ECOLOGY

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

1. **DESCRIPTION:** Participants will answer questions involving content knowledge and process skills in the area of ecology and adaptations in featured North American biomes.

   A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 50 Minutes

2. **EVENT PARAMETERS:** Each team may bring one 8.5" x 11" sheet of paper that may contain information on both sides in any form and from any source along with two non-programmable, non-graphing calculators **dedicated to computation**.

3. **THE COMPETITION:**
   This event will be composed of three sections of approximately equal point value. The event will emphasize these process skills as they apply to ecology: defining variables; analyzing data from graphs and tables; presenting data in graphs and tables; forming hypotheses; making calculations and predictions. If stations are used, students will spend the same amount of time at each station.
   a. Part 1: Review of the General Principles of Ecology
      i. General Principles of Ecology: food webs and trophic pyramids, nutrient cycling, community interactions, population dynamics (including density dependent/independent limiting factors, carrying capacity, doubling time, exponential/logistical growth and how to calculate population growth), extinction, selection, and migration.
      ii. **Divisions B & C: Invitationals, Regionals, & State:** The general ecological principles should focus on local and regional ecology
      iii. **Divisions B & C: State and Nationals**: life history strategies (e.g., age structure, survival curves, life tables, succession, R and K strategies)
   b. Part 2: Terrestrial Ecosystems
      i. **Ecology of the Deserts and Grasslands**
      ii. Understand basic concepts of biodiversity
      iii. **Divisions B & C: State and Nationals**: Understand terminology and be able to calculate biodiversity of sample data - species richness, Simpson index, Shannon-Wiener index
      iv. **Divisions B & C: State and Nationals**: Be able to apply knowledge of biodiversity - plot maps, simulations of selection effects on populations
   c. Part 3: Human Impact on Ecosystems
      i. Topics such as climate change, invasive species, acid rain, erosion, and pollution
      ii. The pros and cons of using alternative energy and its effect on the environment
      iii. Understand what the goals of conservation biology are and how they can be obtained
      iv. Reclamation of disturbed areas versus reintroduction of species
      v. **Division C only: State and Nationals**: Be able to answer questions pertaining to case studies

4. **SAMPLE QUESTIONS:**
   Division B:
   a. From the description of community interactions, create a food web. Then predict what would happen to the food web if the primary producers were greatly reduced in number by a disease.
   b. Given a description of the interaction between two species, identify the type of community interaction.
   c. Provide three reasons how a grassland is different than a desert.
   d. Compare a grassland with a desert. What kinds of adaptations may be common in both environments? How are the organisms in each environment adapted for the rates of nutrient recycling that you would expect to find?

   Division C:
   e. Given a complex food web, create a trophic pyramid and determine the amount of energy in each level when given a quantity of energy entering the producer level.
   f. Students are given a graph depicting the changes in two interacting populations of different species in a habitat. Predict which population is the predator and which is the prey. Give reasons for your choices.
   g. Determine the population growth rate for an area given r (rate of increase) and N (number of individuals).
   h. Students are given three age structures and asked to determine which population has the highest birth rate, death rate, doubling time, and mean age.

5. **SCORING:** Questions will be assigned point values. High score wins. Ties will be broken by pre-determined tiebreaker questions.

Recommended Resources: The Science Olympiad Store (store.soinc.org) carries the Ecology CD and Bio/Earth Science CD; other resources are on the event page at soinc.org.