# Introduction to Ecology

*Applied Ecology (EES 4103)*
*Week 1*

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# Studying Ecosystems

What is an ecosystem?


Banks-Leite and Ewers, 2009

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## What is an ecosystem?

"A **spatially explicit** unit of the Earth that includes all of the organisms (**biota**), along with all components of the **abiotic** environment within its **boundaries"** (Likens, 1992)

**<u>Ecosystem Boundaries</u>**: Discontinuities **or** gradients in environmental conditions and a shift in biotic communities.

Neighboring ecosystems experience ***<u>flows</u>*** **of organisms, materials, and energy** across shared boundaries.

Examples of "convenient" boundaries


Banks-Leite and Ewers, 2009

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| Abiotic | Biotic (Require C + Energy) |
| --- | --- |
| | |

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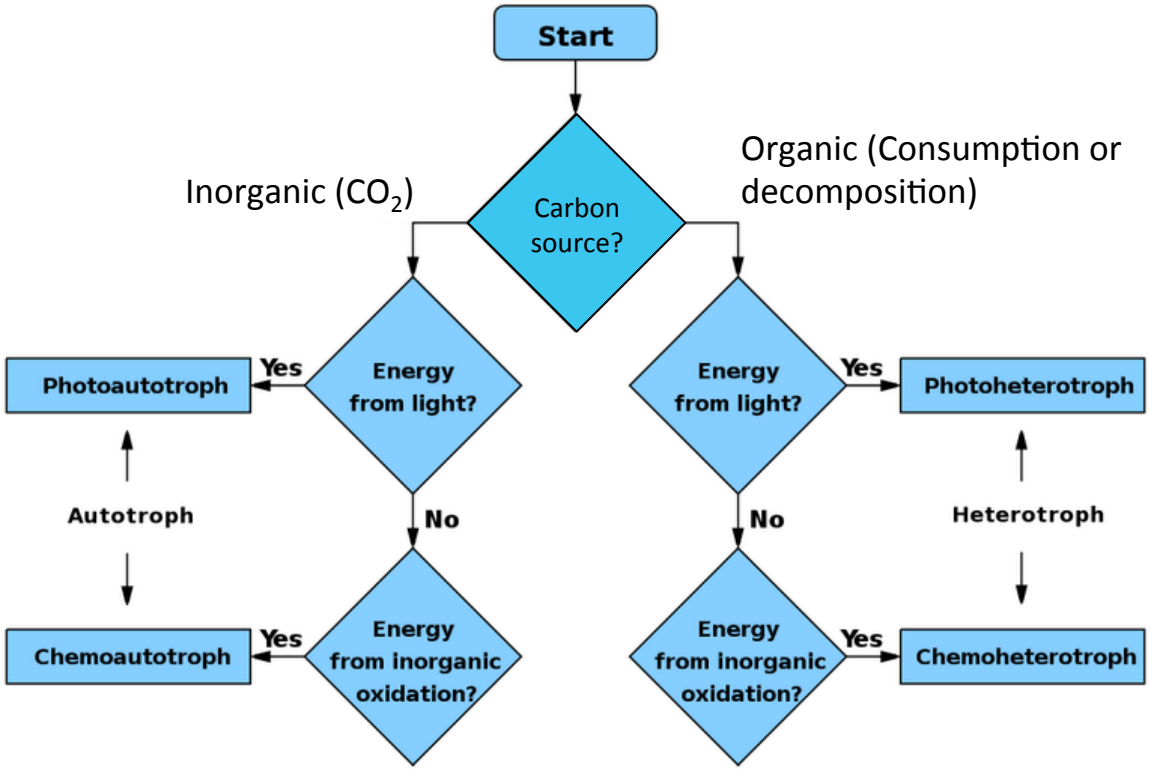
| Abiotic | Biotic (Require C + Energy) |
|---|---|
| • Climate<br>– Temperature<br>– Precipitation<br>• Inorganic and organic compounds<br>– Water<br>– $CO_2$<br>– Minerals<br>– Nitrogen, Phosphorus<br>– Humic acids, cellulose, etc. | • Producers (autotrophs)<br>– Plants<br>– Algae<br>– Some bacteria<br>• Consumers (heterotrophs)<br>– Macroconsumers<br>– Microconsumers: small heterotrophs, bacteria and fungi that break down organic compounds (i.e., decomposers) |

# Studying Ecosystems

## Autotrophs vs. Heterotrophs → C Source

*Auto* = self, same *Hetero* = other, different *Troph* = food, feed



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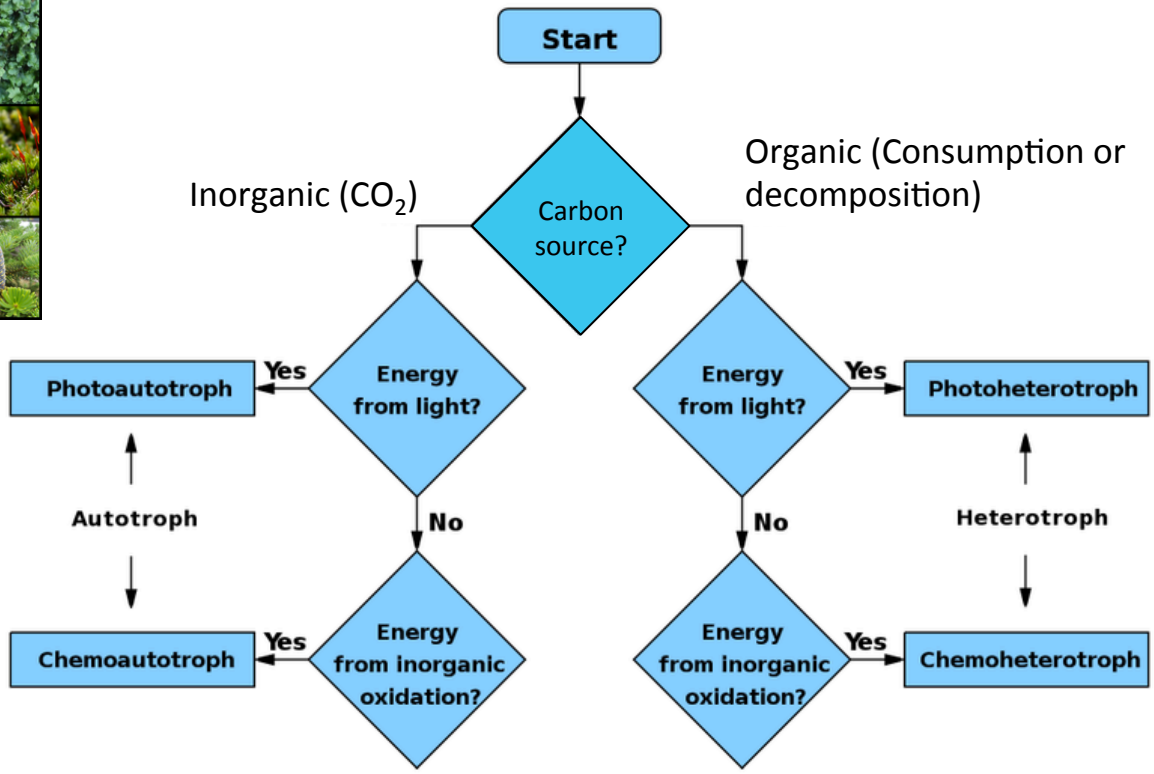


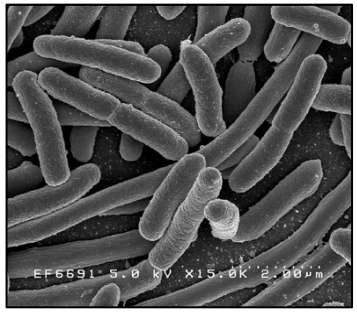

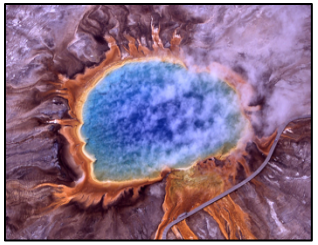

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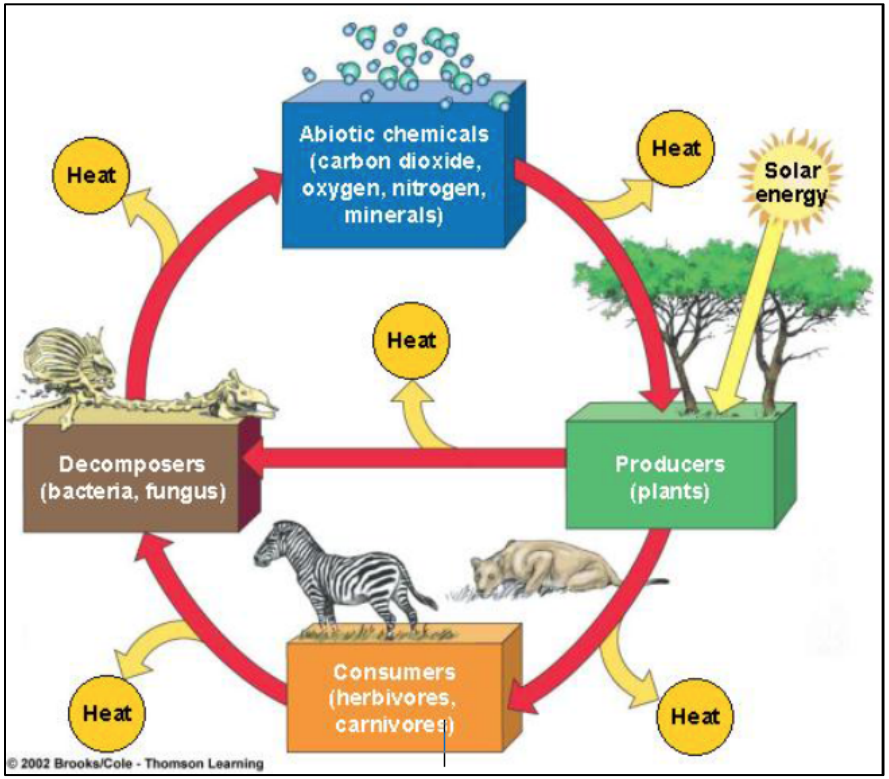
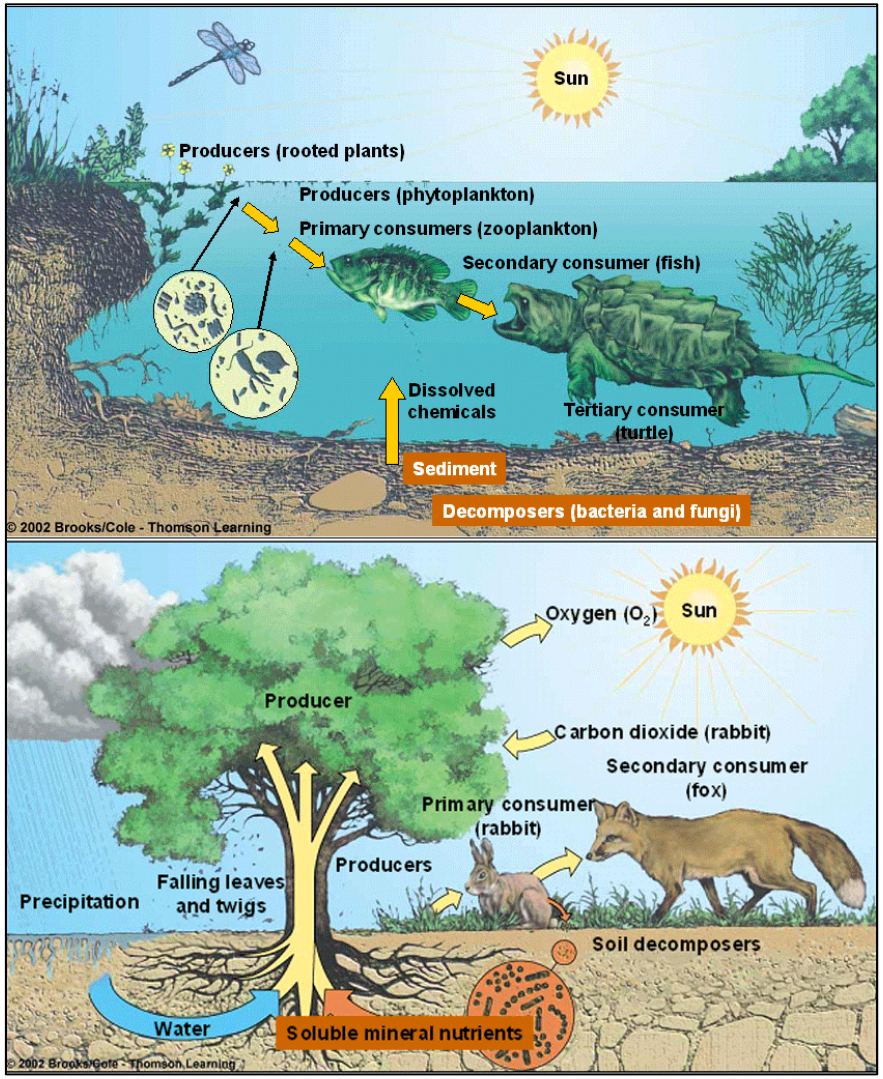


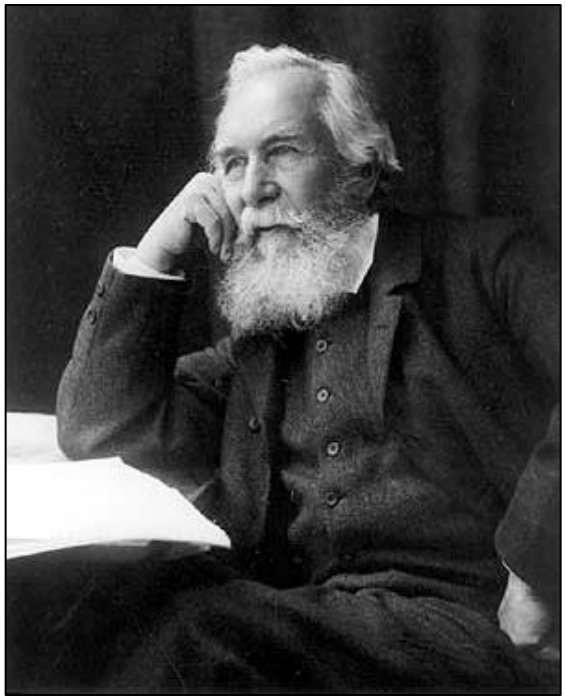

**Ecology**: The study of interactions between organisms and their environments (e.g., Malmstrom, 2010)

Miller, 2005

# Ecology

- "Ecology" coined by German biologist Ernst Haeckel in 1866
- From the Greek:
  - *Oikos* = house, dwelling
  - *Logos* =science, study
  - Ecology = "study of the household of nature"

*"By **ecology** we mean the body of knowledge concerning the economy of nature—the total relations of the animal to both to its inorganic and organic environment."*



Ernst Haeckel (1834 – 1919)

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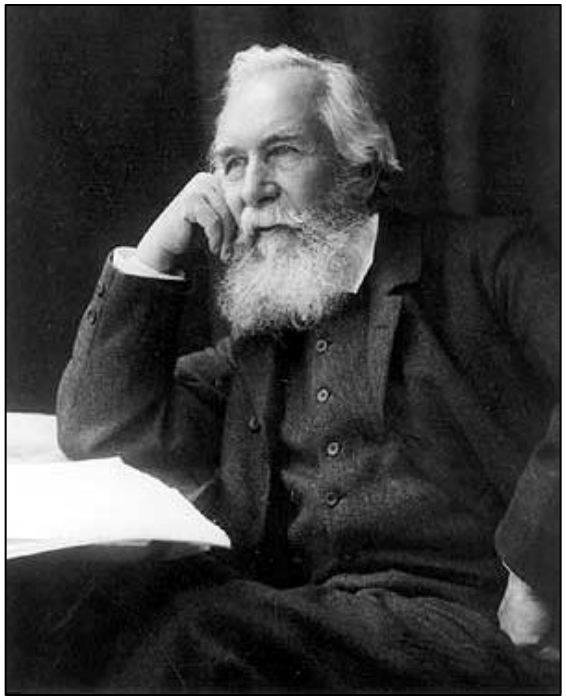

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What happened in 1859?

# Hierarchy of Ecological Studies

## Population Ecology

**Population**: group of interbreeding individuals of the same species

- Population size, density
- Demographics
- Birth and death rates
- Growth and dispersal
- Carrying capacity

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- Predation
- Competition
- Coexistence
- Commensalism
- Mutualism
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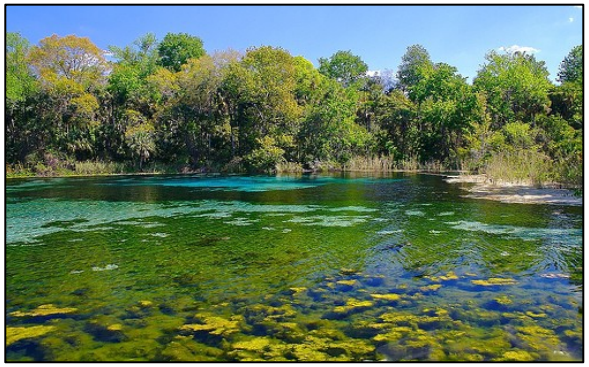
**Ecosystem**: all biotic and abiotic components of a system

- Movement and cycling of energy and matter (carbon, nitrogen, phosphorus)
- Metabolism
- Trophic dynamics and food webs



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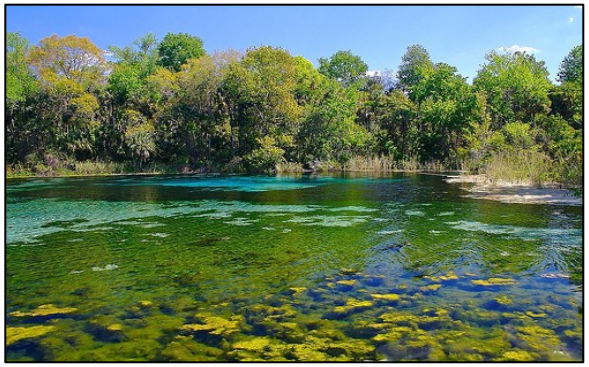

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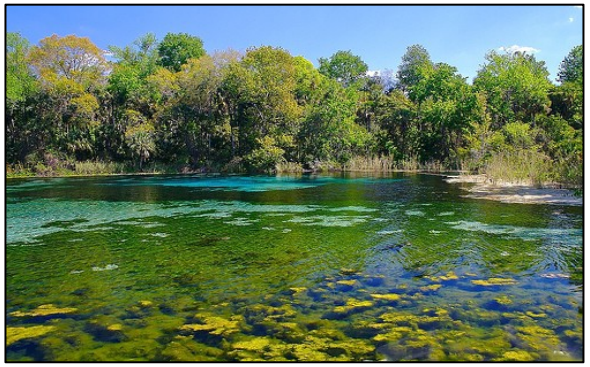

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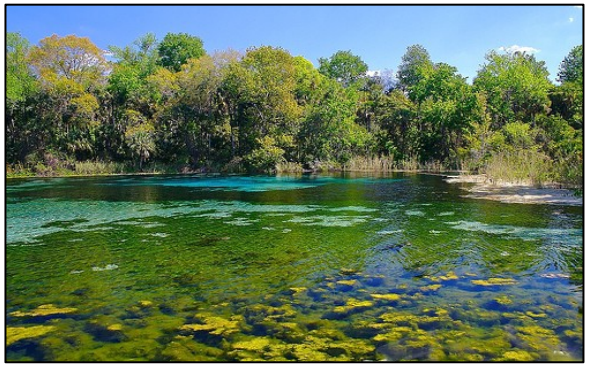

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H.T. Odum

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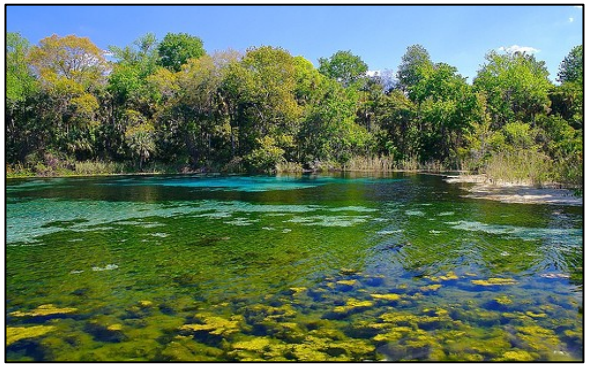

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## Applied Ecology: *Applying ecological concepts to solve environmental problems:*

- Loss of biodiversity
- Habitat fragmentation
- Eutrophication
- Global climate change
- Water quality and quantity, etc…

Tools: Conservation, restoration, enhancement, and management of ecosystems.

# For Next Week

1. Ecology of Florida
2. Ecosystem Services

http://www.bio.fsu.edu/DBImages/slide4.jpg