

## **STEM Workshop – Aquatic Macroinvertebrates**

Reelfoot National Wildlife Refuge

**Trainers:** Shawna Adams, Biology Instructor DSCC

Tara Dowdy, Reelfoot Lake National Wildlife Refuge

**Date:** April 7, 2018 8 a.m.-Noon

(Rain date, April 14, 2018)

Capacity: 16 participants

### **Workshop Activities/Objectives:**

- Participants will be introduced to common types of aquatic macroinvertebrates that can be found in streams at Reelfoot Lake.
- Participants will learn techniques to collect aquatic macroinvertebrates, and take qualitative and quantitative samples.
- Participants will learn how to use dichotomous keys to identify aquatic macroinvertebrates.
- Participants will collect and analyze data for a bioassessment of an aquatic habitat.
- Participants will collect and analyze data for an examination of stream functioning of an aquatic habitat.
- Educators will receive \$100.00 attendance stipend

**Participants will be invited to go on a guided canoe trip with a ranger from the refuge after the workshop!**

**\*\*\*\*\*Bring boots and a sack lunch\*\*\*\*\***

**Registration Information should be emailed to Dr. Brian Wells at [wells@dsc.edu](mailto:wells@dsc.edu)**

**Name** \_\_\_\_\_

**Position/Title** \_\_\_\_\_

**Organization** \_\_\_\_\_

**Brief Summary of your professional duties related to the training:**

**Contact information:**

**Cell Phone**

**Office Phone**

**Email Address**

**Note to Attendees: This workshop can be adapted for most age groups and in a variety of science courses. References to grade specific new state standards that will implemented in 2018-19 are listed below:**

## **Kindergarten**

### **K.LS1 From Molecules to Organisms: Structures and Processes**

- 3) Explain how humans use their five senses in making scientific findings.

### **K.ESS3 Earth and Human Activity**

- 3) Communicate solutions that will reduce the impact from humans on land, water, air, and other living things in the local environment.

### **K.ETS1 Engineering Design**

- 1) Ask and answer questions about the scientific world and gather information using the senses.
- 2) Describe objects accurately by drawing and/or labeling pictures.

### **K.ETS2 Links Among Engineering, Technology, Science, and Society**

- 1) Use appropriate tools (magnifying glass, rain gauge, basic balance scale) to make observations and answer testable scientific questions.

## **First Grade**

### **1.ETS1 Engineering Design**

- 1) Solve scientific problems by asking testable questions, making short-term and long-term observations, and gathering information

### **1.ETS2 Links Among Engineering, Technology, Science, and Society**

- 1) Use appropriate tools (magnifying glass, basic balance scale) to make observations and answer testable scientific questions.

## Second Grade

### **2.LS1 From Molecules to Organisms: Structures and Processes**

- 1) Use evidence and observations to explain that many animals use their body parts and senses in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air.
- 2) Obtain and communicate information to classify animals (vertebrates-mammals, birds, amphibians, reptiles, fish, invertebrates-insects) based on their physical characteristics.
- 3) Use simple graphical representations to show that species have unique and diverse life cycles.

### **2.LS2 Ecosystems: Interactions, Energy, and Dynamics**

- 1) Develop and use models to compare how animals depend on their surroundings and other living things to meet their needs in the places they live.
- 2) Predict what happens to animals when the environment changes (temperature, cutting down trees, wildfires, pollution, salinity, drought, land preservation).

### **2.ESS2: Earth's Systems**

- 4) Use information obtained from reliable sources to explain that water is found in the ocean, rivers, streams, lakes, and ponds, and may be solid or liquid.

### **2.ETS1: Engineering Design**

- 2) Develop a simple sketch, drawing, or physical model that communicates solutions to others.

### **2.ETS2: Links Among Engineering, Technology, Science, and Society**

- Use appropriate tools to make observations, record data, and refine design ideas.

## Third Grade

### **3.LS1: From Molecules to Organisms: Structures and Processes**

- 1) Analyze the internal and external structures that aquatic and land animals and plants have to support survival, growth, behavior, and reproduction.

### **3.LS4: Biological Change: Unity and Diversity**

- 1) Explain the cause and effect relationship between a naturally changing environment and an organism's ability to survive.
- 2) Infer that plant and animal adaptations help them survive in land and aquatic biomes.

### **3.ETS2: Links Among Engineering, Technology, Science, and Society**

- 1) Identify and demonstrate how technology can be used for different purposes

## Fourth Grade

#### **4.LS2: Ecosystems: Interactions, Energy, and Dynamics**

- 2) Develop models of terrestrial and aquatic food chains to describe the movement of energy among producers, herbivores, carnivores, omnivores, and decomposers.
- 3) Using information about the roles of organisms (producers, consumers, decomposers), evaluate how those roles in food chains are interconnected in a food web, and communicate how the organisms are continuously able to meet their needs in a stable food web.
- 5) Analyze and interpret data about changes (land characteristics, water distribution, temperature, food, and other organisms) in the environment and describe what mechanisms organisms can use to affect their ability to survive and reproduce.

### **Sixth Grade**

#### **6.LS2: Ecosystems: Interactions, Energy, and Dynamics**

- 1) Evaluate and communicate the impact of environmental variables on population size.
- 2) Determine the impact of competitive, symbiotic, and predatory interactions in an ecosystem.

#### **6.LS4: Biological Change: Unity and Diversity**

- 1) Explain how changes in biodiversity would impact ecosystem stability and natural resources.
- 2) Design a possible solution for maintaining biodiversity of ecosystems while still providing necessary human resources without disrupting environmental equilibrium.

#### **6.ESS3: Earth and Human Activity**

- 3) Assess the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction.

#### **6.ETS1: Engineering Design**

- 1) Evaluate design constraints on solutions for maintaining ecosystems and biodiversity.

## Seventh Grade

### **7.LS1: From Molecules to Organisms: Structures and Processes**

- 6) Develop an argument based on empirical evidence and scientific reasoning to explain how behavioral and structural adaptations in animals and plants affect the probability of survival and reproductive success.

## Biology I

### **BIO1.LS2: Ecosystems: Interactions, Energy, and Dynamics**

- 1) Analyze mathematical and/or computational representations of population data that support explanations of factors that affect population size and carrying capacities of populations within an ecosystem. Examine a representative ecosystem and, based on interdependent relationships present, predict population size effects due to a given disturbance.

### **BIO1.LS4: Biological Change: Unity and Diversity**

- 3) Identify ecosystem services and assess the role of biodiversity in support of these services. Analyze the role human activities have on disruption of these services.

## Biology II

### **BIO2.LS2: Ecosystems: Interactions, Energy, and Dynamics**

- 1) Plan and carry out an ethology investigation of a simple organism. Gather, analyze, and present data in tabular and graphical formats. Draw conclusions based on data and communicate findings.

### **BIO2.LS4: Biological Change: Unity and Diversity**

- 22) Observe examples of organisms from major animal phyla in order to describe the diverse structures associated with the following functions: gas exchange; energy acquisition; nutrient processing and distribution; environmental responses; and reproduction.

## Earth and Space Science

### **ESS.ESS2: Earth's Systems**

- 11) Obtain, evaluate, and communicate information about human or natural threats to Tennessee.

### **ESS.ESS3: Earth and Human Activity**

- 2) Obtain, evaluate, and communicate information on how natural resource availability, natural hazard occurrences, and climatic changes impact individuals and society.
- 3) Design, evaluate, or refine a technological solution that reduces impacts of human activities on natural systems.

## Ecology

### **ECO.LS2: Ecosystems: Interactions, Energy, and Dynamics**

- 2) Research examples of adaptations of organisms in major marine and freshwater ecosystems. Develop an explanation for the formation of these adaptations and predict how the organisms would be affected by environmental disturbances or long-term ecological changes.
- 3) Create a model of an ecosystem depicting the interrelationships among organisms with a variety of niches. Use the model to explain resource needs of these organisms.
- 10) Plan and carry out an investigation measuring species diversity (richness and evenness) and density in a local ecosystem.
- 12) Use mathematical models to construct an explanation for population growth patterns and rates observed in ecosystems. Account for both density-dependent and density-independent factors in your explanation.

### **ECO.LS4: Biological Change: Unity and Diversity**

- Develop and revise a system for classifying organisms. Justify choice of information (morphology, molecular data, energy acquisition, habitat, niche, trophic level, reproduction, etc.) used in developing your system.

## Environmental Science

### **EVSC.LS2: Ecosystems: Interactions, Energy, and Dynamics**

- 2) Develop an explanation of behavioral and physical adaptations organisms have for life **in aquatic habitats with varying chemical and physical features.**

### **EVSC.ESS3: Earth and Human Activity**

- 5) Plan and carry out an investigation examining best management practices in water usage, agriculture, forestry, urban/suburban development, mining, or fishing and communicate findings
- 13) Analyze and interpret data on the effects of land, water, and air pollution on the environment and on human health. Propose solutions for minimizing pollution from specific sources.

### **EVSC.ETS3: Applications of Science**

- Plan and carry out an investigation of a local ecosystem to assess human impacts. Based on your findings, design and evaluate a solution to minimize impacts.

## **Scientific Research**

### **SCRE.ETS2: Links Among Engineering, Technology, Science, and Society**

- 3) Identify the most appropriate scientific instruments and/or computer programs for different experiments and research, and learn to use, care for, and maintain them, gather data, and analyze results.

### **SCRE.ETS3: Applications of Science**

- 4) Make observations and ask questions about the natural world. Refine the questions such that they can be answered by way of scientific investigation.
- 9) Develop a research proposal including the following: a problem statement; purpose of research; significance of research; objectives; literature review (including both primary and secondary sources); materials and methods; detailed budget; data analysis procedures; and, references. Include a list of potential risks associated with the study and a detailed safety plan as appropriate for materials and methods. Revise the proposal based on feedback from teacher and peers
- 10) Create a scientific journal and/or lab notebook for recording qualitative and quantitative data. 11) Carry out an original scientific investigation (experiment or study) after having received approval of a revised research proposal.
- 15) Use data to develop a model. Evaluate the effectiveness of the model by making and testing predictions.