PIMA COUNTY
NATURAL RESOURCES
PARKS & RECREATION

Environmental Education Field Study

Bat Research Simulation
Grades 1-3

Program Description: Students learn about the fascinating lives of bats while they practice scientific field research methods during this outdoor bat-netting simulation. Students collect model bats, identify species, and record data which is compared to actual bat data from research in the Sonoran Desert.

Duration: 1.5 hours

Objectives:
- Describe at least 5 characteristics of bats
- Demonstrate understanding of bat diversity
- Appreciate the importance of bats to humans
- Appreciate the importance of bats to the ecosystem as a whole
- Describe dangers to bats and explain strategies for species preservation
- Measure accurately weights and lengths
- Practice data collection
- Compare collected data to established data set
- Create hypothesis and use critical thinking skills in data analysis

Vocabulary:

Chiroptera	Migratory	Pollination	Insectivore
Megabats	Hibernation	Insect Control	Piscivore
Microbats	Habitat	Seed Dispersal	Sanguinivore
Echolocation	Beneficial	Fertilizer	Nectarivore
Mammal	Endangered	Carnivore	Frugivore

Equipment and Materials:
Build-a-bat Dress-up
Photographs demonstrating bat diversity
Bat skeletons and mounts
Collection of bat-reliant product
Balance Scales and Metric Weight Sets
Metric Measuring Tapes
Bat Simulation Kit, Early Elementary Version
Graph for class to physically graph the bats collected from the nets
Graph of actual field data for comparison

Preparation:
The teacher groups students into (4) teams (ideally this would be done before arriving at the park).

Introduction:
Welcome
Overview of the day
Expectations: rules and safety considerations

Rationale: Bats play an important role in our Sonoran Desert ecosystem and other ecosystems around the world. Many of the everyday items we use and foods we eat require bats for their production. Bat populations are on the decline. Researchers monitor bat population size and health and other trends in the ecosystem to help understand the reasons for the decline and propose action to improve populations.

Activity Description:
Introductory Session: Students participate in an on-site introductory session about bat biology, natural history, and diversity, as well as threats to bat populations. Students also consider the importance of bats to the health of an ecosystem and to human populations.

Fieldwork Protocol: Students, in teams, collect model bats from simulated mist nets, sort the bats by type, identify the bats through matching to photos, count the number of each type and, as a class, use the models to create a graph. The graph is compared to a graph of actual field research data from previous years. Students determine for each species if the number of bats is more than, less than or the same as that from the research data. Students, as a class, discuss what might account for any difference between their data and the research data as well as what steps scientist may take next to test that hypothesis.

Wrap-up: Students, as a class, discuss what is being done (by scientist, conservation groups, individuals) to protect bat populations.

Extensions:
- Build a bat house
- Observe bats within neighborhood - record time they emerge, weather conditions, behavior
- Observe bats emerge from underneath area bridges - record time they emerge, weather conditions, behavior
- Create a bat garden
- Participate in the Citizen Scientist Bat Monitoring Network (http://www.maranaaz.gov/bats)

Late Arrivals: This field study program is designed for 1.5 hours of instruction (depending on grade level). If the group arrives late or needs to leave early there will be less time allocated to the wrap-up activities.

Linked to Arizona State Standards:

Science S1: C1 - G1PO1-2, G2PO1, G3PO1; C2 - G1PO1-4, G2PO1-4, G3PO1, 3-5; C3 - G1PO1-2, G2PO1-2, G2PO-4, G3PO1-2, G3PO4-5; C4 - G1PO1-2, G2PO1-2, G3PO1, G3PO3; S4: C1 - G1PO2-3, G2PO1; C3 - G1PO2-3, G3PO3-5; C4 - G3PO1, G3PO3. **Math:** 1.MD.A.2; 1.MD.C.4; 1.MP.1; 1.MP.2; 1.MP.5; 1.MP.6; 2.MD.A.1; 2.MD.A.2; 2.MD.A.3; 2.MP.1; 2.MP.2; 2.MP.3; 2.MP.5; 2.MP.6; 2.MP.7; 3.MD.A.2; 3.MD.B.3; 3.MD.B.4; 3.MP.1; 3.MP.2; 3.MP.3; 3.MP.5; 3.MP.6.

Next Generation Science Standards:

Practices:

This Field Study naturally supports the following Science and Engineering Practices:
Asking questions (for science) and defining problems (for engineering), Planning and carrying out investigations, Analyzing and interpreting data, Using mathematics and computational thinking, Constructing explanations (for science) and designing solutions (for engineering), Engaging in argument from evidence.

Follow-up opportunities support the following Science and Engineering Practices:
Obtaining, evaluating, and communicating information and developing and using models.

Crosscutting Concepts:

This Field Study naturally supports the following Crosscutting Concepts:
Structure and Function, Systems and System Models, Cause and Effect
Follow-up opportunities/Further investigation support(s) the following Crosscutting Concepts:
Stability and Change, Energy and Matter, Scale, Proportion and Quantity, and Patterns.

Disciplinary Core Ideas:

This Field Study addresses the following Disciplinary Core Ideas:
LS1.A *Structure and function*, LS1.B *Growth and development of organisms*, LS1.C *Organization for matter and energy flow in organisms*, LS2.A *Interdependent relationships in ecosystems*, LS2.C *Ecosystem dynamics, functioning, and resilience*, LS4.C *Adaptation*

Follow-up opportunities support the following Disciplinary Core Ideas:
LS1.D *Information Processing*, LS2.B *Cycles of matter and energy transfer in ecosystems*, LS2.D *Social interactions and group behavior*, LS4.B *Natural selection*