Biosphere Investigation

A GLOBE® Learning Investigation
Biosphere Investigation at a Glance

Protocols

Daily and Bi-Weekly, Seasonal Measurements
- Cloned and Common Lilacs (daily, Seasonal)
- Green-Up (bi-weekly, seasonal)
- Green-Down (bi-weekly, seasonal)
- Ruby-Throated Hummingbirds (daily or bi-weekly, seasonal)
- Phenological Gardens (daily or bi-weekly, seasonal)
- Arctic Bird Migration (every other day from 2 weeks prior to expected arrival)

Monthly
- Seaweed Receptacle Reproductive Stages (four months in a row)

Once Per Site (or when land cover type has changed)
- Land Cover Sample Site Protocol (Data collected once for each site: GPS location, photographs, land cover classification)
- Biometry Protocol (Data collected once to determine land cover class of Land Cover Sample Sites or more often to study changes in biomass over time: canopy cover and ground cover, tree, shrub and/or graminoid height, tree circumference, graminoid biomass, dominant and co-dominant vegetation)

Suggested Activities

Note: Certain Learning Activities are desirable prior to implementing Protocols.
Read the Introduction to become familiar with concepts of the biosphere, land cover and phenology.

Land Cover
Read the Measurement Logistics and Suggested Methodology in the Introduction.
Perform Getting to Know Your Satellite Imagery and GLOBE Study Site Learning Activity.
Make a densiometer and clinometer (see Investigation Instruments).
Review how to pace and use a compass, densiometer, clinometer and tape measure (see Investigation Instruments).
Practice the GPS Protocol (see GPS Chapter) and the Biometry Protocol.
Choose appropriate Land Cover Sample Sites within your Study Site (review Sample Site Selection and Set-up).
Perform the Site Seeing Learning Activity (Beginner, or Intermediate) - introduces systems concepts.
Perform the Leaf Classification Learning Activity - introduces the concepts of classification.
Practice using the MUC System to classify land cover. Perform the Land Cover Sample Site Protocol at each Sample Site. Perform the Odyssey of the Eyes Learning Activity (Beginning, Intermediate, or Advanced) - introduces remote sensing. Perform the either the Manual Mapping: A Tutorial for the Beverly, MA Image (from the Appendix) if you will be doing a manual map or the Unsupervised Clustering Tutorial if you will be doing a computer-aided map. Perform either Manual or Computer-aided Land Cover Mapping Learning Activity using a Landsat satellite image. Perform the Bird Beak Accuracy Assessment Learning Activity to introduce accuracy assessment. Perform the Accuracy Assessment Tutorial from the Appendix to analyze the accuracy of your land cover type map. Perform the Land Cover Change Detection Learning Activity. Perform the Discovery Area Learning Activity - uses the satellite images and maps students create. Using GLOBE Data to Analyze Land Cover Learning Activity - relates land cover data to other GLOBE investigation measurements.

Phenology
If you intend on doing the Phenological Gardens Protocol, the best time to plant your garden is in the spring or autumn. Also, you must wait a year before collecting data. Green-Up Cards, A Sneak Preview to Budburst, and a First Look at Phenology learning activities set the stage for taking plant phenology measurements. Choose one of the Phenology Protocols to start (Green Down or Hummingbirds in the fall; Green Up, or Hummingbirds in the spring); Phenological Gardens throughout the year). A Beginning Look at Photosynthesis and Investigating Leaf Pigments learning activities help students better understand the process of photosynthesis. Global Patterns in Green-Up and Green-Down and Limiting Factors in Ecosystems help students to explore global trends in green-up and green-down and to explore why these patterns occur in different ecosystems.
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Protocols

Land Cover

Sample Site Selection and Set-Up
Investigation Instruments: The MUC System
Investigation Instruments: Clinometer
Investigation Instruments: Densiometer
Investigation Instruments: Compass
Investigation Instruments: Tape Measure
Land Cover Sample Site Protocol
Biometry Protocol
Fire Fuel Ecology Protocol

Phenology

Green-Up Protocol
Green-Down Protocol
Ruby-throated Hummingbird Protocol
Lilac Phenology Protocol
Phenological Gardens Protocol
Seaweed Reproduction Phenology Protocol
Arctic Bird Migration Monitoring Protocol

Learning Activities

Land Cover

Getting to Know Your Satellite Imagery and GLOBE Study Site
Site Seeing (Beginner, and Intermediate verisons)
Leaf Classification
Odyssey of the Eyes (Beginning, Intermediate, and Advanced versions)

Bird Beak Accuracy Assessment

Discovery Area

Using GLOBE Data to Analyze Land Cover

Manual Land Cover Mapping


Computer-aided Land Cover Mapping

Accuracy Assessment Tutorial

Land Cover Change Detection

Change Detection Tutorial

Do You Know Your MUC?

Phenology

Green-up Cards

A Sneak Preview of Budburst

A First Look at Phenology

A Beginning Look at Photosynthesis

Investigating Leaf Pigments

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Land Cover

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