



1. **DESCRIPTION:** Students will use process skills to complete tasks related to Earth's fresh waters..

A TEAM OF UP TO: 2

APPROXIMATE TIME: 50 minutes

2. **EVENT PARAMETERS:**

- Each team may bring one 2" or smaller three-ring binder, as measured by the interior diameter of the rings, containing information in any form and from any source. Sheet protectors, lamination, tabs, and labels are permitted. If the event features a rotation through a series of laboratory stations where the participants interact with samples, specimens, or displays; no material may be removed from the binder throughout the event.
- Each team may bring two stand-alone calculators of any type.

3. **THE COMPETITION:**

- Participants will be presented with questions which may include one or more tasks at a workstation or a timed station-to-station format.
- The participants will be expected to use process skills (e.g., communicating, classifying, inferring, measuring, observing, predicting, and using number relationships) to answer questions on the following topics:
 - Interpretation of fresh water features shown on USGS topographic maps
 - Stream drainage systems: stream order, drainage patterns, main channel, tributaries and watersheds
 - Channel types: braided, meandering, straight and calculations of sinuosity
 - Sediment: weathering, erosion, clast forms and sizes, transportation, capacity and competence, deposition
 - River valley forms and processes: geology, gradient, base level, floodplain features, dynamic equilibrium, nick points, waterfalls, stream capture, deltas and fans
 - Perennial and intermittent stream flow, stream gauging and monitoring, stream flow calculations, discharge, load, floods, recurrence intervals, (Division C only: Chezy and Manning equations)
 - Groundwater: zone of aeration, zone of saturation, water table, porosity, permeability, aquifers, confining beds, Darcy's Law (Division C only) and hydraulic gradient, water table contour lines, flow lines, capillarity, recharge and discharge, saltwater intrusion, and interactions between surface and groundwater
 - Karst features: sinkholes, solution valleys, springs, disappearing streams, caves
 - Lake formation and types: faulting, rifting, volcanic action, glaciation, damming of rivers, changes over time
 - Lake features: inflow and outflow, physical and chemical properties, stratification, shorelines, waves
 - Wetlands: interactions between surface and groundwater in the evolution of bogs and marshes
 - Destruction/Effects of land use changes, dams and levees: sedimentation, down-cutting, diversion of water, flooding, ecological changes
 - Hydrologic cycle and water budgets: precipitation, runoff, evaporation
 - Pollution: types, sources, transport
 - Critical zone hydrology: infiltration, evapotranspiration, soil moisture, permafrost, pingos

4. **REPRESENTATIVE ACTIVITIES:**

- Analyze and interpret features and actions of a stream or river appearing on a topographic map including watershed boundaries, elevation, gradient, direction of flow, drainage pattern, valley shapes, erosional landscapes, and depositional features.
- Construct a water table contour map and indicate the direction of groundwater movement.
- Analyze data on the thermal structure of a lake and determine how the stratification changes seasonally.
- Given a geologic map, cross section, or lithologic sequence, determine pattern of water flow and storage, optimal reservoir siting.

5. **SCORING:** Points will be awarded for the quality and accuracy of responses. High score wins. Ties will be broken by the accuracy and/or quality of answers to selected questions.

Recommended Resources: The Science Olympiad Store (store.soinc.org) carries a variety of resources to purchase for this event; other resources are on the Event Pages at soinc.org

This event is sponsored by the National Oceanic and Atmospheric Administration (NOAA) and the North American Association for Environmental Education (NAAEE)