

# Biodiversity and Forest Management

## Concepts to Consider when Developing a Forest Management Strategy



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**‘Biodiversity’: a concept in search of a definition..**

➤ **“The variety of life and its processes”**

**(Noss and Cooperrider 1994)**

➤ **“Variety and variability among living organisms and the ecological complexes in which those organisms occur, encompassing many levels of biological organization and spatial extent”**

**(Office of Technology and Assessment 1987)**





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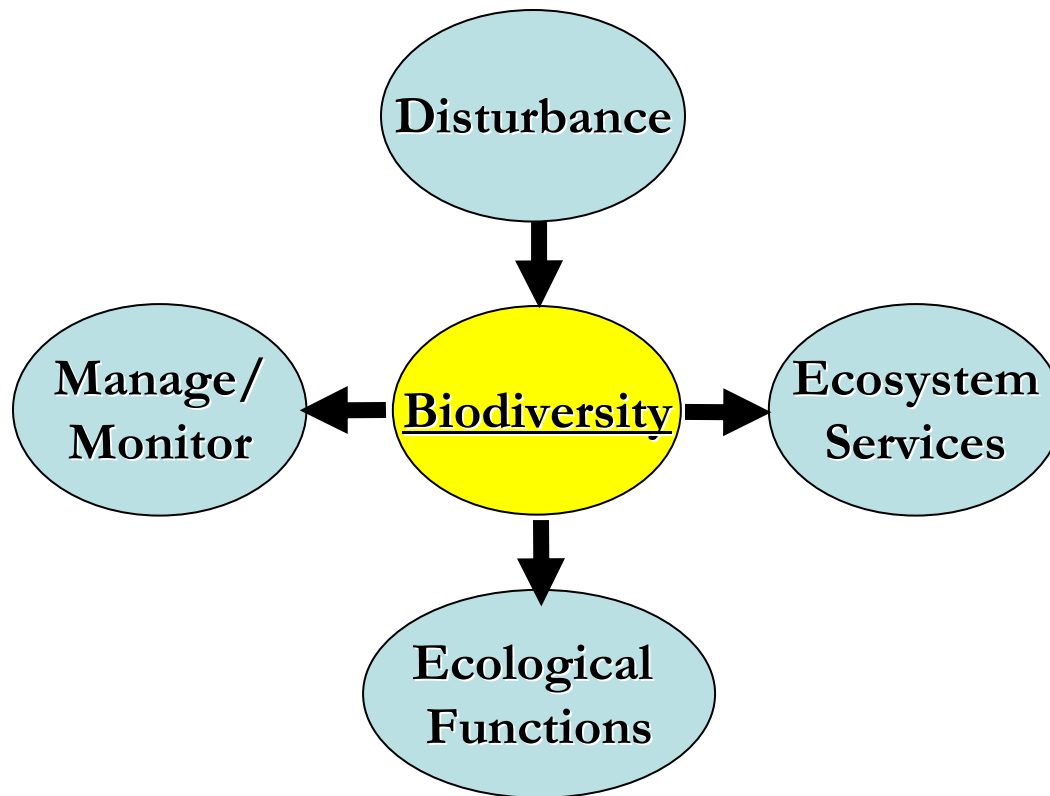




## The 3 Organizational Pillars of Biodiversity...

- Genetic/Individuals
- Species/Populations
- Communities/Ecosystems





*Four Questions to Consider...*

1. How does disturbance affect forest biodiversity?
2. How does biodiversity affect ecosystem services?
3. How does biodiversity affect ecological functions?
4. How can biodiversity be monitored and managed?

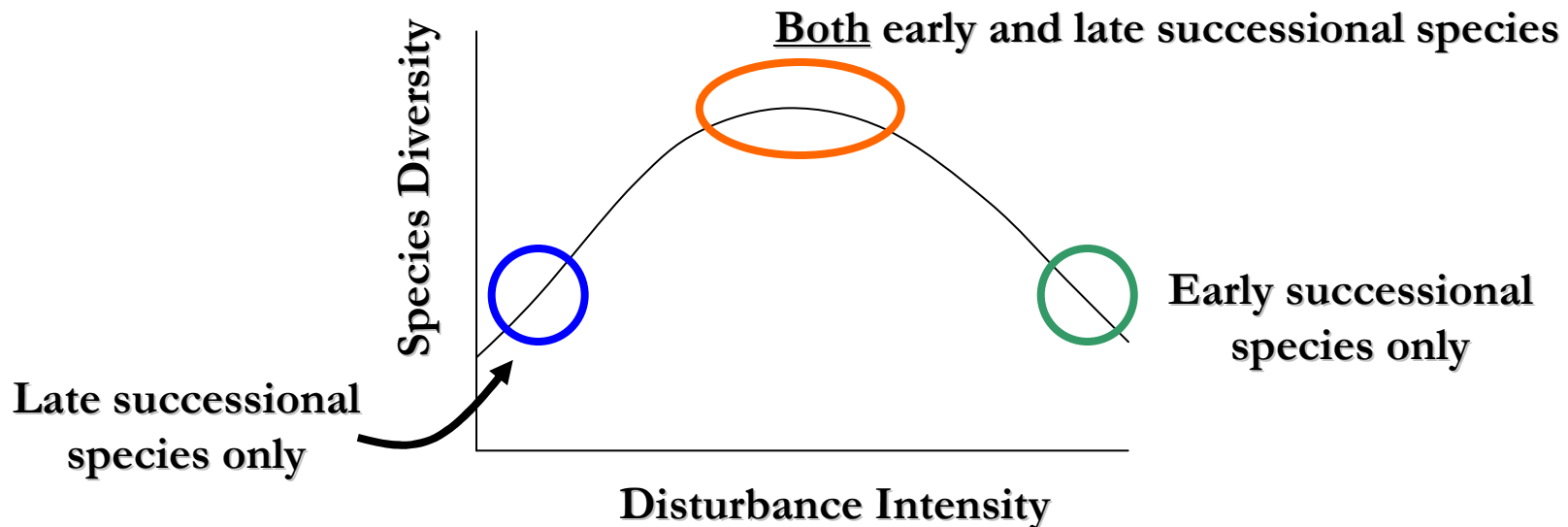
*From:* Marcot, B. G. 2007. *Biodiversity and the lexicon zoo.* Forest Ecology and Management 246:4-13



**Q: How does disturbance affect forest biodiversity?**

➤ Disturbance = natural & human-caused

- Intensity matters: Intermediate levels of disturbance result in the most diverse system





***Q: How does disturbance affect forest biodiversity?***

- **Higher diversity = higher ecosystem resiliency**
  - **Conversely, low-diversity systems are more susceptible to major disturbance events (e.g., pests & monoculture forest)**
- **Fragmentation reduces biodiversity**
  - **“Permanent disturbance”**
- **Human-caused disturbances can compound to affect overall biodiversity and resilience**





***Q: How does biodiversity affect ecosystem services?***

- Ecosystem services = process and resources important to people (e.g., food and water production, pollination, recreation)
- More diverse systems are more productive, stable
- More diverse systems provide a wider range of services
- Ecosystems with greater integrity provide services more reliably
  - Ecological integrity: the degree to which native or historic components and functions have been retained
  - High resource sustainability







***Q: How does biodiversity affect ecological functions?***

- Ecosystem functions = natural process and functions that don't necessarily affect humans directly
- More diverse systems provide for greater arrays of ecological functions
- More diverse systems support more rare species
  - Importance of “naturally rare” species to eco-function:
    - May fill narrow niches
    - May add redundancy to functions, increasing resiliency





***Q: How can biodiversity be monitored and managed?***

**Practical strategies to achieve general biodiversity principles**

(*from*: Lindenmayer, D. B., J. F. Franklin, and J. Fischer. 2006. General management principles and a checklist of strategies to guide forest biodiversity conservation. *Biological Conservation* 131:433-445)

**Principle 1. Maintain Connectivity**

- Riparian and other forest corridors
- Retain vegetation across disturbed areas





## Management Principles for Forest Biodiversity

*(from: Lindenmayer, D. B., J. F. Franklin, and J. Fischer. 2006. General management principles and a checklist of strategies to guide forest biodiversity conservation. Biological Conservation 131:433-445)*

### Principle 2. Maintain Landscape Heterogeneity

- Landscapes are naturally heterogeneous – no “one-size fits all” approach
- Management activities should reflect natural disturbance regimes appropriate for area of interest
- Protect/buffer sensitive or unique habitats





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### Principle 3. Maintain Stand-level Structural Complexity

- Canopy gaps, dead wood, trees in various stages of growth, etc.





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### Principle 4. Maintain Intact Aquatic Ecosystems

- Riparian corridors
- Preserve/ buffer sensitive aquatic habitats





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### Principle 5. Human disturbance regimes should mimic natural disturbance

- Local organisms adapted to historic disturbance regimes
- Intensity, frequency, and amount of residual material need to be considered



*Tornado damage, Hoosier NF*





## Summary...

- **Biodiversity = Variety of life and its processes**
- **Disturbance drives biodiversity**
- **Biodiversity affects ecosystem services, functions, processes**
- **Five Principles to Manage Biodiversity:**
  1. **Maintain connectivity**
  2. **Maintain landscape heterogeneity**
  3. **Maintain stand-level structural integrity**
  4. **Maintain intact aquatic systems**
  5. **Model human disturbance after natural disturbance regimes**

