

**JEFFERSON COUNTY
BOARD OF COUNTY COMMISSIONERS**

AGENDA REQUEST

TO: Board of County Commissioners
Mark McCauley, County Administrator

FROM: Heidi Eisenhour, Commissioner

DATE: February 6, 2023

SUBJECT: Jefferson County Forest Lands Management

STATEMENT OF ISSUE:

Jefferson County contracted with Chickadee Forestry LLC for a 3rd contract in 2022 to further develop the Jefferson County Sustainable Forestry Program and to research options for co-management of DNR lands. The scope of work included a report on the findings of potential collaboration with DNR and recommendations for the future on Jefferson County owned lands. With the DNR Carbon Project announced in fall of 2022, there was more research required to include on assessing options for the inclusion of the 4,000 acres proposed for the project.

ANALYSIS:

Chickadee Forestry and team have finalized a report with the findings and recommendations for continued forest management of county lands as well as options for pursuing expanding the county land base through transferring DNR lands. The report also discusses findings regarding the DNR Carbon Program proposal and considerations for future management of DNR trust lands. We will discuss these findings and the continuing work for this project.

FISCAL IMPACT:

None. This is an informational session.

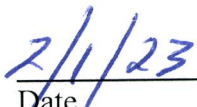
RECOMMENDATION:

Listen, ask questions, and learn. Provide BoCC opportunities for questions with Chickadee Forestry and advisors.

REVIEWED BY:



Mark McCauley, County Administrator



Date

Jefferson County Forestry Presentation

Forest structure and complexity

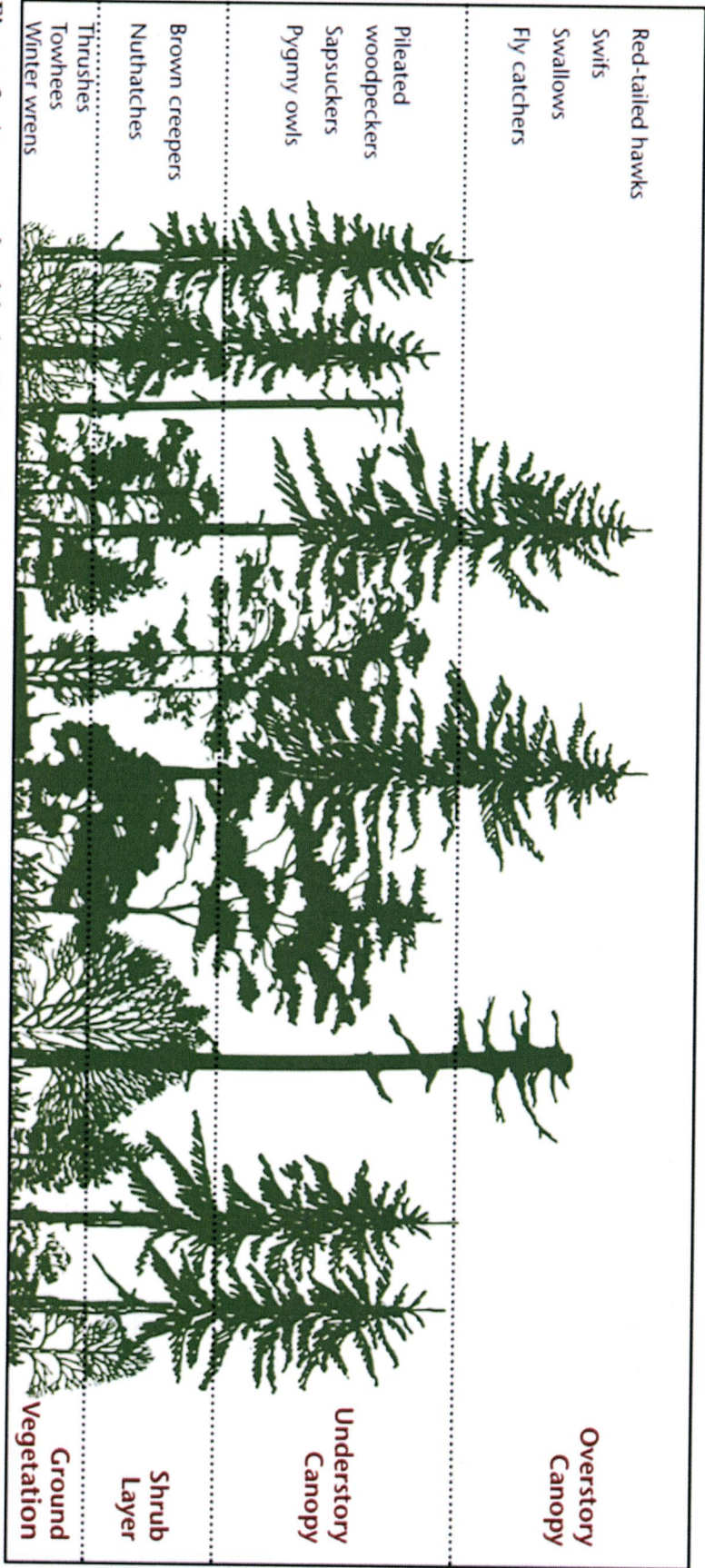


Figure 2. An example of the birds that utilize the vertical diversity in a mature Douglas-fir forest. From Brown (1985)

Large Woody Debris

Soil surface Litter



Jefferson County Forestry Program

Mission is a focus on ecological, social, and economic values to create a land management strategy that enhances these three categories. This will be achieved through the following guiding policies:

Restore and maintain forest health throughout the region

Protect and enhance soil, water quality, and fish and wildlife habitat

Forests are biologically, socially, and economically self-sustaining

Protect and enhance the recreational and aesthetic value of forest lands

Provide natural resources through sustainable forest management to the local community

Jefferson County Forestry Program

- 2019 Feasibility Study
- Focused on environmental (Jefferson County forest inventory), economic (financially viable), and community (dispersed parcels, how to manage for community benefits)
- 2020-2021 Pilot Project
- Forest health improvement and ecological restoration
- Selective thinning in high-risk forests for forest restoration
- Forest management policy
- Economic stability and community development



Jefferson County Forestry Program

- 2022 Scope of Work
 - Examine options for further development of the Jefferson County Forestry Program
 - Assess management options comparison of DNR lands and Jefferson County management, considering transfer of lands from DNR back to county
 - Review alternative management methods including carbon and the DNR carbon project

Jefferson County Forest Stewardship Program

300

Parcels of land, most under
10 acres each

1800

Acres of land owned by
Jefferson County

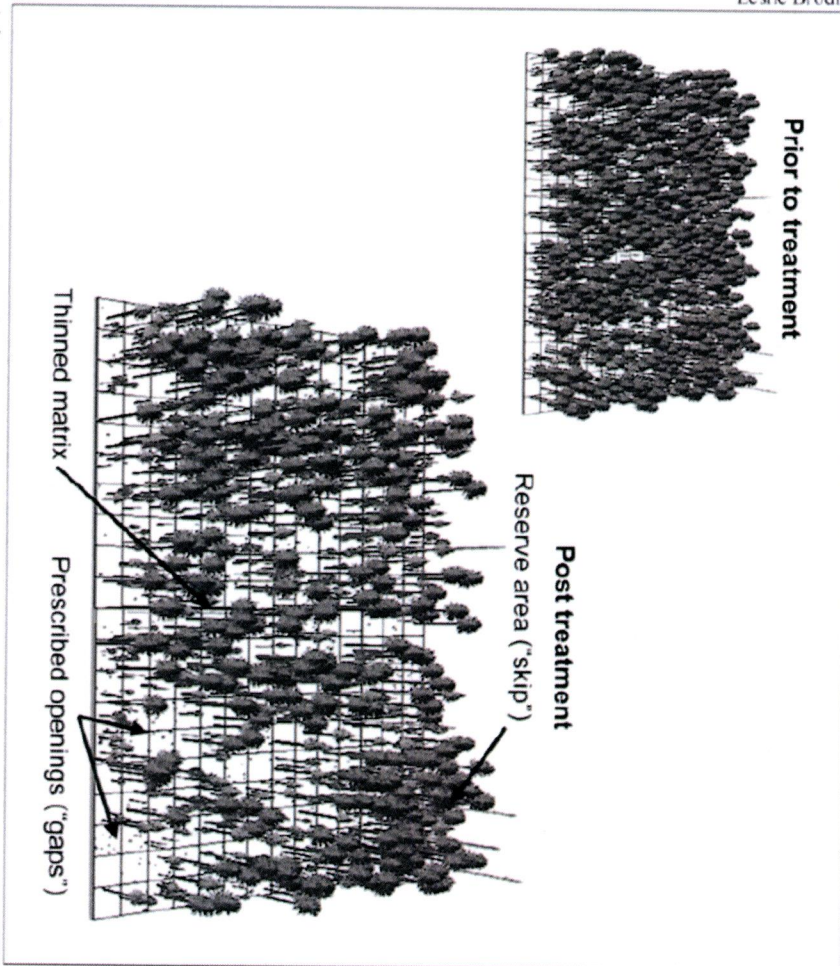
80%

Covered in forest

Jefferson County Community Partnerships

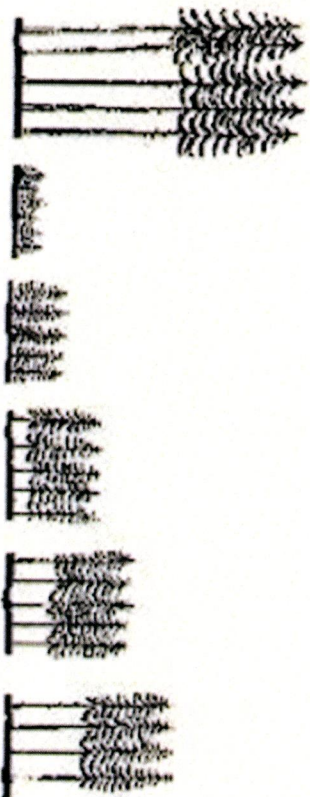
- Parks dept, continued increase in use
- Fire dept, risk reduction/planning, CWPP
- Local jobs, internships, outreach (WSU)
- Local wood sales, PT Paper





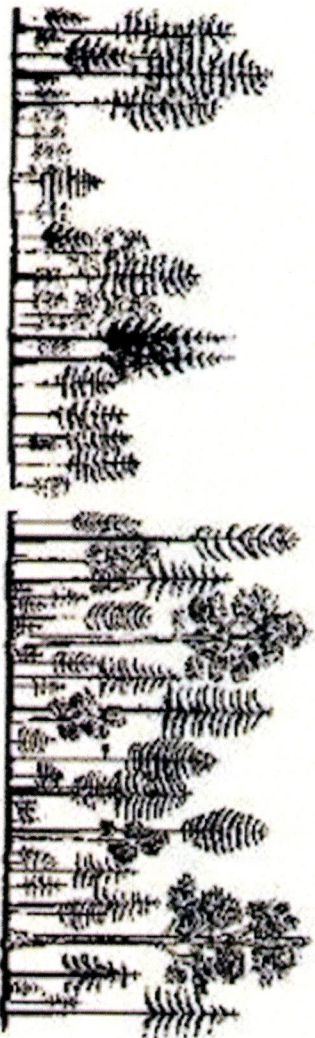
A diagram of a stand before and after thinning with skips and gaps. Snag height is exaggerated for visibility.





GROUP SELECTION

SINGLE TREE SELECTION





Gibbs Lake County Park, Chimacum

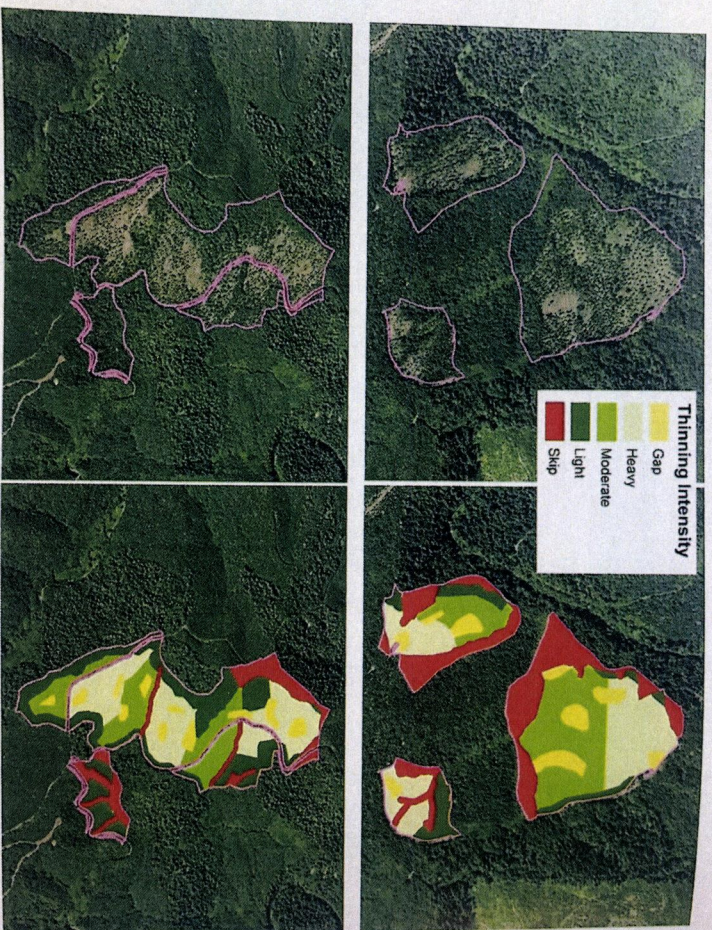
2022 Scope of Work Overview

- Forest Land Management and Financial Analysis
 - Financial analysis comparison of county management and DNR management
 - Review of Jefferson County lands, DNR lands, and private lands (large scale) for forest health, ecological value, and management needs (if any)
- Short and Long Term Management Scenarios
 - Land ownership: Jefferson County, DNR, or combination
 - Management options: carbon, selective thinning, recreation, mix
 - Public meeting and outreach

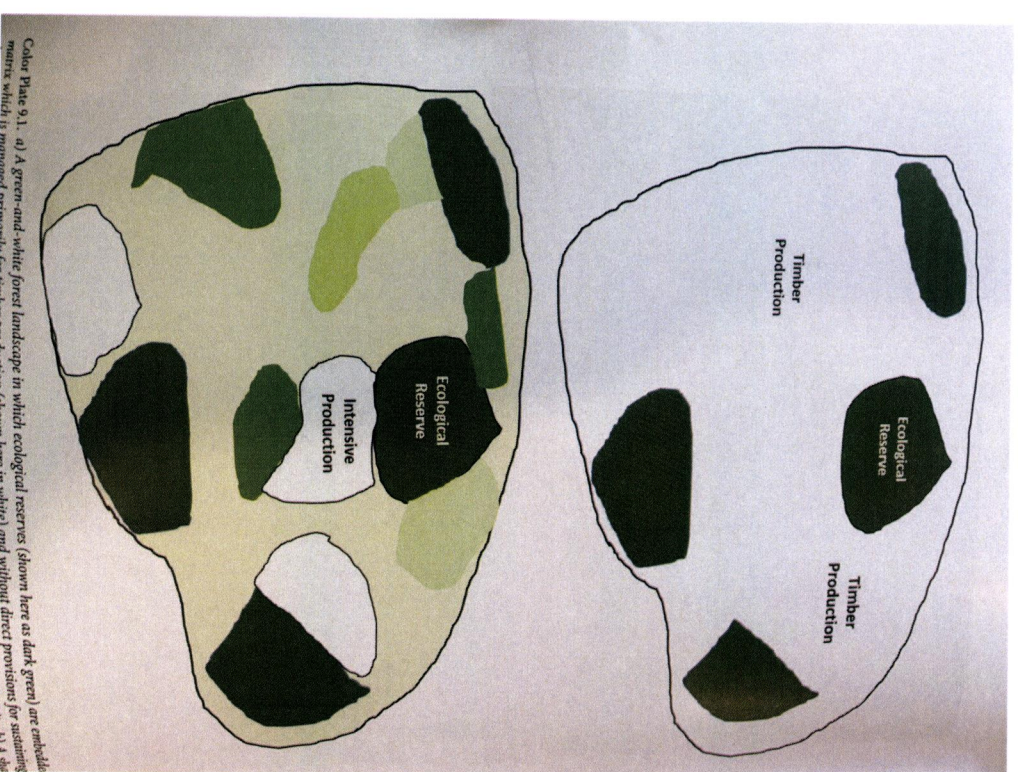
Jefferson County Forest Management

- Smaller scale option to DNR
- Focusing on multiple benefits and higher level of detail/development
- Community partnerships (EJ Fire, Parks and Rec)
- Multiple benefits
- Lower income per harvest, but more frequent and sustained revenue

Variable Density Harvest



Color Plate 8.2. Aerial images of variable density thinning in 40 to 50 year old Douglas-fir-western hemlock stands, illustrating skips, gaps, and varying levels of thinning. In the examples, skips are associated with edges and along streams; more recent applications leave skips in the unit proper. Photo credit: Abraham Wheeler.



Color Plate 9.1. a) A green-and-white forest landscape in which ecological reserves (shown here as dark green) are embedded in a matrix which is managed intensively for production. b) A similar landscape in which ecological reserves are embedded in a matrix which is managed for timber production. Photo credit: Abraham Wheeler.

Near Term Projections 2023-2030

Site	Management	Acres Harvested	Total Volume (MBF)	Volume per acre (MBF)	Timing	Net Revenue to JC	JC Net Revenue/Acre Estimate
Cape George*	PCT	46	-	-	2025	(\$23,000)	(\$500)/acre
Beausite*	PCT	33	-	-	2025	(\$16,500)	(\$500)/acre
Teal Lake E	Selective	100	600	6	2025	\$600,000	\$600/acre
Anderson Lake	Selective	50	350	7	2025	\$350,000	\$700/acre
Cape George	Selective	80	400	5	2030	\$100,000	\$200/acre
Totals	-	309 acres	1350	-	-	\$1,010,500	-

*Indicates county owned land

Initial Harvests Costs and Revenue for Comparison

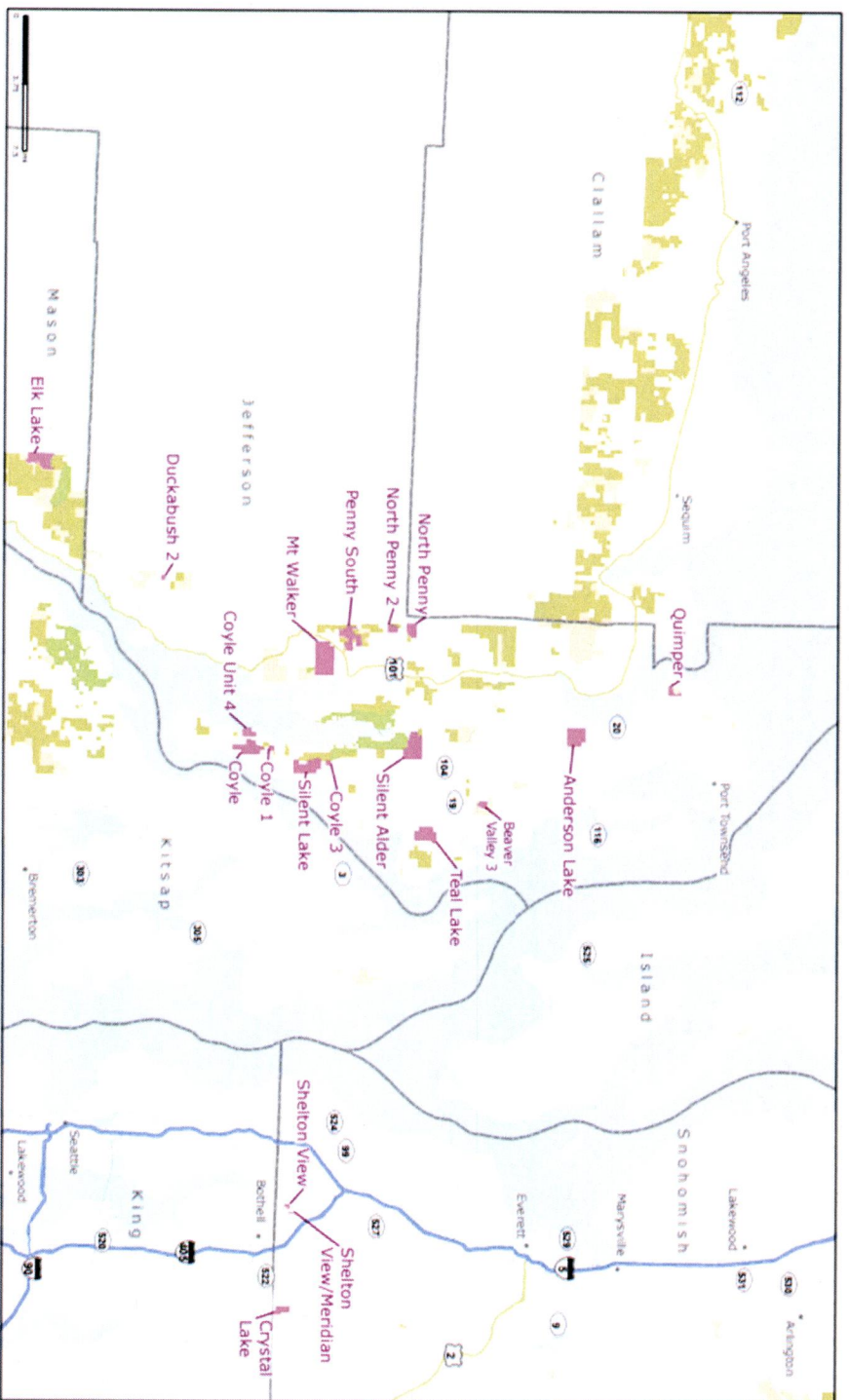
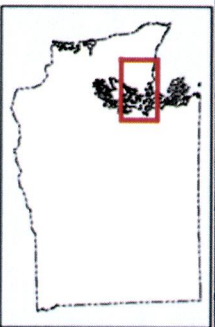
Site	Acres Harvested	Total Volume (MBF)	Volume per Acre (MBF)	JC Total Revenue	JC Revenue/Acre
Chimacum Park	38	376	9.9	\$ 86,026.49	\$ 2,263.86
Beausite	100	377	3.8	\$ 28,374.05	\$ 283.74
CG Gravel	14	5.8	0.4	\$ 13,933.81	\$ 995.27
Trailhead	36	144	4.0	\$ (39,557.80)	\$ (1,098.83)
Totals	188 acres	902.80	-	\$ 88,776.55	\$ 611.01

Phase II Carbon Project Candidate Parcels Jefferson

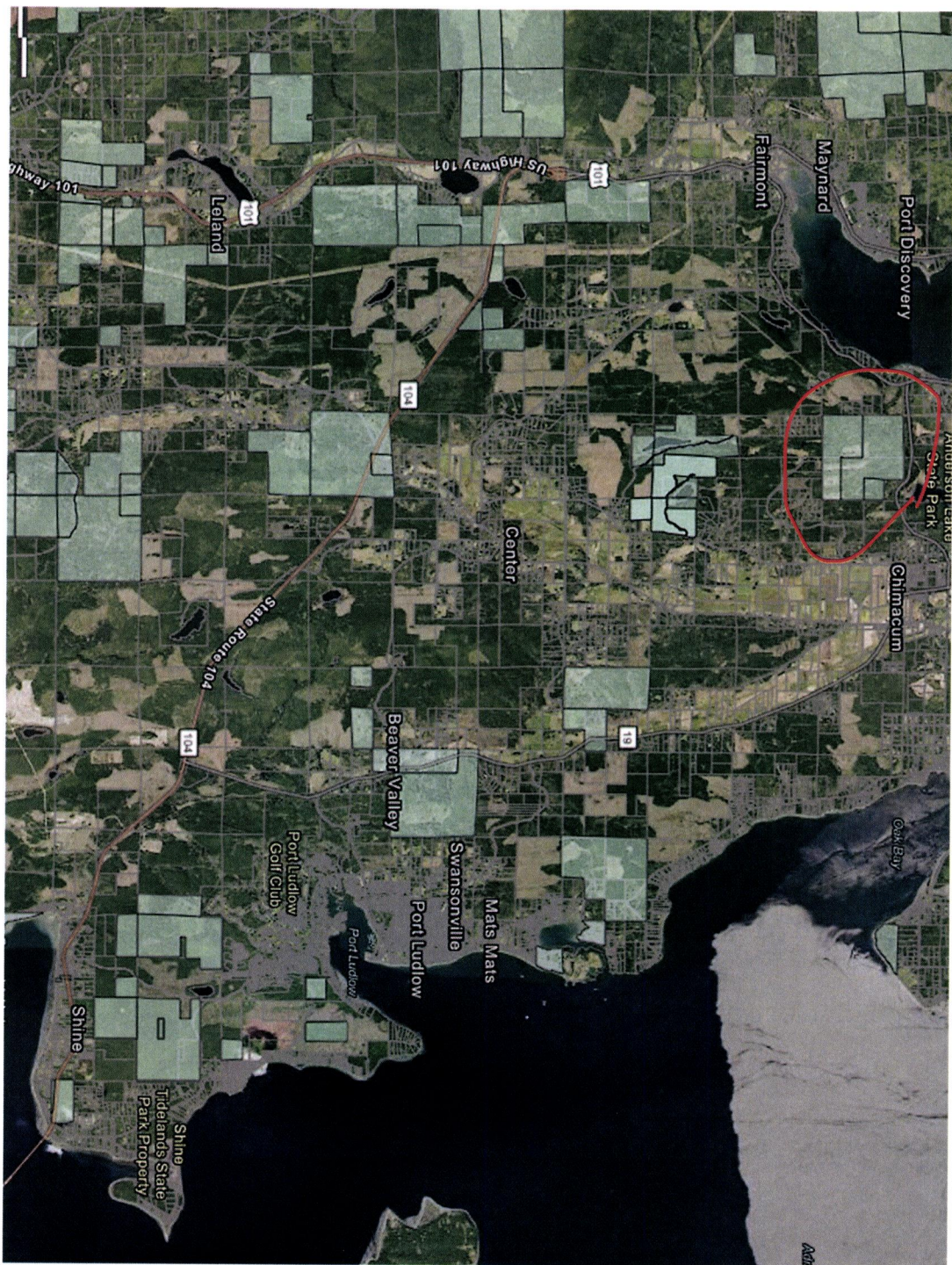


- Draft Carbon Project Areas**
- Phase I Carbon Project Areas
 - Phase II Candidate Parcels
- DNR-Managed Lands**
- Granted Trust Lands
 - Forest Board Trust Lands
 - NAP / NRCA
 - Other DNR-Managed Lands

Disclaimer: All data are draft and subject to change.







Jefferson County Forestry Report

2023 Update to Recommendations



Written by Malloreë Weinheimer, Principal & Forester, Chickadee Forestry LLC

Contributors

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Denise Pranger

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Executive Summary

Since 2018, Jefferson County has contracted with Chickadee Forestry LLC to research and develop a forest stewardship strategy for managing county forest lands focused on balancing long term forest health improvement, ecological restoration, and timber production. This has consisted of multiple phases including an initial feasibility study to assess the current status of forest lands, including risks and opportunities. Initial pilot harvests were conducted subsequently to address three of the highest need properties: Trailhead County Park, Gibbs Lake County Park, and Chimacum County Park. Selective harvests were implemented to address forest health issues, increase forest health and resiliency, and to mitigate significant fire risk. We also focused on developing the local wood market to increase county revenue and improve the local economy. Finally, worked on cultural and ecological improvements through forest management for the community.

Now in the third phase of this project and program development, Chickadee Forestry has been contracted to set longer range objectives for Jefferson County forest lands and to conduct a DNR lands analysis. One of the main issues for management of Jefferson County owned forest lands is that the majority of the parcels are smaller than 10 acres and scattered across the landscape, making management difficult and expensive. If the county wishes to further invest in forest management program development it would be beneficial to increase the forest land base, which is a possibility through transferring back certain DNR lands into county management.

During the summer of 2022 community concerns were raised over DNR harvests in Jefferson County that would remove some of the small percentage of remaining older forest (pre-1930). This issue brought up the discussion to determine ways to foster collaboration with DNR to have a comprehensive approach for forest management in line with county objectives.

Jefferson County's forest landscape is made up of a combination of federal lands, small private ownership, industrial ownership, state lands (DNR), and county lands. For the purposes of this report we will only be focusing on county and state lands. Furthermore, we will be focusing the report on forest lands in East Jefferson County for multiple reasons which are expanded on in the report. However, it is worth noting that more collaboration across the landscape and a larger land management strategy to provide continuity and increased forest resilience will benefit the landscape long term. While small private land ownership is not in the scope of work for this report, it is relevant to mention because small private land ownership is a key part of a larger land management strategy in an increasingly divided landscape and finding more ways to support small private lands is an important consideration for the future. Jefferson County can offer support by promoting public small forest landowner resources through DNR's SFLO program and WSU Extension's Forestry programs.

Through this research, we have found that there are viable opportunities to meet all the objectives here: expanding a county forest management program, working more collaboratively with DNR, and expanding the county land base through transferring specific DNR parcels back to the county in a way

that is beneficial for both DNR and the county. We also want to stress that while many options were assessed, this project aims towards a middle path that is intended to yield positive results for as many parties as possible. The following report includes several strategies to address maintaining and improving a local timber economy, improving forest health and ecology, and providing more benefits to the community through strategic forest land management.

This work would not be possible without the generosity and expertise of Chickadee Forestry's technical advisors and collaborators, who have provided endless support and knowledge over the past 5 years. Also, to the staff at Jefferson County, who recognize the value of taking a proactive approach towards forest management on the county scale and have continued to support the development of this program. This particular phase of the project also owes thanks to the regional DNR staff for their generous time and expertise to help navigate the options that will improve management for both county and DNR lands.

Regional Lands Strategy & Rationale

Jefferson County first invested in this research in 2018 with Chickadee Forestry to start exploring management opportunities and needs in the forest landscape. Jefferson County has around 1,800 acres in forest land, spread across roughly 300 parcels. Most of these parcels are less than 10 acres and scattered, many located in community centers throughout East Jefferson County, which makes forest management difficult logistically and expensive. West Jefferson County has a very small percentage of county-owned lands, most public land is either DNR or federal.

The current needs for the next five to ten years for improving forest health and fire risk mitigation includes pre-commercial thinning of approximately 80 acres of forest land, mostly between Gibbs Lake and Cape George. These young harvests are important for ensuring the health of the forests as they develop, but they are net losses financially. During the first three selective harvests we focused on a mix of properties that would each address a forest health concern while also balancing out the costs through a combination of higher value forest stands and young stands to pre-commercially thin. Going forward there is a low volume of merchantable timber that meets the criteria for ecological forest management and improvement to offset these pre-commercial thinnings, which means that unless the land base is increased or other funding is secured, needed county forest management will occur at a financial net loss.

With these considerations in mind, there are two main strategies identified for moving forward with Jefferson County forest lands management. The first option is to maintain the current land base and keep operations limited. Within the next 5-10 years, in order to reduce fire risk and improve forest health, county lands will require management including using pre-commercial thinning methods to thin overly dense young stands. Due to the small land base, this focus on risk mitigation/forest health improvement, while necessary, will not likely generate revenue. However, there will be limited

opportunity to harvest timber that could bring revenue to offset costs for needed management actions in these young stands.

The second option is to work with DNR to transition specific lands back to the county for forest management and increase the county land base. The feasibility of this strategy for Jefferson County has been explored since the start of this research in 2018. Other county provide examples of the potential success (and challenges) of this strategy. Kitsap County and Grays Harbor County are examples of the two counties in Washington that have either kept or transferred DNR lands back to county ownership and built substantial county forest management programs. Increasing the forest land base for the county will increase the potential for sustainable timber revenue, which would be selectively harvested and focused on a lighter touch than DNR. This would provide more timber revenue for the county to help sustain the county forestry program, and funding will support harvests and restoration activities that would be a financial loss, creating a financially and ecologically sustainable program.

In discussions with DNR staff and local experts including multiple technical advisors to Chickadee Forestry, a county wide strategy has been discussed that could provide benefits to both DNR and the county. This strategy would designate the following focus management areas around the county: DNR lands north of Highway 104 (Chimacum, Port Townsend, Port Hadlock, Port Ludlow areas) would be considered for reconveyance or other transfer options back to the county.

DNR lands south of Highway 104 in Junior Taxing District 3 would remain in DNR management and remain largely focused on timber production and revenue to support the community.

Conservation and recreation dense areas will continue to have their own focus for expansion, including Chimacum Ridge area and Dabob Natural Area Preserve in the Tarboo watershed.

DNR lands in western Jefferson County will remain focused on timber production and conservation, as they are currently designated.

This strategy would be mutually beneficial for the county and DNR for multiple reasons. Areas north of Highway 104 have higher population densities, a more divided landscape, and are further from mills. The combination of these factors increases pressure and difficulties for DNR to manage land as effectively in the north county as in the south county. Additionally these lands are less fertile and productive for timber, so they are less desirable for timber production solely, but present opportunities for multiple management objectives including lighter touch forest management, ecological restoration, and providing recreational opportunities to the community.

Additional considerations for the county on which parcels would be best suited to transition from DNR to county forest include; health risks (fire, disease), connectivity with other county lands or other conservation/recreation lands, recreational opportunities, the ecological significance of rare and imperiled plant communities, and conservation initiatives, particularly those related to older forest preservation. All these considerations can go hand in hand with timber production in a way that benefits the landscape and community.

There are also advantages to the county managing some of these northern parcels as has been demonstrated in the development of the forest management program. One of these is the local partnerships that we have continued to focus on through this forestry program development including multiple county departments, local land management organizations, and local operators. As a state agency, DNR is tasked with efficiently managing forests on a larger scale more efficiently, with a focus on fiduciary targets within environmental constraints. The county can manage smaller parcels with a more nuanced and customized approach. Rural county staff maximize capacity through partnerships and collaboration among departments and organizations, which has been demonstrated through collaboration of the public works department including roads and parks, the fire department, public health, and private environmental organizations who have all been involved to date in providing resources and/or expertise to inform the development of forest lands. This cooperation has saved money and helped to align efforts between departments to make forest management mutually beneficial.

As a county, we have already successfully demonstrated the benefits of partnerships within the agricultural industry to support small farms, and similar opportunities are available in the forest industry to work in conjunction with DNR to adapt a smaller scale forest industry that continues to support our local economy and while providing ecosystem services.

County Recommendations Summary

Near term (5-10 year) management for Jefferson County Forest Management

- Pre-commercially harvest Gibbs Lake and Cape George properties, approximately 80 acres total
- Continue annual monitoring, train forest stewards to assist monitoring.
- Selectively harvest small properties as appropriate for risk mitigation, forest health improvement, and timber revenue.
- Continue to develop opportunities for building local capacity on small scale forest management and additional industries, including biochar, forest mulching, and waste wood opportunities.

The main consideration here is that forest management will be more difficult logistically and costly on the small properties that the county currently owns. There are recommendations on balancing some of the costs for forest health improvement in the appendix with county properties. Increasing the county land base through transferring select DNR lands will also make management of county lands more financially viable. More detail is provided in the appendix for *Jefferson County Forest Management Strategies 2023-2030*.

DNR Lands Recommended for Transfer to County Ownership

DNR Parcel Name	Acres	Type	Recommendation	Ranking
Cape George	243	Common School	TLT or Purchase	1
Teal Lake East	655	Forest Board	Reconveyance	1
Teal Lake West	532	Forest Board	Reconveyance	1
Anderson Lake	582	Common School - 542, Forest Board - 39	TLT and Reconveyance	1
Tala Point	73	Forest Board	Reconveyance	2
Termination Point	59	University	TLT or Purchase	2
West Jacob Miller	121	Common School	TLT or Purchase	2
Beaver Valley	521	Common School	TLT or Purchase	2

Based on our research and understanding of different capabilities and strengths of Jefferson County and DNR in management, we came up with this list of prioritized parcels recommended for transferring from DNR to the county based on a two phase ranking system, with 1 being the highest priority and 2 being the 2nd phase of transfer. The highest ranked properties are mainly reconveyance, which is an easier strategy than TLT and will allow the county to increase its land base quickly. Properties like Teal Lake have steady timber revenue that can help fund other property purchases in lower ranking or forest management and restoration efforts initially. Cape George is included in the higher ranking even though it requires TLT or purchase because it has an ecologically significant forest of interest for the local community to protect and is a difficult property logistically for DNR to manage. In addition to this table we conducted an in-depth analysis of DNR parcels including an updated recommendations table and financial and management scenarios for 3 DNR parcels (Cape George, Anderson Lake, and Teal Lake E) included in the Appendix: *DNR Lands Management Scenarios*

County Forest Lands: Tools for Management

Transfer of DNR Properties to County

There are multiple categories of DNR trust forests in the county and different strategies for transitioning land back to the county if desired would apply to the different trusts. The two primary types of DNR trust forest are 1) county forests (aka State Forest Transfer Lands or County Transfer Lands). These were originally county lands given in trust to DNR to manage on behalf of the county. Revenue from County Transfer forests is distributed to the county and junior taxing districts. The other main type is Common School Trusts, revenue from which goes to a general pool used to fund school construction. The two major strategies available are 1) Reconveyance or 2) Trust Land Transfer.

Reconveyance, which puts the lands back under County management, can only be applied to the County Transfer Lands. The process for reconveyance requires the county to request the parcel and pay for an appraisal, the lands would technically become 'parks' although there is flexibility in management so that forest management actions can occur if in line with a park management plan.

Trust Land Transfer is a second option. Under TLT, parcels are transferred to either DNR as part of a Natural Area, or any government agency (city, county, federal) or Tribe. This program is funded by the state legislature in the state capital budget. The TLT process involves generating a proposal for the parcel, which is then ranked for available funding. Emphasis is given to projects with high conservation and recreation potential. Trust Land Transfer has been used to include *both County Transfer* and Common School Parcels in the Dabob Natural Area Preserve, and to create and expand Devil's Lake Natural Area. One benefit of the TLT program is that the Trusts are compensated through replacement parcels of roughly equal value. Proposed changes to the TLT program would create more flexibility for asset management using TLT by broadening the scope to all Trust types.

As noted above, Kitsap has already successfully reconveyed lands and DNR staff have been supportive and informative in providing information and exploring management options that would be mutually beneficial for the county and DNR. Arno Bergstrom, Kitsap County's Stewardship Forester, has been a key advisor for this process. Acquisition of more forest land for Jefferson County land base will allow for a more stable flow of timber revenue, but still focused on balancing long term forest health improvement, ecological restoration, and timber production. More information is provided in the "Ecological Forest Management" section below. The appendix provides further information on DNR lands and analysis.

Ecological Forest Management

Timber production has always been a part of this landscape's cultural identity. After all, trees grow better in our region than in most places in the world. The intention of this forest management program is to identify and build a program that focuses on multiple interrelated goals- both financial and ecological- that can help serve as a model for local collaboration. This has already been demonstrated effectively in the agricultural sector, and the forestry sector provides a very similar opportunity. Our objectives are to work with the native landscape and foster management methods that support ecological functions and mimic natural forest development patterns, providing sustainable sources of timber and healthy, ecologically complex forests.

Ecological forestry is a strategy for addressing this approach to forest management to address multiple objectives. According to Jerry Franklin : "Ecological forestry recognizes that forests are ecosystems with diverse biota, complex structure, and multiple functions, and not simply collections of trees valuable primarily for production of wood. In doing so, it seeks to maintain the fundamental capacities (integrity) of the forest ecosystems to which it is applied" (*Source: Ecological Forest Management. Johnson,*

Franklin, Johnson. 2018.) In general, forest management on the county level will continue to focus on balancing long term forest health improvement, ecological restoration, and timber production through selective thinning models that retain a range of species and age classes of trees. County forests will be managed on longer rotations of 80+ years and include mixes of ages of stands and mixed densities to benefit different wildlife and ecosystem functions based on specific site considerations. Examples of ecological forest management prescriptions and timelines will be outlined in the appendix.

Further Reading:

- ["Ecological Forest Management" Jerry Franklin Interview](#)
- ["What if we can have our cake, and eat it too?" Paula Swedeen](#)

Woodshed Development

The "Woodshed," is a term we've used to capture the idea of a local wood economy. The woodshed has two meanings: first, to evoke the idea of a literal woodshed where one stores wood on their property as part of the idea that we want to promote more local use of wood to make it accessible to local citizens, and second, to represent the an idea analogous to the idea of a watershed, where a "woodshed" represents the local region where wood comes from. Timber production has been a significant part of this region's cultural identity and we hope to help revitalize the concept of local wood much like local farms have revitalized the idea of local food. While the county will still sell the bulk of harvested wood to larger mills, we hope to also increase capacity to support small mills and local direct sales with smaller harvests that don't necessarily make sense to ship out of the county to the commercial market. This requires building a local chain of custody and a network of operators that support each other, but it also requires a local market of buyers to support the industry.

Chickadee Forestry's principal, Mallore Weinheimer, has been working with local organizations and operators including Northwest Sawmill, Woodsong Tree Company, North Hills Logging, and Wayland Constructive to adapt a model that can fit smaller projects and sell small scale wood back to the community, as well as adapt operations appropriate to scale for the sizes of property in the county lands, which will ultimately also help serve small forest landowners in the region. In 2021, wood from the Chimacum County Park harvest was sold to the Port of Portland for the new wing of the Portland International Airport, which will recognize Jefferson County as one of the contributors. There are more efforts underway to help open more opportunities for local wood sources as well which will be shared as they develop.

Ecosystem Services

Part of the incredible contribution a healthy forest makes is the ecosystem services they provide; such as water quality/quantity, air quality, habitat diversity and carbon sequestration. Many of these services can now be monetized in support of conservation, climate adaptation and improved forest management.

One of the mature markets for ecosystem services is the forest carbon market. Participating in the carbon market is mostly the purview of larger landowners (10,000 acres and above). This is due to the cost of developing a quality carbon program for a landowner. Whether it is the forest sampling, verification, ongoing record keeping or the loss of timber revenue, most small forest landowners find it cost prohibitive to participate in regulated or voluntary forest carbon markets. While there are differences between voluntary and compliance markets, there are still significant commitments to participating in a quality carbon program for small landowners.

Recently DNR has discussed a carbon project with a few of the county beneficiaries suggested for participation. While DNR's desire to support conservation and the lengthening of harvest rotations while continuing to support public schools and other beneficiaries is laudable, the program currently lacks significant detail regarding quantities of carbon sequestered and potential revenue going to counties over time. More information can be found at [Introduction to Carbon Markets](#) – which provides an overview of the types of carbon markets currently available and how they function.

While the DNR program may take time to evolve, there are other sources for revenue to support climate adaptation, carbon sequestration and habitat protection. Below are programs both national and statewide that may be more appropriate for the Jefferson County forest program at this time. These programs may provide support for land ownership transfers or purchases as well as funds for conservation.

Further Reading:

- [WA State Natural Climate Solutions](#) - There are 5 different categories for forest preservation and water quality.
- [Climate Commitment Act](#) – This program provides for forests and water for salmon recovery.
- [Inflation Reduction Act](#) - State and private forestry conservation programs can receive \$2.2 billion to promote natural carbon sequestration, including planting trees.

County Considerations Regarding DNR Management

Following the discussions that arose around the DNR harvests during the summer of 2022 on some of what the Center for Responsible Forestry has termed, “legacy forests” (the remaining stands of forests

that are pre-1920), the Jefferson County Board of County Commissioners requested a deeper dive into how the county can mitigate future problems of this kind and foster collaboration in future management of DNR lands managed for county revenue. This conversation is ongoing and will continue to develop, but this report will provide context of where we are at currently.

Additionally, the proposal of the nearly 4,000 acres of forest land as part of DNR's carbon program also raised many questions from the community for the county to consider. As a result of reviewing DNR lands and the carbon program proposal, consulting technical advisors and DNR staff, and working to take in multiple stakeholders viewpoints into consideration, these are the following conclusions to date that we have come to as recommendations:

- The county recognizes and supports the potential for a viable carbon program through DNR in the future, however the proposed project boundaries need to be fully developed. The current proposed project will need more discussion and consideration with the county before final approval. For example, parcels containing significant older forests could be included in this program.
- Continue to collaborate with DNR to create a comprehensive plan for forest management parameters on all county trust lands that focuses on the retention of stands with high ecological value and balances long term forest health improvement and timber production. Aim for joint management agreement reached in 2023.

Forests for the Future Report

A previous effort by the County's Working Lands Group was completed in 2012 with the Forests for the Future report (FFF) (SOURCE). FFF assessed the landscape at a broad scale- generating a map that split east Jefferson County into two zones of forest management approach- "Interim Hold/Manage" which is a zone roughly north of Highway 104 and the Dabob Peninsula and "Working Forest Landscapes" which was the zone south and west of 104 from Blyn in the north to Triton Cove in the south.

The FFF report provided a very useful framework and context for this recent work. In particular we adopted the names used for parcels or groups of parcels that links them to local roads or landmarks, for example Teal Lake, City/Skidder, Duckabush Lower. The following list highlights major updates since the FFF:

- There have been some minor updates to the DNR land base with parcel additions particularly in the East Blyn and Spencer Creek.
- Many parcels labeled "Existing or in process TLT" have been included in the current Dabob Natural Area Preserve Boundary.
- Through TLT and other mechanisms, some parcels have gone to the County (Quimper Corridor, South Shine, Thorndyke 160)

- TLT is in process for an additional Devils Lake parcel with funding earmarked in the 2023 state budget
- A boundary expansion of Dabob Natural Area Preserve has been proposed to include parcels to the north (Tarboo East) as well as to the south (Silent Lake, Camp Harmony, Eaton and Lone 40 parcels).

The basic zoned approach described in the FFF report continues to make good sense and is reflected in the proposals in this report. Many of the considerations summarized in the report, including recreational use, adjacency, threat of conversion evaluated in that report hold true. This report builds on the FFF by updating the status of parcels and providing further evaluation and context in terms of forest management. We evaluated DNR parcels individually to reflect new considerations including more in-depth forest structure and detailed forest management options appropriate for the county scale, presence of ecologically significant communities, and current or potential for inclusion in the DNR carbon project.

Rare and Imperiled Forests in East Jefferson County

The unique rainshadow zone of the eastern Olympic Peninsula has given rise to a series of lowland conifer forests whose range appears to be very limited within east Jefferson County and Island County. The extent, quality and connectivity of these forests has been significantly impacted by human alteration of the landscape, primarily conversion to industrial timber plantations and development. Because of their rarity and limited distribution, these forest types have been given conservation status rankings by the Washington Natural Heritage Program.

East Jefferson County has three forest types which are ranked as imperiled globally or critically imperiled statewide. These imperiled conifer forests feature an overstory of Douglas-fir mixed with Western Hemlock and Western Redcedar. The presence of Evergreen huckleberry (*Vaccinium ovatum*) in combination with Sword fern (*Polystichum munitum*), and Pacific rhododendron (*Rhododendron macrophyllum*) are key indicators for identifying the three different imperiled forests. The Washington Natural Heritage Program has done surveys in some of the DNR parcels in this study, particularly in the areas around Dabob Bay, and has generated spatial data of the occurrences of these rare and imperiled forest types.

These forest types require special management consideration because under sustainable forest certification programs such as FSC and SFI they cannot be harvested. DNR lands are certified through SFI (Sustainable Forestry Initiative) and are required uphold their standards to stay certified as well as the Washington State Forest Practices Rules. These two requirements combined hold DNR to some of the highest standards for forest protection in the country for a public land management entity to continue to monitor and protect these rare plant communities.

Conclusion

Through this research we have aimed for a balanced approach at every angle. We looked at options and strategies to help answer the main question: how can Jefferson County support healthier forests for generations to come, provide sustainable timber and jobs to our local economy, and provide our community and visitors with increased recreational opportunities? There are still questions and considerations that we were unable to address fully in the timeline for this project, but the work is ongoing and we have found there is sufficient evidence that this is a viable approach and can continue to be expanded. Based on our research we think there are practical options and objectives that are complementary between DNR and Jefferson County to continue to build a larger land management strategy for the region where Jefferson County is a more active forest land manager. Furthermore, we believe Jefferson County has the opportunity to continue to build on a standard of what county forest management can achieve as a partner on the landscape.

Appendix

Jefferson County Advisors

Jefferson County Forest Management Priorities 2023-2030

DNR Lands Management Scenarios

USFS Variable Density Thinning Primer

2023 DNR Parcels Reference List

Forests for the Future Report, 2011

Jefferson County Property Maps

Jefferson County Forest Management Program Advisors

Chickadee Forestry relies on expertise from a wide group of local experts representing different aspects of forest management. Our aim is to be as well rounded in approach as possible and take multiple stakeholder viewpoints into consideration for a balanced approach. A special thanks to the following people for supporting this effort and providing expertise.

Arno Bergstrom, Forester, Kitsap County Forest Stewardship

Created Kitsap County's forest stewardship program and has run it for 5 years successfully

Dr. Catharine Copass, Ecologist, Olympic National Park Service

Specializing in plant community classification and mapping, landscape change detection and vegetation change on the Olympic Peninsula.

Mike Cronin, retired Forester, DNR and Cronin Forestry

Experienced forester in Jefferson County, informed the feasibility study and provides continued expertise on forest management

Jennifer Gallant, Fiber Procurement Manager, Port Townsend Paper Company

Jennifer is a new addition to the advisors as requested this year to have more industry represented and comes with a background in marketing and long family history with PTPC.

Ross Goodwin, Department of Revenue, Forester

Has been with DNR and DoR as forester in the region for many years and is well versed on DNR forest practices and ensured compliance to DNR Forest Practices Rules in the region.

Ian Hanna, Consultant, Altruist Partners, formerly Forest Stewardship Council

International experience in sustainable forestry and community economic development, based in Jefferson County

Al Latham, Jefferson County Conservation District Supervisor

Served as manager/technician at the Jefferson Co. Conservation District for 20 years and currently serves on the Conservation District Board of Supervisors, based in Jefferson County

Tami Pokorny, Natural Resources Coordinator, Jefferson County Environmental Health

Manages natural resources and the Conservation Futures program for Jefferson County

Denise Pranger, retired Director, Northwest Natural Resources Group

Specializing in forest certification and forest carbon sequestration, based in Jefferson County

Matt Tyler, Director, Jefferson County Parks and Recreation

Manages parks and recreation programs, staff, and development for Jefferson County

Operators

A special thank you to operators and collaborators who have helped problem solve and find creative solutions to build this forestry program. North Hills Logging, Northwest Sawmill, and WoodSong Tree Company owners have all shared their time and expertise regarding forest management for the county and are ongoing trusted project partners.

Jefferson County Forest Management Priorities 2023-2030

Pre-commercially Thin Higher Risk Forests by 2028

Properties:

Beausite (Parcel 901273001) 46 acres

Cape George (Parcel 001172002) 33 acres

Financials:

Cost: \$500/acre approximately. Can be done in sections or all at once.

Revenue: Typically none. Exploring option of biochar or other small wood product sales to offset cost.

Why harvest? Both stands were harvested around 2000 and the young trees have grown to a density where they are in intense competition. If these stands are left alone the trees will continue to get more stressed, which will increase risk of forest health concerns and fire risk over time. Thinning stands around 20 years old helps to release the young trees, decrease competition, and help improve growth. The harvest will focus on retaining all native species, which includes Western white pine at the Cape George parcel, to maximize a native forest composition.

This type of thinning is called a pre-commercial thinning because the trees are too small at this stage to sell and they will be cut down and left on site to break down over time. This wood will protect the soil and provide nutrients back into the soil over time, and help the soil retain moisture during the hottest times of the year. The downed wood will also help the site from more noxious weeds establishing and will provide habitat to insects and wildlife.

Selective Commercial Harvest

Potential Properties:

Parcel Number	Area	Acreage	Volume/Acre	Total Volume	Notes
001083012	Port Townsend	30	7MBF/acre	210 MBF	Hazard tree requests
901111009	Tri-Area	20	7MBF/acre	140 MBF	Low complexity, low priority
821302002	104	20	5MBF/acre	100 MBF	~25 yrs old, medium priority
701071002	Quilcene	20	5MBF/acre	100 MBF	~ 25 yrs old, medium priority

Financials:

Cost: Trucking and operator costs. Variable based on market, but will likely be higher percentage (>60%) due to small volume. Combining harvests will be more cost effective.

Revenue: Each of these harvests should yield approximately 5-10 MBF/acre on average.

Why harvest? Small properties may be appropriate for smaller selective harvests to improve forest health and offset costs of the pre-commercial thinning harvests. A list of smaller properties that are overstocked and exhibit some forest health concerns are listed as options for potential selective harvests. These harvests are targeted to improve forest health and ecosystem function as well as providing revenue for the forestry program.

Monitoring

Continue monitoring sites that have been harvested with photo points and sample plots.

Annual monitoring of county properties. Potential for training volunteers as forest stewards.

Replanting and Noxious Weed Management

Replanting site appropriate native species in gaps where mortality has occurred. Continued noxious weed management as necessary. Work with county partners.

Local Wood and Partnerships Development

Continue to develop opportunities for building local capacity on small scale forest management and additional industries, including biochar, forest mulching, and waste wood opportunities.

DNR Lands Collaboration

Continue working with DNR and BoCC on potential land transfers and management priorities on trust lands.

DNR Land Management Scenarios

Site Name Anderson Lake
Trust Type Common School – 542, Forest Board – 39
Total Acres 582

Transition Method Reconveyance, TLT or Purchase
DNR Carbon Program Yes
DNR Planned Sale Yes

Stands

Stand 1 200 acres, harvested 2005-2010, large diameter Western redcedar (40"+) and snags
Stand 2 75 acres, harvested 2020
Stand 3 70 acres, harvested 1970's
Stand 4 200+ acres, harvested pre-1970's, some was set aside for Marbled Murrelet habitat, much protected riparian areas

Management Considerations

Adjacent to Anderson Lake State Park, already in use for recreation especially mountain biking, and potential for Olympic Discovery Trail corridor to pass through. Higher ecological value with riparian areas, 60+ year old diversified stands with Douglas-fir, Big-leaf maple, Western redcedar. Large (40"+ diameter) Western red cedar preserved from past harvests. Higher site quality (Site class 3 and 4), potential for more sustained selectively harvested timber on longer rotations. Higher density area, high use areas.

Benefits to Transition

Potential for community forest to demonstrate mix of lower impact forest management, higher touch forest management for community. Fire risk mitigation and access design with local fire department. More potential opportunities for recreation (trails) through local partnerships

Suggested Management Timeline

Activity*	Stand	Acreage	Volume	Total	Timing	Notes
Selective	Stand 4	50 acres	7 MBF/acre	350 MBF	2025	Diversify, timber revenue
PCT	Stand 2	75 acres	-	-	2040	Net loss
Selective	Stand 4	50 acres	8 MBF/acre	400 MBF	2040	Diversify, revenue, offset PCT costs
Selective	Stand 3	50 acres	9 MBF/acre	450 MBF	2060	Partial harvest, diversify
Selective	Stand 2	50 acres	5 MBF/acre	250 MBF	2060	Partial harvest, first commercial

*(Harvest activity descriptions on last page)

Other Management:

Monitoring, especially first years post-harvest. Manage noxious weeds and replant as appropriate. Work with operators and project partners to develop trails and maintain access for fire. Provide community education on forest management.

Adjacency

Anderson Lake State Park directly adjacent, Gibbs Lake County Park, Chimacum County Park and HJ Carroll County Park all in vicinity creating green space corridors and more recreational opportunities.

Site Name Cape George
Trust Type Common School – 243
Total Acres 243

Transition Method TLT or Purchase
DNR Carbon Program Yes
DNR Sale Planned Yes

Stands

Stand 1 100 acres 30 years old, planned DNR sale
 Stand 2 21 acres, harvested 1970's, mixed willow forest, no harvest planned
 Stand 3 31 acres, some pre-1900, no harvest
 Stand 4 51 acres, harvested ~2010

Management Considerations

Poor site quality and growth (Site class 4) make it a less desirable property for focusing on timber production. Older forest, locally termed "Quimper Lost Wilderness," ecological and cultural value to community would benefit from permanent protection. Fire risk in young regeneration and higher risk with high density population surrounding. High recreation use property. Ecological significance also as one of few areas in eastern Jefferson County with higher Western white pine occurrence.

Benefits to Transition

Potential for community forest to demonstrate mix of lower impact forest management, higher touch forest management for community. Fire risk mitigation and access design with local fire department. More potential opportunities for recreation (trails) through local partnerships

Suggested Management Timeline

Activity*	Stand	Acreage	Volume	Total	Timing	Notes
Selective	Stand 1	80 acres	5MBF/acre	400 MBF	2030	Partial harvest, diversify, improve
PCT	Stand 4	51 acres	-	-	2035	Net loss
Selective	Stand 4	51 acres	5MBF/acre	255 MBF	2050	First thin, improve growth
Selective	Stand 1	40 acres	7MBF/acre	280 MBF	2060	Partial harvest, diversify

*(Harvest activity descriptions on last page)

Other Management:

Monitoring, especially first years post-harvest. Manage noxious weeds and replant as appropriate. Work with operators and project partners to develop trails and maintain access for fire. Provide community education on forest management.

Adjacency

Quimper Wildlife Corridor region, West Jacob Miller, County lands including solid waste facilities and Trailhead County Park. Area is most at risk of conversion in East Jefferson County.

Site Name Teal Lake East
Trust Type Forest Board
Total Acres 655

Transition Method Reconveyance
DNR Carbon Program No
DNR Sale Planned Yes

Stands

Stand 1 200 acres 30 years old, planned DNR sale
Stand 2 450 acres, harvested 1980's

Management Considerations

Fairly productive site (Site Class 3), and large amount of healthy commercial timber. Property can be selectively thinned intermittently on longer rotations to provide sustained smaller amounts of revenue to the county, which also would help offset restoration costs, and can demonstrate larger parcel of transitioning to older, selective rotation. If transitioned with Teal Lake West (532 acres), combined could be beneficial for part of county designed carbon and thinning program for ecosystem services. Community already uses these forests heavily with established trails and signage, which makes ideal for more park-like use as well.

Benefits to Transition

Potential for community forest to demonstrate mix of lower impact forest management, higher touch forest management for community. Fire risk mitigation and access design with local fire department. More potential opportunities for recreation (trails) through local partnerships

Suggested Management Timeline

Activity	Stand	Acreage	Volume	Total	Timing	Notes
Selective	Stand 1	50 acres	6 MBF/acre	300 MBF	2025	Partial harvest, diversify, improve
Selective	Stand 2	50 acres	6 MBF/acre	300 MBF	2025	Partial harvest, diversify, improve
Selective	Stand 1	50 acres	7 MBF/acre	350 MBF	2040	Partial harvest, diversify, improve
Selective	Stand 2	50 acres	8 MBF/acre	400 MBF	2050	Partial harvest, diversify, improve
Selective	Stand 1	50 acres	8 MBF/acre	400 MBF	2060	Partial harvest, diversify, improve

**(Harvest activity descriptions on last page)*

Other Management:

Monitoring, especially first years post-harvest. Manage noxious weeds and replant as appropriate. Work with operators and project partners to develop trails and maintain access for fire. Provide community education on forest management.

Adjacency

Teal Lake West, Termination Point, Tala Point.

Management Timeline Considerations

Near Term Projections 2023-2030

Site	Management	Acres Harvested	Total Volume (MBF)	Volume per acre (MBF)	Timing	Net Revenue to JC	JC Net Revenue/Acre Estimate
Cape George*	PCT	46	-	-	2025	(\$23,000)	(\$500)/acre
Beausite*	PCT	33	-	-	2025	(\$16,500)	(\$500)/acre
Teal Lake E	Selective	100	600	6	2025	\$600,000	\$600/acre
Anderson Lake	Selective	50	350	7	2025	\$350,000	\$700/acre
Cape George	Selective	80	400	5	2030	\$100,000	\$200/acre
Totals	-	309 acres	1350	-	-	\$1,010,500	-

*Indicates county owned land

Rationale: Initial costs to transfer DNR lands and to address higher need pre-commercial thinning on county properties are considered here. County designed carbon offset and DNR carbon programs do not have enough information to assess revenue at this point effectively. The volume and revenue estimates above are best guesses and are dependent on various factors including operator costs, fuel costs, mill prices for wood, amount of defect and pulp percentages in properties.

NOTE: DNR has planned sales already on each of these properties in the same time frame and will generate more revenue due to optimized operating costs. These projections are for lighter touch, longer rotations that focus less on highest return on timber and balancing multiple ecological, community, and financial objectives.

Initial Harvests Costs and Revenue for Comparison

Site	Acres Harvested	Total Volume (MBF)	Volume per Acre (MBF)	JC Total Revenue	JC Revenue/Acre
Chimacum Park	38	376	9.9	\$ 86,026.49	\$ 2,263.86
Beausite	100	377	3.8	\$ 28,374.05	\$ 283.74
CG Gravel	14	5.8	0.4	\$ 13,933.81	\$ 995.27
Trailhead	36	144	4.0	\$ (39,557.80)	\$ (1,098.83)
Totals	188 acres	902.80	-	\$ 88,776.55	\$ 611.01

Harvest Types

Pre-commercial Thinning (PCT): A harvest prescription for young stands generally in the first 20 years of a commercial planting. Commercial stands are planted overly dense intentionally and a pre-commercial thin is needed to release trees and allow them to grow freely once they get into a stage of intense competition around age 20. This practice is called pre-commercial because there is no commercial value in the harvest and it is a net loss, but it is an important investment in a healthier forest.

Selective Thinning (Selective): These harvests can be designed in several ways, but they are designed to remove about 30% of the volume from a given stand and to leave the healthiest trees. There are different strategies such as thinning from below, and variable density thinning, depending on what the specific goals are for the site. These harvests do provide revenue generation from timber that is large enough to be sold for profit.

Science

FINDINGS

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"Science affects the way we think together."

Lewis Thomas

LET'S MIX IT UP! THE BENEFITS OF VARIABLE-DENSITY THINNING



James Dollins

The Olympic Habitat Development Study on the Olympic National Forest used variable-density thinning with skips and gaps to increase variability in tree growth rates.

"The opportunity lies in creatively using knowledge of these forests to improve the sustainability of all forest management in the region."

—T.Spies and S.Duncan, eds.,
Old Growth in a New World

Old-growth forest—there's not much of it left. And to get more, we'd have to wait awhile, a century or so on the short side to a millennium or more, depending on whom you ask. Undoubtedly, time is an indispensable ingredient. But if we step away from the term "old growth" and look at some of the physical and biological characteristics typical of an older

forest, it appears forest management can help nudge a young stand a little faster along the path of forest succession.

Many late-successional forests in the Pacific Northwest are characterized by the high levels of biodiversity they support, variable tree spacing, and multiple layers in the overhead canopy. They are a stark contrast to young, dense stands or stands managed primarily for timber where there is little variation in tree spacing and species composition. Because little light reaches the forest floor in these types of forest stands, the understory is often sparse to nonexistent. If you're a marbled murrelet or a northern spotted owl looking for a place to call

IN SUMMARY

Can management of 40- to 80-year-old forests on the Olympic Peninsula accelerate the development of stand structures and plant and animal communities associated with much older forests? The Olympic Habitat Development Study, a cooperative project between the Pacific Northwest Research Station and the Olympic National Forest, began in 1994 to examine this question. It uses a novel type of variable-density thinning called thinning with skips and gaps. Ten percent of the study area was left unthinned, while 15 percent was cleared to create openings in the forest canopy. These gaps also yielded most of the merchantable timber. The remaining 75 percent of the area received a light thinning that removed mostly the smaller trees of the most common tree species.

Five years after treatment, there was a noticeable difference in growth rates throughout the study area. In thinned areas, average growth was nearly 26 percent greater than in the unthinned areas. Tree growth was greatest around the gaps. Understory vegetation increased, and the presence of nonnative species was low, with most of the nonnatives found in the gaps. Wind damage was low and predictable. The treatments were easy to apply, and these findings suggest that greater diversity in stand structures and plant communities can be accelerated by thinning with skips and gaps.

home, these differences in real estate are a deal breaker.

Maintaining biodiversity and enhancing wildlife habitat for threatened and endangered species are now important aspects of management for many public land managers and are also of interest to environmental organizations, land trusts, and others. Working under the legacy of past management has prompted some forest managers to ask, can we manage stands that are fairly simple in structure to make them more complex? How long will it take to notice any change?

Scientists from the Pacific Northwest (PNW) Research Station began working in 1994 with staff on the Olympic National Forest in Washington to implement the Olympic Habitat Development Study to address these questions.

"The goal," says Connie Harrington, a research forester with the PNW Research Station in Olympia, Washington, "was to test if management could be used to accelerate the development of stand structures and plant and animal communities associated with late-successional stands."

KEY FINDINGS
• This type of variable-density thinning with skips and gaps was easy to apply and resulted in little damage to residual trees.
• Variability in tree growth rates increased within stands that had received variable-density thinnings. Responses were evident within 5 years, and all sizes of trees responded in the areas that were thinned.
• Variability increased in plant cover (especially herbaceous plants) and in tree regeneration.

In the moist coastal forest of the Olympic National Forest, this meant thinning stands of 40- to 80-year-old Douglas-fir, western hemlock, western redcedar, and Sitka spruce in a way that encouraged a diversity of tree species, growth rates, and development of understory vegetation.

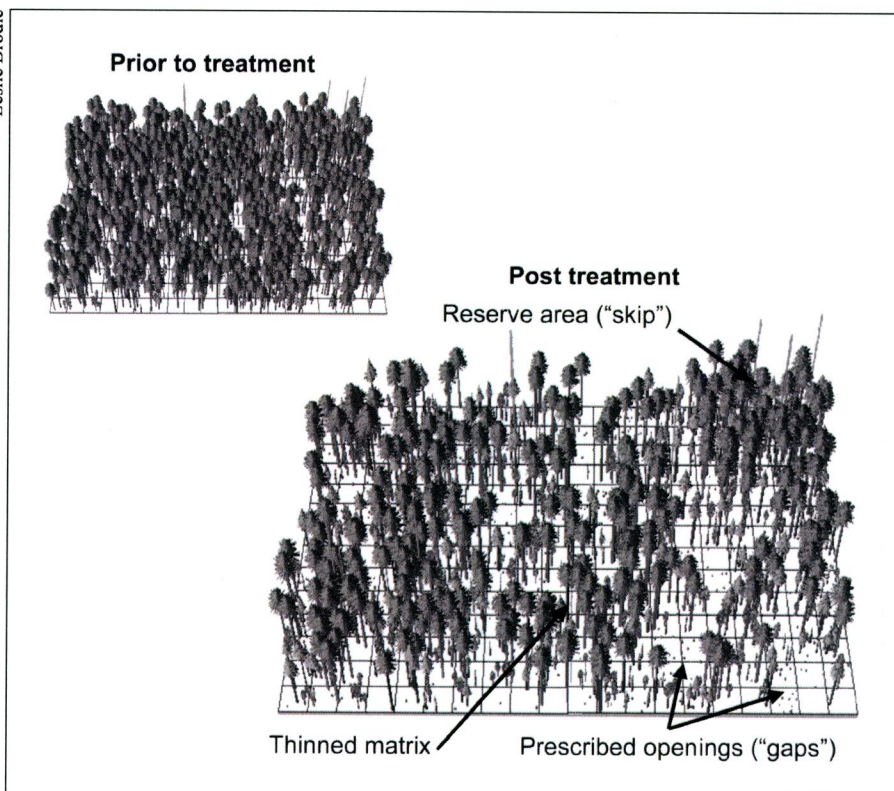
Eight study areas in total were established on the west and east sides of the Olympic Peninsula. All areas had been logged and burned at some point beginning in the 1930s

through the 1950s. Most stands regenerated naturally, but two had a mix of planted and naturally regenerated trees.

Management since harvest varied: five of the stands had not been thinned prior to the study, one had been precommercially thinned, and two had been commercially thinned in the 1970s and 1980s. Stands were selected to provide a range of species composition and to be typical of conifer forests that would be managed in the future.

"The Olympic National Forest had a wide range of stand conditions, and these stands were old enough to support commercial thinning, making it a good location for this study" says Harrington. The commercial thinning paid for itself and benefited nearby communities with timber-based jobs. A study into ways to create old-growth-like habitat while providing timber jobs fell right in line with the Northwest Forest Plan, which had been developed earlier in the year.

Leslie Brodie



A diagram of a stand before and after thinning with skips and gaps. Snag height is exaggerated for visibility.

Purpose of PNW Science Findings

To provide scientific information to people who make and influence decisions about managing land.

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United States
Department
of Agriculture



Forest
Service



Leslie Brodie



Diana Livada

By leaving some areas undisturbed (left), while creating gaps in the canopy in others (right), the stand becomes more diverse in terms of structure, tree size, and habitat it provides for other plants and animals.

THINNING WITH SKIPS AND GAPS

The main treatment was a novel type of variable-density thinning called “thinning with skips and gaps,” explains Harrington. Variable-density thinning, as the name implies, is variable. Some areas of the treatment are more heavily thinned than others. In this study, 10 percent of the area was left unthinned (or skipped), and mechanized equipment was prohibited from entering those areas. The gaps, on the other hand, comprised about 15 percent of the area and were cleared to create openings in the forest canopy about the size of two side-by-side tennis courts. The remaining 75 percent received a light thinning in which the smaller trees of the most common tree species were removed.

“The skips were a novel part of this treatment,” says Harrington. Previous studies have looked at the effects of gaps and different thinning levels but have not included small-scale skips. In this study, the skips were strategically placed to maintain certain conditions. “Often when applying a thinning treatment, you have to fell snags for the loggers’ safety,” explains Harrington. When working with a treatment that includes skips, “you can arrange the skips to avoid working in areas with lots of snags or other key structures that you want to maintain for wildlife habitat.”

The skips essentially created small reserves across the treatment area. Ecologists have argued for the importance of maintaining reserves at different scales, explains Harrington, and in places other than riparian zones. The skipped areas can become a refuge for species that are particularly sensitive to disturbance, while the variation in the landscape created by the gaps and the thinned areas may provide for the habitat needs of other species.

Andrew Carey, a now-retired research wildlife biologist, initiated the wildlife component of this study, which measures the response of forest floor small mammals to variable-density thinning. Since Carey’s retirement, Todd Wilson, a research wildlife biologist with the PNW Research Station in Corvallis, Oregon, has led this work and added an amphibian component. Analysis of pre- and posttreatment populations of small mammals and amphibians is underway.

Opinions differed as to whether it was actually possible to use silvicultural activities to create diverse stand structure, explains Harrington. “Some people thought the treatments would make the trees more susceptible to wind damage. Others thought the treatments would be too difficult or cumbersome to apply effectively,” she recalls.

“There was a lot of discussion about how to specify the treatments,” says Harrington. “We didn’t want the loggers to find them impractical.” These discussions included personnel on the Olympic National Forest.

Kathy O’Halloran, a natural resource staff officer on the forest, has worked with the scientists since the initial planning period and has found this close communication immensely valuable. “When it first started, there were some operational issues to work out, and there was a bit of a learning curve,” she recalls. “But now we implement this concept in all our timber sales. It’s not a cookie cutter approach by any means, but we’ve embraced it on all levels, from planning, to layout, to timber sale administrator. They all get the concept.”

“The loggers liked creating the gaps because they could fell the trees into them,” says Harrington. When selectively thinning in dense forests, trees and understory intended to be left standing can be damaged by the machinery and felling of the tree slated for removal. With this treatment, there was very little damage to the residual trees. The gaps were also the source of the larger, merchantable trees, which helped make the timber sales pay for themselves.



Jana Carlson

The gaps provided most of the merchantable timber, enabling the timber sale to pay for itself.

RESPONDING TO CUSTOM TREATMENTS

“Some people said 60-, 70-, 80-year-old trees were too old to respond to thinning,” recalls Harrington. “But within 5 years, we saw a response, which is a very short period. The trees took advantage of the extra space and additional light that the thinning provided. The poorest growth and development was in the skipped areas,” she says.

The scientists found that in the thinned areas, average growth was nearly 26 percent greater than in the unthinned areas, when adjusted for species, initial tree size, and crown class. Midstory trees and the understory also responded positively. The stand conditions prior to the most recent thinning influenced the magnitude of the growth. “Tree growth was greatest if the stand had not been previously thinned,” notes Harrington.

“One interesting thing was that the effects of the thinnings and gaps extended past the treatment lines on the ground,” says Harrington. Vegetation along the edges of skips developed more than vegetation farther away from the edges. Trees closer to the gaps grew more than trees located farther within the thinned areas. “With this variable-density thinning treatment, we created many edges within each stand, which created another level of variability,” says Harrington. When the objective is to create diversity in stand structure and vegetation, all this variability is a good thing.

An issue of concern before the treatments was the potential for increased wind damage after thinning. If a tree is suddenly exposed to more wind than it is accustomed to, it may snap or blow over, perhaps taking other trees with it on its way down. Trees eventually adjust to the conditions, and over time the risk of windthrow is reduced. “We found little significant wind damage if you’re careful where you place gaps, skid trails, and landings in relation to topography,” explains Harrington. That means avoid placing gaps on hilltops, ridges, and other locations susceptible to high wind speeds, especially if a stand is fairly dense.

Scientists also determined that damage from windstorms can be predicted based on the height-to-diameter ratio—the taller and skinnier the tree, the more susceptible it is to wind damage. The gaps were designed to be smaller in diameter than the height of the tree canopy to reduce the likelihood that gaps would funnel the wind into the stand downwind of the gaps. Of course when the objective is to increase stand diversity, a certain level of wind damage may be welcome. A snapped tree becomes a snag, and blowdowns create their own gaps in the forest canopy and add woody debris to the forest floor.



Connie Harrington

Wind damage was minimal and predictable.



Leslie Brodie

The gaps created the opportunity for young trees and a more diverse understory to become established.

The main reason for creating gaps in the forest canopy is to let more light reach the forest floor. The variable-density thinning created a wide range of overstory and understory conditions and the coverage of herbaceous plants reflected that. The greatest increase in the number and coverage of herbaceous species was in the gaps and thinned areas, while coverage of mosses and liverworts was reduced in those areas.

A common concern is that disturbances associated with thinning and harvest treatments will clear a path for invasion by non-native plants. Harrington says, “In general there were fairly few nonnative plants that developed after thinning—and since most of the invasive nonnative plants are adapted to disturbed, high light environments, it’s not surprising that most of them were restricted to gaps.”

WRITER’S PROFILE

Rhonda Mazza is a science writer with the Pacific Northwest Research Station.

NEXT STEPS

Walking through the study areas on the Olympic National Forest 10 years after the first variable-density thinning, the differences are obvious to even the most casual observer. O'Halloran, the staff officer, has helped lead a number of field trips through the study areas. "We have had people from all different backgrounds come out to see this study, Forest Service, non-Forest Service, environmentalists, loggers. For the most part they've all liked what they've seen," she says.

"It's encouraging to see this treatment push the stands in the right direction, and I expect the effects to continue for a long time. But if you really want to test how quickly we can accelerate structural diversity or develop some plant communities, then we need to re-enter these stands and try various treatments in both the overstory and understory" says Harrington. "For example, thinning the western hemlock understory which is developing in some stands might favor some of the herbaceous species we would like to see increase in cover."

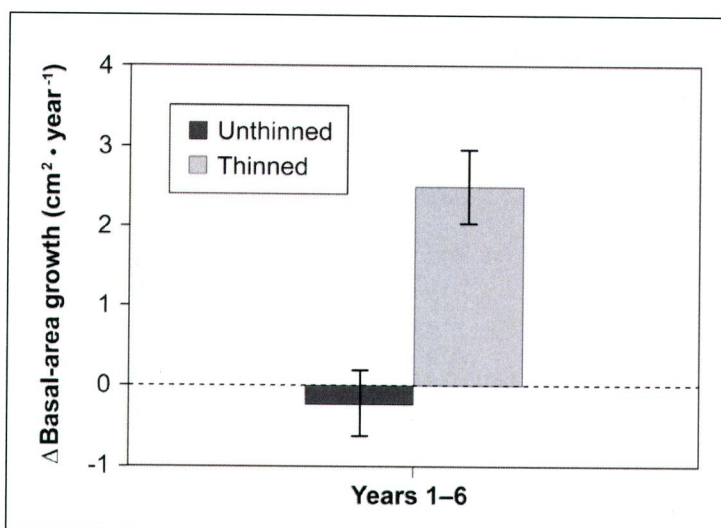
Another beneficial outcome from this study is the new information about growth rates. The thinning treatment has caused some trees to grow faster than others, as intended, but it complicates growth-rate projections. "Forest managers use growth models to predict what's going to happen," explains Harrington. "Data from this study are being used to test growth models to see how accurately the models predict what we have observed. So far, we found that they do a good job predicting the growth of big trees but not of small trees under a forest overstory."

Scientists are at work on this next phase. Growth models that incorporate the effects of thinning with skips and gaps will be a useful tool for forest managers designing treatments to meet specific objectives, such as accelerating the development of stand structures associated with older forests.

Harrington commented, "One thing that is very impressive about these forests is not just the longevity of the trees but the longevity of their growth rates. They could continue to grow in height and diameter for centuries." Thus, applying treatments in stands that previously might have been considered "rotation age" and ready for a regeneration harvest can effectively nudge stand development toward goals associated with providing more acres of forests with stand structures typical of those found in older stands.

*"To make knowledge productive
we will have to learn to see
both the forest and the tree."*

—Peter Drucker



Midstory western hemlock trees grew much faster in the 6 years after thinning than they did in the 5 years before treatment, whereas similar-sized trees in the unthinned areas grew slightly less in the same 6-year period than they did earlier.



LAND MANAGEMENT IMPLICATIONS



- Variable-density thinning with skips and gaps can be operationally applied with little damage to residual trees.
- Damage from windstorms following thinning can be kept low (and can be predicted by the ratio of mean tree height to diameter).
- Tree growth in all stands (including those 60 to 80 years old) increased in response to thinning in a fairly short period.
- Different growth responses among trees within and between different treatment components increased the development of structural diversity.
- Understory plant responses to thinning were rapid. The responses varied with initial stand conditions as well as the variability in resources created by thinning with skips and gaps.

FOR FURTHER READING

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- Roberts, S.D.; Harrington, C.A. 2008. *Individual tree growth response to variable-density thinning in coastal Pacific Northwest forests*. Forest Ecology and Management. 255(7): 2771–2781.
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DNR Property Recommendations for Jefferson County

DNR Parcel Name	Acres	Region	Type	Recommendation
Anderson Lake	582	N 104	Common School - 542, Forest Board	TLT and Reconveyance
Beaver Valley	521	N 104	Common School	TLT or Purchase
Camp Harmony	182	Dabob	Common School	TLT or Carbon
Cape George	243	N 104	Common School	TLT or Purchase
Coyle Road	149	Dabob	Forest Board	TLT
Crocker Ridge	1002	WFL	Common School - 77, Forest Board	DNR Hold
Dabob Bay Natural Area	1909	Dabob	NRCA	DNR Hold
Dabob East	158	Dabob	Forest Board	TLT
Dabob West	817	Dabob	Common School - 384, Forest Board	TLT or DNR Carbon, DNR Hold
Devils Lake	494	WFL	Common School - 415, Natural Area	TLT
Disco	120	WFL	Forest Board	DNR Hold, DNR Carbon
Duckabush Lower	44	WFL	Common School	TLT
Duckabush Upper	40	WFL	Common School	TLT
Eaglemount 80	80	N 104	Forest Board	DNR Hold
East Blyn	1321	WFL	Common School, Forest Board, Carbon	DNR Hold, DNR Carbon
Eaton	657	Dabob	Forest Board	TLT
Egg and I	325	N 104	Common School	DNR Hold
Larson Lake 40	40	N 104	Forest Board	DNR HOLD or Reconveyance
Larson Lake 80	79	N 104	Forest Board	DNR HOLD or Reconveyance
Leland/Ripley	1070	WFL	Common School - 366, Forest Board	DNR Hold, DNR Carbon
Lemons Road	79	Dabob	Forest Board	TLT
Lone 40	40	Dabob	Forest Board	TLT
McDonald Creek	587	WFL	Common School	DNR Hold
Mt Jupiter	695	WFL	Common School - 461, Forest Board	DNR Hold
Penny Creek	2322	WFL	Common School - 314, Forest Board	DNR Hold
Quimper Corridor	112	N 104	Common School	TLT
Silent Lake	1104	Dabob	Common School - 40, Forest Board	TLT
Skidder/Snow	2674	WFL	Common School - 1332, Forest Board	DNR Hold, DNR Carbon
South Shine	49	WFL	University	TLT
South Snow	346	WFL	Forest Board	DNR Hold
Spencer Creek	156	WFL	Common School	DNR Hold
Tala Point	73	N 104	Forest Board	Reconveyance
Tarboo East	820	Dabob	Common School - 77, Forest Board	TLT, Carbon, Reconveyance
Tarboo Upper	863	Dabob	Common School - 581, Forest Board	TLT, Carbon, Reconveyance
Teal 40 (Paradise Bay)	38	N 104	University	TLT, Community Forest
Teal Lake East	655	N 104	Forest Board	Reconveyance
Teal Lake West	532	N 104	Forest Board	Reconveyance
Termination Point	59	N 104	University	TLT or Purchase
Thorndyke 160	157	WFL	Forest Board	TLT
Thorndyke 80	78	WFL	University	DNR Hold
Triton Cove	294	WFL	Common School	DNR Hold
Walker Mtn	1119	WFL	Common School - 103, Forest Board	DNR Hold
West Jacob Miller	121	N 104	Common School	TLT or Purchase
Zelatched Point	360	Dabob	Common School - 40, Forest Board	DNR Hold

Recommendations

DNR Carbon: indicates that there is older forest (pre-1920) on this parcel for consideration

TLT: Trust Land Transfer

Reconveyance: Only allowed with Forest Board lands to transition to parks

Purchase: Direct real estate purchase

DNR Hold: DNR continues to manage

Regions

WFL: Working Forest Landscape

N 104: Region North of Highway 104

Dabob: Part of or adjacent to the Dabob Natural Conservation Recreation Area (NRCA)