EASTERN ARIZONA COLLEGE
Ecology
Course Design
2013-2014

Course Information
Division: Science
Course Number: BIO 226
Title: Ecology
Credits: 4
Developed by: David J. Henson
Lecture/Lab Ratio: 3 Lecture/3 Lab
Transfer Status

<table>
<thead>
<tr>
<th>ASU</th>
<th>NAU</th>
<th>UA</th>
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<tbody>
<tr>
<td>Elective Credit</td>
<td>Elective Credit also satisfies: Lab Science [LS]</td>
<td>Elective Credit, Tier 1 &amp; 2 Natural Sciences (NS)</td>
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Activity Course: No
CIP Code: 26.0400
Assessment Mode: Pre/Post Test (50 Questions/100 Points)
Semester Taught: Fall
GE Category: Lab Science
Separate Lab: Yes
Awareness Course: No
Intensive Writing Course: No

Prerequisites
ENG 091 with a grade of "C" or higher or reading placement test score as established by District policy

Educational Value
This course will provide students a unique opportunity to earn 4 lab science credits in an established outdoor environmental learning center of Discovery Park's Nature's Hideaway.

Description
Arizona contains a broad diversity of biotic and abiotic variables acting upon the plant and animal species that have adapted to life in a sometimes harsh, desert environment. These fragile ecosystems have been affected from both a positive and negative standpoint by an increasing human population. This course will provide students with a basic understanding of ecological principles, concepts of energy flow through an environment, and knowledge and hands-on experiences to better understand the characteristics, restoration strategies, interactions within, and stewardship for healthy ecosystems.

Supplies
Field Journals

**Competencies and Performance Standards**

1. Identify basic ecological concepts and principles including the structure and function of an ecosystem, its population dynamics, and environmental cycles.

   **Learning objectives**

   *What you will learn as you master the competency:*

   a. Students will learn how ecological systems relate to biodiversity.
   b. Students will learn the function of an Ecologist.
   c. Students will learn the relationship of an organism's habitat and corresponding functional role in nature.
   d. Students will learn pathways of elements in an ecosystem.
   e. Students will learn about population structures, distribution and growth rates.

   **Performance Standards**

   *You will demonstrate your competence:*

   - learner accurately identifies the role of an ecologist in a given ecological study
   - learner explains a given organism's niche in a specific habitat
   - learner calculates growth rates of a population given appropriate data
   - learner describes pathway alternatives given an essential molecule

   *Your performance will be successful when:*

   - learner associates an organism's functionality with its niche
   - learner describes best practices of an ecologist
   - learner traces elemental and molecular flow through a given ecosystem
   - learner comprehends population dynamics, distribution reasoning, and growth rate patterns
   - learner identifies and describes population interactions

2. Apply appropriate Ecological and Riparian terminology in course and field work based on relevance.

   **Learning objectives**

   *What you will learn as you master the competency:*

   a. Students will learn appropriate terminology for use in the discussion of ecological and desert riparian.
   b. Students will learn to identify and understand the use of ecological and desert riparian terminology in written and verbal communications.
   c. Students will learn how to communicate their thoughts and ideas using appropriate ecological and riparian terminology.

   **Performance Standards**

   *You will demonstrate your competence:*

   - learner accurately communicates with ecological and riparian terminology appropriate for the assessment tool
   - learner communicates with appropriate terminology in field work situations
   - learner accurately portrays data and research findings in appropriate ecological and riparian terminology

   *Your performance will be successful when:*

   - learner accurately identifies the role of an ecologist in a given ecological study
   - learner explains a given organism's niche in a specific habitat
   - learner calculates growth rates of a population given appropriate data
   - learner describes pathway alternatives given an essential molecule

   *Your performance will be successful when:*

   - learner associates an organism's functionality with its niche
   - learner describes best practices of an ecologist
   - learner traces elemental and molecular flow through a given ecosystem
   - learner comprehends population dynamics, distribution reasoning, and growth rate patterns
   - learner identifies and describes population interactions
3. Analyze Arizona Topography as related to major watersheds and corresponding intermittent, ephemeral, and perennial surface water.

**Learning objectives**

*What you will learn as you master the competency:*

a. Students will learn how to read and determine information from topographic, graphic relief, and spatial maps of Arizona.

b. Students will learn how to use global positioning instruments to collect data for field activities.

c. Students will learn how watersheds form the major drainage basins of Arizona.

d. Students will observe first hand the different stream types and learn how topography plays a role in their designation.

**Performance Standards**

*You will demonstrate your competence:*

- learner accurately uses tools (GPS, compass, maps) to generate data
- learner contrasts the different deserts of Arizona based on topographic conditions
- learner accurately identifies stream type based on present and historical observations
- learner discusses human actions that affect surface water in Arizona riparian corridors

*Your performance will be successful when:*

- learner identifies major Arizona drainage basins
- learner identifies the four deserts that converge in Arizona and how they relate to Arizona topography
- learner lists major perennial and intermittent waterways on a map of Arizona
- learner discusses contributions of the Central Arizona and Salt River Projects to available, useable surface water
- learner visits selected perennial waterways and completes educational objectives determined for such trips

4. Analyze fundamental characteristics, draft, and recharge of a sub-surface aquifer.

**Learning objectives**

*What you will learn as you master the competency:*

a. Students will learn the history of groundwater management in Arizona.

b. Students will learn the procedure for recharge into pre-existing aquifers.

c. Students will learn best management practices in balancing draft and recharge of Arizona's aquifers.

d. Students will learn structures and functions of a sub-surface aquifer.

**Performance Standards**

*You will demonstrate your competence:*

learner uses an underground water demonstration model to identify structures and functions of an aquifer
learner describes proven strategies to balance overdraft and recharge of Arizona's underground water supplies
learner uses an underground water model to demonstrate water movement into, out of, and within an aquifer
learner discusses the components of a successful water conservation plan

Your performance will be successful when:

- learner applies Range and Basin concepts to aquifer storage related to alluvial deposition
- learner identifies successful components of programs for recharge to address overdraft of groundwater
- learner identifies legal declarations that have shaped today's best management practices for groundwater
- learner discusses groundwater characteristics through manipulation and observation of groundwater models
- learner identifies groundwater structures and relates the function
- learner identifies strategies for the conservation and promotion of a sustainable groundwater supply for future generations

5. **Analyze biotic and abiotic factors that interact within established Biome designations including an Arizona Desert Riparian Zone.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Students will learn of the world's major biomes, their flora and fauna characteristics, and abiotic tendencies.

b. Students will learn the physical characteristics of a Desert Riparian Ecosystem.

c. Students will learn the chemical characteristics of a Desert Riparian Ecosystem.

d. Students will learn of the specific plants and animals that inhabit Desert Riparian Ecosystems.

e. Students will learn the interactions within the Desert Riparian Ecosystem that lead to successful living conditions.

**Performance Standards**

*You will demonstrate your competence:*

- learner identifies earth biome designations, the abiotic conditions of each, and the flora and fauna that have adapted to these living conditions
- learner produces an appropriately tagged Desert Riparian Plant collection
- learner discusses nutrient cycling in a Desert Riparian Ecosystem
- learner performs soil sampling and uses data to compare and contrast various ecosystems
- learner describes the role of organisms that live in a Desert Riparian Ecosystem
- learner states patterns of adaptation that are present in the flora and fauna of a Desert Riparian Ecosystem

*Your performance will be successful when:*

- learner successfully identifies world locations of earth biomes
learner participates in investigations of riparian corridors
learner identifies the components of a desert riparian basin
learner identifies fauna of an Arizona Desert Riparian Ecosystem
learner collects, processes, and identifies riparian flora of an Arizona Desert Riparian ecosystem
learner identifies biogeochemical cycles that are present in a riparian zone
learner compares and contrasts soil samples of desert riparian zones with desert uplands
learner describes adaptations of flora and fauna to a desert biome
learner identifies population relationships within an ecosystem
learner researches invasive species and their effects on an ecosystem

6. **Synthesize appropriate strategies and processes to determine health in an ecosystem.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Students will learn field testing processes for water quality.
b. Students will learn how to establish a riparian zone as a monitoring site.
c. Students will learn established characteristics and values that suggest a healthy riparian ecosystem.
d. Students will learn positive and negative effects of human actions on a riparian ecosystem.

**Performance Standards**

*You will demonstrate your competence:*

- learner participates in on-site assessments of riparian health
- learner demonstrates appropriate technique in performing tests for water quality analysis
- learner identifies the biotic and abiotic components of the riparian zone and their relationship to riparian health
- learner identifies possible sources of riparian contamination
- learner recognizes human interactions within a desert riparian corridor as positive or negative to the health of the ecosystem

*Your performance will be successful when:*

- learner performs an on-site assessment of riparian health
- learner measures physical characteristics of a riparian corridor
- learner performs water quality analysis at selected riparian sites
- learner recognizes the balance necessary between biotic and abiotic components within an ecosystem
- learner draws conclusions about the health of a desert riparian ecosystem based on collected data and established criteria
- learner recognizes the relationship between a healthy riparian ecosystem and the biodiversity of a desert biome
- learner discusses the correlation between a healthy desert riparian ecosystem with the potential for human habitation in a desert biome
- learner recognizes human interactions that affect the health of a desert riparian ecosystem
7. **Analyze energy flow within an ecosystem.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Students will learn energy resources for all trophic levels of an ecosystem.
b. Students will learn the roles for primary producers, decomposers, and detritivores.
c. Students will learn species composition within food chains and webs of a Desert Riparian Ecosystem.

**Performance Standards**

*You will demonstrate your competence:*

- learner organizes data and visual observations of a Desert Riparian Ecosystem into appropriate energy flow pathways
- learner identifies species location within trophic levels
- learner compares and contrasts energy flow within a Desert Ecosystem versus a Riparian Ecosystem

*Your performance will be successful when:*

- learner understands the flow of energy through a desert ecosystem
- learner identifies trophic levels within an ecosystem
- learner constructs a food web based on identified flora and fauna unique to a desert riparian ecosystem
- learner compares the complexity of energy flow between the desert and a riparian corridor

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8. **Evaluate the effect of human interaction with an Ecosystem.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Students will learn about strategies to ensure healthy Ecosystems.
b. Students will learn best management practices used to restore damaged Desert Riparian Ecosystems.
c. Students will learn about several human actions that are considered as favorable or detrimental to the health of an Ecosystem.

**Performance Standards**

*You will demonstrate your competence:*

- learner is capable of designing an action plan to restore an Ecosystem using best management practices
- learner determines strategies for conservation of Desert Riparian Ecosystems
- learner suggests strategies for preventative maintenance of a Desert Riparian Ecosystem by private, local and/or government entities

*Your performance will be successful when:*

- learner recognizes human interactions that affect the health of a desert riparian ecosystem
- learner identifies strategies in the restoration of a riparian ecosystem
- learner observes the effect of flood control and fire suppression by humans on a desert watershed
learner determines human interactions as positive or negative when relating to effect of a desert riparian ecosystem

learner discusses water usage in Arizona

learner describes best management practices in water conservation

learner discusses the use of effluent recharge into riparian flow basins

9. Analyze interventions practiced by government agencies and citizens on behalf of Arizona's Desert Riparian Ecosystems.

Learning objectives

Competence will be demonstrated when:

a. Students will learn about action plans practiced by different agencies in correlation with our Desert Riparian Ecosystems.

b. Students will learn the history of water legislation in Arizona.

c. Students will learn current information about drought plans, litigation, and conservation programs in practice, or designed for Arizona Desert Riparian Ecosystems.

Performance Standards

You will demonstrate your competence:

- learner lists current and historical variables that affect today's Desert Riparian Ecosystems

- learner discusses the future of Desert Riparian Ecosystems based on supporting information for their conclusions

Your performance will be successful when:

- learner debates state water issues

- learner outlines historical time-line of water legislation in Arizona

- learner describes the effect of drought on the state and the interventions practiced by government entities

- learner discusses the future of desert riparian areas in Arizona

- learner describes actions taken by government entities to manage, conserve and reintroduce native flora and fauna in an Arizona Desert Riparian Ecosystem

- learner describes projects by local Resource Conservations Districts in managing existing riparian corridors

Types of Instruction

Classroom Presentation

Hands-on, in-field and controlled outdoor environments

Lab field trips to off-campus sites

Grading Information

Grading Rationale

Performance Assessment Activities: Actual assignments that learners must do to demonstrate achievement of the target competencies.

1. Participate in a lecture/discussion atmosphere in the classroom.

2. Participate in lab and field activities located across Southern Arizona

3. Participate in lab activities at Discovery Park.
4. Participate in field trips to the Arizona Sonoran Desert Museum and the Biosphere II.
5. Participate in quizzes, exams and lab write-ups related to the prescribed curriculum.
6. Listen to guest speakers and presenters.

**Evaluation Methods:**
12 labs x 10 pts. = 120 pts., lab attendance 10 pts., 2 lab practicals x 50 pts. (25%)
Reflection Journal x 100 pts. (10%)
4 exams x 100 pts., 1 Post-Test x 100 pts. (50%)
12 quizzes x 10 pts. (15%)

**Grading Scale**
A 100 - 89.5%
B 89.4 - 79.5%
C 79.4 - 69.5%
D 69.4 - 59.5%
F 59.4% and below