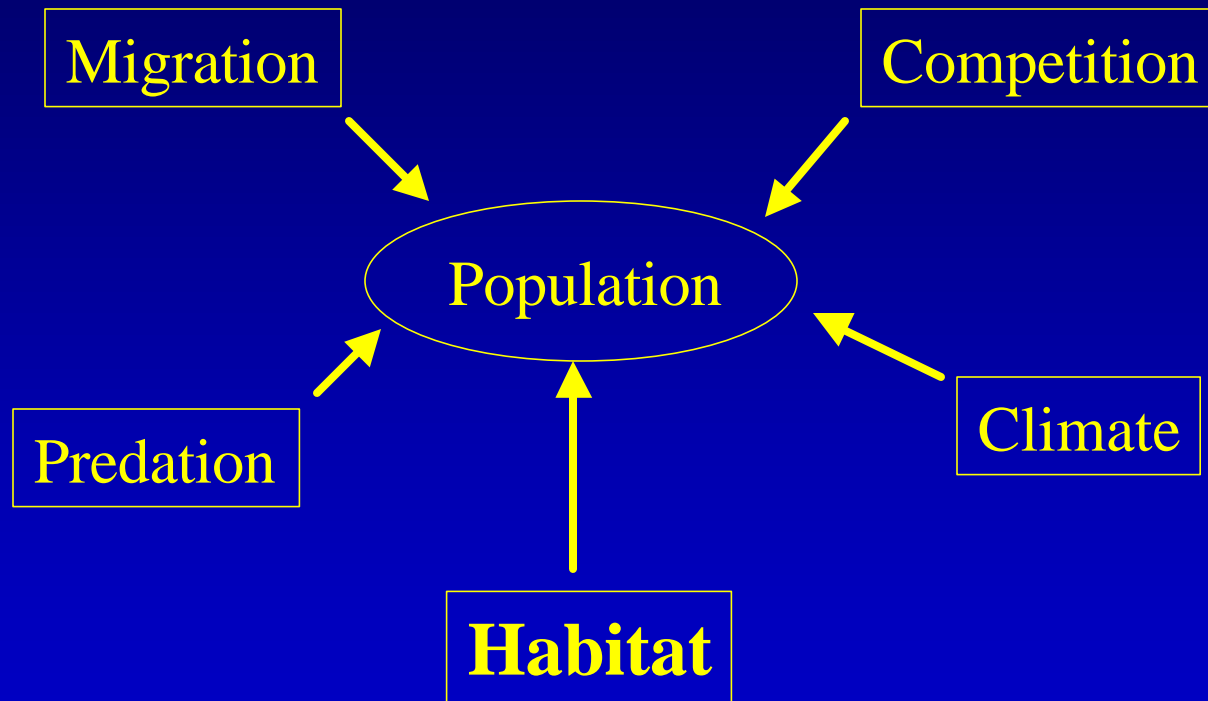Species Viability

Ecosystem Diversity and Processes
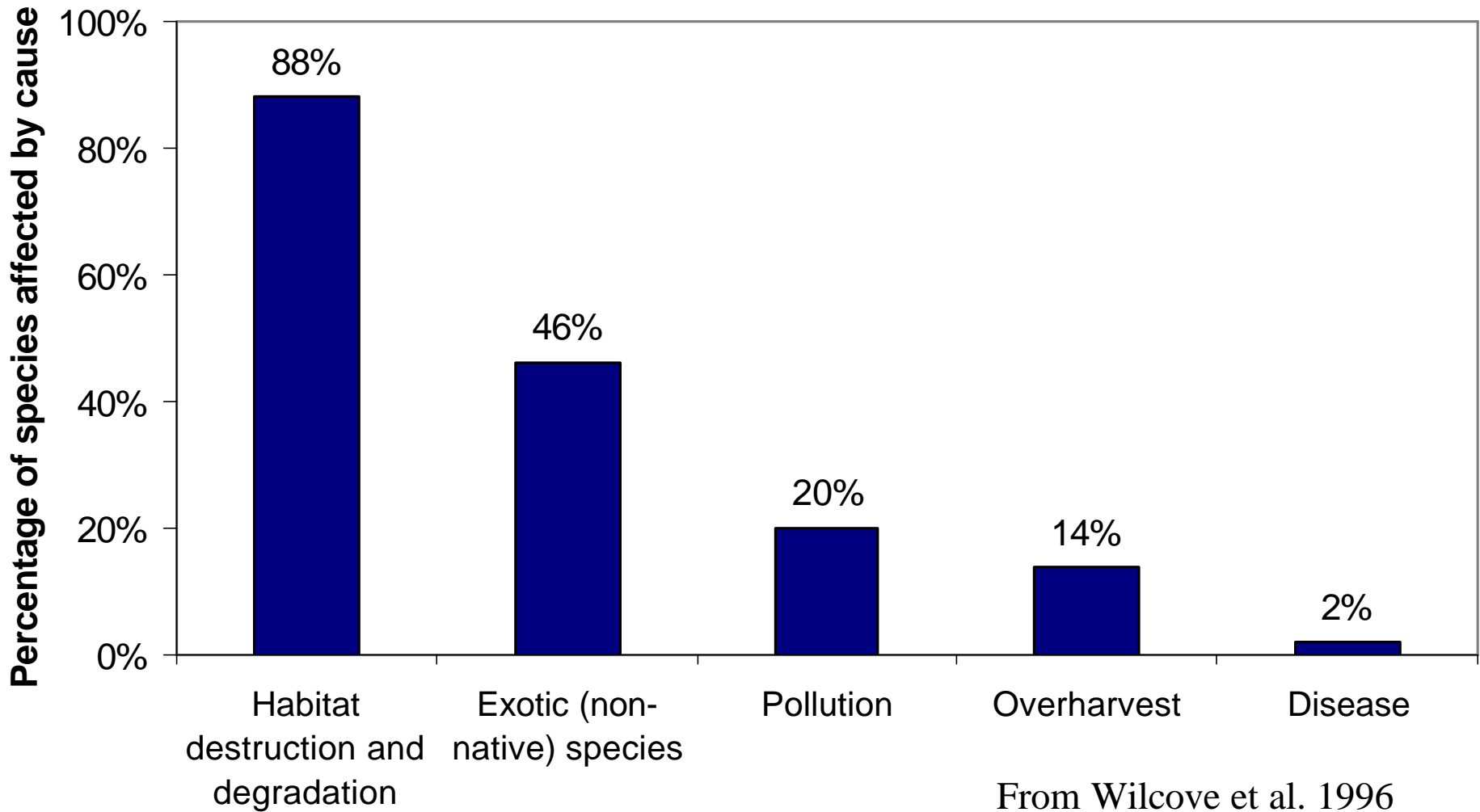
The guiding stars of conservation

Major Influences on Population Dynamics
Interactions not shown
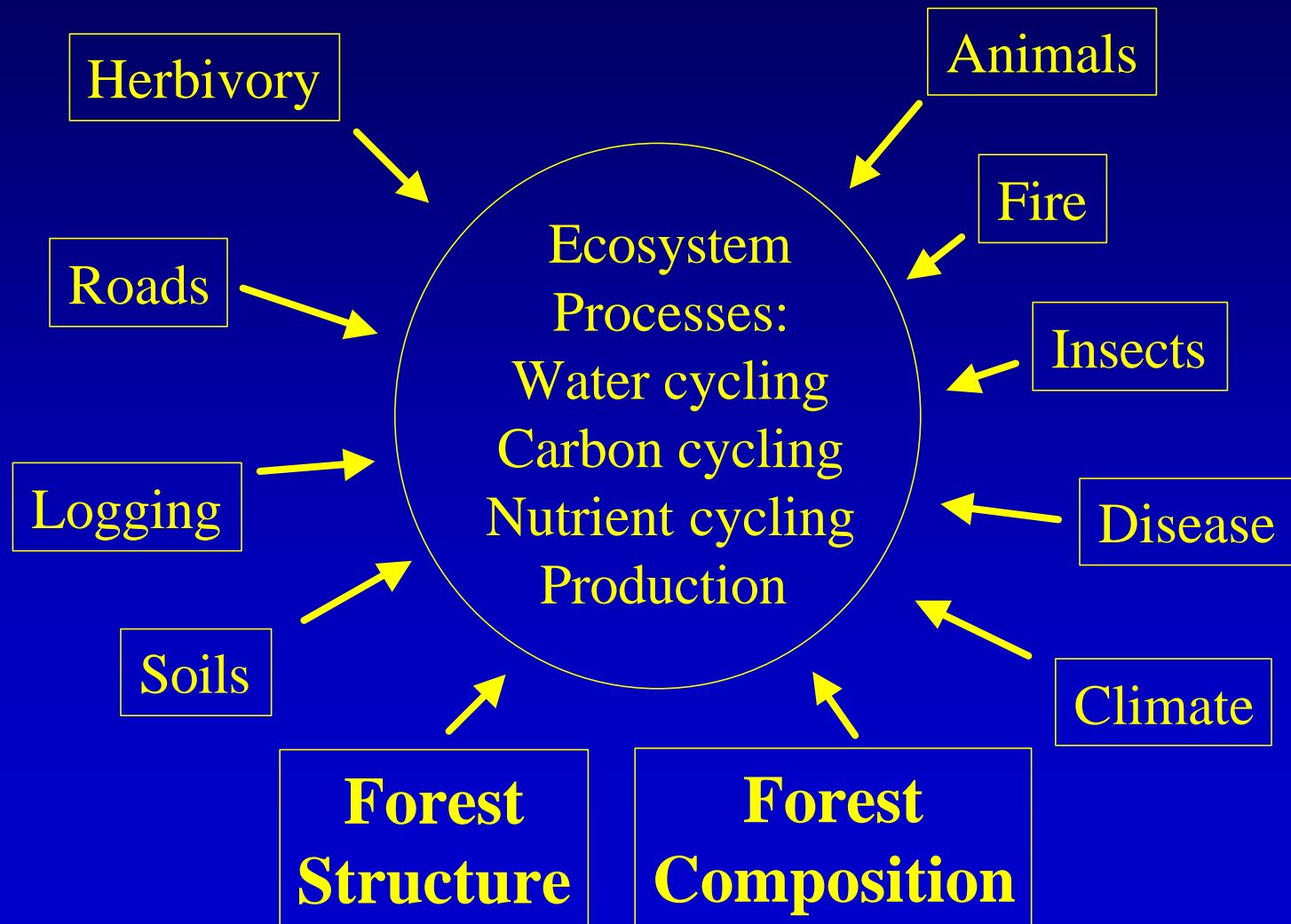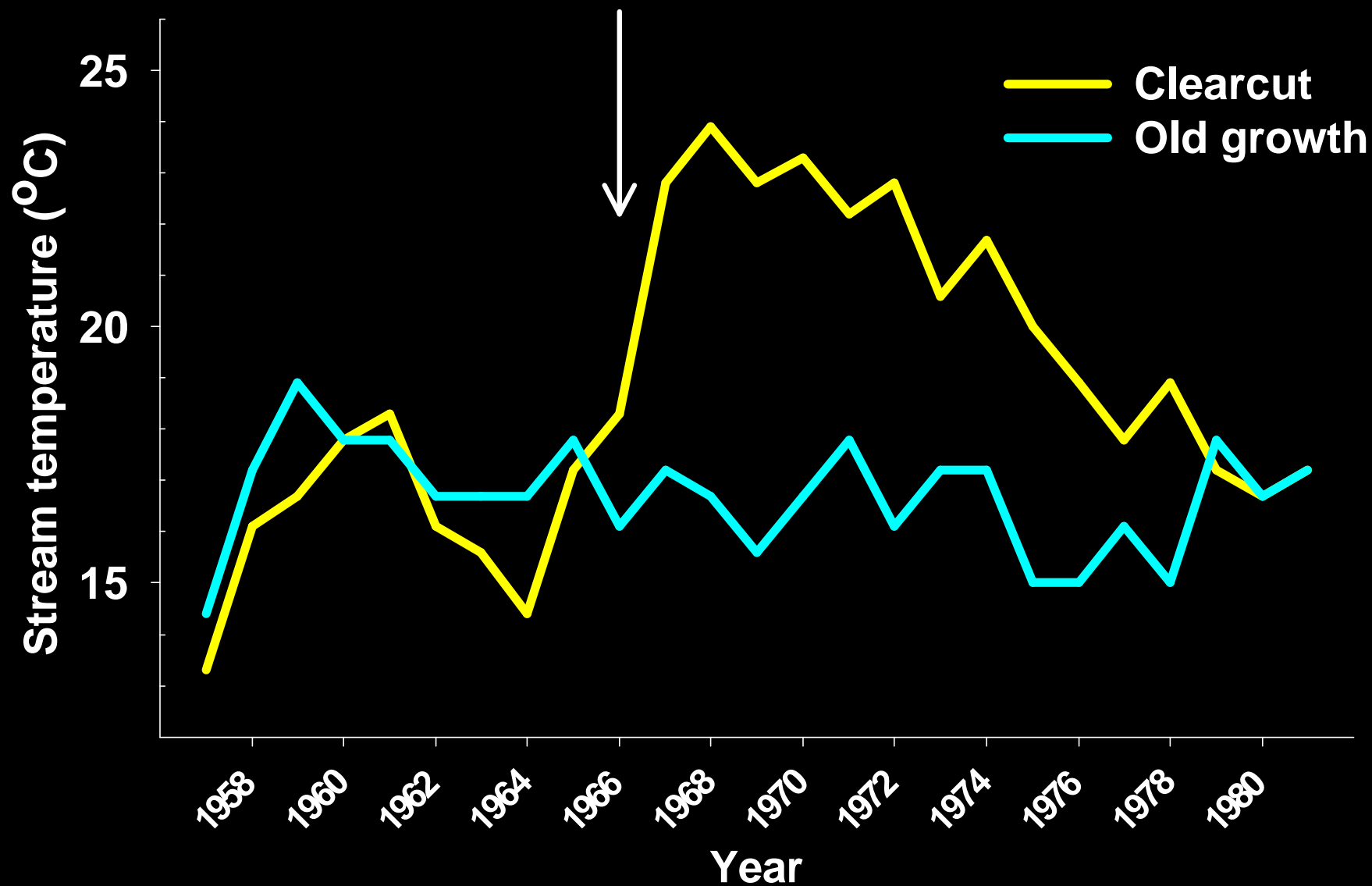
Sources of Threats to Biological Diversity

From Wilcove et al. 1996

Major Influences on Forest Ecosystem Processes

Interactions not shown

Herbivory
Animals
Roads
Fire
Insects
Logging
Disease
Soils
Climate

Ecosystem Processes:
Water cycling
Carbon cycling
Nutrient cycling
Production

Forest Structure

Forest Composition

Effect of removal of riparian vegetation

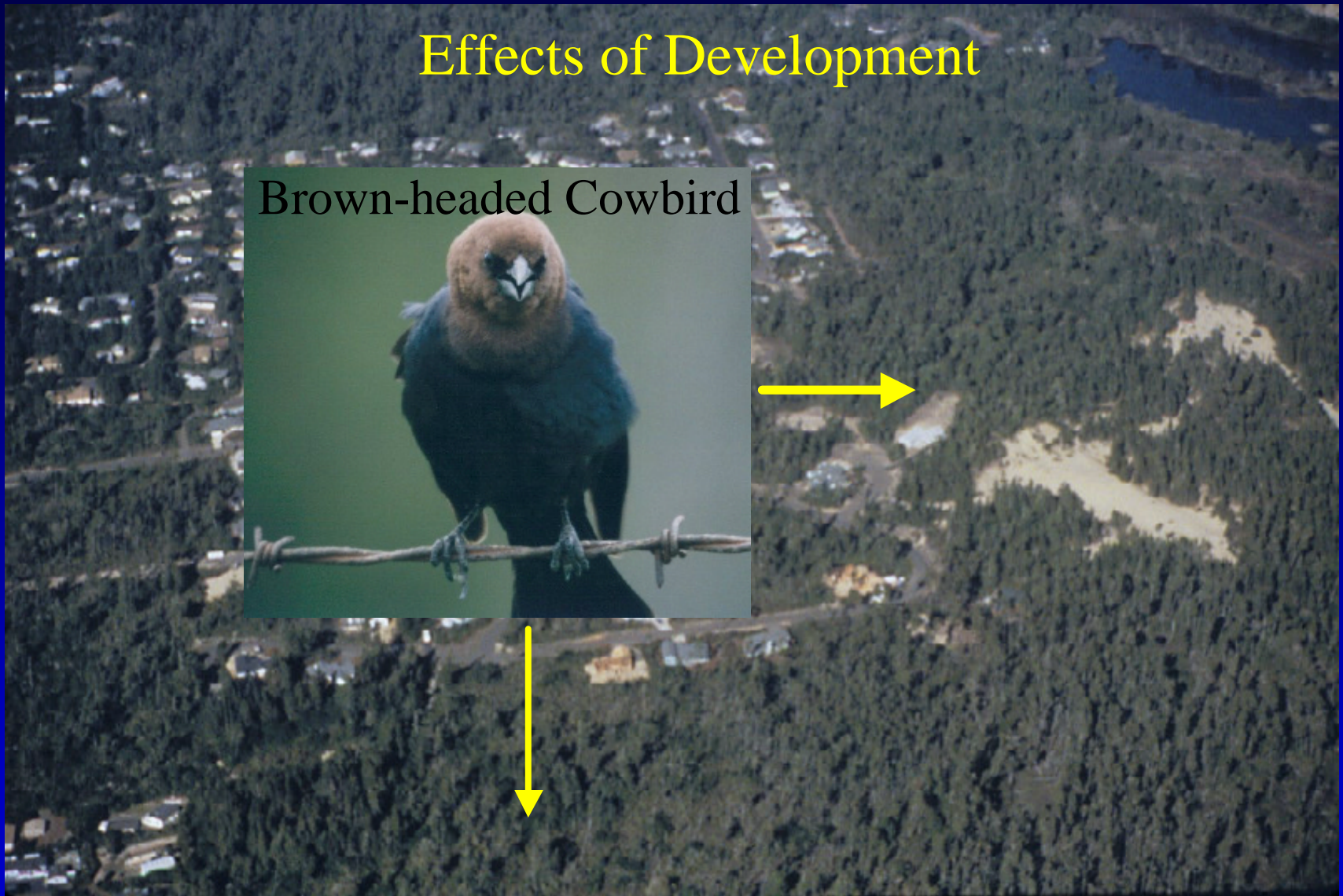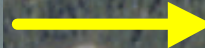# Hardwood patches add lichen diversity to conifer forests

47 species

59 species

Effects of Development

Brown-headed Cowbird

Ecological Indicator Spectrum

Fine ⟶ Coarse

Species	**Community**	**Ecosystem**
Indicator/ Focal Species	Community Types	Stand Structure
Population Viability	Species Groups Guilds	Landscape Structure
		Disturbance
		Processes

Forest Types for Biodiversity Analysis
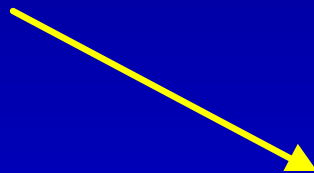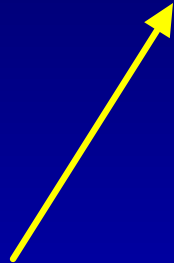

Young

Mature

Open

Hardwood
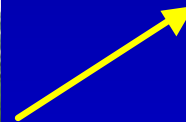
Old Growth

Habitat Elements for Biodiversity Associated with "Old-Growth" Stage

Attribute	OWL	Murrelet	R. Tree Vole	Canopy Lichen
Tree Dia (cm)	**75**	**50-75**	**50**	Wide range
Time Imp?	NO	NO	Maybe	Yes
Tree spp	No	Yes	Yes	Yes
Use Hwds ?	No	No	No	Yes
Spatial Scale	2.4 km	50 m	<50 m	<100 m

Forest Structure

Size and density of trees

Diversity of tree/canopy sizes

Spatial heterogeneity
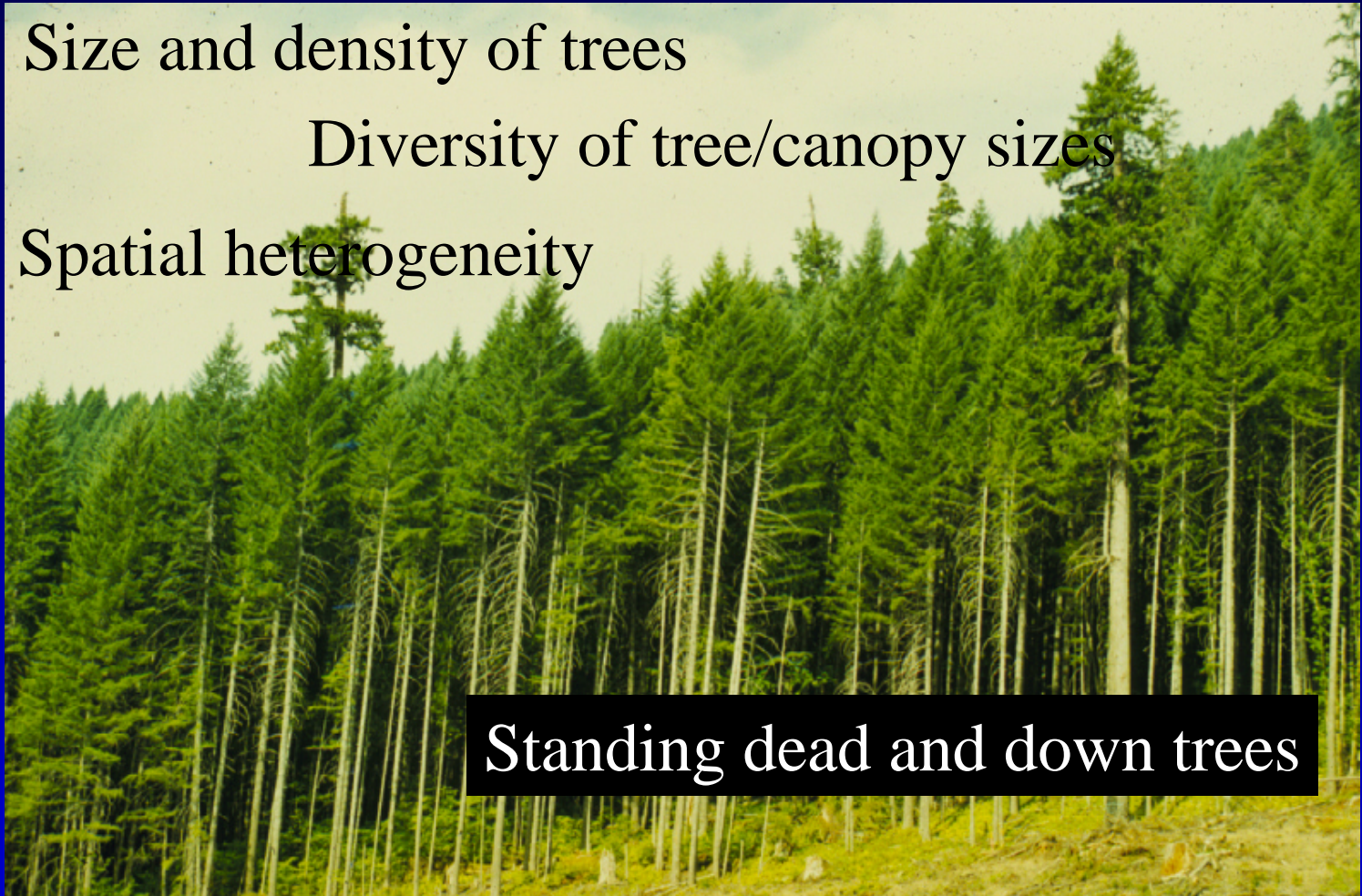
Standing dead and down trees

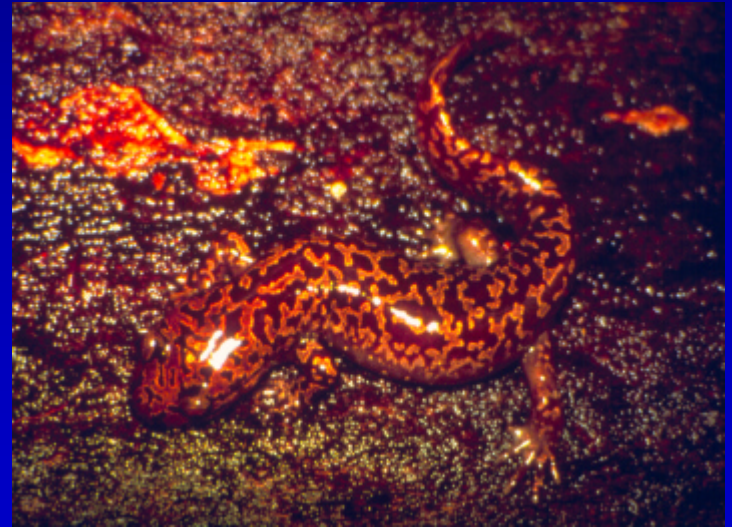# Biological diversity measures
In CLAMS

- ## **Species level**
  - ### **Focal Species--habitat quality**
    - 15-20 species
  - ### **Population viability**
    - Northern Spotted Owl habitat

- ## **Community level**
  - Wildlife-Stand Types

Vertebrate Focal Species

Criterion	No. Spp.	Example
At Risk (listed)	13	Marbled Murrelet
Seral Stage	15	Willow flycatcher
Ecological Func	5	American Beaver
Keystone	1	Pileated Woodpeck.
Umbrella	3	N. Spotted Owl
Game	1	Elk
Public/Regulatory	5	Bald Eagle

# Northern Spotted Owl Habitat Suitability Index

- **Nesting Suitability Index (patch)**
  - Density of trees > 100cm dbh/ha
  - Diameter Diversity Index

- **Foraging Suitability Index (patch/landscape level)**
  - Canopy height
  - Diameter Diversity Index
  - Habitat availability within 2.2 km of patch

- HSI = SQRT (NSI * FSI)

Biological diversity measures (cont.)

- **Ecosystem level**
  - Stand structure
  - Landscape pattern
  - Landslide/debris flow potential
  - Watershed-scale aquatic habitat indices
  - Disturbance regime
  - Range of variability in amounts of seral stages over last 3,000 years
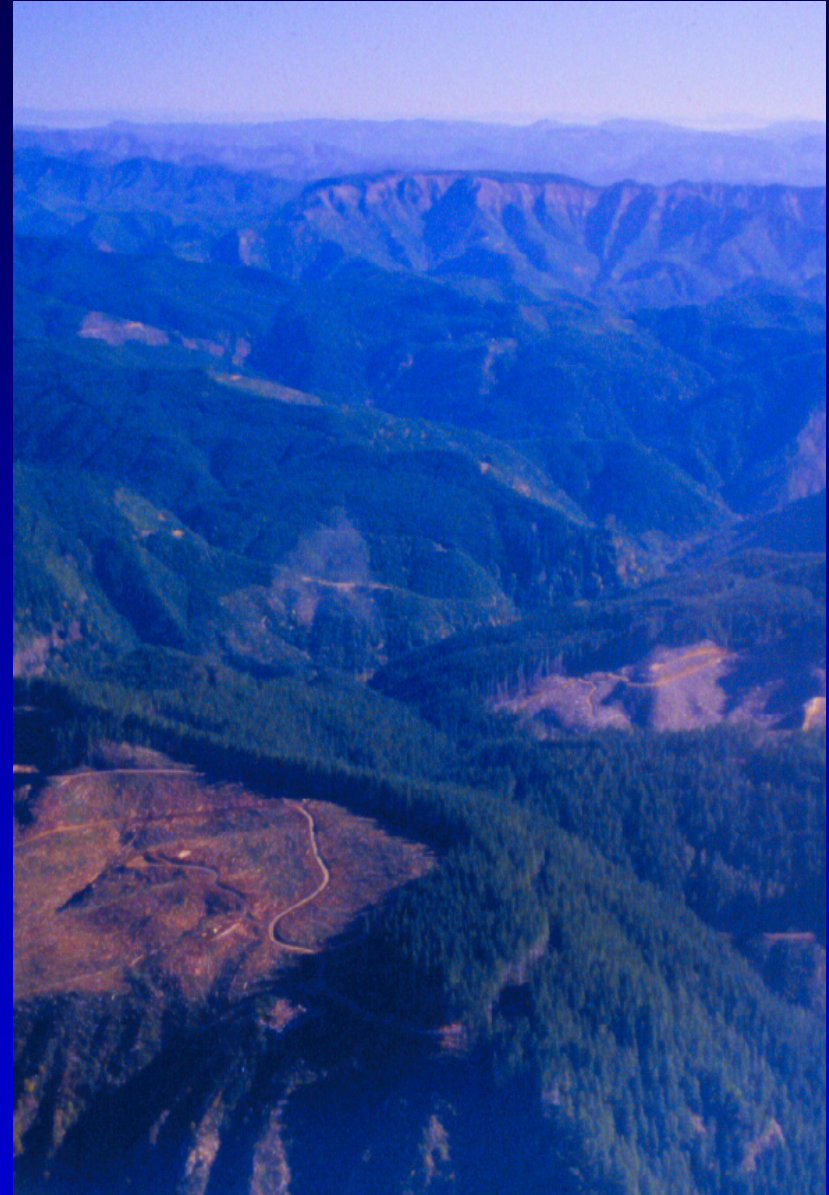
Old-Growth Habitat Index (patch level)

- Density of trees > 100cm dbh/ha

- Diameter Diversity Index

- Density of large snags (>50cm dbh & >15m tall)

- Volume of down woody debris

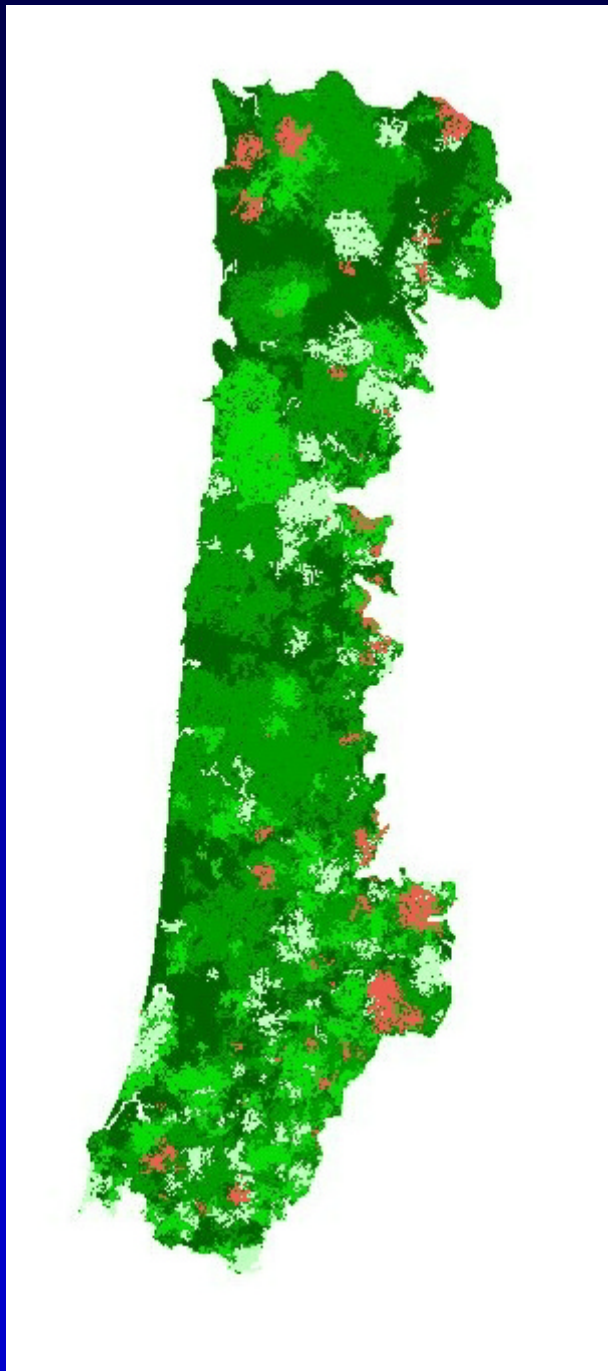- Age of dominant trees

- OGHI = (VI + V2 + V3 + V4 + V5) / 5
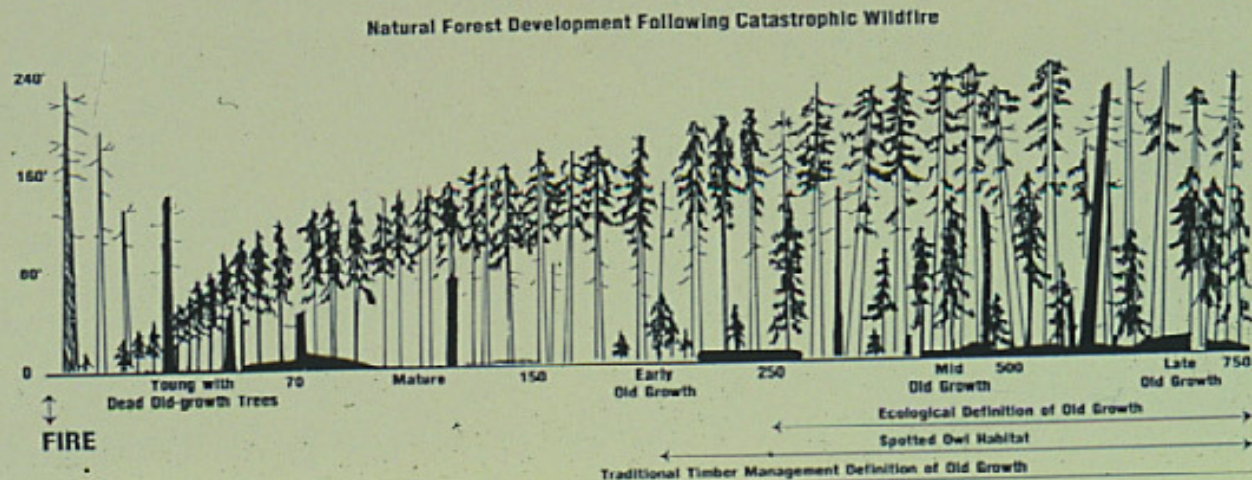
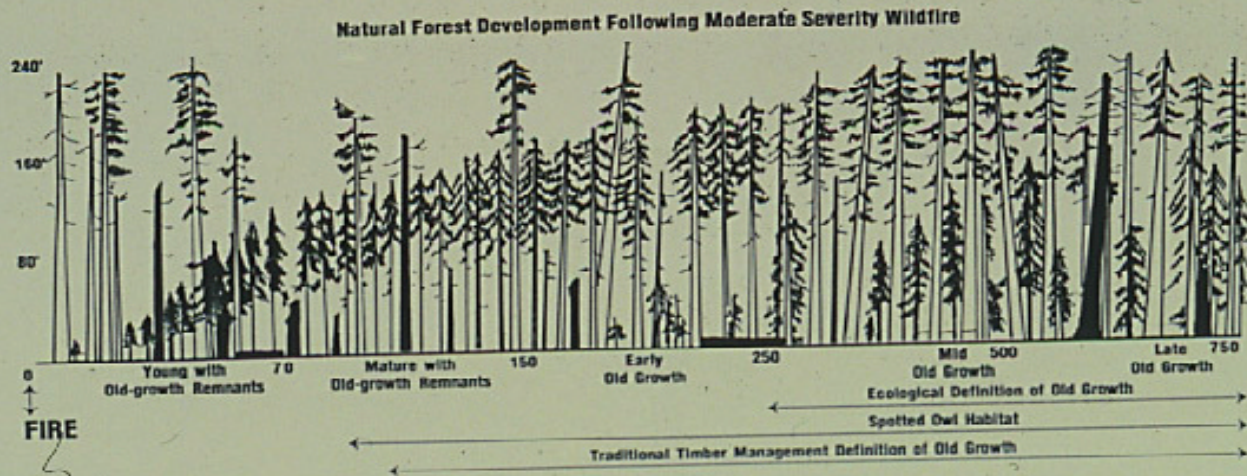# Landscape Pattern

Forest Dynamics

Stand Age
- < 10
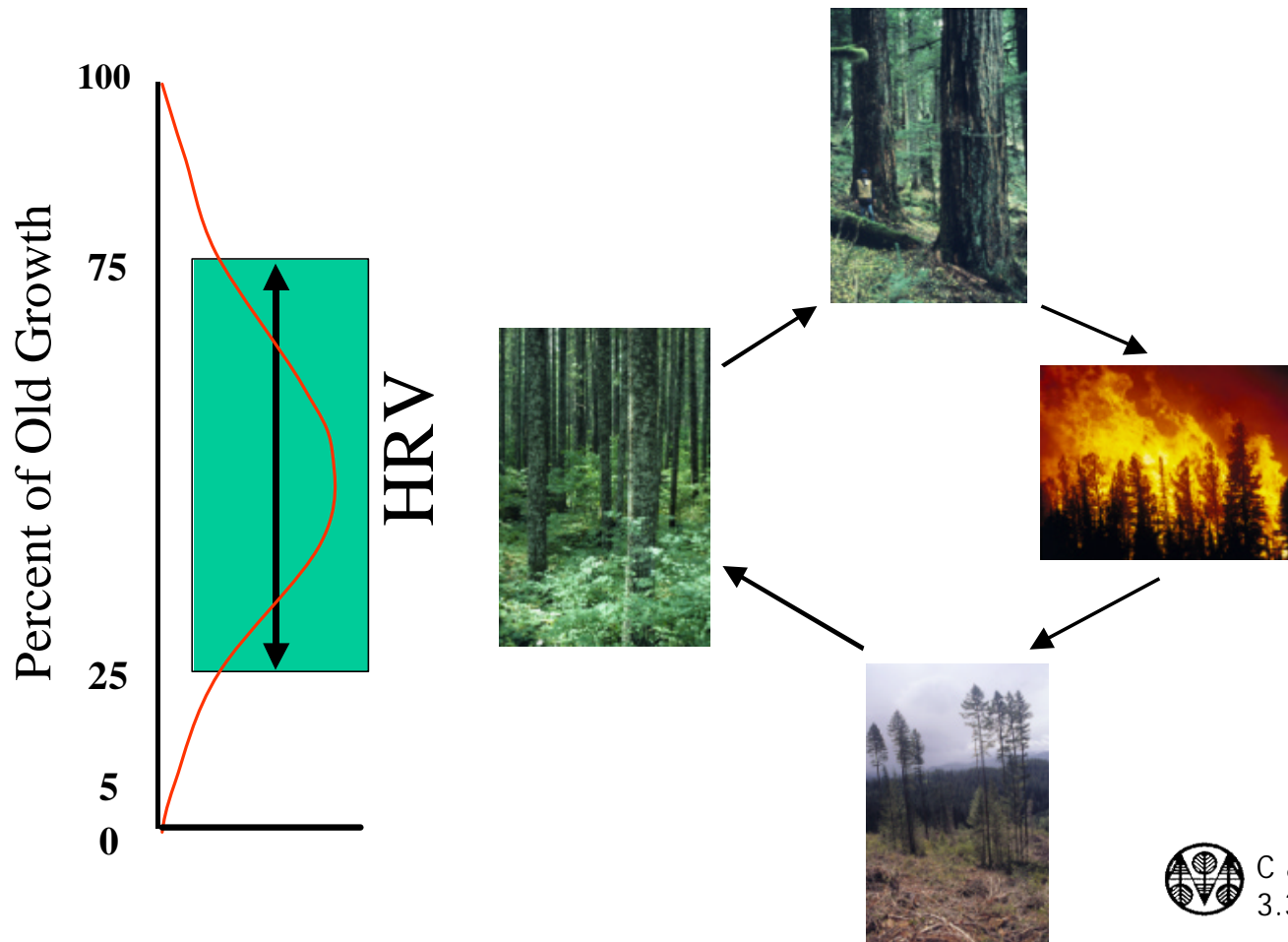- 11 - 40
- 41 - 80
- 81 - 200
- > 200

Three Centuries Of Simulated Fire History in Oregon Coast Range

By Nonaka and Wimberly

Forest Development Pathways

Historical Range of Variation

Conclusions

- No single best approach to assessing biodiversity
- Use a variety of strategies: species-ecosystems
- Forest structure and composition are key
- Incorporate variability and dynamics
- Given complexity of systems and lack of information, surogates and indicators are needed
- Measures and models are working hypotheses.