

1. **DESCRIPTION:** Students will answer questions involving content knowledge and process skills in the area of ecology and adaptation by examining different ecosystems.

A TEAM OF UP TO: 2

APPROXIMATE TIME: 50 Minutes

2. **EVENT PARAMETERS:** Students may bring a non-programmable calculator. No other reference material will be allowed. References and training resources are available on the Official Science Olympiad Web Page at <http://www.soinc.org>.



3. **THE COMPETITION:**

- a) 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.
- b) All questions should deal with the following ecological principles: Energy flow through food webs and trophic pyramids including quantitative analysis of data; 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; life history strategies (age structure, survival curves, life tables); extinction, selection and migration; human impact upon ecosystems (global warming, invasive species, acid rain, erosion, pollution). If stations are used, students must spend the same amount of time at each station.
- c) **Approximately 40% (regional), 50% (state), 60% (national) of the questions** should specifically address ecological principles as they apply to two ecosystems for 2007: **Marine (including estuaries) and Forest of North America. The remainder of the questions will cover general ecological principles.** In each subsequent year, one ecosystem will remain and one replaced by the next ecosystem on the list: freshwater lakes and streams, marine (including estuaries), forests of all kinds including rain forests, deserts, grasslands, taiga, tundra.

4. **SAMPLE QUESTIONS**

- a) 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.
- b) 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.
- c) Determine the population growth rate for an area given r (rate of increase) and N (number of individuals).
- d) Compare a coniferous forest with a tropical rain forest. 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?
- e) Students are given three age structures and asked to determine which population has the highest birth rate, death rate, doubling time, and mean age.
- f) An aquarium that contains algae and snails is compared with an aquarium that only contains algae. Students are asked to graph and then explain their prediction of oxygen and carbon dioxide levels in each of the aquaria over a twenty-four hour period if light is provided for only 12 of the hours.
- g) Why is the burning of natural gas (CH_4) less of a problem for acid rain than other fossil fuels?

5. **SCORING:** Questions will be assigned point values. Students will be ranked from highest to lowest score. Ties will be broken by pre-determined tiebreaker questions.