
WASHINGTON
DEPARTMENT OF NATURAL RESOURCES

Scientific Perspectives on Variable Retention Harvests & Managing Older Forests

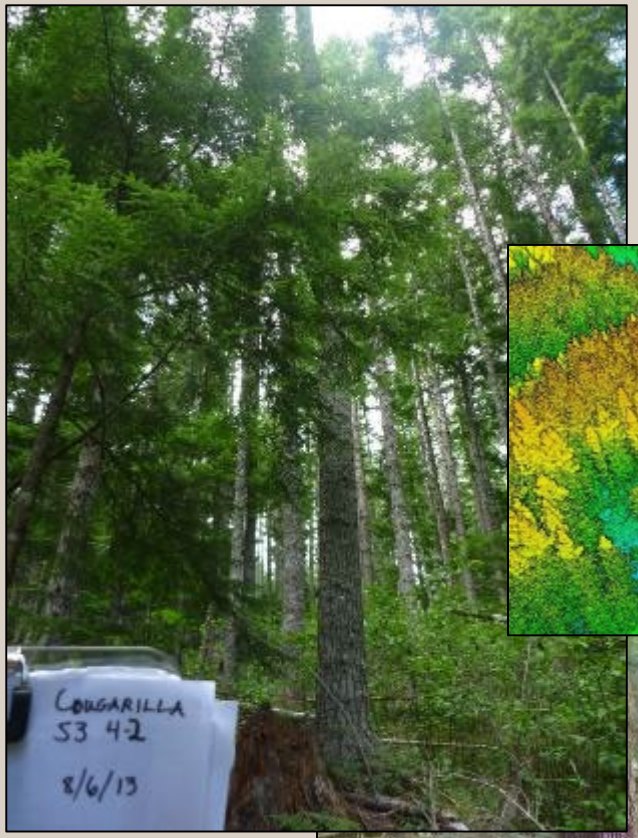
May 2, 2023

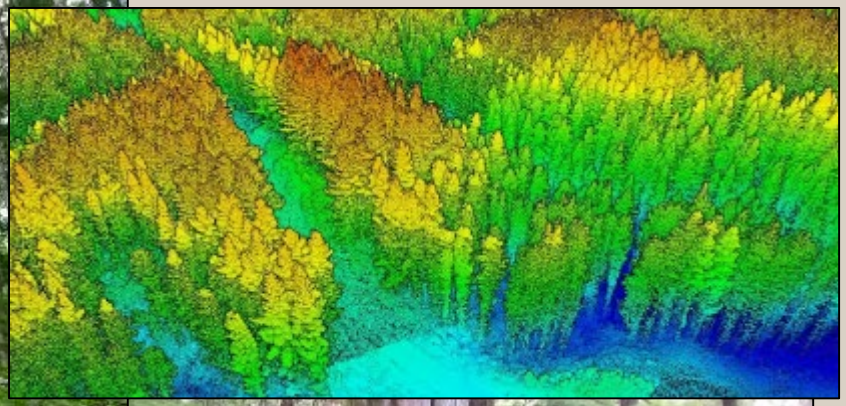
A Presentation to the Board of Natural Resources

By Daniel Donato, PhD

Background: My role at DNR

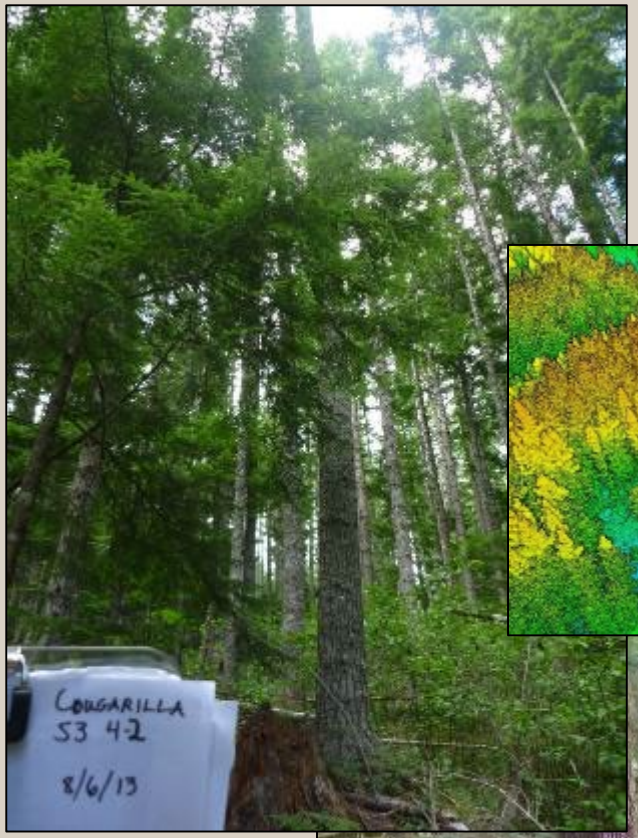
- Research & Monitoring programs (HCP)
- Designated expert on old-growth
- Independent; consult as needed

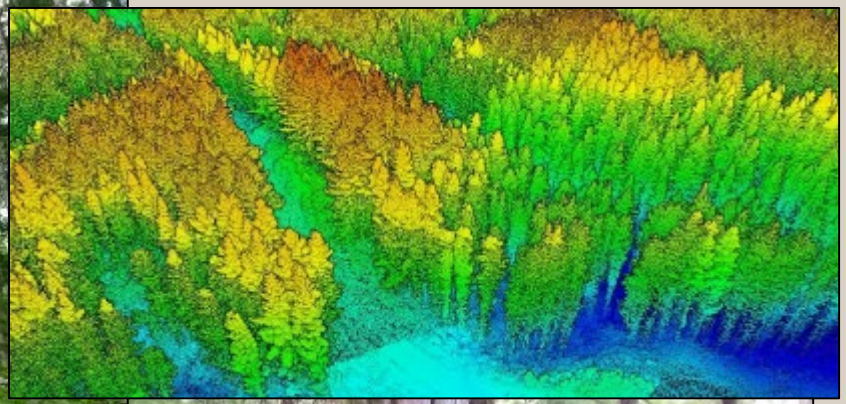




Background: My role at DNR

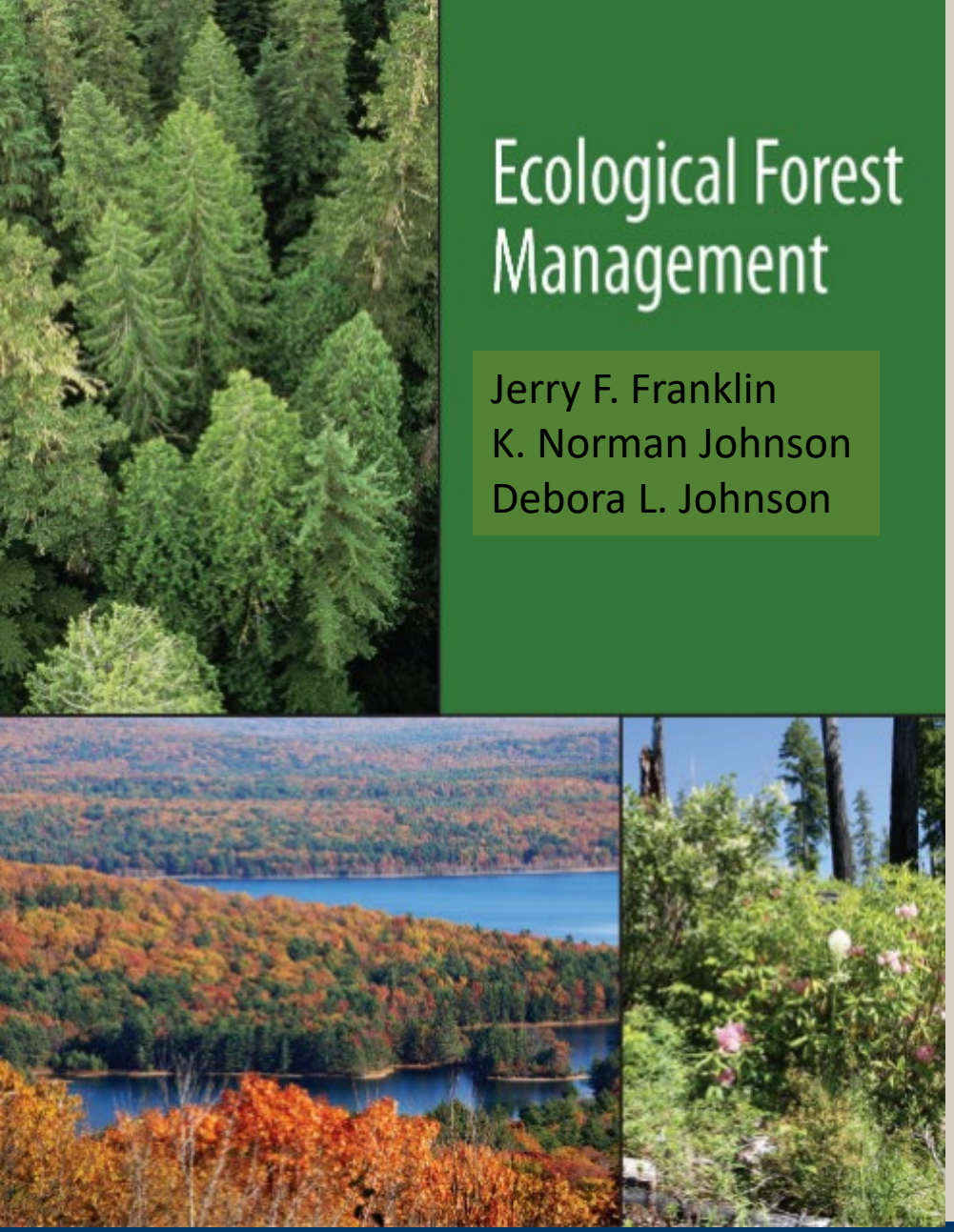
- Research & Monitoring programs (HCP)
- Designated expert on old-growth
- Independent; consult as needed
- Why I came to DNR
  - DNR's reputation: true multi-objective forestry
  - "Not because it's easy, but because it's hard"





Variable Retention Harvest (VRH)

Variable Retention Harvest (VRH)



Franklin, J.F., Donato, D.C. *Ecol Process* 9, 8 (2020).
[Variable retention harvesting in the Douglas-fir region]

REVIEW Open Access

Variable retention harvesting in the Douglas-fir region

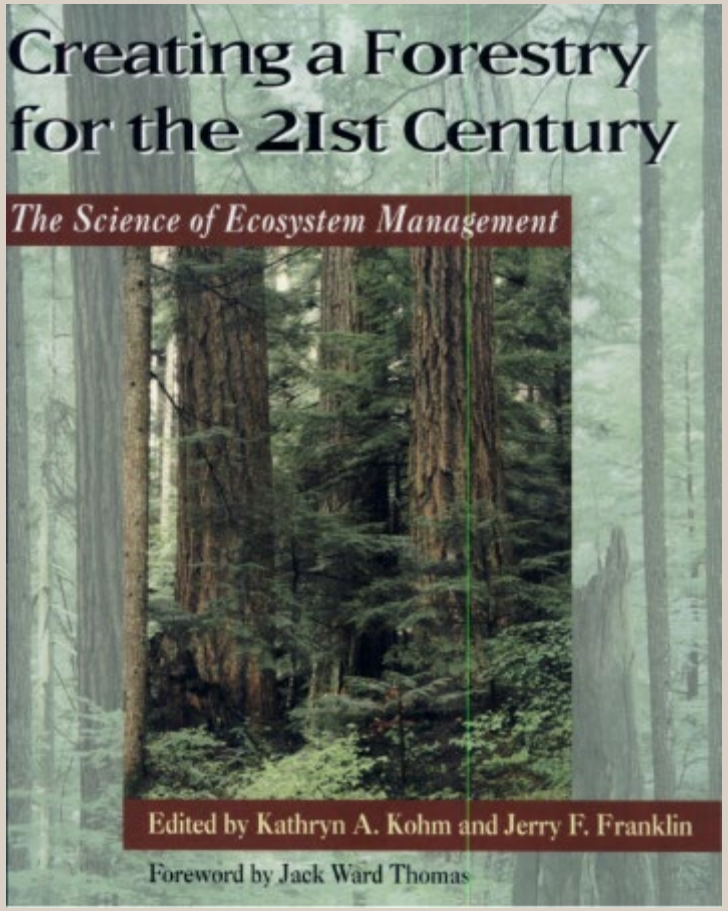
Check for updates

Jerry F. Franklin[1*] and Daniel C. Donato[1,2]

Abstract

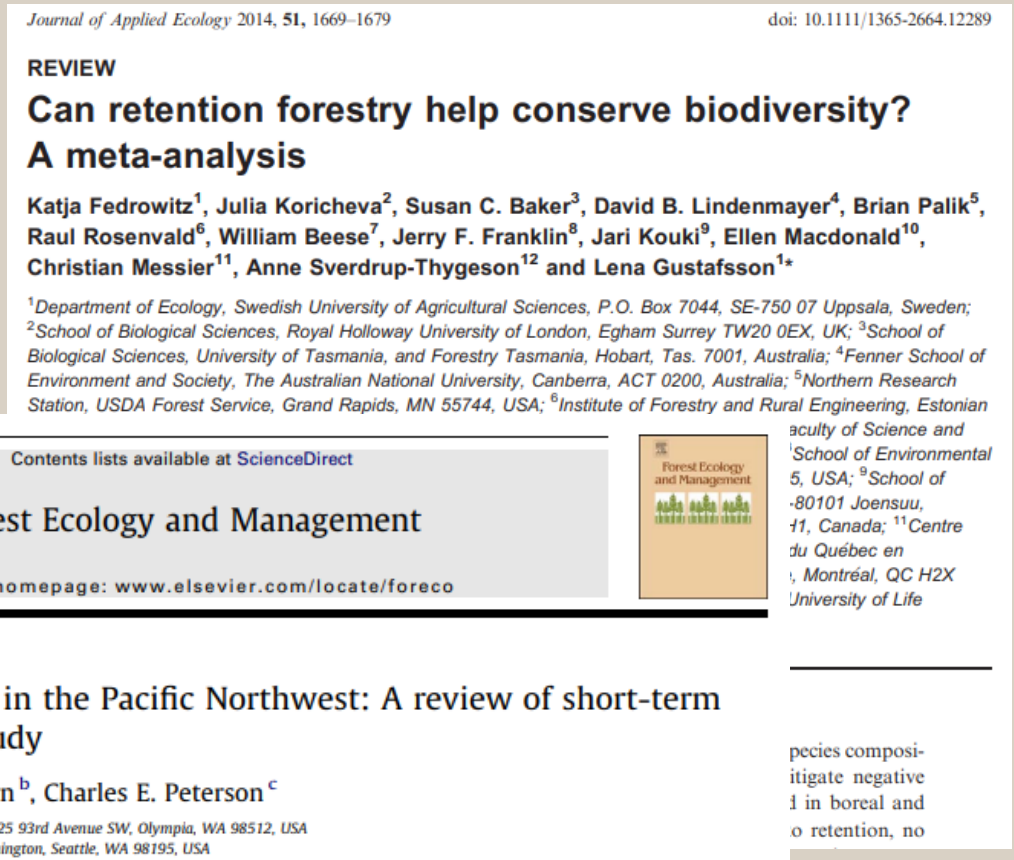
Variable retention harvesting evolved in the Douglas-fir region of the Pacific Northwest gradually in response to

Science literature on Variable Retention Harvest: Rich, long-running, national, global



1997; Includes a chapter on VRH

Journal of Applied Ecology, 2014, 51. 1669-1679



Journal of Applied Ecology 2014, **51**, 1669–1679 doi: 10.1111/1365-2664.12289

REVIEW

Can retention forestry help conserve biodiversity? A meta-analysis

Katja Fedrowitz[1], Julia Koricheva[2], Susan C. Baker[3], David B. Lindenmayer[4], Brian Palik[5], Raul Rosenvald[6], William Beese[7], Jerry F. Franklin[8], Jari Kouki[9], Ellen Macdonald[10], Christian Messier[11], Anne Sverdrup-Thygeson[12] and Lena Gustafsson[1]*

[1]Department of Ecology, Swedish University of Agricultural Sciences, P.O. Box 7044, SE-750 07 Uppsala, Sweden; [2]School of Biological Sciences, Royal Holloway University of London, Egham Surrey TW20 0EX, UK; [3]School of Biological Sciences, University of Tasmania, and Forestry Tasmania, Hobart, Tas. 7001, Australia; [4]Fenner School of Environment and Society, The Australian National University, Canberra, ACT 0200, Australia; [5]Northern Research Station, USDA Forest Service, Grand Rapids, MN 55744, USA; [6]Institute of Forestry and Rural Engineering, Estonian

Contents lists available at ScienceDirect

Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

Variable-retention harvests in the Pacific Northwest: A review of short-term findings from the DEMO study

Keith B. Aubry[a,*], Charles B. Halpern[b], Charles E. Peterson[c]

[a] USDA Forest Service, Pacific Northwest Research Station, 3625 93rd Avenue SW, Olympia, WA 98512, USA
[b] College of Forest Resources, Box 352100, University of Washington, Seattle, WA 98195, USA
[c] USDA Forest Service, Pacific Northwest Research Station, 6200 SW Main Street, Suite 400, Portland, OR 97205, USA

ARTICLE INFO

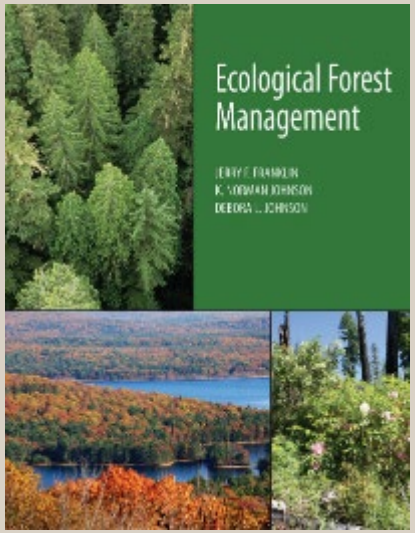
Article history:

ABSTRACT

In the Pacific Northwest (PNW) region of the contiguous United States, retention of live (green) trees in

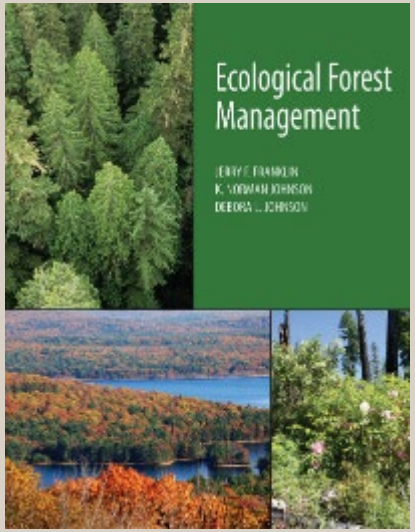
Forest Ecology & Management, 2009, 258, 398-408

Context: Ecological Forestry



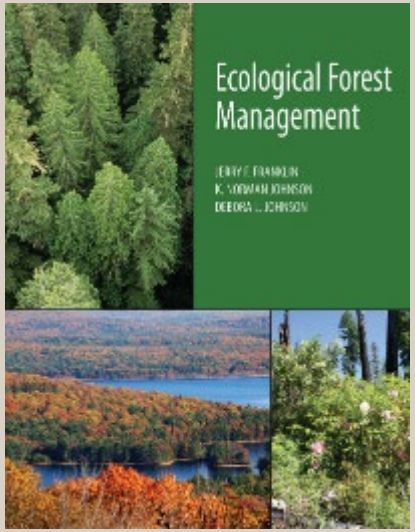
Context: Ecological Forestry

- Uses ecological models from natural forests and disturbance regimes
- Emphasizes complexity over simplicity

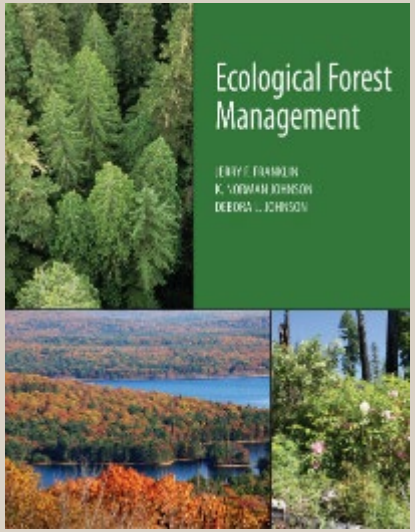


Context: Ecological Forestry

- Uses ecological models from natural forests and disturbance regimes
- Emphasizes complexity over simplicity
- Continuity among forest generations in structure, function, biota
  - “legacies” retained – live trees, snags, down wood,…

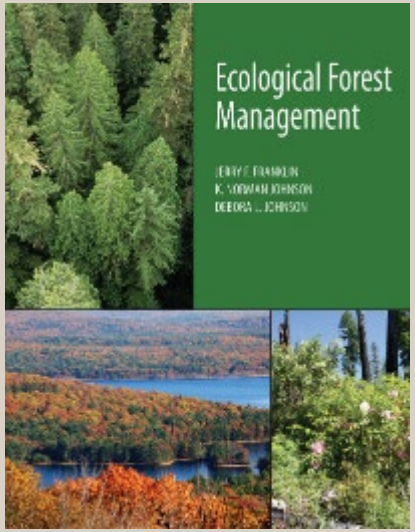


Context: Ecological Forestry



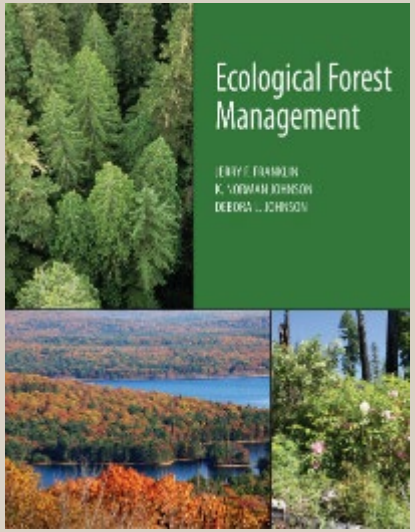
- Uses ecological models from natural forests and disturbance regimes
- Emphasizes complexity over simplicity
- Continuity among forest generations in structure, function, biota
  - “legacies” retained – live trees, snags, down wood,…
- Conserving mature and old-growth forests
- Longer harvest rotations

Context: Ecological Forestry



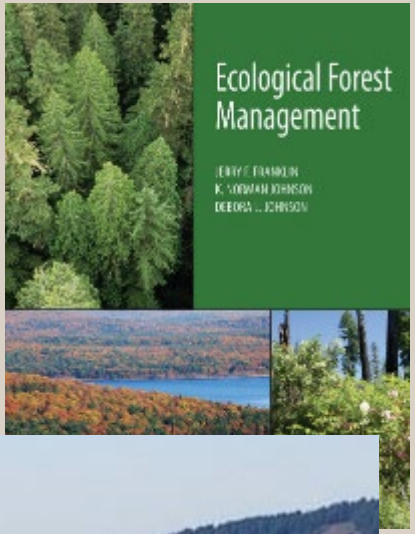
- Uses ecological models from natural forests and disturbance regimes
- Emphasizes complexity over simplicity
- Continuity among forest generations in structure, function, biota
  - “legacies” retained – live trees, snags, down wood,…
- Conserving mature and old-growth forests
- Longer harvest rotations
- Promotes all successional stages including diverse early-seral through OG

Context: Ecological Forestry



- Uses ecological models from natural forests and disturbance regimes
- Emphasizes complexity over simplicity
- Continuity among forest generations in structure, function, biota
  - "legacies" retained – live trees, snags, down wood,…
- Conserving mature and old-growth forests
- Longer harvest rotations
- Promotes all successional stages including diverse early-seral through OG
- Variable Density Thinning (VDT) a common element
- Variable Retention Harvest (VRH) another common element
  - ~30-35% retention in and around harvest units

Context: Ecological Forestry



Variable Density Thinning

Variable Retention Harvest

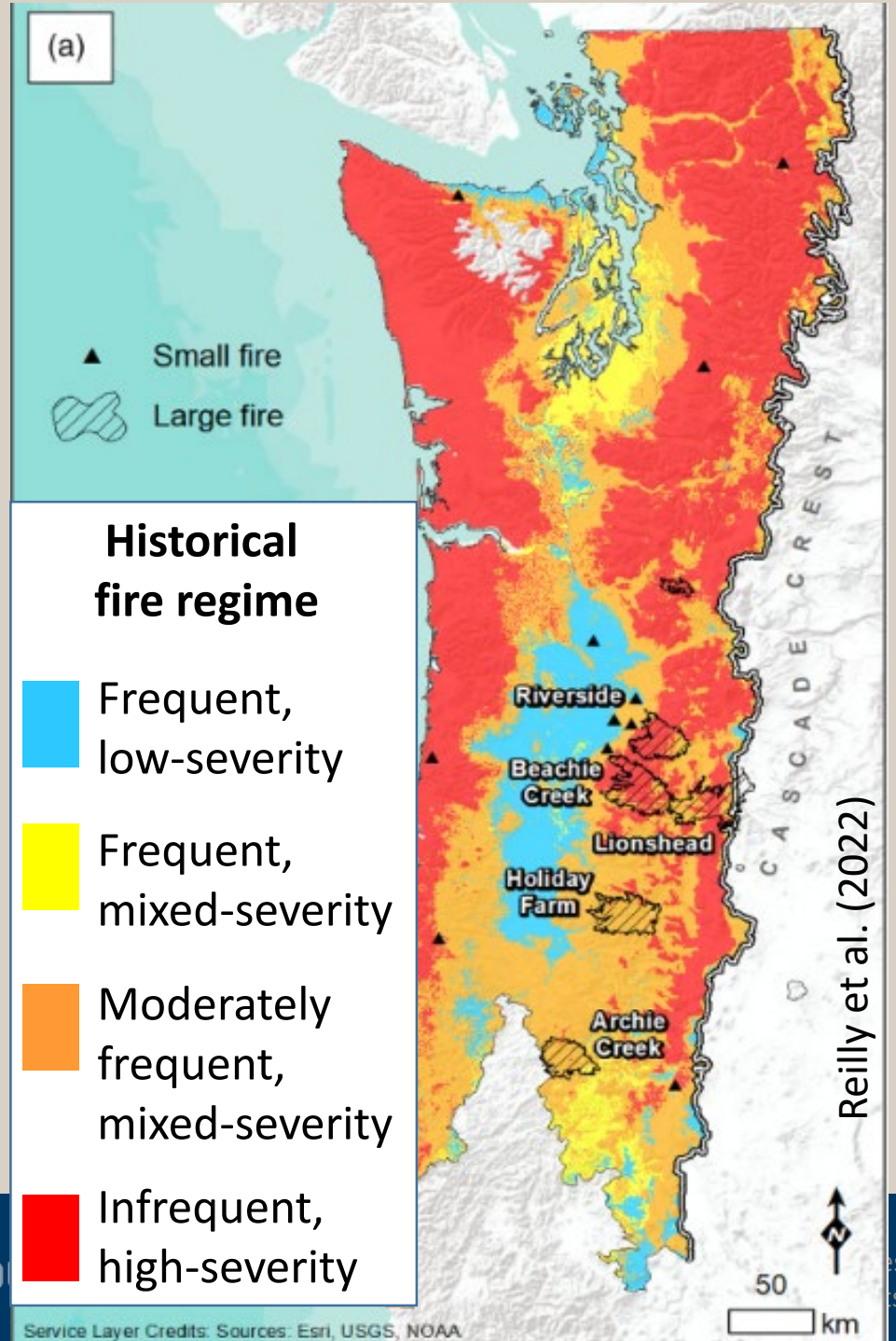
VRH contrast with traditional clearcutting

Roseburg BLM (OR) example

VRH contrast with traditional clearcutting

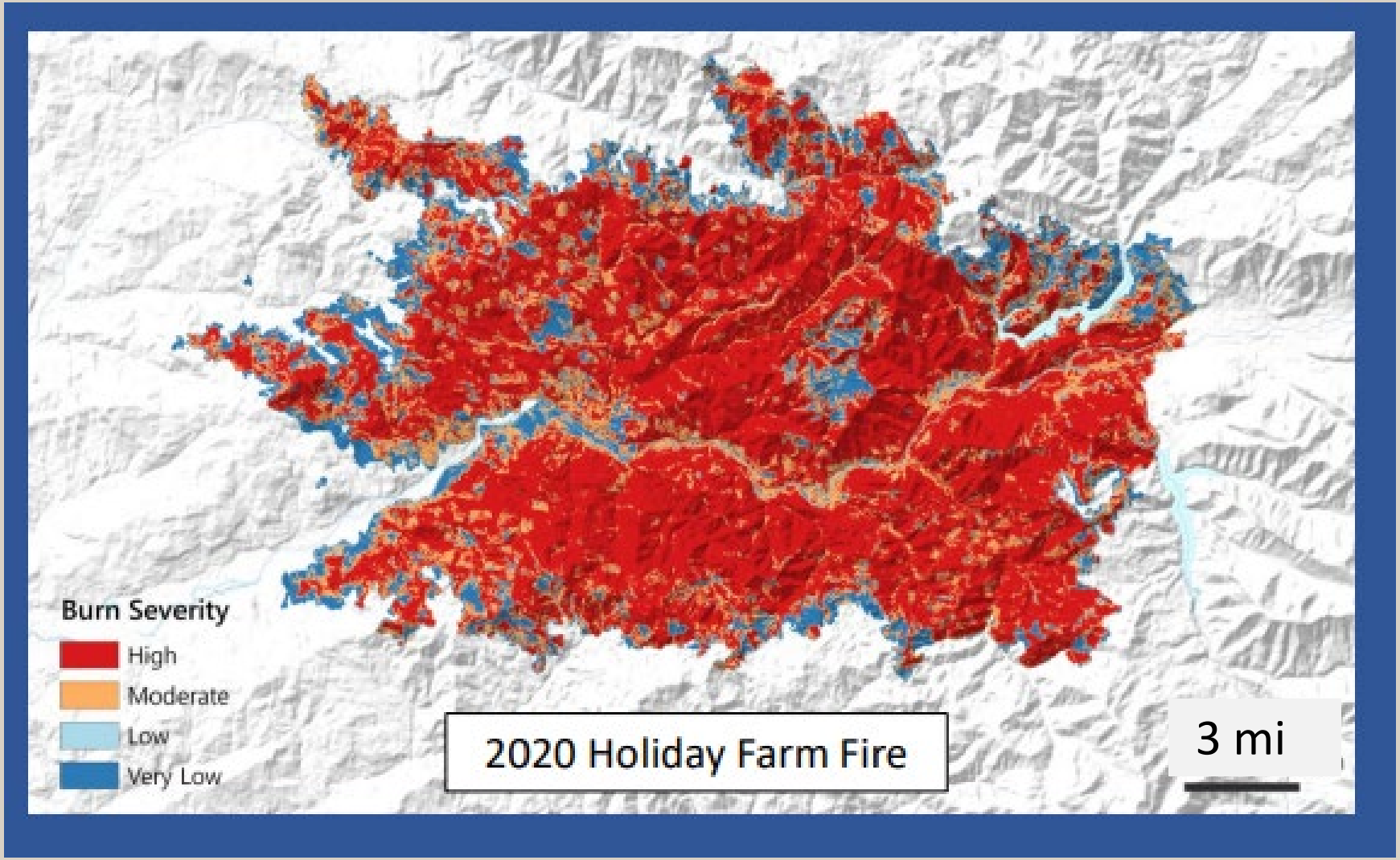
Roseburg BLM (OR) example

Natural disturbance model



Natural disturbance model

Includes large patches of “stand-replacement” fire



Burn patches

Burn patches

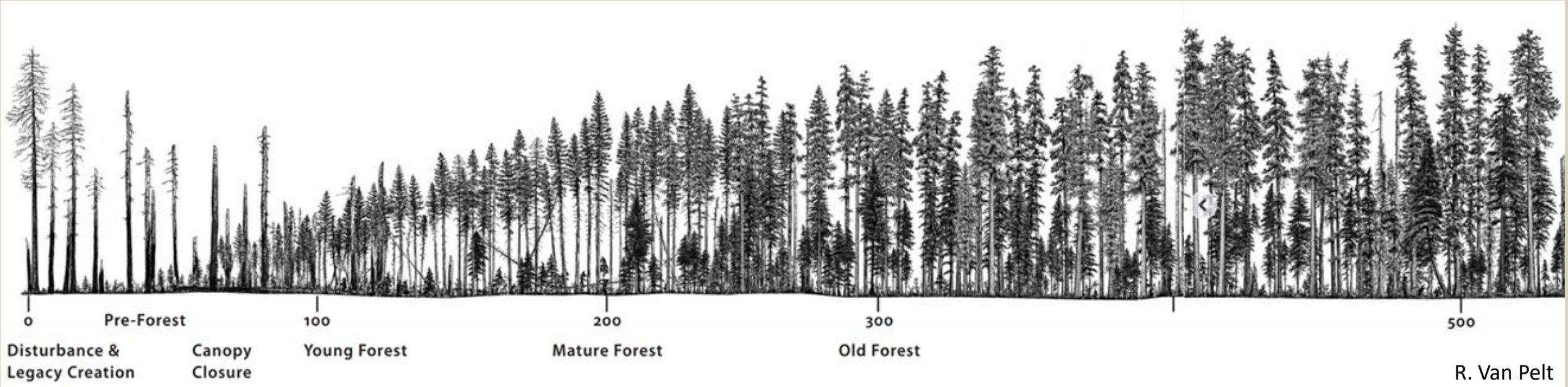
Burn patches

2020 Riverside Fire

1902 Yacolt Burn

Wind disturbance

Stand development pathway(s)



R. Van Pelt

Why Variable Retention Harvest?

- Openings of various sizes are consistent with natural disturbance regimes
- Douglas-fir is shade-intolerant, needs openings
- No coincidence: region's dominant overstory species adapted to disturbance-created openings
- Better able to sustain multiple values & objectives

How DNR implements VRH

- DNR among first to operationalize at scale

Franklin and Donato *Ecological Processes* (2020) 9:8
https://doi.org/10.1186/s13717-019-0205-5

Ecological Processes

REVIEW Open Access

Variable retention harvesting in the Douglas-fir region

Jerry F. Franklin[1*] and Daniel C. Donato[1,2]

Check for updates

How DNR implements VRH

- DNR among first to operationalize at scale
- Complex shapes/edges

Franklin and Donato *Ecological Processes* (2020) 9:8
https://doi.org/10.1186/s13717-019-0205-5

Ecological Processes

REVIEW Open Access

Variable retention harvesting in the Douglas-fir region

Jerry F. Franklin[1*] and Daniel C. Donato[1,2]

Check for updates

How DNR implements VRH

- DNR among first to operationalize at scale
- Complex shapes/edges
- ~30% average retention in and around harvest units
  - Not a specific objective; rather the outcome of retention/buffer guidelines (riparian, unstable slopes, leave trees/clumps, etc.)

How DNR implements VRH

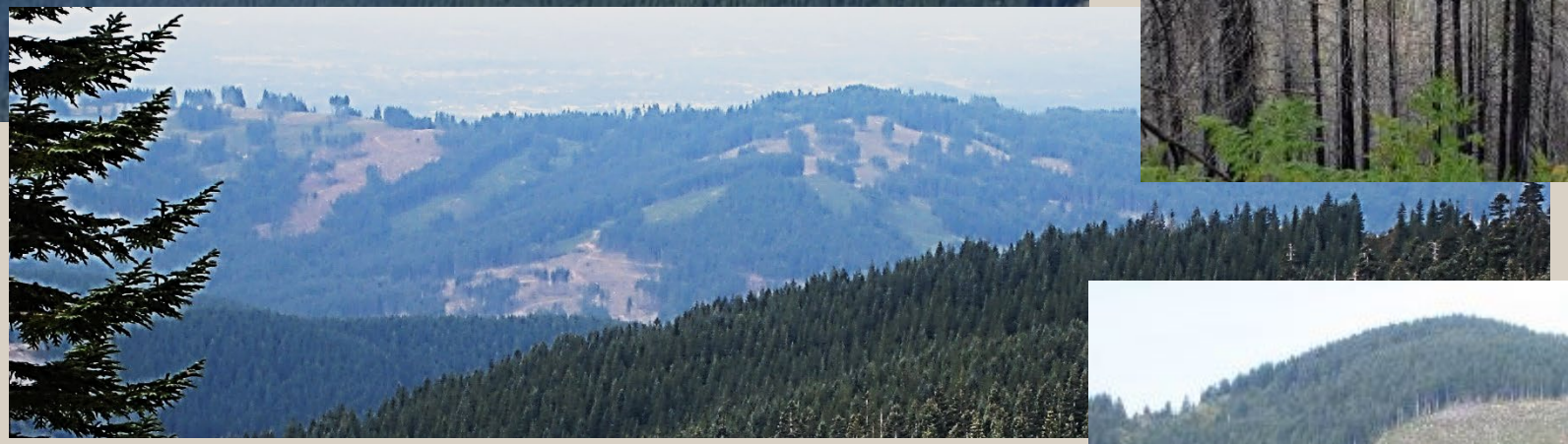
- DNR among first to operationalize at scale
- Complex shapes/edges
- ~30% average retention in and around harvest units
  - Not a specific objective; rather the outcome of retention/buffer guidelines (riparian, unstable slopes, leave trees/clumps, etc.)
- Riparian buffers & leave tree #'s exceed Forest Practices minima

How DNR implements VRH

- DNR among first to operationalize at scale
- Complex shapes/edges
- ~30% average retention in and around harvest units
  - Not a specific objective; rather the outcome of retention/buffer guidelines (riparian, unstable slopes, leave trees/clumps, etc.)
- Riparian buffers & leave tree #'s exceed Forest Practices minima
- Some of this stand-scale retention is separate from (complements) the 48% of conserved lands at landscape scale: Welker/Wells BNR April presentation

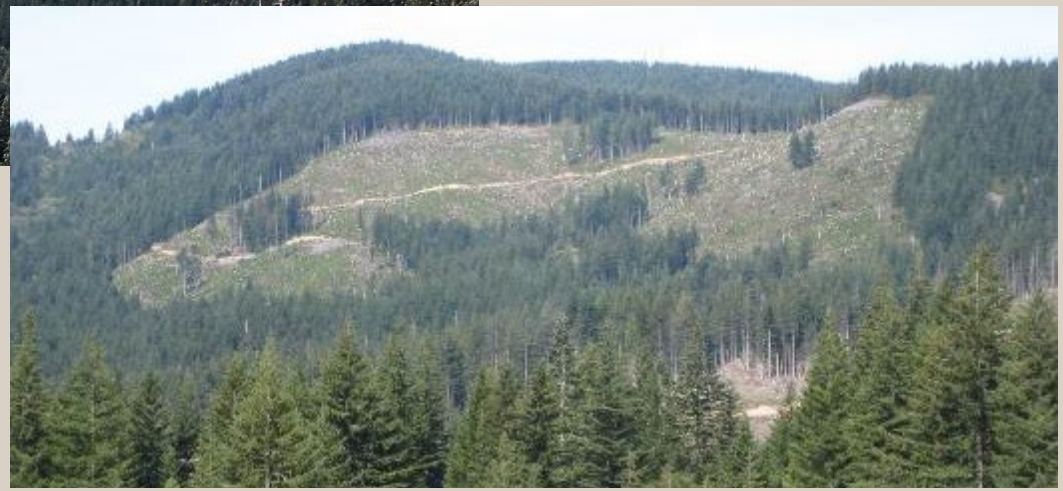
How DNR implements VRH

- DNR among first to operationalize at scale
- Complex shapes/edges
- ~30% average retention in and around harvest units
  - Not a specific objective; rather the outcome of retention/buffer guidelines (riparian, unstable slopes, leave trees/clumps, etc.)
- Riparian buffers & leave tree #'s exceed Forest Practices minima
- Some of this stand-scale retention is separate from (complements) the 48% of conserved lands at landscape scale: Welker/Wells BNR April presentation
- Always prioritize leaving largest and true 'legacy' (older) trees
- Objectives to retain snags & down wood



VRH examples

Fire pattern



Prioritizing retention of large/old trees

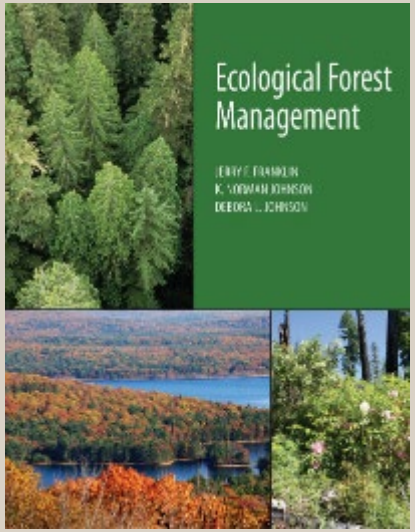
Fates and roles of retention trees

Age and structural diversity over time

2010

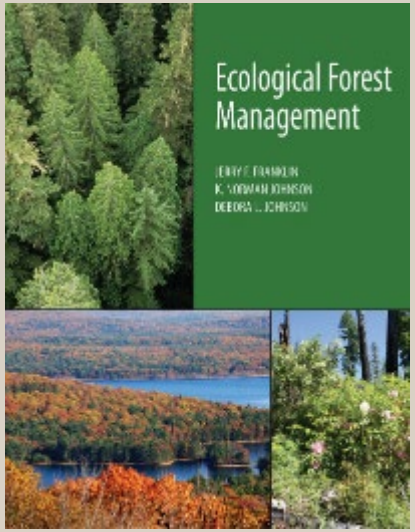
2022

Revisiting the context: Ecological Forestry



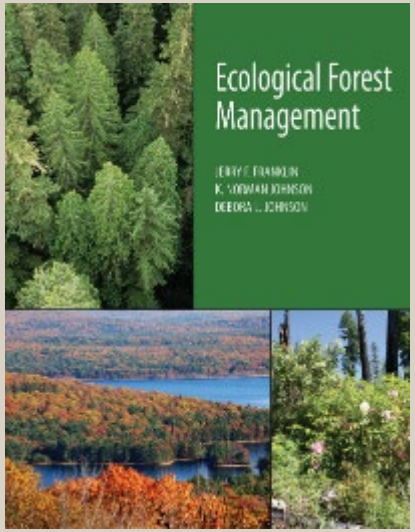
- Uses ecological models from natural forests and disturbance regimes
- Emphasizes complexity over simplicity
- Continuity among forest generations in structure, function, biota
  - “legacies” retained – live trees, snags, down wood,…
- Conserving mature and old-growth forests
- Longer harvest rotations
- Promotes all successional stages including diverse early-seral through OG
- Variable Density Thinning (VDT) a common element
- Variable Retention Harvest (VRH) another common element
  - ~30-35% retention in and around harvest units

Revisiting the context: Ecological Forestry



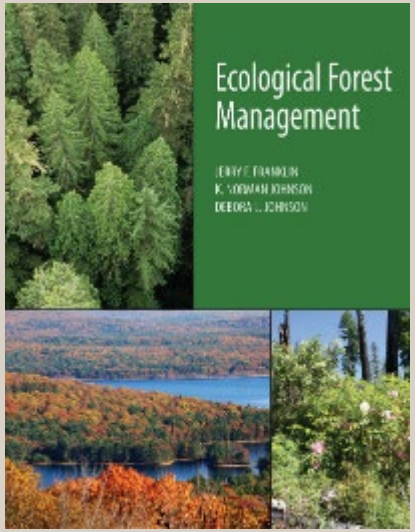
- ✓ Uses ecological models from natural forests and disturbance regimes
- ✓ Emphasizes complexity over simplicity
- Continuity among forest generations in structure, function, biota
  - "legacies" retained – live trees, snags, down wood,…
- Conserving mature and old-growth forests
- Longer harvest rotations
- Promotes all successional stages including diverse early-seral through OG
- Variable Density Thinning (VDT) a common element
- Variable Retention Harvest (VRH) another common element
  - ~30-35% retention in and around harvest units

Revisiting the context: Ecological Forestry



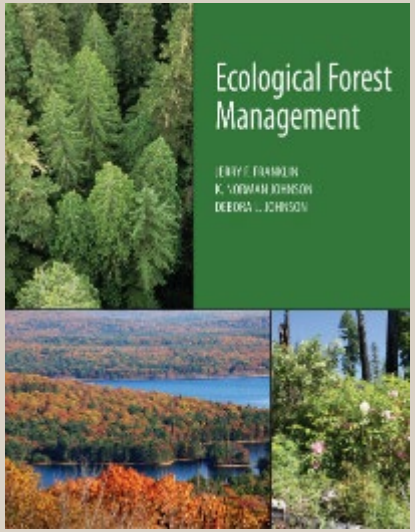
- ✓ Uses ecological models from natural forests and disturbance regimes
- ✓ Emphasizes complexity over simplicity
- ✓ Continuity among forest generations in structure, function, biota
  - "legacies" retained – live trees, snags, down wood,…
- ✓ Conserving mature and old-growth forests
- Longer harvest rotations
- Promotes all successional stages including diverse early-seral through OG
- Variable Density Thinning (VDT) a common element
- Variable Retention Harvest (VRH) another common element
  - ~30-35% retention in and around harvest units

Revisiting the context: Ecological Forestry



- ✓ Uses ecological models from natural forests and disturbance regimes
- ✓ Emphasizes complexity over simplicity
- ✓ Continuity among forest generations in structure, function, biota
  - "legacies" retained – live trees, snags, down wood,…
- ✓ Conserving mature and old-growth forests
- ✓ Longer harvest rotations
- ✓ Promotes all successional stages including diverse early-seral through OG
- Variable Density Thinning (VDT) a common element
- Variable Retention Harvest (VRH) another common element
  - ~30-35% retention in and around harvest units

Revisiting the context: Ecological Forestry



- Uses ecological models from natural forests and disturbance regimes
- Emphasizes complexity over simplicity
- Continuity among forest generations in structure, function, biota
  - "legacies" retained – live trees, snags, down wood,…
- Conserving mature and old-growth forests
- Longer harvest rotations
- Promotes all successional stages including diverse early-seral through OG
- Variable Density Thinning (VDT) a common element
- Variable Retention Harvest (VRH) another common element
  - ~30-35% retention in and around harvest units

“Legacy forests”

“Legacy forests”

- What are they?
  - Term recently coined by conservation community; definition varies/not clear
  - Stands >80 years old (pre WWII), not planted
  - Mostly second-growth following early clearcut harvests
  - Not old-growth

“Legacy forests”

- What are they?
  - Term recently coined by conservation community; definition varies/not clear
  - Stands >80 years old (pre WWII), not planted
  - Mostly second-growth following early clearcut harvests
  - Not old-growth

- Among forest ecologists & scientists, generally this is not a meaningful term
  - Has a compelling ring to it
  - Not based in peer-reviewed science literature

“Legacy forests”

- What are they?
  - Term recently coined by conservation community; definition varies/not clear
  - Stands >80 years old (pre WWII), not planted
  - Mostly second-growth following early clearcut harvests
  - Not old-growth

- Among forest ecologists & scientists, generally this is not a meaningful term
  - Has a compelling ring to it
  - Not based in peer-reviewed science literature

- Most of these stands are a legacy of forest management
  - inevitable, expected outcome of longer rotations
    → i.e. could have been harvested earlier but were allowed to grow longer

“Legacy forests”

- What are they?
  - Term recently coined by conservation community; definition varies/not clear
  - Stands >80 years old (pre WWII), not planted
  - Mostly second-growth following early clearcut harvests
  - Not old-growth

- Among forest ecologists & scientists, generally this is not a meaningful term
  - Has a compelling ring to it
  - Not based in peer-reviewed science literature

- Most of these stands are a legacy of forest management
  - inevitable, expected outcome of longer rotations
    → i.e. could have been harvested earlier but were allowed to grow longer

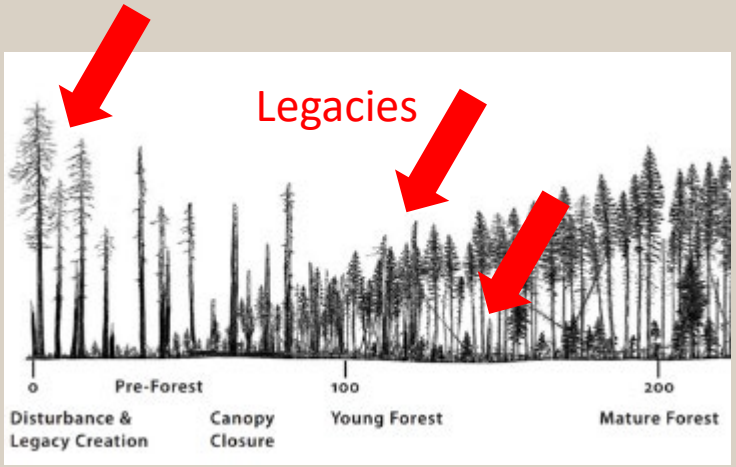
- Age is not a very useful criterion for ecological value or function

Age is not useful by itself: Two stands, both ~135 years old

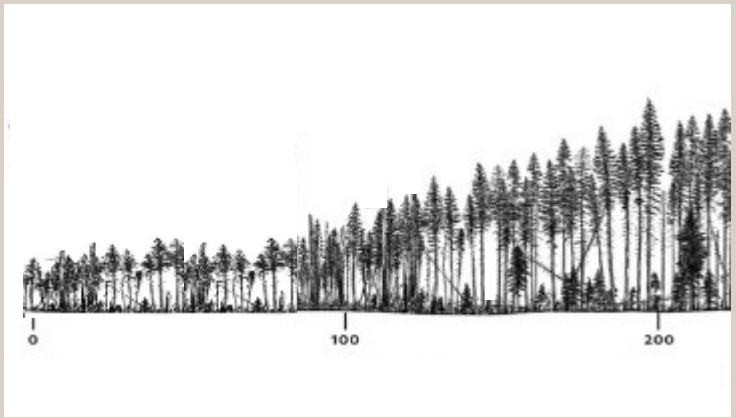
Compared to natural-origin mature stands,

many second-growth stands are incomplete ecosystems (lack legacy structure)

Fire origin



Early 1900s
clearcut origin



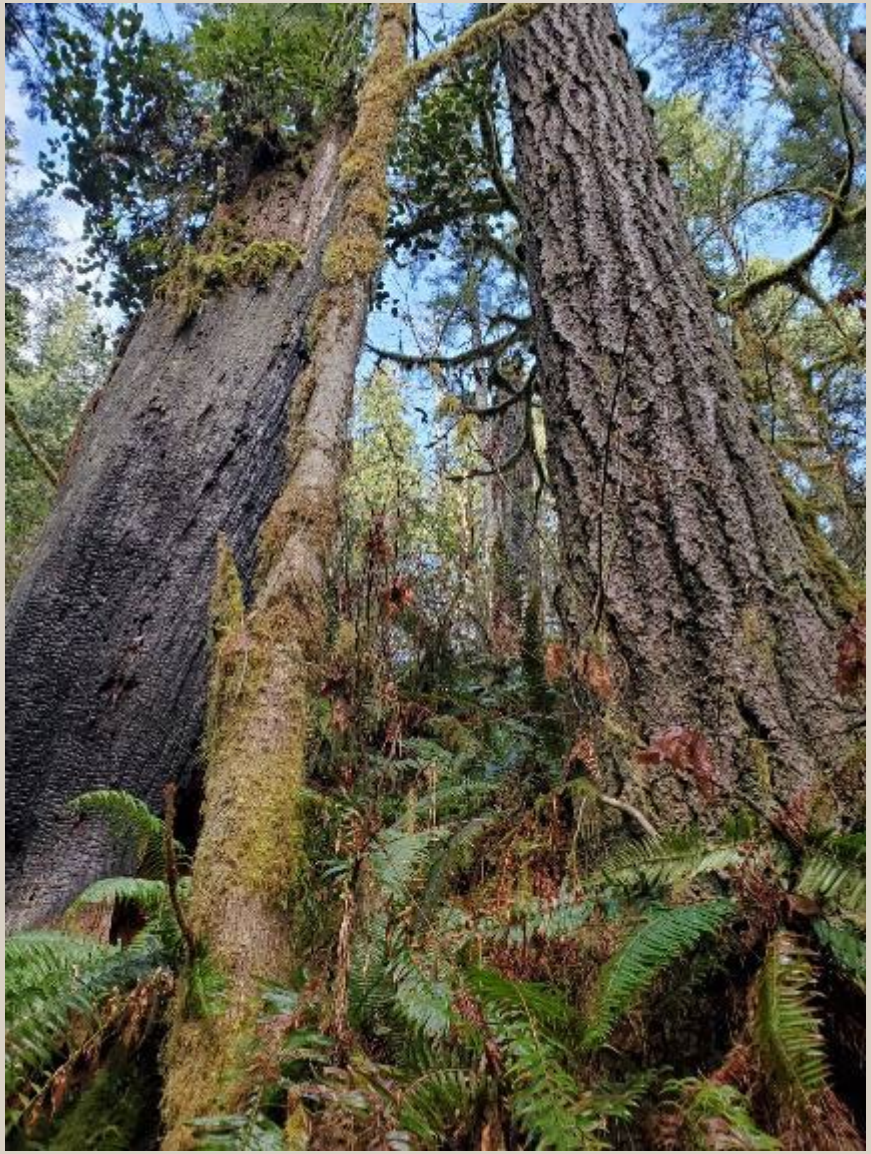
Adapted from R. Van Pelt

Legacy components (agents of continuity) in natural-origin mature stands

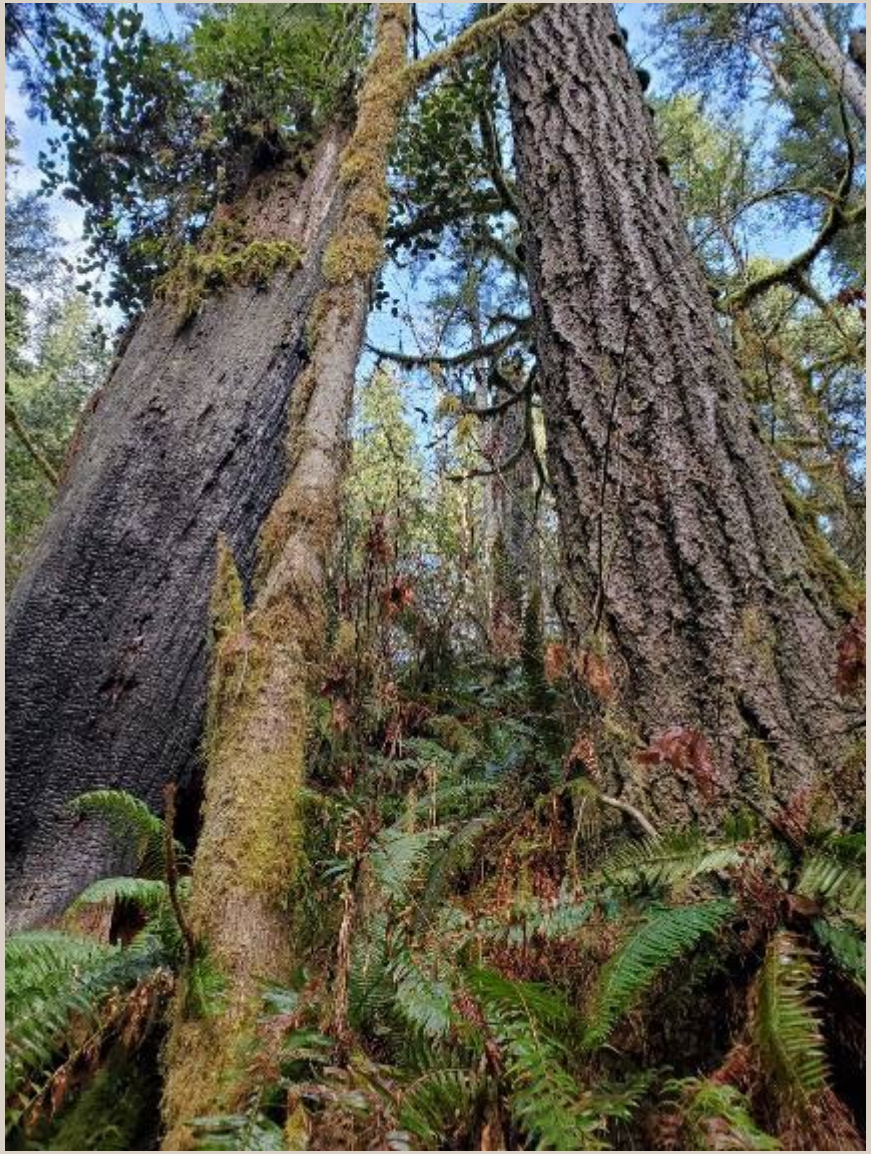
~120-year-old fire-origin stands
with snag legacies

Legacies can last >150 years

~120-yr-old harvest-origin (post clearcut)
without legacies

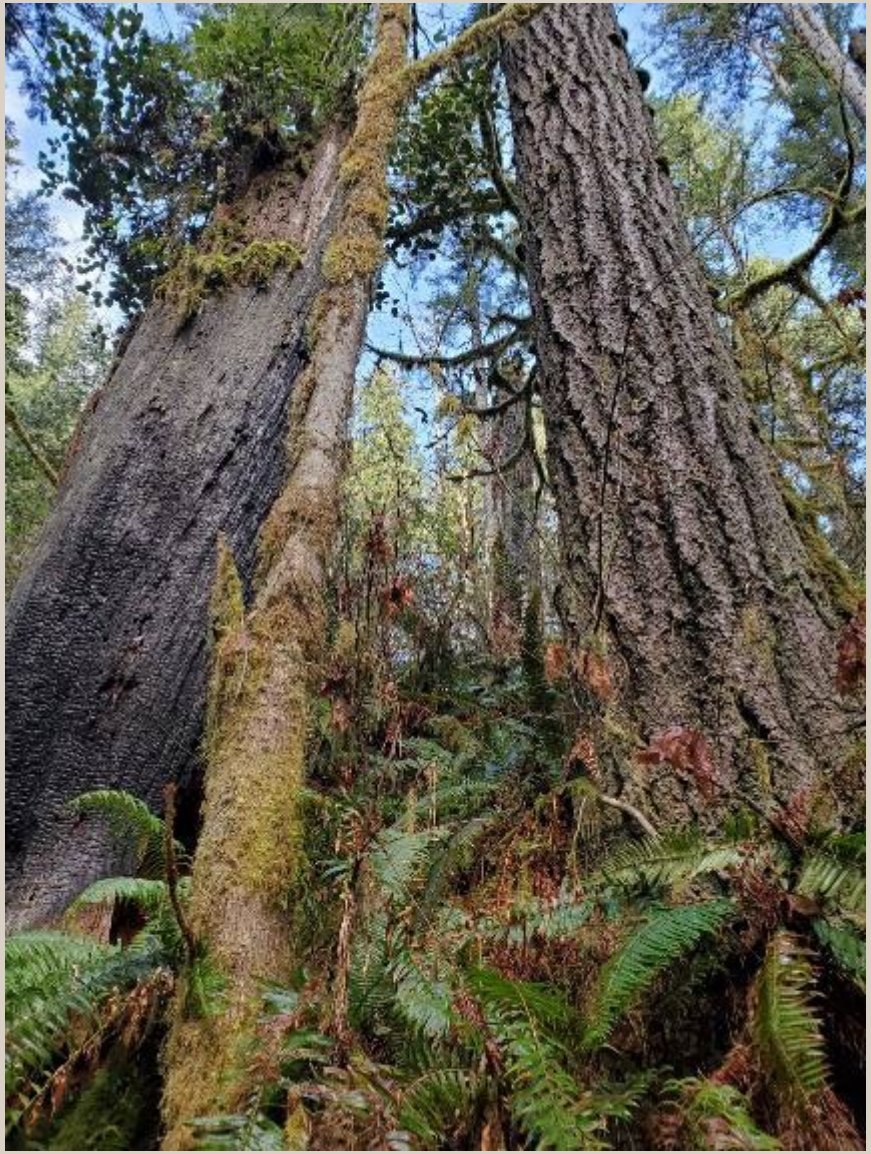


Mature forests have conservation value, but not all are the same



Mature forests have conservation value, but not all are the same

- Ecologically, best to evaluate based on…
  - stand structure
  - tree size/character
  - development potential
  - biomass/carbon storage & productivity
  - landscape context



Mature forests have conservation value, but not all are the same

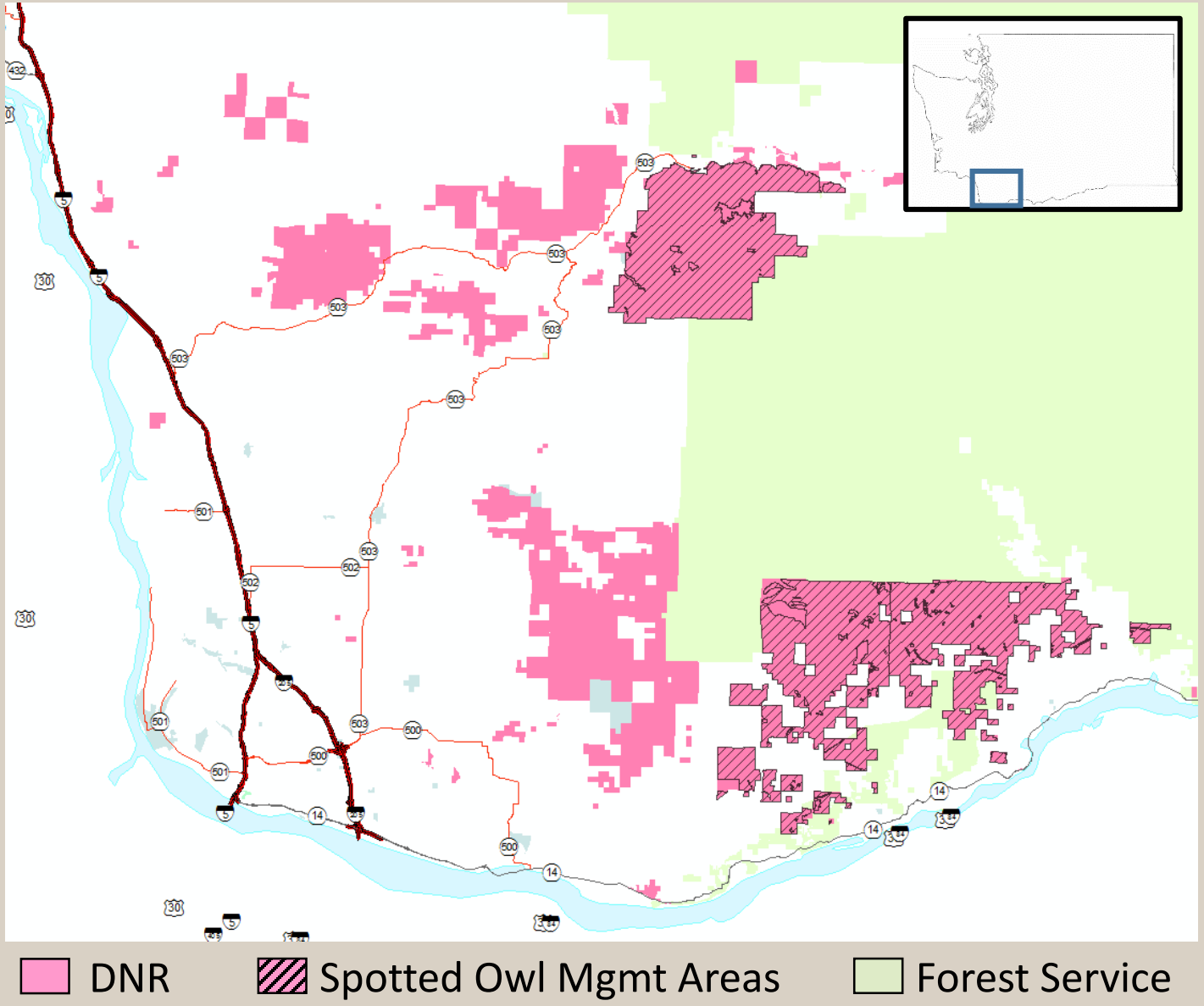
- Ecologically, best to evaluate based on…
  - stand structure
  - tree size/character
  - development potential
  - biomass/carbon storage & productivity
  - landscape context

- Placing stands in ‘buckets’ based primarily on age is too simplistic
  - A stand may be 30 years older than another but much less structurally developed or high biomass – and vice versa
  - Certain younger stands may offer better potential

Landscape context

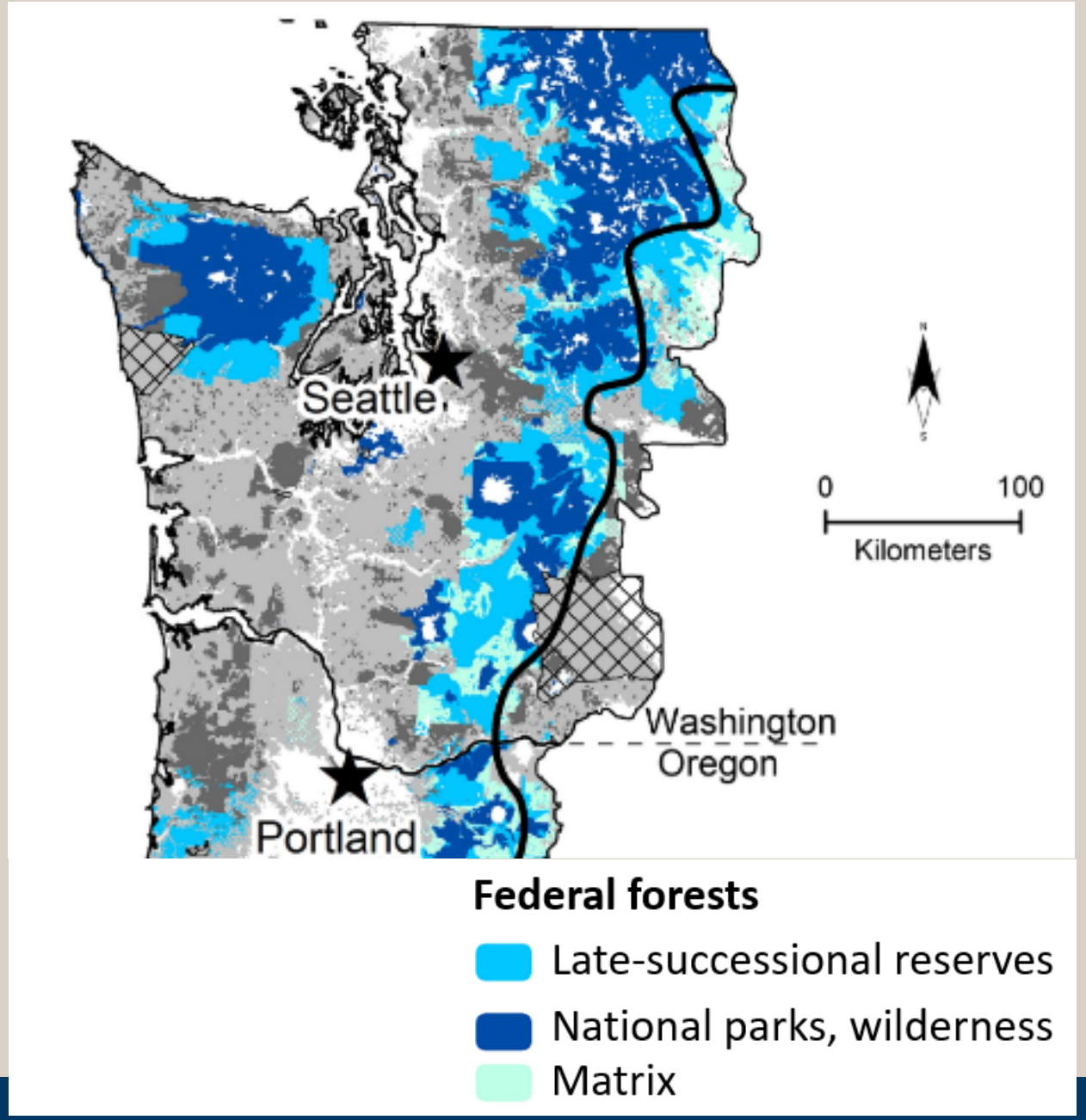
- Conservation Biology fundamentals:
  - Habitat more functional when in large patches, well connected

- Federal adjacency:
  - Habitat more functional when supporting federal-land habitat



Landscape context

- Similar example:
  Northwest Forest Plan (federal lands)
  - Late-successional reserves (LSRs)
  - Emphasized larger contiguous patches, not isolated remnant parcels
  - Adjacency to other habitats/ownerships



“Legacy forests”

- What are they?
  - Term recently coined by conservation community; definition varies/not clear
  - Stands >80 years old (pre WWII), not planted
  - Mostly second-growth following early clearcut harvests
  - Not old-growth

- Among forest ecologists & scientists, generally this is not a meaningful term
  - Has a compelling ring to it
  - Not based in peer-reviewed science literature

- Most of these stands are a legacy of forest management
  - inevitable, expected outcome of longer rotations
    → i.e. could have been harvested earlier but were allowed to grow longer

- Age is not a very useful criterion for ecological value or function

“Legacy forests”

- What are they?
  - Term recently coined by conservation community; definition varies/not clear
  - Stands >80 years old (pre WWII), not planted
  - Mostly second-growth following early clearcut harvests
  - Not old-growth

- Among forest ecologists & scientists, generally this is not a meaningful term
  - Has a compelling ring to it
  - Not based in peer-reviewed science literature

- Most of these stands are a legacy of forest management
  - inevitable, expected outcome of longer rotations
    → i.e. could have been harvested earlier but were allowed to grow longer

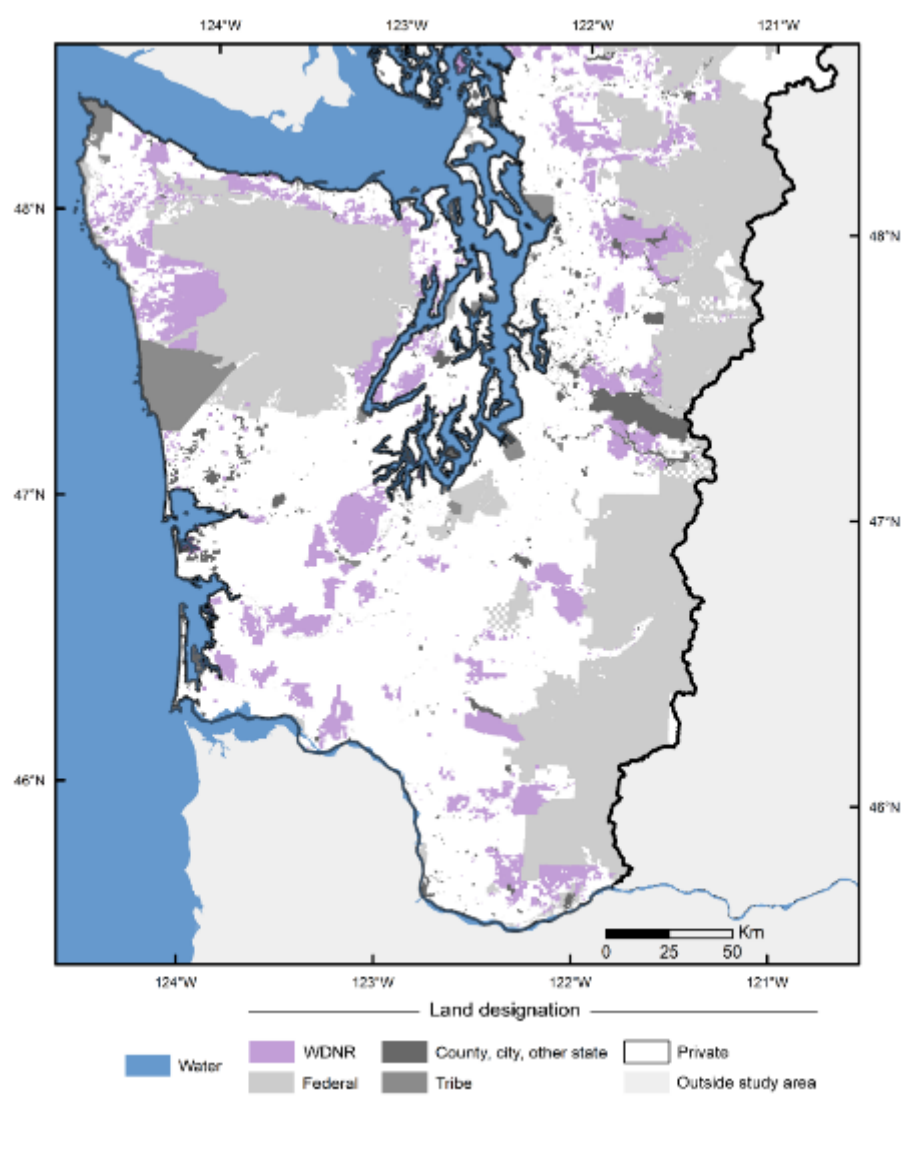
- Age is not a very useful criterion for ecological value or function

- *Overall, ‘legacy forests’ as currently defined are not necessarily the best or most important candidates for mature forest conservation*
  - *Little ecological justification or scientific basis*

Long-term monitoring of old-forest habitat & carbon under DNR's Habitat Conservation Plan (HCP)

Or…

Is the HCP working?



Question:

Across westside HCP lands, are trends in older forest habitat, spatial configuration, and aboveground carbon different since implementation of the HCP?

Method:

GNN data, independent source
(US Forest Service PNW Research Station)

Answer: Yes

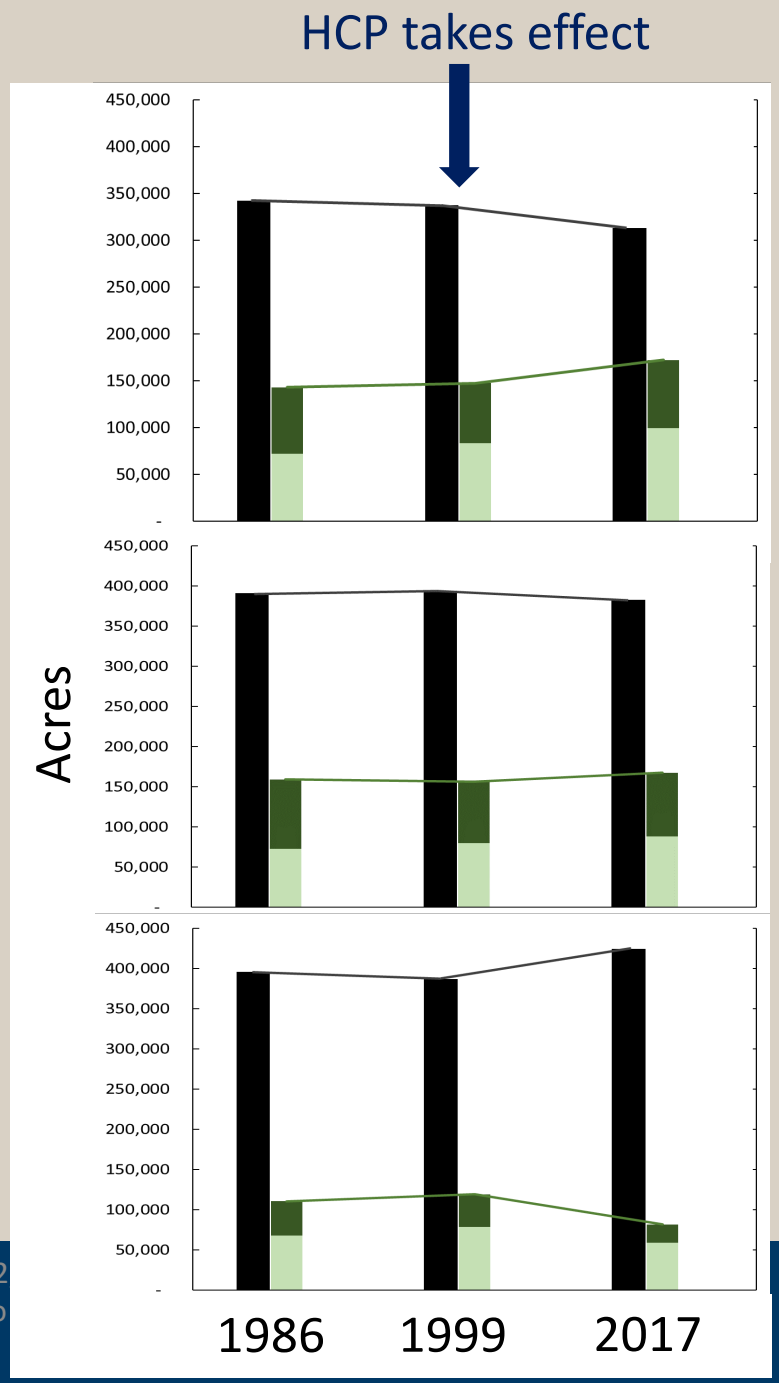
Old-forest habitat is shifting to HCP-intended areas

Increasing management intensity

Riparian management zones

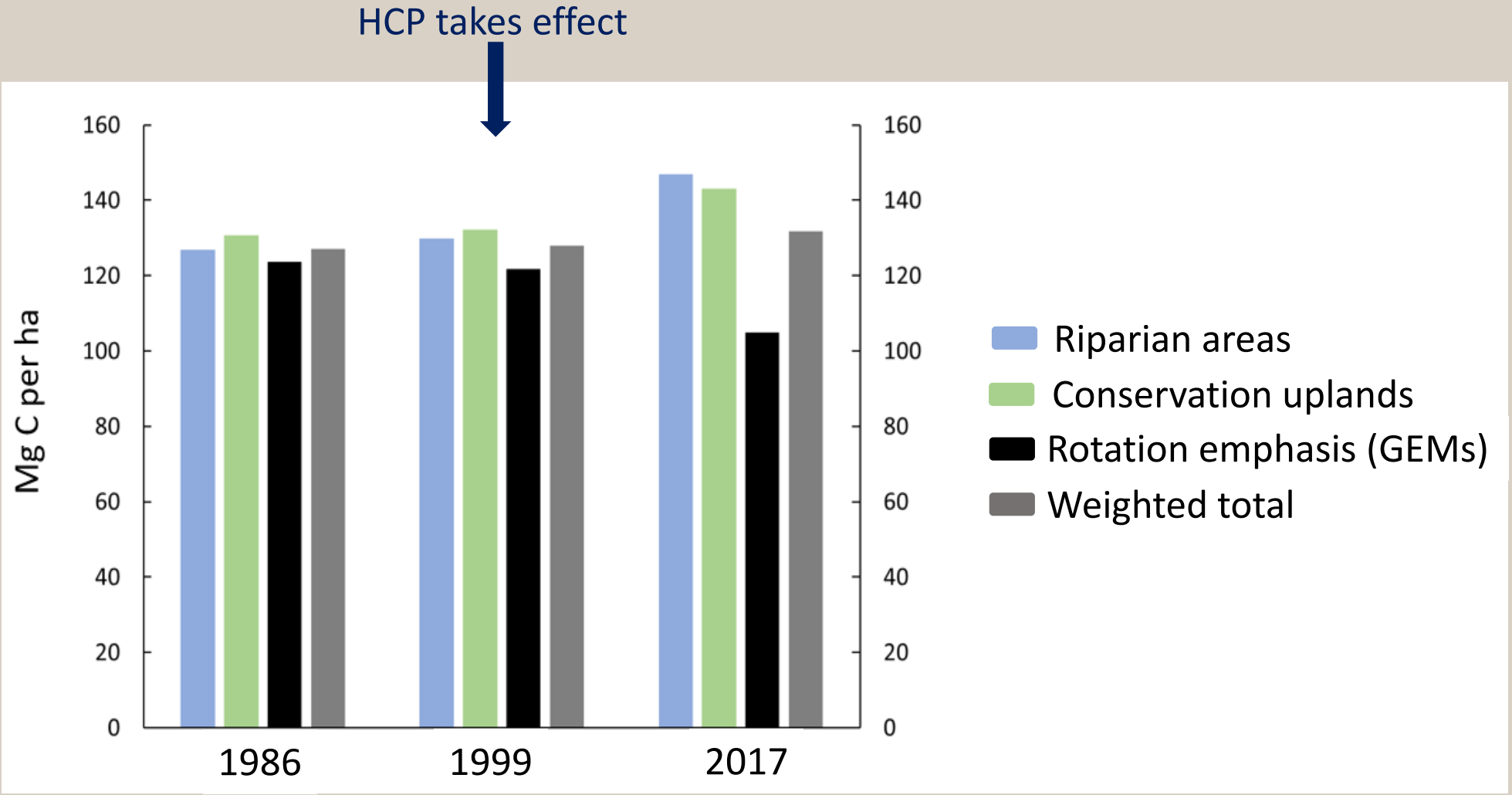
Upland conservation areas

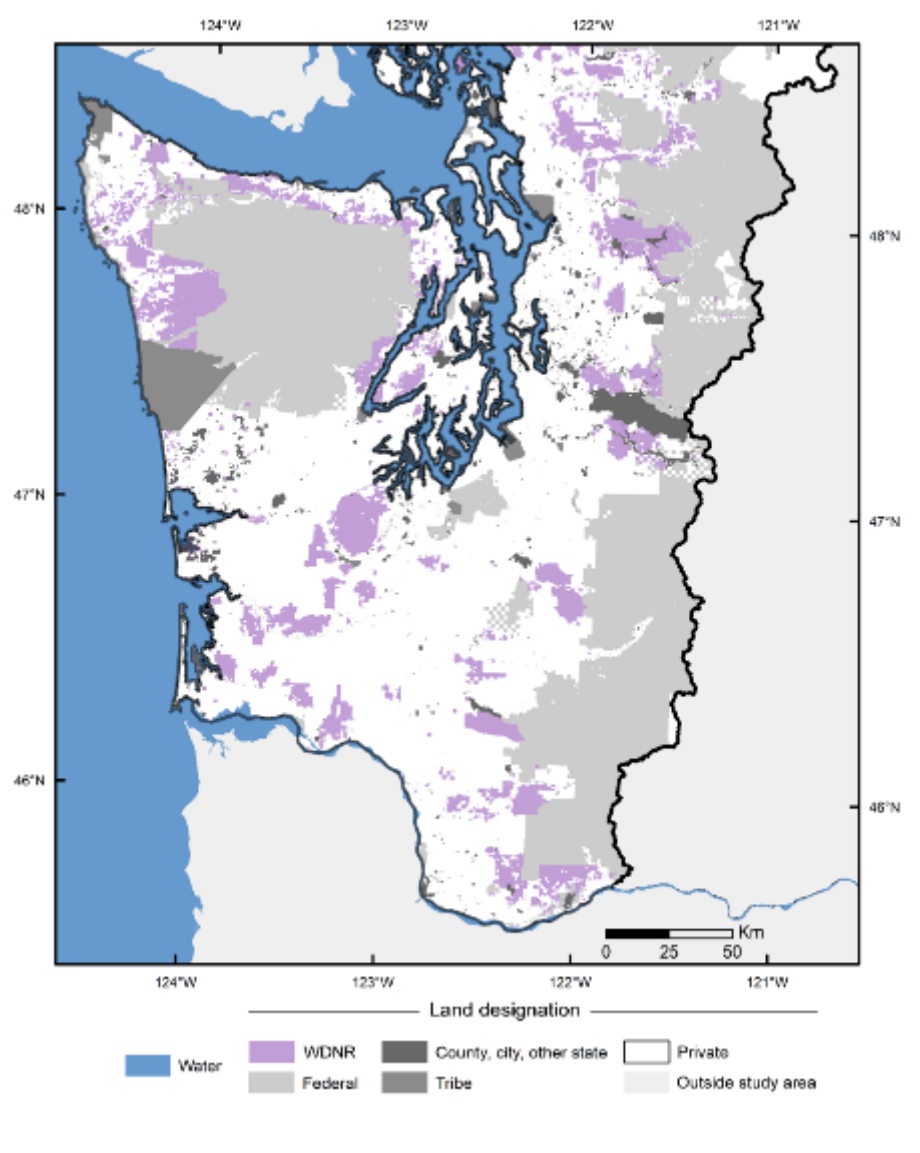
"GEM" lands (rotation forestry emphasis)



Answer: Yes

Aboveground carbon storage is shifting toward conservation areas (and increasing)





Question:

Across westside HCP lands, are trends in older forest habitat, spatial configuration, and aboveground carbon different since implementation of the HCP?

Answer: Yes

Older-forest habitat is increasing in (shifting to) HCP-intended areas

Connectivity increasing

Carbon shifting similar to older-forest, overall increase in forest C storage

Summary

Summary

Variable Retention Harvest – a component of Ecological Forestry – is grounded in ecological models of natural disturbance regimes

Summary

Variable Retention Harvest – a component of Ecological Forestry – is grounded in ecological models of natural disturbance regimes

“Legacy forests” (as recently coined/defined) are not old growth, nor necessarily the highest ecological value stands to promote old-forest functions

Summary

Variable Retention Harvest – a component of Ecological Forestry – is grounded in ecological models of natural disturbance regimes

“Legacy forests” (as recently coined/defined) are not old growth, nor necessarily the highest ecological value stands to promote old-forest functions

Mature forest habitat on DNR lands is managed not on a piecemeal basis as encountered, but rather with a federally approved landscape strategy – which appears to be working toward intended objectives

Questions?


WASHINGTON
DEPARTMENT OF NATURAL RESOURCES