

Introduction of Ecology

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TRICHY-24

INTRODUCTION TO ECOLOGY

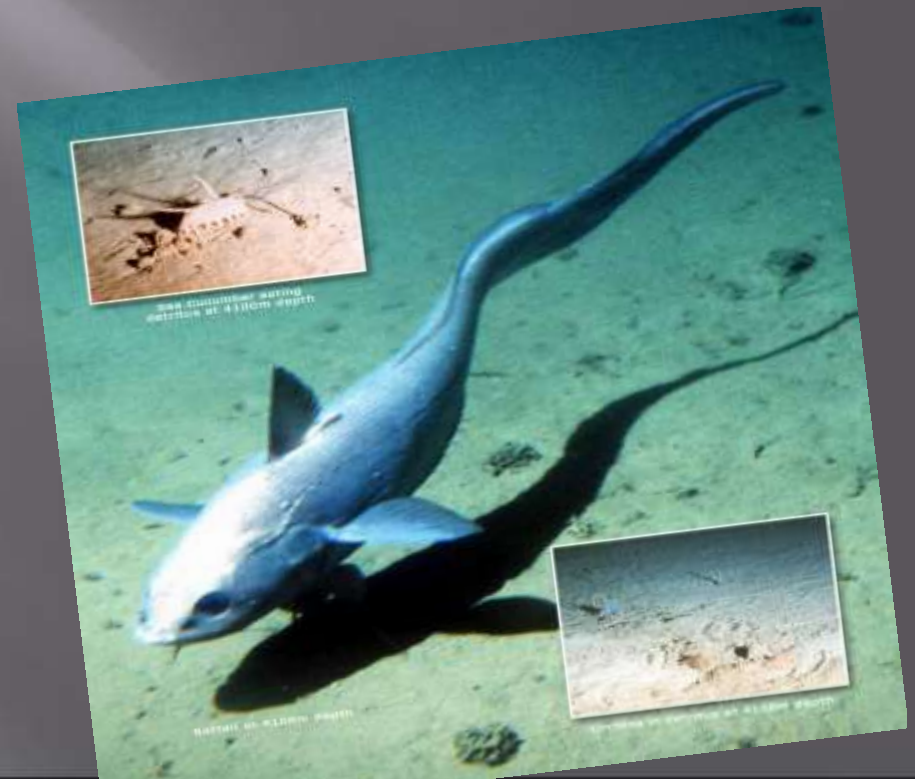
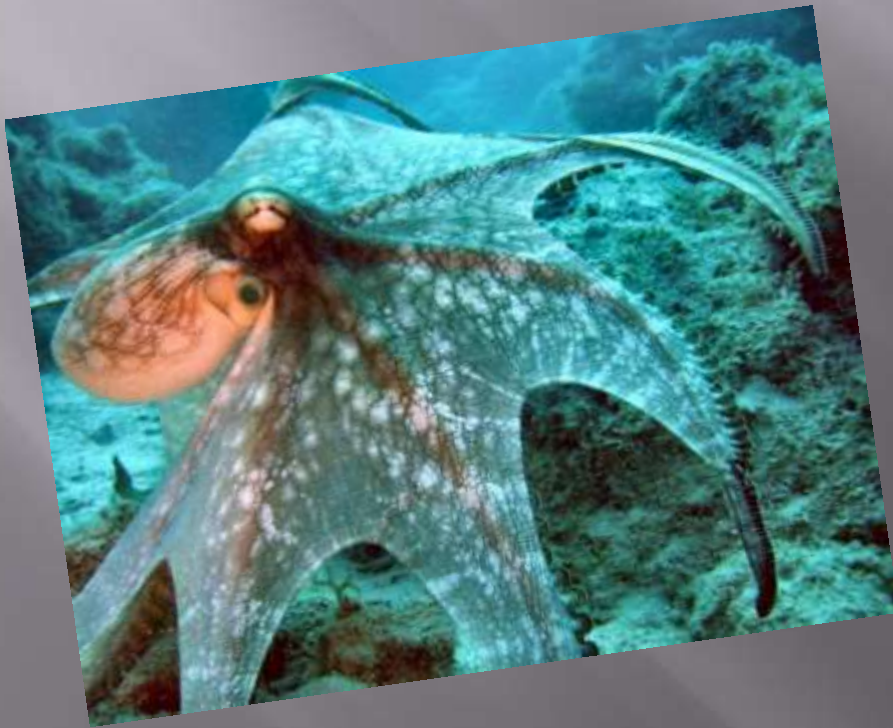


Definition of Ecology

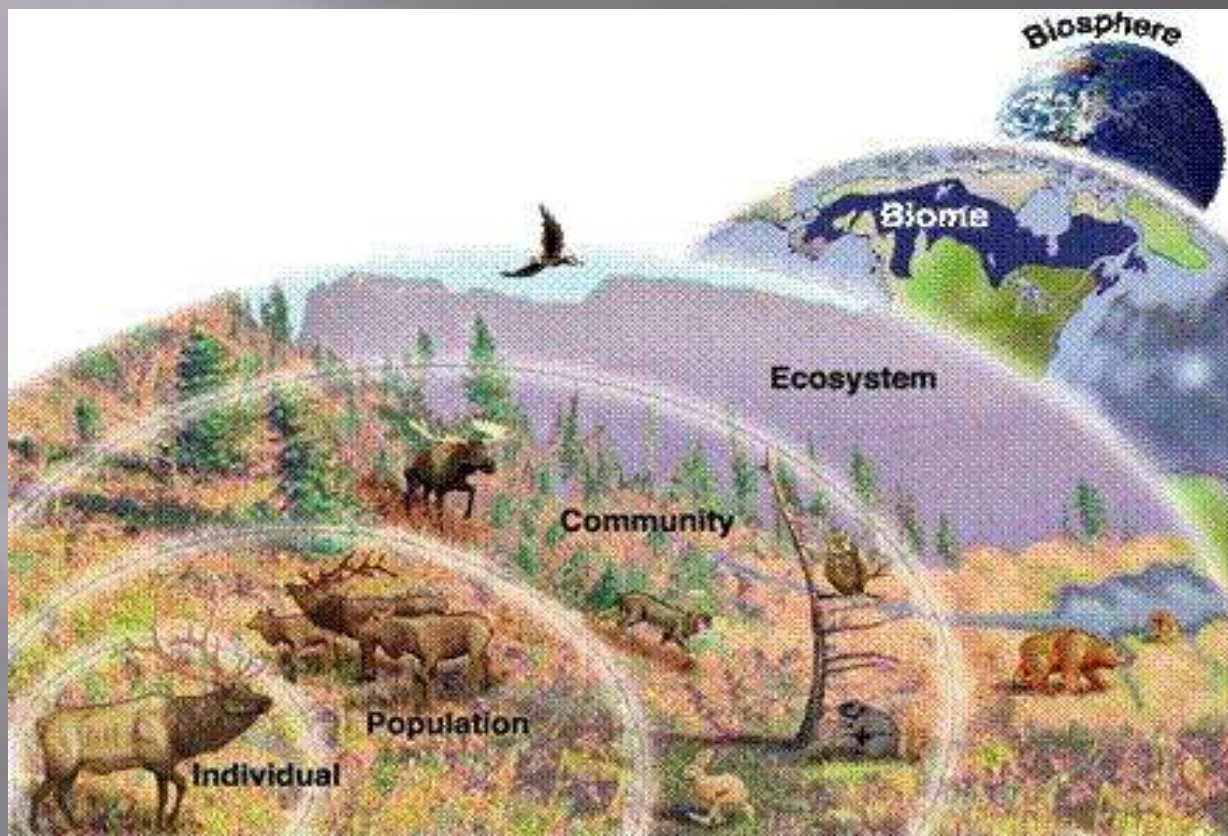
- ▣ *By ecology, we mean the body of knowledge concerning the economy of nature -- the investigation of the total relations of the animal both to its organic and to its inorganic environment; including above all, its friendly and inimical relation with those animals and plants with which it comes directly or indirectly into contact -- in a word, ecology is the study of all the complex interrelationships referred to by Darwin as the conditions of the struggle for existence.*

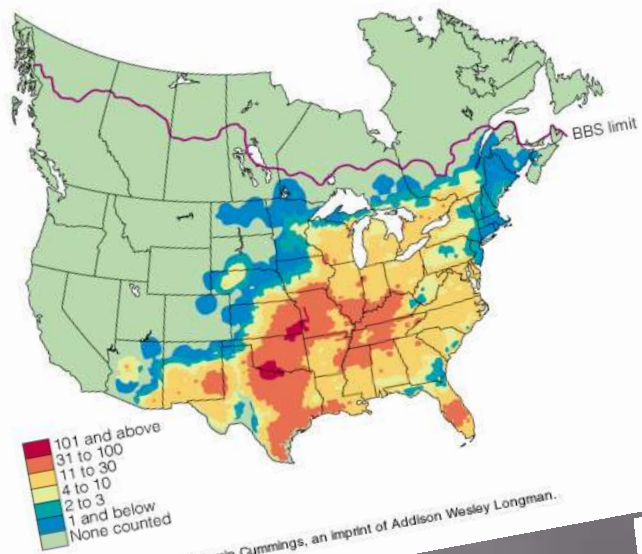
Modern Definition

- Ecology is the scientific study of the interactions that determine the distribution and abundance of organisms

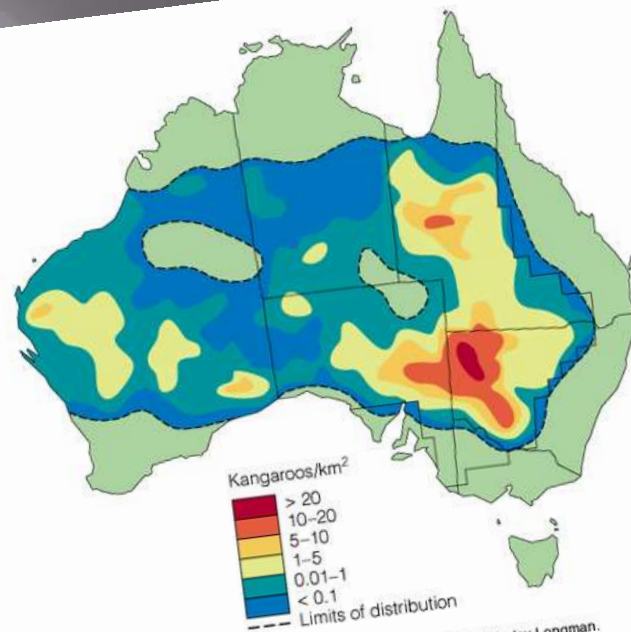


Levels of organization...





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History of Ecology

- ▣ Draws upon need to control pests in agriculture, disease spread in humans
- ▣ Wildlife and Fisheries management and harvesting
- ▣ Human population change-demography, important in insurance and government
- ▣ Mathematics and Computers-Equations describing systems and simulations

Ecology - A Science for Today

- ▣ We have a great need for ecological understanding:
 - what are the best policies for managing our environmental support systems -- our watersheds, agricultural lands, wetlands?
 - we must apply ecological principles to:
 - ▣ solve or prevent environmental problems
 - ▣ inform our economic, political, and social thought and practice

Ecology

- ▣ Ecology provides the science behind many questions related to human impacts on the environment.
- ▣ Most ecologists would tend to support efforts to protect natural systems and restore degraded environments



Levels of Ecology

- ▣ Primarily from Organism to Biosphere
- ▣ Highly interrelated with physiology, behavior, genetics, and evolution
- ▣ Strongly suggest taking courses in these related topics if are interested in a career in ecology



Figure 1.1



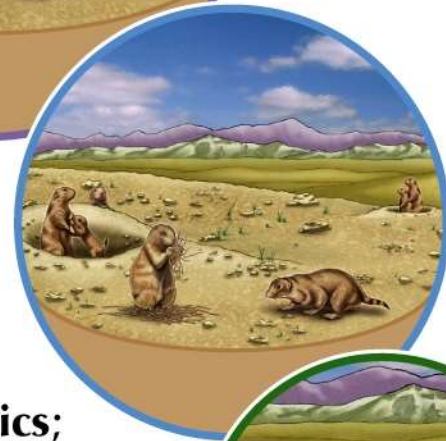
Biosphere:
Global processes



Ecosystem:
Energy flux and cycling
of nutrients



Community:
Interactions among
populations



Population:
Population dynamics;
the unit of evolution



Organism:
Survival and reproduction;
the unit of natural selection

Perspectives of Ecologists: Organism Approach

- ▣ How do form, physiology, and behavior lead to survival?
- ▣ Focus is on adaptations, modifications of structure and function, that suit the organism for life in its environment:
 - adaptations result from evolutionary change by natural selection, a natural link to population approach...



Perspectives of Ecologists: Population Approach

- ▣ What determines the numbers of individuals and their variations in time and space?
- ▣ Focus is on processes of birth and death, immigration and emigration, influenced by:
 - the physical environment
 - evolutionary processes
 - interactions with other populations, a natural link to community approach...



Perspectives of Ecologists: Community Approach

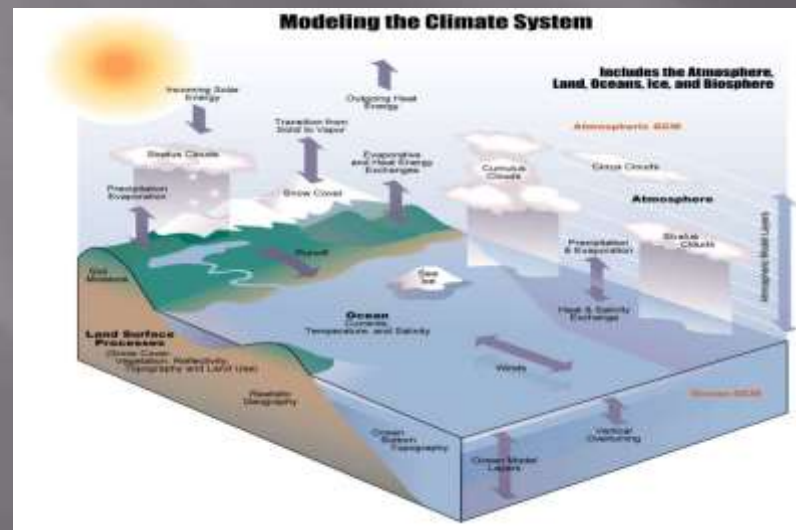
- ▣ How are communities structured from their component populations?
- ▣ Diversity and relative abundance of different kinds of organisms living together, affected by:
 - population interactions, promoting and limiting coexistence
 - feeding relationships, responsible for fluxes of energy and materials, a natural link to ecosystem approach...





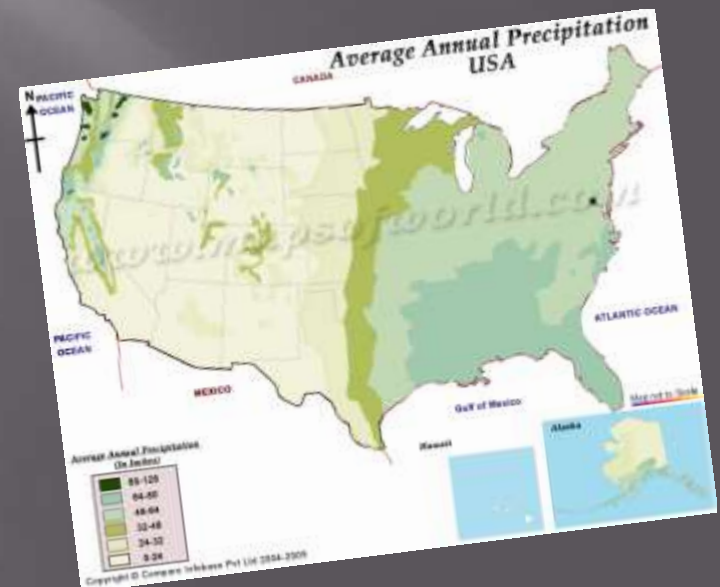
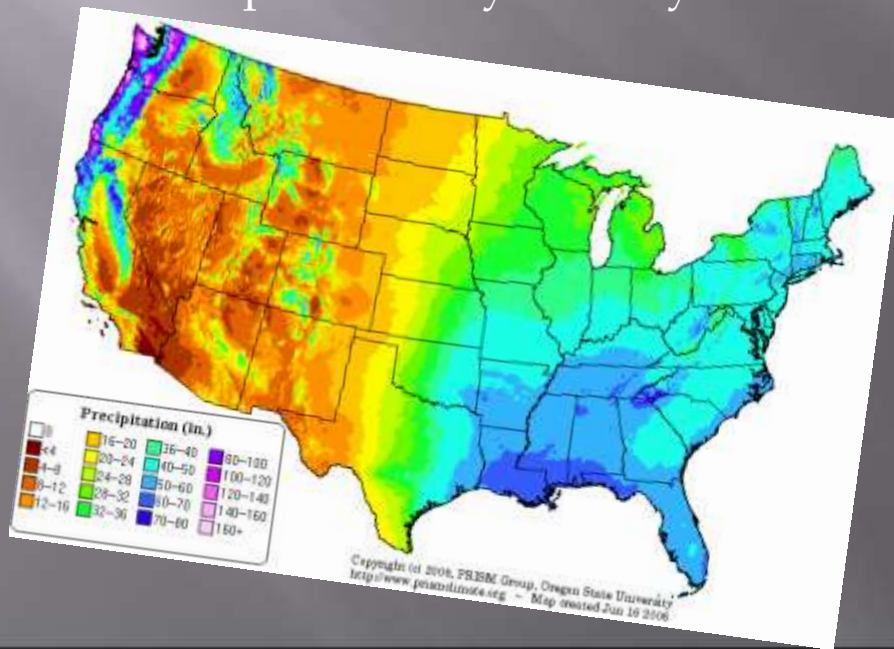
Perspectives of Ecologists: Ecosystem Approach

- How can we account for the activities of populations in the common “currencies” of energy and materials?
- Focus is on movements of energy and materials and influences of:
 - organisms large and small
- climate and other physical factors, including those acting on a global scale, a natural link to biosphere approach...



Perspectives of Ecologists: Biosphere Approach

- Focus is on the global circulation of matter and energy, affecting:
 - distributions of organisms
 - changes in populations
 - composition of communities
 - productivity of ecosystems



Plant Hardiness Zone Map

Average Annual Min Temperature

Temperature (F) Zone

Below -50	1
-45 to -50	2a
-40 to -45	2b
-35 to -40	3a
-30 to -35	3b
-25 to -30	4a
-20 to -25	4b
-15 to -20	5a
-10 to -15	5b
-5 to -10	6a
0 to -5	6b
5 to 10	7a
10 to 15	7b
15 to 20	8a
20 to 25	8b
25 to 30	9a
30 to 35	9b
35 to 40	10a
40 to 45	10b
45 +	11

Approaches to Ecology

▣ Descriptive

- What is the pattern? First step, correlative

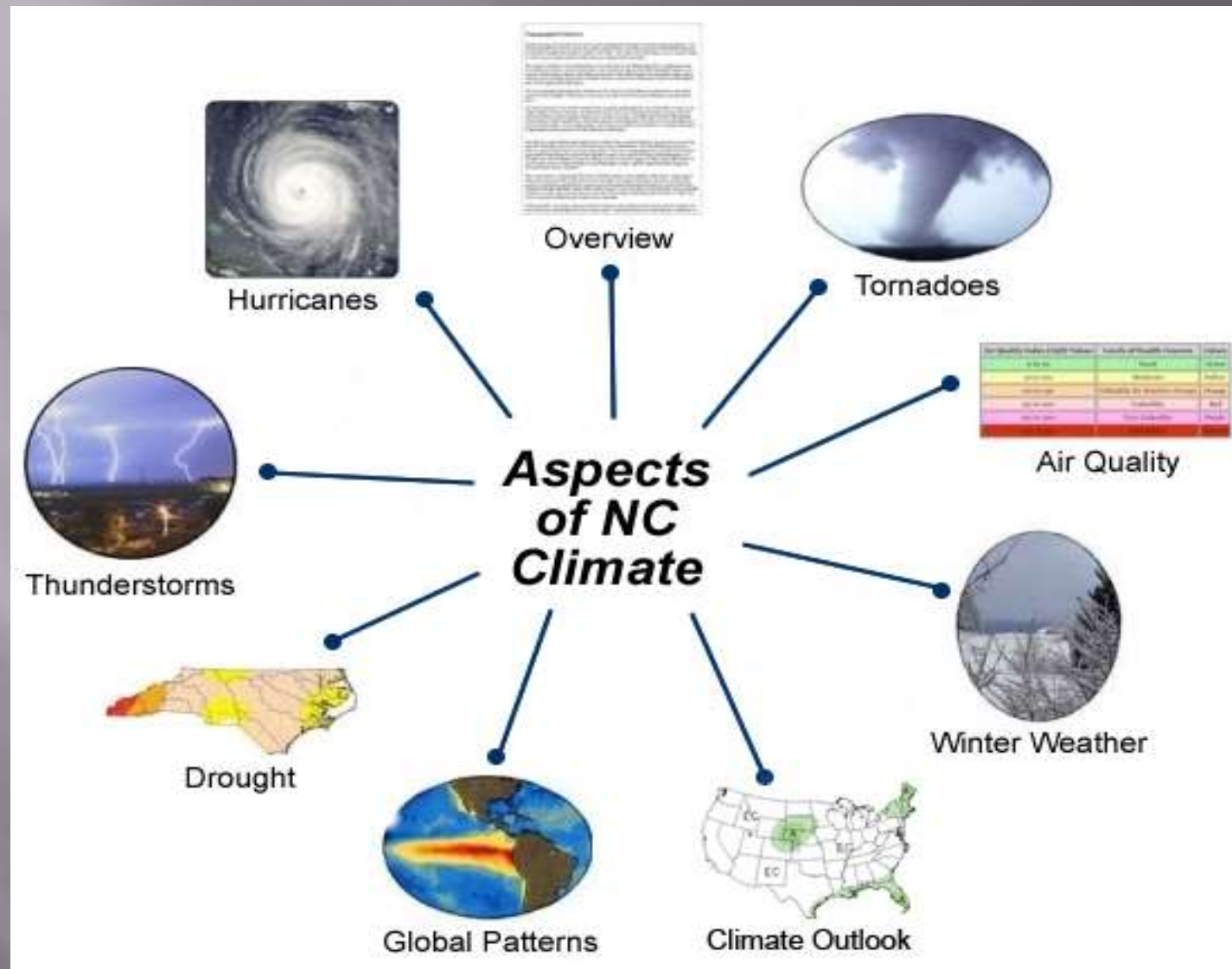
▣ Functional

- Why does the pattern exist? Proximate causal explanations, can be tested experimentally

▣ Evolutionary

- Ultimate causal explanations, long-time scale, may be hard to test experimentally





Methods to Study Ecology

- ▣ Theoretical
 - Mathematical models
- ▣ Laboratory
 - Highly controlled but lack realism
- ▣ Field
 - Highly realistic but may lack control

