

# Lecture 10

**What is an Ecosystem?**

# Ecosystem

- **First proposed by Tansley in 1935**
- **Modified over time as we learned more about interactions between plants, between animals, and between plants and animals**

# Whittaker (1975)

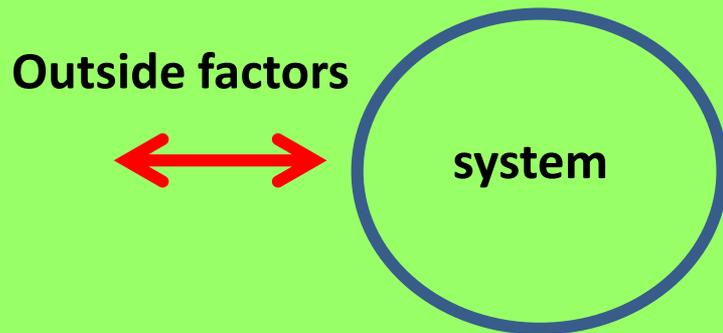
**“an ecosystem is a functioning system that includes an assemblage of interacting organisms (plants, animals, and saprobes) and their environment, which acts on them and on which they act”**

- **System**
- **Interacting**
- **Environment**
- **Acts on them**
- **On which they act**

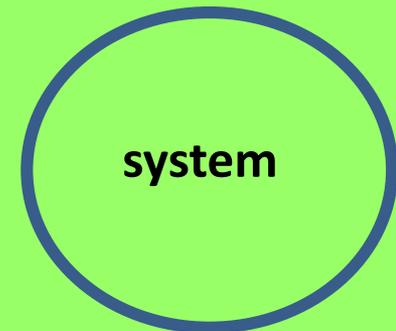


# Systems Theory

- **Boundary**
  - Space
  - Time?
- **Open vs. closed**



**Open system**

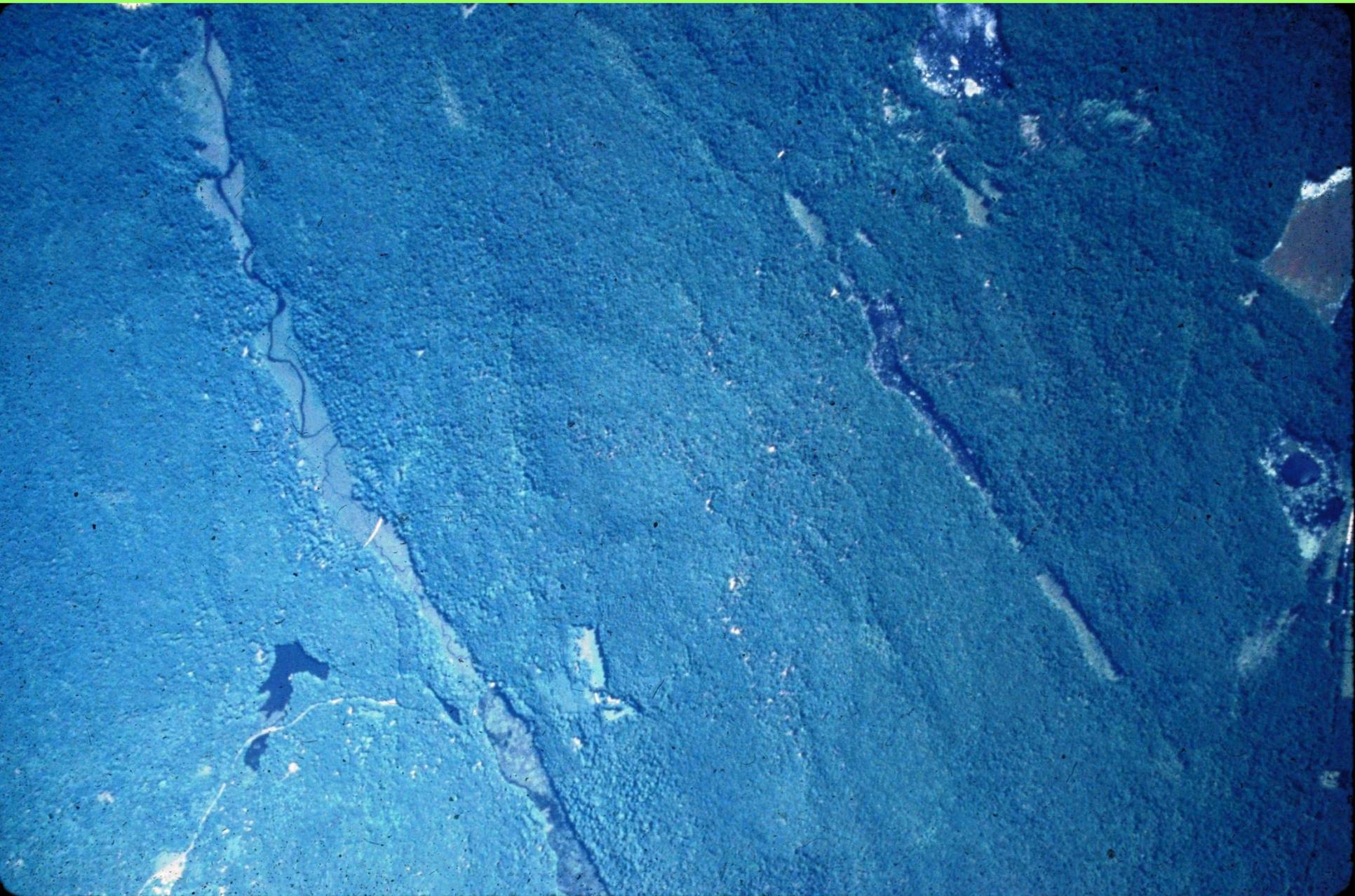


**Closed system**

**Ecosystems are considered open systems.**

**But where are the boundaries?**

**The watershed concept**



# Trophic Levels

**Level 1: Plants and algae make their own food and are called primary producers.**

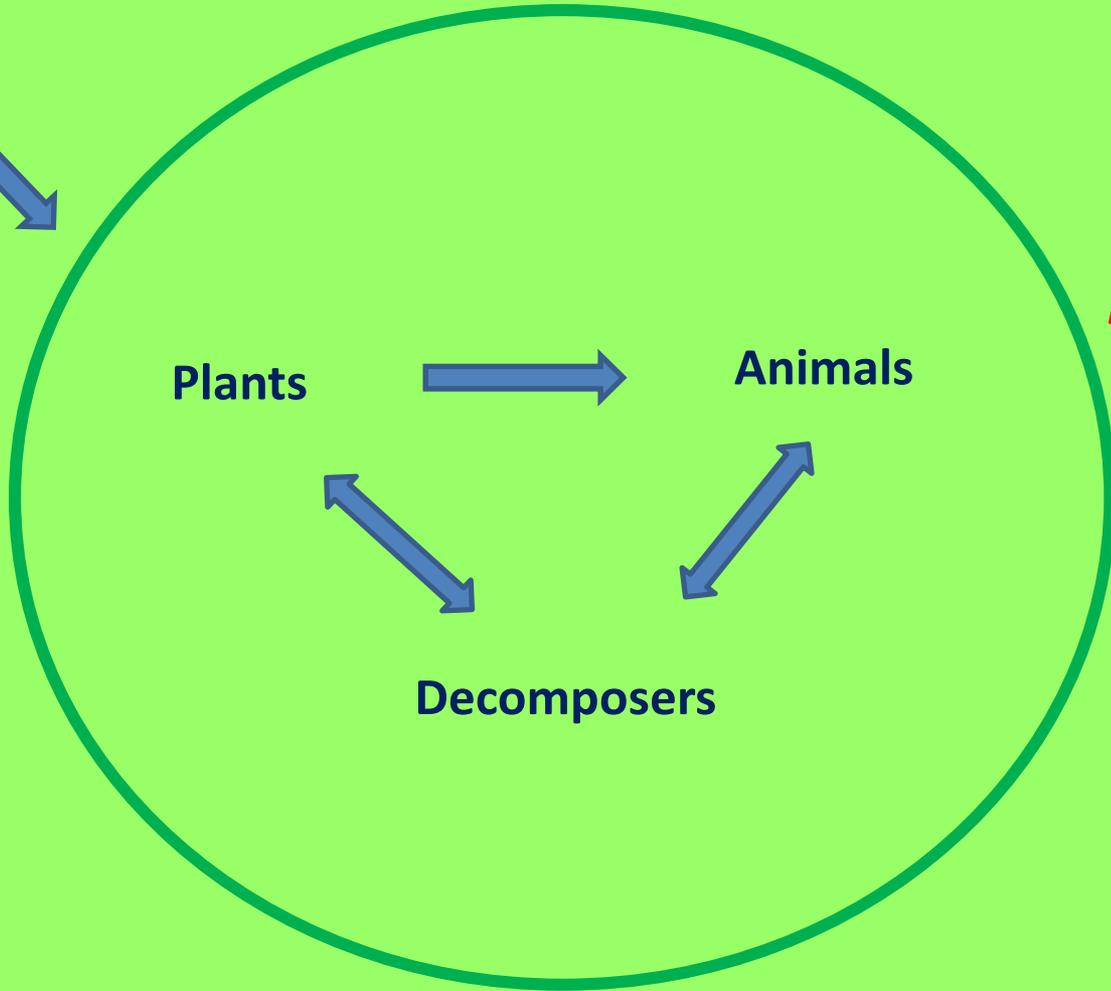
**Level 2: Herbivores eat plants and are called primary consumers.**

**Level 3: Carnivores which eat herbivores are called secondary consumers.**

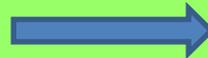
**Level 4: Carnivores which eat other carnivores are called tertiary consumers.**

# Energy Flow

Sunlight



Plants



Animals



Decomposers

Fire



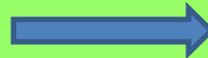
Harvested  
Products

# Nutrient Flow

atmosphere



Plants



Animals



Decomposers



Soil and water





Photo from Steve Mitchell



Photo from Steve Mitchell

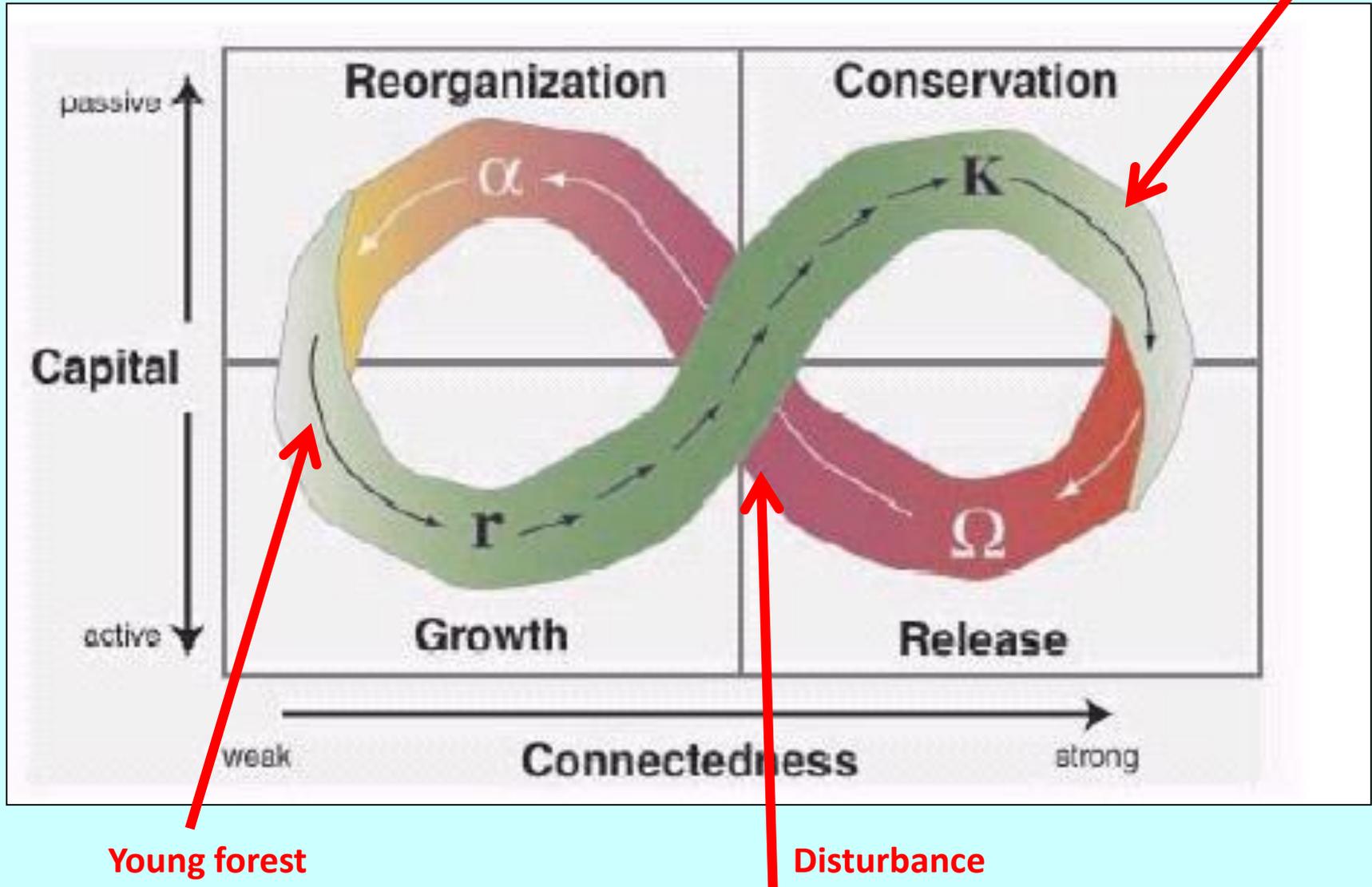


Photo from  
Steve  
Mitchell

# Ecosystems are Dynamic

- **Structure is always changing**
- ***Autogenic* change**
  - Without outside influence
  - Are diseases autogenic?
- ***Allogenic* change**
  - Outside agent

# Holling



# Complex Adaptive Systems

- **Dynamic network of interactive systems**
  - Mycorrhizal connections
- **Energy flow**
- **Nutrient flow**

# Not a 'super-organism'

- **No natural selection at community level**
  - Need competition
  - Individual level
- **Plants rarely exhibit mutualism**
  - No food web between plants
  - Plant – animal interactions can
- **Redundancy**

# Role of Disturbances

- Resistant
  - Ecosystem property of remaining essentially unchanged
- Resilient
  - Ecosystem property of recovering quickly
  - Recovering to what?

# Ecosystem Management

- **Maintaining a healthy system**
  - What is “healthy”?
- **The heart of sustainability**
  - Meeting the needs of today and tomorrow