

The March 2000 cruise estimated a net timber volume of 850,000 board feet on 73.3 timbered acres, or 11,592 bd.ft./ac. Basal area growth was measured at 7.3 percent. Managed conifer stands on similar sites typically have volume growth rates in the range of 6–8%, higher when young and decreasing with maturity. When large numbers of small trees are present (as in types 2 and 7), growth on currently undersized trees can account for an additional 2–4% (termed ingrowth). Hardwood and mixed stands are growing significantly slower than the property average, due to maturity, low stocking, and the slower growth inherent in hardwoods. As understocked mixed stands (types 1 and 8) naturally develop higher stocking, growth rates will increase.

For long term economic analysis, stumpage appreciation must also be considered. Over the past 3–4 decades stumpage appreciation has averaged 1–2% above inflation. Total rate of return is the sum of three components — physical growth, ingrowth, and stumpage appreciation. Total growth for the Fort Hoskins forest is likely in the range of 10–14%. For growth and yield projections, a conservative 9% growth rate was used for the first decade, and 7% for the second.

Wildlife & Biological Resources

The Fort Hoskins forest has a rich variety of biological resources. The opportunistic cutting of the 1980s passed over defective trees and clumps of smaller trees, leaving some remnant older forest character, mostly found in types 1 and 10. A few oaks escaped recent harvest, offering opportunities for savanna restoration (types 6, 7 and 11). Maple, cherry and alder are common in types 1, 3 and 9. Deer, elk, woodpeckers, raptors, songbirds, and coyote were observed as inhabiting the forest. A more complete wildlife use assessment should be prepared.

SNAGS

The timber cruise found 7.7 snags per acre on the property, of which 7.2 are Douglas-fir and 0.5 maple. Snags range from 6–60" dbh and 12–68' tall, but most are recently dead smaller trees (57% of stems average 9" dbh, decay class 1 or 2). The number of large snags is inadequate to sustain large populations of many woodpeckers and smaller foraging birds (<2 snags per acre over 11" dbh). The target of 2 live and 2 dead snags per acre (with at least 20% >24" dbh) can be attained over time by: (1) creating additional snags by girdling or other means, (2) permanently protecting potential wildlife trees that will become large snags over time, (3) restricting salvage of scattered dead trees and (4) marking and protecting existing snags from logging damage.

COARSE WOODY DEBRIS

Down woody debris is an important part of forest wildlife habitat and a future source of organic matter for soil structure and fertility. It is especially critical for conserving moisture and fertility on drier sites. Coarse woody debris levels were measured at 8 tons per acre property-wide, compared to a minimum target of 20 tons per acre. Most of this material (74%) is small recently fallen logs (avg. 10" diameter). There is a scarcity of large down logs, a concern for long-term CWD levels. Deficiencies can be remedied by: (1) leaving cull and pulpwood log sections lie in the woods, (2) allowing the natural decline of living and dead snags, and (3) preventing larger trees that die in the forest from being salvaged. If tree loss is widespread and represents significant economic loss, salvage should occur.

FOREST UNDERSTORY VEGETATION

The forest includes understory plant communities typically associated with stands in succession toward the Douglas-fir / western hemlock climax forest type of Oregon Coast Range. Native species are dominant in most areas. However, in abandoned fields and disturbed areas, invasive non-native scotch broom, evergreen and Himalayan blackberry have choked out native vegetation, including conifer seedlings.

On drier south-facing slopes hazel, ocean spray, bracken fern and poison oak tend to dominate the understory. Scattered white oak is found in the overstory and as seedlings at stand edges. With more moisture, or on north aspects, vine maple, Oregon-grape, snowbrush, salal, thimbleberry and sword fern become more prominent.

OAK SAVANNA PLANT COMMUNITIES

Called "Open Woodland" by early surveyors, these savanna-like areas were dominated by groves of white oak and Douglas-fir with camas meadows and other berry, root, nut, and fiber crops cultivated by the local indigenous people.

In a recent survey of the meadow/oak savanna (Type 11), the following herbaceous perennials were found: *Achillea millefolium, Senecio spp, Fritillaria lanceolata, Iris tenax, Sidalcea hendersonii,* and *Hackelia micrantha*. These plants are commonly a component of tall forb prairie communities. However, the meadow/oak savanna has a thick cover of non-native grass species and other introduced forbs such as *Hypericum perforatum, Cirsium spp., Taraxacum officinale* , and *Daucus carota*.. On the higher elevation portion of the site, heavy browsing by large ungulates, probably local elk and deer, contribute to perpetuating the non-native grass cover. Some of the species, *Dicentra formosa, Trientalis latifolia, Osmorhiza sitchensis, Disporum hookeri,* and *Erythronium oreganum* are more commonly found in adjacent forest and forest edge plant communities.

The oak savanna forb community is presently in a degraded state as a result of prior forest and agricultural practices.

SPECIAL HABITAT & CONSERVATION ZONES

The property includes areas where timber harvesting could have undesirable impacts on wildlife habitat or sensitive resources. Steep slopes southeast of the ridge have erosion and equipment limitations, and contain older trees and diverse vegetation. These areas (type 10) and riparian stands (type 3) are recommended as biological reserves. The streams on the property do not directly provide fish habitat, but do contribute to downstream water quality. The eastern stream is the park's water supply, and must be given the highest level of protection. Roadside trees in type 1 should be retained to protect aesthetic values.

LANDSCAPE-LEVEL CONSIDERATIONS

From a landscape perspective the Fort Hoskins forest is not currently unique — 30 to 50 year old stands are fairly common in the surrounding area. However, it will become more unique as the forest ages. Over the past two decades harvesting has intensified nearby, as many owners (especially forest industry) consider 50-year old trees to be financially mature. No significant tracts of older timber are found within several miles.

Across the property older stands will naturally begin to develop old forest character as they age. Management can accelerate this natural development by retaining legacy trees and encouraging age and species diversity. Over the next 10 to 20 years the Fort Hoskins forest will play an increasingly important local role as a old forest, even though of a modest acreage.

Cultural Resources

The area of greatest historic and cultural significance is the site of Fort Hoskins, located in the southwest portion of type 11. Officers quarters, soldiers quarters and worker housing surrounded an upper and lower parade grounds situated on a bench above the Luckiamute River Valley. No structures from this period remain. The Dunn house and outbuildings occupy the site of the fort hospital, and date from around 1870. The ruins of several barns and outbuildings, an old orchard, and the ruins of the Hoskins school now occupy the fort site, and date from the 1900s or later. Few other areas of the property have notable historic or cultural significance.

For more information see Cultural Resources Overview and Preliminary Interpretive Themes for the Fort Hoskins County Park by David Brauner and Nahani Stricker (1994).

Riparian Areas

The property has important riparian resources. Two small perennial streams originate on the property. These are unclassified by ODF, but both are likely small non-fishbearing streams (Type-N). The eastern stream would be considered a Type-D stream, as it serves as a water supply (with legal water rights). Both Type-N and Type-D small streams have legally mandated 10 foot vegetative buffers, but no tree retention requirements. A written plan is required for operations within 100 feet of Type-D streams. The springs and small ponds associated with these streams are important year-round water sources for wildlife, and are visually attractive. Riparian zones (type 3) should be reserved from any timber management.

Skid trails should avoid riparian zones (within 50-100 feet of streams) to the greatest extent possible. Soil mobility from past harvest activities appears to be minor and localized. Locating wildlife and legacy trees in riparian zones will provide the greatest benefit to wildlife.

Soils

The soils of Fort Hoskins are productive to very productive (high Site III to mid Site II). A small wet flat in the extreme south is the only area unsuited to forest growth. Other soils are all well suited to rapid growth of Douglas-fir and grand fir, as well as bigleaf maple. Oregon white oak is a minor associate on south and west facing slopes. A soils map is found in the appendix.

Benches and gentle slopes in the west of the property are dominated by Jory silty clay loams at 2–12% slope. These soils are moderately deep, well drained, and productive (high Site III). Effective rooting depth is 20–40 inches, with a moderate water holding capacity. The high clay content makes these soils easily compacted by machinery, but there are few other hazards.

Moderate to steep slopes to the south and east are dominated by Bellpine silty clay loams at 12–50% slope, with similar qualities to Jory soils but moderate to severe equipment limitations and erosion hazard due to slope.

Moderate slopes in the center of the property are dominated by Apt silty clay loams at 25–50% slope. These soils are deep, well drained, and very productive (mid Site II). Effective rooting depth is greater than 40 inches, with a high water holding capacity. These soils are easily compacted, and have moderate to severe equipment limitations, erosion hazard and landslide risk. Peavine soils along Luckiamute Road are similar.

Waldo silty clay loam soils occupy a wet flat along Luckiamute Road. These are deep but very poorly drained, wet most of the year, and unsuited to forest growth.

Forest Health and Protection

Management activities within the forest can either increase or decrease the risk of forest loss or decline from fire, wind, soil disturbance, insects and disease. Forest protection is accomplished through thoughtful actions that reduce this risk.

INSECTS AND DISEASE: At present there is little evidence of serious losses from insects or disease at Fort Hoskins. Potential disease agents include Swiss needle cast disease (P. gaeumannii), laminated root rot (Phellinus weirii), red ring rot (Phellinus pini) and brown cubicle rot (P. schweinitzii). Potentially damaging insects include Douglas-fir tussock moth, western spruce budworm and western oak looper. Many native insects and diseases are likely present at low levels in the forest, and may cause minor annual volume losses. Older, less vigorous trees that have prior stem injuries can lose most of their merchantable value as rot progresses. Healthy trees are generally resistant to decay.

The greatest current risk is presented by Swiss needle cast, a native fungal disease, which has recently affected Douglas-fir over a wide area of the Oregon coast range. Serious disease symptoms, which include needle loss and growth decline, have been spreading annually. The sudden increase in severity of this problem illustrates the potential risk to the forest from disease, and the wisdom of encouraging multi-species stands that are inherently less vulnerable.

The best overall protection against disease and insects is to promote a healthy, diverse forest with abundant wildlife habitat. Healthy trees are much better at resisting disease and insect attacks. Diversity in tree species reduces the chance of insect and disease infestations, and lessens the impact if one tree

species is lost. While Douglas-fir is dominant at Fort Hoskins, encouraging other species will help maintain long-term forest health. Regeneration plantings should feature multiple tree species. Soil protection and thinning to increase stand vigor will help safeguard the forest. By increasing the wildlife habitat, the natural control by feeding birds, mammals and other insects will be enhanced.

FIRE RISK: While fire can play an important role in forest ecosystem dynamics, the risk of catastrophic loss from wildfire is always a concern. The two primary causes of wildfire are "Man" and "Lightning". This plan stresses (1) reducing the risk of an uncontrolled fire starting and (2) reducing the potential size and hazard of any wildfire by controlled burning, upgrading and maintaining roads and trails, minimizing slash concentrations, regulating recreation use, and maintaining basic suppression equipment (shovels, crawlers, etc.). Following basic Department of Forestry rules on fire safety is important, especially when harvests coincide with late summer fire season.

BLOWDOWN: Blowdown and snow breakage are minor threats. While some areas have moderate exposure to periodic high winds, soils are deep and well-drained, at low risk of windthrow. Trees that are exposed after a harvest are susceptible to wind or snow damage until they become acclimated to the new conditions. Light intensity thinnings which retain vigorous trees minimize this threat. Trees are generally stable and vigorous, and have adjusted to any trauma associated with past cutting.

NON-NATIVE PLANTS AND ANIMALS: Scotch broom and Himalaya and evergreen blackberry are invasive, non-native weeds present in dense thickets that threaten to take over fields and forest openings (type 11). However, where conifers are rapidly established, they eventually shade out blackberries and broom (types 2, 7). Weed populations should be monitored, as shade tolerant blackberry can invade even moderately well-stocked stands.

To control the spread of exotics, problem areas should be routinely mowed or burned. Plants encroaching on field edges should be pulled or hand cut. For best control, mowing or cutting should be done in early June. Specific control strategies are found under Savanna Restoration.

Recreation and Aesthetics

Fort Hoskins will be posted to prohibit public access until recreation facilities are developed. Detailed plans for recreation development have been made, with construction anticipated to begin fall 2000 (contingent upon funding). Facilities for medium density day-use will be developed in the southwest portion of the Historical Interpretation / Savanna Zone. Hiking trails (with interpretation materials) will be developed within the Sustainable Forestry Demonstration Zone. Other than foot trails, there will be no development in the Biological Reserve Zone.

As a public park, aesthetics are very important, especially in areas visible from park facilities, roads and main trails. As a forestry demonstration area, no attempt will be made to “hide” harvesting from trails (outside of historic interpretation areas). However, log landings and haul roads shall be kept to the smallest size practicable, and reseeded immediately after use. Several portions of the property are visible in distant views from the surrounding valley. Light-impact harvests will have minimal visual impact from close-up or afar.

Special features to emphasize in planning trails include large “character” trees along the southeast ridgeline and in type 4, tall maple in type 10, several riparian features along the northwest stream. Impressive views are available from the ridge, but need development and maintenance (see Viewshed Management).

Trails should be placed within several forest types to facilitate diverse forest stewardship demonstrations. Trails and interpretive displays should be designed with frequent timber harvesting in mind. Signing should be easily removed and reinstalled to prevent damage. For ease of post-harvest maintenance trails should have minimal improvements, and avoid log landings and main skid trails.

Access and Roads

The Fort Hoskins Park has a network of earth-surfaced roads that provide access to most portions the property. The northwest access road will be redesigned to serve as the primary year-round access

point (must accommodate loaded log trucks for 3-season use). The current “main road” to the southwest will serve only as a minor secondary access.

Roads not required for the historic interpretation area will be gated to restrict vehicle use. Access to the caretakers house and water supply will be rocked, with most other roads remaining dirt-surfaced. Consideration should be given to providing a light rock surface (2–3” deep) on the main road to the ridgetop for late season burning and possible emergency access. Haul roads can serve as recreation trails when not in use for timber harvesting.

Old landings and skid trails are in place over much of the forest. Most skid trails are well-designed and conveniently located. Some are unnecessary, and should be decommissioned as encountered in harvest planning. The overall goal of restricting trails, roads and landings to 10% of the property (forestry demonstration area) can easily be achieved. This is met when skid trails average 150 feet apart.

Two old farm roads cross the northwest stream, with water passing through rocky fill (no culverts are visible). Any fish passage is blocked by fill at the western crossing. While roads appear to be stable, surviving recent peak flows, they do not meet current ODF standards for forest roads. If modified they will require major rebuilding to meet current guidelines. They are inadequate for use as haul roads, though the western crossing may be adequate for skidder or forwarder passage.

An old road leads from the caretakers house past the spring, following the east boundary to a saddle near the ridge. With it’s close proximity to the spring it should be decommissioned for all except emergency use. With a gentle grade, its position below the steep north slope and a tree cover of towering maples it is a good location for a recreation trail.

Boundaries

The property was surveyed by Benton County in 1983 by John Howell, who found or set monuments at all corners, including a central lot division. County tax records indicate a total tract area of 128.36 acres, however, Howell found 125.95 acres. The survey acreage was used for this plan. Boundaries today are generally evident, typically indicated by old fence (N,W,E), changes in timber condition (E,S), or scattered old blazes (N). Portions of north and east lines are difficult to follow.

Boundary evidence should be improved, with blazing and painting offering the best long-term marking. Lines should be inspected and maintained at no greater than 10 year intervals. This will help preserve survey evidence and prevent timber trespass.

Legal Restrictions

The Oregon Forest Practices Act became law in 1972. The Act provides for a set of rules establishing minimum standards (e.g. slash disposal and reforestation requirements) which encourage and enhance the growth and harvest of trees. Harvest rules have also been updated to regulate the maximum size of clearcuts and provide for green tree retention within clearcuts. At the same time, the act considers and protects other environmental resources — air, water, soil, and wildlife. The Act regulates forest practices when they conflict with "special resources" (sites used by threatened and endangered species, sensitive bird nesting, roosting and watering sites, significant wetlands, and biological sites that are ecologically and scientifically significant).

The forest practice rules for streams were revised in 1994, extending riparian protection to much smaller streams and wetlands. These rules require no overstory retention near the small the Type-N or Type-D streams, though understory vegetation within 10 feet must be retained. Both streams on the property are currently unclassified by ODF, but the northern stream is likely a small Type-N stream and the eastern stream a small Type-D. However, it is possible that the ODF could reclassify these drainages at any time. It is advisable to check the status of any stream prior to any operations near it, in conjunction with filing a notification of operations.

The Forest Practices Act requires that an operator, timber owner, landowner or owner's agent, before starting a regulated operation, notify the State Forester. Special harvest permits are required for operations within 100 feet of domestic water supplies (Type-D) and fish-bearing streams (Type-F). Notification and/or permits are required for any commercial thinning or harvest, road building, scarification, burning, or spraying. Harvest and Privilege Taxes must be paid annually for all harvested forest products.

BENTON COUNTY PARKS — FORT HOSKINS FOREST POLICY & PERFORMANCE STANDARDS

I. General

A. Within the Historical Interpretation Area, Fort Hoskins Historic Park will be managed to protect significant historic and cultural resources, and to optimize opportunities for public understanding.

B. Within the Forest Demonstration Area, Fort Hoskins Historic Park will be managed as a sustainable "working forest", with efficient, periodic harvests that optimize returns and seek to protect and enhance the natural forest character of the site.

C. Protecting the biological resources of the forest will be accomplished by emphasizing selective (uneven-aged) silviculture, light-impact harvest methods, and restricting harvests to sustainable levels.

D. Management will strive for a balanced approach, giving sustainable harvest levels, ecosystem protection, and community and social benefits equal consideration.

II. Community and Contractor Relations

A. Public education - Education opportunities are effectively realized.
   1. Forest management and timber harvesting are used as opportunities for educating the public on sustainable forestry, through workshops, tours, or press releases, as appropriate.
   2. Casual recreational users are informed of forest management activities through signage.
   3. The site is available to appropriate groups for forestry study purposes.

B. Community relations - Positive relations are fostered.
   1. Meetings with the Ft. Hoskins Advisory Committee are held annually to provide information on and gather input concerning proposed management plans and activities.
   2. Interested neighbors and the public are invited to an annual Open House, where information on forest management operations will be included.
   3. Boundary lines will be marked prior to any harvest activity. Adjoining property owners are notified before harvest start-up.
   4. Logging is conducted in ways that insure public safety and minimize user conflicts.

C. Contractor relations - Loggers and contractors are viewed as important partners in sustainable management and communities.
   1. Loggers are paid on the basis of measured volumes delivered to the mill, at regionally competitive rates, as determined by negotiated bid. The expectation of extra care taken to protect the resource is included when analyzing bids.
   2. Loggers and contractors from the local vicinity, or with a record of good work on the property are preferred.

III. Forest Management

A. Management plans - Written forest management and harvest plans document the decision-making process used to justify and schedule forestry operations.
   1. Forest management and harvest plans are written and implemented by a professional forester.

B. Adaptive management - The management plan is adaptive, designed to be flexible and change over time, as goals, forest conditions, and our understanding of ecosystems change.

1. The plan emphasizes policies, silvicultural techniques and operational standards to guide management towards specific goals, and deliberately de-emphasizes detailed operational timetables and specific stand prescriptions (experience shows that the later are rarely useful beyond a few initial years).

C. Certification - Forest Demonstration Area management meets Forest Stewardship Council standards for Forest Certification.

D. Plan standards - Specific management plan standards are followed:
   1. The plan is based on a statistically relevant inventory of the timber resource, as well as assessments of other forest values and functions.
   2. Management perpetuates or enhances the full range of forest values and functions, as possible.
   3. The timber is inventoried and the plan is updated every 10 years
   4. The management plan includes:
      a. a summary of management goals and policies
      b. 20-year management priorities, including harvest volume and income/cost estimates
      c. a list of pertinent demonstration opportunities
      d. supporting information (forest type map, aerial photo, forest inventory summary, wildlife and biological resources, growth and yield projections)

E. Harvest plans - Specific harvest planning standards are followed:
   1. Operational plans are prepared prior to any harvest or other significant management activity.
   2. Pre-harvest plans include a detailed map and a brief operational plan. Maps include: stand delineations, cutting boundaries and locations of landings and major skid trails. Plans include: brief silvicultural prescriptions for each stand (using basal area cruise information), volume and value harvest estimates by species, and a description of current markets and potential buyers.

F. Harvest supervision - Specific supervision standards are followed:
   1. All trees to be cut are marked or designated prior to harvest.
   2. All wildlife and legacy trees, and other protected resources are marked in the field before harvesting begins.
   3. All haul roads, skid trails, and landings are flagged in the field before harvesting begins.
   4. Adjoining property owners and interested others are notified before harvesting.
   5. The forester is present to supervise operations as necessary (at logging start-up, frequently during operations, before logger departs site, post-sale).
   6. The forester provides ongoing and final stumpage accounting.
   7. The forester notifies Benton County Parks immediately in case of contract or environmental infractions.

G. Data collection - Management and harvest planning and execution are used as opportunities for data gathering in the field.
   1. Information collected on stand and forest conditions are recorded on forest monitoring reports, and attached to the Management Plan.

IV. Silviculture

A. Science-based silviculture - The silvicultural systems used to accomplish economic and ecological objectives will be suited to forest conditions, and based on the best forest science available.
   1. Ecosystem dynamics are addressed in silvicultural prescriptions (stage of stand development, tree species diversity, presence of gaps or clumps, special biological resources, etc.)

2. Forest management seeks to mimic the size, type, and frequency of disturbances found in natural forests.

B. Desired future conditions - Management will actively move stands towards stated desired future conditions.
   1. The forest has a composed of both uneven-aged stands and even-aged stands of various ages, for regular harvests of high value timber.
   2. The forest contains a diversity of tree species and age classes, and provides high quality wildlife habitat. Trees currently older than 100 years are identified and retained. Alder, grand fir, bigleaf maple and other species are present where appropriate sites exist.
   3. Seedlings and saplings comprise at least 10% of the forest. Every ten years enough regeneration is secured to maintain this balance.
   4. Uneven-aged stand structures are present on approximately 60% of the Tract. Selective thinning is used in areas of high visual and/or environmental sensitivity.
   5. Even-aged stand structures are present on approximately 40% the Tract. Clearcutting is restricted to areas of low visual and/or environmental sensitivity, where insect or disease problems exist, or where income maximization is the primary goal.

C. Harvests levels - Harvests levels are conservative, allowing a portion of the forest to become more mature.
   1. Harvests do not exceed growth during any five-year period.
   2. The allowable periodic harvest is determined by actual between-inventory growth:
   3. Preferred harvest levels are 50–70% of growth for young stands, 80% for older stands.

D. Intermediate harvests - Thinnings are used to promote stand growth and longevity, forest health, and for frequent economic returns.
   1. Thinning is the preferred harvest method.
   2. No more than 30 percent of stand volume is removed in any entry.
   3. In stands with a goal to build diversity and/or uneven-aged structure, harvest trees are selected from across the range of diameters
   4. Harvest cycle is determined from thinning response. Stands are reentered when crown competition slows growth.

E. Regeneration harvests - Stands which are mature, understocked, or at risk of serious loss from fire, insects or disease are regenerated.
   1. Group Selection is the preferred regeneration method. Small openings (less than 1 tree height) are used to regenerate shade tolerant species, and large openings (width 1–2 tree heights) to regenerate moderate- or shade-intolerant species.
   2. Clearcuts are the least preferred regeneration method. If used, at least 10% of the original stand remains after harvest. Remaining trees: are left in groups, contain large vigorous representatives of the original stand, and are permanently protected (wildlife trees) or retained until regeneration reaches commercial thinning size (legacy trees).
   3. Individual clearcuts do not exceed 5 acres in size, with exceptions for salvage of insect, disease, wind or fire damage.

F. Reforestation - Reforestation by natural reseeding is preferred, though planting may be used to assure regeneration success.
   1. Natural regeneration is favored where it exists or can be initiated. Scarification is used to encourage natural regeneration on appropriate sites. Advance regeneration is protected from damage during logging.
   2. Unless early sufficient advance regeneration is present, any harvest operation that reduces stand basal area below 80 sq.ft. per acre is planted (per Oregon Forest Practices Act).

3. When planting, a variety of native, site-adapted commercial tree species are used. No single species comprises more than 70% of the future stand. Seedlings from appropriate seed zones are used.
4. Planted seedlings and natural regeneration are kept vigorous and free to grow by judicious and economical vegetation control. Manual brush cutting is the preferred control method where needs are not extensive and a single treatment is likely effective. Chemical control is preferred for exotic weeds, where manual methods would be ineffective, or to restore degraded stands. No aerial application of forest chemicals is allowed.

G. Restoration - In selected areas, management will attempt to restore forests to native savanna conditions.
1. Existing oaks are given highest levels of protection. Mechanisms for assuring oak regeneration are investigated.
2. A variety of methods for reestablishing native ground cover, and controlling competing vegetation are investigated.

V. Environmental Protection

A. Protection - Protection of biological resources will be a priority.
1. Management planning includes an analysis of the impact on forest biological resources.
2. Harvest planning includes steps to protect and enhance these resources, if possible.

B. Soils - Soils will be protected from adverse impacts associated with harvest activities, including soil erosion and loss of soil structure from compaction. Soil fertility will be encouraged by leaving down woody debris in the forest to rot.
1. All cull or pulp logs are left in the woods to decay (except where a fire hazard or when there are operational safety concerns).
2. For ground-based logging only dry-season logging is used. Extended logging seasons are used only on well-drained soils and during dry periods, or for cable logging units.
3. Skidding is restricted to previously marked skid trails. Skid trails, landings and haul roads cover less than 10% of the land area.
4. Skid trails and roads are designed to follow slope contours, and use dips, water bars and seeding as needed. Haul road grades are kept to under 20%, skid trails under 40% (avg. over 100’). Road drainage structures are maintained to prevent failures, as needed.
5. Slash burning is avoided, except to reduce fire hazard in key areas, and in savanna areas. If piling excessive slash, piles are kept small (under 4 feet high)

C. Riparian zones - Special care will be taken to identify riparian resources and protect water quality. Management of riparian zones will give priority to wildlife habitat and water quality.
1. All riparian zones are clearly identified on management and harvest plan maps. Riparian zones are marked in the field prior to harvest. Timber sale contracts contain logger restrictions for riparian zone protection.
2. Timber removals in riparian zones are prohibited within 100 feet of streams, except for restoration activities. Practices promote older structure and diversity. Reserve areas are sited to include riparian areas.
3. Skid trails or roads in sensitive areas are retired or relocated. Equipment operation in riparian zones is prohibited, except at designated crossings.

D. Wildlife - Special care will be taken to identify and protect the full array of wildlife habitats present, with habitats enhanced where desirable.
1. Trees of special value to wildlife are marked for permanent protection. Wildlife trees provide critical habitat (cavities for dens or nests perch sites) or mast

(acorns, seeds, or fruit) for many forest dwelling species. Wildlife trees are allowed to naturally die, providing future snags and large woody debris for soil fertility.

2. Where not a safety hazard, standing dead trees (snags) are permanently retained and allowed to naturally deteriorate.
3. Criteria for wildlife tree and snag selection and management are followed (Table 6).
4. Input from wildlife professionals is solicited and incorporated into management plans.

E. Legacy trees - Select trees will be retained as "linkages" to the next forest, as seed sources for natural regeneration, and for stand structure.

1. Trees that are unique for their size, age, species, wildlife value or location are marked for retention.
2. Criteria for legacy tree selection and management are followed (Table 6).
3. Future harvest of legacy trees is either deferred (providing future high-quality logs), or restricted (providing snags and large woody debris).

F. Coarse Woody Debris - CWD will be managed to promote soil productivity.

1. A CWD assessment is provided in management plans.
2. A minimum of 20 tons per acre is maintained; additional CWD recruitment is encouraged.
3. Trees are cut, limbed and bucked in place; slash and cull log sections are left in woods. Boundary line trees preserved. Pulp wood and firewood removals restricted.
4. Salvage is allowed only in cases of significant risk or loss (at least 1 load of logs in a landing area).

G. Special Resources - Special protection will be given to areas of steep slope, or special value for cultural resources, recreation use, wildlife habitat, open space or watershed protection.

1. Special resource areas are either off-limits to harvesting, or where management seeks primarily to enhance unique qualities or resources.
2. Special resource areas are marked on the ground prior to harvest.
3. All remnants of the older forest (e.g. residual trees, snags, large cull logs) receive the highest levels of protection.
4. A target of 10% of the managed forest area will be reserved from or receive alternative management.

VI. Monitoring & Assessment

A. Goals - Setting of specific performance goals, regularly assessing progress towards them, and adapting the management approach when necessary will be a key part of the planning process.

1. Progress towards achieving performance goals is assessed at 10-year intervals.
2. The performance of the forest manager(s) is assessed at least every 10 years, coincident with a forest inventory.
3. The Forest Management Plan is updated and revised every 10 years.

B. Monitoring - Monitoring will serve as the basis for evaluating and modifying the management plan, including how the forest changes in response to management activities, assessing the progress toward specific goals, and providing for adjustments if goals are not met.

1. Data are collected during each scheduled property inventory, or as possible during routine management operations (tree marking, harvest planning)
2. Systematic property-wide timber inventory is conducted every 10 years. For consistency, the same protocols (and firm) are used whenever possible.

C. Indicators - Measurable indicators of key forest processes and structures will serve as the basis for monitoring and assessment.

1. Regeneration of at least 200 trees per acre is naturally established and/or planted when stand-level stocking of commercial species falls below 80 sq.ft./ac. basal area. Monitor overstory basal area and preexisting seedling numbers in harvest planning walk-through.
2. Property-wide CWD levels of at least 20 tons per acre (>4") are maintained. Monitor by sampling during periodic property inventory; visually estimate stand level CWD levels during harvest planning walk-through.
3. Wildlife tree, snag, and legacy trees averages meet targets at the stand level (1–2 wildlife trees, 3–4 snags, 4 legacy trees; at least half conifer). New recruits are marked as needed. Monitor by sampling during periodic property inventory; visually estimate presence during harvest planning walk-through.
4. Skid trails, roads and landings cover less than 10% of the forest floor; skid trails are at least 150 ft. apart (average). Monitor by visual assessment during harvesting.
5. Erosion control devices are installed correctly, and effectively shed water to prevent erosion. Monitor at post-harvest walk-through.
6. Timber volume growth is maintained at 8% or more for young stands, 4–6% as forests mature (poor sites and stressed stands will not perform as well). Monitor with systematic inventory at 5-year intervals; note growth response during harvest planning walk-through.
7. Understory vegetation, natural regeneration, and ground cover are dominated by native species of desired groups; invasive exotics are reduced in numbers. Monitor by sampling during periodic property inventory; visually estimate presence during walk-throughs.

Table 6: Selection and management of special trees

SELECTION CRITERIA

	Wildlife Trees	Snags	Legacy Trees
Number	1-2 per acre	3-4 per acre	eventually 4 or more per acre; mark at least 1/ac at each entry until target is met
Species	representative of stand; at least 50% conifer	any conifer and oak preferred for longest persistence	representative of stand; for diversity include minor species
Size	large diameter from any crown class	larger snags have greatest habitat value	larger dominants; smaller trees may be selected if likely future dominants
Vigor	any vigor	n/a	high vigor: good growth, leaf color/density, crown depth
Form	trees with current or potential cavities, heavy limbs, dead tops	n/a	good form: low taper, small branching, few defects
Location	well distributed wherever present; especially valuable if near riparian areas	highest value and least safety hazard when located at stand margins or in riparian or reserve areas	well distributed or clumped (4 per group); may be concentrated in riparian areas (not to exceed 25% of total)

MANAGEMENT

	Wildlife Trees	Snags	Legacy Trees
Marking	mark with paint or tags	not required	mark with paint or tags
Recording	tally by stand, species, diameter	tally by stand, species, diameter	tally by stand, species, diameter
Protection	reserve from harvest; damage acceptable (serves to hasten creation of snags and CWD); fell only where a safety hazard	fell only where a safety risk; retain as CWD	highest level of protection during harvest
Replacement	mark replacements when felled as safety hazards or lost through natural mortality	secure replacements by marking additional wildlife trees	mark replacements if trees damaged or lost from logging, natural disturbance, or disease
Longevity	retain as future snags and CWD	retain as future CWD	reserve from harvest until suitable replacements are available (regen at least pole size); retain at least 25% as future snags

GLOSSARY

Aspect - direction toward which a slope faces (exposure)
Biodiversity - the entire spectrum of plants, animals and other life forms, and their associated environments
Blowdown - trees that have been knocked over by the wind
CWD - Coarse 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.
Commercial harvest - a timber stand improvement or harvest operation that results in a net landowner income
Crown - the canopy of leaves and branches formed by a tree
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
Forest Certification - An independent assessment of management practices and forest conditions evaluated against a prescribed set of sustainable forestry standards. In this case referring to a program accredited by the Forest Stewardship Council (SmartWood, Scientific Certification Systems)
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
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.
Operability - ease with which logging machinery could work a site; often limited by rockiness, steep slopes, wetness, etc.
Prescribed burn - a fire intentionally set and closely managed to produce a specific management effect. Prescribed fires are typically slow moving, cool burning, and carefully controlled to prevent escape.
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.
RMA - riparian management area (forest practice rules)
Seedling - tree greater than six inches tall but less than one inch DBH
Site Class - a relative measure of site productivity for growing trees, rated on a scale of I to V, with I being most productive
Slash - tree tops, branches, bark and other debris left after a harvest operation
Snag - standing dead and/or dying tree. Important habitat element for numerous wildlife species
Stocking - stand measurement relative to the optimal number of trees that a unit of forestland could grow
Stumpage - payment by a logger for purchase of standing timber. The residual value after logging and trucking costs are deducted from mill delivered log values.
Sustainable - able to perpetuated over the very long-term; without foreseeable future impacts
Timber Type - a homogeneous unit of forestland, delineated because it supports trees of common species, age, potential, etc.
Uneven-aged - trees within a forest stand are of two (or more) distinct age groups