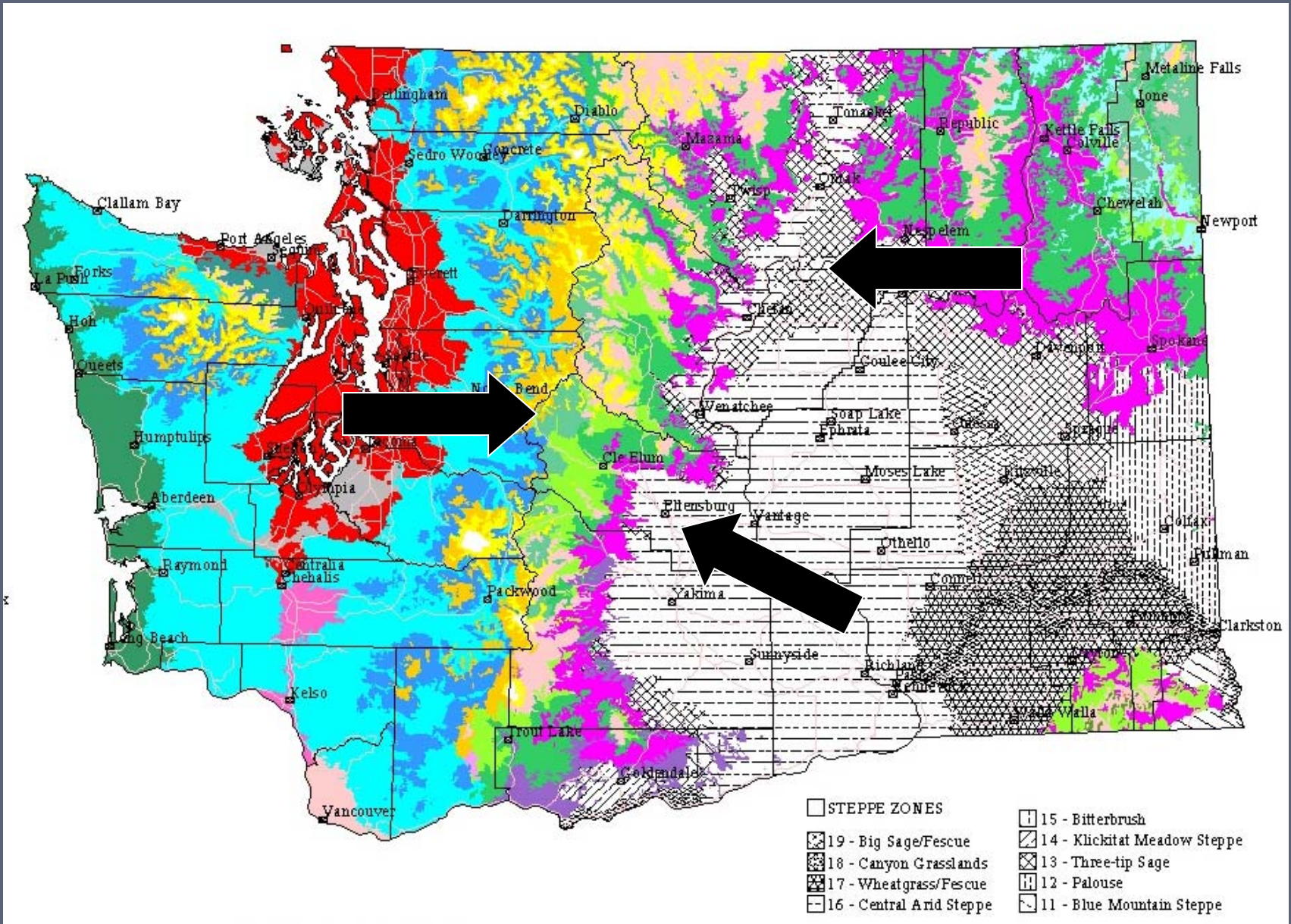


# MANAGING PNW WILDLIFE HABITAT UNDER CLIMATE CHANGE

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Wenatchee, WA  
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# Vegetation complex....

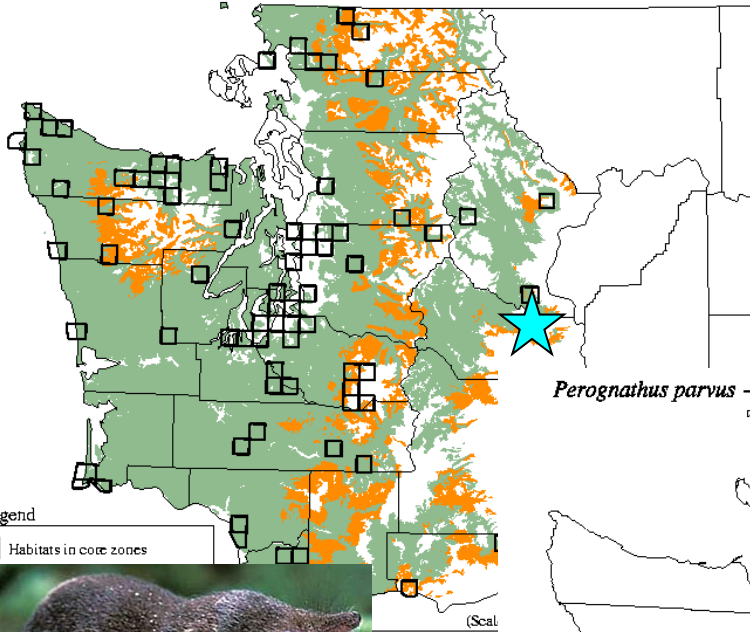


# Biogeography complex....



*Tamias amoenus* - Yellow-pine Chipmunk

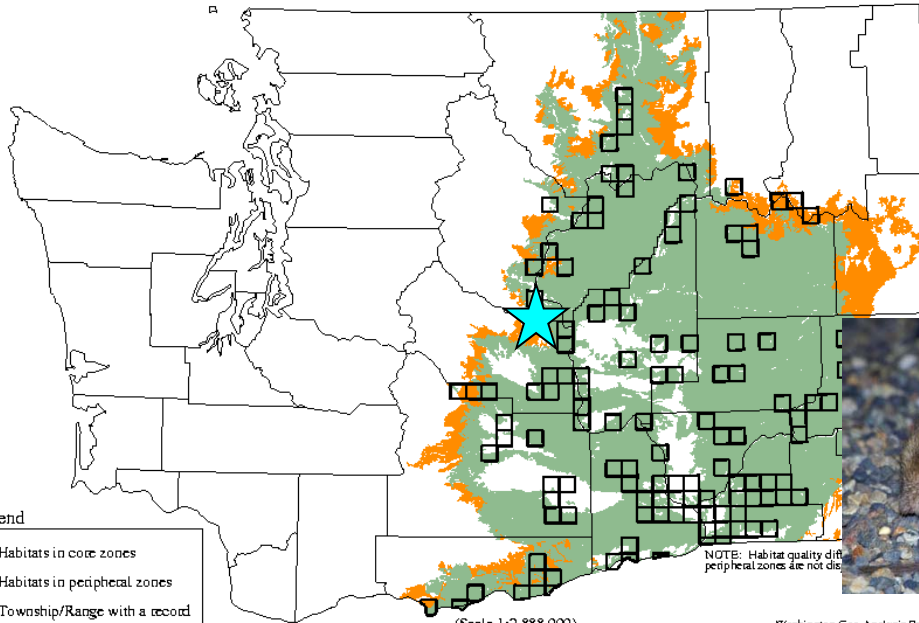
*Sorex trowbridgii* - Trowbridge's Shrew



Legend  
 ■ Habitats in core zones

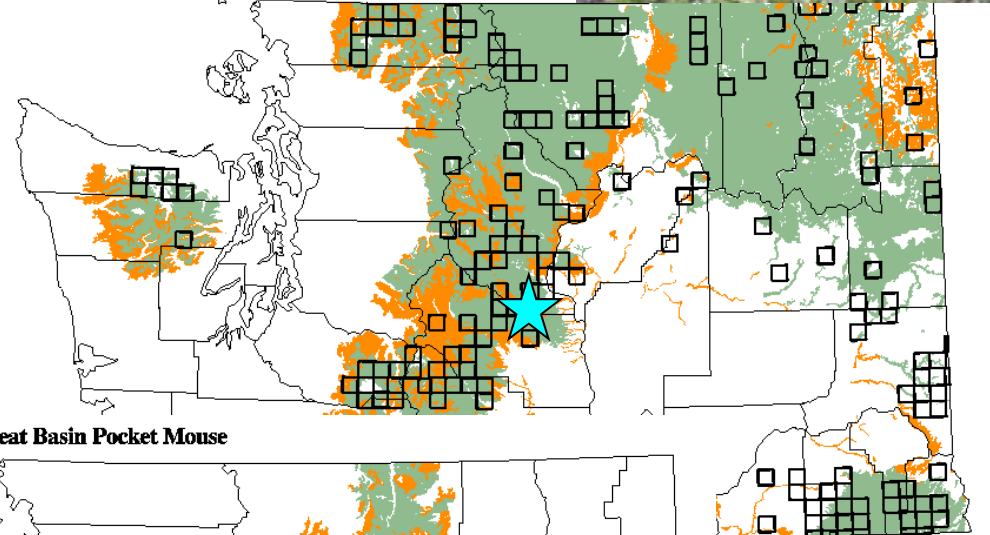
(Scale)

*Perognathus parvus* - Great Basin Pocket Mouse



Legend  
 ■ Habitats in core zones  
 ■ Habitats in peripheral zones  
 □ Township/Range with a record

(Scale 1:2,888,000)



NOTE: Habitat quality differences within core and peripheral zones are not displayed.

Washington Gap Analysis Project 1997

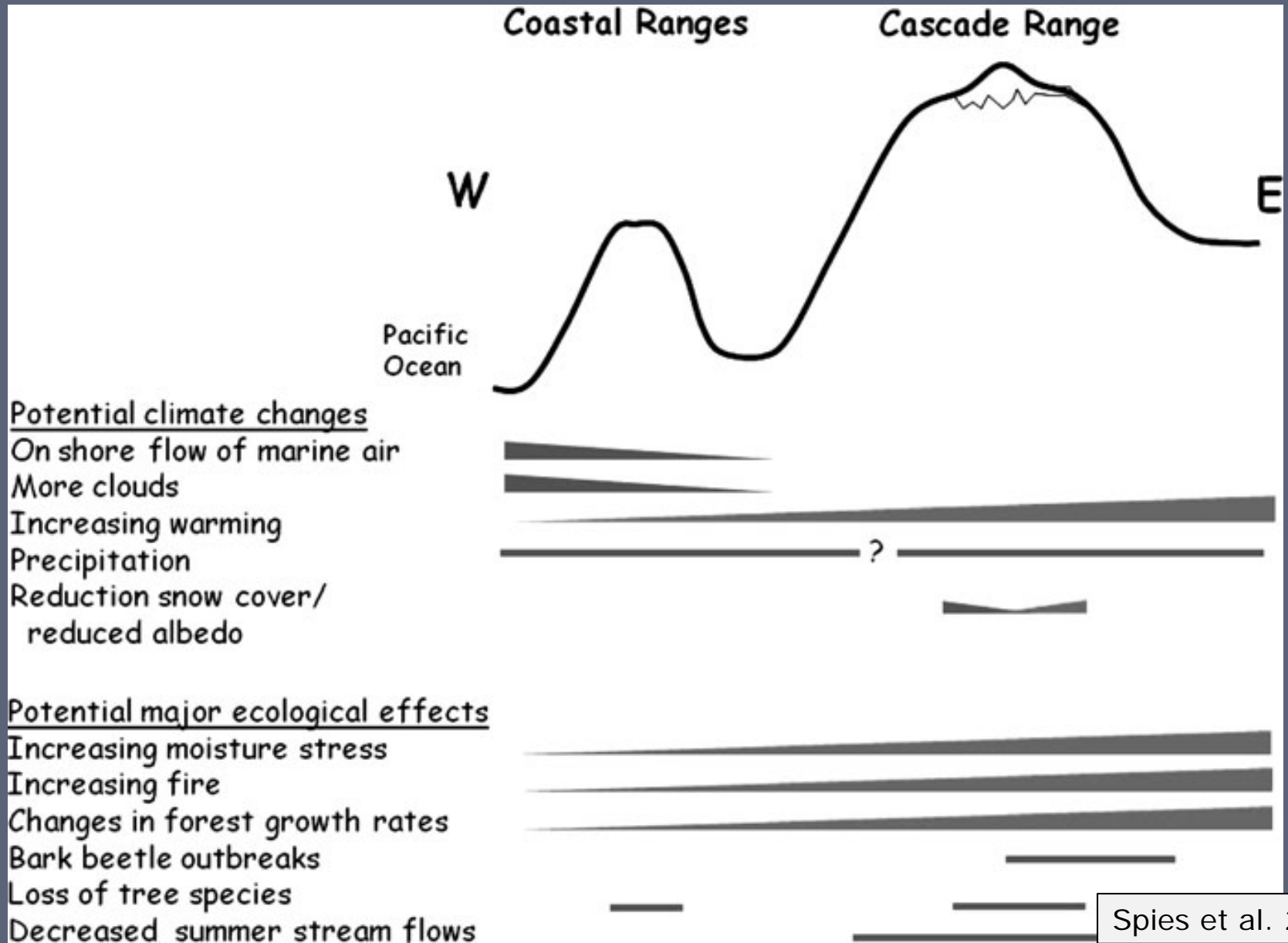


NOTE: Habitat quality differences within core and peripheral zones are not displayed.

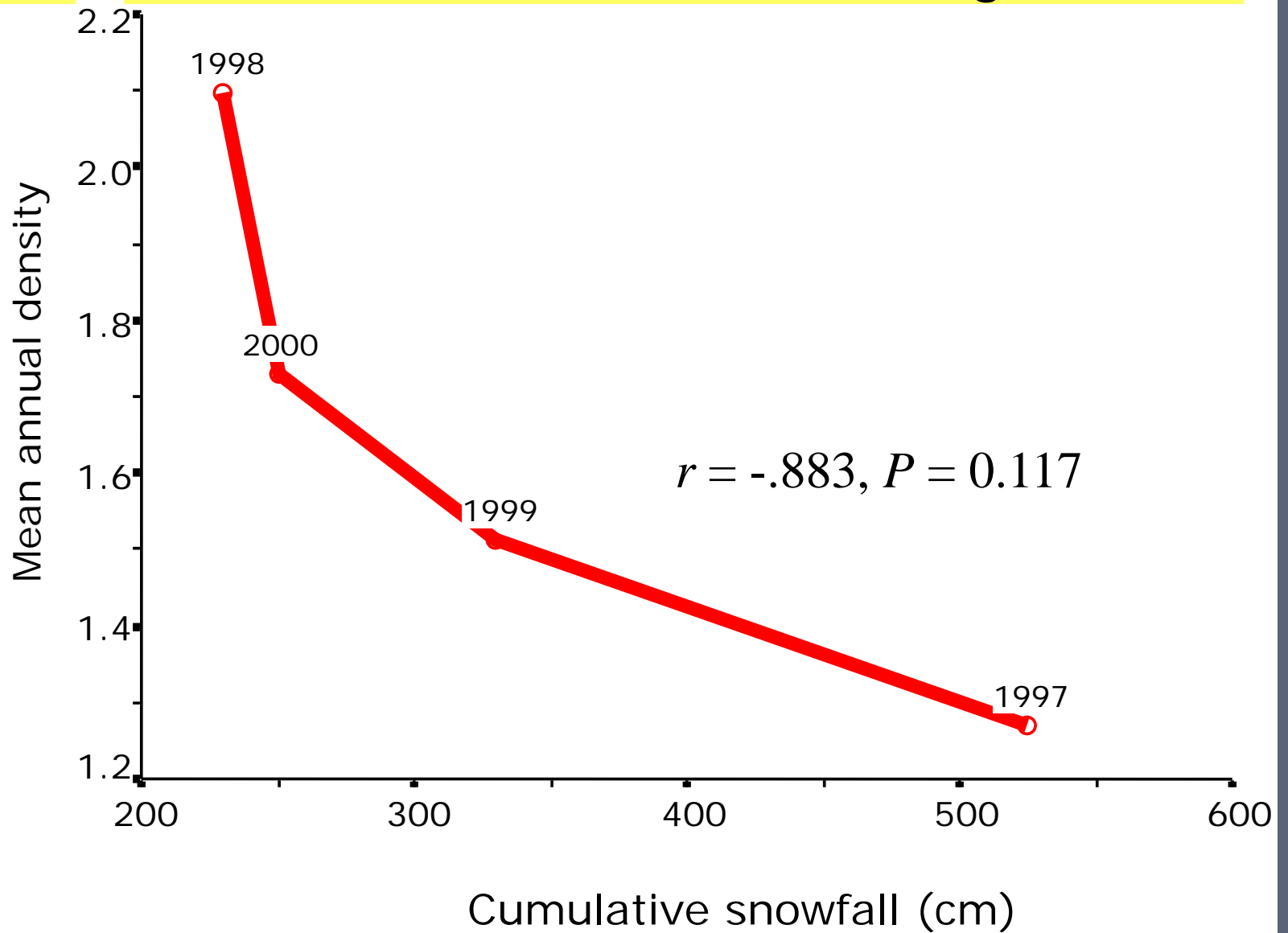
Washington Gap Analysis Project 1997



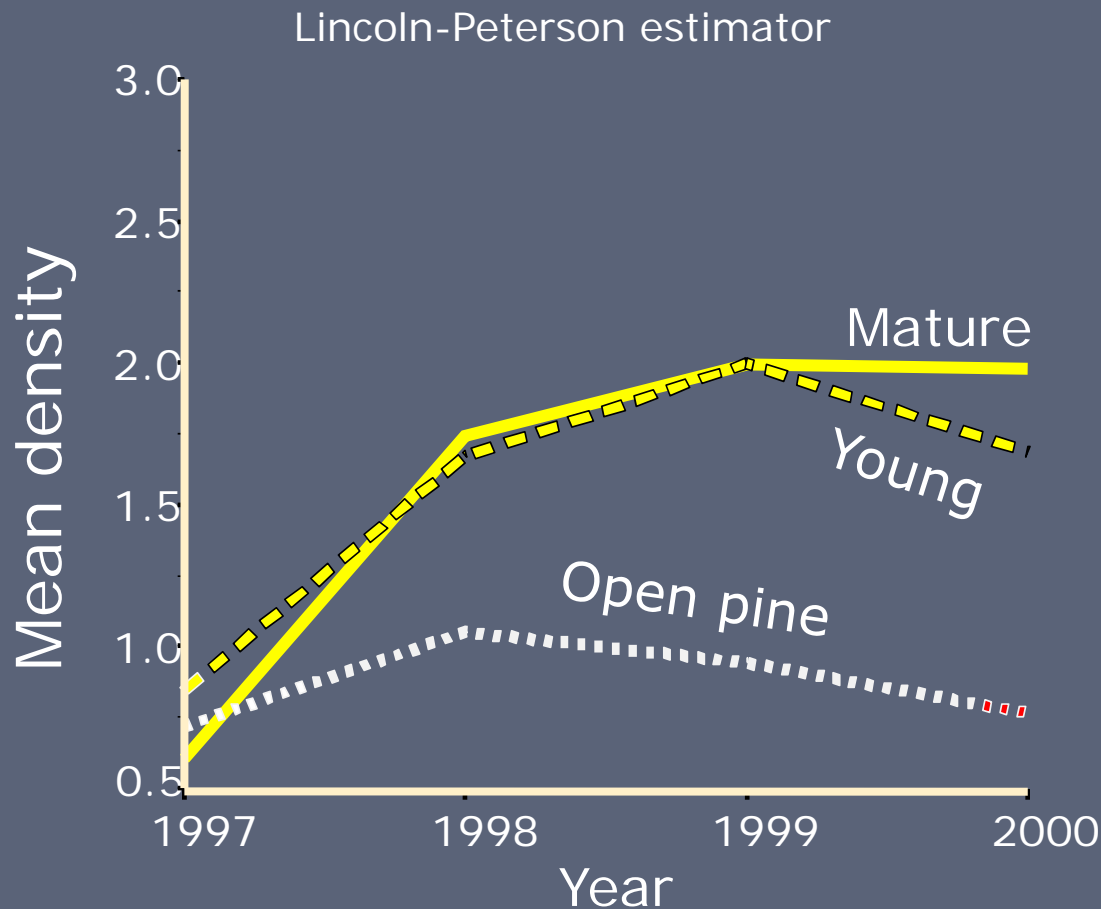
# CC effects vary across the region



# Density of arboreal rodents declines with increasing snowfall

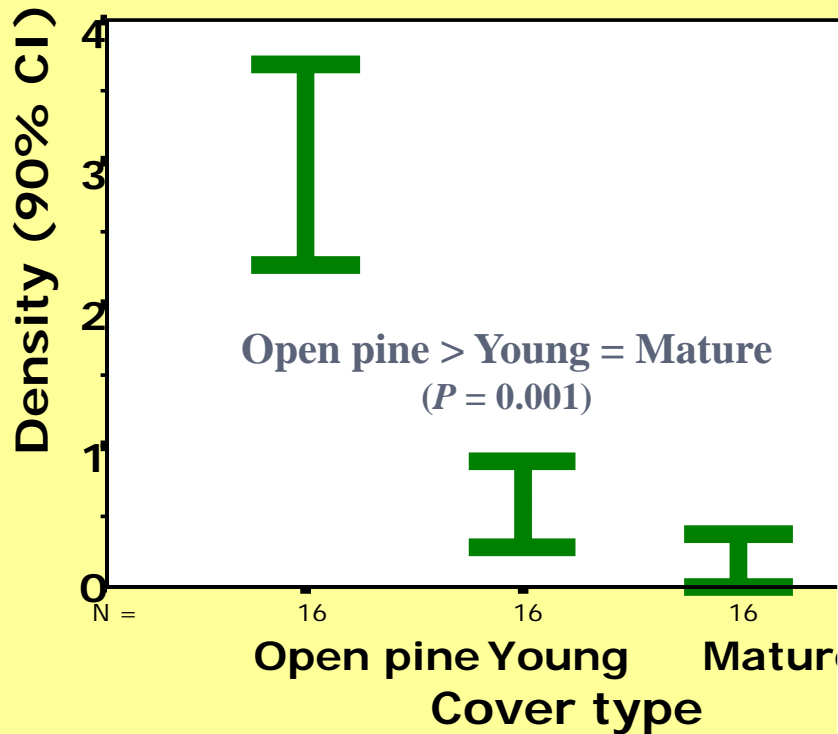


# Flying squirrel density

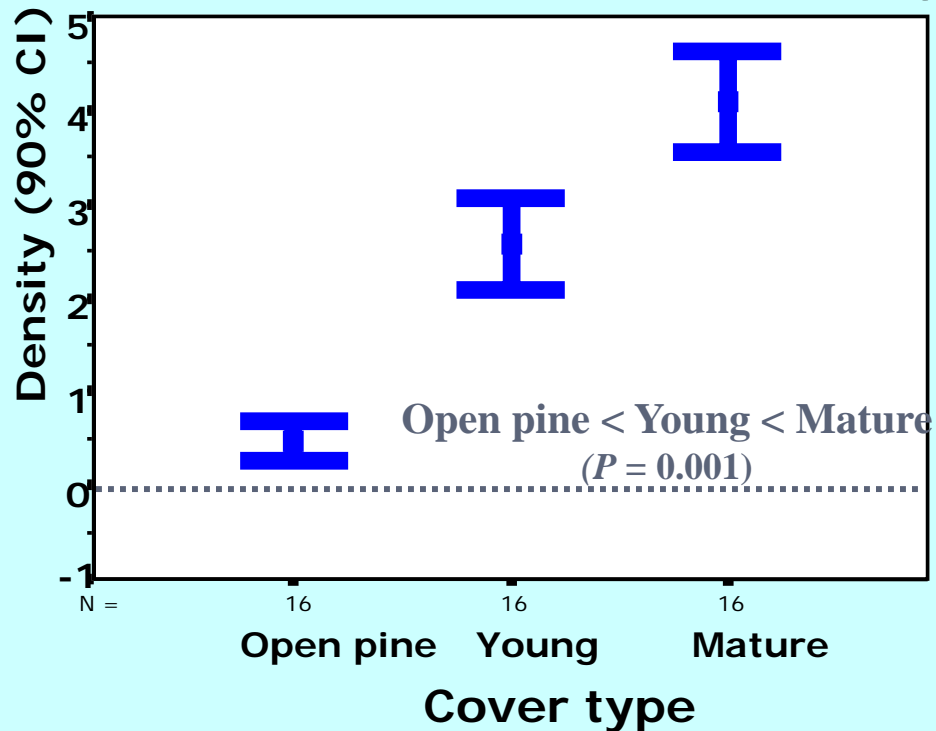


Open pine forest is *poorer* habitat than either young or mature mixed-conifer forest consistently over time.

# Yellow-pine chipmunk density



# Townsend's chipmunk density



# Species shifts along moisture-temp gradient.



*Great Basin pocket mouse*

Species	Mesic stands						Dry stands								
southern red-backed vole	1														
long-tailed vole				1											
montane shrew	1	1		1											
Townsend's chipmunk	1	1													
creeping vole	1	1	1	1	1	1									
American shrew-mole		1		1		1									
deer mouse <span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span>	3	3	3	3	2	2	1	1	1	1	2	1			
Trowbridge's shrew	1	2	2	1	1	1		2							
northern pocket gopher	1			1	1	1	1								
Great Basin pocket mouse						1		1	1		1	1			
vagrant shrew			1	1			1	1			1				
yellow-pine chipmunk <span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span>	1	1	1	1	1	1	1	1	2	2	2	1			

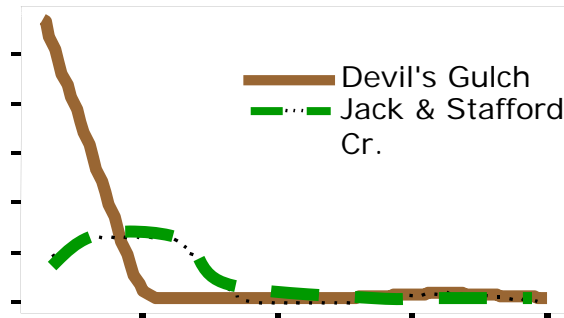


# Riparian "indicator" species

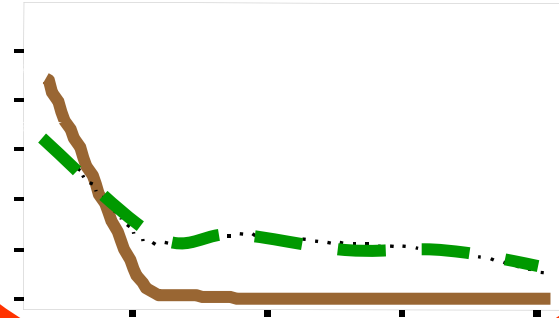


*Water shrew*

### Water shrew



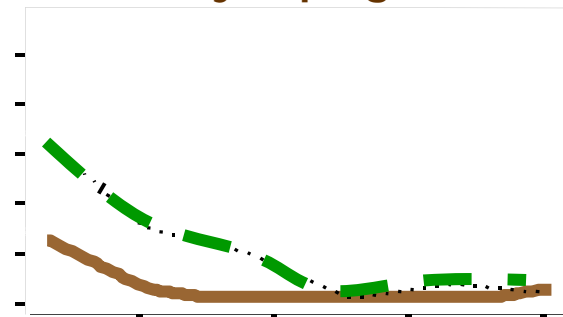
### Keen's mouse



### Long-tailed vole



### Western jumping mouse



# *Good news!*

- ▣ Current sound basis in policy & management for addressing CC issues.
  - Maintain critical habitats & species.
  - Restore or mitigate impacts of past management.
  - Restore or mitigate critical processes (e.g. fire & insect disturbance).

# Time frames

- ▣ **Short-term** → carry on with maintenance & restoration of habitats w/ focus on resistance & resilience!

*At the same time plan for the....*

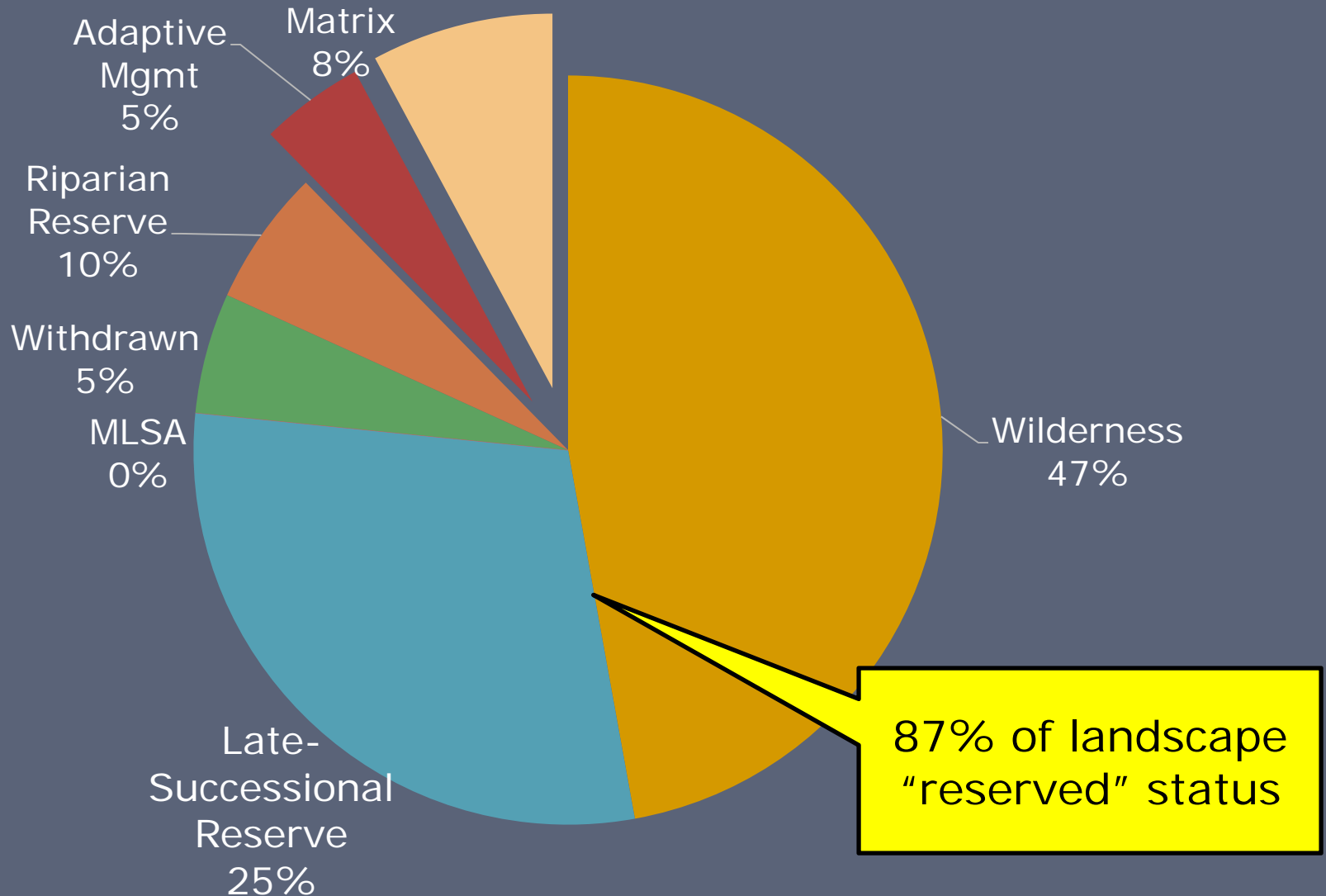
- ▣ **Long-term** → enable change with innovative management.

# Location, location, location...

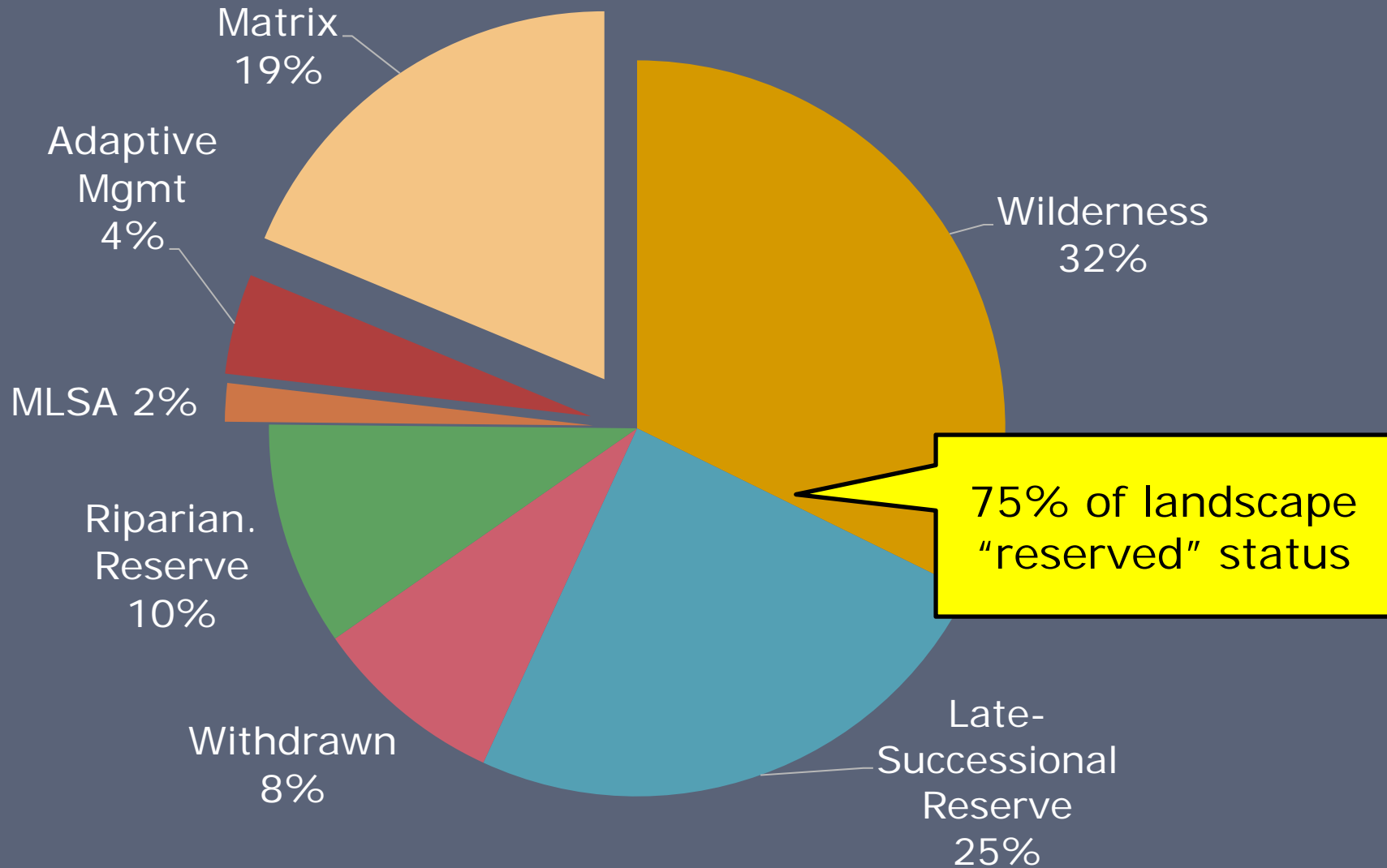
- ▣ **Environment** → West vs. East side
  - vegetation (pattern)
  - disturbance (process)
- ▣ **Allocations:** reserves vs. matrix

	<b>Reserves</b>	<b>Matrix</b>
Westside	Resistance	Enable
Eastside	Resistance, resilience, enable	Resistance, resilience, enable

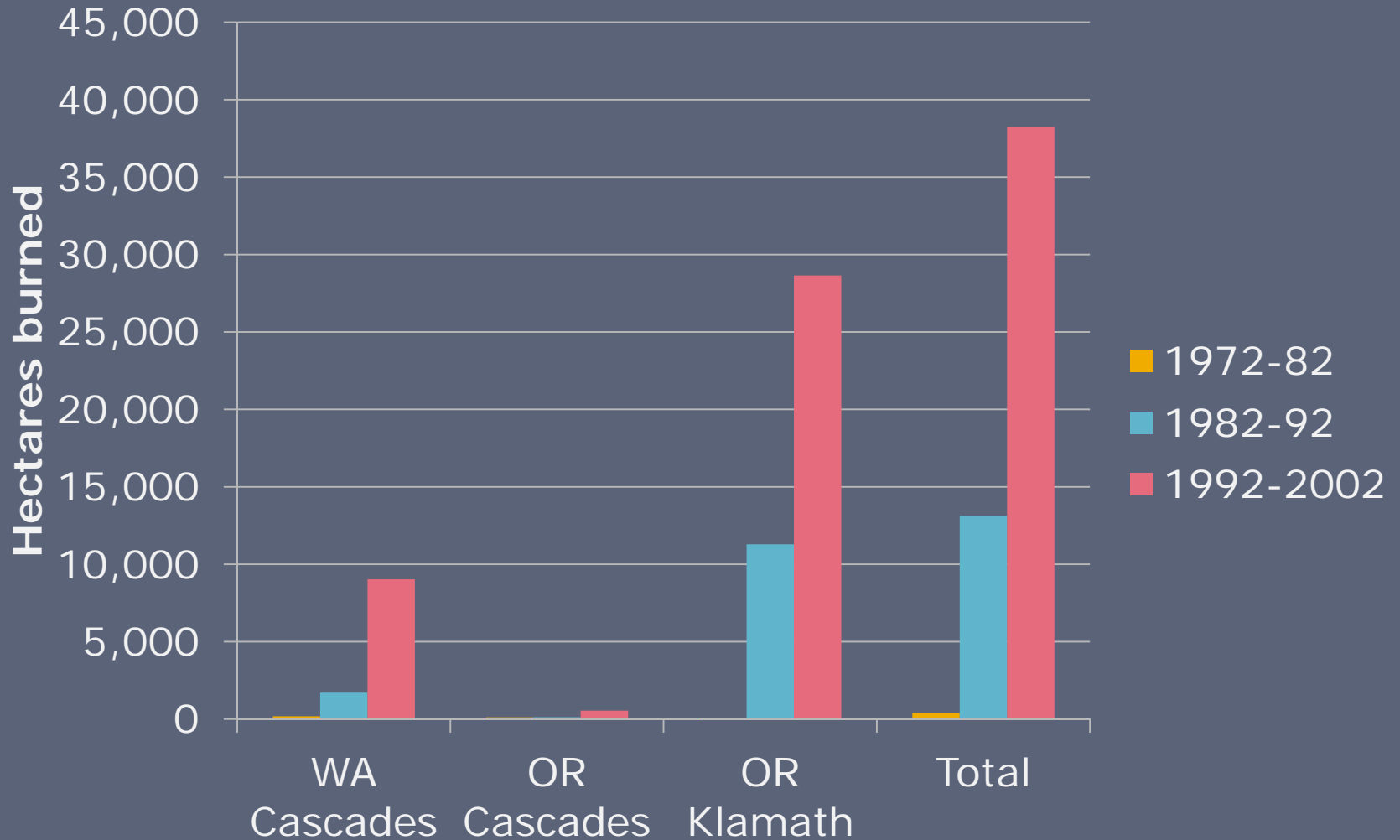
# Northwest Forest Plan allocations western Cascades



# Northwest Forest Plan allocations eastern Cascades

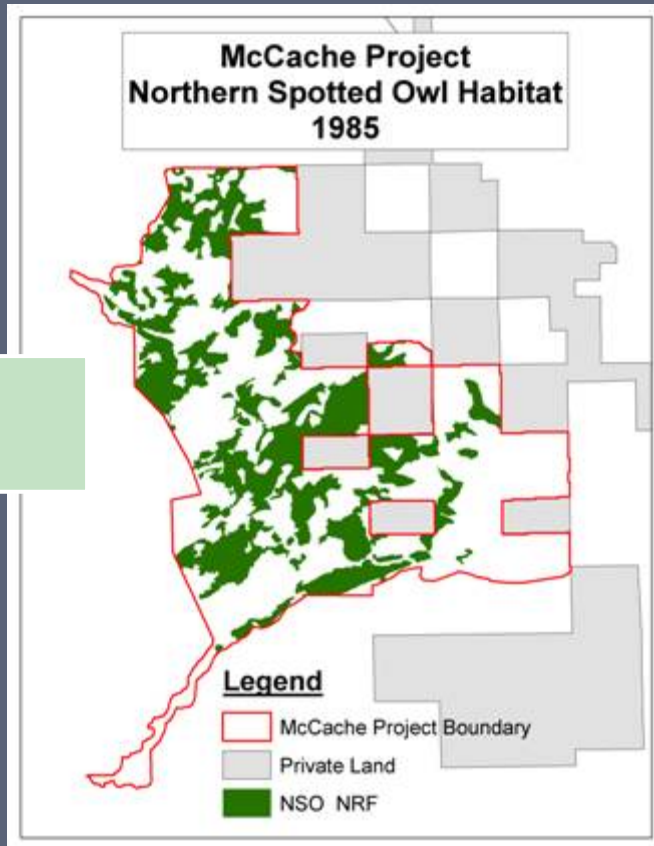


# Area stand-replacement fire in dry forest provinces, 1972-2002 (Healey et al. 2008)

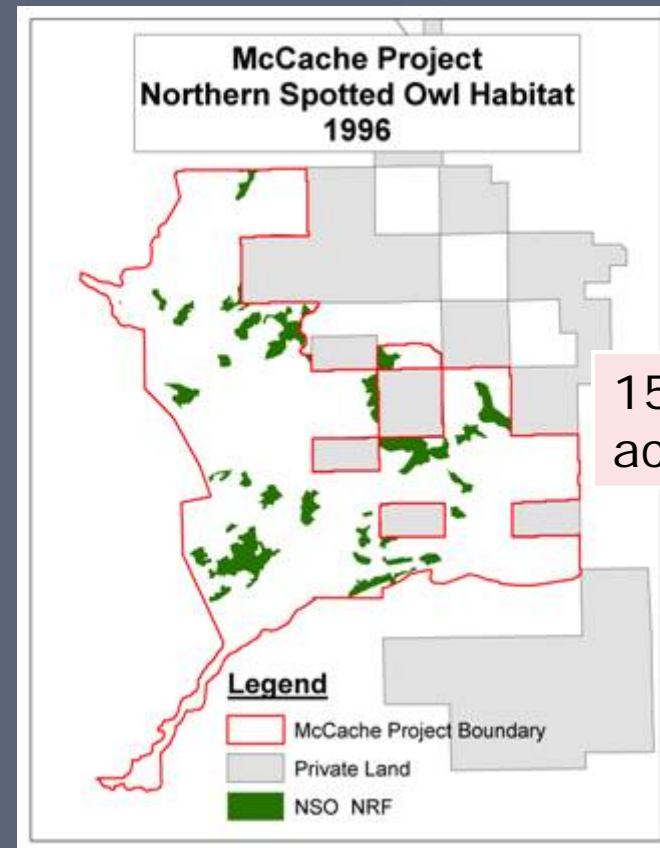


# Deschutes NF: 72% loss habitat due to *insect & disease* in McCaCache Project Area

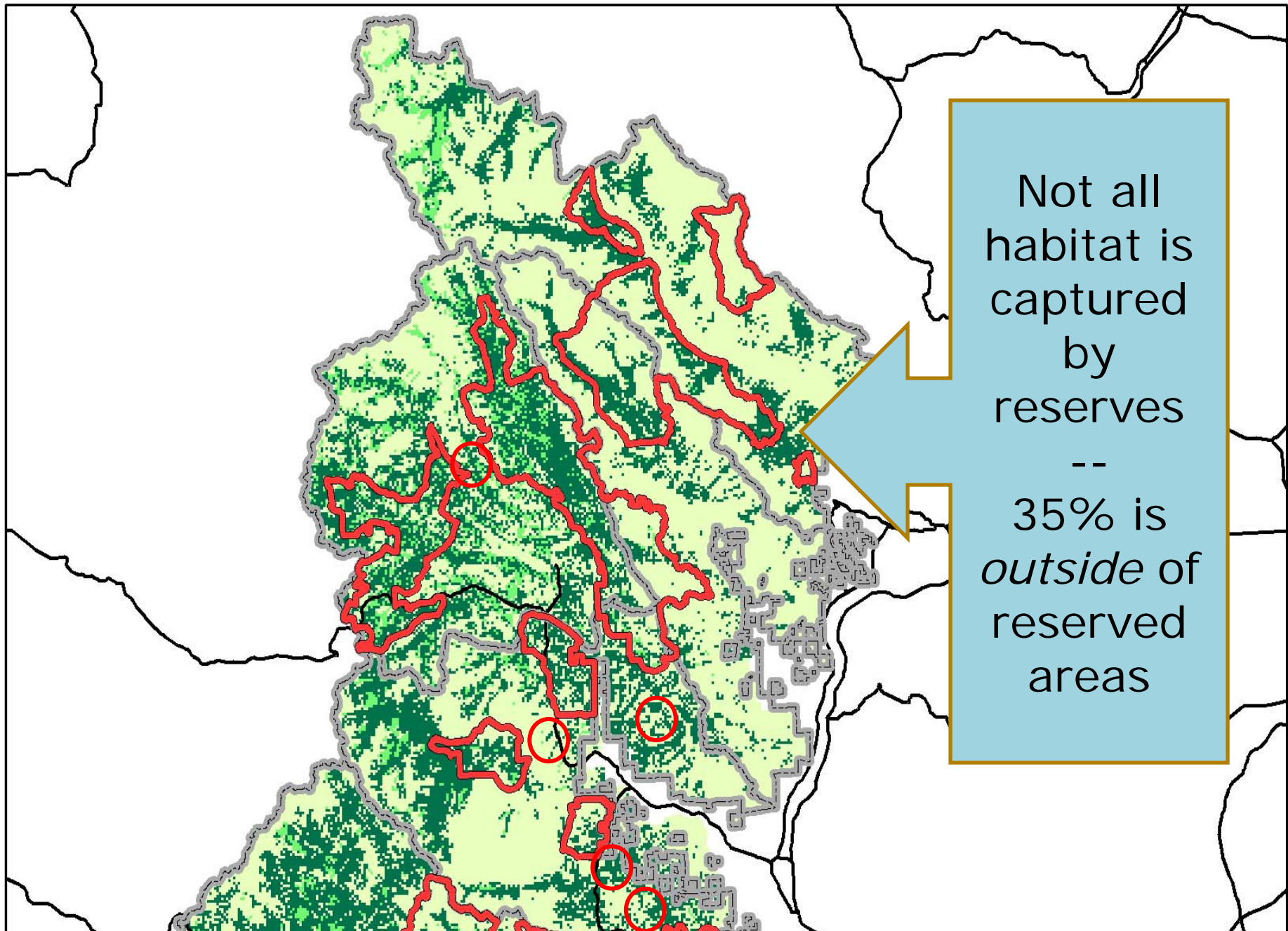
1985



1996







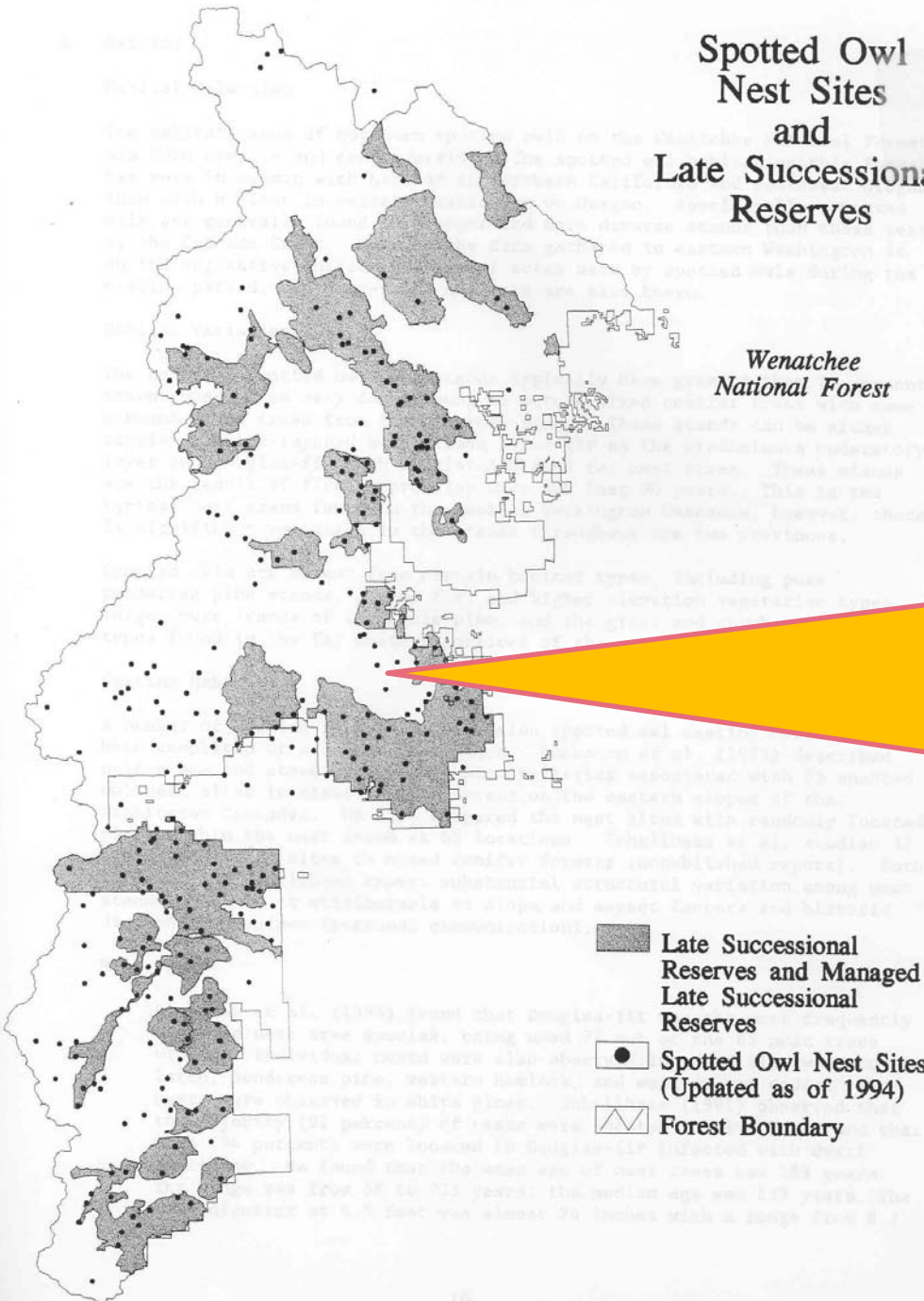
Not all  
habitat is  
captured  
by  
reserves

--

35% is  
*outside* of  
reserved  
areas

# Spotted Owl Nest Sites and Late Successional Reserves

Wenatchee  
National Forest



Not all historical  
owl activity  
centers captured  
by reserves

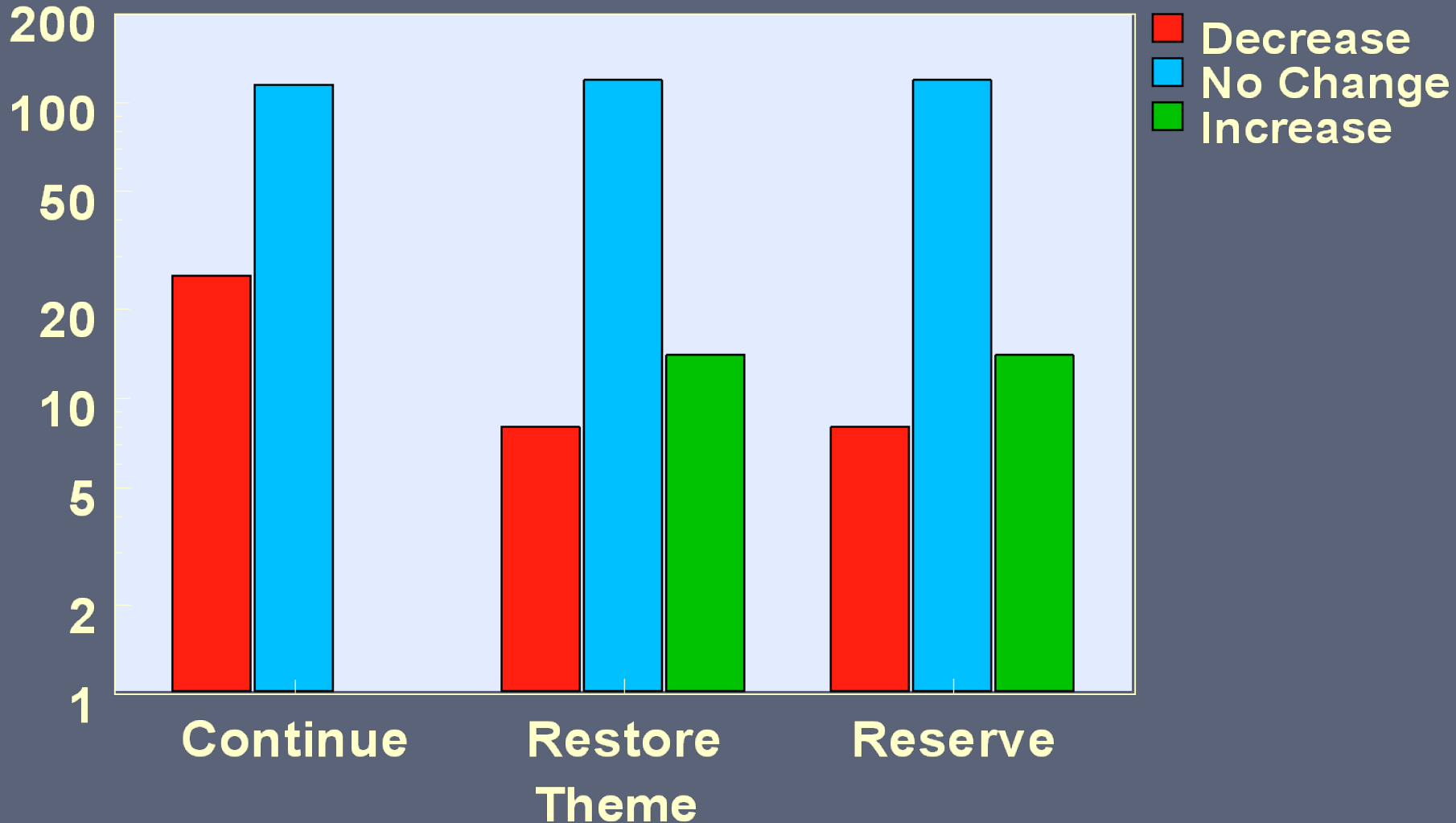
—

25% are  
*outside* reserved  
areas

# Reserves vs. Active Management?

ICBEMP, 1994

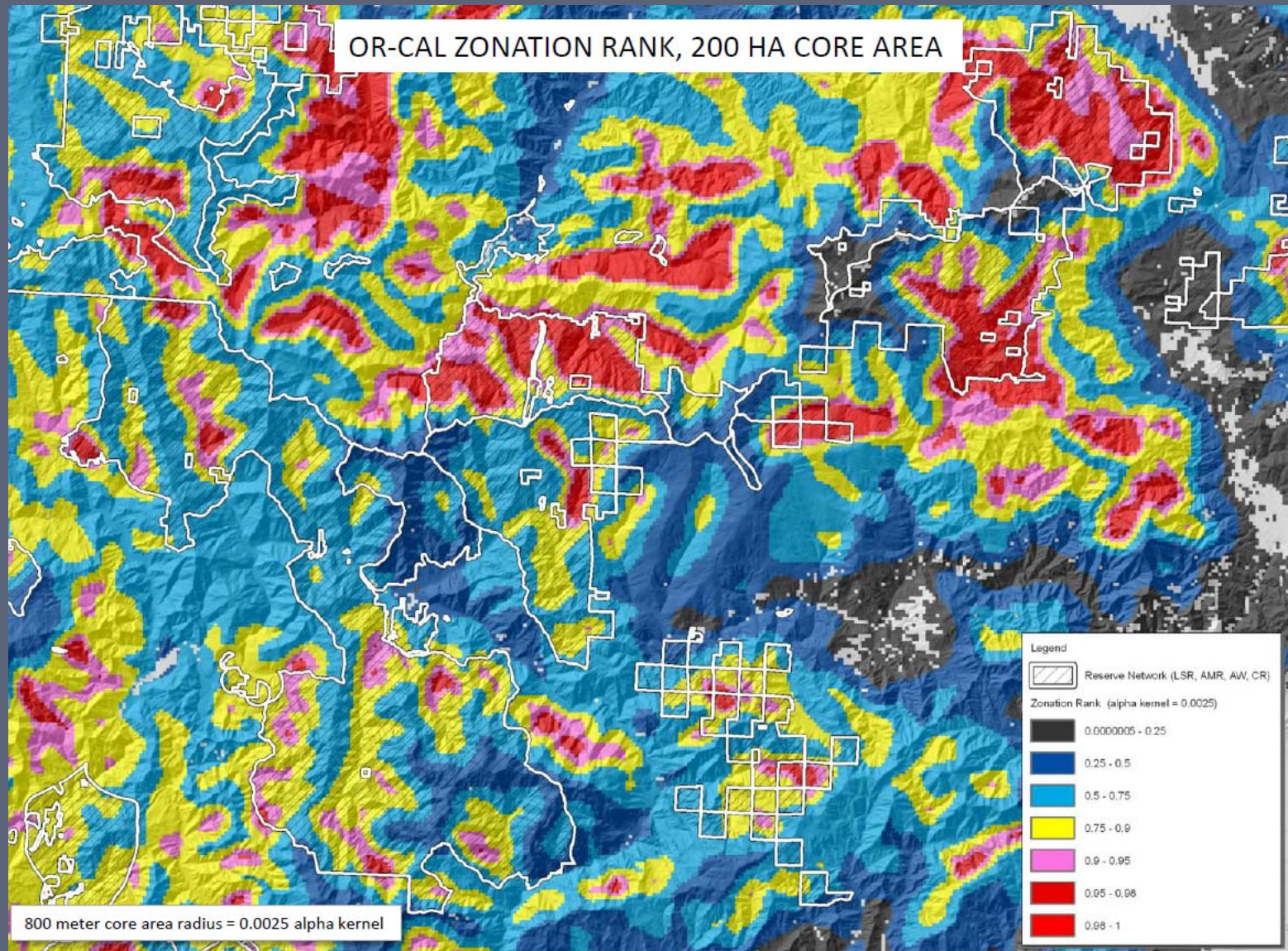
Number of Species



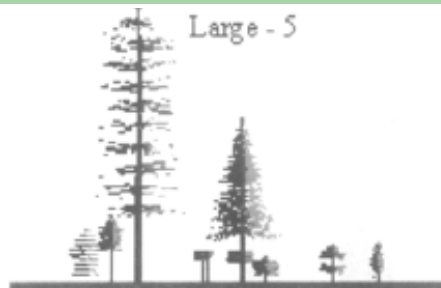
# Coarse-filter management

- ▣ Maintain or restore vegetation pattern & disturbance processes for wildlife communities.
- ▣ Management that emulates disturbance regimes should be a good *coarse-filter* approach to management.

# Landscape-silviculture...



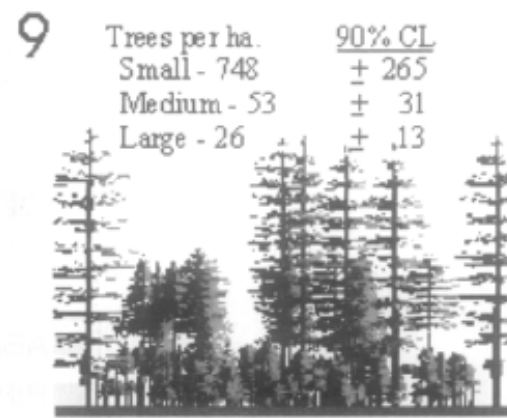
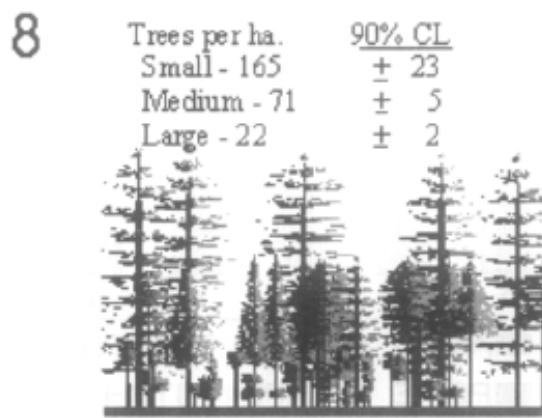
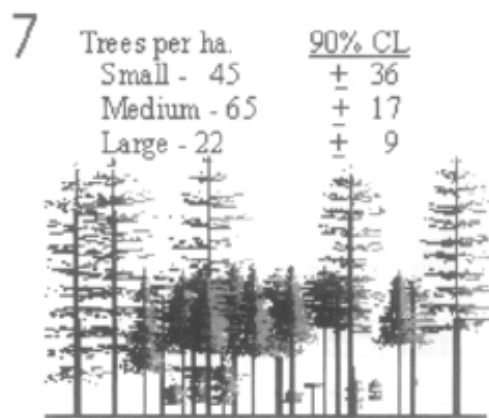
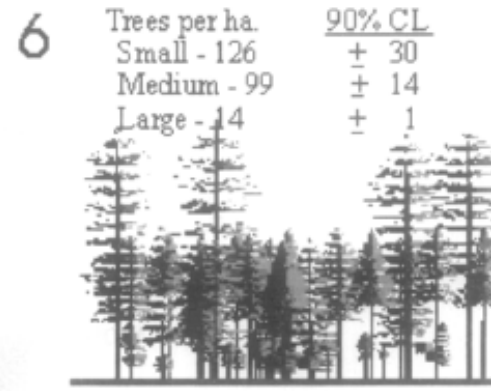
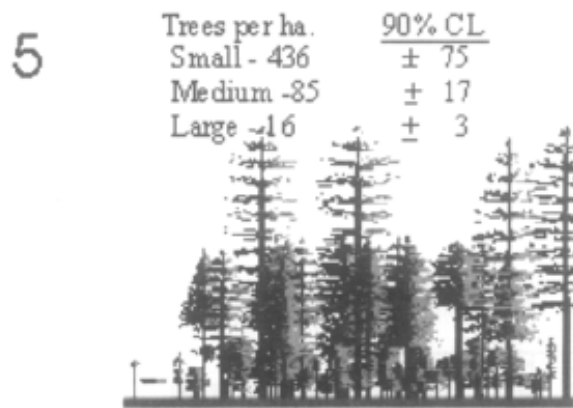
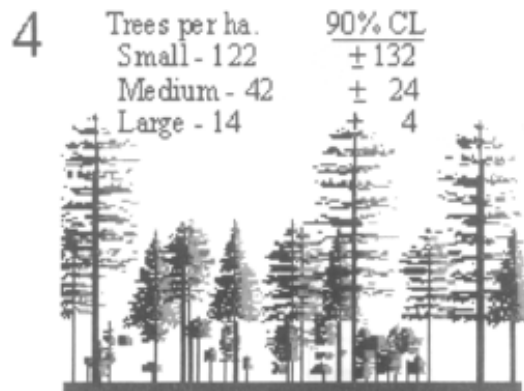
# Stand-scale silviculture



Large - 5



Large - 5



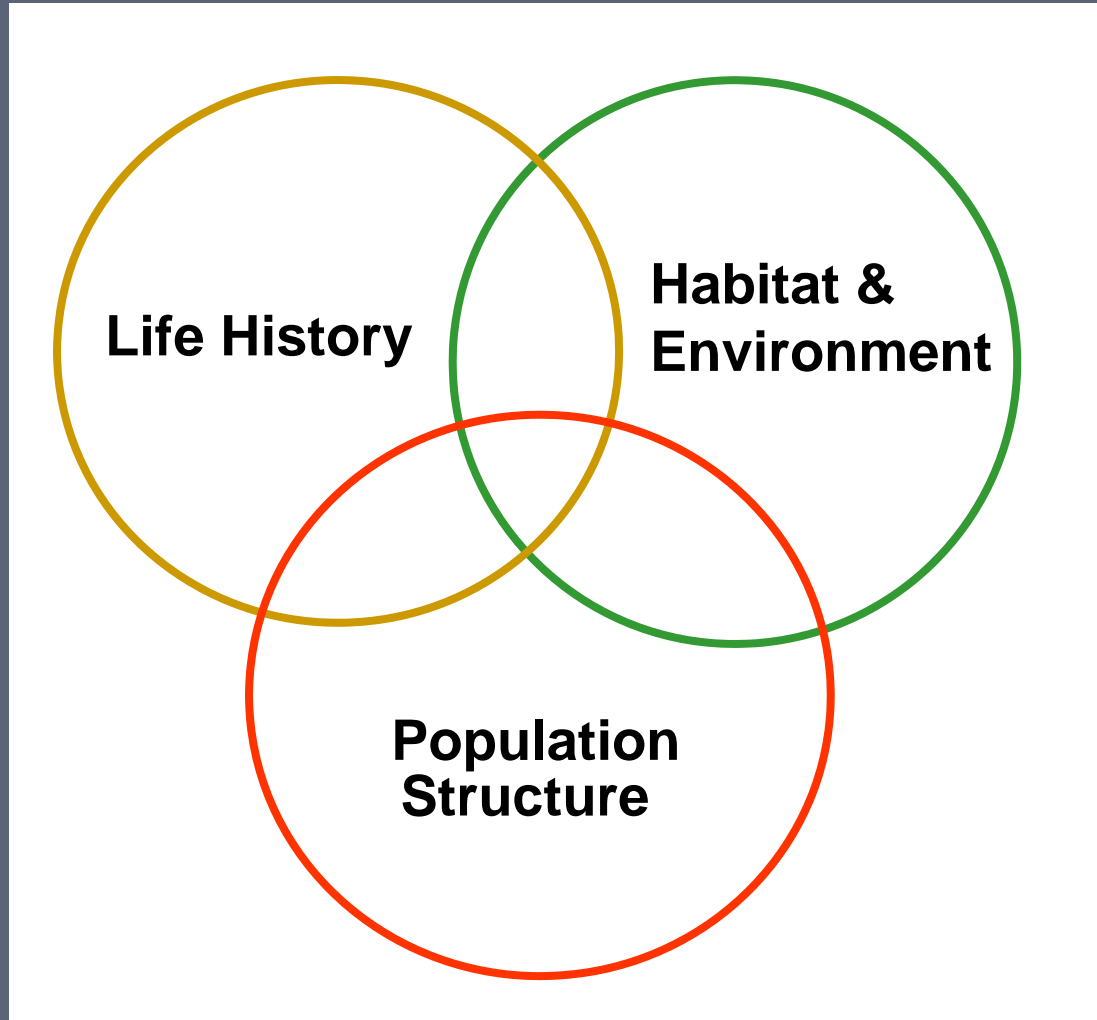
90% CL  
 $\pm 98$   
 $\pm 25$   
 $\pm 2$

3  
 Trees per ha.  
 Small - 276  $\pm 62$   
 Medium - 101  $\pm 13$   
 Large - 7  $\pm 1$

# Wildlife/ecological elements to maintain & restore, resilience, enable..

- ▣ **Heterogeneity:** skips & gaps, clustering, etc.
  - Canopy & understory diversity, esp. shrubs.
  - Fire effects.
  - *Prescribe for variability, not averages.*
- ▣ **Large live & dead trees.** More large trees in diameter distribution.
- ▣ **Defective trees**...pattern & process!
  - Insects & disease
  - Mistletoe
- ▣ **Large logs, woody debris.**

# Fine-filter species PVA approach...





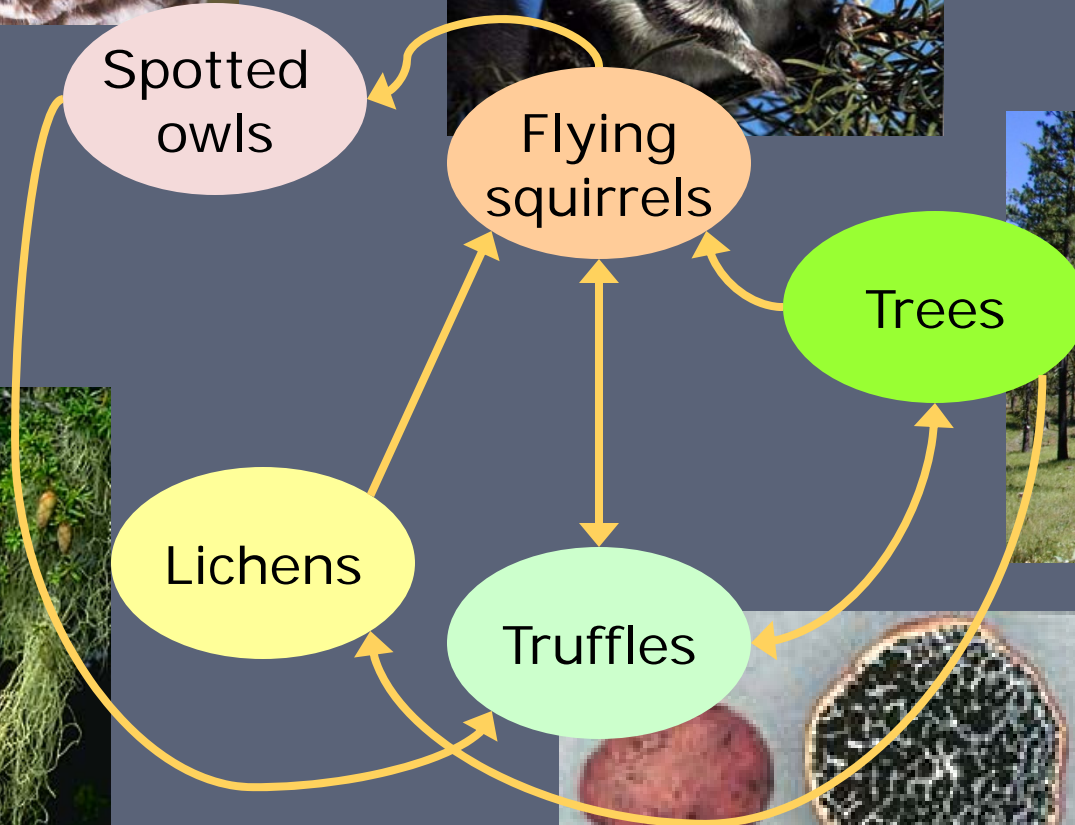
# *Fine-filter* mgmt. Eastside wildlife of concern...

- ▣ “Source habitats” analysis of Wisdom et al. (2000) a good guide. Two species “families” of concern:
  - **Low-elevation old-forest spp.** (5 spp): low-severity fire forest type.
  - **Broad elevation old-forest spp.** (24 spp):
    - mixed-severity fire forest types.

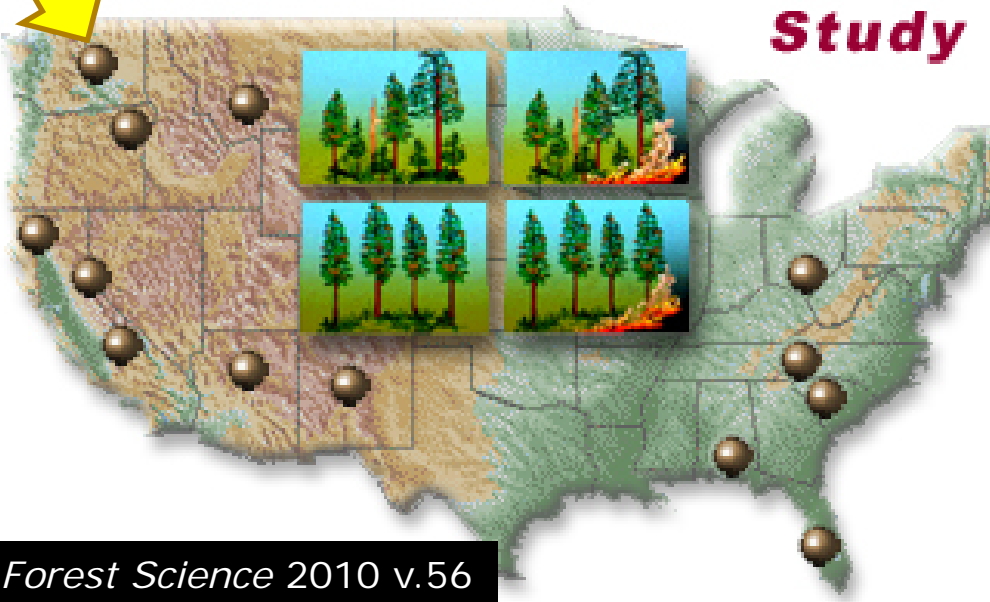
# Develop & *test* novel prescriptions to meet ecological & social objectives...



# Spotted Owl Ecological Web

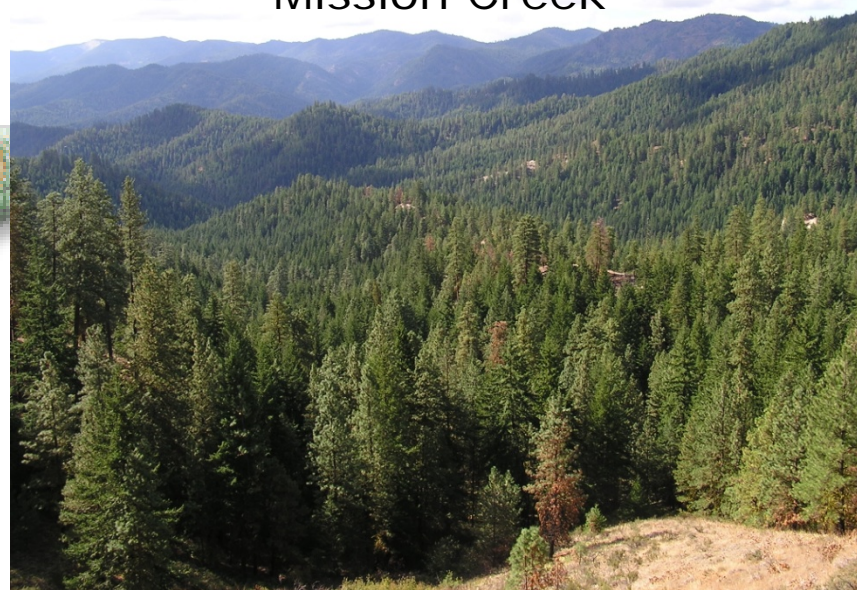


# Fire and Fire Surrogate Study



Forest Science 2010 v.56

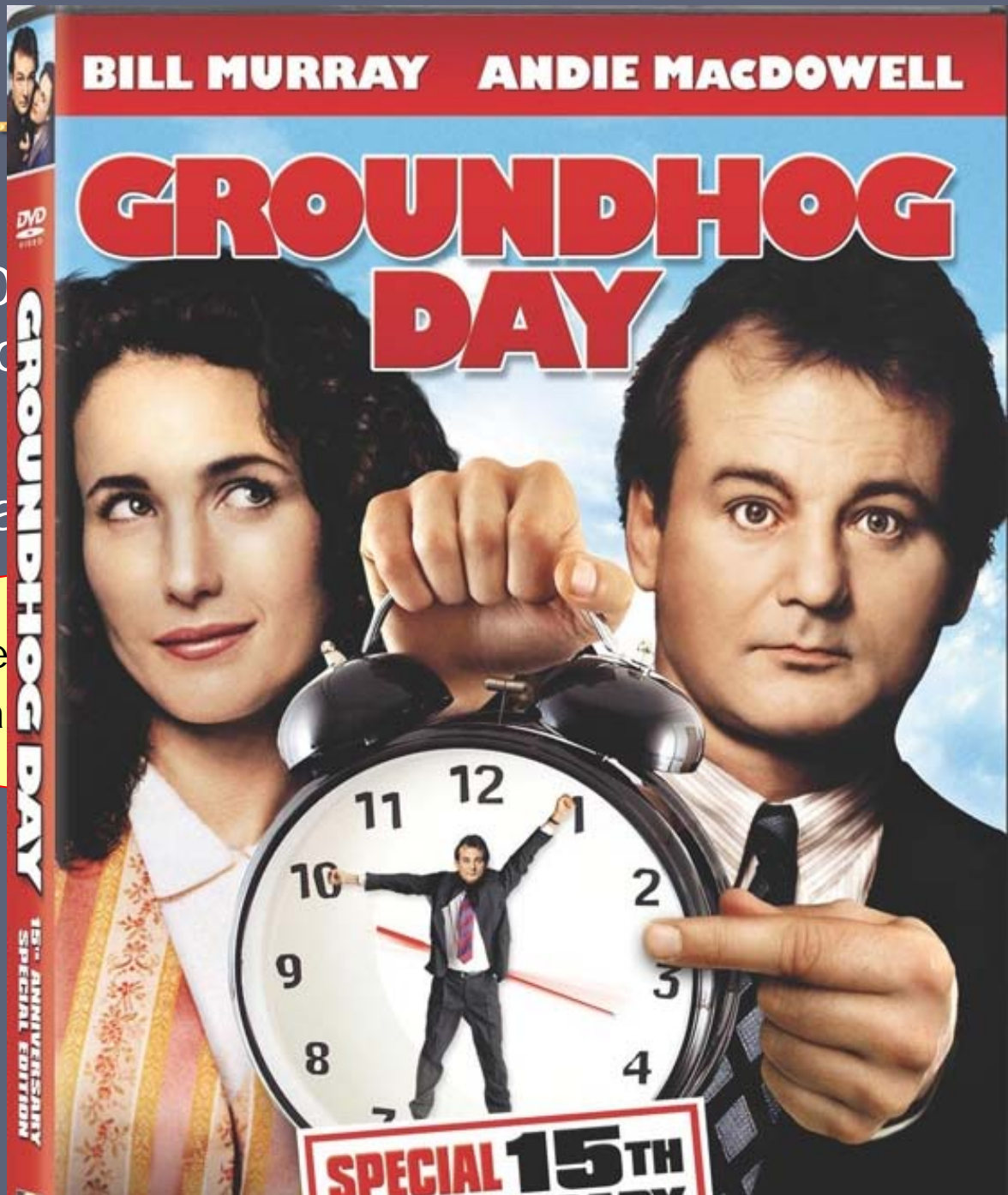
Mission Creek



(a.k.a.)

- 2001 restoration
- Still an important

De  
trea



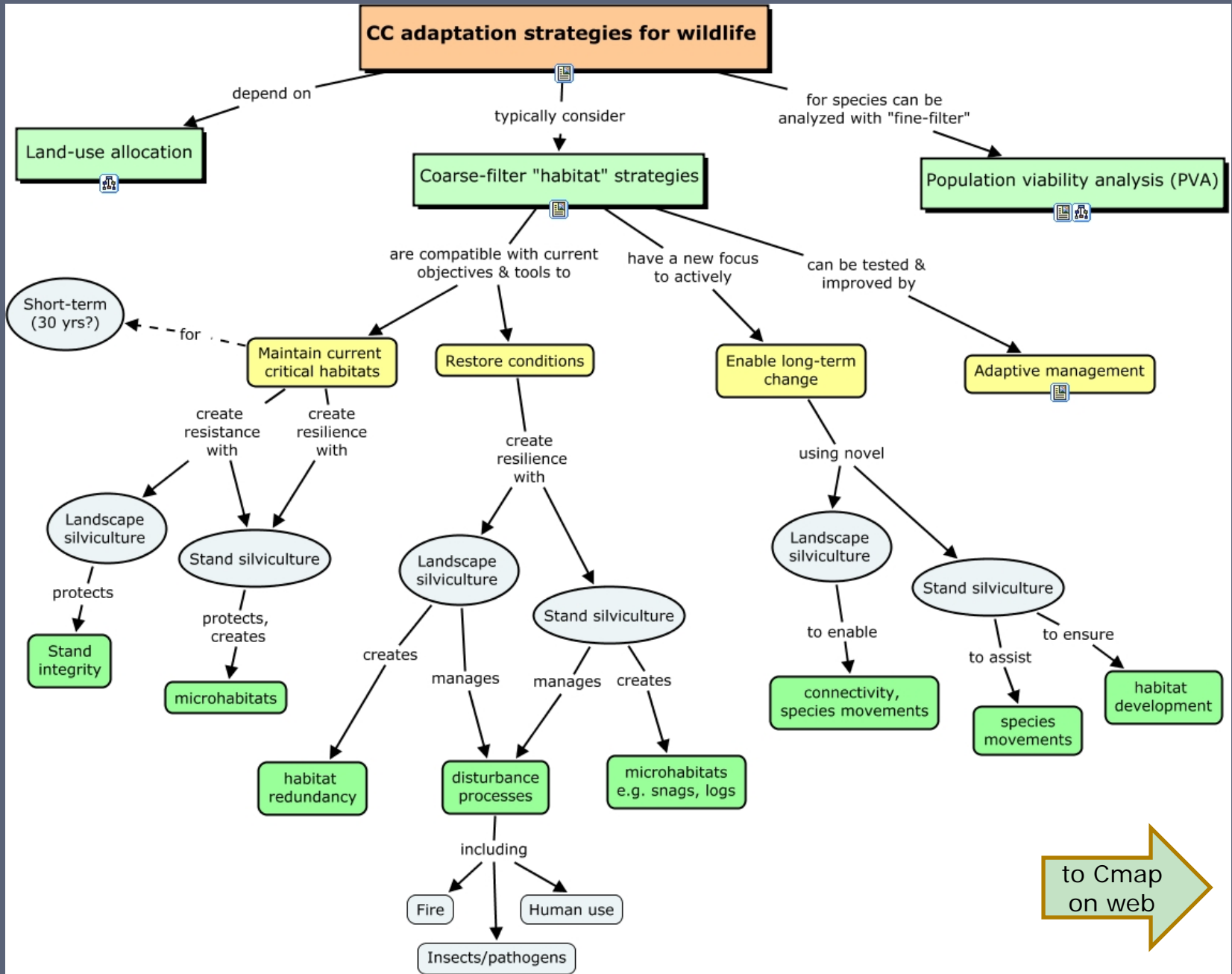
... will be

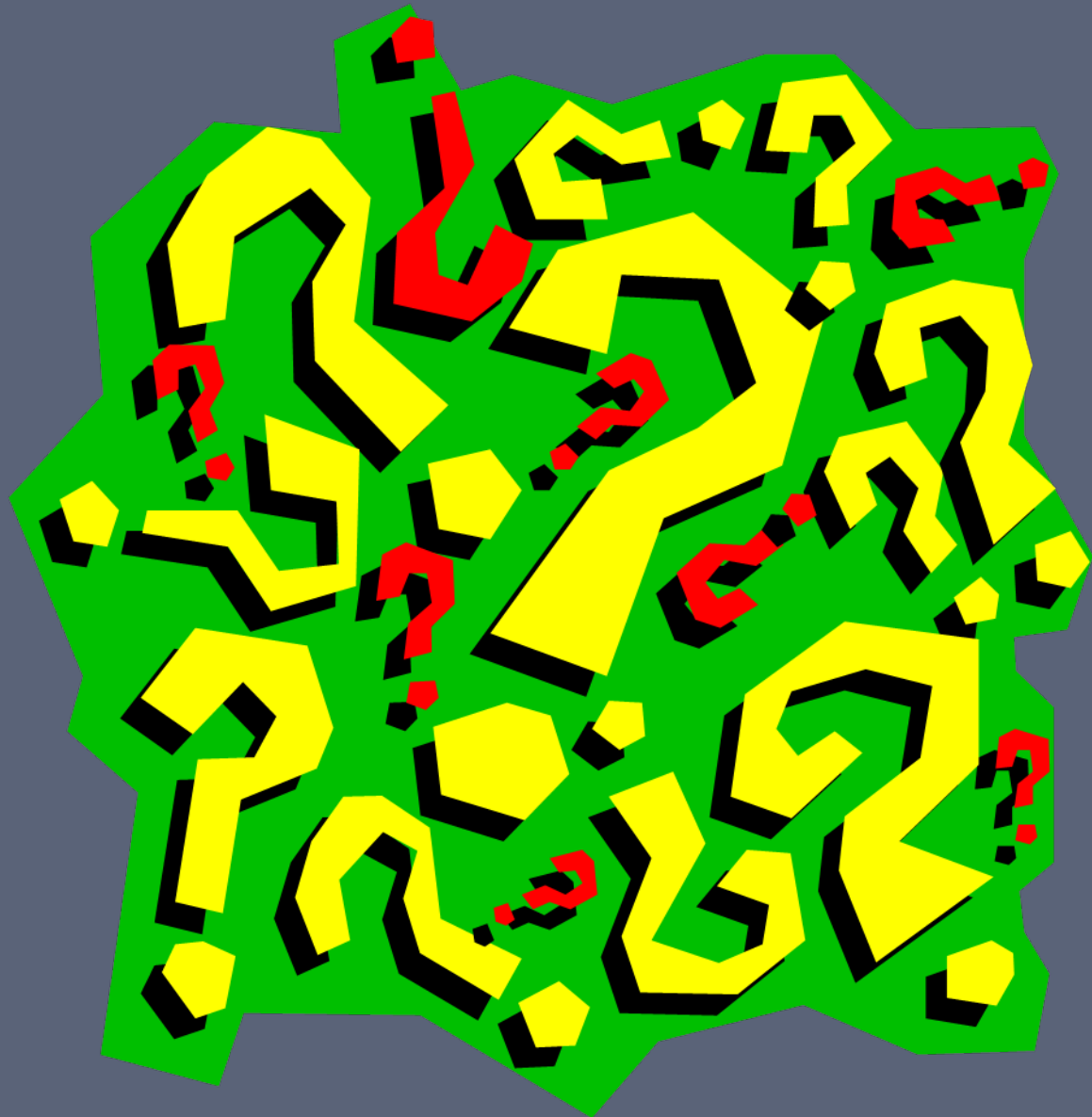
s &  
critical.

ure/  
effects

uate

# Concept Map @ IHMC Public Cmaps (3)/Cascade Range Dry Forests







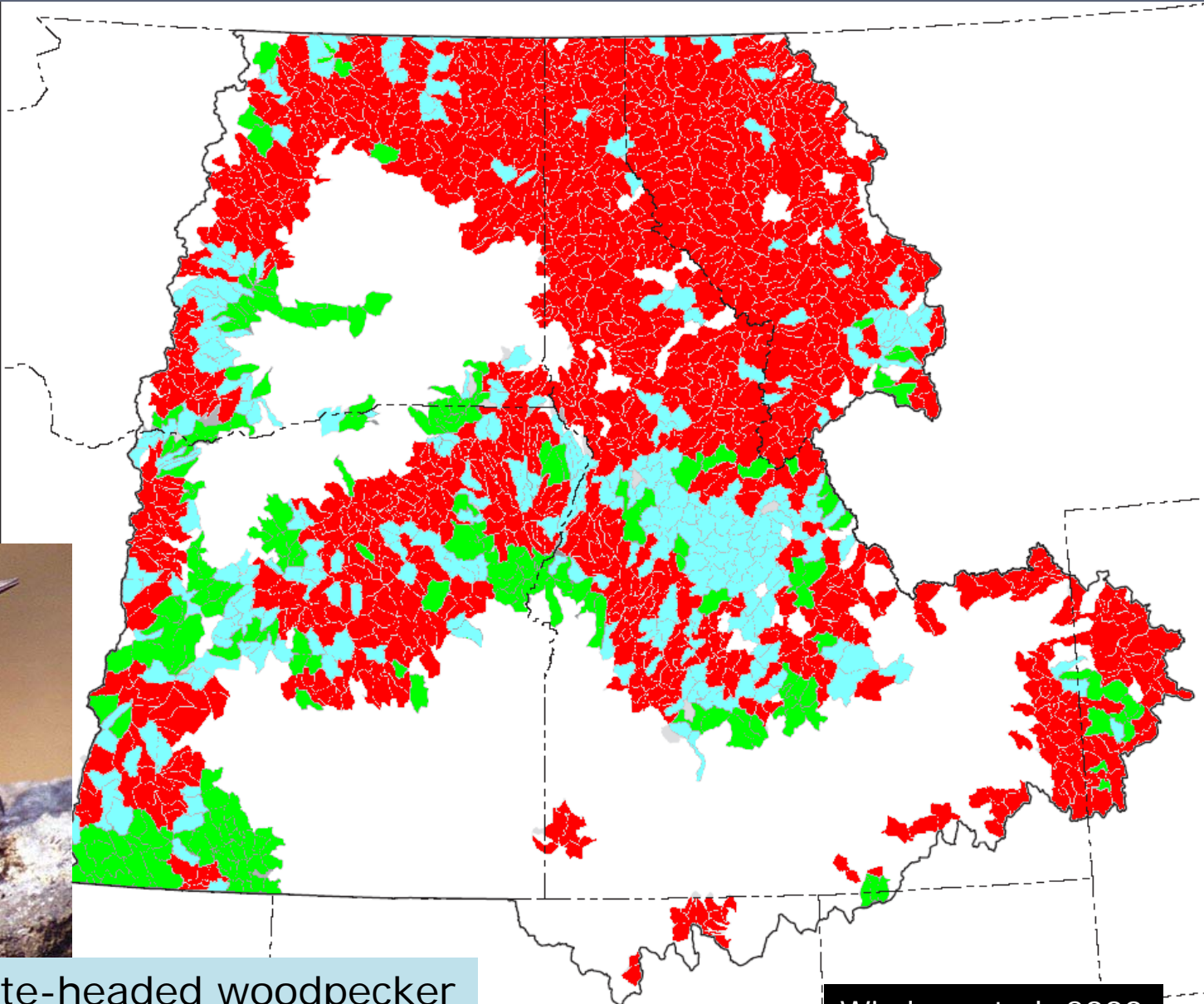
## **“Keystone” species: *flying squirrels***

- ▣ Important prey for forest carnivores.
- ▣ Link in tree-truffle-lichen-carnivore ecological web.
- ▣ “Closed-canopy” species.
- ▣ Fitness associated with patchy fire effects



# Trends in low-elevation, open pine spp.

- Increasing
- No change
- Decreasing
- Family not present
- State boundaries
- Columbia River basin assessment boundary



White-headed woodpecker

Wisdom et al. 2000

# Management issues: “Low-Elevation Old Forest” species

- ▣ Decline late-seral PIP0 forest & large (>21 in) overstory & emergent trees.
- ▣ Loss of large-diameter snags.
- ▣ Decline in shrub/herb understories from stand exclusion phase.
- ▣ Loss of oak.
- ▣ Fragmentation of low-elevation landscapes due to habitat conversion.
- ▣ Exclusion of low-intensity burns.

# Management issues: “Broad-Elevation Old Forest” species

- ▣ Decline late-seral forests & large snags, down wood, lichens, & fungi.
- ▣ *Conflicts managing low-severity habitat for Family 1.*
- ▣ Balance some spp needs for connectivity vs. other spp needs for contrast.
- ▣ *Departures from historical landscape patterns.*
- ▣ Negative effects of roads.
- ▣ *Exclusion of low-intensity burns.*



Flammulated owl



*Pinus ponderosa*  
forest

*Pseudotsuga-  
Abies*

mixed-conifer  
forest

