

GRANDE PRAIRIE REGIONAL COLLEGE
DEPARTMENT OF SCIENCE
BIOLOGY INSTRUCTIONAL GROUP

ZOOLOGY 331
ANIMAL ECOLOGY
SPRING SESSION 1991
COURSE OUTLINE

1. Ecology as a science
 - Ecology defined
 - History of Ecology
 - Ecology today
2. Ecology of individual organisms: principles
 - Relationships to the abiotic environment
 - Tolerance range
 - Range of the optimum
 - When conditions change
 - Limiting factors and the environmental complex
 - Ecological indicators
 - Energy balance
 - Energy and work
 - Energy in organisms
 - Autotrophs, heterotrophs, and chemotrophs
 - Variations
 - Energy flow through an individual organism
 - Energy subsidies
 - Animal behavior
 - Evolutionary considerations
 - Proximate and ultimate factors
 - Adaptation
 - Ecotypes
 - Habitat Selection
 - The spread of organisms
 - Dispersal
 - Range expansion
3. Ecology of individual organisms: abiotic factors
 - Temperature
 - Thermal relations of organisms
 - Homeotherms and poikilotherms
 - Interactions of temperature and wind
 - Life forms of plants
 - Moisture
 - Humidity
 - Vapor pressure
 - Water balance in plants
 - Water balance in animals
 - Light
 - Shade tolerance
 - Photoperiodism

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- Soil
 - Soil formation
 - Soil texture and fertility
 - Soil water
 - Loams and humus
 - Soil names
- Fire
 - Types of fire
 - Effects of fire
 - Fire frequency
 - Fire as a management tool
- 4. Population ecology: growth and density
 - Birth and death
 - Birth rate and death rate
 - Life tables and longevity
 - Types of life tables
 - Survivorship curves
 - Population growth
 - Exponential population growth
 - Biotic potential
 - Logistic population growth
 - The logistic curve as a model
 - Mathematical treatments of population growth
 - Exponential growth
 - Logistic growth
 - Adding time lags
 - Intrinsic rate of natural increase
 - Net reproductive rate
 - Population density and population regulation
 - Carrying capacity
 - Population regulation
 - Intraspecific competition
 - Nonequilibrium populations
 - The Allee effect
- 5. Population ecology: organization and evolution
 - Organization
 - Spacing
 - Sociality
 - Predator protection
 - Increased foraging efficiency
 - Modifying environment
 - Other benefits
 - Social organizations
 - Mating systems
 - Age structure
 - Animals
 - Plants

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- Evolution
 - Natural Selection
 - The Hardy-Weinberg Law
 - Genetic fitness
 - The evolution of life history traits
 - r and K selection
 - Beyond the r/K model
 - Sociobiology
 - Altruism
 - Group selection
 - Extinction
- 6. Population-community interface: herbivory and predation
 - Types of species interactions
 - Trophic interactions
 - Optimal foraging
 - Where to look
 - Whether to pursue
 - Energy and fitness
 - Optimization
 - Herbivory
 - Types
 - Plant defenses
 - Effects on plant distribution and abundance
 - Frugivory
 - Seed predation
 - Predation
 - The Lotka-Volterra predator-prey model
 - The Rosenzweig-MacArthur model
 - Fluctuations in population size
 - Cyclic populations
 - Functional and numerical responses
 - Control of prey numbers by predators
 - Biological control
 - Mimicry and other kinds of advantageous resemblances
- 7. Population-community interface: parasitism, commensalism, and saprobism
 - Parasitism
 - Types of parasites
 - Parasitic organisms
 - Ecology of parasites
 - Parasite-host interactions
 - Epidemics
 - Effects on host numbers and distribution
 - Evolution within the parasite-host system
 - Commensalism
 - Phoresy

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- Saprobism
 - Carrion
 - Vertebrates
 - Insects
 - Dung
 - Tumblebugs and other buriers
 - Dead trees
 - Litter
 - Aquatic habitats
- 8. Population-community interface: competition and mutualism
 - Interspecific competition
 - Outcomes of competition
 - Competitive exclusion
 - Competitive replacement
 - Competition as a factor in geographical and habitat distribution
 - Competitive exclusion in the laboratory
 - Coexistence of competing species
 - Mathematical models of competition
 - The Lotka-Volterra model
 - Adding species to the model
 - Can two species live on one resource?
 - Amensalism and allelopathy
 - Neutralism
 - Mutualism
 - Symbiotic mutualism
 - Nonsymbiotic mutualism
 - Mycorrhizae
 - Pollination
 - Evolution of mutualism
- 9. Communities and ecosystems: structure and diversity
 - Community structure
 - Dominance
 - Chemical ecology
 - Spatial structure
 - Synusia and guild
 - Temporal structure
 - Day-night change
 - Seasonal change
 - Phenology
 - The ecological niche
 - Hutchinson's niche as hypervolume
 - Hutchinson's ecological theatre and evolutionary play
 - Ant-acacia system
 - Bat-moth coevolution
 - What produces community organization?

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- Importance of competition
 - Are there regularities in species composition based on competitive exclusion?
 - The species/genus ratio
 - Assembly rules
 - Is there evidence that current competition affects the structure of communities?
 - Is there evidence that evolution based on reduction of competition has been widespread?
 - Integrated vs. individualistic community
 - Ecological diversity
 - Ways of being diverse
 - Factors affecting diversity
 - Unique history
 - Time
 - Extreme habitats
 - Resource diversity
 - Productivity
 - Climatic stability
 - Predation
 - Disturbance
 - Diversity indices
 - What determines the number of species on islands?
 - Habitat islands
 - Park theory
10. Communities and ecosystems: reactions
- Reactions on land
 - Soil formation
 - Topography
 - Soil moisture
 - Reactions on air
 - Solar radiation
 - Temperature, humidity, rainfall, and wind
 - Reactions in fresh water
 - Reactions in the ocean
11. Communities and ecosystems: energy
- Trophic structure and the food chain
 - Producers
 - Consumers
 - Decomposers
 - Pyramids of numbers and biomass
 - Energy flow
 - Solar energy input
 - Energy flow within the ecosystem
 - Grazing food chains
 - Detritus food chains
 - Biomass

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- Productivity
 - Primary and secondary production
 - Energetic steady states
 - Net primary production in the biosphere
 - Relationships between productivity and biomass
- Ecological efficiencies
 - Producer level efficiencies
 - GPP/sunlight
 - NPP/GPP
 - Harvesting efficiencies of herbivores
 - Consumer efficiencies
 - Within trophic levels
 - Between trophic levels
- Difficulties with trophic levels
- Chemolithoautotrophs
 - Lakes and coastal marine ecosystems
 - Hydrothermal vents
- Regulatory processes and energy quality
- Energy in agriculture
 - Basic patterns
 - Energy flow in food systems
- 12. Communities and ecosystems: biogeochemistry
 - Nutrient cycling
 - Carbon cycle
 - Nitrogen cycle
 - Phosphorus cycle
 - Sulphur cycle
 - Hydrological cycle
 - Watershed studies
 - Biological control of the composition of the atmosphere and oceans
 - Early Earth
 - The world's greatest reaction
 - Biological controls
 - The Gaia Hypothesis
- 13. Communities and ecosystems: community change
 - Types of community change
 - Replacement changes
 - Canopy replacement in forests
 - Fluctuation
 - The great drought
 - Succession
 - Types
 - Microseres
 - Causes
 - Role of reactions
 - An evolutionary view of succession
 - Role of coactions

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- Examples of succession
 - Sand dune succession
 - Old-field succession
- Climax community
 - Monoclimax and polyclimax
- Stability
- Paleocology
 - Uniformitarianism
 - The paleocommunity
 - Autecology
 - Population ecology
 - Community ecology
 - Early Tertiary
 - Later Tertiary
 - Pleistocene