My NASA Data - GLOBE Connections

GLOBE Connections: Phytoplankton Distribution

This resource helps to identify and access GLOBE protocols and hands-on learning activities that complement the Phytoplankton Distribution phenomenon. Students conduct their own investigations and see how their data related to global patterns by using GLOBE and My NASA Data together.

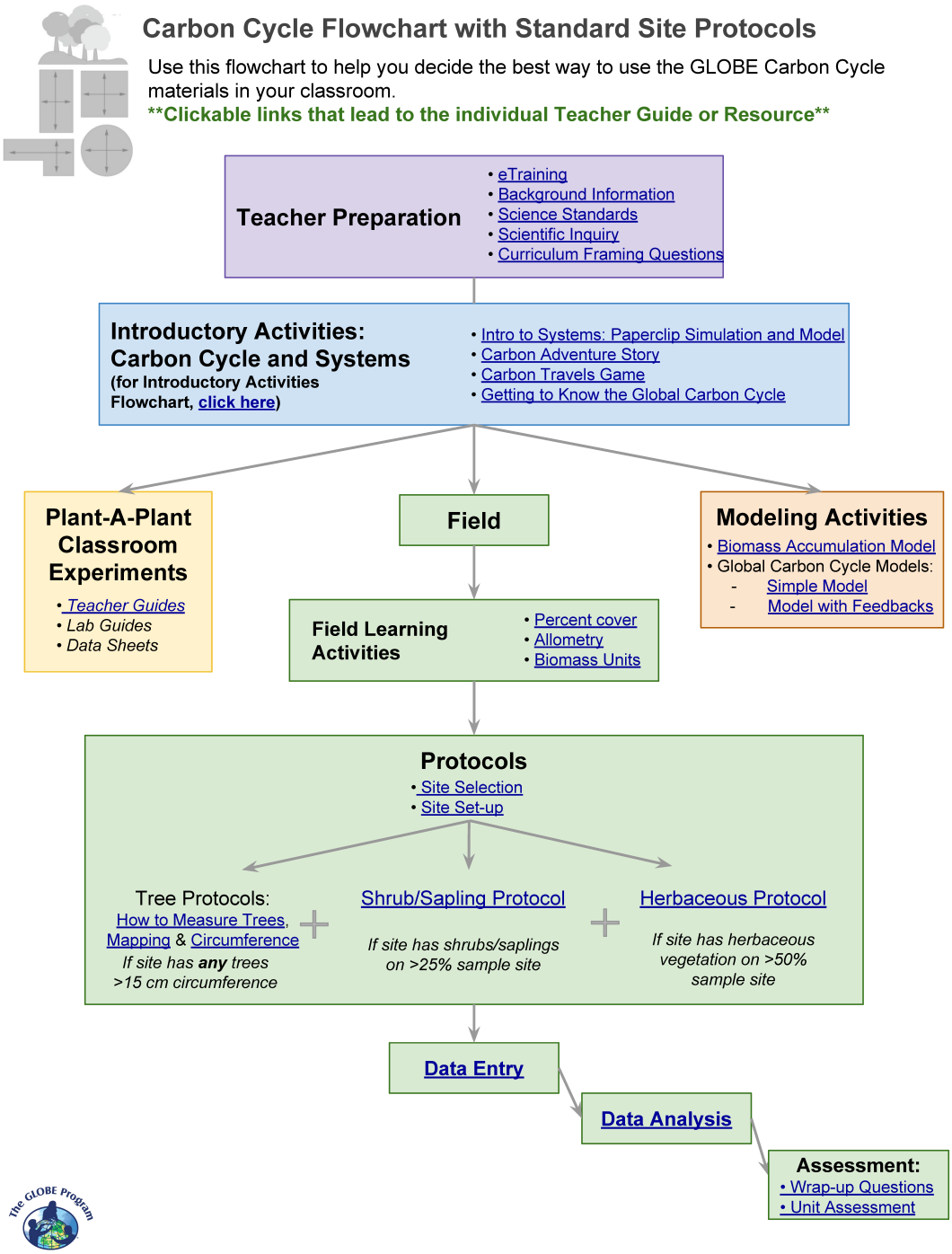
Visit the **GLOBE Biosphere Protocols & Related ESDE Datasets** page that outlines the datasets available in the Earth System Data Explorer. These data complement student GLOBE investigations using the following protocols.

Phytoplankton Distribution

Students use GLOBE protocols in rivers to see how the runoff might impact the ocean growth of phytoplankton.

Protocols

GLOBE protocols are used to collect many types of data to explore the conditions related to suitability for phytoplankton growth. Students can use the protocols to collect data and share their data with other GLOBE students around the world.

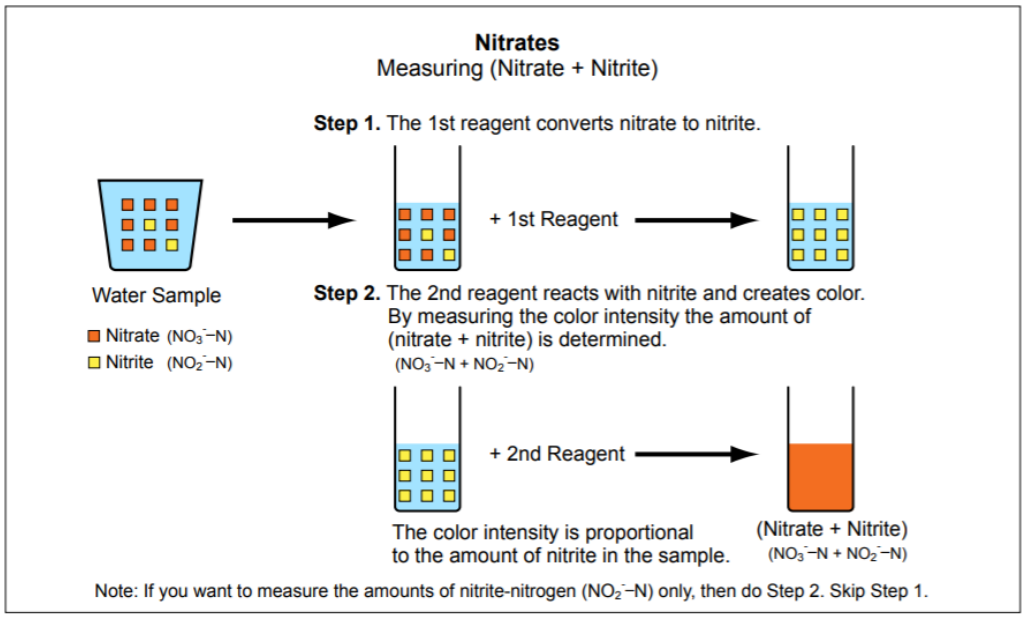


Source: GLOBE Website

Carbon Cycle: Students learn the necessary skills and work in teams to set-up a carbon cycle site. Determine which vegetation types you will measure at your site. There are decision trees available to facilitate decision making as well as a variety of carbon cycle learning activities and protocols.

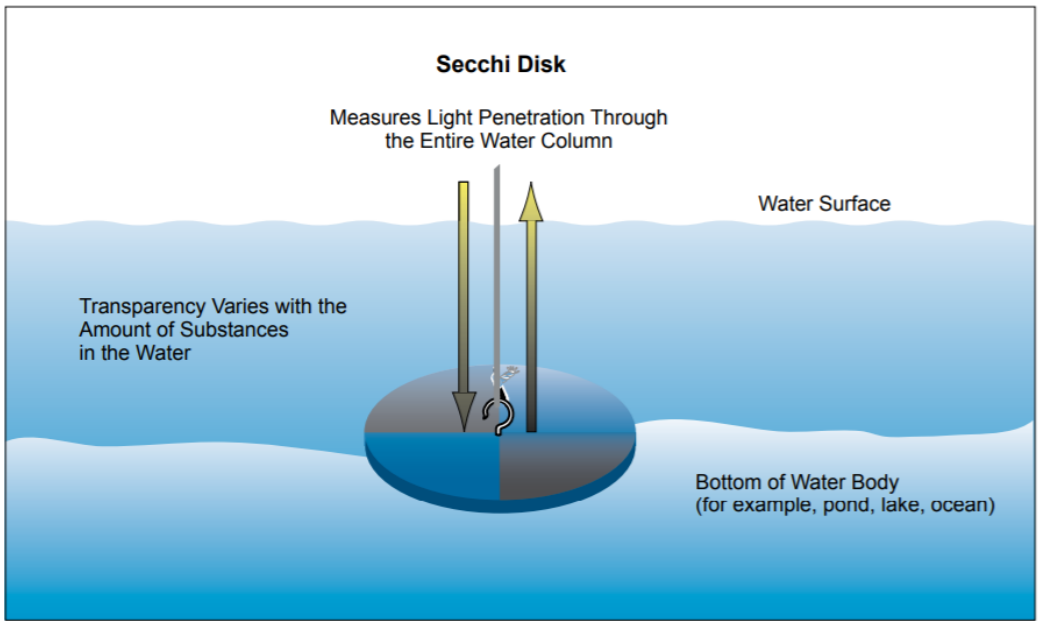
NASA image courtesy Jeff Schmaltz, MODIS Rapid Response

Dissolved Oxygen Protocol: Students measure dissolved oxygen in the water at their site using a dissolved oxygen test kit or probe.



Source: GLOBE Website

Nitrates: Students will measure the nitrate-nitrogen content of water using a nitrate test kit.



Source: GLOBE Website

Water Transparency: Students measure water transparency at their undisturbed study site using a transparency tube or Secchi disk.

Protocol Bundles

The ocean protocol bundle can be used in conjunction with phytoplankton data.

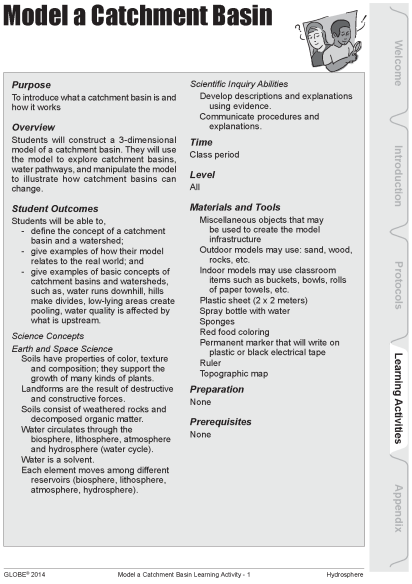
GLOBE Ocean Bundle - Oceans are complex ecosystems, which implies that their study needs to take into consideration several interrelated physical parameters, not to mention the mechanisms and processes which reflect the interaction between land and oceans along coastal zones as well as the interaction between the atmosphere and oceans. This group of protocols is to be jointly implemented to improve our knowledge about oceans.

The water quality protocol bundle can be used to evaluate conditions related to phytoplankton growth.

GLOBE Water Quality Bundle - As water interacts with the atmosphere, soil and the surrounding land cover bordering water bodies, and the surface over which the water flows, the water quality changes. Water quality determines what can live in the water body and how the water may be used. This bundle contains atmosphere, hydrosphere, and pedosphere protocols.

Learning Activities

Check out the three learning activities to help prepare students for collecting data and to support the integration of MND with *GLOBE* in your curriculum.



Model a Catchment Basin

Purpose
To introduce what a catchment basin is and how it works

Overview
Students will construct a 3-dimensional model of a catchment basin. They will use the model to explore catchment basins, water pathways, and manipulate the model to illustrate how catchment basins can change.

Student Outcomes
Students will be able to,
- define the concept of a catchment basin and a watershed;
- give examples of how their model relates to the real world; and
- give examples of basic concepts of catchment basins and watersheds, such as, water runs downhill, hills make divides, low-lying areas create pooling, water quality is affected by what is upstream.

Science Concepts
Earth and Space Science
Soils have properties of color, texture and composition; they support the growth of many kinds of plants.
Landforms are the result of destructive and constructive forces.
Soils consist of weathered rocks and decomposed organic matter.
Water circulates through the biosphere, lithosphere, atmosphere and hydrosphere (water cycle).
Water is a solvent.
Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).

Scientific Inquiry Abilities
Develop descriptions and explanations using evidence.
Communicate procedures and explanations.

Time
Class period

Level
All

Materials and Tools
Miscellaneous objects that may be used to create the model infrastructure
Outdoor models may use: sand, wood, rocks, etc.
Indoor models may use classroom items such as buckets, bowls, rolls of paper towels, etc.
Plastic sheet (2 x 2 meters)
Spray bottle with water
Sponges
Red food coloring
Permanent marker that will write on plastic or black electrical tape
Ruler
Topographic map

Preparation
None

Prerequisites
None

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GLOBE® 2014 Model a Catchment Basin Learning Activity - 1 Hydrosphere

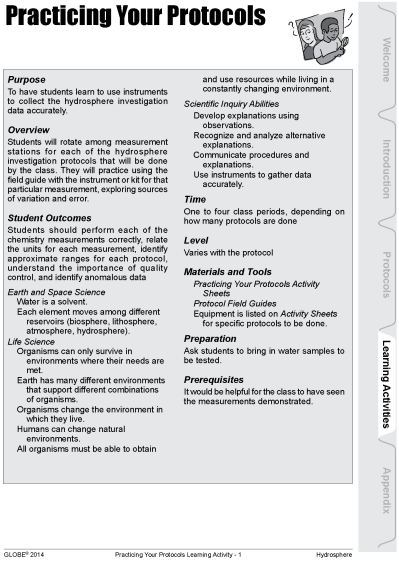
Source: GLOBE Website

Model a Catchment Basin

Overview: Students will construct a 3-dimensional model of a catchment basin. They will use the model to explore catchment basins, water pathways, and manipulate the model to illustrate how catchment basins can change.

Student Outcomes:

- Define the concept of a catchment basin and a watershed
- Give examples of how their model relates to the real world
- Give examples of basic concepts of catchment basins and watersheds, such as, water runs downhill, hills make divides, low-lying areas create pooling, water quality is affected by what is upstream
- Soils have properties of color, texture and composition; they support the growth of many kinds of plants
- Landforms are the result of destructive and constructive forces
- Soils consist of weathered rocks and decomposed organic matter
- Water circulates through the biosphere, lithosphere, atmosphere and hydrosphere (water cycle)
- Water is a solvent
- Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere)



Practicing Your Protocols

Purpose
To have students learn to use instruments to collect the hydrosphere investigation data accurately.

Overview
Students will rotate among measurement stations for each of the hydrosphere investigation protocols that will be done by the class. They will practice using the field guide with the instrument or kit for that particular measurement, exploring sources of variation and error.

Student Outcomes
Students should perform each of the chemistry measurements correctly, relate the units for each measurement, identify approximate ranges for each protocol, understand the importance of quality control, and identify anomalous data

Earth and Space Science
- Water is a solvent.
- Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).

Life Science
- Organisms can only survive in environments where their needs are met.
- Earth has many different environments that support different combinations of organisms.
- Organisms change the environment in which they live.
- Humans can change natural environments.
- All organisms must be able to obtain and use resources while living in a constantly changing environment.

Scientific Inquiry Abilities
- Develop explanations using observations.
- Recognize and analyze alternative explanations.
- Communicate procedures and explanations.
- Use instruments to gather data accurately.

Time
One to four class periods, depending on how many protocols are done

Level
Varies with the protocol

Materials and Tools
- *Practicing Your Protocols Activity Sheets*
- *Protocol Field Guides*
- Equipment is listed on *Activity Sheets* for specific protocols to be done.

Preparation
Ask students to bring in water samples to be tested.

Prerequisites
It would be helpful for the class to have seen the measurements demonstrated.

GLOBE® 2014 Practicing Your Protocols Learning Activity - 1 Hydrosphere

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Source: GLOBE Website

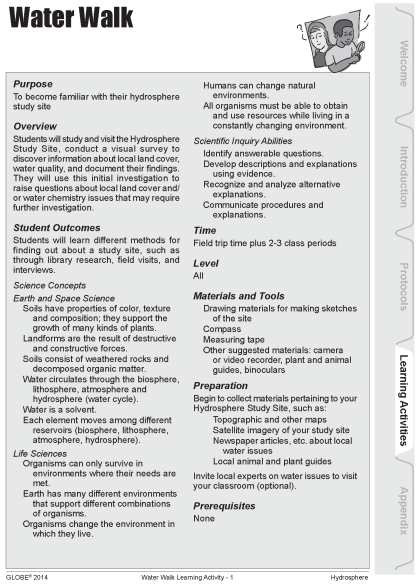
[Practicing Your Protocols]

In the classroom, students practice using the instruments or kits for protocols, exploring the range of measurements and sources of variation and error.

[Water Walk]

Overview: Students will study and visit the Hydrosphere Study Site, conduct a visual survey to discover information about local land cover, water quality, and document their findings. They will use this initial investigation to raise questions about local land cover and/ or water chemistry issues that may require further investigation.

Student Outcomes:



Water Walk

Purpose
To become familiar with their hydrosphere study site

Overview
Students will study and visit the Hydrosphere Study Site, conduct a visual survey to discover information about local land cover, water quality, and document their findings. They will use this initial investigation to raise questions about local land cover and/ or water chemistry issues that may require further investigation.

Student Outcomes
Students will learn different methods for finding out about a study site, such as through library research, field visits, and interviews.

Science Concepts

Earth and Space Science
- Soils have properties of color, texture and composition; they support the growth of many kinds of plants.
- Landforms are the result of destructive and constructive forces.
- Soils consist of weathered rocks and decomposed organic matter.
- Water circulates through the biosphere, lithosphere, atmosphere and hydrosphere (water cycle).
- Water is a solvent.
- Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).

Life Sciences
- Organisms can only survive in environments where their needs are met.
- Earth has many different environments that support different combinations of organisms.
- Organisms change the environment in which they live.
- Humans can change natural environments.
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Scientific Inquiry Abilities
- Identify answerable questions.
- Develop descriptions and explanations using evidence.
- Recognize and analyze alternative explanations.
- Communicate procedures and explanations.

Time
Field trip time plus 2-3 class periods

Level
All

Materials and Tools
- Drawing materials for making sketches of the site
- Compass
- Measuring tape
- Other suggested materials: camera or video recorder, plant and animal guides, binoculars

Preparation
Begin to collect materials pertaining to your Hydrosphere Study Site, such as:
- Topographic and other maps
- Satellite imagery of your study site
- Newspaper articles, etc. about local water issues
- Local animal and plant guides

Invite local experts on water issues to visit your classroom (optional).

Prerequisites
None

GLOBE® 2014 Water Walk Learning Activity - 1 Hydrosphere

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[Source: GLOBE Website]

- Students will learn different methods for finding out about a study site, such as through library research, field visits, and interviews
- Soils have properties of color, texture and composition; they support the growth of many kinds of plants
- Landforms are the result of destructive and constructive forces
- Soils consist of weathered rocks and decomposed organic matter
- Water circulates through the biosphere, lithosphere (geosphere), atmosphere, and hydrosphere (water cycle)
- Water is a solvent
- Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere)
- Organisms can only survive in environments where their needs are met
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Water Detectives

Students will investigate how they use their senses for observation and why we use instruments to collect data.

Cup	Look	Listen	Smell	Feel	pH Test
1 one					
2 two					
3 three					
4 four					

Source: GLOBE Website