Biomass and Wildlife

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Oregon State University

Presented by:

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Outline

I. Basics of managing forests for wildlife
II. How differing intensities of forest management for biomass could affect wildlife
III. Unanswered questions and research opportunities
IV. Conclusions

4 Basic Needs of Wildlife

- Food
- Shelter or cover
- Water
- Space

Basic Management Principle

Animal diversity increases with increasing:

- plant diversity,
- habitat structural components, and
- horizontal and vertical forest structural diversity.

Structural Components of Wildlife Habitats

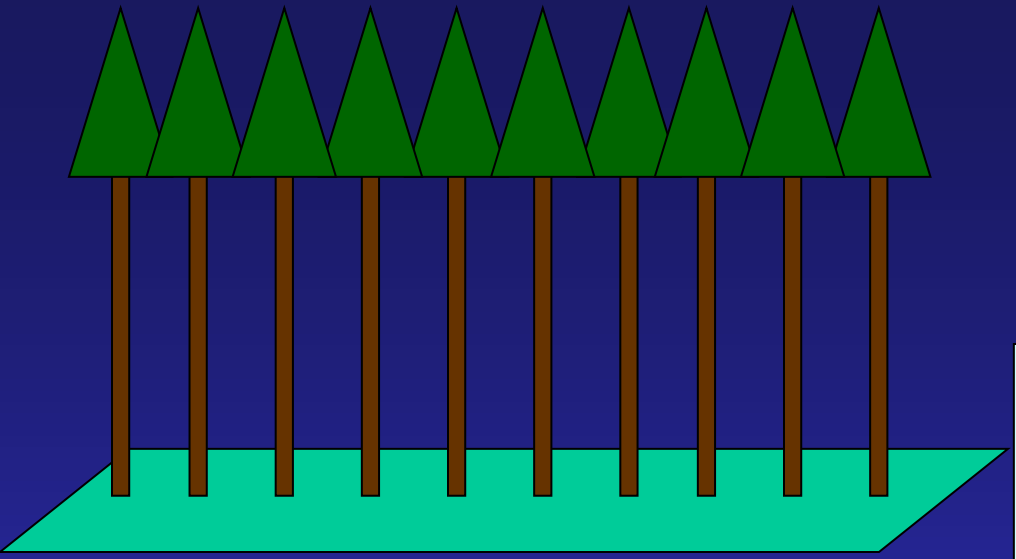
- Foliage-height diversity
- Snags
- Logs
- Stand density
- Tree size

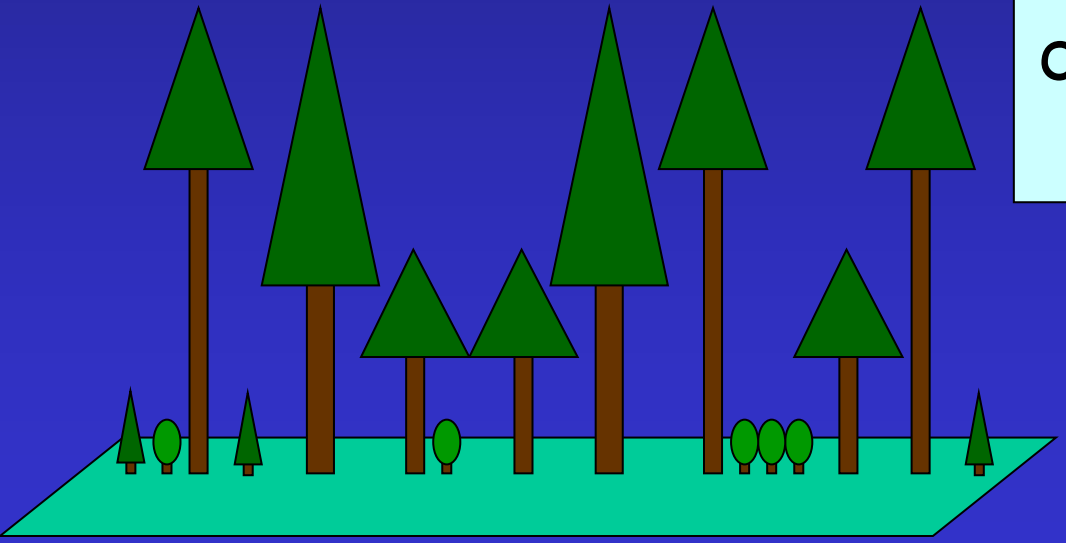
Key structural elements of forests that influence biodiversity at the stand scale

Vertical diversity

Horizontal diversity

Quantity and quality of dead wood

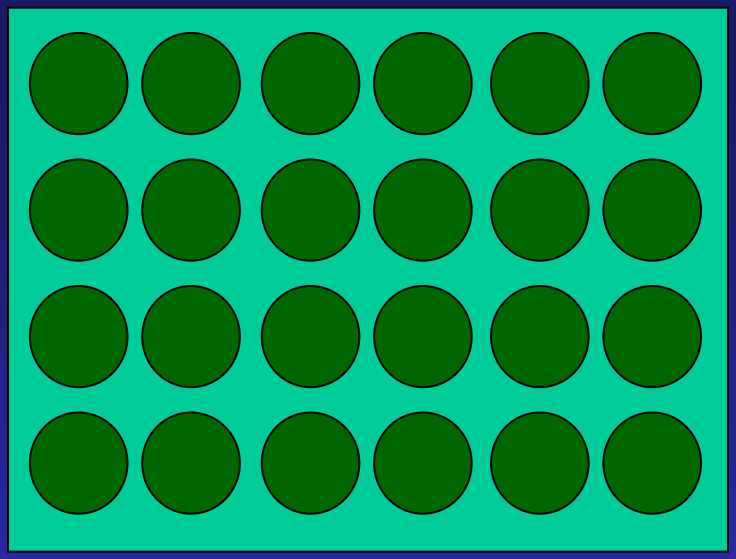




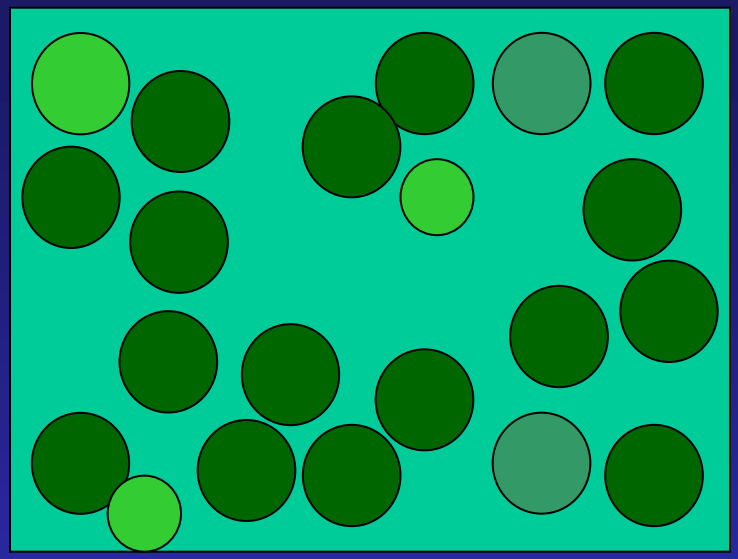
Vertical diversity

The amount and type of vegetation at different heights above the forest floor

Simple



Complex

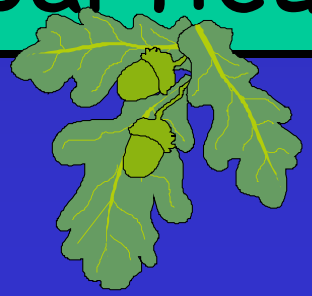


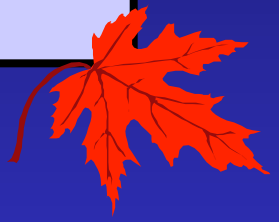
Horizontal diversity:

The variation in plant community composition and cover in a stand.

Conifers and hardwoods have different characteristics that result in differing influences on wildlife

Leaf characteristics are particularly important





Habitat use by forest-dwelling vertebrates in British Columbia

% species restricted to or favoring	Ponderosa pine	Coastal Douglas-fir
Cavities	29	30
Downed wood	12	10
Shrubs	13	10
Hardwoods	26	26
Riparian	49	51
Early seral	23	16
Late seral	33	18

(from Bunnell et al. 1999 Environ. Rev. 7:97-146)

Shrubs either directly …

… or indirectly provide the primary food source for forest feeding animals

17 of 34 (50%) of neotropical migrants in Alaska, British Columbia, Washington, and Oregon nest in shrubs or on the ground

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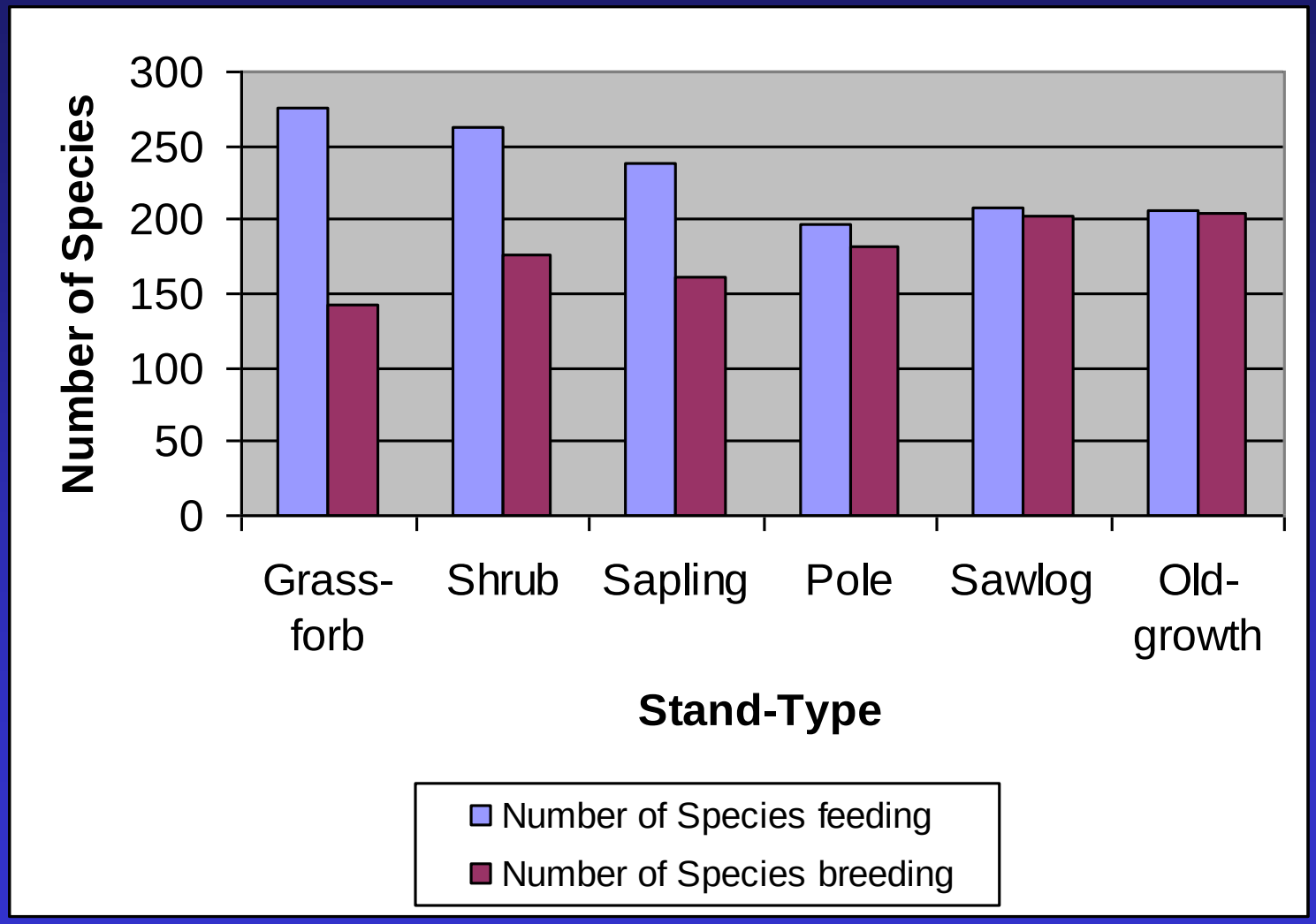
Some species of wildlife have strong associations with hardwoods or particular species of trees and shrubs

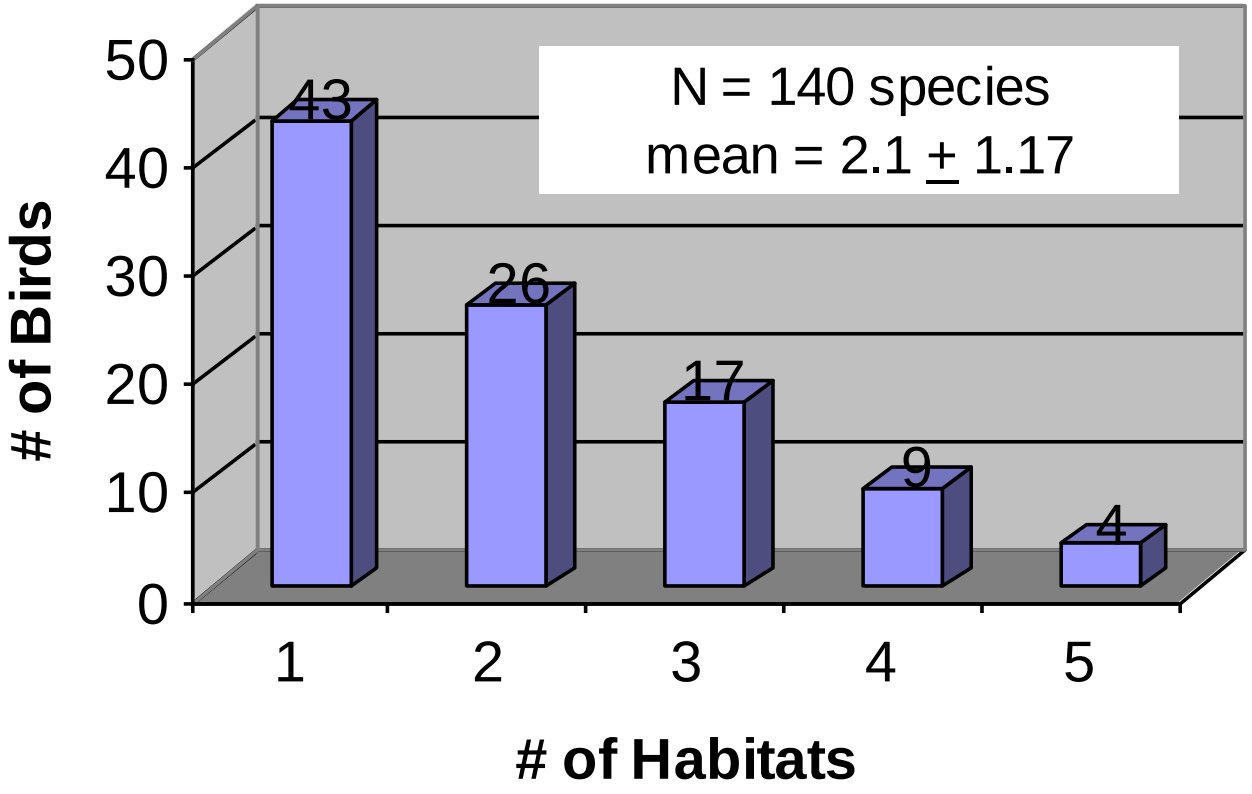
Management tip

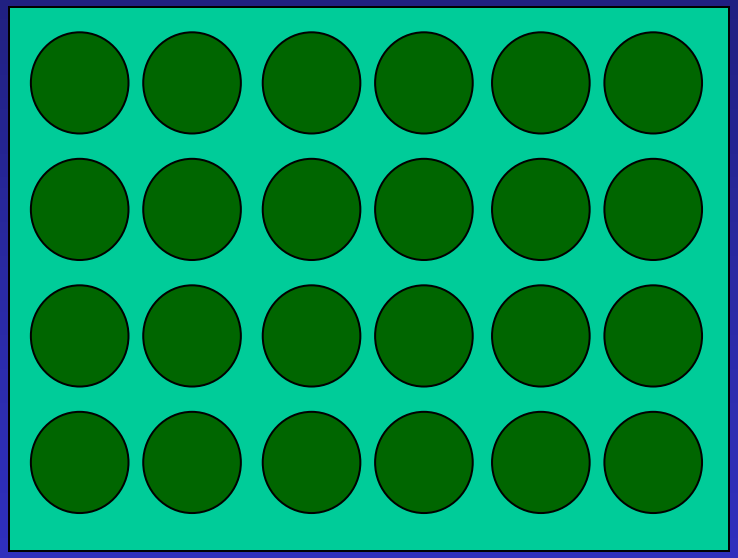
Maintaining even a few hardwoods in conifer-dominated forests can have significant influences on local biodiversity

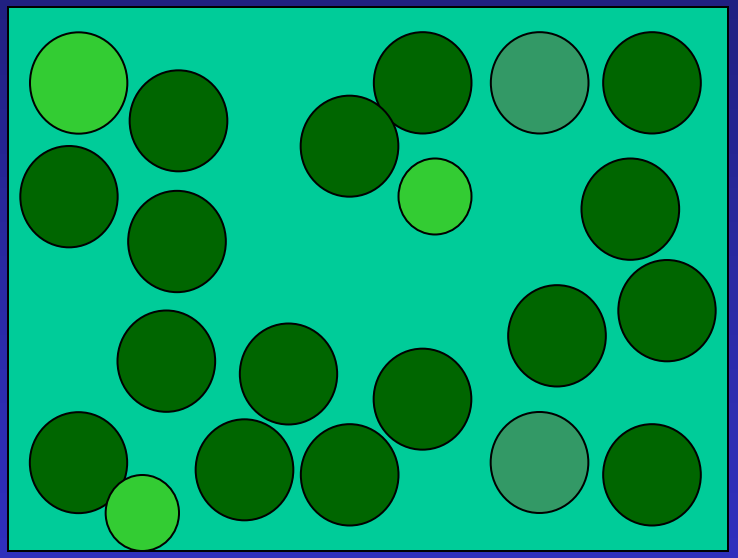
Number of Bird Species in Different Stand Types



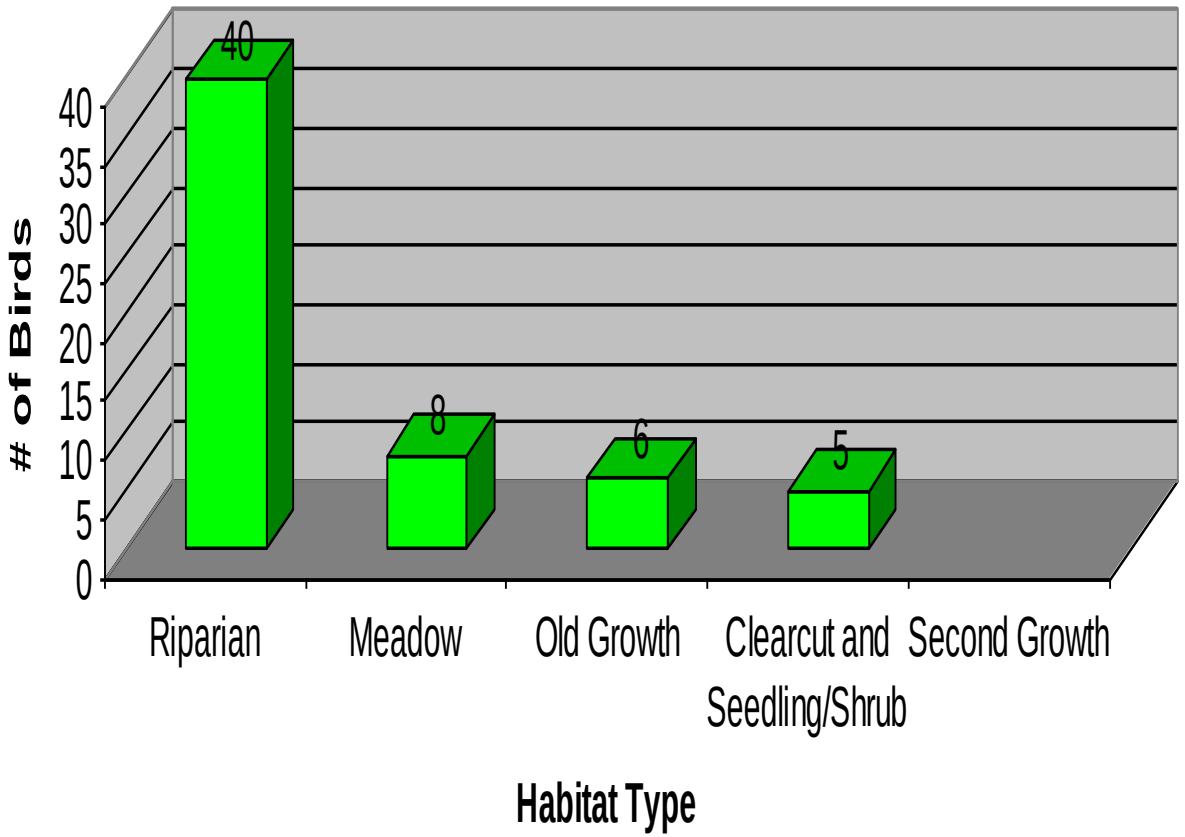
Percent of Birds Requiring Multiple Habitat Types



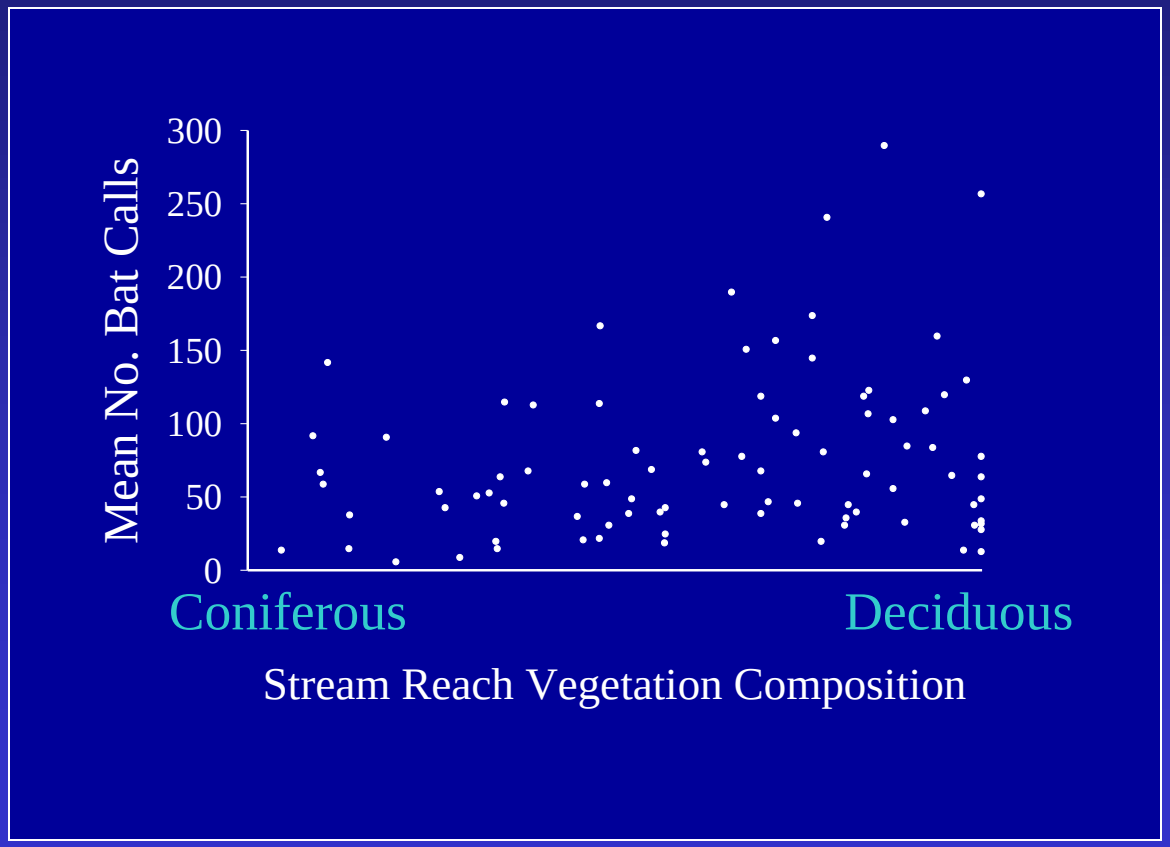




Number of Birds Requiring a Specific Habitat Type



Bat activity in relation to streamside vegetation composition



(Ober and Hayes, unpublished)

Habitat Structural Complexity

- Dead wood on the forest floor
- Standing dead wood
- Snags
- Rock outcroppings

Dead wood on the forest floor


Den sites


Protective cover
Foraging
Moisture


Protective cover
Foraging
Nest sites


Den sites
Foraging

Use of Logs in Coniferous Forests in Oregon

(Oregon Nongame Wildlife Mgmt Plan)

	Total Species	Using Logs #	Using Logs %
Herptiles	28	24	66
Birds	89	13	15
Mammals	63	44	70

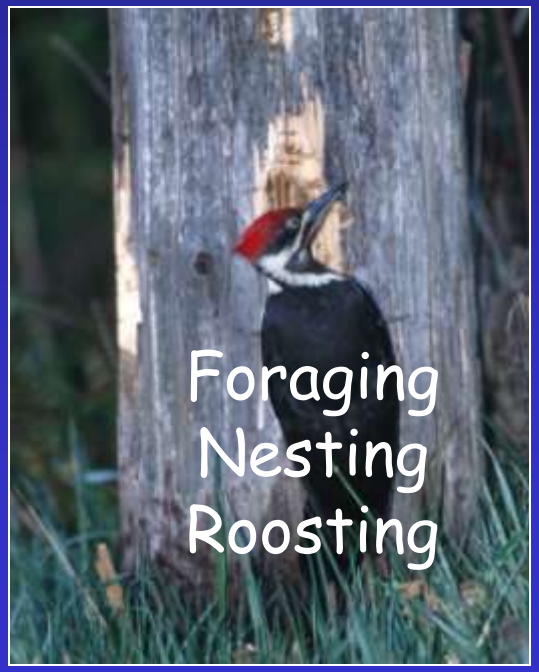
Leave cull and low value
logs in the stand for wildlife habitat

Snags and standing dead wood


Roosting


Den sites


Den sites


Foraging
Nesting
Roosting


Nesting

Use of Snags in Coniferous Forests in Oregon

(Oregon Nongame Wildlife Mgmt Plan)

	Total Species	Using Snags #	Using Snags %
Herptiles	28	undetermined	
Birds	89	33	37
Mammals	63	24	38

Habitat use by forest-dwelling vertebrates in British Columbia

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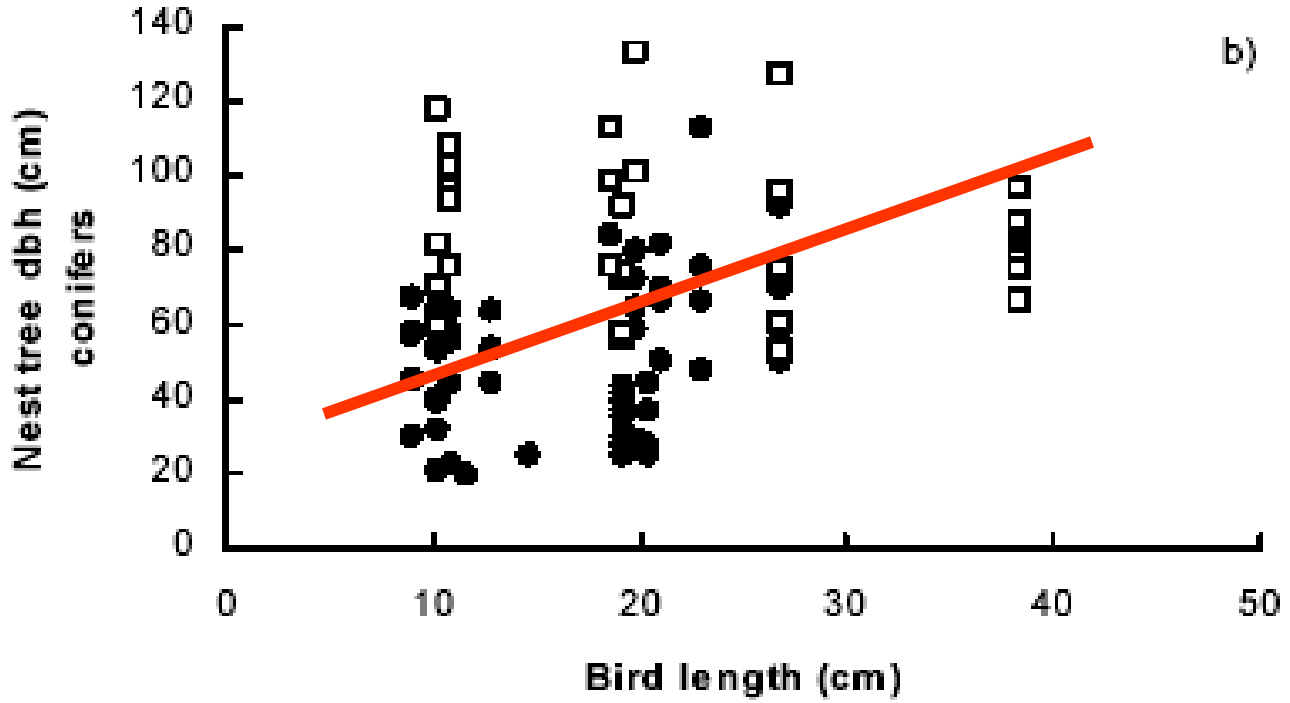
(from Bunnell et al. 1999 Environ. Rev. 7:97-146)

Interaction between forest condition and stage of decay

Forest condition	Tree decay stage		
	Live cavity tree	Hard snag	Soft snag
Young	House wren	American kestrel	Western bluebird
Mature	Red-breasted nuthatch	Red-bellied woodpecker	Red-breasted sapsucker
Old growth	Spotted owl	Pileated woodpecker	Northern flying squirrel

Size matters!

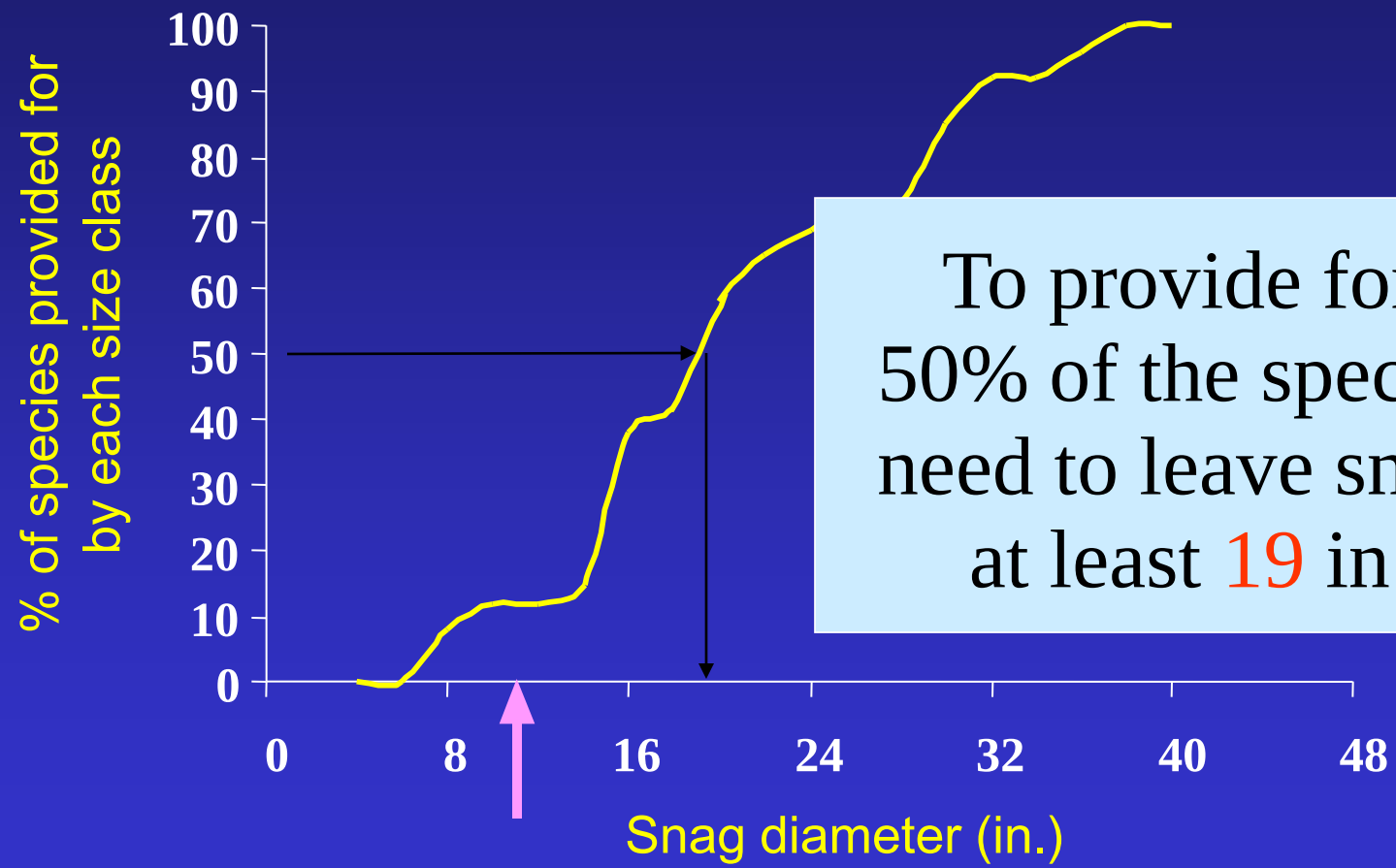


Relationship of size of bird and dbh of nest tree

from Boyland and Bunnell

www.forestry.ubc.ca/atlas-simfor/webdocs/extension/Vertebrates%20&%20Dead%20wood.pdf

Sizes of snags used by 26 species of wildlife in the Coast Range of Oregon (based on lowest mean recorded in any study)



To provide for 50% of the species, need to leave snags at least 19 in

(Prepared by Jennifer Weikel)

Section II

Differing levels of forest management for biomass and how it affects wildlife

Biomass Sources and Harvest Intensity options:

1. Urban/Industrial wood waste
2. Logging slash and by-products
3. By-products from forest thinning or restoration operations
4. Managing forests for biomass production

Wildlife issues with biomass harvest and managing forests for biomass production:

1. Slash
   a) Should it be removed?
   b) How its removed or reduced
2. Forest structural diversity
3. Effects on wildlife of increased harvest rates and decreased rotation time
4. Where do we go from here?

Leaving slash following harvest or thinning:

- Lower soil temperatures
- Decreased soil erosion
- Increase in soil moisture
- Possible protection of seedlings from depredation (ungulates)
- Encourages insects, mountain beaver, rabbits, microtines, herptiles, amphibians, mollusks, ground feeding and nesting birds

Leaving slash following harvest or thinning:

- Possible increase in fire danger
- Increased forest pests and disease
- Potential increase in seedling depredation, and therefore reduction in survival
- More difficult and costly to replant

Slash reduced by burning on site or removed for biomass production:

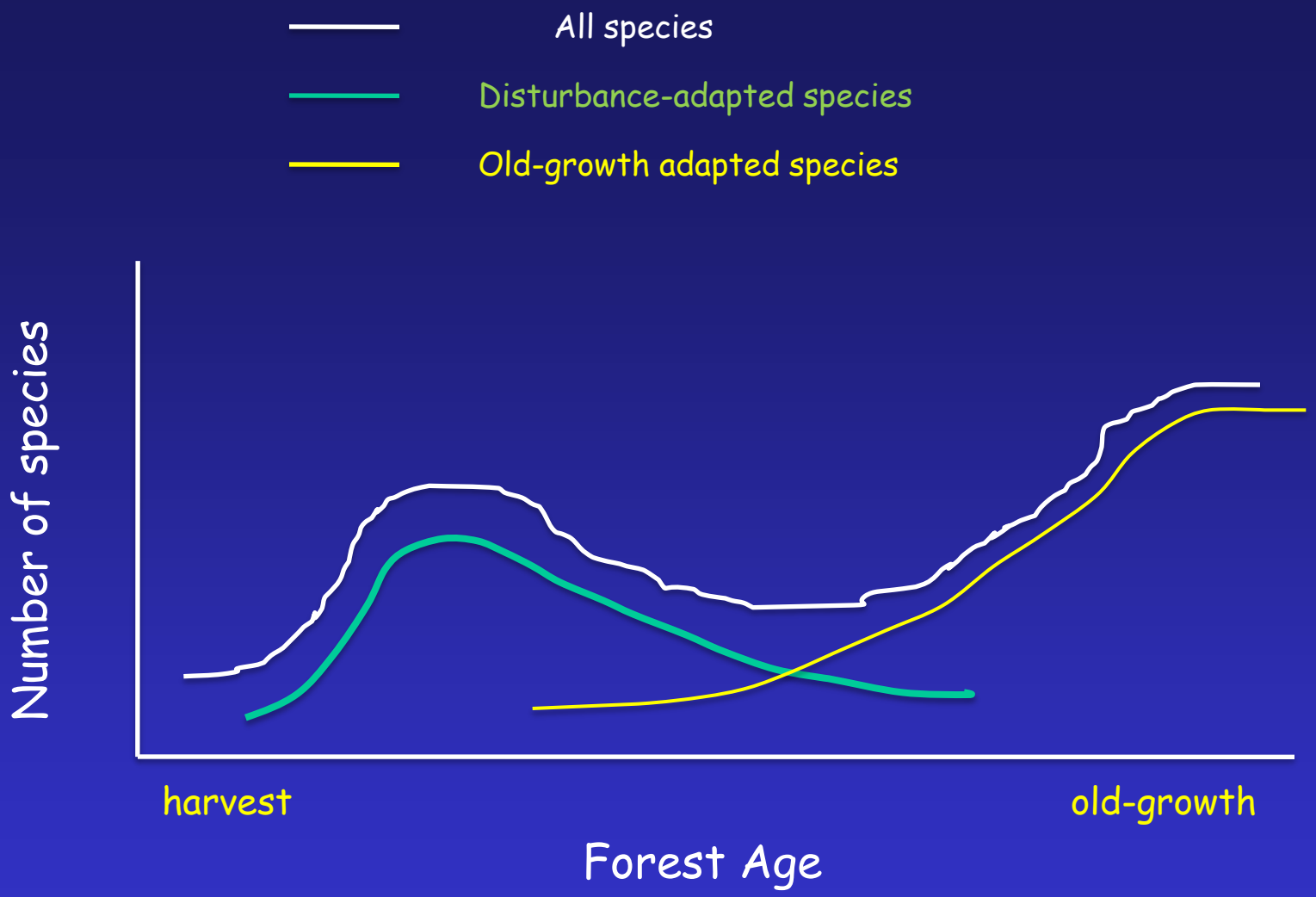
- Reduction in species mentioned previously
- Potential decreased seedling depredation (microtines)
- Better conditions for ground foraging (and nesting?) ungulates and birds
- Potential increased seedling growth (warmer soils)
- Reduction in greenhouse gas emissions with biomass

Thinning or restoration for biomass production

- Short-term reductions in species that depend upon shrubs for food or habitat
- Short-term increase in ground foraging species and those species that rely on sight distance for survival (ex. turkeys, quail, elk, deer)

Thinning or restoration for biomass production and forest structural diversity

- Short-term reductions in shrub-dependent species
- Increase in ground foraging species and those species that rely on sight distance for survival (ex. turkeys, quail, elk, deer)
- Long-term increase in habitat quality for most forest dwelling species (except those species that decrease with any kind of management eg. Pacific-slope flycatchers, giant salamanders)


All species
Disturbance-adapted species
Old-growth adapted species
Number of species
harvest
old-growth
Forest Age

Wildlife effects of forest management for biomass production:

- Reduction in old-growth adapted species needing large blocks of undisturbed forest (ex. some raptors, amphibians, carnivores, tree voles, marbled murrelets, Pacific-slope flycatchers)
- Increase in disturbance-adapted species (ex. black-tailed deer, most woodpeckers, flycatchers, warblers, rodents)

Where do we go from here?

We need to know:

1. How biomass retention and distribution in different habitats and in different climate zones influences fire susceptibility, intensity, and behavior

Where do we go from here?

We need to know:

2. How differing levels of biomass retention and distribution affect or determine wildlife species diversity and numbers

- Insects
- Amphibians
- Reptiles
- Microtines

Where do we go from here?

We need to know:

3. How biomass retention and distribution in different habitats and in different climate zones influences insect populations and the potential for insect damage to regenerating or surrounding forests

Where do we go from here?

We need to know:

4. How biomass removal affects long-term soil productivity and ways to maximize nitrogen retention with biomass removal (ex. needle fall)

Where do we go from here?

We need to know:

5. How biomass removal or retention affects tree seedling growth and survival

Bottom Line:

- Effect on wildlife of slash removal for biomass production is the same as logging (real question is whether or not to remove slash at all)
- Effect on wildlife of thinning or restoration can be mitigated by creation or preservation of forest structural diversity
- Effects on wildlife of forest management for biomass depends on intensity, but could reduce species that are shaping our current approaches to sustainable forest management

I am not advocating stopping biomass removal while these questions are being answered, but instead see our lack of understanding of the effects of biomass removal on wildlife populations as an opportunity to imbed research projects that answer these questions into biomass removal operations.

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