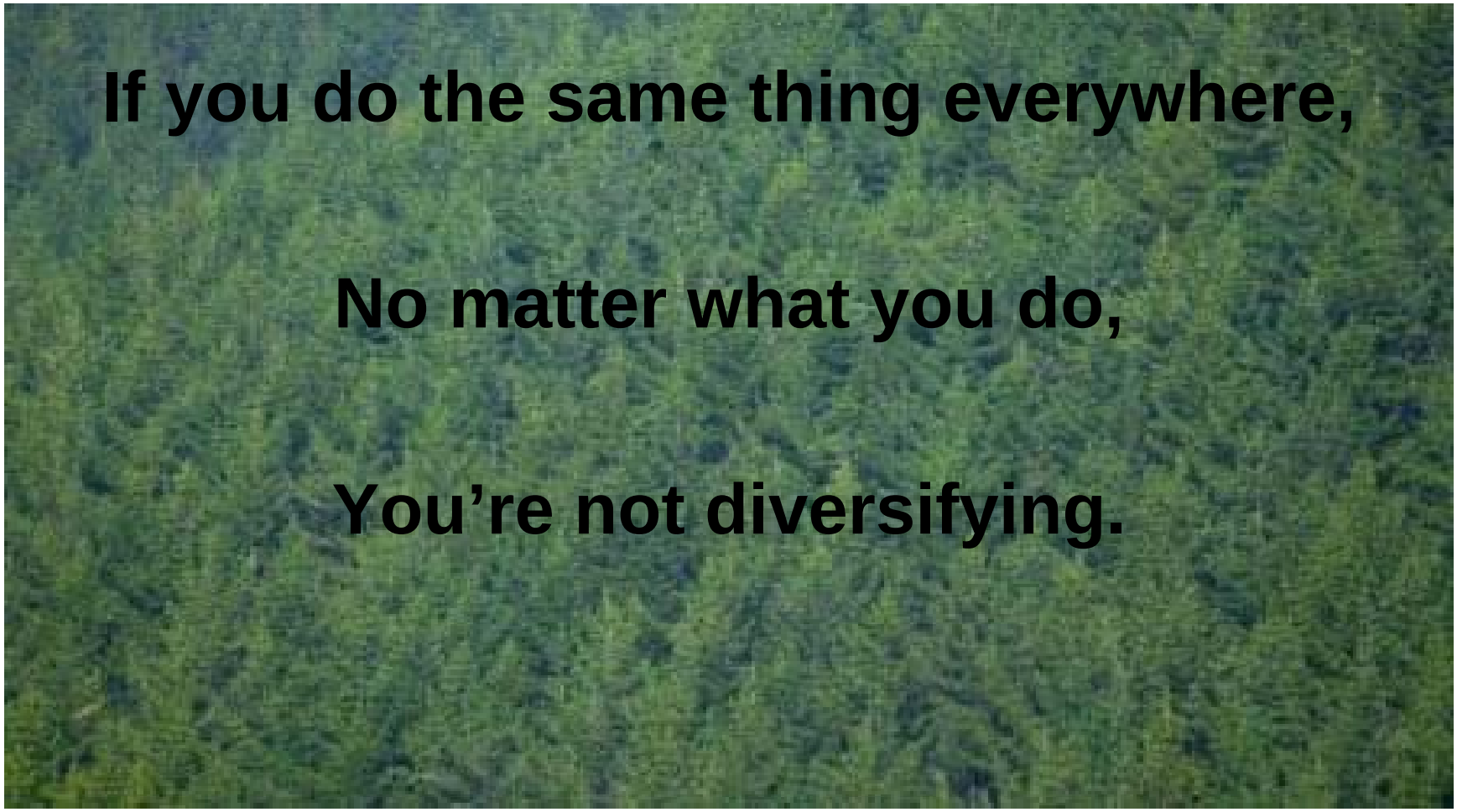
Wildlife Response to Forest Structure

Talking Points

- We don’t know all the answers
- We never will know all the answers
- No matter what you do, there will be winners and losers
- The best way to maximize biodiversity is to maximize habitat diversity:
  - at both the coarse - and fine - scales
- Decadence is the key to providing for many wildlife species
- Always hedge your bet!

Talking Points



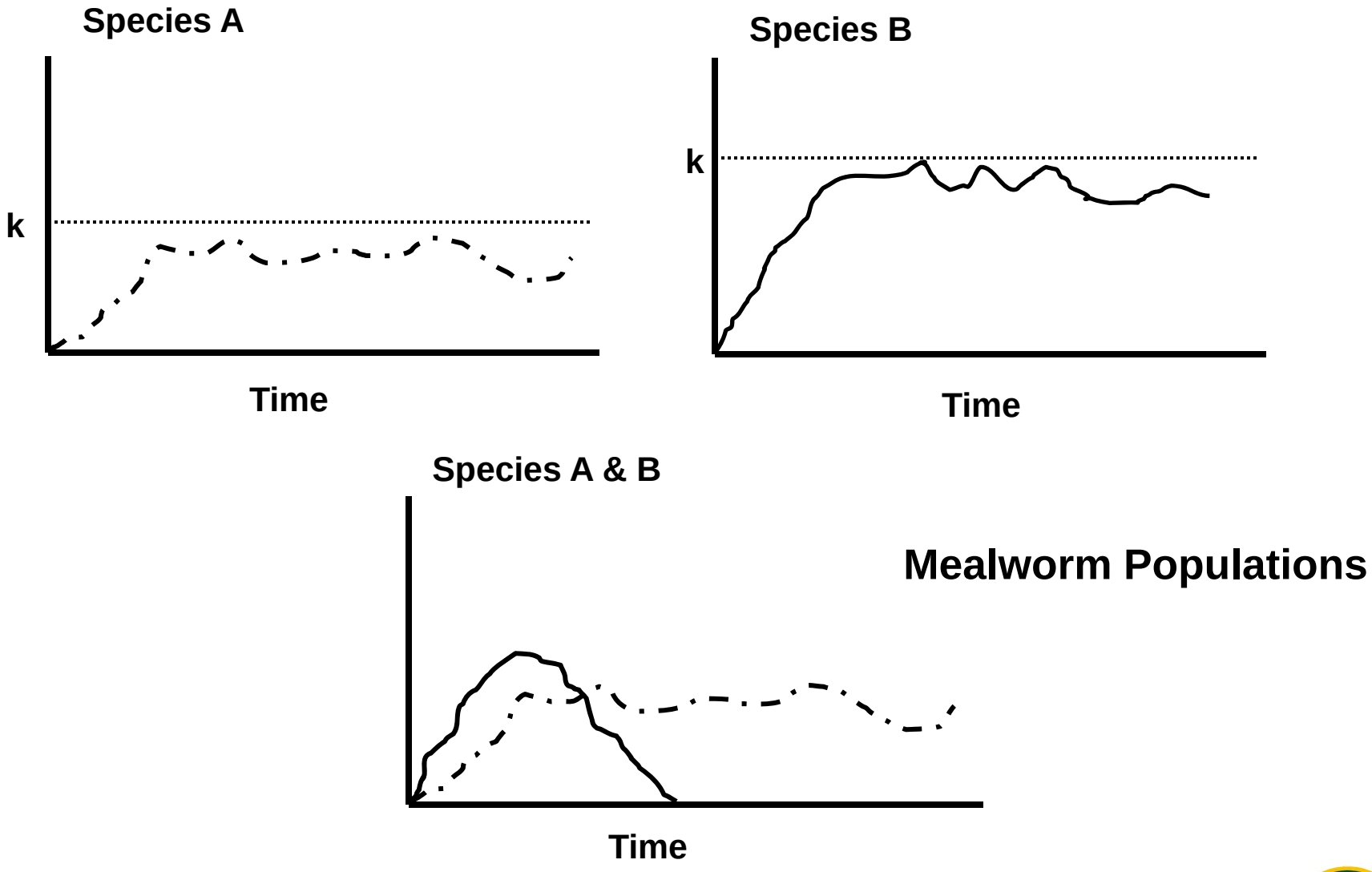
Ecological Niche

A particular combination of physical factors (microhabitat) and biotic relations (role) required by a species for its life activities and continued existence in a community

OR

What the species “does for a living”

Competitive Exclusion



Mealworm Populations

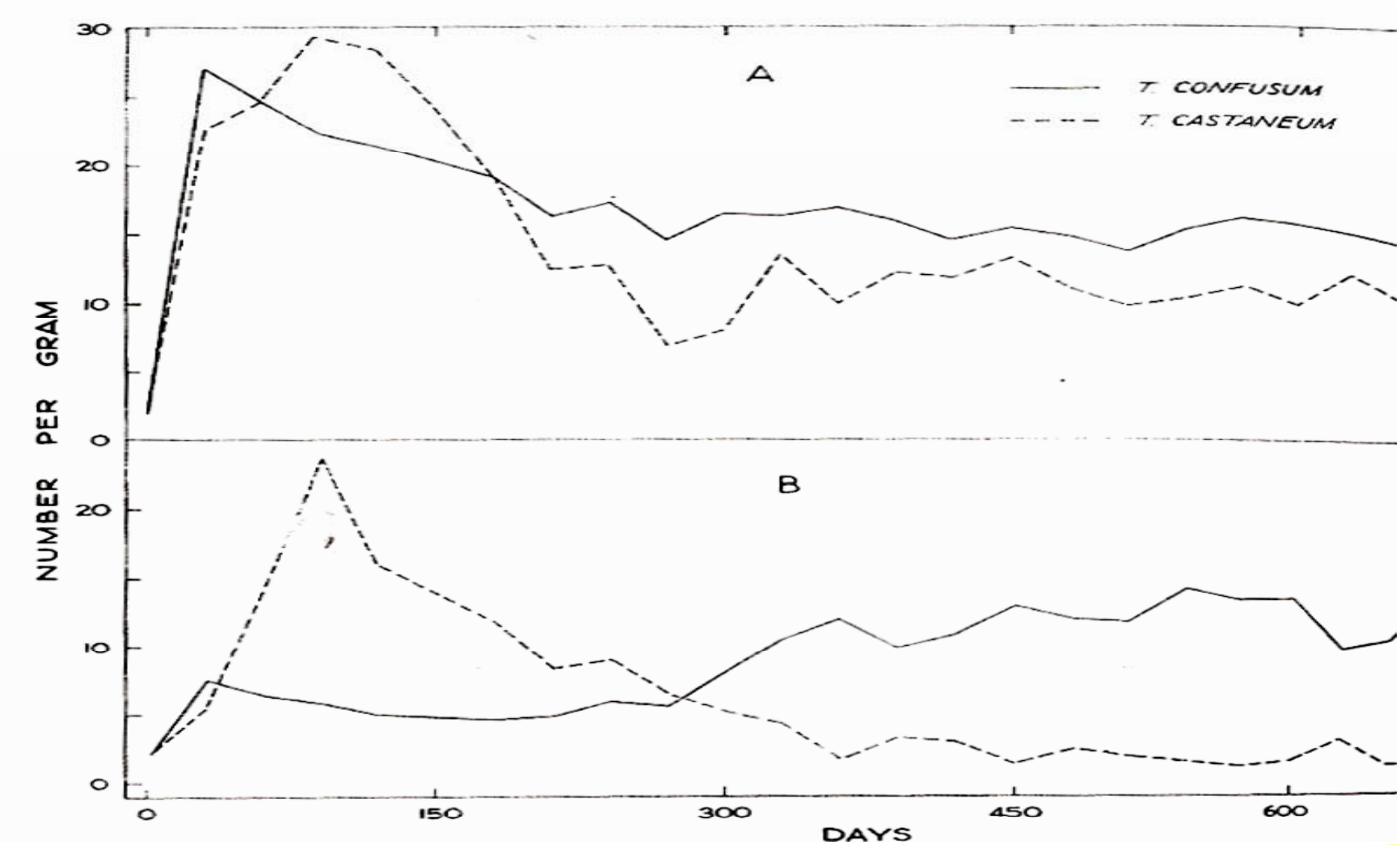
Competitive Exclusion

An ecological niche cannot be simultaneously and completely occupied by stabilized populations of more than one species

OR

Two or more species with closely similar niche requirements cannot exist indefinitely in the same area.

Example: Spotted Owl ↔ Barred Owl


A
B
T. CONFUSUM
T. CASTANEUM
NUMBER PER GRAM
DAYS
0
10
20
30
150
300
450
600

Spotted Owl

Why are there so many different kinds of animals?

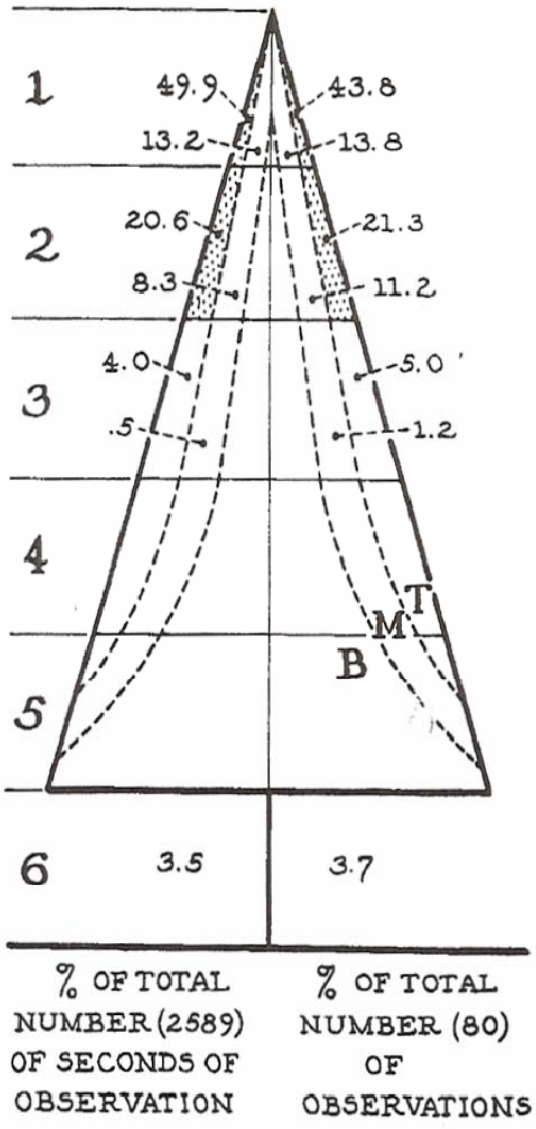
Two species with similar niche requirements meet in competition under natural conditions:

- **One species is better adapted overall**
  - **Will spread rapidly throughout the range of the other.**
  - **Competitive exclusion.**

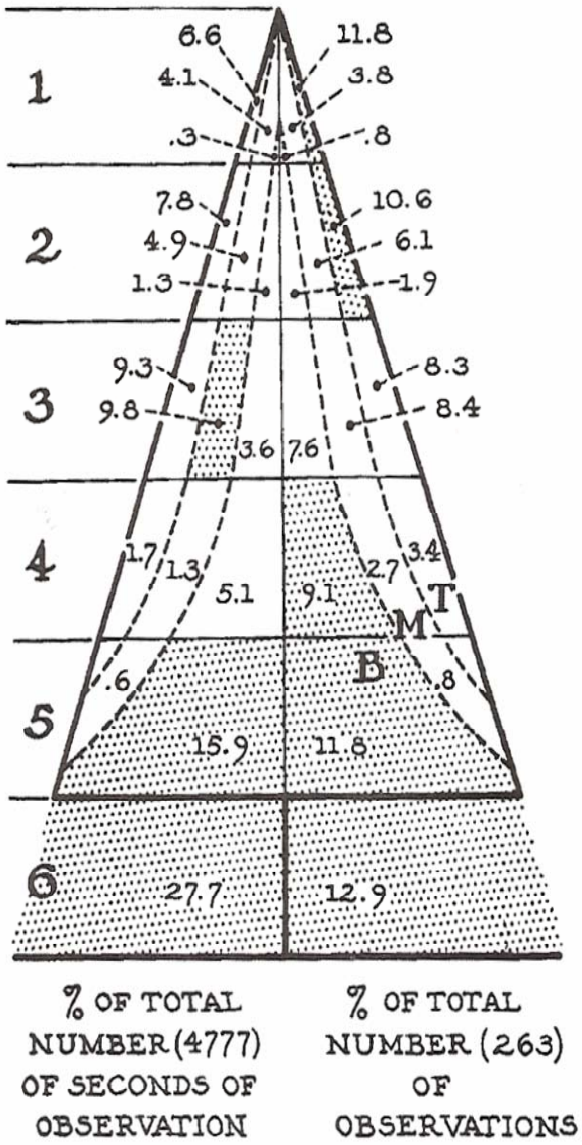
- **One species is better adapted to a portion of the range**
  - **The other species is better adapted to the remainder of the range.**
  - **The two species occupy separate, but adjacent ranges.**

- **Each species is better adapted to a different portion of the niche**
  - **Both species occupy similar ranges.**
  - **Each species occurs within different microhabitats.**

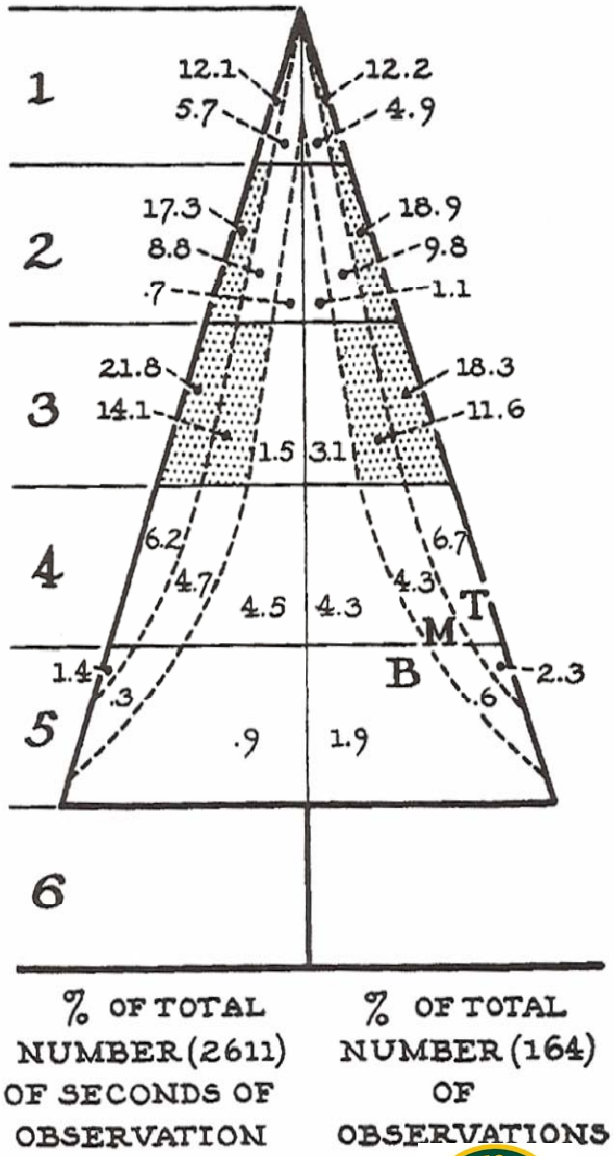
Cape May warbler



Myrtle warbler



Black-throated green warbler



Nesting Height of Warblers

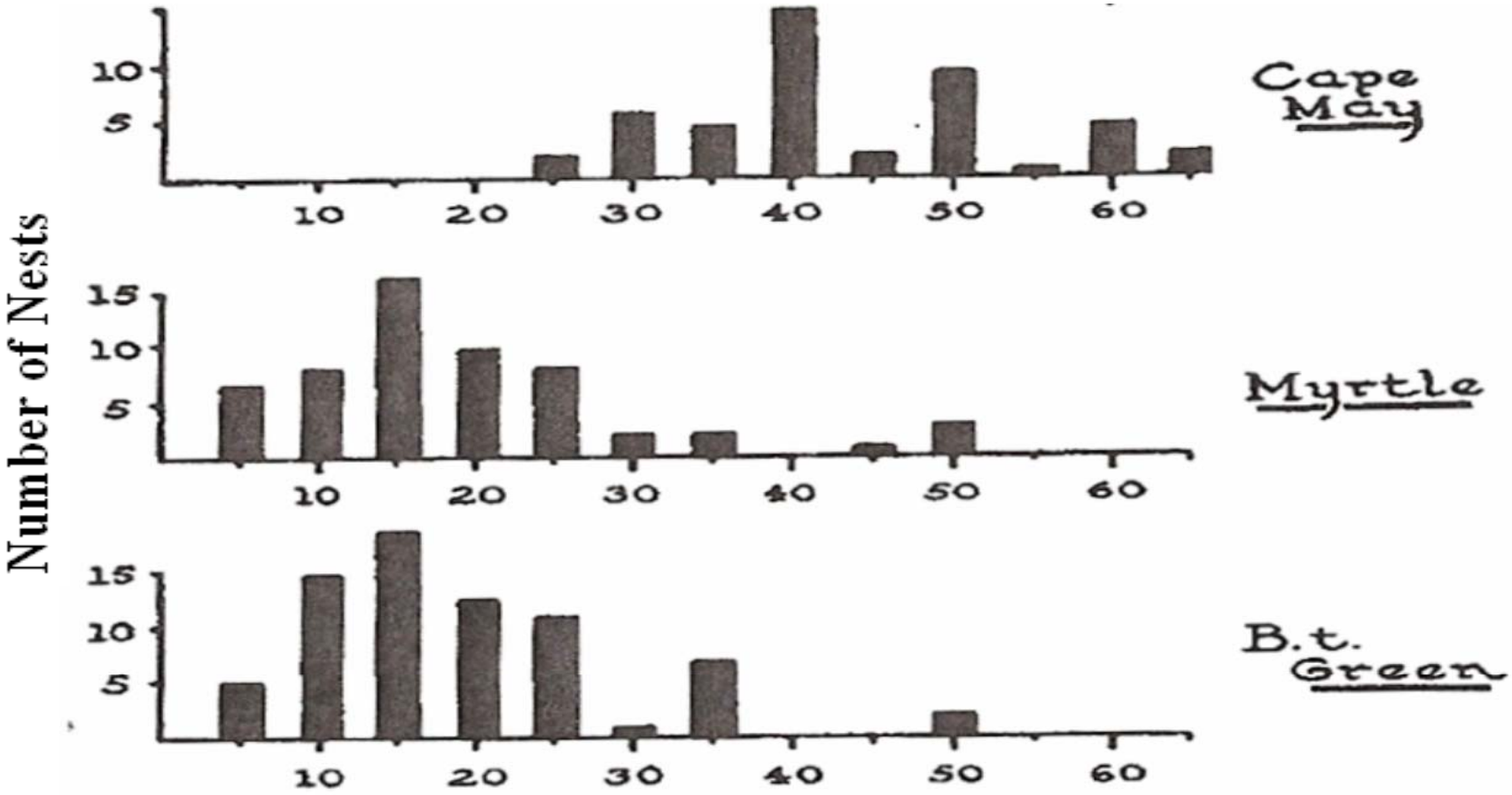
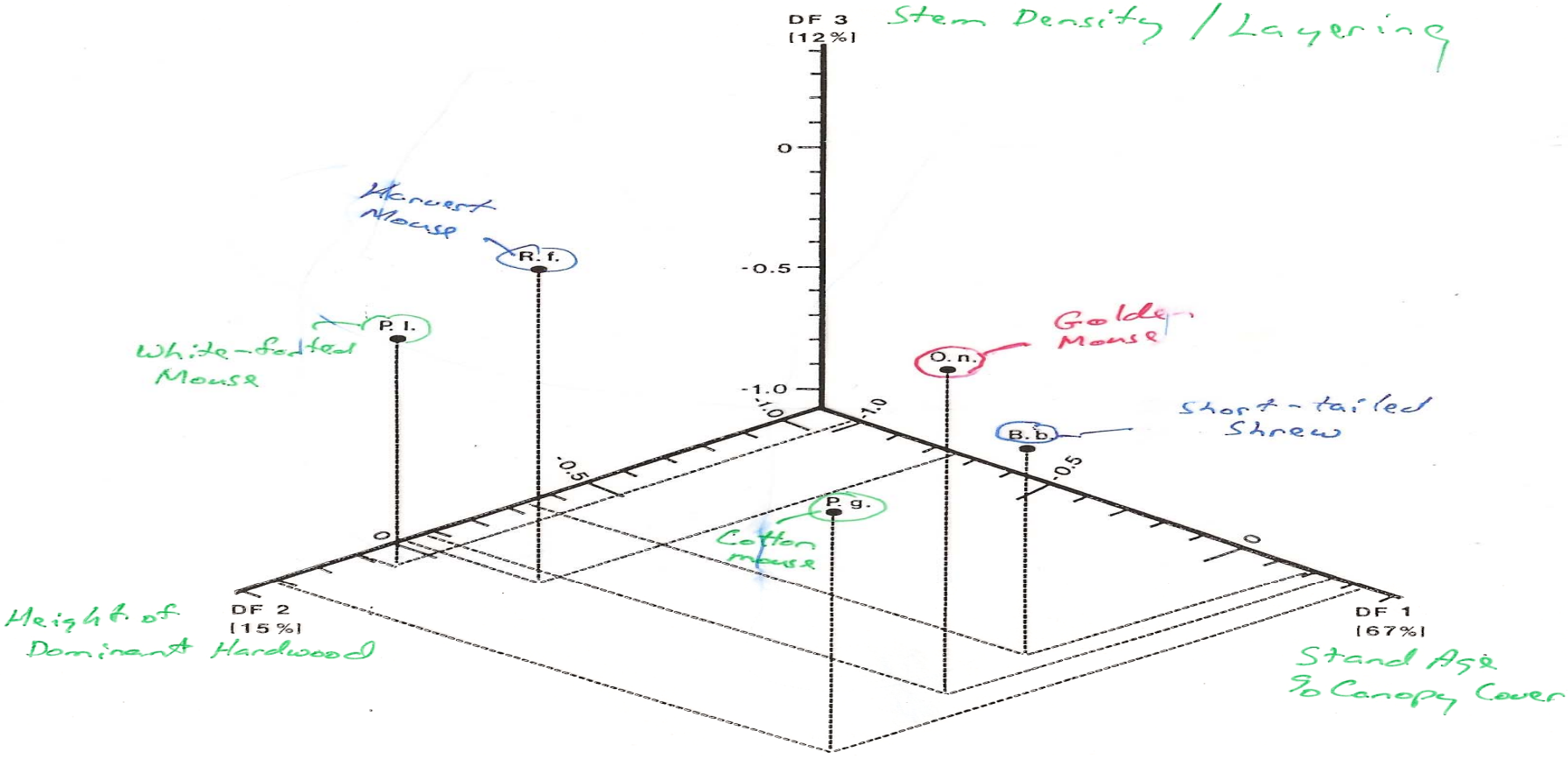
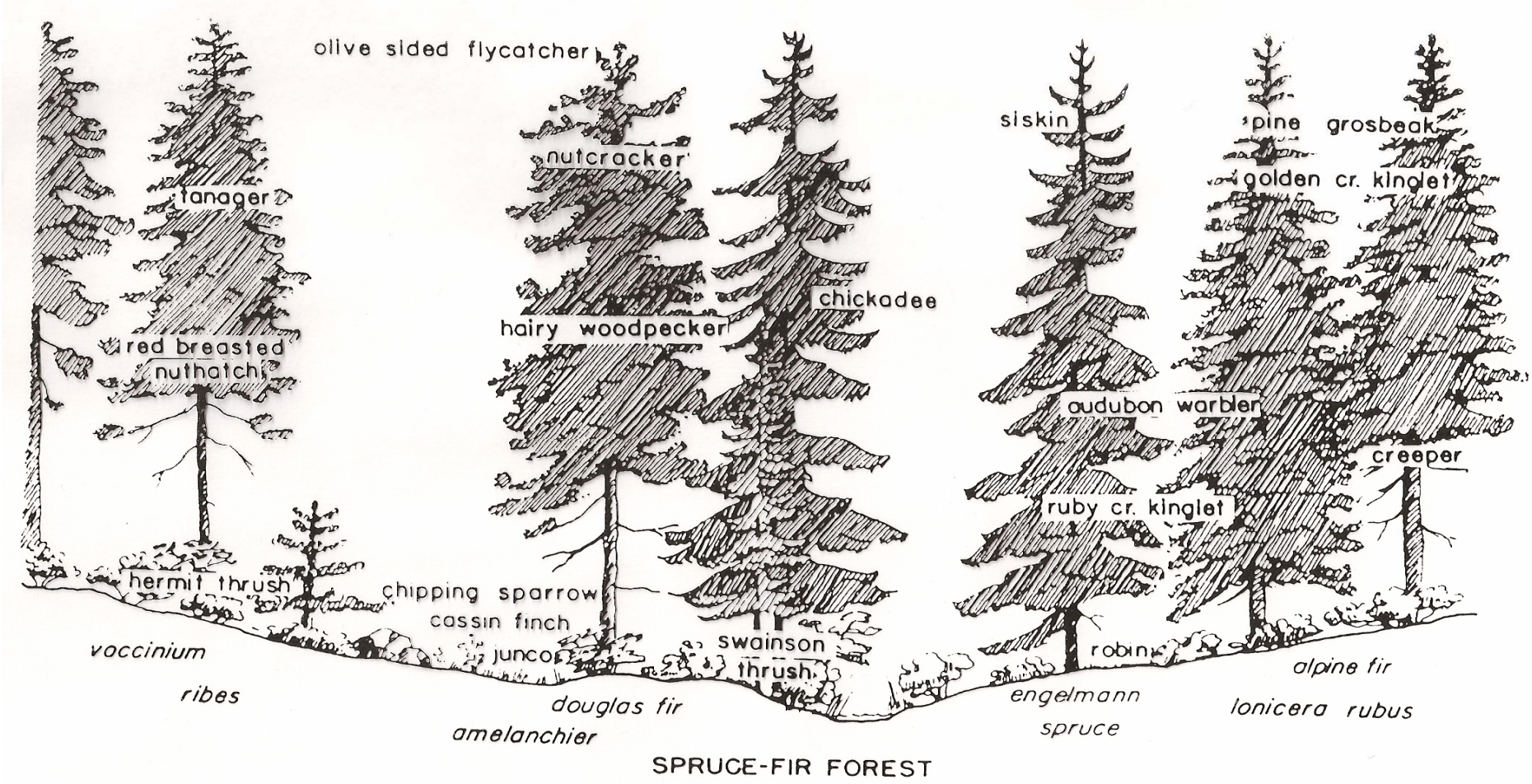


Figure 1. Positions of the centroids for five small mammal species in 3 - dimensional discriminant space. See text for explanation of the three axes. Numbers in parentheses represent the percentage of the total sample variance accounted for by each DF.



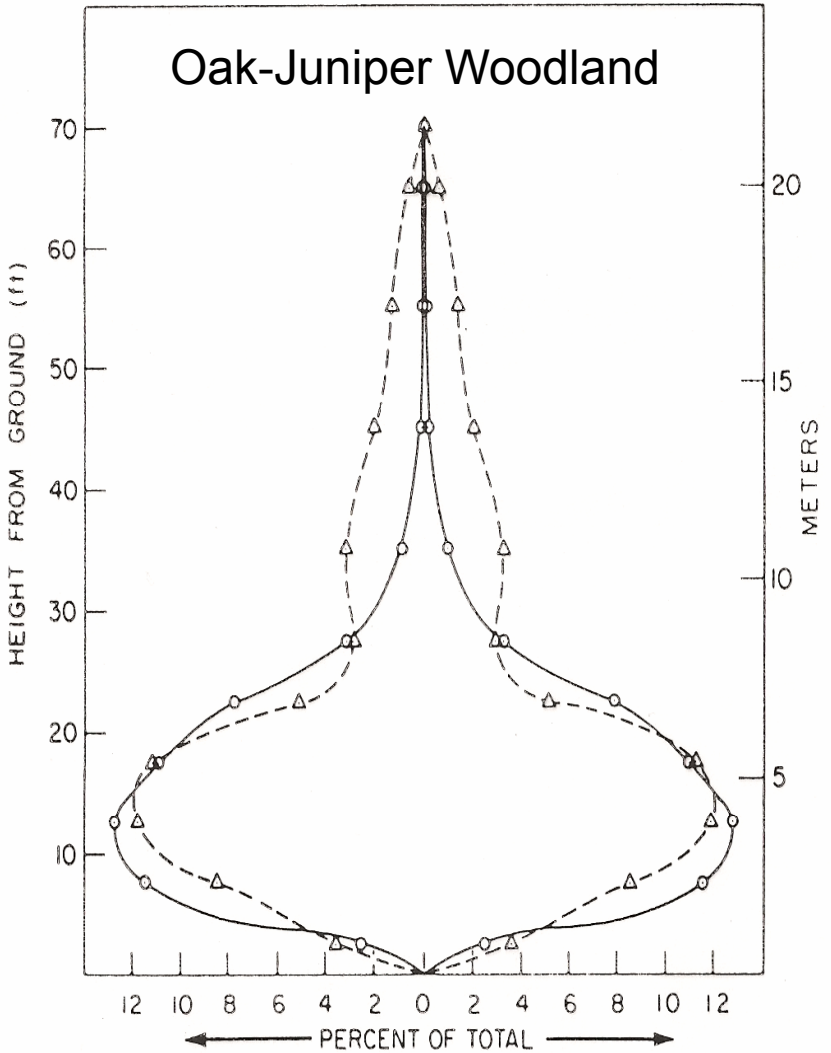
Foraging Niches of Birds in the Montane Forests

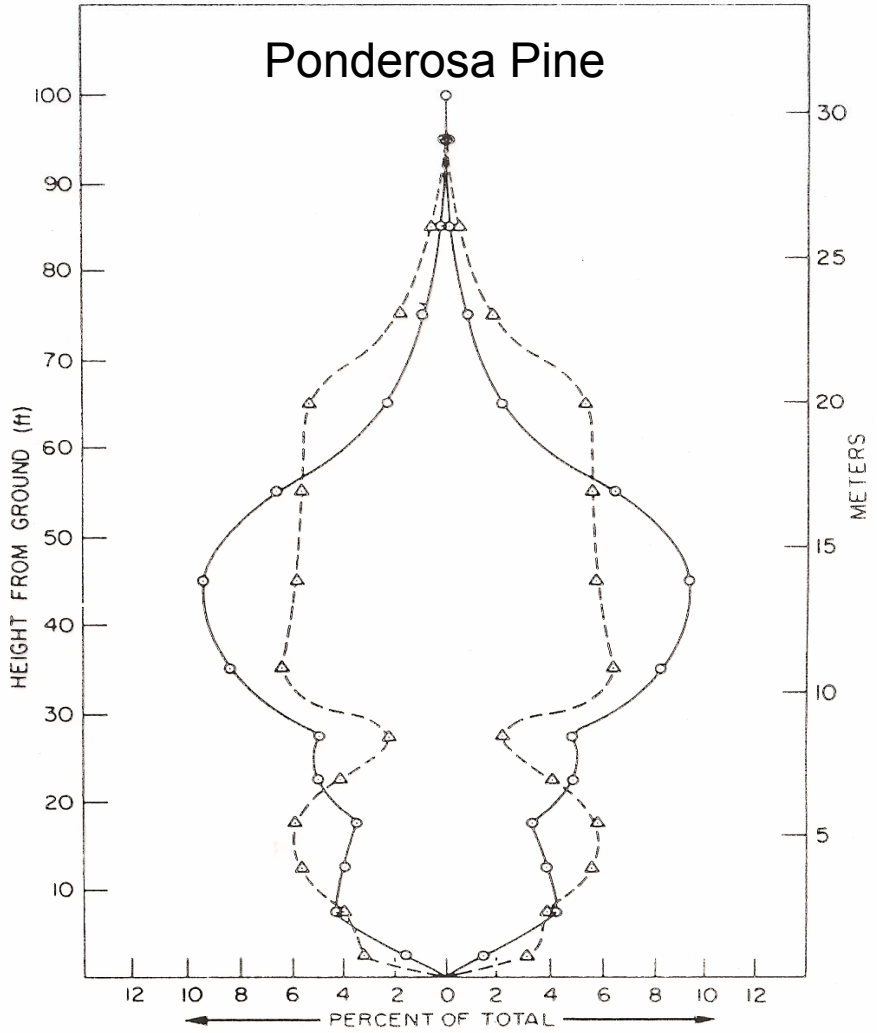


Conclusion

More structurally complex forests (fine scale/within stand diversity) support greater wildlife species diversity than do forests with simple structure.

Use by all bird species of tree foliage





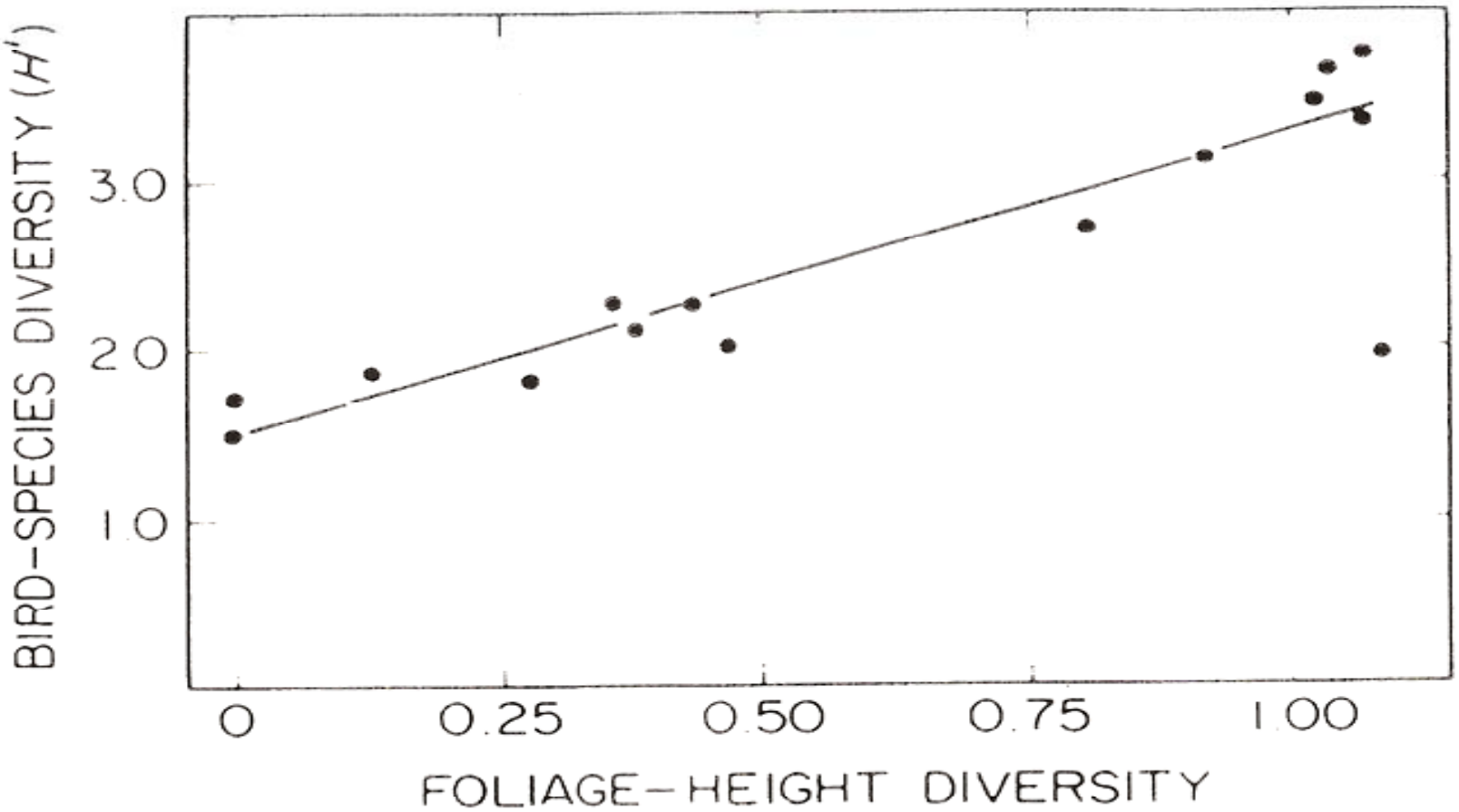
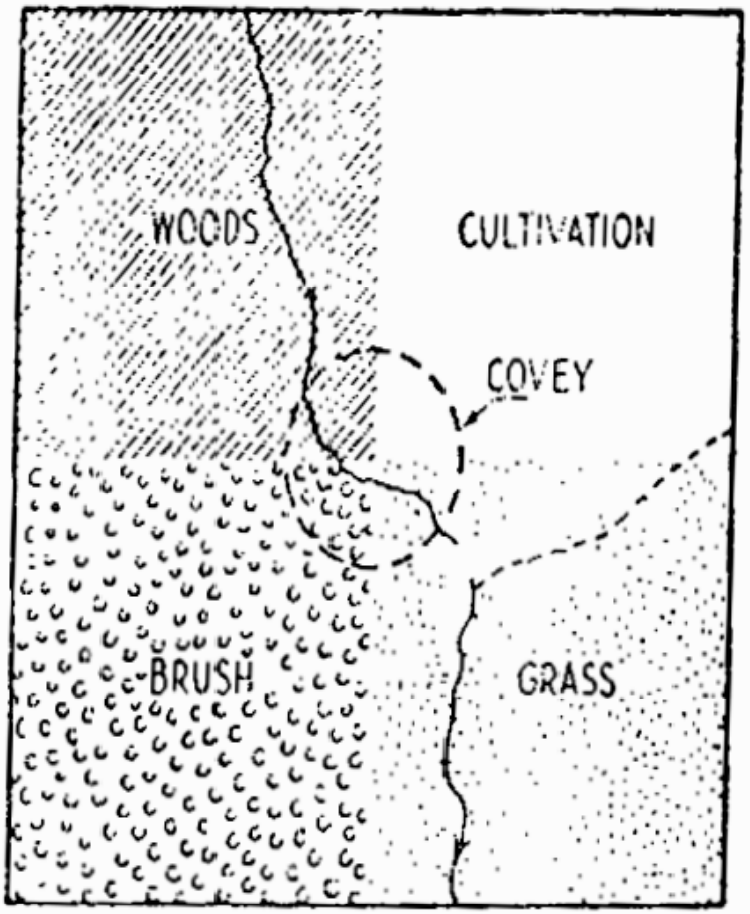


Fig. 16-13 Regression of bird-species diversity on foliage-height diversity (Karr and Roth 1971).

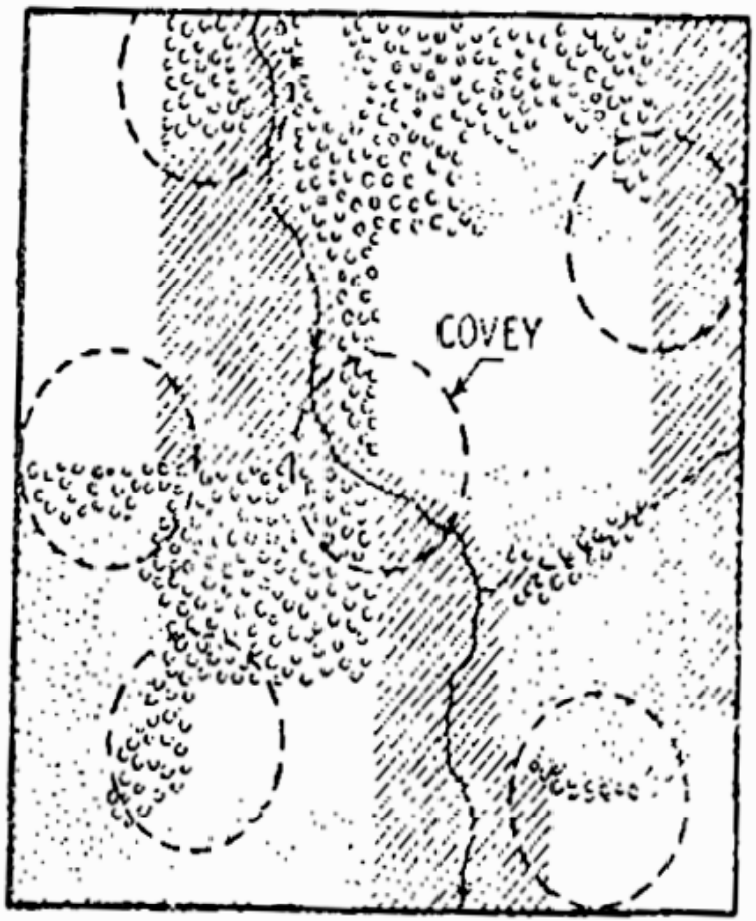
Course scale diversity over the landscape results in increased wildlife species diversity

Quail Covey Locations

Poor Interspersion (1 Covey)

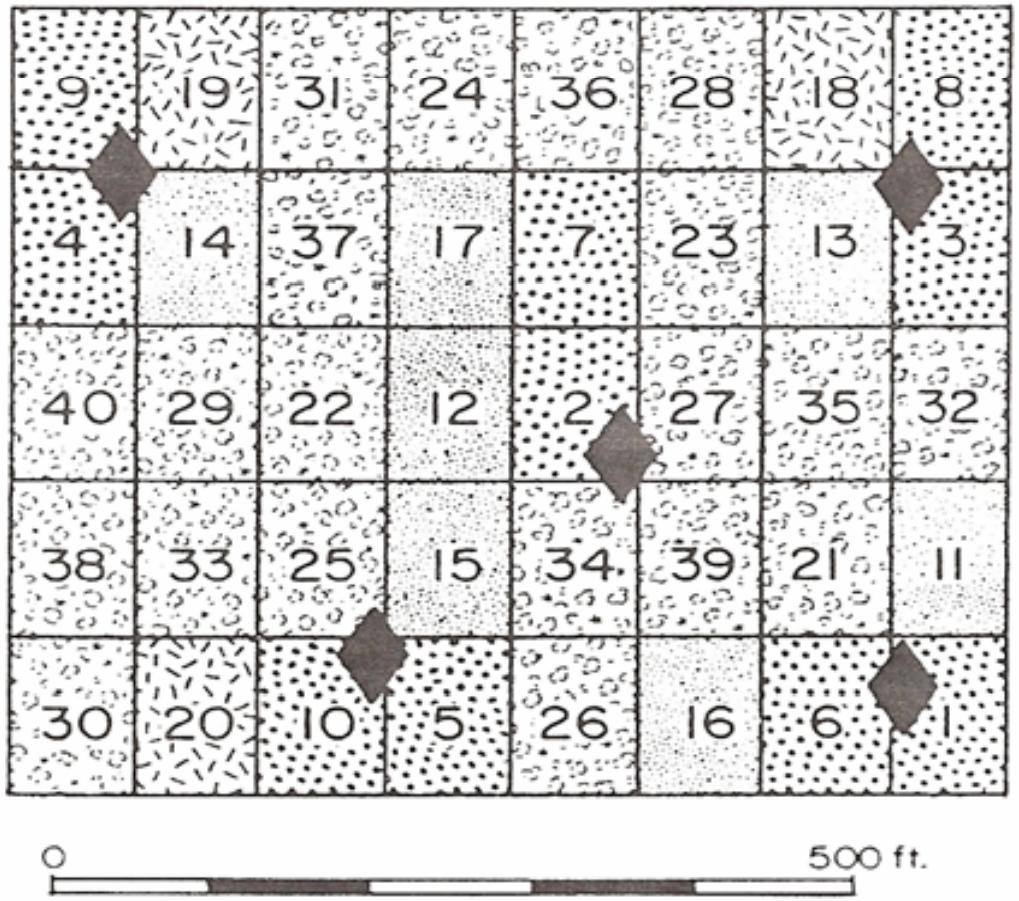


Good Interspersion (6 Coveys)



Ruffed Grouse Drumming Sites

40 Acre Aspen Stand



Recently Cut

Sapling Stand

Small Pole Stand

Original Forest

Expected Location of a Ruffed Grouse Drumming Site

Scaled Perception

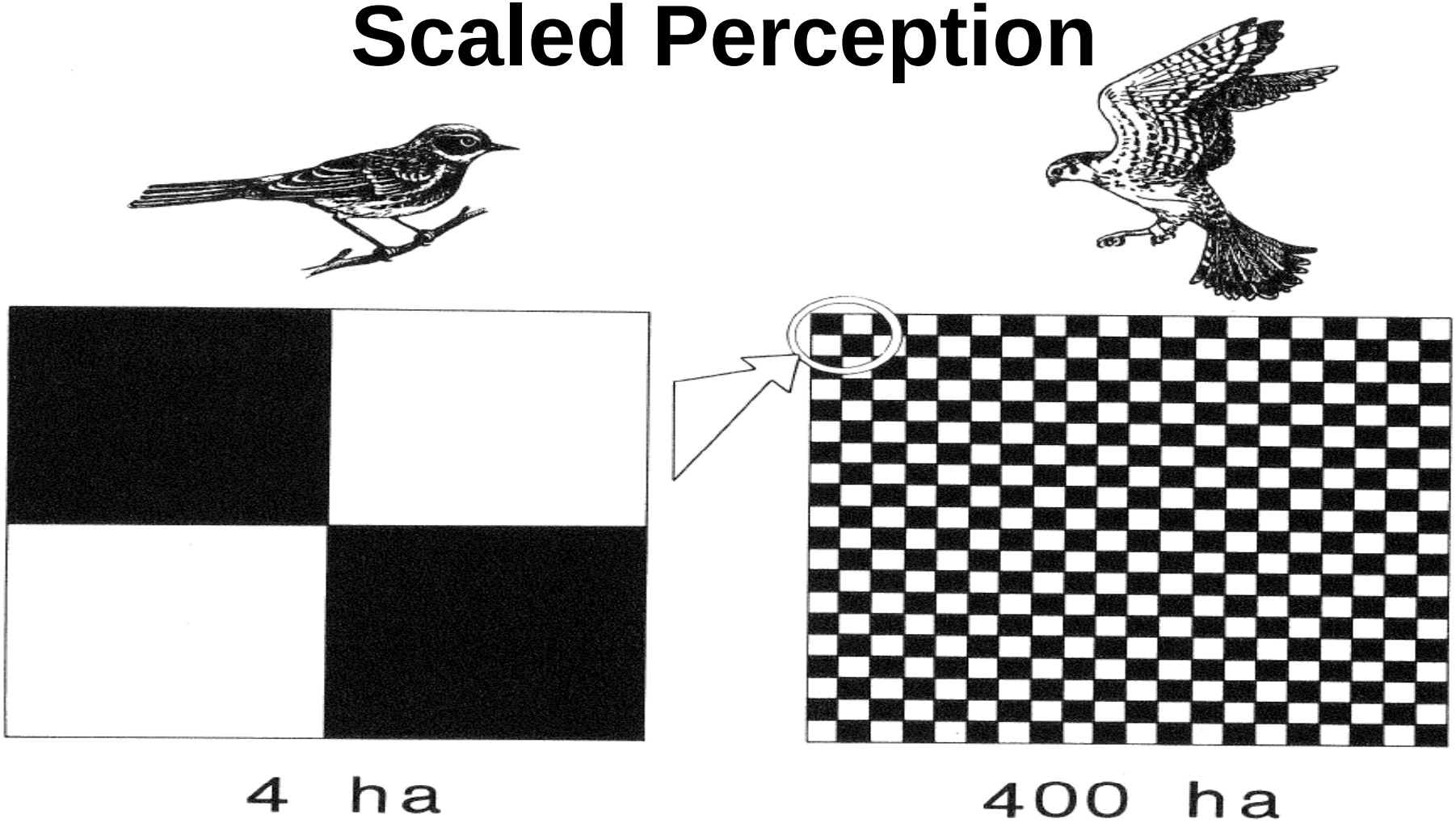


Figure 6.1 In each block the individual cells represent 1 ha of 60-year-old forest (black) or 5-year-old forest (white). The left figure represents the scale of perception of a yellow-rumped warbler; the right represents an American kestrel's scale. (Redrawn from Hunter 1986)

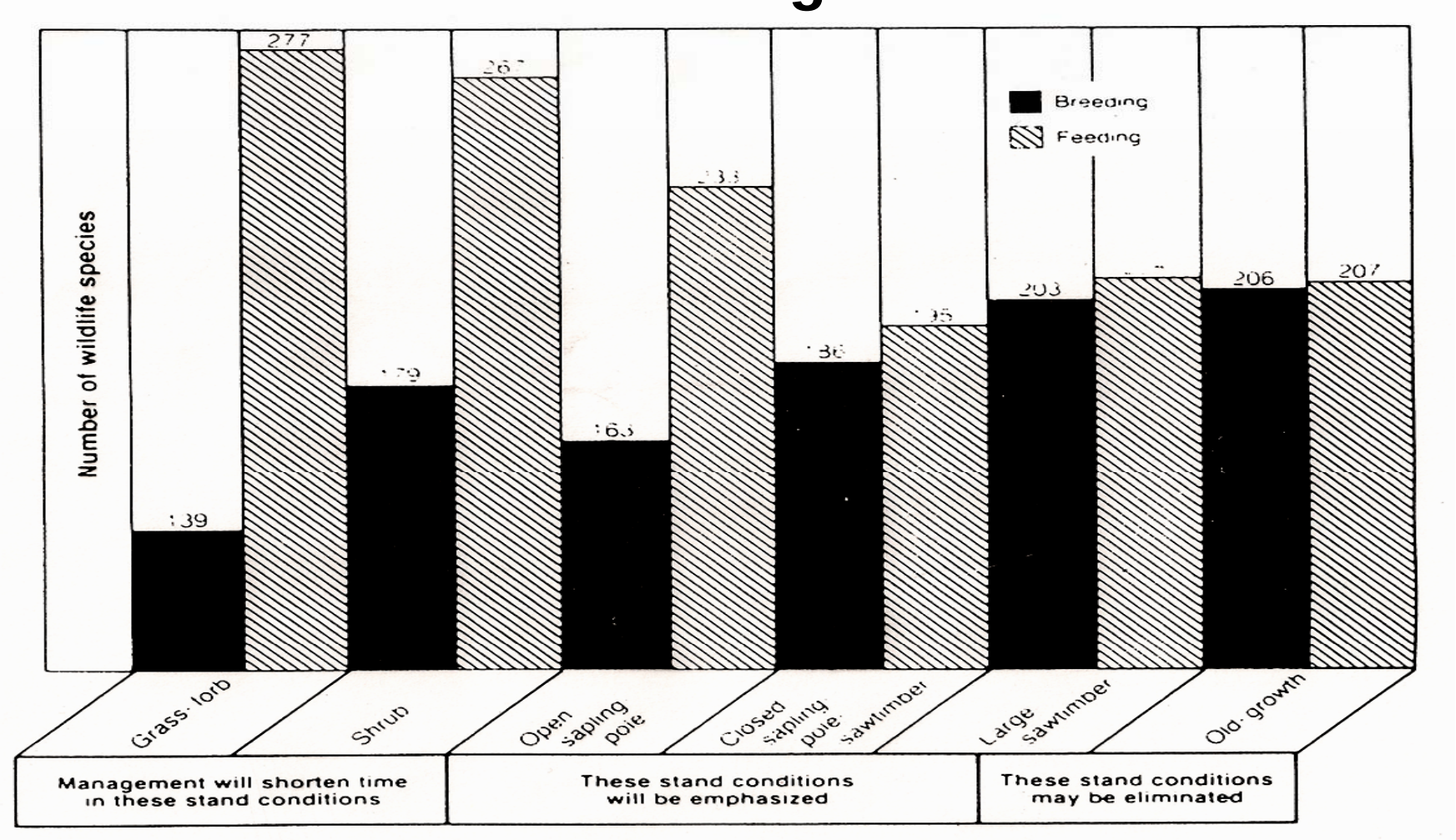
Structure Based Management

- **Diversity of Stand Structure Types**
  - Regeneration
  - Closed Single Canopy
  - Understory
  - Layered
  - Older Forest Structure

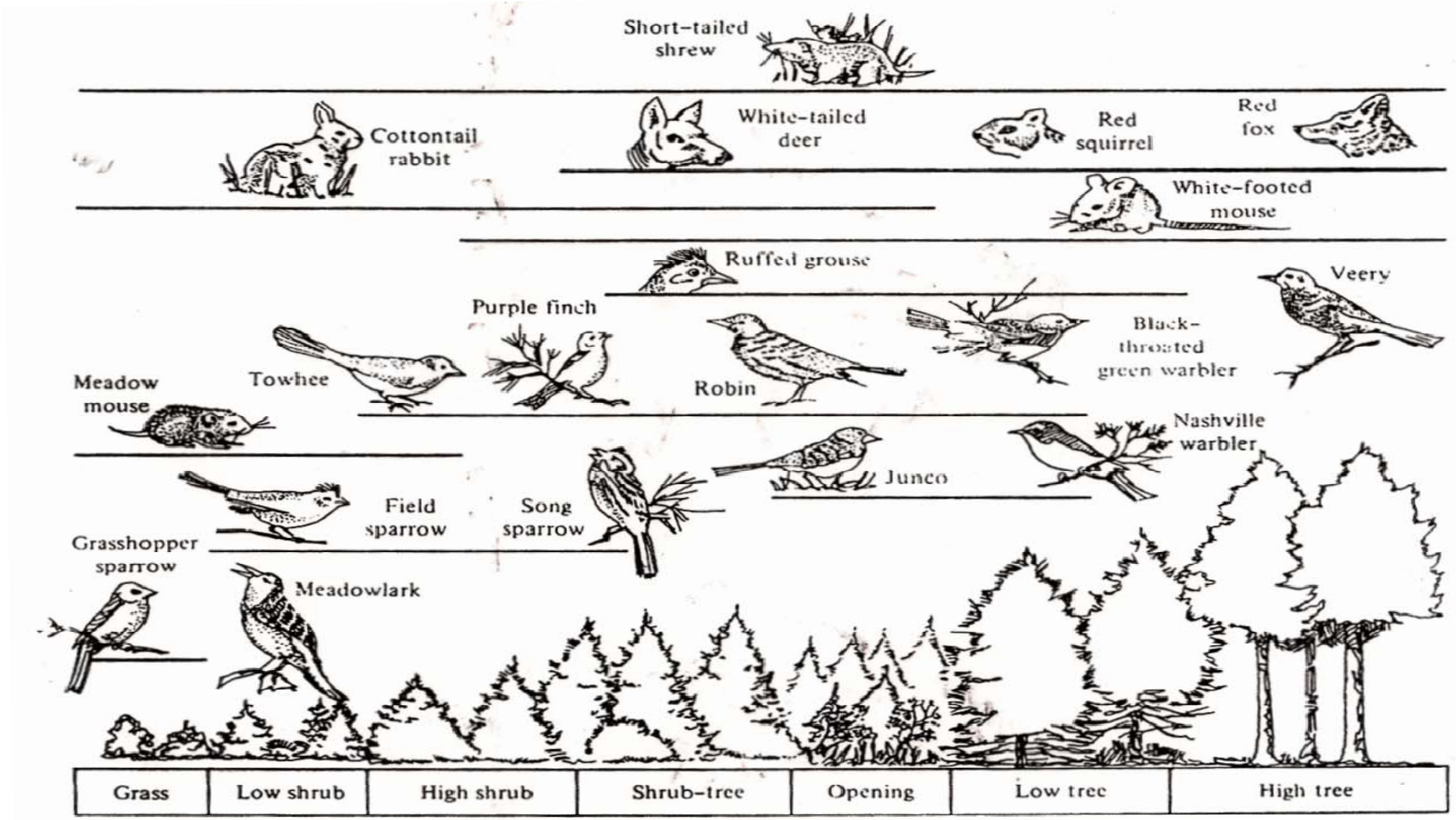
- **Include wildlife habitat components within stands**
  - Layering
  - Decadence
    - Snags
    - Down wood
    - Old growth trees
  - Tree Species Diversity
    - Including hardwoods
  - Herb Shrub Consideration
  - Gaps

- **Landscape Design**
  - Mini-fragmentation
  - Maxi-fragmentation

Number of wildlife species oriented to each stand condition and the potential effects of intensive timber management



Sequence of animals associated with different structures in a pine plantation



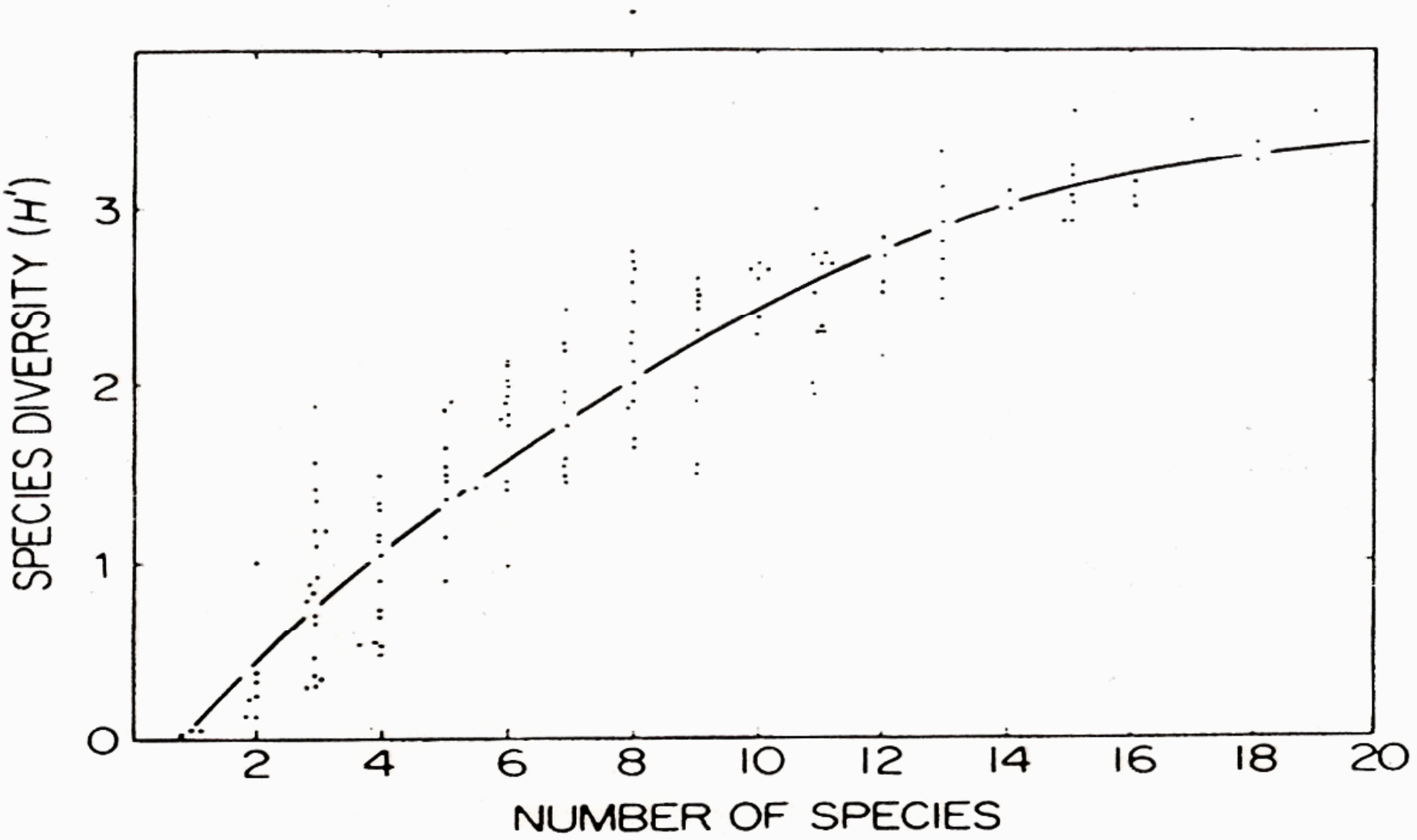


Fig. 16-8 Relation of the species diversity index to the number of tree species (from Monk 1967).

Bird communities in commercially thinned and unthinned Douglas-fir stands of western Oregon

Joan C. Hagar, William C. McComb, and William H. Emmingham

Abstract We compared abundance and diversity of breeding and winter birds between commercially thinned and unthinned 40- to 55-year-old Douglas-fir (*Pseudotsuga menziesii*) stands in the Oregon Coast Ranges. Abundance of breeding birds was greater in thinned stands. Bird species richness was correlated with habitat patchiness and densities of hardwoods, snags, and conifers. During the breeding season, Hammond's flycatchers (*Empidonax hammondii*), hairy woodpeckers (*Picoides villosus*), red-breasted nuthatches (*Sitta canadensis*), dark-eyed juncos (*Junco hyemalis*), warbling vireos (*Vireo gilvus*), and evening grosbeaks (*Coccothraustes vespertinus*) were more abundant in thinned than unthinned stands. Pacific-slope flycatchers (*Empidonax difficilis*) were more abundant in unthinned stands. Golden-crowned kinglets (*Regulus satrapa*), gray jays (*Perisoreus canadensis*), and black-throated gray warblers (*Dendroica nigrescens*) were more abundant in unthinned than thinned stands, but these patterns were inconsistent between seasons, regions, or years. Stand-scale habitat features were associated with the abundance of 18 bird species.

Key words avian-habitat, forest-management, habitat-management, silviculture, USA

Mechanisms

- Insect Diversity

Mechanisms

- Decadence / Cavities

Mechanisms

- Fruit-producing trees & shrubs

Mechanisms

- Stand Structure / Diversity
- “Overall…mixed red alder – conifer stands provided more heterogeneous structures than pure conifer stands, with more even diameter distributions, multiple canopy layers, and similar numbers of large diameter conifers.” (Deal et al. 2004)
- Provide characteristics of older forests.

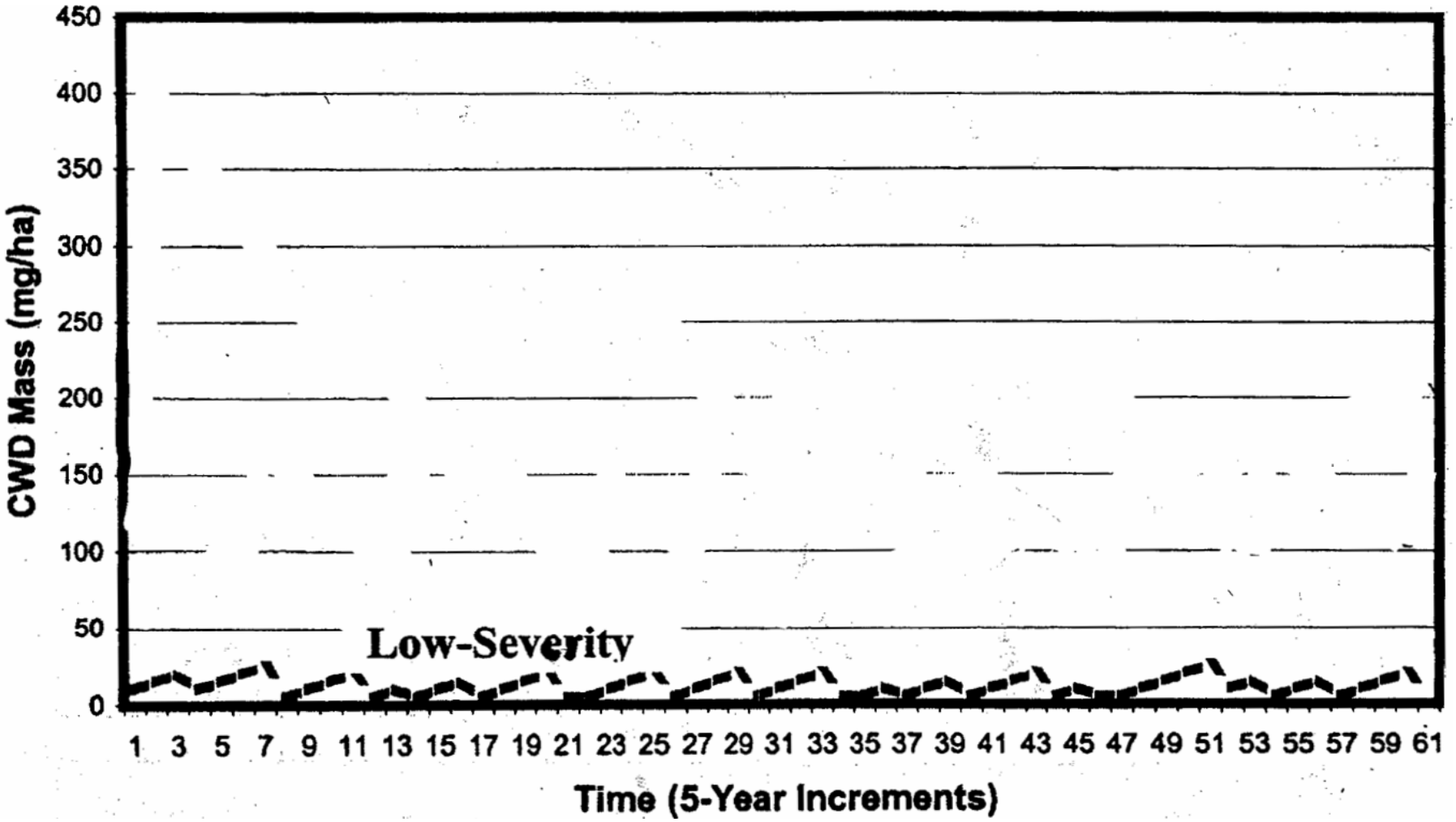
Ecosystem Management

- Inherent Disturbance Regimes

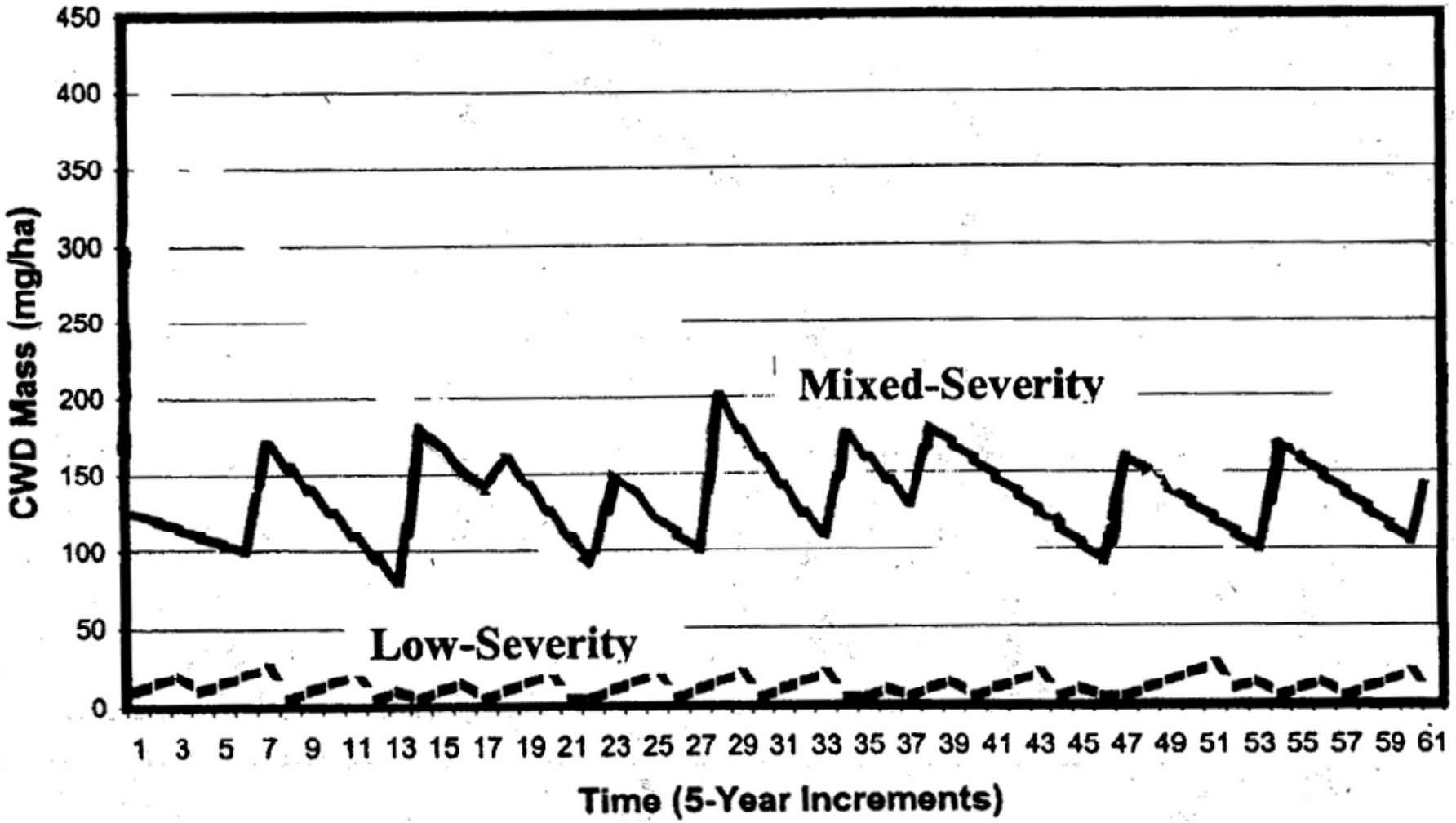
Fire Regimes

Return Interval	Intensity	Example
Frequent	Low	East-side Ponderosa Pine
Infrequent	High	Northwest Oregon D-fir / Hemlock
Mixed	Patchy	Southwest Oregon Mixed Conifer

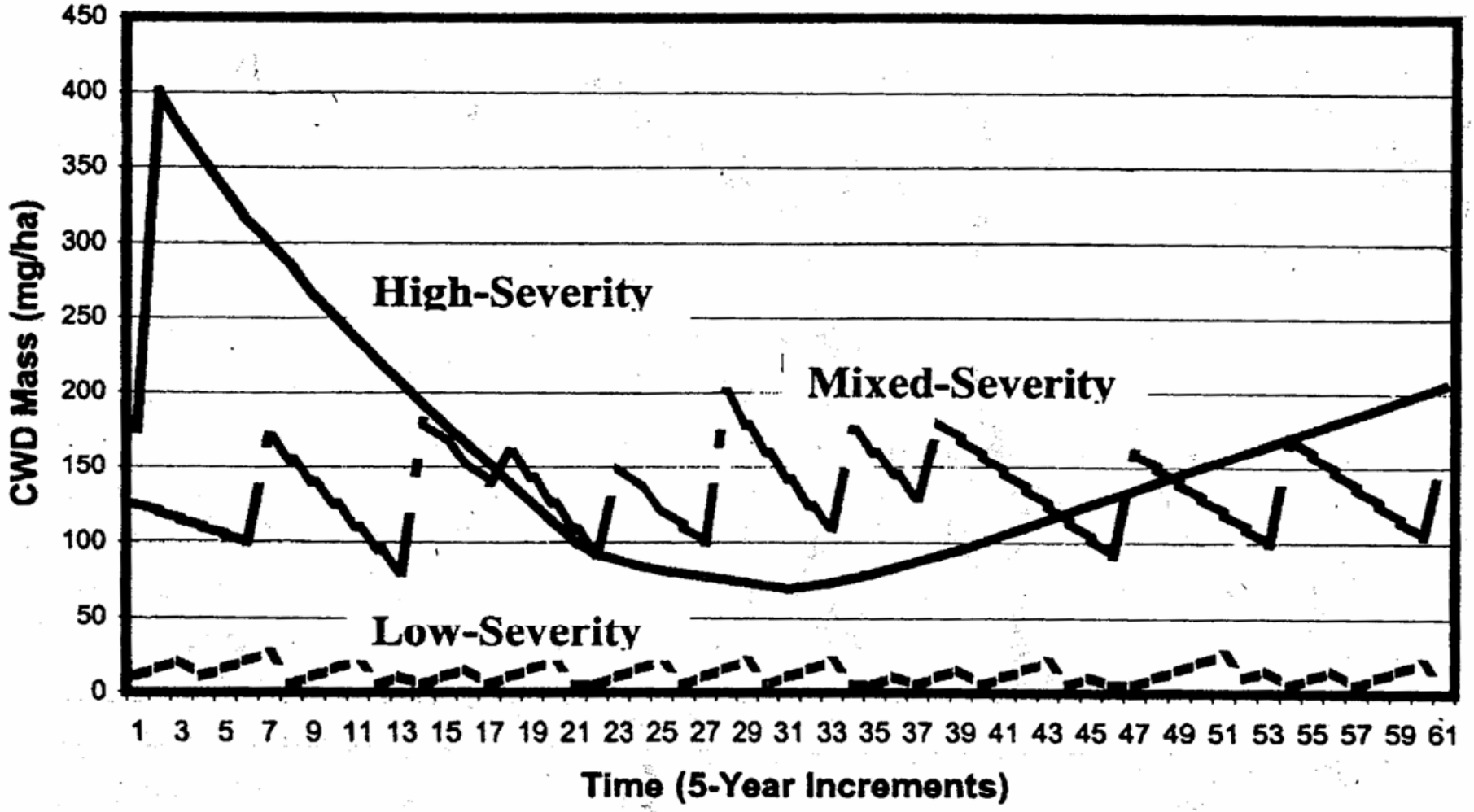
CWD Over Time



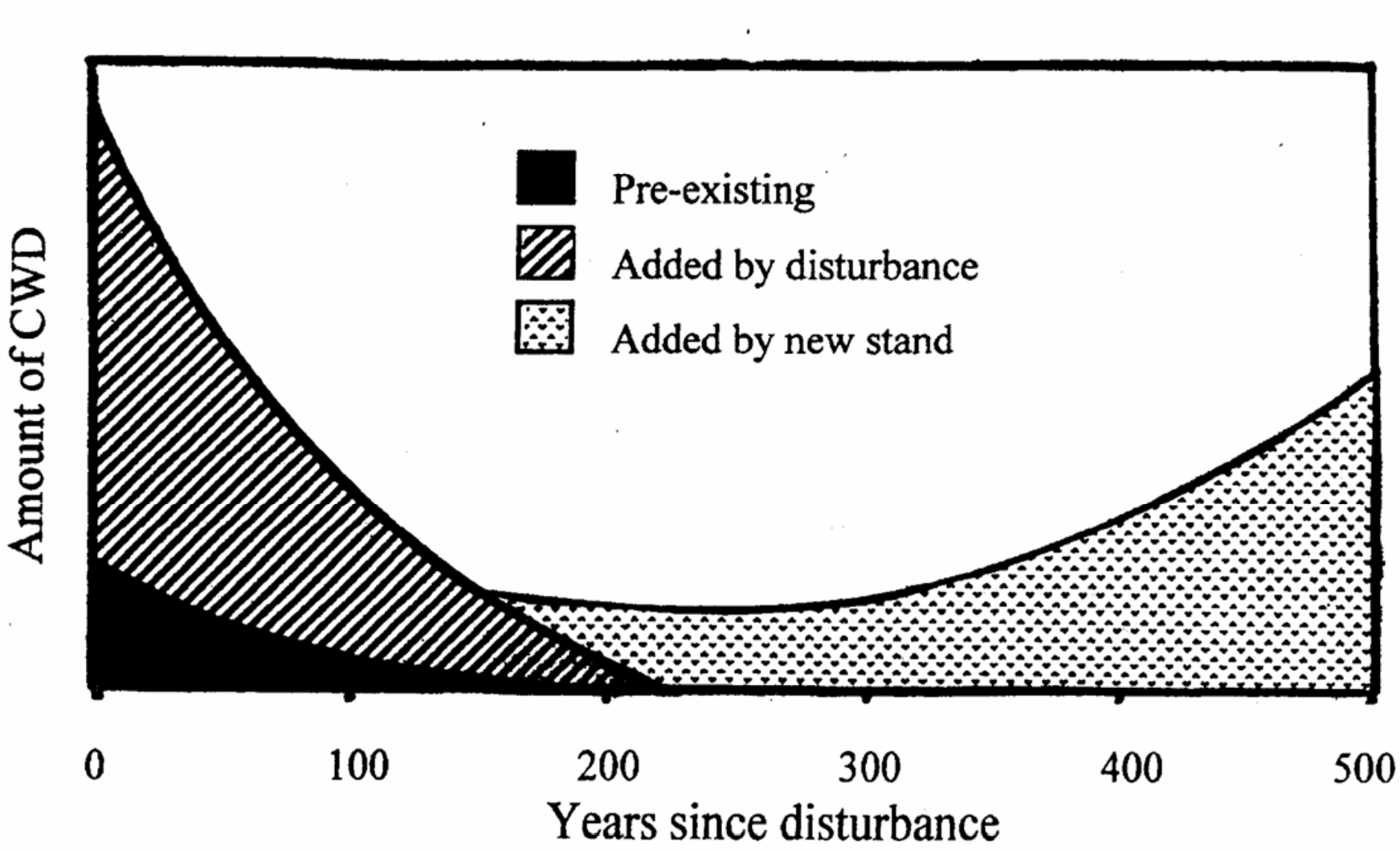
CWD Over Time



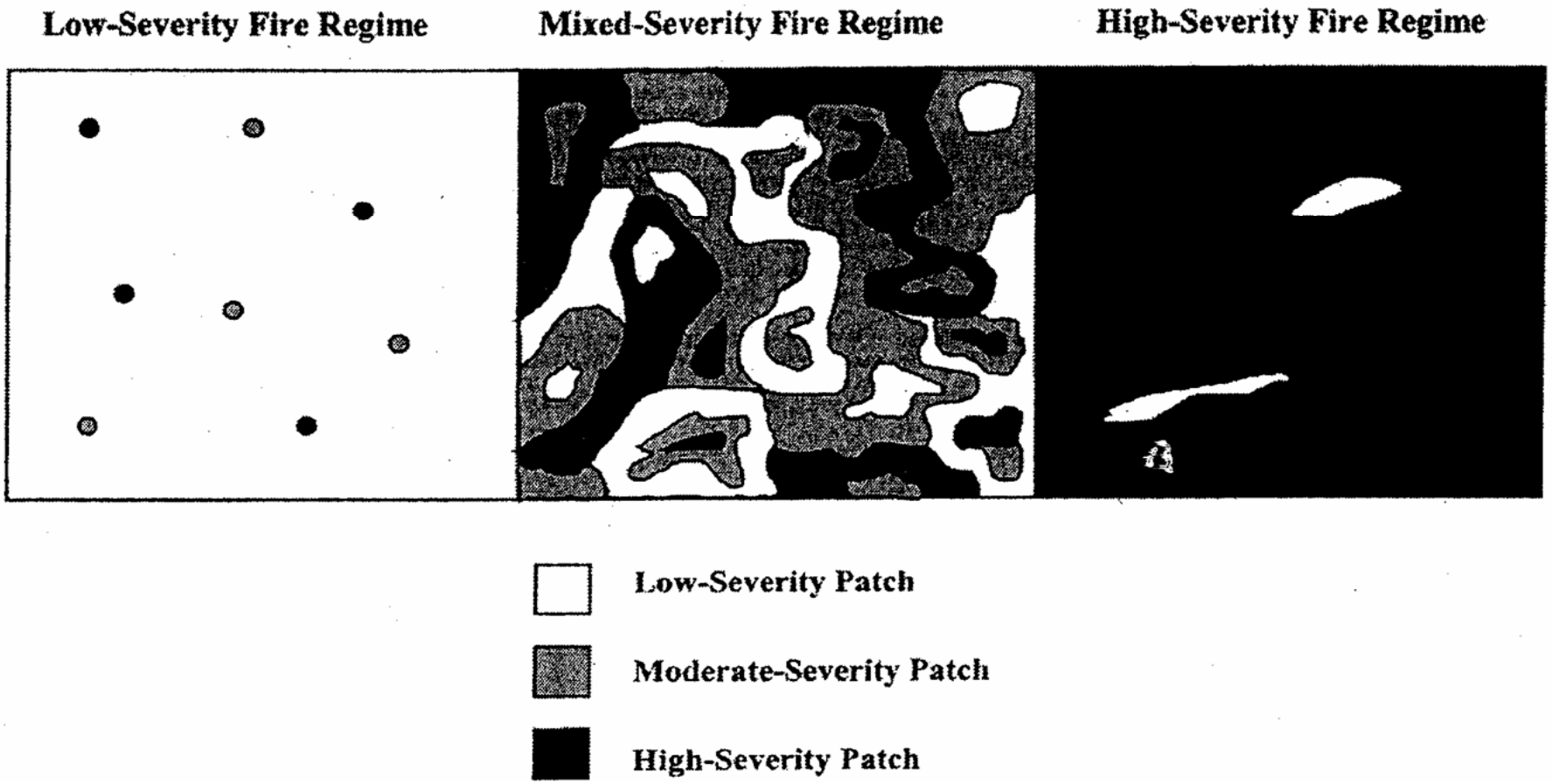
CWD Over Time



Source of CWD



Distribution Pattern Varies with Severity Regime



Enhances & Maintains Long Term Soil/Site Productivity

- Major reservoir & long-term source of nutrients & organic material
- Increased water holding capacity
- Promotes development of soil structure / better water infiltration & nutrient cycling
- Enhances soil cation-exchange capacity / enhances nutrient retention & availability
- Sites of nitrogen fixation by bacteria / gradual input accumulates over time

Biotic Diversity

- **Organisms that feed on the wood**
  - **Ants & Termites**
- **Microorganisms & fungi on the surface**
  - **Bacteria, Yeasts, & Micorhizzae**
  - **Animals that eat microorganisms**
    - **Mites & beetles**
    - **Animals that eat these animals**
      - **Shrews, spiders, snakes, salamanders**

Biotic Diversity (continued)

- Plants that root on the log
  - Hemlock, spruce, huckleberry, mushrooms
- Animals that use logs for cover
  - Rodents, snakes, salamanders, insects
- Animals that eat detritus & feces from plants & animals
  - Earthworms & mites

Other Drivers of Disturbance

- Windthrow
- Disease
- Insects

Conclusions

- We don’t know all the answers
- We never will know all the answers
- No matter what you do, there will be winners and losers
- The best way to maximize biodiversity is to maximize habitat diversity:
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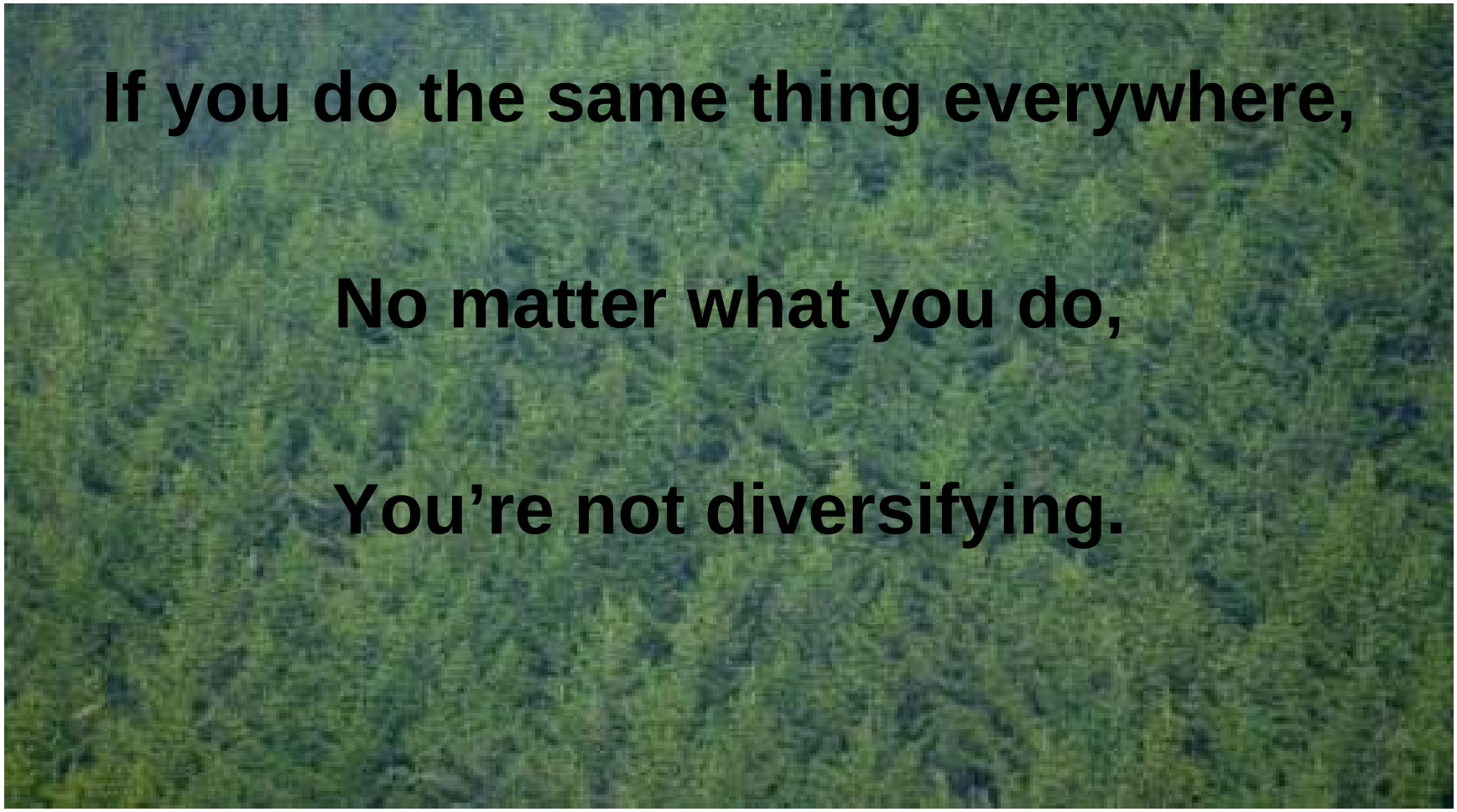
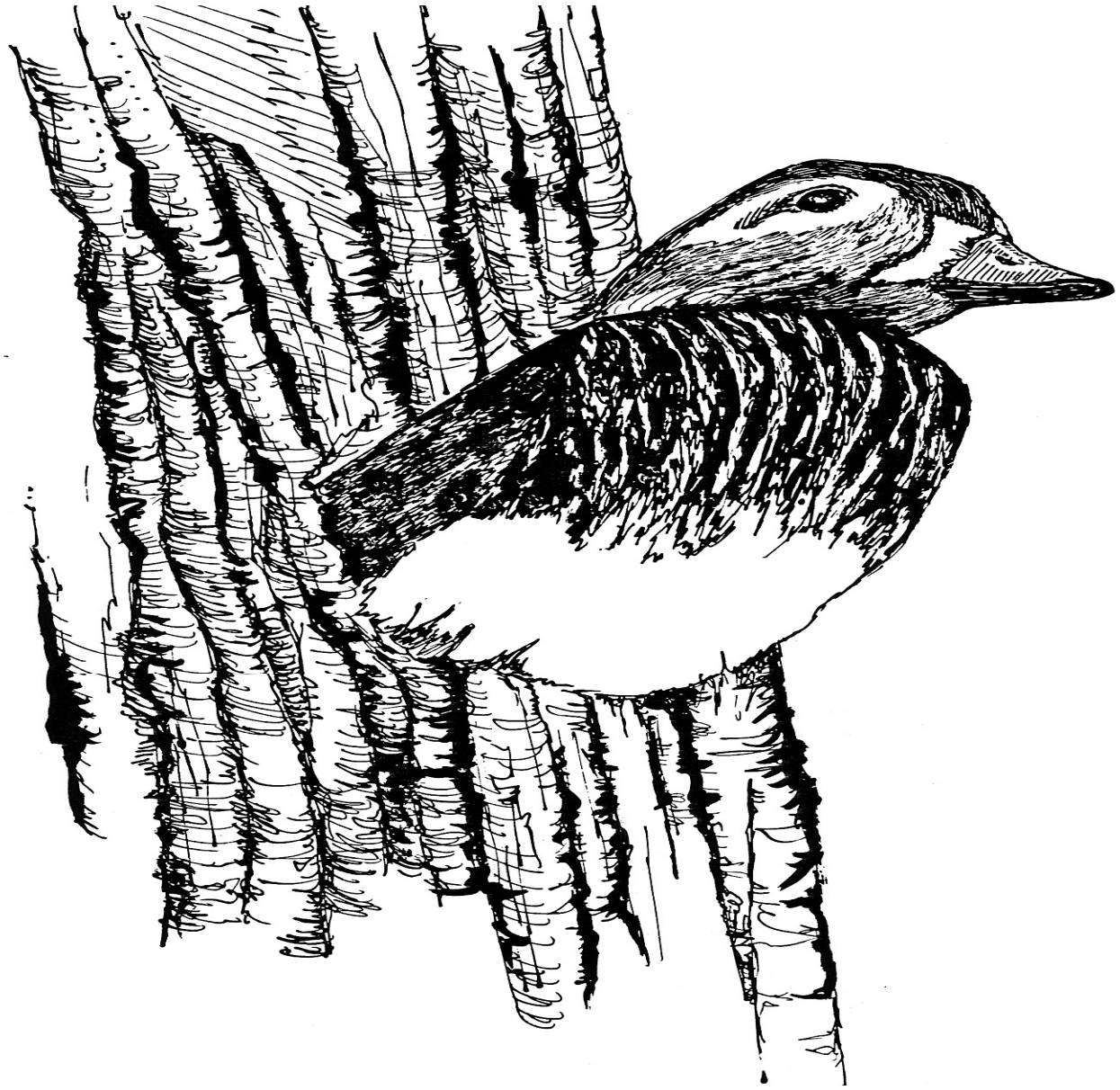
Talking Points





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