

Restoration in westside forests

Increasing ecosystem function and resilience through diversification and mitigation



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Some Take Home Points

- Restoration Terminology needs updating and context in an era of climate change
- Restoration is a relevant objective for west-side forests
- A multi-scaled perspective is required
- Terrestrial, riparian and aquatic systems are integrated
- Multi-ownership landscapes pose special challenges and opportunities
- Use landscape to set priorities for site/stand-level activity
- Silviculture is important to achieving landscape goals

Outline

- Restoration – what do we mean?
- Importance of scale – Stands,
Landscapes & Time
- Some west-side examples of restoration
treatments and landscape applications
- Unresolved Issues

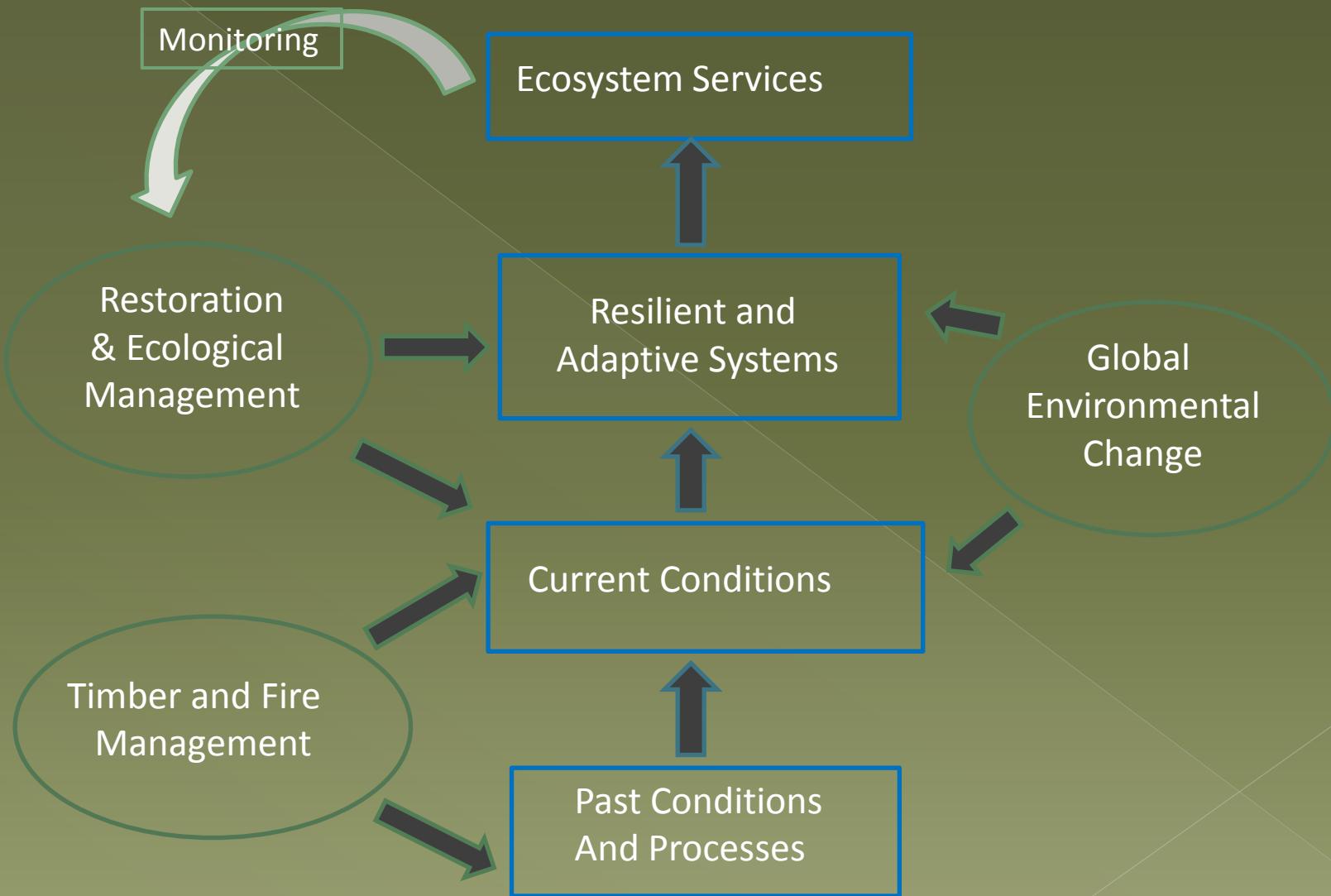
A Contemporary Definition of Restoration

- *Practices that counter the effects of past human actions that have degraded or destroyed ecosystems and promote or create resilient and sustainable landscapes ecosystems in an era of global environmental change*

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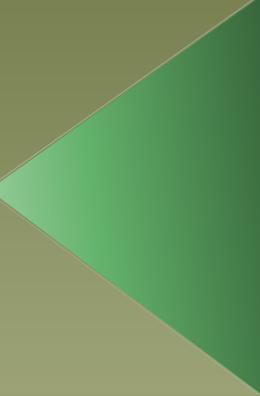
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A Contemporary Vision of Restoration

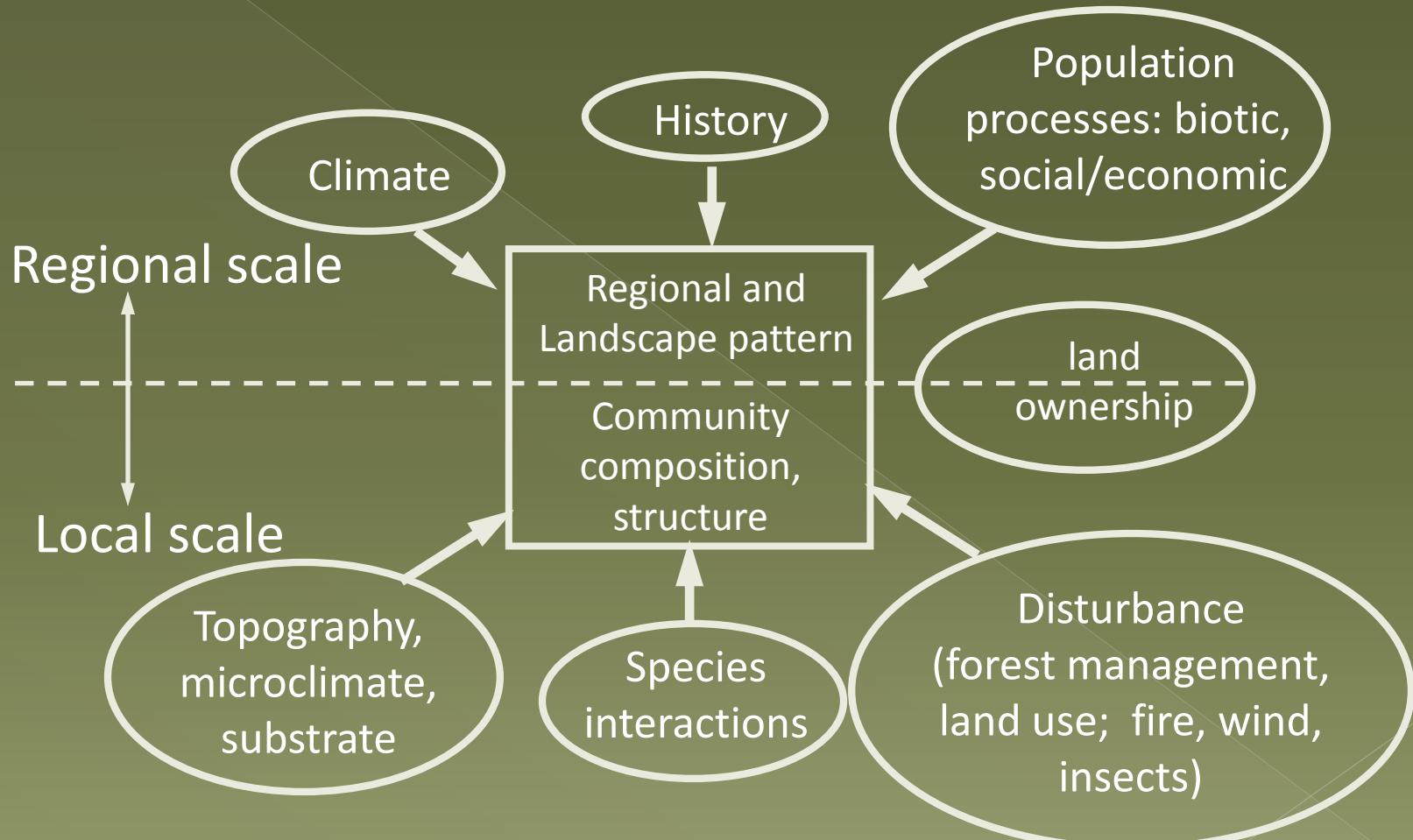




Restoration is Inherently
Multi-scaled



Landscape and Local Factors Influencing Forest Composition, Structure and Function



Why Landscapes?

- Ecological processes operate across large areas and are affected by the spatial pattern of vegetation and environment
- Effects of management may be hard to see at site level but can emerge at larger scales
- Used to prioritize stand/site activity to make management more effective

Why Stands?

- Long-term adaptation to environmental changes will require healthy and productive forests in the near-term
- Enhance adaptation by fostering resistant and resilient forest stands and landscapes
- With innovative application, current silviculture principles and practices continue to be applicable



Temporal scales

- Long-term environmental trends
- Disturbance frequency
- Annual and diurnal weather patterns
- Succession
- Stand development
- Phenology
- Physiological processes

Impetus for Restoration

Examples of Past Actions	Examples of Undesirable Ecological Effects	Actions to promote resilience and recovery
Logging and plantations	<ul style="list-style-type: none">•Loss of older forest and habitat•Fragmentation	<ul style="list-style-type: none">•Variable density thinning•Planting new species•Ecological silviculture
Road networks	<ul style="list-style-type: none">•Landslides•Altered hydrology•Invasive species	<ul style="list-style-type: none">•Decommission roads
Fire Suppression	<ul style="list-style-type: none">•Increased risk of high severity fire•Loss of habitat	<ul style="list-style-type: none">•Reduce fuels•Reintroduce fire
Introduced species	<ul style="list-style-type: none">•Loss of native species•Increased fire risk	<ul style="list-style-type: none">•Physical removal•Biological Control
Dams	<ul style="list-style-type: none">•Reduced variation in hydrological flows (floods)	<ul style="list-style-type: none">•Remove Dams•Restore stream channels

Some West-side Restoration and Mitigation Issues

- Extensive young, simplified Douglas-fir forests
- Water quality concerns related to active forest management
- Insufficient or degraded aquatic or riparian habitat
- Lack of quality early seral forest habitat
- Landscape fragmentation



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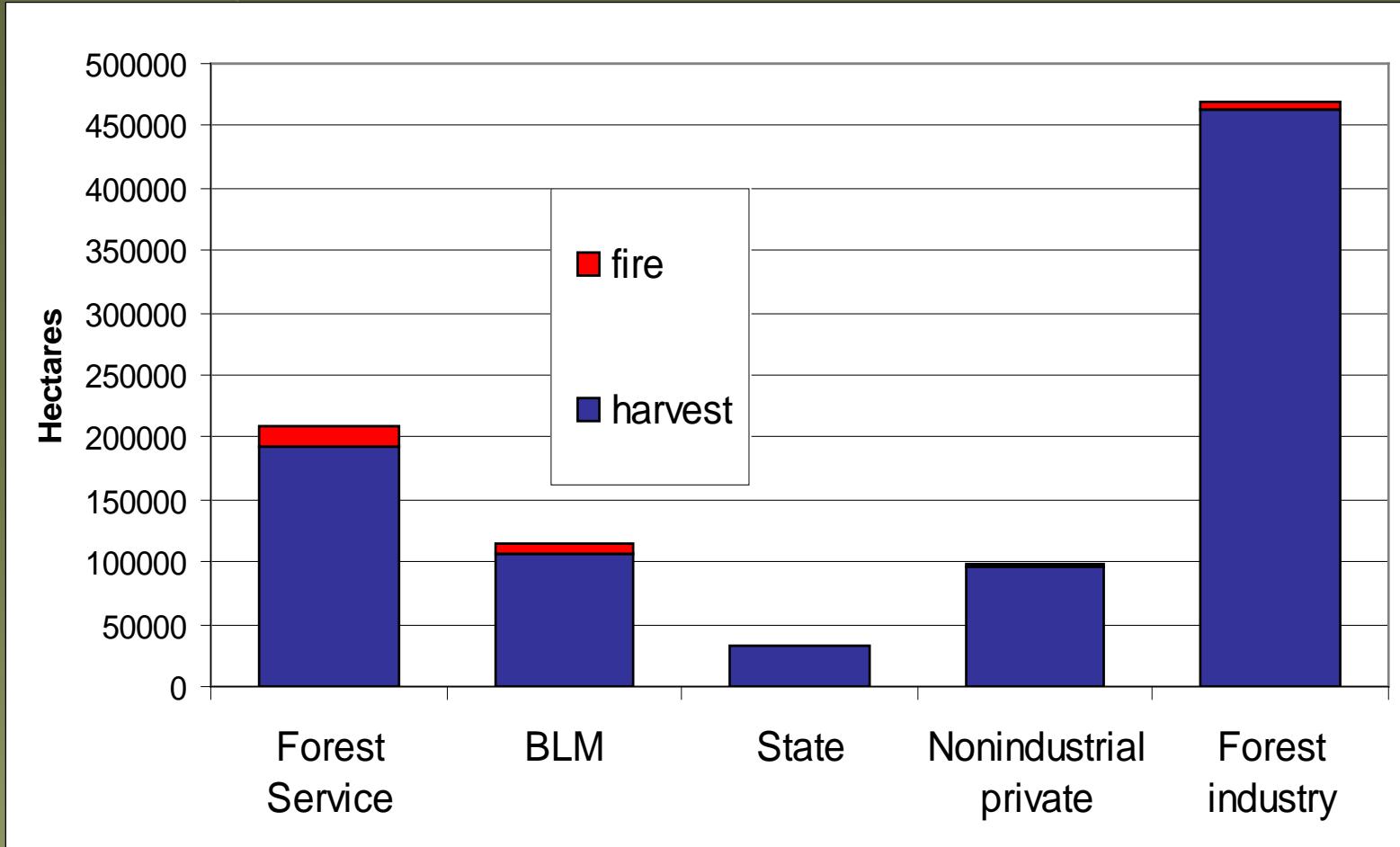


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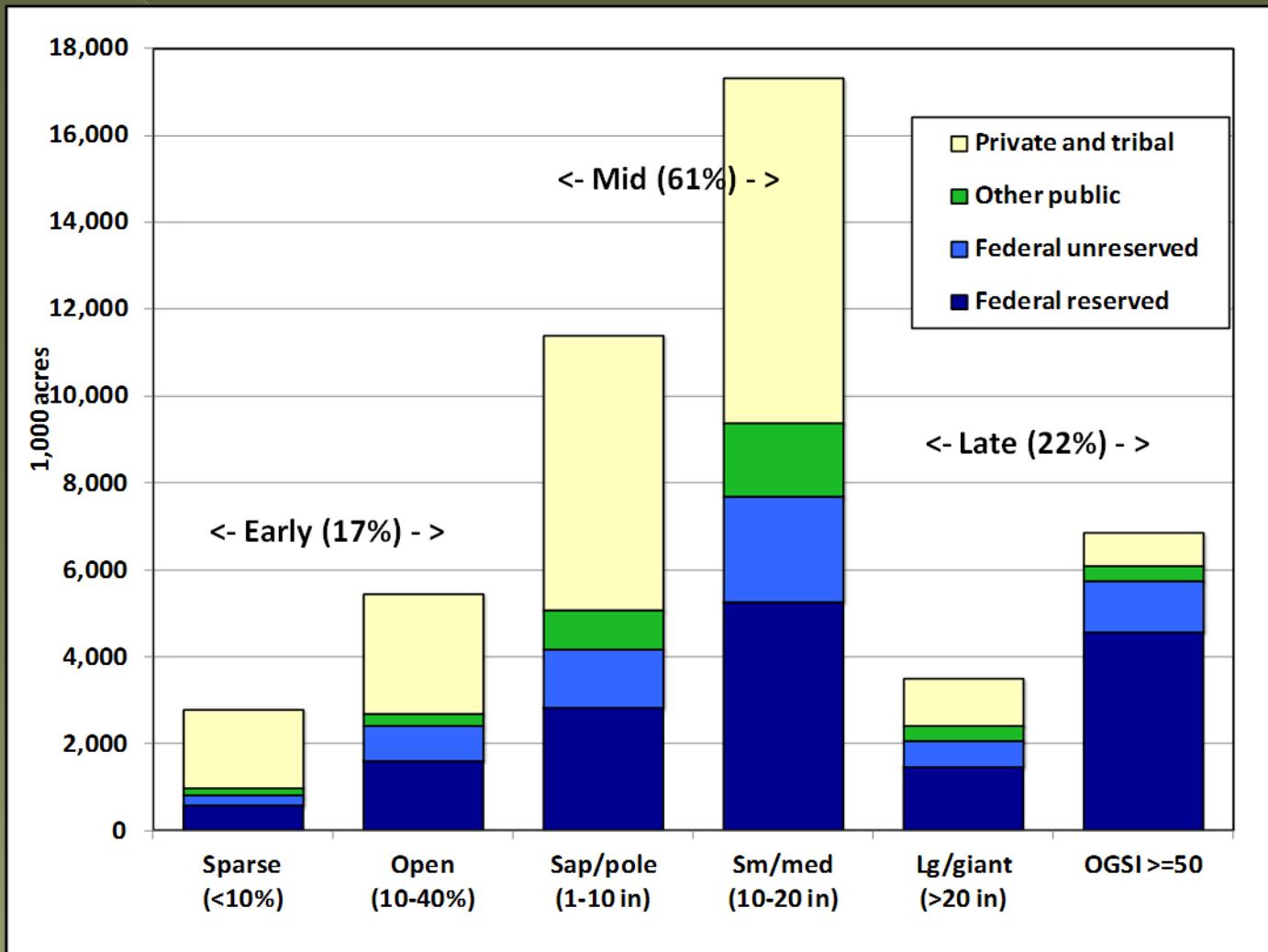


Stand-Replacing Disturbance in Western Oregon, 1972-1995



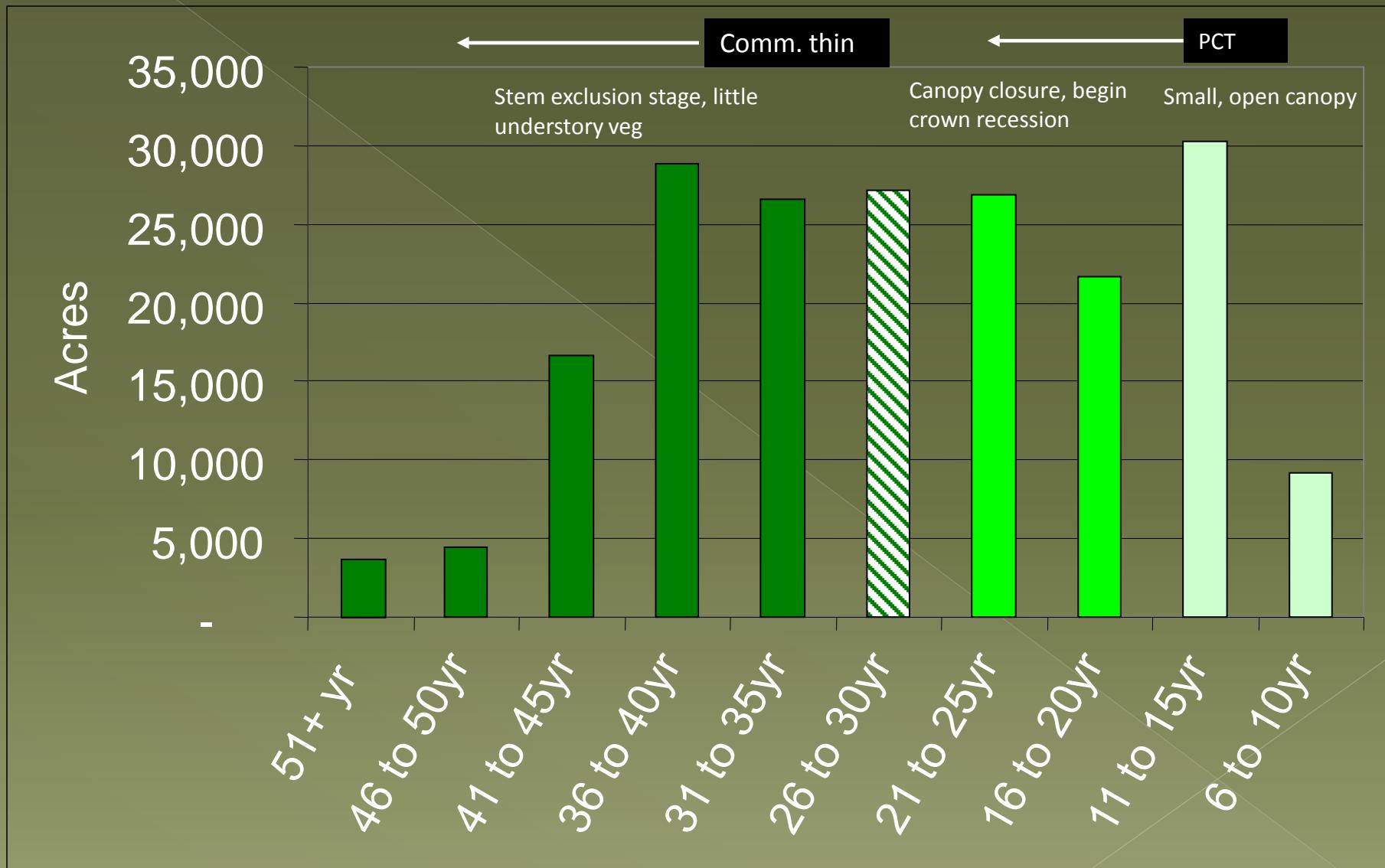
From Cohen et al. (2002), based on change detection analysis of Landsat imagery

NWFP: Structural Conditions by Ownership (2006/7)



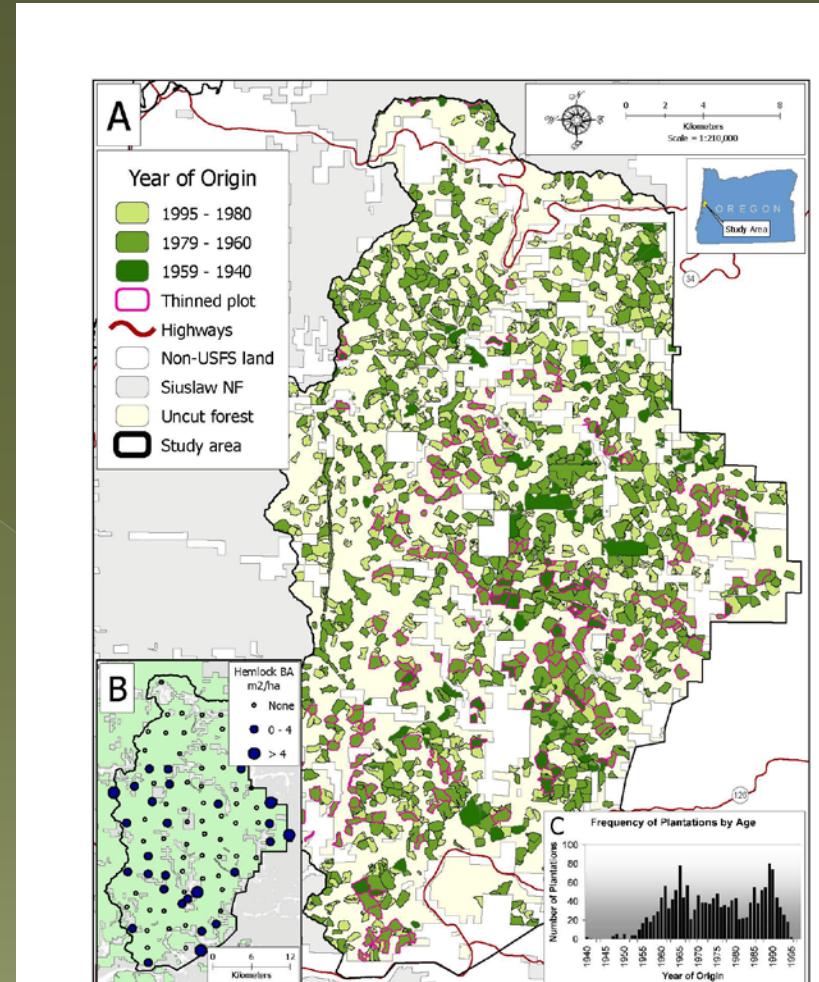
From Janet Ohmann

Siuslaw NF Managed Stands



Landscape Legacies of Logging and Plantation Establishment

- Reduce ecological diversity at stand levels
- Increased fragmentation of older forest habitats
- Eliminated habitat for some species (e.g. Northern Spotted Owl, Marbled murrelet)
- Increase edge effect



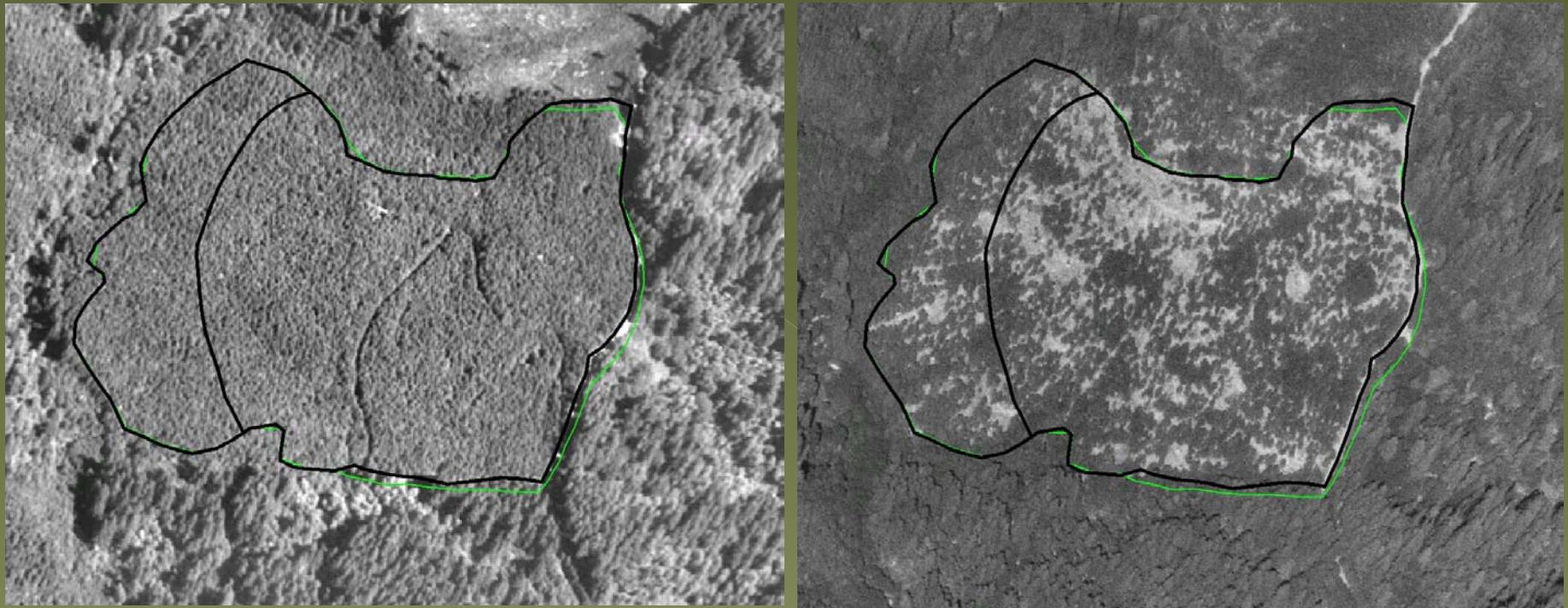
Plantations in a Late Successional Reserve on the Siuslaw N.F.

Restoration thinning in young Douglas-fir forests

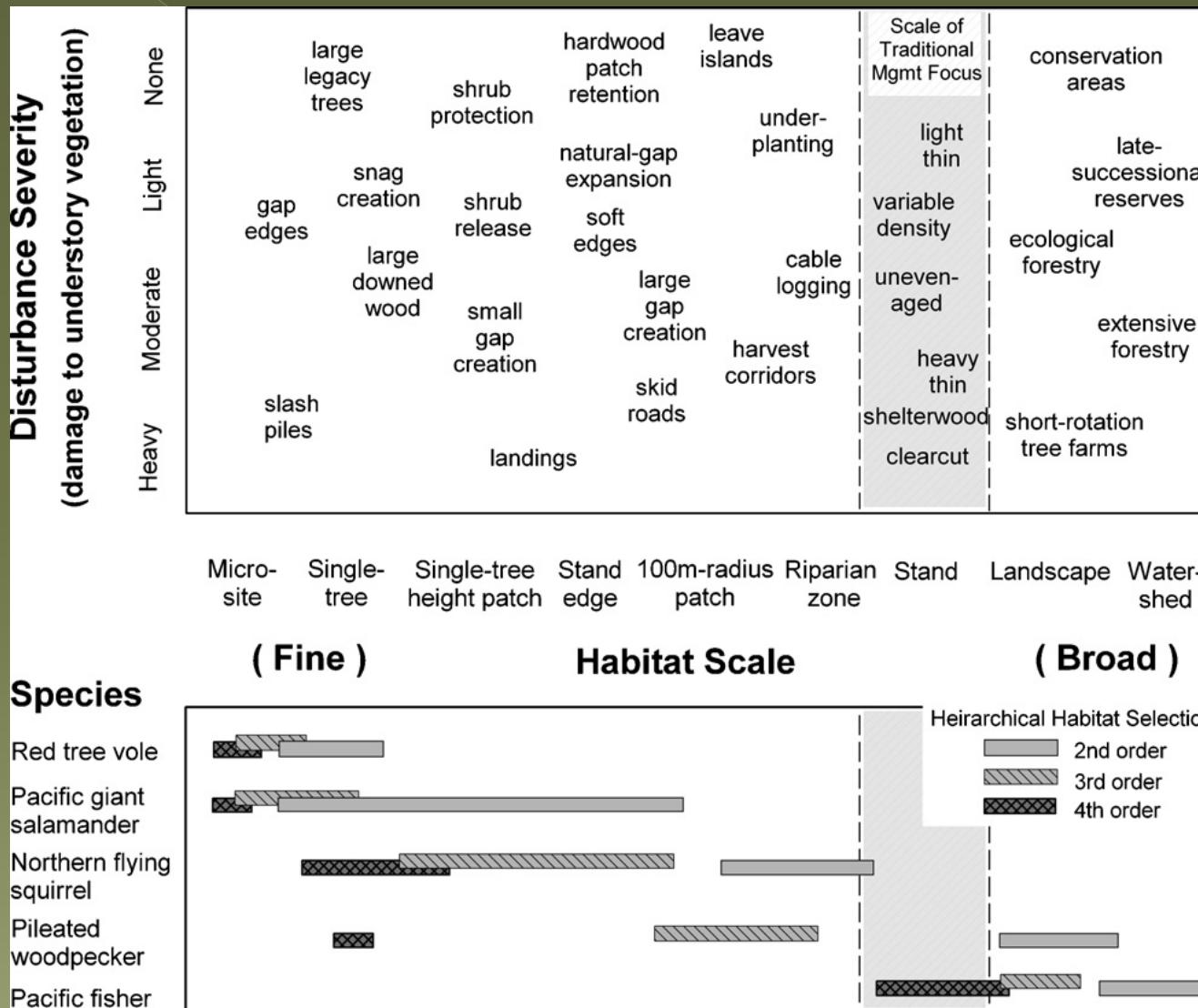
- Can we enhance the development of late-successional characteristics by thinning young stands?
- Remnant old-growth forests may have developed at densities substantially less than the current young forests



Enhancing Complexity: Variable Density Thinning

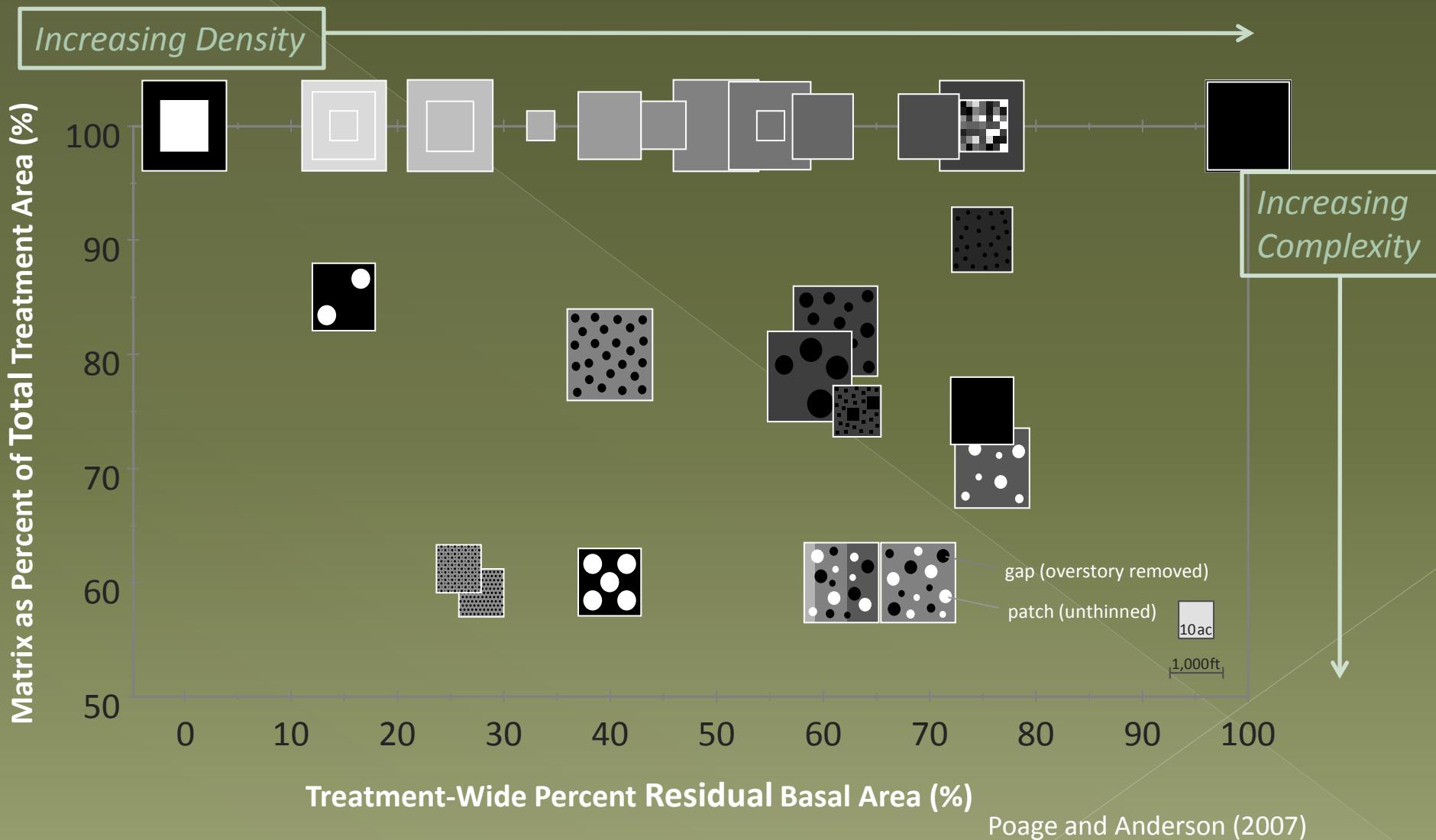


Diversification of young plantations on the Siuslaw NF using variable density thinning



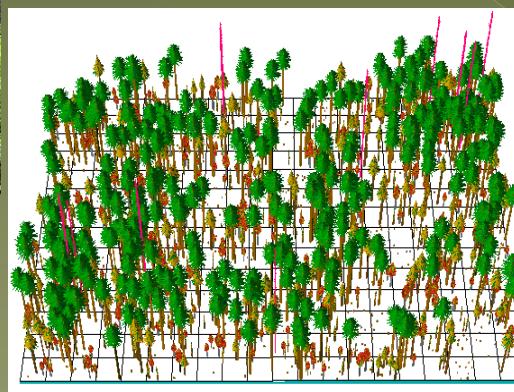
Wilson and
Puettmann
(2007)

Range of Experimental Treatments



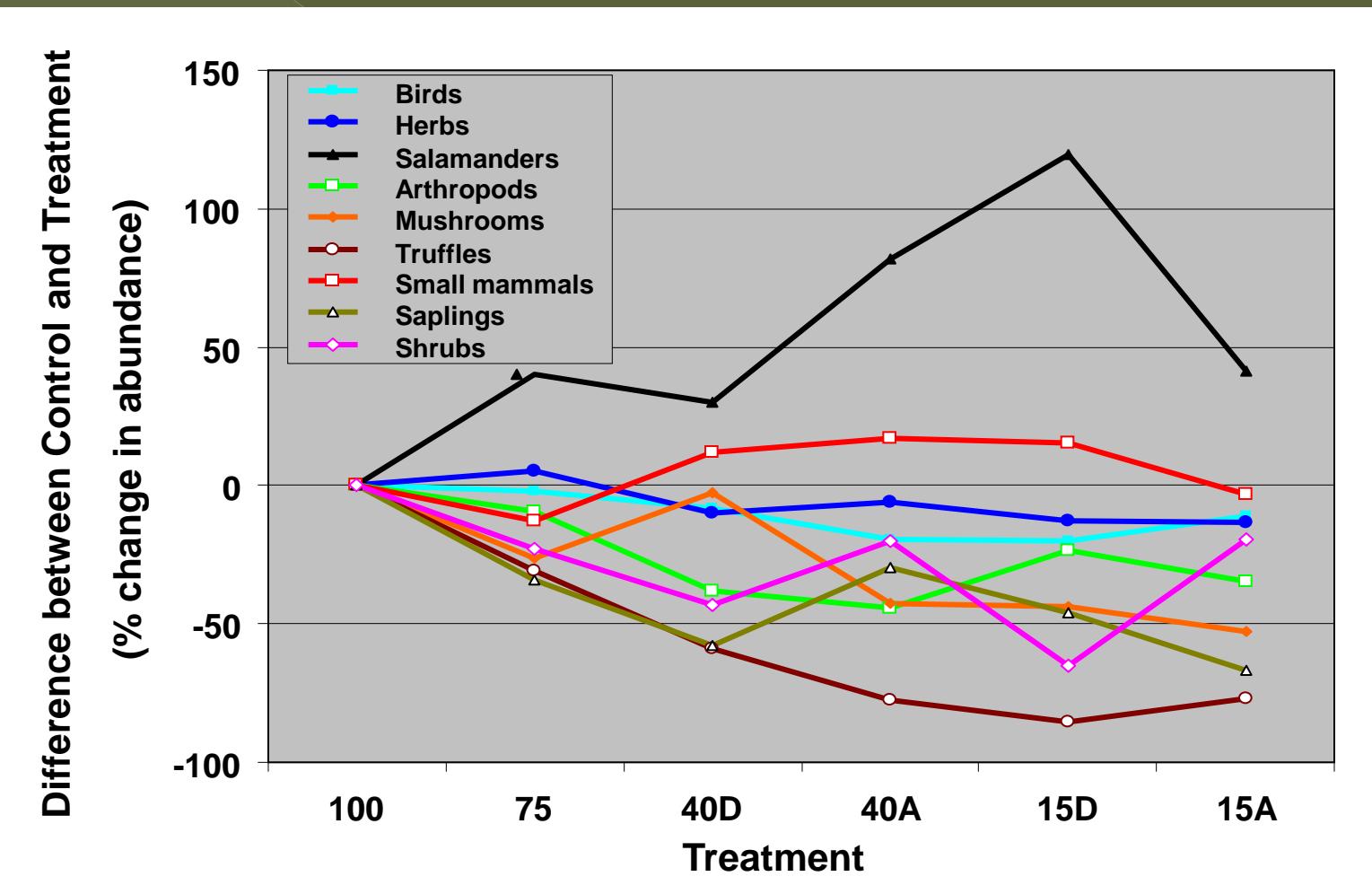
Young-stand restoration

- We can increase stand heterogeneity through variable density thinning



Skips and Gaps

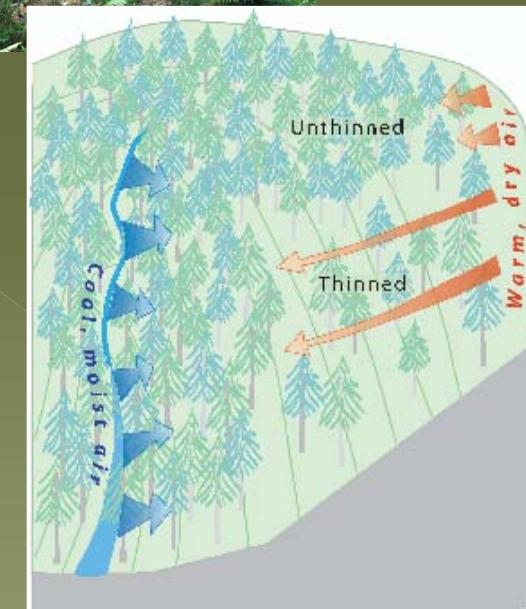
Does structural heterogeneity translate into habitat use?



From Maguire, OSU (unpublished)

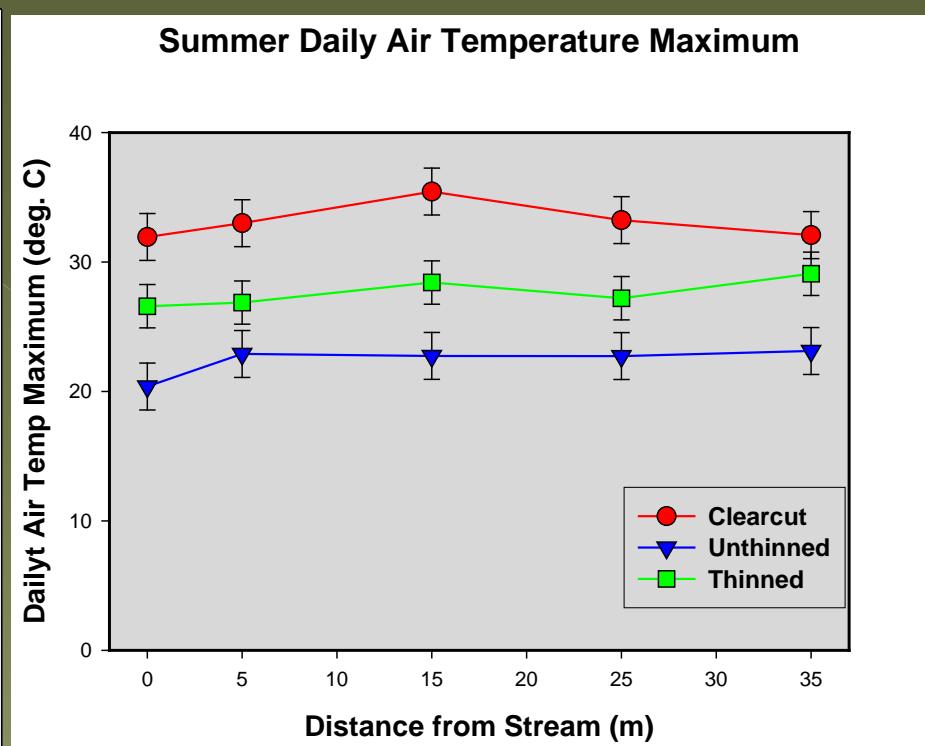
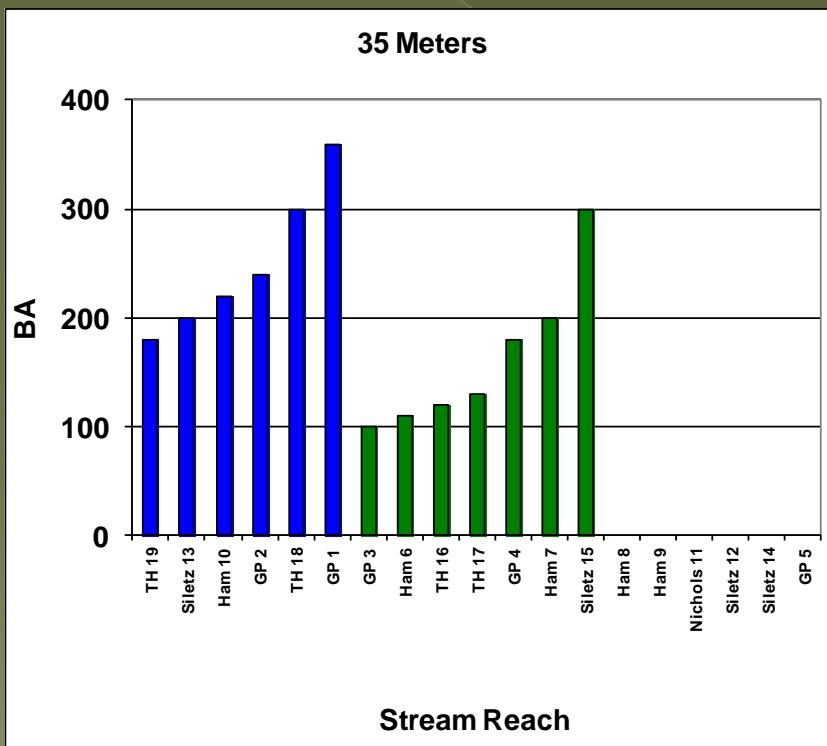
Mitigation of harvest impacts on riparian and aquatic ecosystems

- Buffers on headwater streams:
 - mitigate upslope harvest effects on microclimate
 - provide amphibian habitat
 - provide connectivity across the landscape

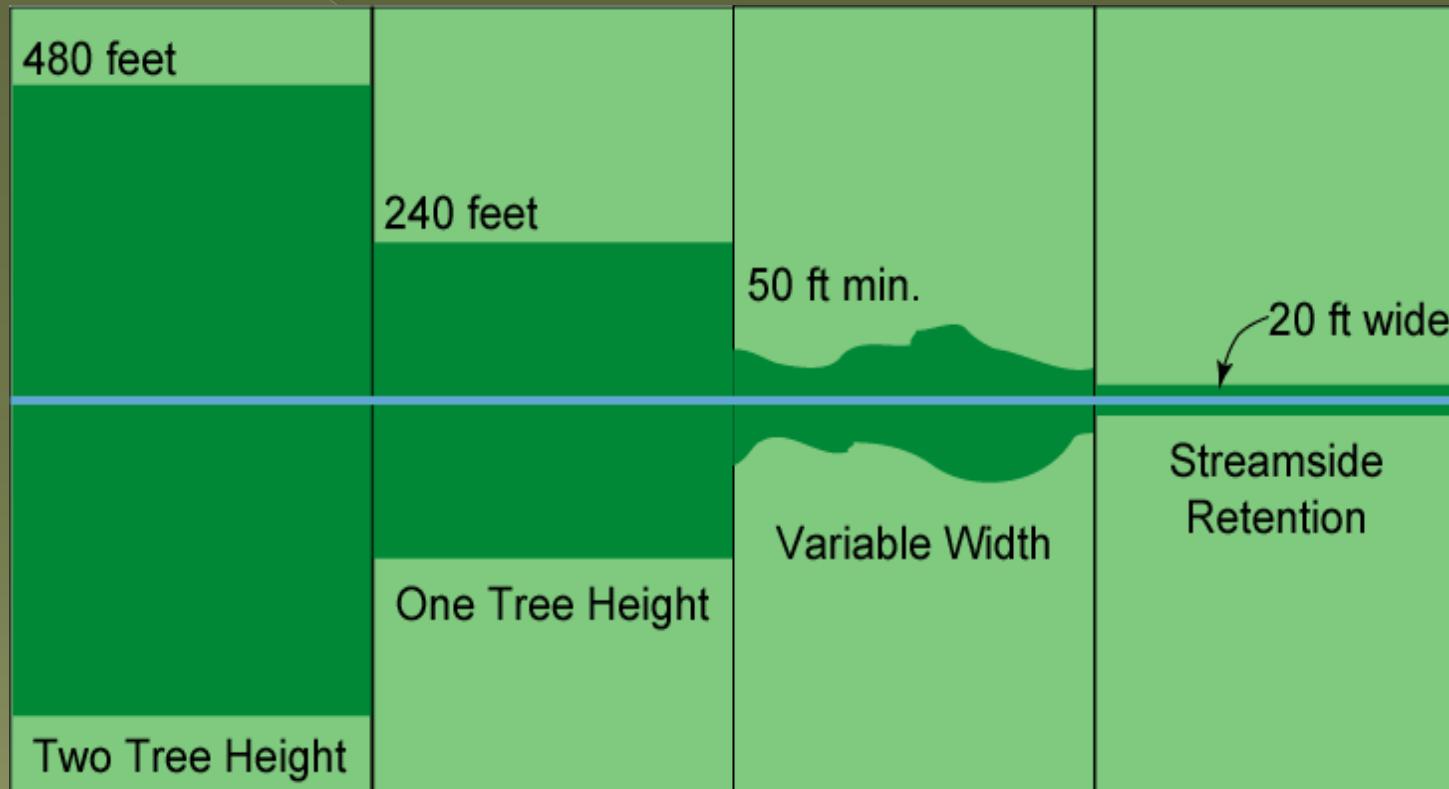


Upslope and downslope influences of interacting stream and forest microclimates

Harvest Impacts on Riparian Microclimate: Air Temperature



Riparian Buffer Alternatives



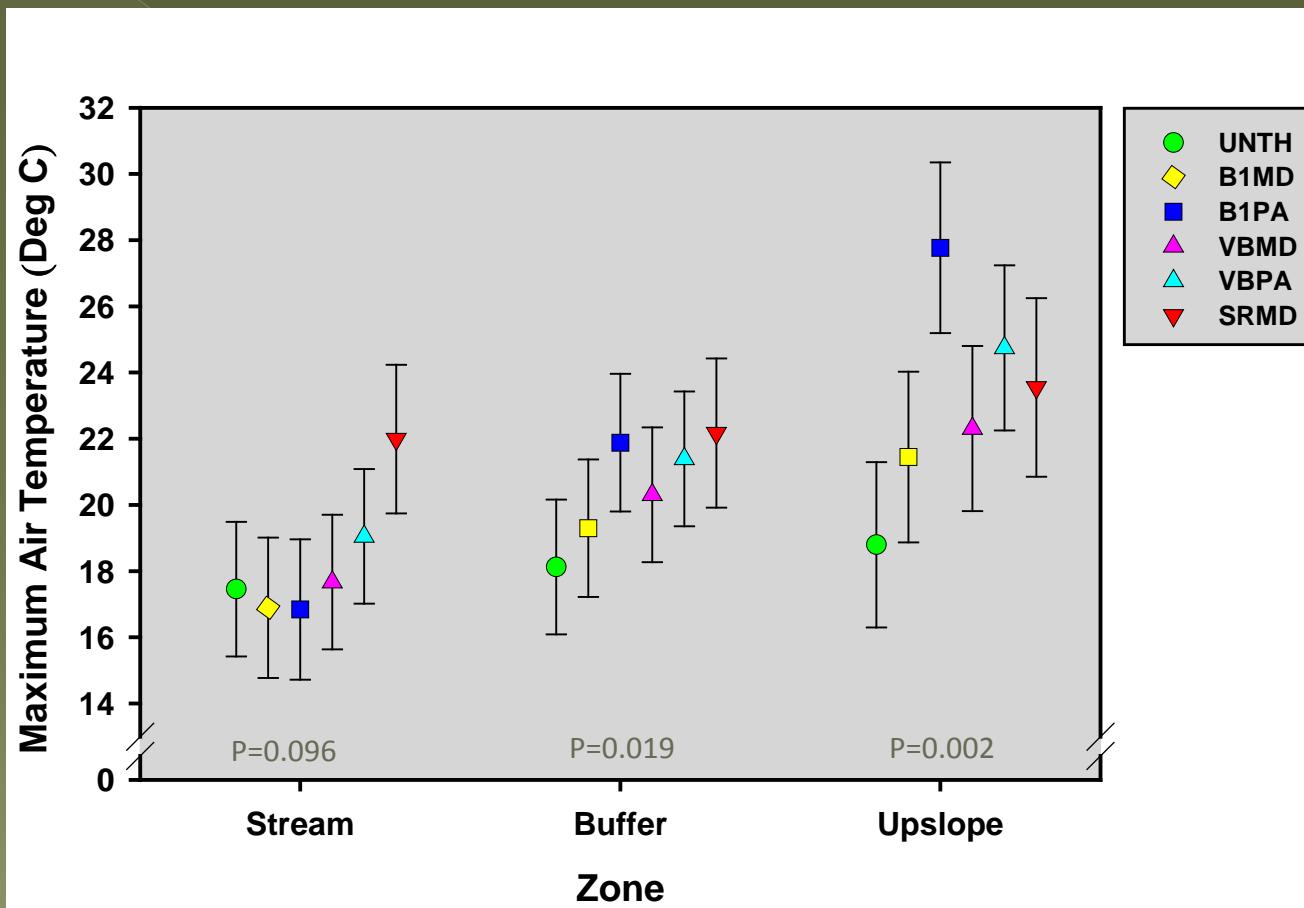
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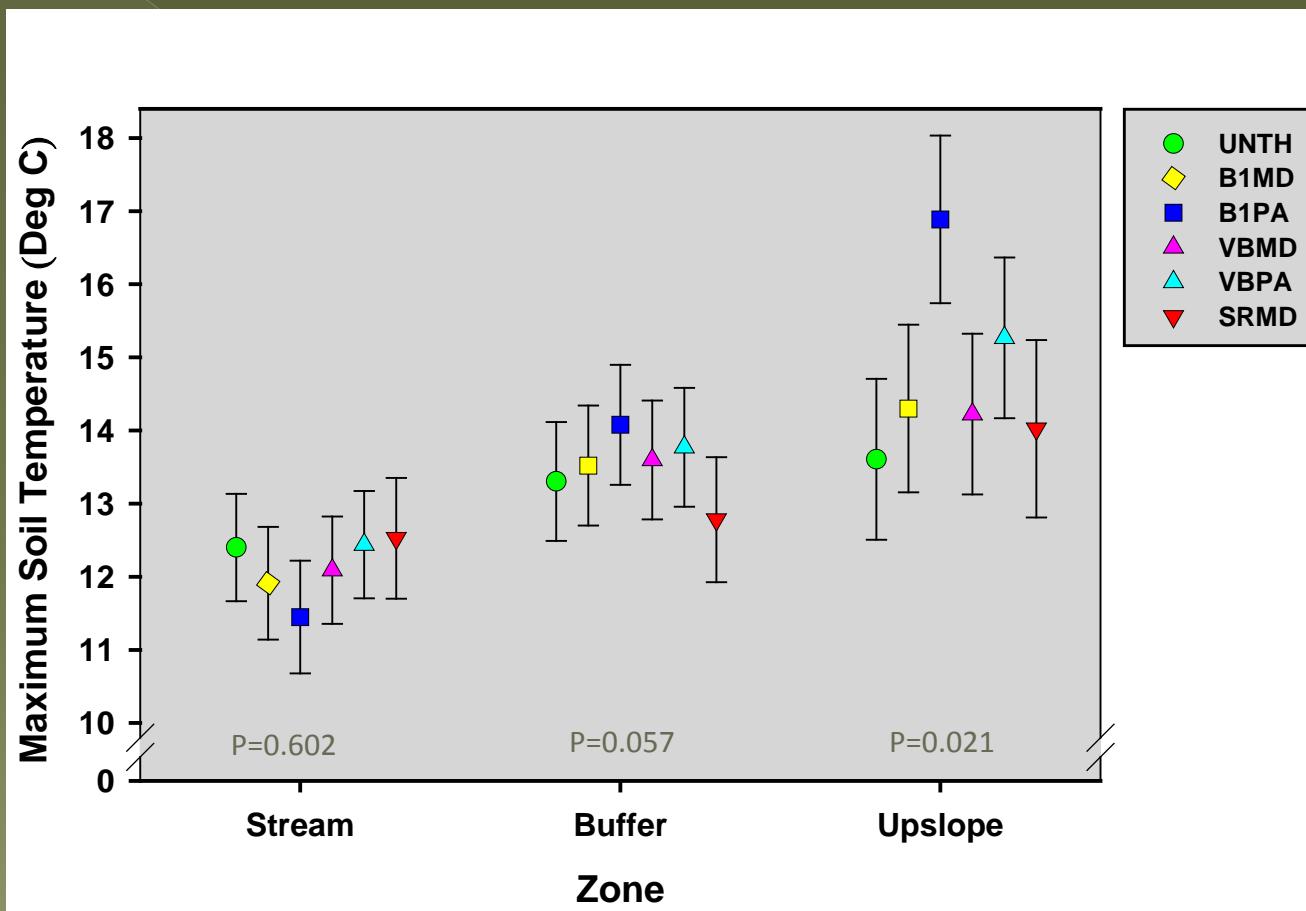
VB

SR

Mean Daily Maximum Air Temperature by Zone



Mean Daily Maximum Streambed or Soil Temperature by Zone

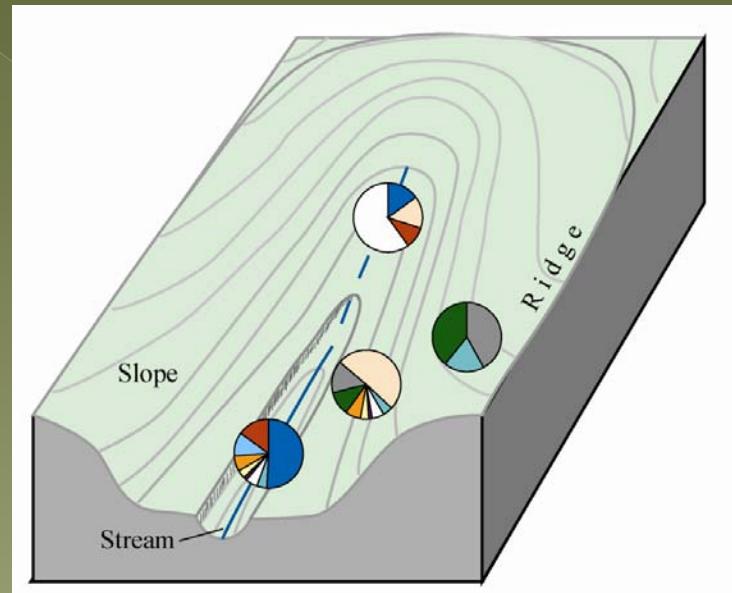


Microclimate Conclusions

- Differences in microclimate along transects with different buffer widths and upslope treatments tend to occur only during the warmest part of the day and in the upslope treated zone
- With moderate thinning, microclimate is moderated within approximately 10 m of the stream, regardless of upslope density treatment when buffered a minimum of 15-25 m

Stream-breeding Amphibians and Forest Buffers

- Early post-thinning findings:
 - > No negative effects of treatments on animals
 - > All species retained
 - > Banks: Newts increased in buffers, declined in reference streams
 - > Instream: Giant salamanders increased in buffers, declined in reference streams
 - > No treatment effects on habitat
- Spatially distinct headwater assemblages:
 - > Intermittent streams
 - > Perennial streams
 - > Streambanks
 - > Uplands

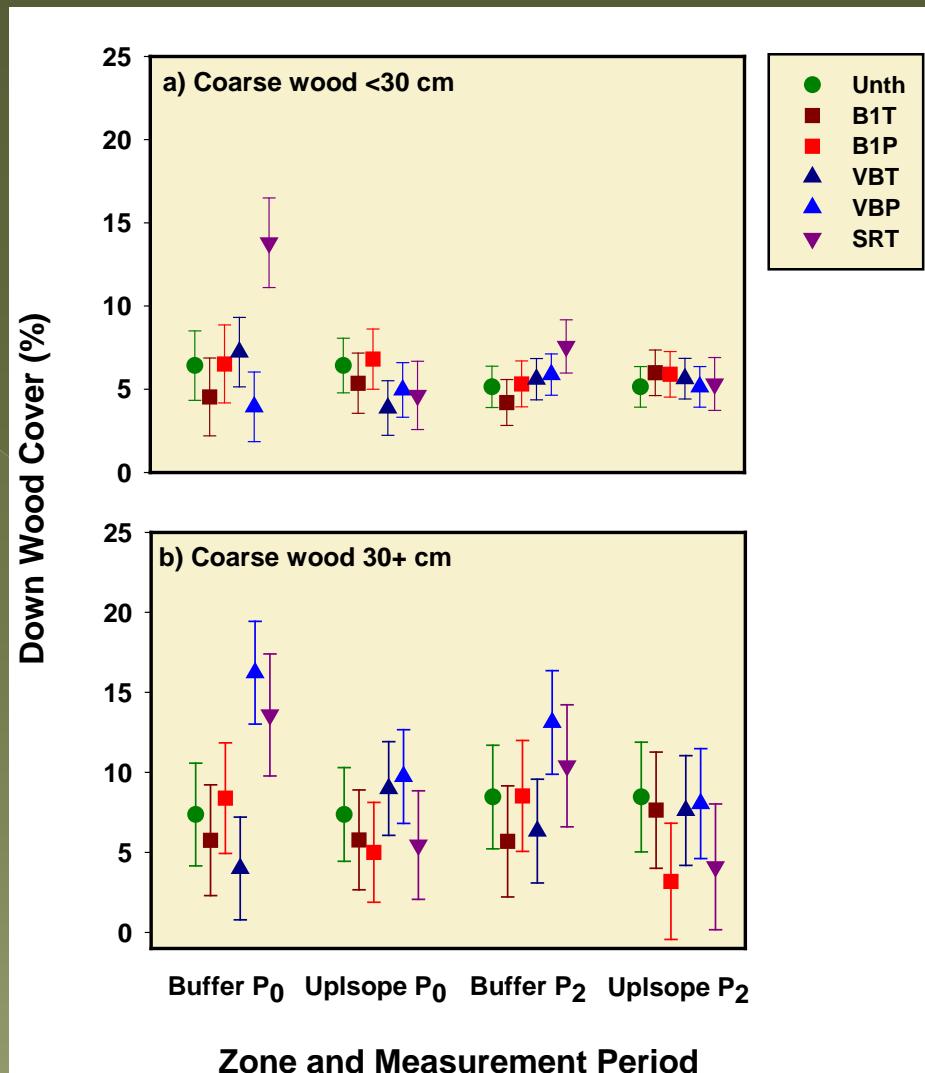


Olson and Rugger (2007)

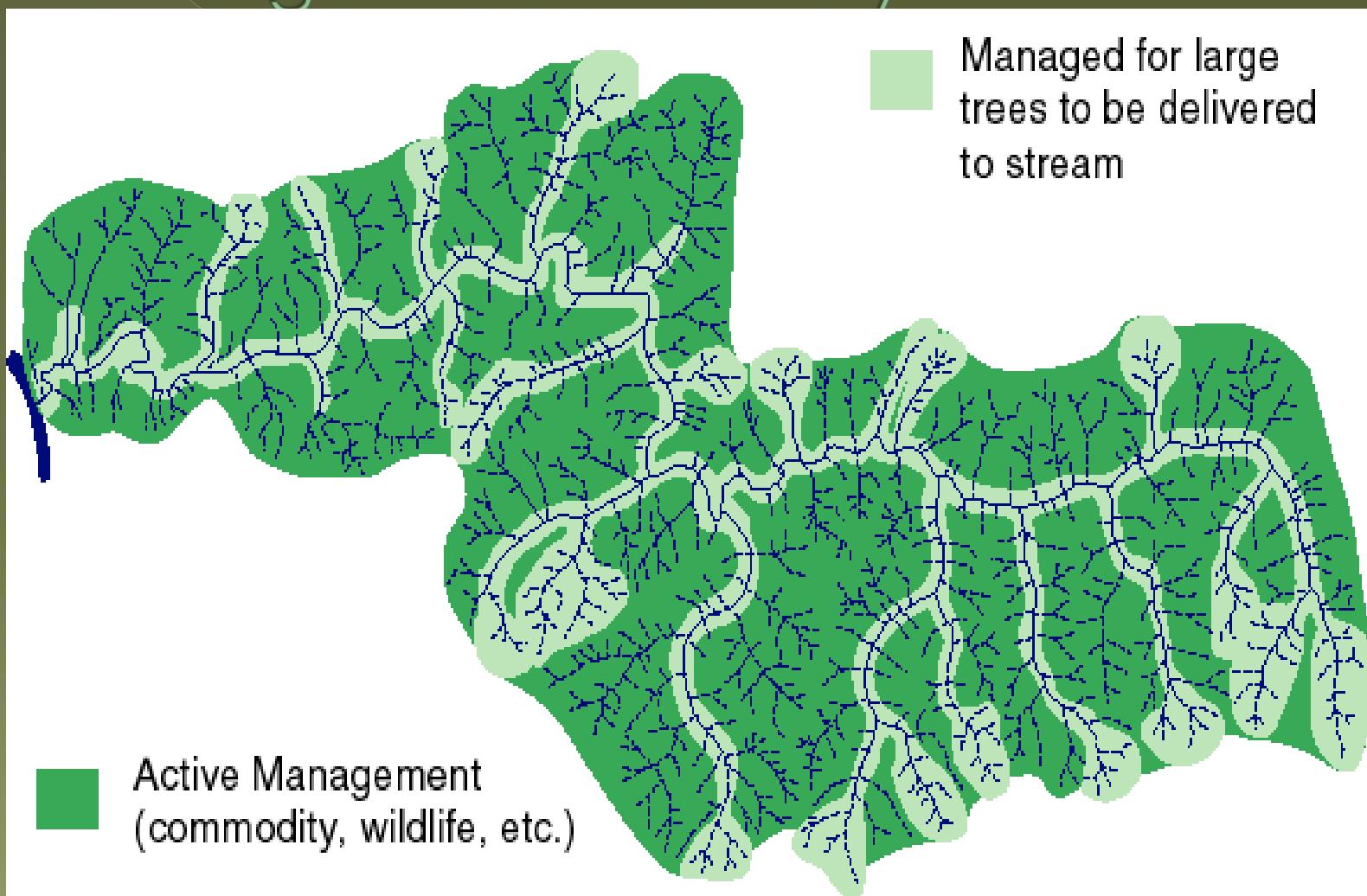
Sheridan and Olson (2005)

Thinning, Buffers and Down Wood

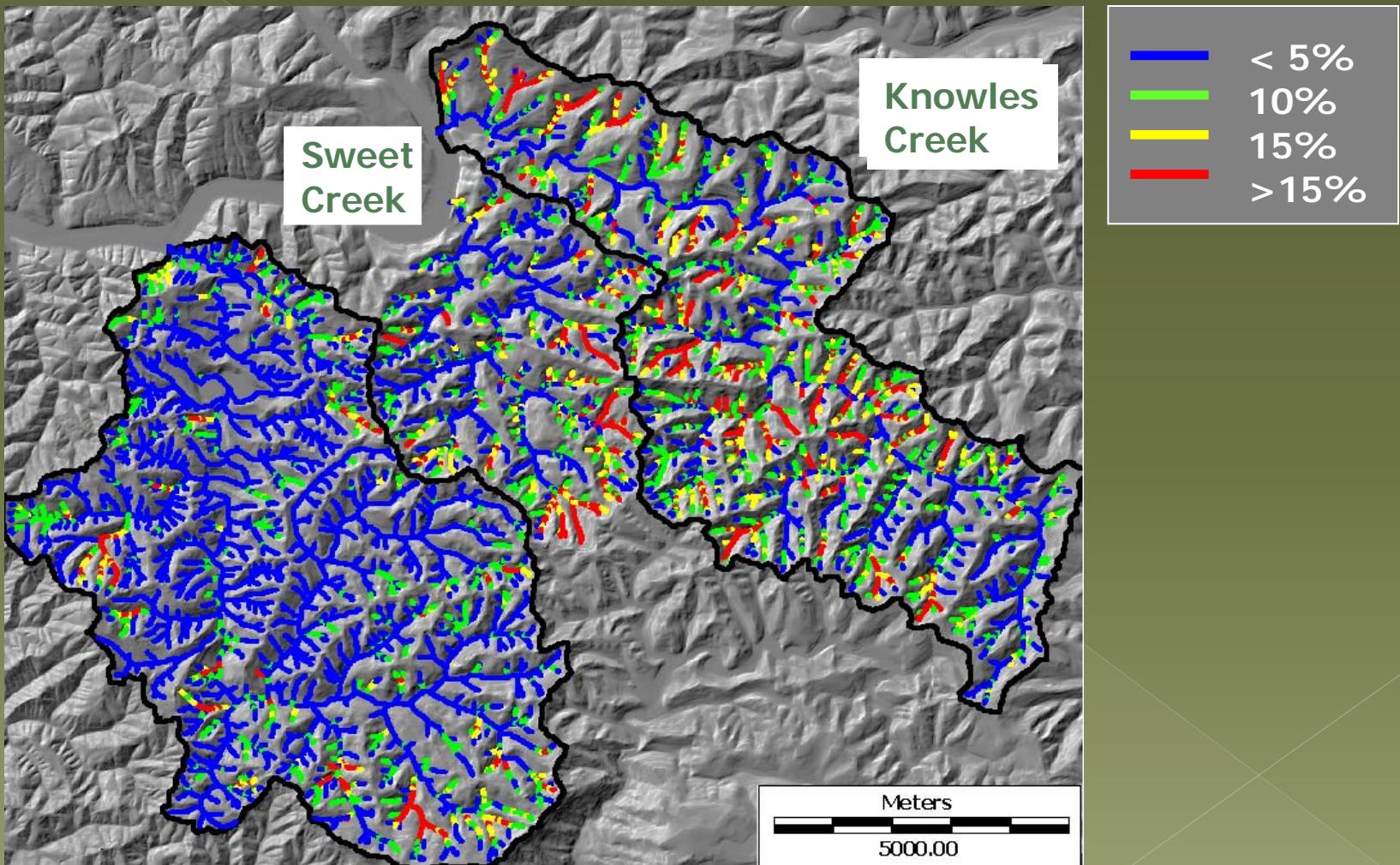
- Thinning lead to subtle changes in down wood cover
- In the treated upland, these responses tended to be most prevalent in patch openings
- Within buffers, responses most prevalent for narrow buffers, particularly when directly adjacent to patch openings
- Small down wood cover became more homogenous across reaches



Possible Riparian Management Design for Large Wood Delivery

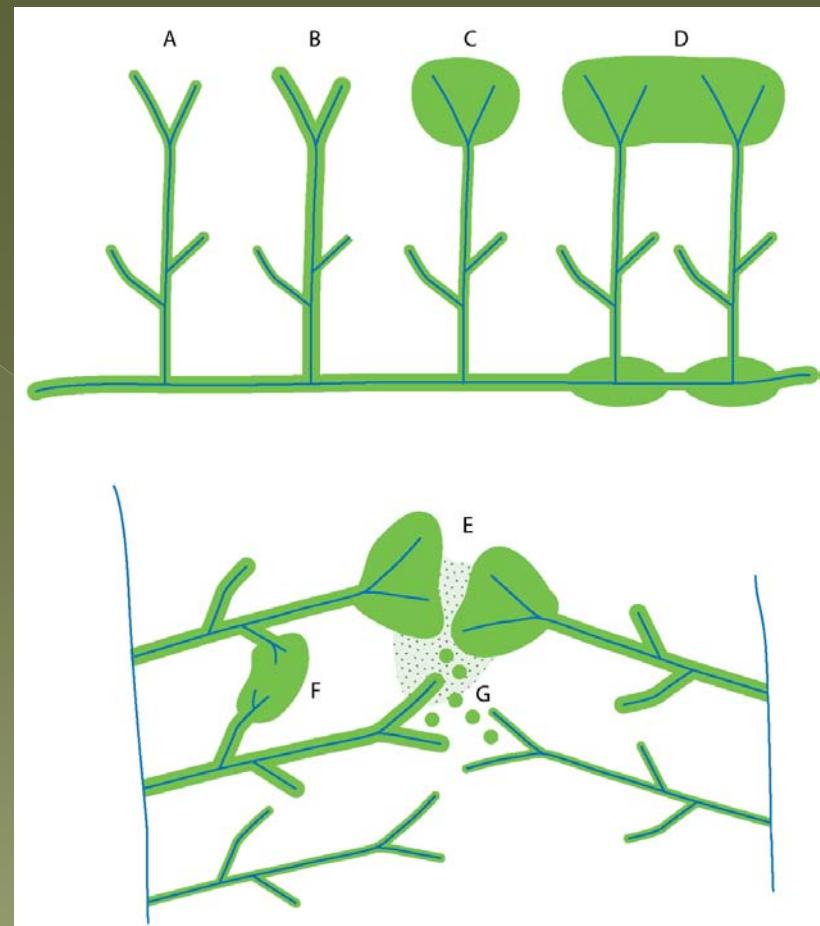


Debris Flow Probability in Siuslaw Basins

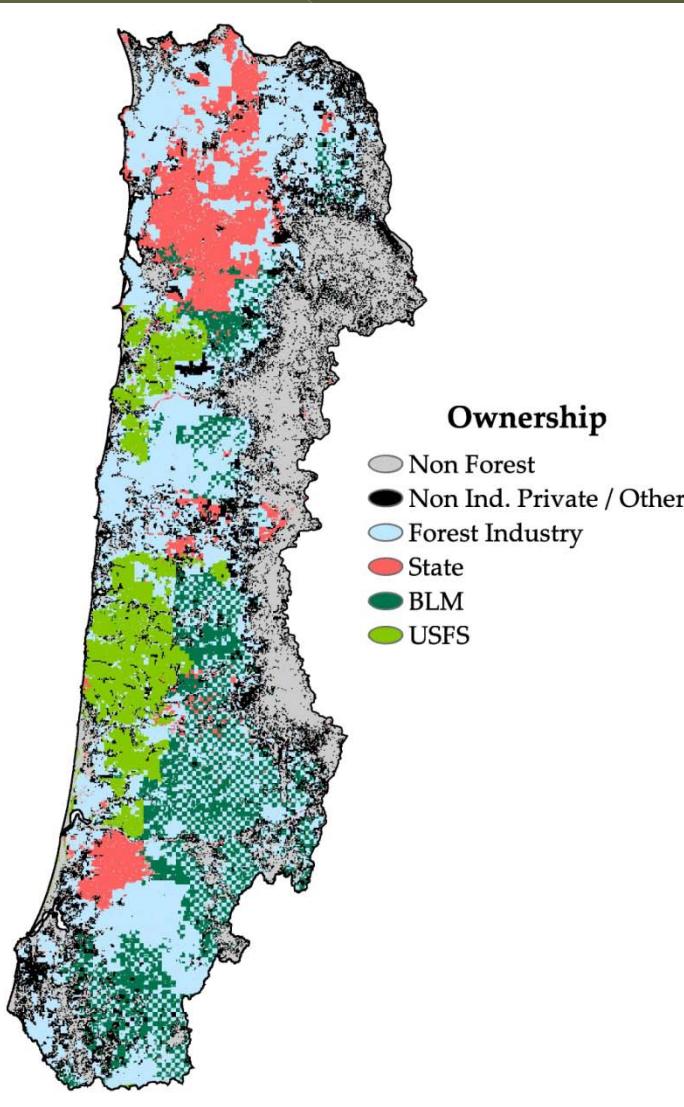


Creating habitat linkages at the headwaters

- Expand and connect buffers
- Over-ridge distances are shortest in the headwaters
- Serve as landscape linkage areas

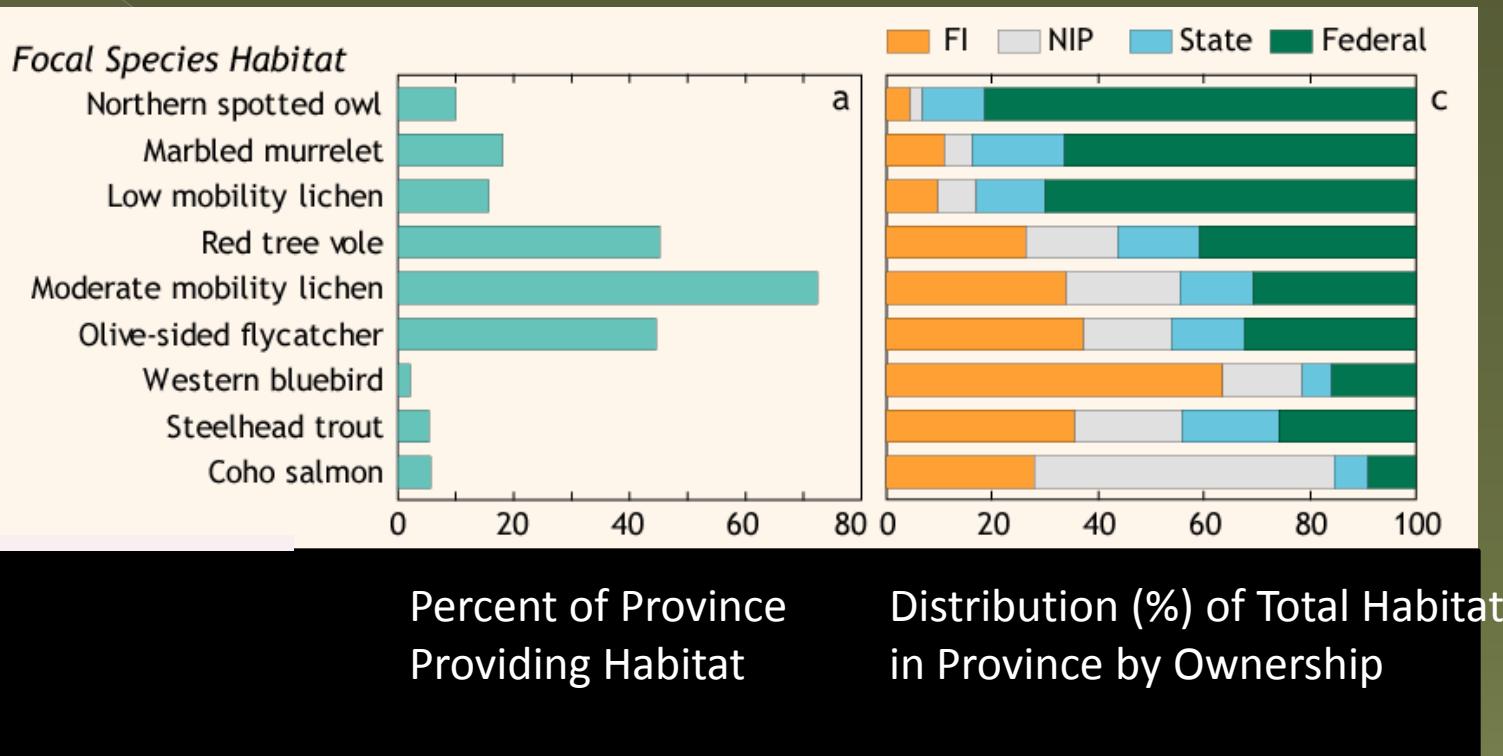


Multi-ownership Landscapes: Coastal Landscape Assessment and Modeling Study (CLAMS)



Owner	Policy	Goals	Strategy
USFS and BLM	NW Forest Plan Forest Plans	LS/OG T&E species Aquatic Commodities	Reserves Matrix Gr-Tree retention AMA
State of Oregon	New Forest plans	Healthy forests Indigenous species Abundant timber T&E species	Structure-based management Hab. Cons. Plan
Private, Industrial and Non-Industrial	Forest Practices Act	Priority to growth and harvest of trees Protect environment and fish/wildlife	Retain trees in clearcuts, Streamside protection rules

Multi-ownership Landscapes: Who Provides What?



Multi-ownership Landscapes

- Forest policies developed by individual landowners in relative isolation do not necessarily add up to an effective conservation program at a landscape level
- Federal lands will bear the burden for restoring and providing many ecosystem services
- Federal lands will not be sufficient to meet all restoration goals
- Diverse management goals could be complementary for providing ecosystem services—but requires coordination

Ongoing Discussions

- What are the appropriate targets for restoration management?
- Are the correct “controls” being used in the research informing managers
- What is the fate of forests reaching age or size limits for active management?
- If a large-scale stand replacing disturbance were to occur today, what is our capacity to respond?
- Is thinning a sustainable practice on federal lands?

Thank You

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