





Agenda

- Introduction and Older Forest Policy Review
- Old Growth Field Assessment
- Monitoring Forest Growth Over Time
- Measuring Older Forest Progression
- Forest Carbon
- Summary and Next Steps



Old Growth and Older Forest Policy Review



Policies that shaped our current management

- 1997 Habitat Conservation Plan
- 2004 Sustainable Harvest Calculation
- 2004 Legislation on Old-Growth
- 2006 Policy for Sustainable Forests
- 2019 Marbled Murrelet Long-term Conservation Strategy – Habitat Conservation Plan Amendment



Summary from May 2021

REVIEW

Trust Lands are managed for long-term revenue

Old Growth is identified and protected
from harvest

HCP landscape conservation protects species,
habitat, and biodiversity

Policy framework creates landscapes with
substantial structurally complex forests



HCP Amendment reinforced landscape conservation and
released older forests not essential to conservation goals



Daniel Donato



Natural Resource
Scientist



Washington State
Department of
Natural Resources



Outline:

- DNR's Old-Growth Program structure (west side)
- What triggers an assessment?
- Field work
- Criteria assessed and how
- Outcomes



Structure of DNR's Old-Growth Program

Purpose: Implement the Board's policy on deferring old-growth forests

- Old-growth structure
- Age (pre-1850)
- >5 acres

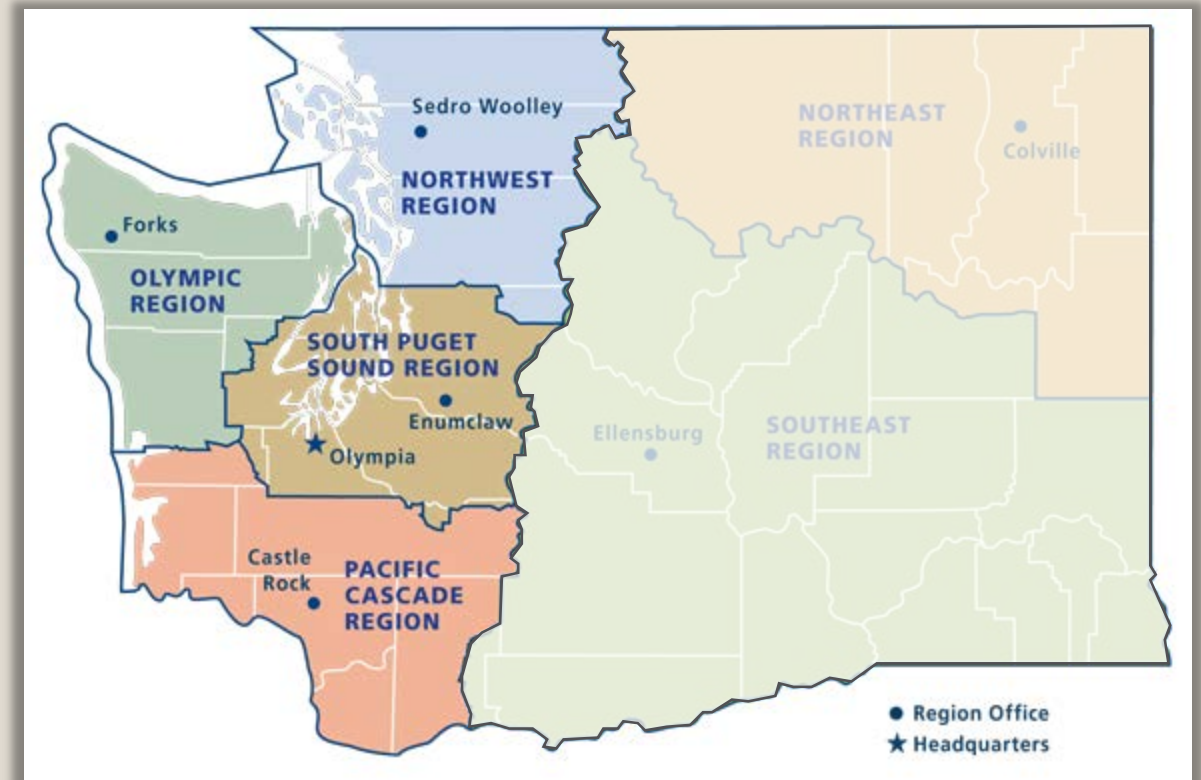
Headed by Forest Resources Division scientists (Olympia)

Each west-side region has trained OG "designees"

OG trainings conducted every ~1-3 years

Approach:

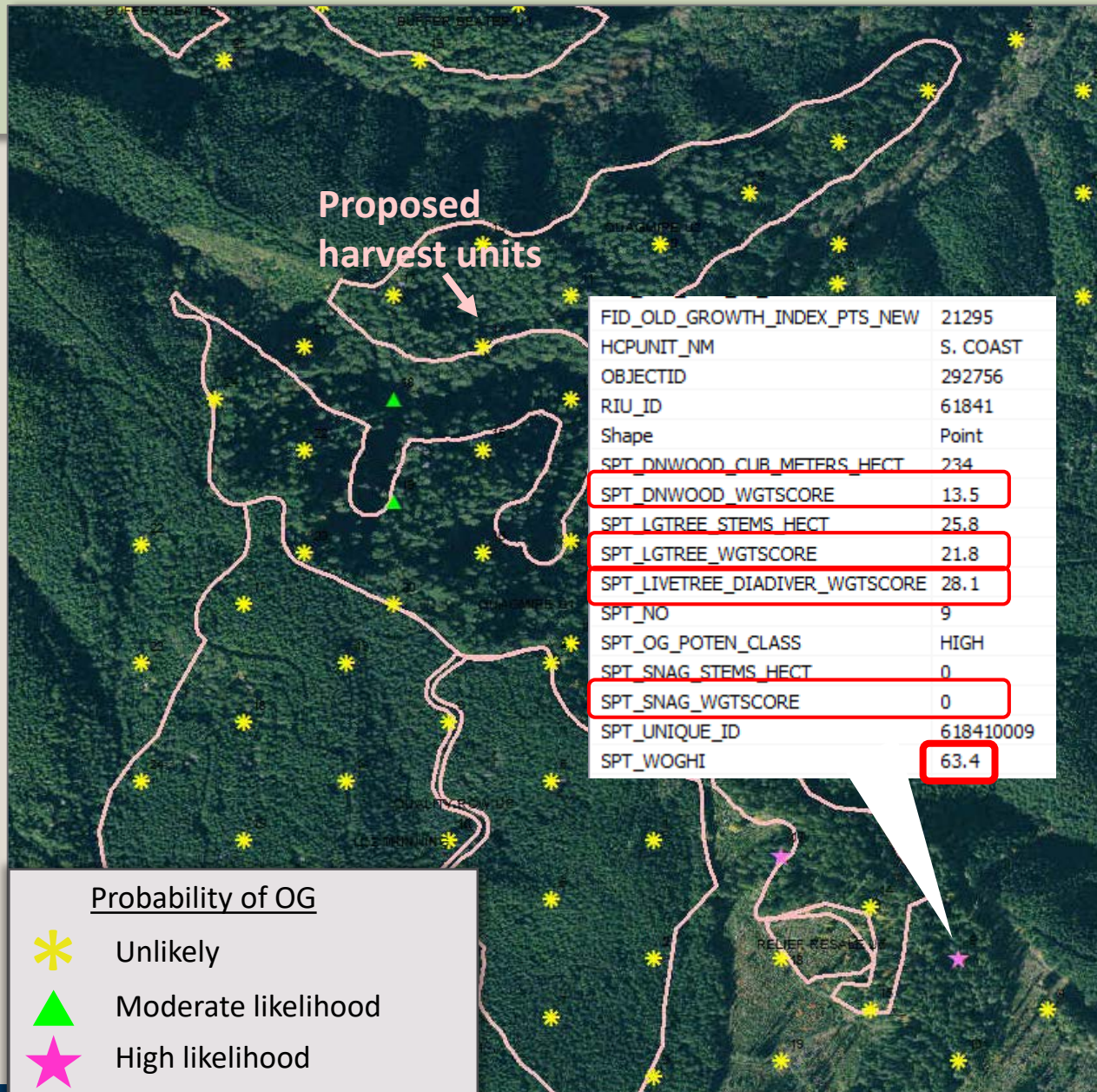
- Expose lots of staff to training to increase awareness
- "Designee" status conferred only after several assessments completed satisfactorily



What triggers an OG assessment?

1. Forest inventory data

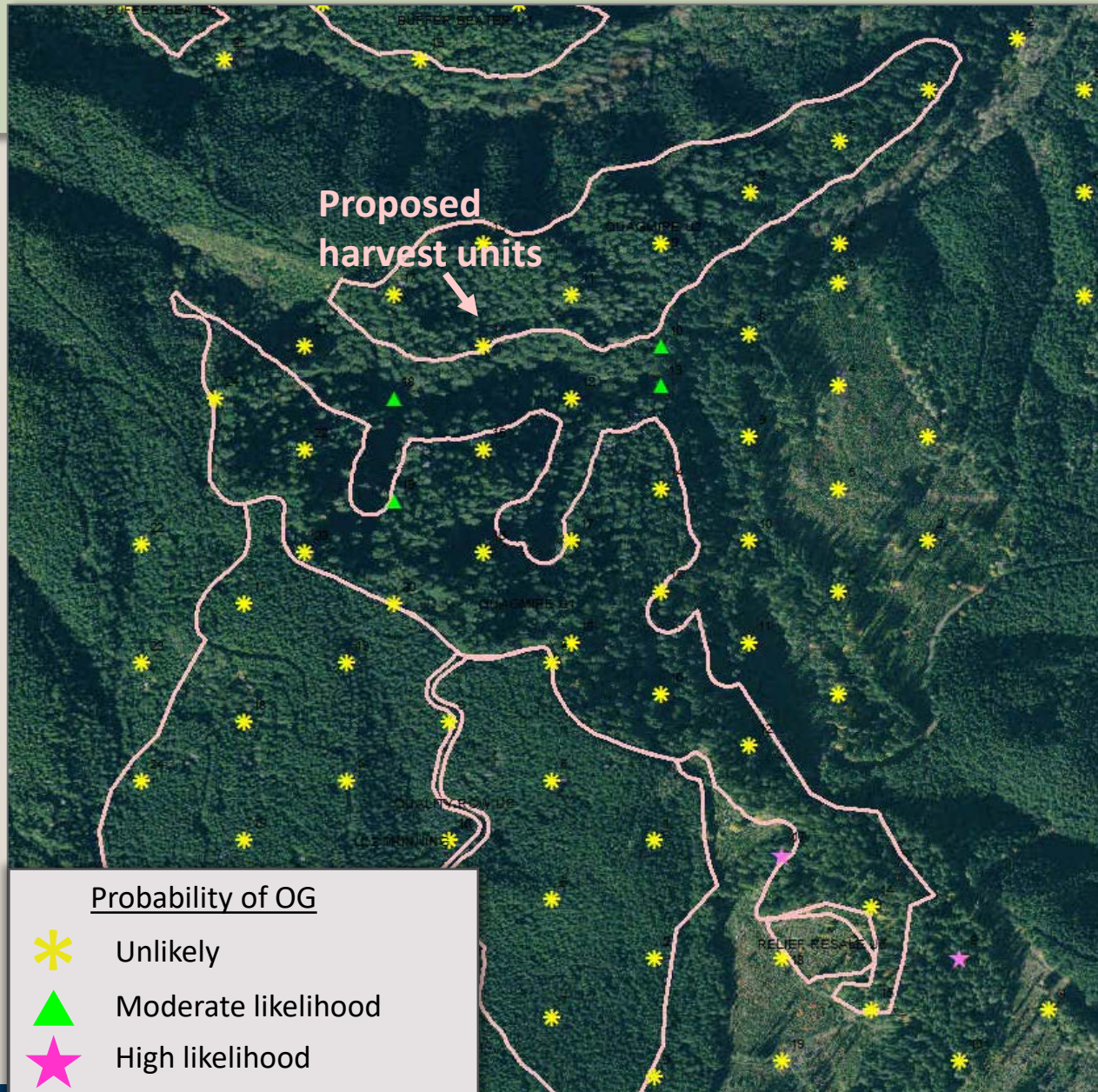
- “WOGHI” scores
(Weighted Old Growth Habitat Index)
- Developed by original Old-Growth expert panel (*Franklin, Spies, Van Pelt, Pabst, et al.*)
- Statistical regressions based on abundance of:
 - Large trees
 - Large snags
 - Down wood
 - Diameter diversity (canopy layers)



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 - Large trees
 - Large snags
 - Down wood
 - Diameter diversity (canopy layers)
- Moderate & high points in/next to proposed activity trigger an assessment





What triggers an OG assessment?

1. Forest inventory data

- “WOGHI” scores
(Weighted Old Growth Habitat Index)

2. Observations on the ground

What triggers an OG assessment?



1. Forest inventory data

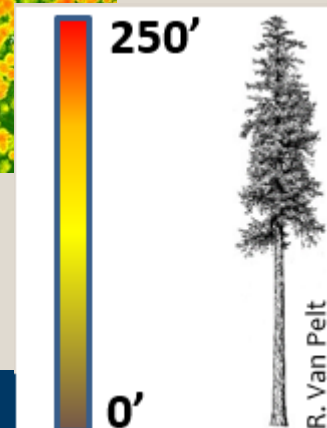
- “WOGHI” scores
(Weighted Old Growth Habitat Index)

2. Observations on the ground

3. Aerial/remote sensing data

4. Other sources

(e.g. neighbor/public input)



Field work in an assessment

Visit WOGHI points

Walk, walk, walk the stand (spatially thorough)

Evaluate stand for:

- Structural development
- Pre-1850 age
- Acreage

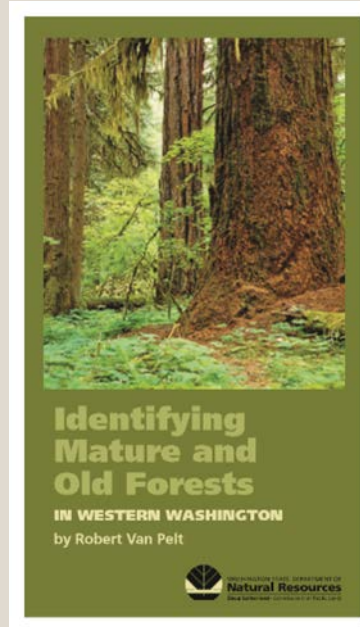
PSF
old growth
definition



Field work in an assessment

Structural development

Emphasizes stand development key
(Van Pelt 2007)



Stand Development in Natural Douglas Fir Forests

Key to Stand Development Stages in Western Washington for Western hemlock, Sitka spruce, and Pacific silver fir zones.

While this key has been tested in a wide variety of stands in western Washington, there may exist stands that do not key out properly. In these situations, relax the percentage values slightly and retry.

1. Cut stumps present throughout stand	2
No cut stumps	Natural forest* 3
2. Stumps cut by chain saw (short stumps – planted seedlings)	3
Stumps cut by hand saw (tall stumps, springboard notches – naturally reseeded) 3	
3. Legacy trees – trees considerably older/larger than the others, or a subset of trees with charcoal on bark present.	4
No legacy trees	6
4. Legacy trees < than 20 % canopy cover.	Stand with legacies 6**
Legacy trees ≥ 20 % canopy cover	Two cohort stand 5
5. Each cohort must be keyed out separately	
Older cohort	10
Younger cohort	6
6. Douglas fir (live or dead) ≥ 25 % of main canopy stems	7
Douglas fir < 25 % of main canopy stems	15
7. Young, planted Douglas fir trees < 10 years old. Cohort establishment phase	
Not as above	8
8. Young, planted Douglas fir trees 5-20 years old, abundant shrub cover	Canopy closure
Not as above	9
9. Douglas fir trees, not yet overhead, overlapping crowns, shrubs present ≥ 15 %	
Not as above	Canopy closure 10
10. Douglas fir canopy overhead, self pruning, scant understory	Biomass accumulation/stem exclusion
Not as above	11

Stand Development in Natural Douglas Fir Forests

11. Douglas fir overhead, self pruning; western hemlock, western redcedar, or Pacific silver fir present only in understory	Maturation I—Forests originating after Euro-American settlement***
Not as above	12
12. Douglas fir overhead, epicormic branches present, western hemlock, western redcedar, or Pacific silver fir seedlings, saplings, or small poles present, yet no main canopy trees	Maturation II—Forests originating before Euro-American settlement***
Not as above	13
13. Douglas fir upper canopy, western hemlock, western redcedar, or Pacific silver fir abundant and in many height classes, including main canopy	Vertical diversification
Not as above	14
14. Douglas fir canopy patchy, large canopy gaps present, western hemlock, western redcedar, or Pacific silver fir abundant in all canopy levels	Horizontal diversification
All Douglas fir trees dead (snags or logs), western hemlock, western redcedar, or Pacific silver fir abundant in all canopy levels.	Pioneer cohort loss
15. Sitka spruce, noble fir, or red alder ≥ 25 % of main canopy stems	use
steps 7-14, replacing Douglas fir with Sitka spruce, noble fir, or red alder	
Sitka spruce, noble fir, or red alder < 25 % of main canopy stems	use steps 7-14, replacing Douglas fir for
western hemlock, western redcedar, and Pacific silver fir collectively****	

* Certain areas in the Puget Basin were cleared of stumps during the early days of Euro-American settlement. While very few of these cleared areas have been reconverted to forests, the occasional stand may be encountered.

** For Douglas fir legacies, see the Rating System for Aging Legacy Trees on page 64. For Sitka spruce, western hemlock, or western redcedar legacies, use visual indicators under their individual sections.

*** Key was written in 2007. While stands keying out to Maturation I and II will be valid in any year, their relation to Euro-American settlement will not.

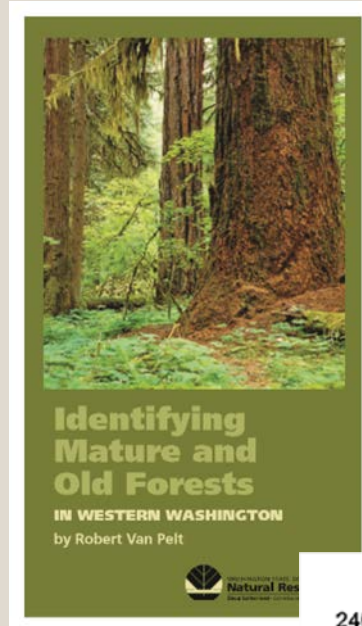
**** The horizontal diversification stage in this sequence is equivalent to the pioneer cohort loss stage of both the Douglas fir and Sitka spruce sequences.



Field work in an assessment

Structural
development

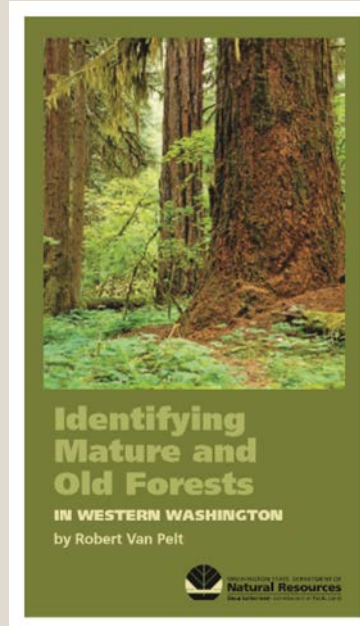
Emphasizes stand
development key
(*Van Pelt 2007*)



Field work in an assessment

Structural development

Emphasizes stand development key
(Van Pelt 2007)



Additional components evaluated
(e.g. snags, down wood, old cut stumps)
as clues to stand history/development
- but no strict thresholds on these

Stand Development in Natural Douglas Fir Forests

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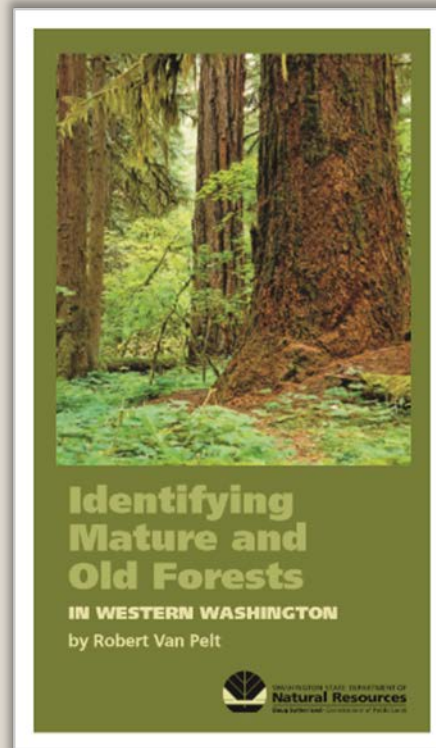
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Field work in an assessment

- Pre-1850 stand age
- Individual tree age score from Van Pelt 2007



Rating system for determining general age of Douglas fir legacy trees

Choose one score from each category and sum scores to determine developmental stage

Bark condition, lower one-third of tree	Score
Hard, boney bark with small fissures0
Hard bark with deep fissures1
Hard bark with charcoal present2
Soft, flaky bark with deep fissures2
Flaky bark with charcoal present3

Knot indicators, lower one-third of tree	Score
Branch stubs present	0
Old knot/whorl indicators visible1
No knot/whorl indicators visible2

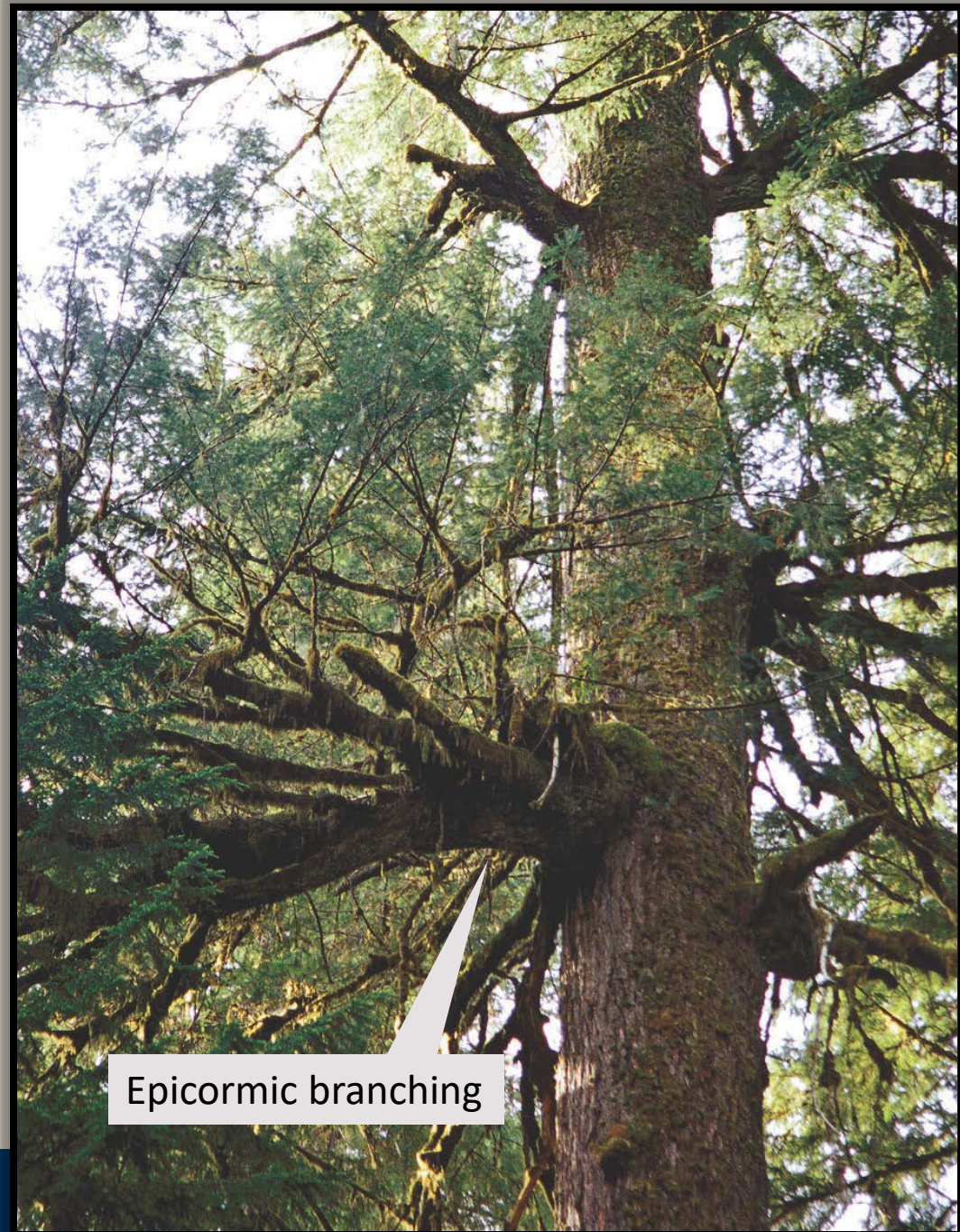
Lower crown indicators	Score
No epicormic branches	0
Small epicormic branches present1
Large and/or gnarly epicormic branches present2

Scoring Key	Age Range
< 2	Biomass accumulation/stem exclusion (35–80 years)
2–3	Maturation I – Forests originating after Euro-American settlement (70–160 years)
4–5	Maturation II – Forests originating before Euro-American settlement (140–240 years)
> 5	Old-growth (210+ years)



Lower branch indicators

Lower bark texture



Epicormic branching



Field work in an assessment

- Pre-1850 stand age
- Individual tree age score from Van Pelt 2007
- If necessary, tree coring
 - Minimum ~10-12 cores
 - Can be >50 cores
 - Extra levels of statistical rigor when pre-1850 call is less certain initially



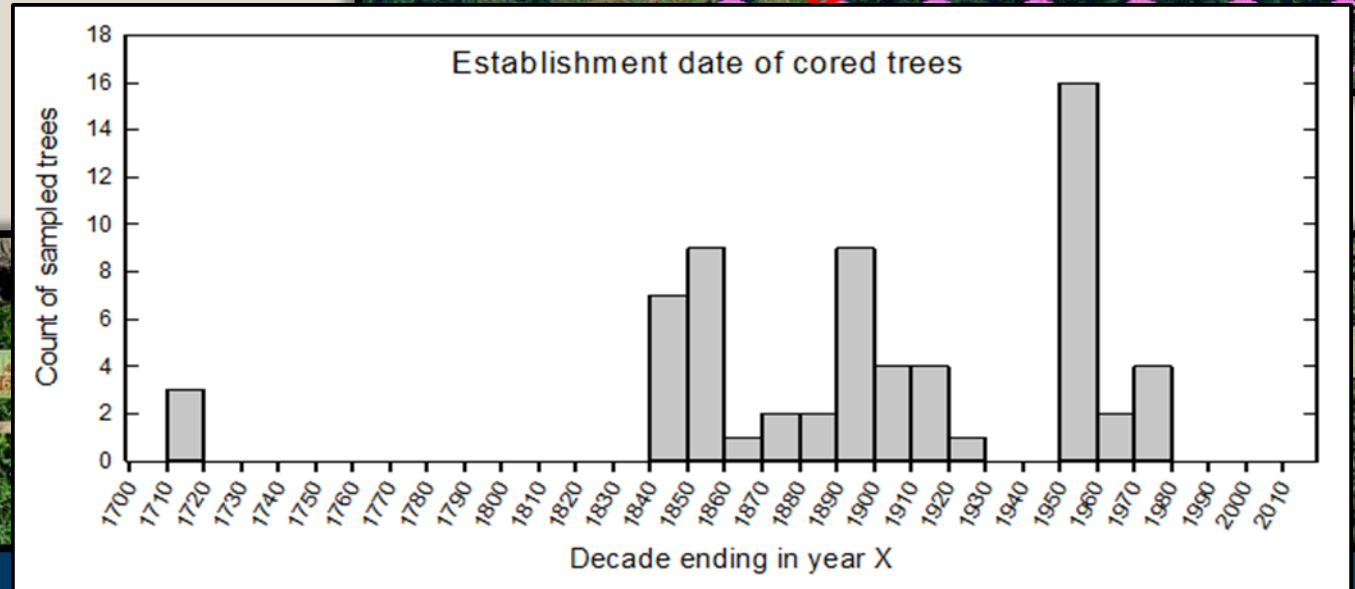
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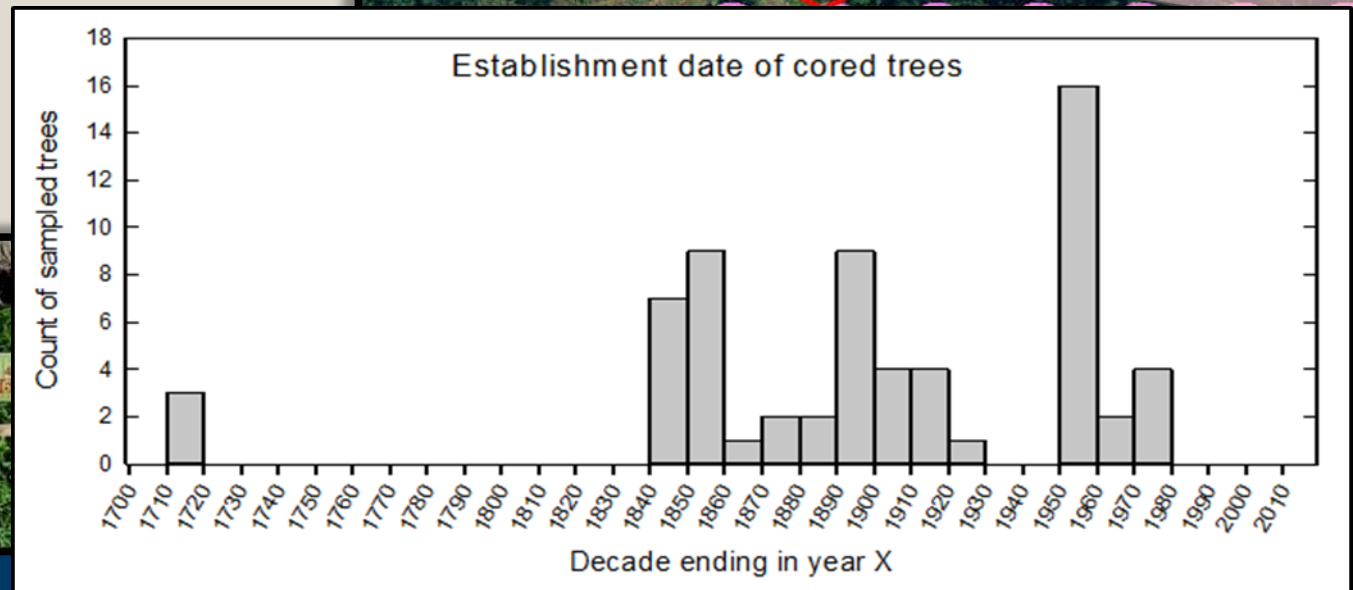
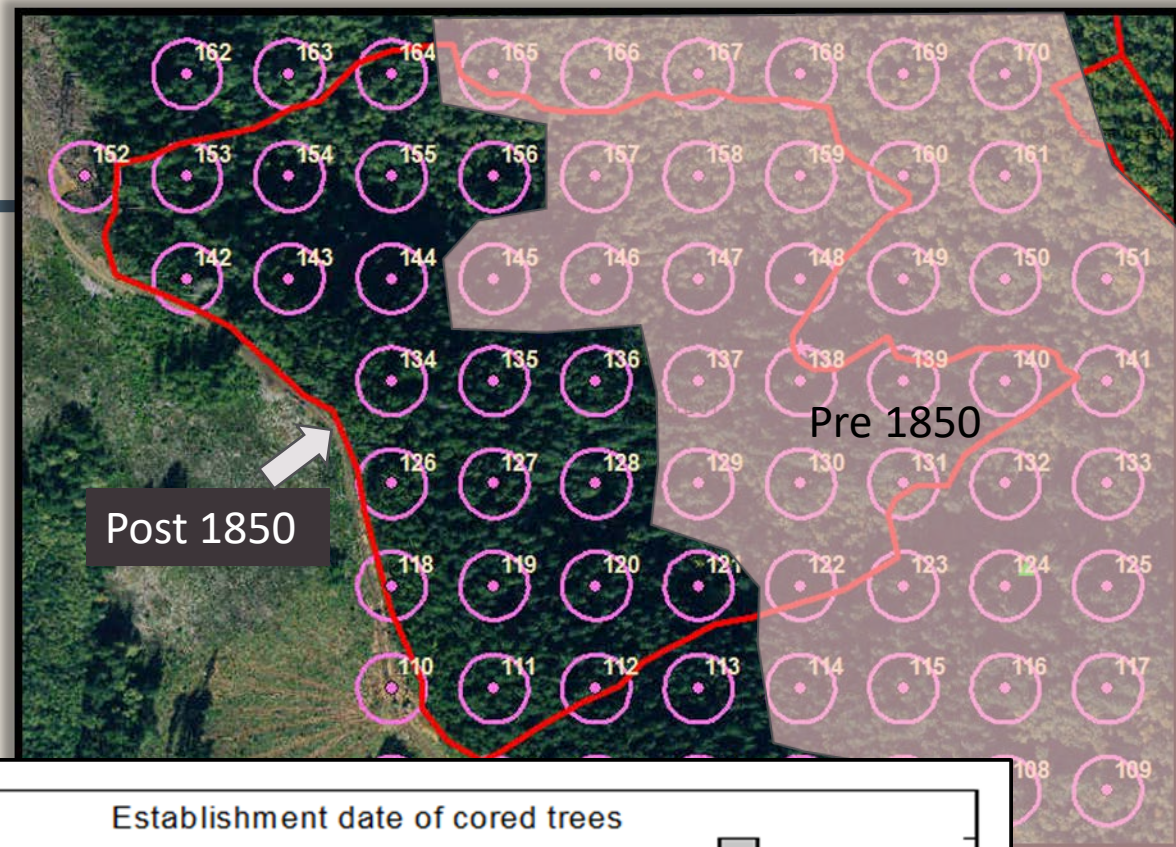
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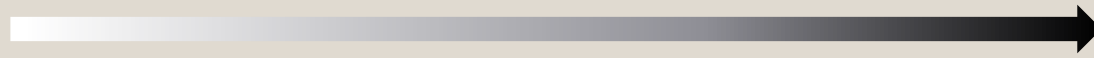
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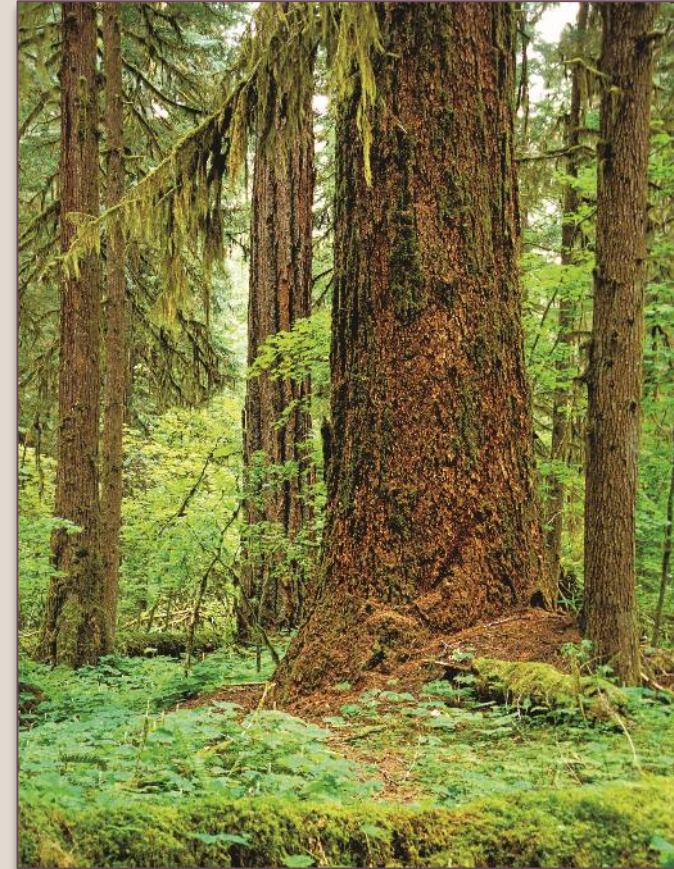
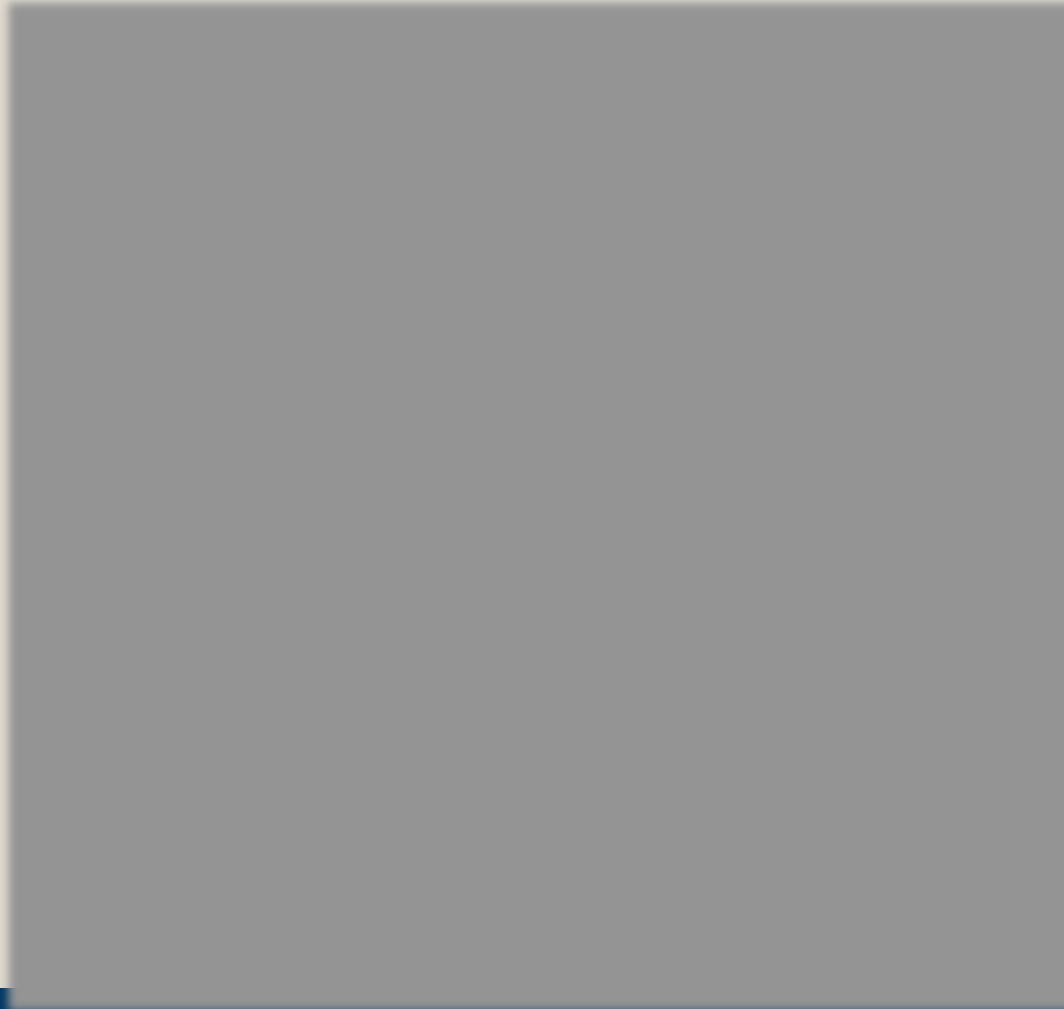


Not all outcomes are simple...

Clearly NOT Old Growth

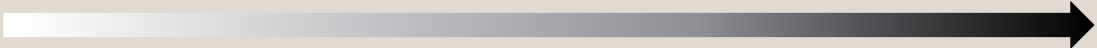


Clearly Old-Growth

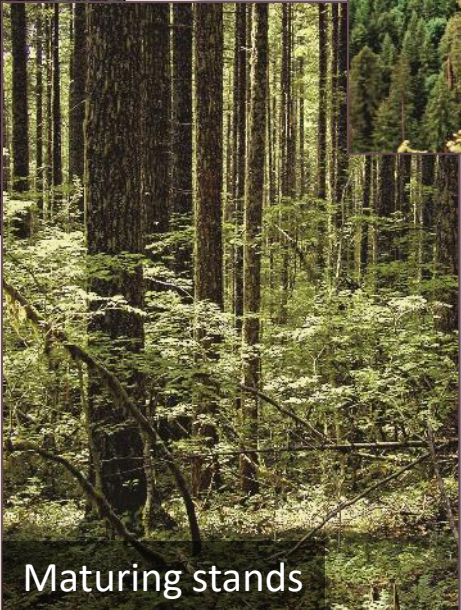


Not all outcomes are simple...

Clearly NOT Old Growth



Clearly Old-Growth



Documented on an Assessment Form

WADNR WEST SIDE OLD GROWTH ASSESSMENT

June, 2007

1. BATCH COVER SHEET TABLE

Older Forest Batch Id	Primary Twn-Rge-Sect		Name of Assessor	Exam Date	Number Sample Points Visited	Number Old Growth Polys Created	Number LULC FIUs Visited
<u>OF_batch_id</u>	<u>Pri_township</u>	<u>Pri_sect</u>	<u>Assessor_name</u>	<u>Exam_date</u>	<u>num_spt_visit</u>	<u>num_OGpolys</u>	<u>num_lulc_visit</u>
020274-07062015	T03R04E	13	Sirrine, Doug	07/06/2015	6	2	x

Sale name:	Access notes: Sale is accessed from the L-1200 to L-1210, to L-1211. A single gate is located on the L-1210 and can be accessed with a PCP1 key.
Moonster	

Opt. #1: Describes Old Growth Polygon		Opt. #2: Describes FRIS Sample Point			Opt. #3: Describes LULC FIU		
Old Growth Polygon Id	020274_2	RIU Id	020274	Spt No	xxxx	Lulc Riu Id	xxxxxxx
<u>OG_poly_id</u>		<u>Riu_id</u>		<u>spt_no</u>		<u>Lulc_riu_id</u>	

5a. Large Tree Characteristics (largetree_narr):



Old-growth Douglas-fir trees dominate this stand (see IMG_0276), comprising >20% of the canopy cover. Trees are 50+ inches in diameter, have hard bark with deep fissures, no knot indicators on the lower bole, large epicormic branches, and dead tops. These large trees are evenly distributed throughout the delineated polygon.

5b Snag Characteristics (snag_narr):

Very few snags exist on the site. Snags that do exist are from a younger cohort and are a result of competitive exclusion or damage done by a bear.

5c. Down Wood Characteristics (downwood_narr):

Down wood amounts are below average for the Larch landscape. No evidence of snagging that occurred after the Yacont Burn was present in the polygon.

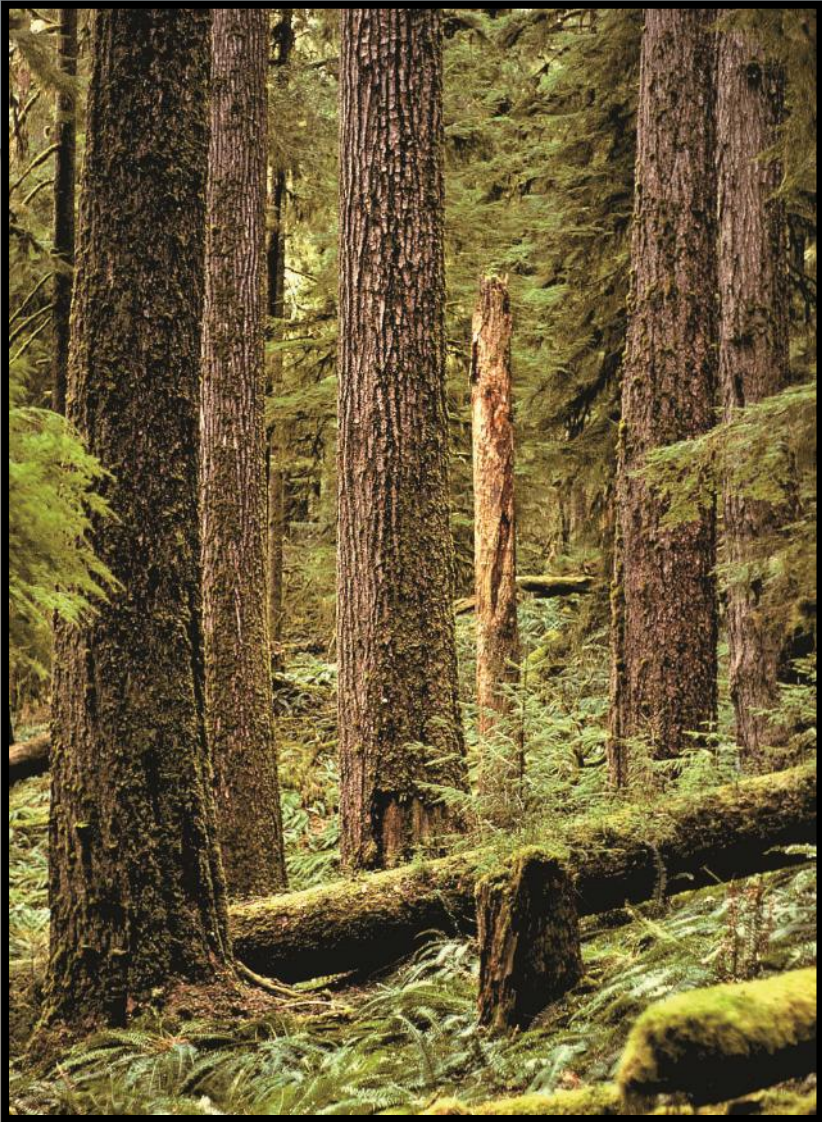
LULC Riu Id	Photo Temp. File Name	Photo Description (above), Photo (below):
<u>Lulc_riu_id</u>	<u>photo_id_temp</u>	<u>photo_descript</u>
	IMG_0263	Photo occurs on the lower portion of 020274_1. Large <u>epicormic</u> branches and deep bark fissures evident on this remnant Douglas-fir. Exact age could not be determined due to soundness. Increment borer indicated pre-1850.
		
	IMG_0265	Different angle illustrates several different age classes of Pacific silver fir and the heavy brush component on some areas of the site.
		



Outcomes



1. The assessed area meets all old-growth policy criteria
 - ➔ 5+ acre patch delineated and deferred from harvest
2. Old trees or small patches with old-growth components present, but less than 5 acres
 - ➔ No patch deferred
 - BUT, trees/patches emphasized for retention (*under different procedures*)
3. No old-growth components present
 - ➔ Activity proceeds



Field Assessment Summary

Completed to date...

- ~250 field assessments
- ~920 points assessed

41 Old-Growth stands protected (~1550 acres)

There is other old-growth on DNR land

- WOGHI points needing assessment

And within areas managed for

- Marbled murrelets
- Northern spotted owls
- Riparian

Thanks



Monitoring Forest Growth Over Time

Josh Halofsky

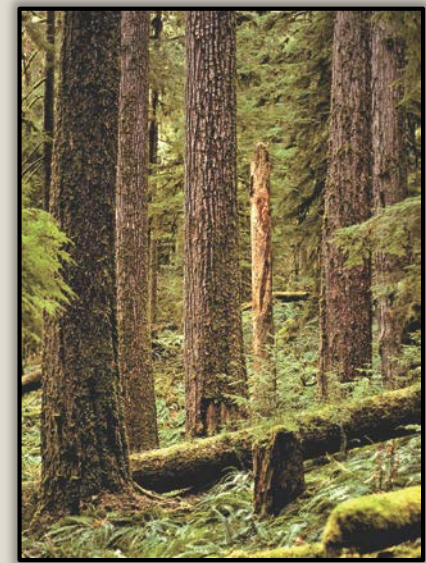
Natural Resource Scientist

Washington State Department of Natural Resources

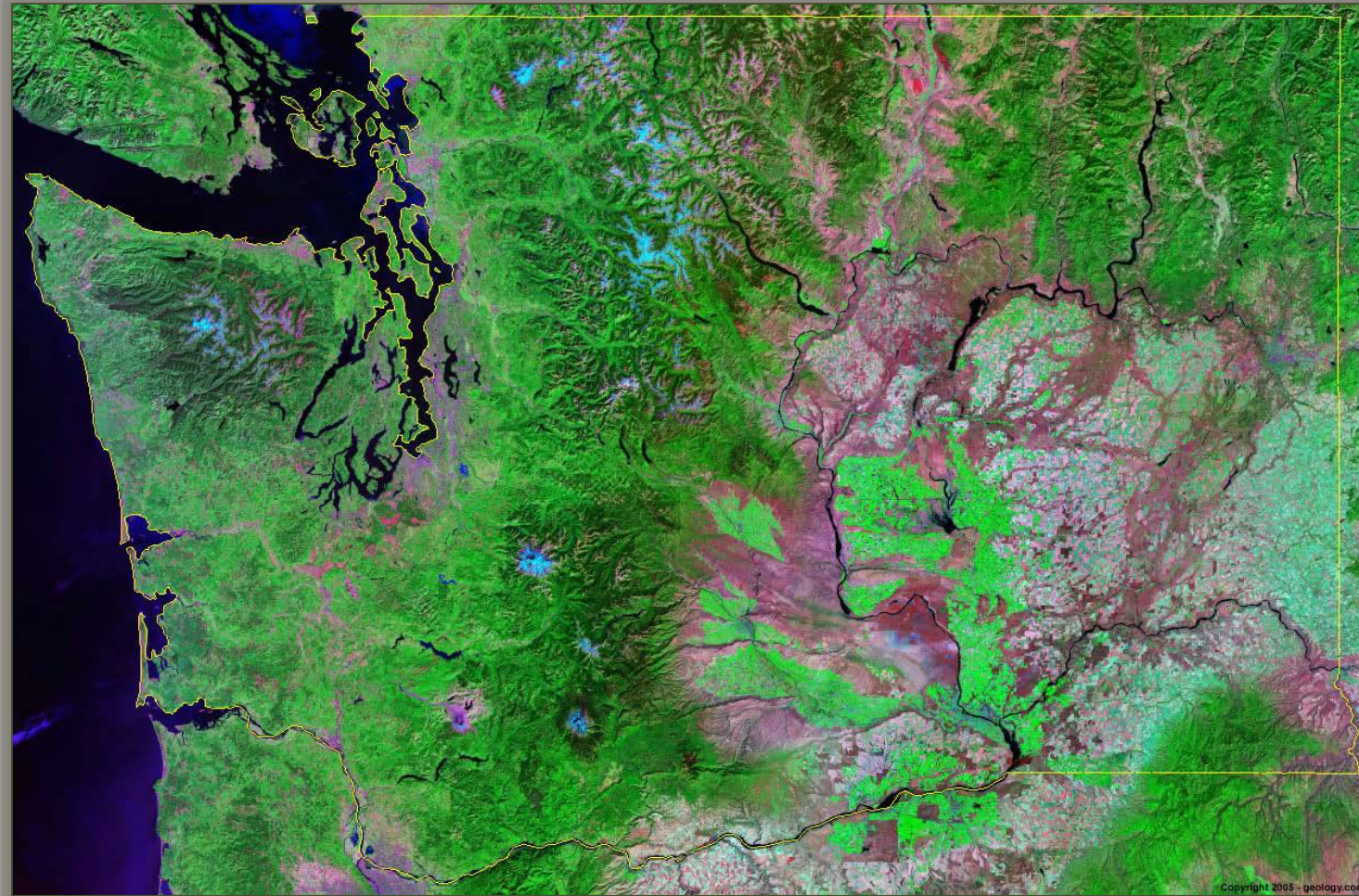


How are we doing?

Assessing the effectiveness of DNR's Habitat Conservation Plan in fostering complex forest structure



Ways to measure change in habitat condition



Ways to measure change in habitat condition

Research Projects | Methods | **Maps and Data** | Publications | About Us

Landscape Ecology, Modeling, Mapping & Analysis

LEMMA

Maps and Data


Home | Structure maps | Species maps | Plot Database

GNN Maps and Data

Available GNN maps


We are currently serving both GNN structure and species maps for large areas of the Pacific Coast States. Please see our [model types](#) page to determine which map would be best suited for your purposes. The maps below show the current extent of each dataset. Please **click the map** to be directed to the data download page.

GNN Structure maps



This page provides links for downloading master mosaics that cover the entire geographic area for which the most current GNN 'structure' maps are available. The grids are created by mosaicking together the GNN output for all of the modeling regions (see map) for a given imagery year. Since the modeling region boundaries are non-overlapping, the mosaics contain exactly the same results as the individual modeling region grids. Each mosaic is based on the same imagery date and plot datasets, so the mosaics are internally consistent across modeling regions.

GNN Species maps



This page provides links for downloading GNN species maps. For modeling region 118 (see map), a single GNN model was developed for the entire area (see Ohmann et al. 2011). Response variables used in model development were cover by species for woody species (all tree species, and shrub species present on at least 20 plots). This species model excludes satellite imagery, disturbance, and land ownership variables as explanatory variables, as they are more strongly correlated with forest structure than with species composition.



United States Department of Agriculture



NORTHWEST
FOREST PLAN

THE FIRST 20 YEARS (1994–2013)

Status and Trends of Late-Successional and Old-Growth Forests

Raymond J. Davis, Janet L. Ohmann, Robert E. Kennedy, Warren B. Cohen,
Matthew J. Gregory, Zhiqiang Yang, Heather M. Roberts, Andrew N. Gray, and
Thomas A. Spies



WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES

June 2021 Draft Subject to Change

dnr.wa.gov

Dividing the landscape



Somewhere in
Washington...
recently

Low
Management intensity
High



Riparian lands



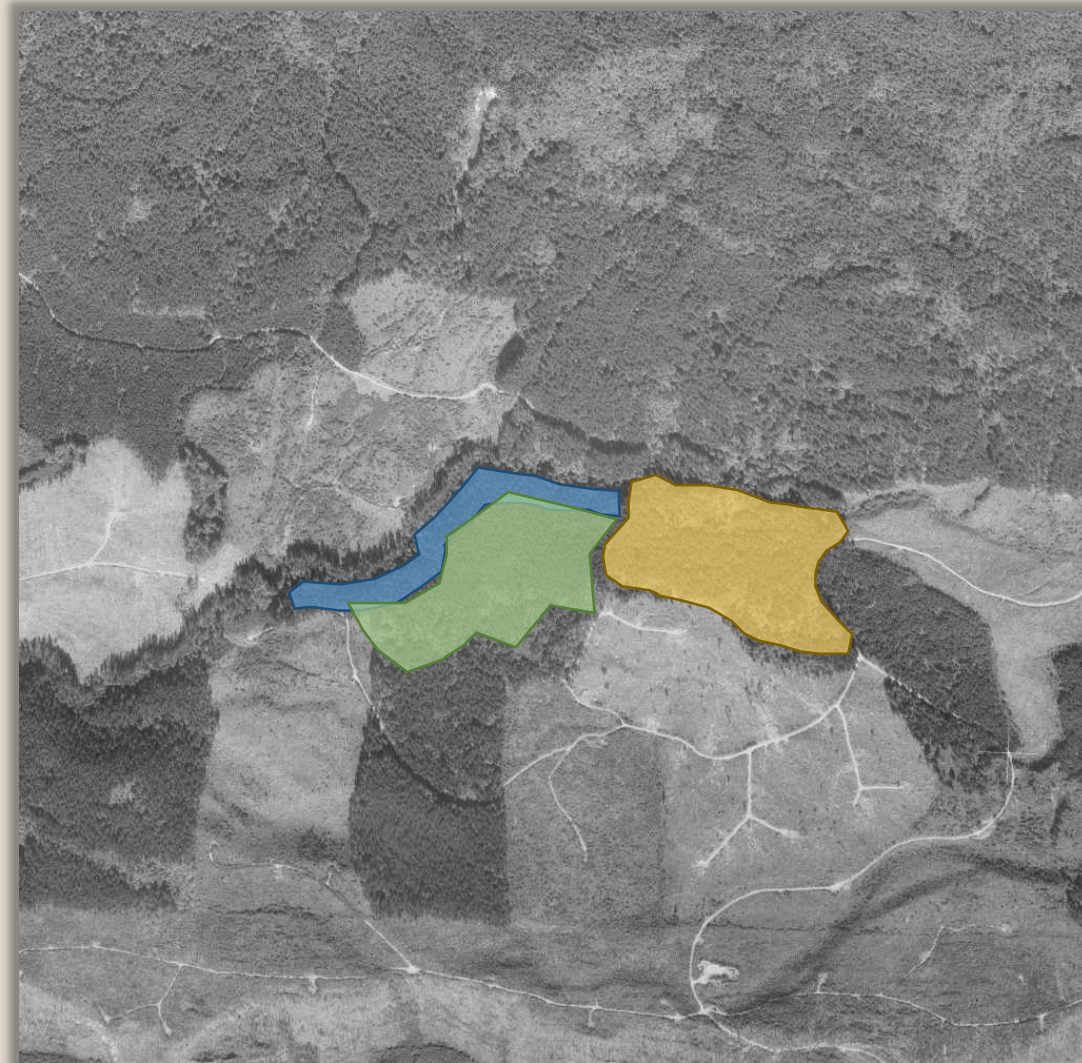
Uplands



GEM lands



Dividing the landscape



Same place...
in the past

Low
↑
Management
intensity
↓
High



Riparian lands



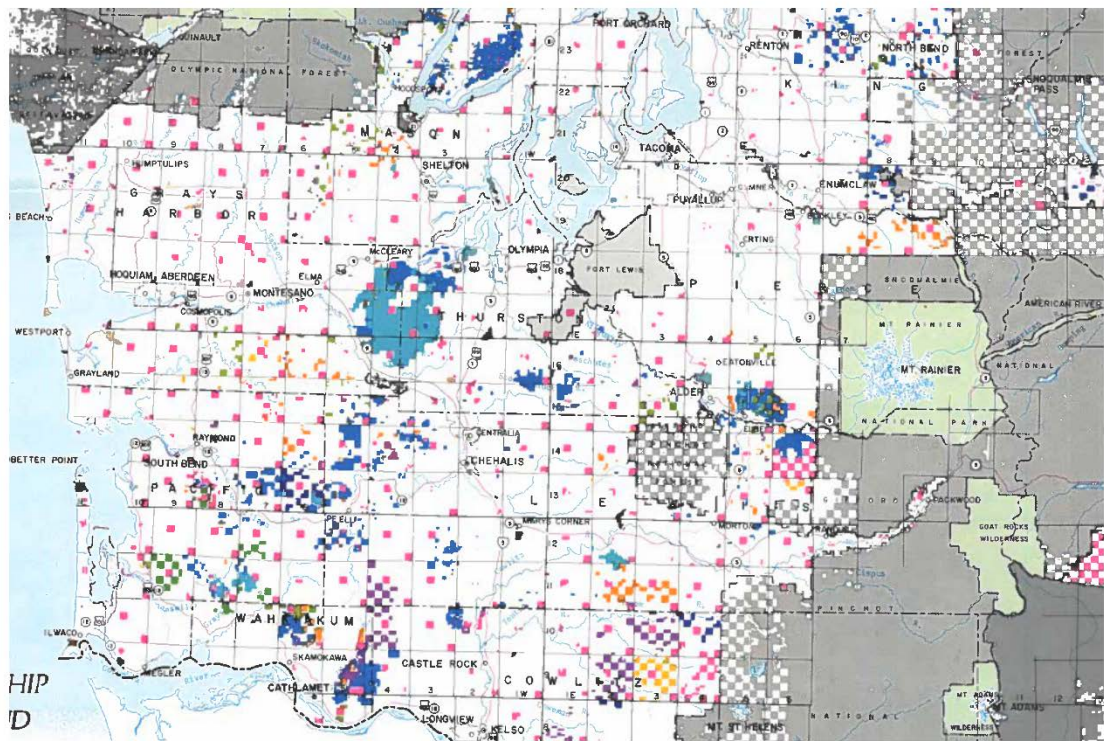
Uplands



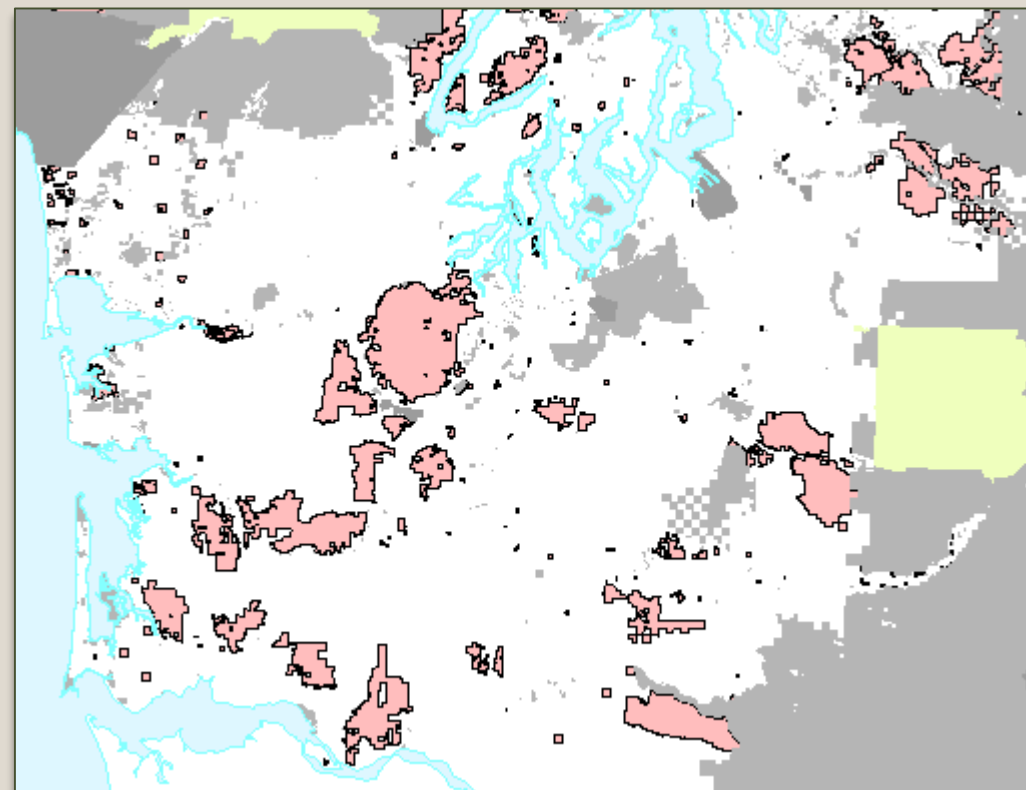
GEM lands



Area analyzed



DNR - 1973

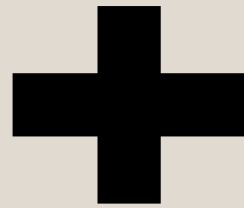


DNR - 2020



What are we assessing?

Mature



Old-growth



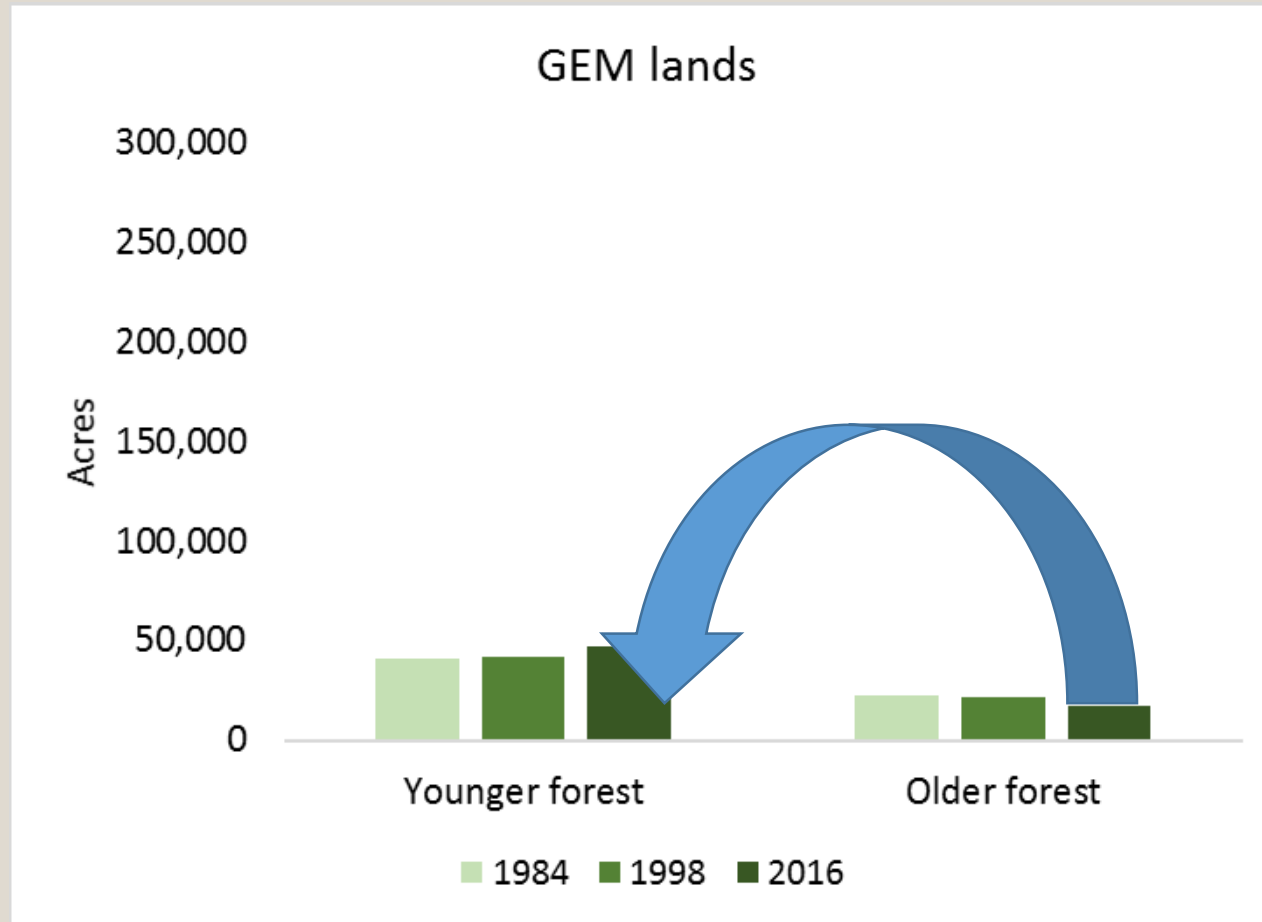
**Old Growth
Structural Index**

OGSI_80

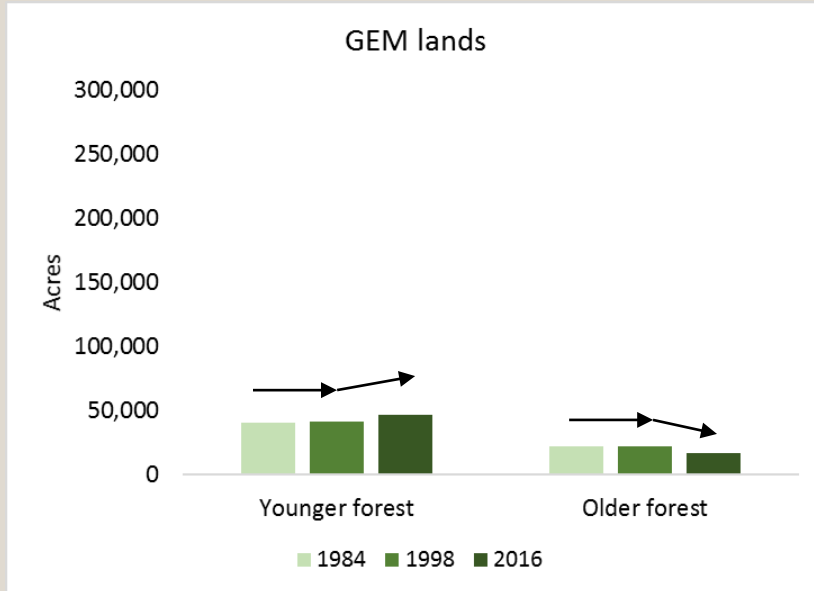
Older forest



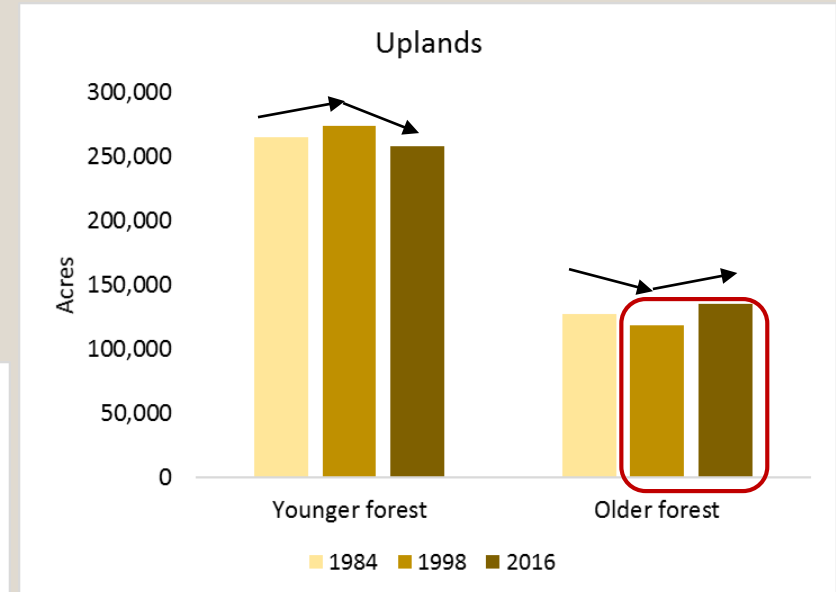
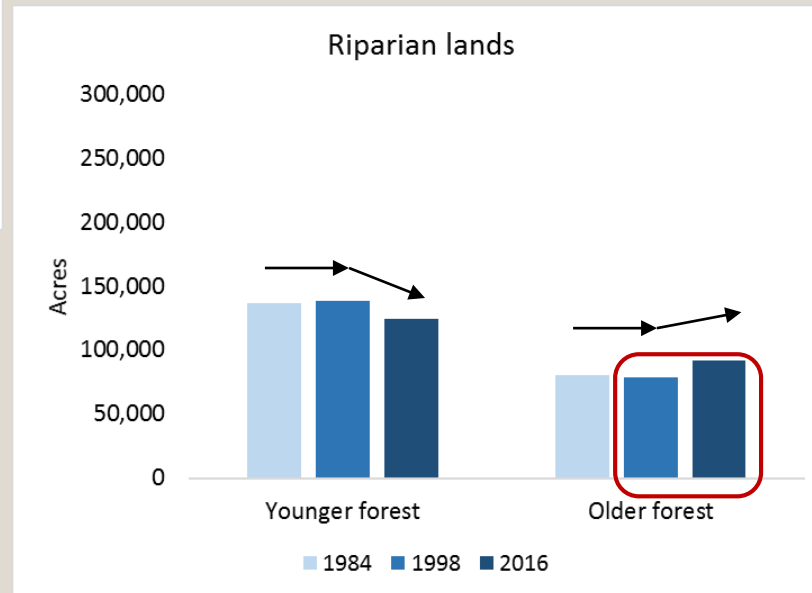
So...how are we doing?



So...how are we doing?



1984-1998
5% decline in older forest
(-10,974 acres)

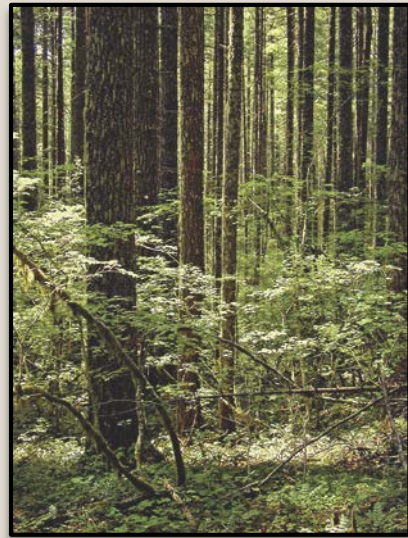


1998-2016
13% increase in older forest
(+29,873 acres)

In summary

- Quantitative, independent, and repeatable
- Structurally complex forests are increasing
- All we need is time

Thanks!



Measuring Older Forest Progression

Mike Buffo

Assistant Division Manager Forest Informatics

Washington State Department of Natural Resources

Stand Development Stages

REVIEW

- Foundation of Ecological Forestry (*Carey, Franklin, et al.*)
- Interrelationships of biodiversity, function, and structure
- Use to assist in silviculture decision making

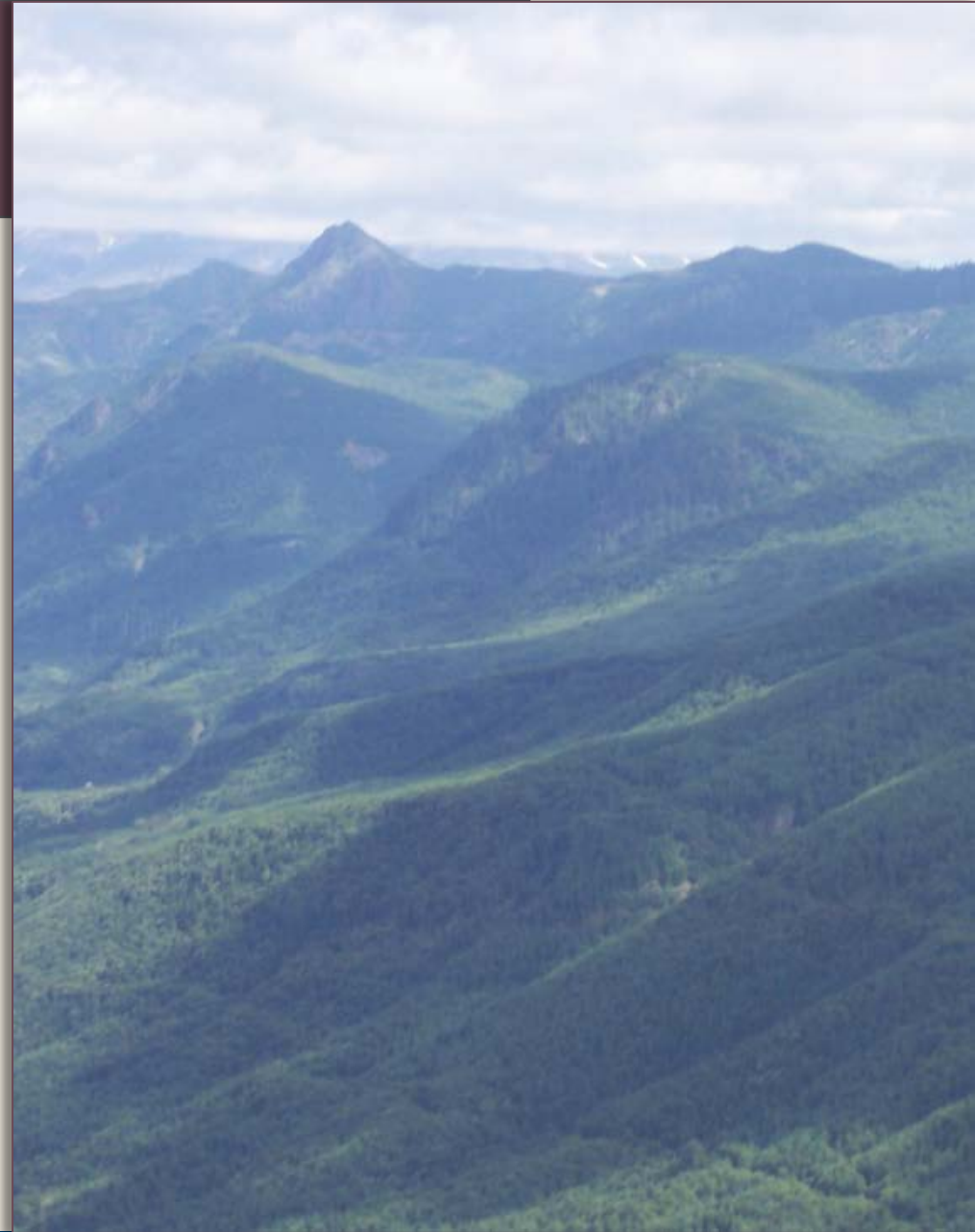


	Summarized Stand Development Stage	Stand Development Stage
Less Complex Forest	Ecosystem Initiation	Ecosystem Initiation
	Competitive Exclusion	Sapling Exclusion
Pole Exclusion		
Large Tree Exclusion		
Understory Development		
More Complex Forest	Structurally Complex	Botanically Diverse
		Niche Diversification
		Fully Functional



How were the forests analyzed?

- 2004 Sustainable Harvest Calculation
 - Defined and queried
 - Plot-based inventory
- Updated analysis
 - Remote-sensing and plot based inventory
 - Older forests in areas conserved by the law, policy, or HCP strategies:
 - Northern Spotted Owl
 - Marbled Murrelet
 - Riparian



Older Forest Comparison with Prior Analyses

Source	Analysis Area	Current Older Forest %	~2060 Older Forest %	2100 Older Forest %
2004 Sustainable harvest FEIS	Western Washington	<2%	10% (2067)	-
2007 Sustainable harvest FEIS addendum	Western Washington	<1%	16% (2067)	-
2010 South Puget HCP Planning Unit Forest Land Plan FEIS	South Puget HCP Planning Unit	<2%	18.2%	33.3%
2016 Olympic Experimental State Forest HCP Planning Unit Forest Land Plan FEIS	OESF HCP Planning Unit	11%	15.5% (2013 RDEIS)	21.6% (2013 RDEIS)
2019 Sustainable harvest FEIS	Western Washington	3.1%	8% (2068)	-
2021 Older Forest <i>(this analysis)</i>	Western Washington	3.4%	6.9%	20.5%

Current and future area of older forest conditions based on analyses performed as part of previous landscape planning processes

Current and Projected Area of Older Forest Conditions

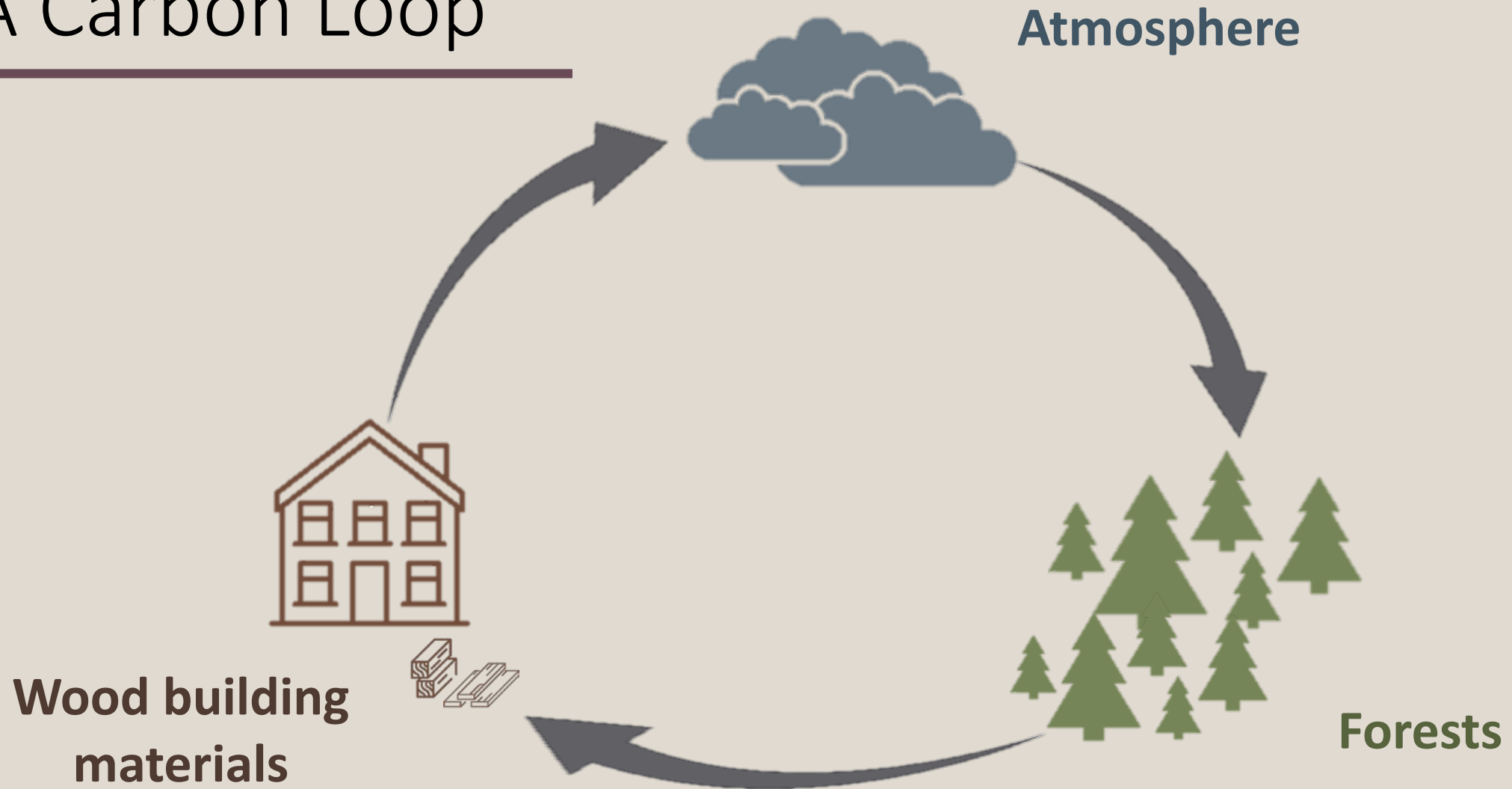
HCP Planning Unit	Year								
	2021	2030	2040	2050	2060	2070	2080	2090	2100
Columbia	1.0%	1.1%	1.3%	1.7%	2.6%	4.4%	7.4%	11.6%	16.1%
North Puget	3.3%	4.1%	5.1%	6.6%	8.6%	11.3%	14.6%	18.5%	22.5%
OESF	10.3%	10.9%	11.4%	12.3%	13.5%	15.5%	18.9%	25.6%	32.6%
South Coast	0.2%	0.3%	0.7%	1.2%	2.2%	3.6%	6.1%	9.0%	12.5%
South Puget	2.5%	3.3%	4.3%	5.7%	7.4%	9.8%	12.9%	16.3%	19.6%
Straits	1.7%	2.4%	3.1%	4.1%	5.4%	7.1%	9.6%	12.3%	14.8%
TOTAL (Western Washington)	3.4%	3.9%	4.5%	5.5%	6.9%	9.0%	12.0%	16.1%	20.5%

Percent area western Washington HCP planning units with older forest conditions in conservation areas by decade through 2100
 Values over 10% in bold

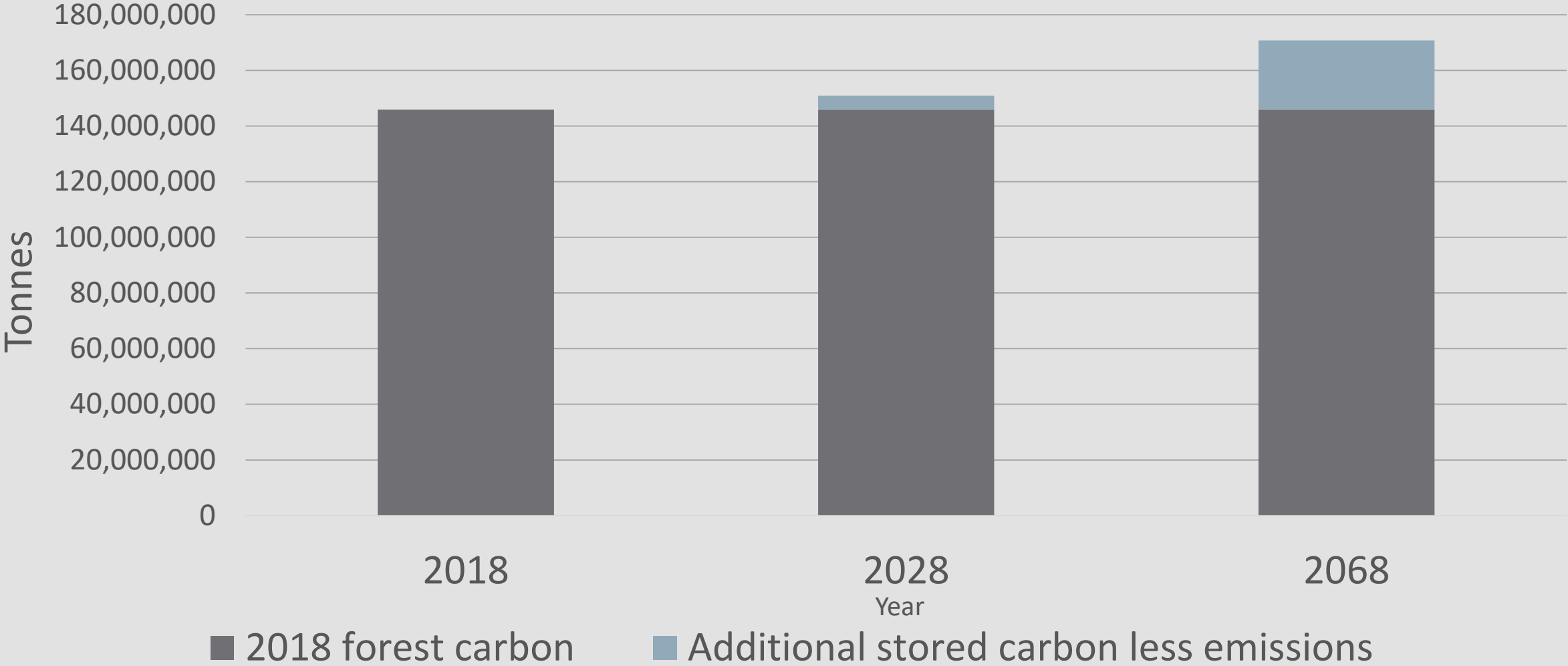
Forest Carbon



A Carbon Loop



Estimated Forest and Wood Products Carbon



Estimated carbon stored in the forest and wood products over the next 50 years (data from 2019 SHL FEIS)

Summary

- Conducting ongoing old-growth field assessments
- HCP strategies have resulted in increased older forest conditions
- Projections show:
 - Continuing increase in older forest conditions
 - Increasing stored forest carbon



Next Steps

- Board discussion of possible next steps at July meeting



