MULTI Summer 2018 Assessing Water Quality

6/5/18

JANELLE JOHNSON APR 09, 2018 08:33AM

What's the Problem?

JANELLE JOHNSON JUN 03, 2018 03:35PM

Essential questions or statement of problem

From the UN Development Goals

6_Why-it-Matters_Sanitation_2p.pdf
PDF document
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JANELLE JOHNSON JUN 03, 2018 05:18PM

Possible PBL

PBL: Poor water; impact on humans and environment
I have/who has reading of:
https://www.sciencenewsforstudents.org/article/will-water-woes-leave-americans-thirsty (article for students that discusses common forms of contamination for water quality in the US. How is water regulated in the U.S? How can we reduce the risk of water contamination?)

JANELLE JOHNSON JUN 03, 2018 05:19PM

Video on Denver water

Planning for a changing climate (4 min.)
https://toolkit.climate.gov/case-studies/water-utility-plans-climate-uncertainty

JANELLE JOHNSON JUN 05, 2018 09:06AM

PBL idea

How do weather events like monsoons interact with landslides to impact wildlife populations?

JANELLE JOHNSON JUN 05, 2018 09:12AM

PBL Idea

How do some watershed areas recover more quickly after fires than others?

JENNIFER JUN 05, 2018 09:22AM

How do water quality impacts from fires change as water moves down the watershed?

JENNIFER JUN 05, 2018 09:24AM

How do numbers of observed wildlife change as the result of water quality impacts from 1-5 years after a fire?

BRITTANY LANG JUN 05, 2018 09:28AM

Human Footprint

How can humans inadvertently alter ecosystems and water quality.
CONNECTION: fires and carbon cycle

MARIA CROUSE JUN 07, 2018 07:01AM

HS Math PBL

Explore and represent quantitative relationships in the real world: Using Landsat images, explore the impact of forest fires. Mathematically represent decay/growth over time as related to this topic.

Forest Fire Impact on the Watershed

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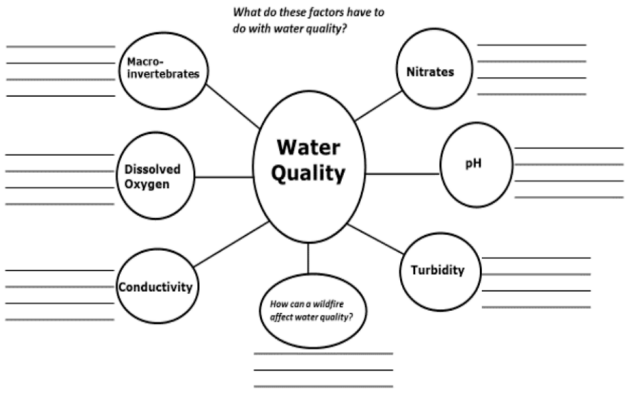
graphic organizer on water quality



water quality graphic organizer.docx
Word document

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CASSIE HAYTER JUN 05, 2018 08:18AM

UCS

Resource mentioned by guest speaker, Dr. Ashley Rust

Union of Concerned Scientists

https://www.ucsusa.org/

JANELLE JOHNSON JUN 05, 2018 08:22AM

Community stakeholders

Engagement with community members key to the work.

JANELLE JOHNSON JUN 05, 2018 09:00AM

Water Chemistry

Specific populations have specific water chemistry needs

foam fire and increase in water phosphate levels, role of trees in uptake of nitrogen and phosphate — **CASSIE HAYTER**

top layer soil that burns and chemical transformation to hydrophobic layer — **CASSIE HAYTER**

introduction of metals to water source from channel erosion — **CASSIE HAYTER**

carbon + chlorine and harmful byproducts — **CASSIE HAYTER**

CASSIE HAYTER JUN 05, 2018 10:38AM

Fire Resource

https://www.firescience.org/

Referenced in Dr. Rust's presentation

JENNIFER BOURGEAULT JUN 05, 2018 11:31AM

MultiSpec

The software is available from the Purdue University MultiSpec website. It is available for both Windows and Mac. There is also an online version (this may be able to run off a Chromebook but I will confirm with the developer).

MultiSpec© | Home
A Freeware Multispectral Image Data Analysis System

PURDUE

DAWN_CUMMINGS JUN 06, 2018 08:35AM

Dr. Ashley Rust power point presentation

Rust_fire and bugs pres_v2.pptx
Powerpoint presentation
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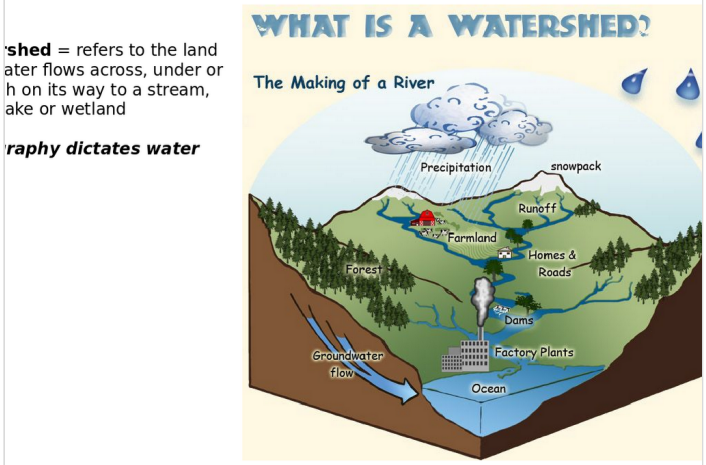

Macroinverts_and_water_quality.pptx
Powerpoint presentation
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DAWN_CUMMINGS JUN 06, 2018 08:36AM

D. Rust paper and links to measuring stream flow

Post-fire water-quality response in the western United States

Ashley J. Rust A C , Terri S. Hogue A B , Samuel Saxe A and John McCray A B
International Journal of Wildland Fire 27(3) 203-216
https://doi.org/10.1071/WF17115
Submitted: 8 March 2017 Accepted: 28 January 2018
Published: 28 March 2018

And here is a link to the USGS website that describes how you measure streamflow. This is the research method but it can be done with a measuring tape, something that floats (like an orange peel) and a timer too so it is a fun activity with students. These links give a great overview and the detailed specifics of how you do it.

https://water.usgs.gov/edu/streamflow2.html
https://water.usgs.gov/edu/measureflow.html

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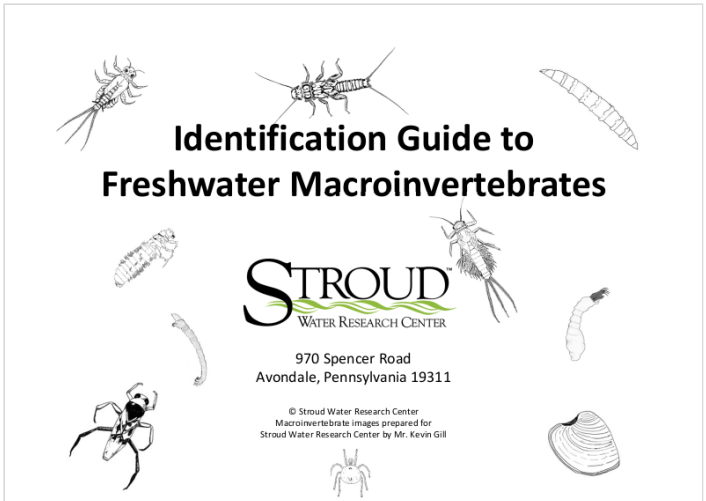

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Measuring Water Quality on Earth

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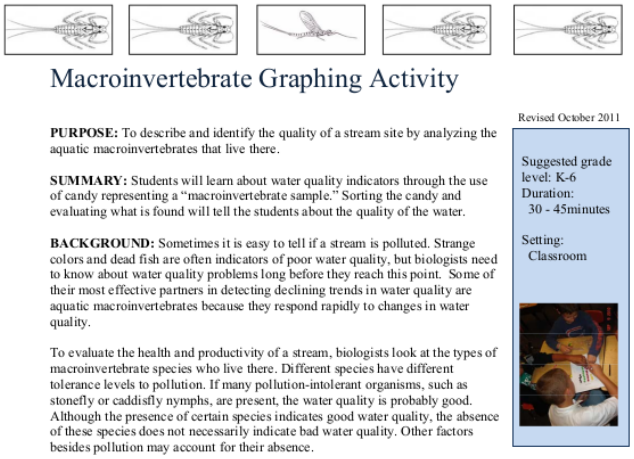

Macroinvertebrate Graphing Activity

Revised October 2011

PURPOSE: To describe and identify the quality of a stream site by analyzing the aquatic macroinvertebrates that live there.

Suggested grade level: K-6
Duration: 30 - 45minutes

Setting: Classroom

SUMMARY: Students will learn about water quality indicators through the use of candy representing a "macroinvertebrate sample." Sorting the candy and evaluating what is found will tell the students about the quality of the water.

BACKGROUND: Sometimes it is easy to tell if a stream is polluted. Strange colors and dead fish are often indicators of poor water quality, but biologists need to know about water quality problems long before they reach this point. Some of their most effective partners in detecting declining trends in water quality are aquatic macroinvertebrates because they respond rapidly to changes in water quality.

To evaluate the health and productivity of a stream, biologists look at the types of macroinvertebrate species who live there. Different species have different tolerance levels to pollution. If many pollution-intolerant organisms, such as stonefly or caddisfly nymphs, are present, the water quality is probably good. Although the presence of certain species indicates good water quality, the absence of these species does not necessarily indicate bad water quality. Other factors besides pollution may account for their absence.

Sensitive or Intolerant Species:
Organisms easily killed, impaired, or driven off by bad water quality; includes many types of stonefly, dobsonfly, and mayfly nymphs and caddisfly larvae.

Somewhat Tolerant Species:
Organisms with the ability to live under varying conditions may be found in good or poor quality water; includes amphipods, scuds, beetle and cranefly larvae, crayfish, and dragonfly nymphs.

Tolerant Species:
Organisms capable of withstanding poor water quality; includes most leeches, aquatic worms, midge larvae, and sow bugs.

MATERIALS:

Small coated candies (i.e. Skittles or M&M's)
Small plastic bags (1 per group of students)
Graph paper (see page 3)
Colored pencils
Pictures of macroinvertebrates (see pages 4-6)

Macroinvertebrate_Graphing_Activity.pdf
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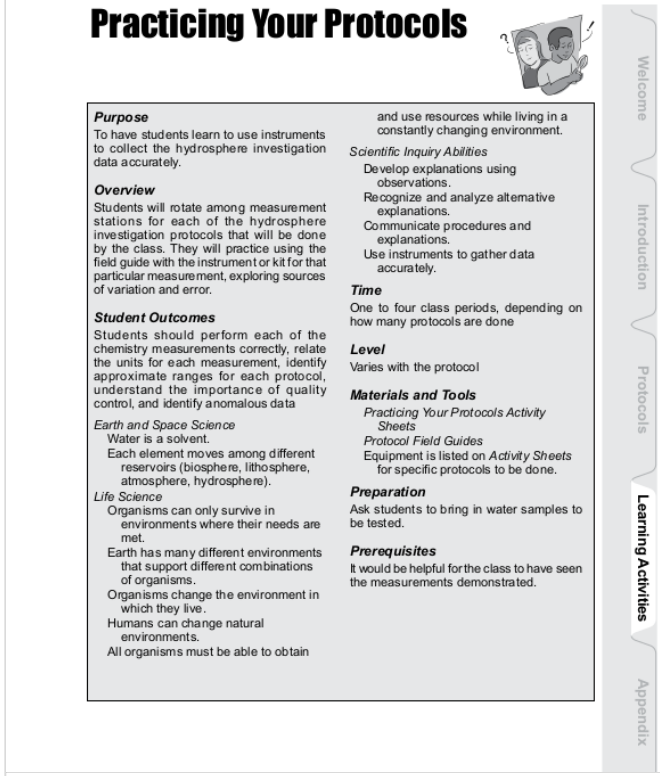

Practicing Your Protocols

Welcome
Introduction
Protocols
Learning Activities
Appendix

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.

Practicing Your protocols.pdf
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ROSEANN VIK MAY 30, 2018 01:51PM

ANONYMOUS JUN 02, 2018 02:42PM

institute alkalinity protocol

Alkalinity is expressed as the amount of calcium carbonate (CaCO3) in your water, although other substances can contribute to alkalinity as well. The units of alkalinity are either part per million (ppm) or mg/L. These units are equivalent, as 1 ppm =1 mg/L. Let us say your water has a high alkalinity. When acid is added to the water, the alkalinity neutralizes the acid. Some of the alkalinity will be used up, so that alkalinity will go down. If more acid is added, the alkalinity will continue to decrease. Eventually, when the alkalinity is low enough, adding acid will cause the pH to decrease. When water has high alkalinity, we say that it is well buffered. It resists a decrease in pH when acidic water, such as rain or snowmelt, enters it.

Why measure alkalinity of the water?

Alkalinity comes from dissolved rocks, particularly limestone (CaCO3), and soils. It is added to the water naturally as water comes in contact with rocks and soil. Water dissolves the CaCO3, carrying it into streams and lakes. Lakes and streams in areas rich in limestone bedrock will tend to have a higher alkalinity than those in regions with non-carbonate bedrock. If water has an alkalinity below about 100 mg/L as CaCO3, it is poorly buffered and pH sensitive. A big rainfall or snowmelt event could add enough acid to lower the pH in a sensitive system. This could be harmful to the plants and animals that live there, particularly at certain times of the year (e.g., when fish or insect larvae are hatching).

Supporting Protocols

pH: Alkalinity is directly related to pH; waters with higher alkalinity are more resistant to changes in pH from the influx of acid. It is, therefore, important to collect accurate pH data to compare with your alkalinity data.

Atmosphere: Atmosphere measurements, especially precipitation and temperature, are also important for interpreting your alkalinity data. Heavy rain or snowmelt, resulting in an influx of large amounts of freshwater to the system, may decrease your water's alkalinity. In addition, knowing the geology and soil types of your area is important for interpreting your alkalinity data.

alkalinity.docx
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ANONYMOUS JUN 02, 2018 02:43PM

institute conductivity protocol

Solids are found in water as dissolved or suspended solids.

Total Dissolved Solids (TDS): come in the form of sodium ions, magnesium ions, calcium ions, chloride ions, hydrogen carbonate ions and sulfate ions. Soluble solids can also be organic; however, the most common form is as an inorganic salt. Thus, we can **test for TDS by testing for conductivity with Probe.**

Total Suspended Solids (TSS): Suspended solids (TSS) can block the penetration of light, clog the gills of fish or other organisms. Cloudy water also holds more heat. These solids come from soil erosion or channelization from dredging. Increased water flow erodes stream banks and allows the water to carry a heavier load of particles. We can measure TSS by measuring transparency. See transparency protocol.

Why measure TDS (conductivity)?

Fresh water has many natural impurities –including salts or minerals dissolved in the water that we cannot always see or smell. As water comes in contact with rocks and soil, some minerals dissolve in the water. Other impurities can enter a water body through runoff or wastewater releases. If water contains high amounts of dissolved salts, it may be harmful to use for watering crops. We call the amount of mineral and salt impurities in the water the total dissolved solids (abbreviated TDS). We measure TDS as parts per million (ppm). For water we use at home, we prefer a TDS of less than 500ppm, although water with higher TDS can still be quite safe. Water used for agriculture should have a TDS below 1200 ppm so sensitive crops are not harmed.

conductivity.docx

Word document

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The dominant aquatic organisms (animals) in small-order streams are called macro-invertebrates. **Macro** means they are big enough to see with the naked eye, and they are **invertebrates** which means they don't have a backbone, unlike fish, amphibians, and mammals. Macroinvertbrates includes worms, clams, aquatic insects and crustaceans, and many aquatic larvae of terrestrial adult insects, like dragonflies.

Macroinvertebrates are important ecosystem players in small-order streams. They are a **primary food source** for the upper trophic levels in the aquatic food web. Macro-invertebrates are found in a variety of habitats within the stream, in leaf packs, on vegetation, under rocks; some prefer riffles (shallows with water bubbling over rocks), some prefer slow moving water, still pools or buried in the sediment.

Using Macroinvertebrates as indicators of water quality

Physical and chemical measures of water quality are useful to determine sources of contamination, but they only indirectly measure health of ecosystem. These measures do not tell us anything about the **biological responses to those values**.

Also, **chemical water samples are only a snapshot** since chemical concentrations can fluctuate over time, (daily or seasonally) depending on the timing of discharges, precipitation and water flow patterns. Whereas, aquatic organisms must cope with any influences in their habitat over their entire aquatic lifecycle, sometimes several years. Thus, **monitoring aquatic organisms is a better indicator of long-term trends** in the health of the ecosystem.

Because water moves so rapidly in streams, it can be difficult to monitor them for pollution. However, certain kinds of **pollution** can have long-term effects on the living organisms in streams. One method is to sample a stream for organisms; giving the organisms that are least tolerant of pollution a greater weight in our assessment than organisms that are very tolerant of pollution. Thus, the organisms found will serve as a marker for the presence of pollution – the

macroinvertebrates.docx

Word document

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ANONYMOUS JUN 02, 2018 02:44PM

institute dissolved oxygen protocol

Aquatic animals need dissolved oxygen to live. Oxygen dissolves readily into water from the atmosphere until it is saturated. Once dissolved in water, oxygen diffuses very slowly, and distribution depends on the movement of the aerated water. Oxygen is also produced by aquatic plants, algae, and phytoplankton as a by-product of photosynthesis. The saturation level of oxygen in the water is dependent upon the atmospheric pressure and the water temperature.

Why measure DO in the water?

Aquatic organisms require different amounts of dissolved oxygen, some are more sensitive than other species. Dissolved Oxygen levels below 3 ppm are stressful to most aquatic organisms. Dissolved Oxygen levels below 2 or 1 ppm will not support fish. Levels of 5-6 ppm are required for the reproduction and growth of most aquatic organisms.

Supporting Protocols:

Water Temperature: Oxygen solubility is dependent on temperature. It is therefore important to collect water temperature data along with dissolved oxygen data.

Salinity: Oxygen solubility is dependent on salinity. To find percent solubility, it is important to collect salinity data in water bodies where salinity is a factor. If your water body is less than 1ppt (1000mg/L) you do not need to adjust for salinity.

Atmosphere: Atmosphere measurements such as cloud cover, precipitation, and air temperature may also be useful in interpreting dissolved oxygen data. Increased cloud cover, ce, may result in a decrease in photosynthesis during the day.

dissolved oxygen.docx

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ANONYMOUS JUN 02, 2018 02:45PM

institute nitrates protocol

ction

Nitrogen can have many chemical forms in water bodies Nitrogen can be found as dissolved molecular nitrogen (N_2), as organic compounds (both dissolved and particulate), as numerous inorganic forms such as ammonium (NH_4^+), nitrite (NO_2^-) and nitrate (NO_3^-). Nitrate (NO_3^-) is usually the most important inorganic form of nitrogen becauseit is an essential nutrient for the growth and reproduction of many algae and other aquatic plants. Nitrite (NO_2^-) is usually found only in waters with low dissolved oxygen levels, called suboxic waters.

Why measure the nitrogen in water?

Scientists often call nitrogen a "limiting nutrient" because in low amounts, plants use up
all the available nitrogen in the water and cannot grow or reproduce anymore. The nitrate form of nitrogen found in natural waters comes from the atmosphere by precipitation or dry deposition by wind, from groundwater inputs, and from surface and below surface run-off that flows off and through surrounding land cover and soils.

As well, the decay of plant or animal matter in soil or sediments creates nitrates. Human activities can greatly affect the amounts of nitrate in water.
When an excess amount of a limiting nutrient such as nitrogen is added to a lake or stream the water becomes highly productive. This may cause tremendous growth of algae and other plants. This process of enriching the water is called ***eutrophication*.**
As plants and algae die and decay, bacteria multiply and use the dissolved oxygen in the water. The amount of available dissolved oxygen in the water may become very low and harm fish and other aquatic animals.

Field Sampling Suggestion:

Most natural waters have nitrate levels under 1.0 mg/L nitrate-nitrogen, but concentrations over 10 mg/L nitrate-nitrogen are found in some areas. If your kit has a low range (0-1 ppm) and a high range (1-10 ppm), most likely you will only use the low range test. If you are not sure

nitrates.docx

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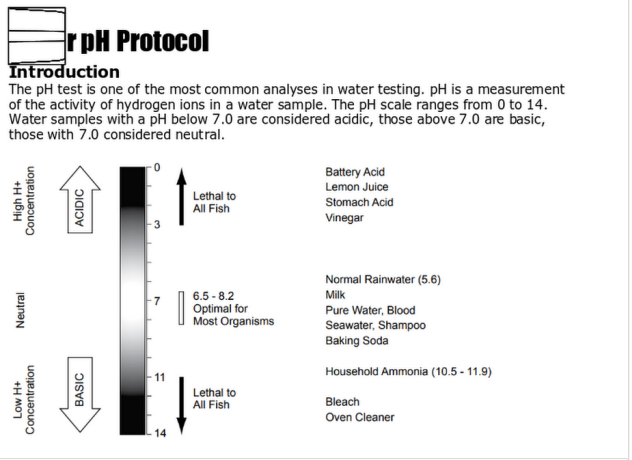
institute macroinvertebrates protocol

ANONYMOUS JUN 02, 2018 02:45PM

institute pH protocol



r pH Protocol

Introduction

The pH test is one of the most common analyses in water testing. pH is a measurement of the activity of hydrogen ions in a water sample. The pH scale ranges from 0 to 14. Water samples with a pH below 7.0 are considered acidic, those above 7.0 are basic, those with 7.0 considered neutral.

pH.docx

Word document

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Total Suspended Solids (TSS): Suspended solids (TSS) are finer particles suspended in the water. More particles in the water also absorbs more heat and increases water temperature.

Transparency decreases with the presence of molecules and particles that can absorb or scatter light.
Dark or black material absorb most wavelengths of light, whereas white or light materials reflect most wavelengths of light. The size of a particle is important as well. Small particles (diameters less than 1µm) can scatter light.

"Hard" water lakes with lots of suspended $CaCO_3$ particles preferentially scatter blue-green light, whereas lakes with organic materials appear more green or yellow. Rivers with high loads of sediments are often the color of the sediments (e.g. brown).

Why measure transparency in water?

Suspended particles in our water behave similarly to dust in the atmosphere. They reduce the depth to which light can penetrate. Sunlight provides the energy for photosynthesis (the process by which plants grow by taking up carbon, nitrogen, phosphorus and other nutrients, and releasing oxygen).
How deeply light penetrates into a water body determines the depth to which aquatic plants can grow.

Most people have seen how rivers turn brown after a heavy rain. Soil particles carried by runoff cause this to happen. High amounts of soil in the water will block sunlight from reaching the bottom of a river or a lake in shallow water. When the water is turbid, floating particles absorb heat from the sun and cause the water temperature to rise. Higher temperatures cause oxygen levels in the water to fall, limiting the ability

transparency.docx

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institute water temperature protocol

Temperature influences the amount and diversity of aquatic life. Lakes that are cold and have little plant life in winter, bloom in spring and summer when water temperatures rise and the nutrient-rich bottom waters mix with the upper waters. Because of this mixing and the warmer water temperatures, the spring overturn is followed by a period of rapid growth of microscopic aquatic plants and animals. Many fish and other aquatic animals also spawn at this time of year when the temperatures rise and food is abundant. Shallow lakes are an exception to this cycle, as they mix throughout the year.

Water temperature is also important because warm water can be fatal for sensitive species, such as trout or salmon, which require cold, oxygen-rich conditions. ***Warmer water tends to have lower levels of dissolved oxygen.*** Water temperatures can help understand local and global weather patterns, since water temperatures change differently than air temperatures due to the higher heat capacity of water compared to air. Water also helps change air temperature through the processes of evaporation and condensation.

Protocol for Alcohol Filled Thermometer

1. Put the thermometer into the stream or pond water to a depth of 10 cm.
2. Leave it in the water for three minutes.
3. Read the temperature quickly upon removing the thermometer from the water.
4. Put the thermometer back in the water for one more minute.
5. Read the temperature again. If the temperature has not changed, go to Step 6. If the temperature has changed since the last reading, repeat Step 2-4 until the temperature stays the same.
6. Record the temperature on the *data table*.
7. Calculate the average of the three measurements.
8. All temperatures should be within 1.0° C of the average. If they are not, repeat process.

temperature.docx

Word document

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institute transparency protocol

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GLOBE mapping your hydrosphere site protocol

Mapping Your Hydrosphere Study Site

Field Guide

Task

Make a scaled field map of your Hydrosphere Site.

Materials

- ❑ *Hydrosphere Site Mapping Sheet* (1 cm grid paper)
- ❑ Flags (18)
- ❑ Measuring tape (50 m)
- ❑ Pencil/eraser
- ❑ Compass

In the Field

1. Select a section of the bank at least 50 meters long as your study area, if possible. You may consider the entire water body as your study area if it is small enough. The area should contain the sampling site where you collect your water measurements as well as a variety of habitats.
2. Use the measuring tape to measure a straight transect, at least 50 meters long, parallel to the shoreline, and within 10 meters of the bank. The transect will be varying distances from the water if the bank is not straight.
3. Place flags at the two ends and at every 2 meters along the transect.
4. Start drawing your map using the flags to help keep it to scale.

   Note: Using the *Mapping Field Sheet* or graph paper with 1 cm squares, each square should represent 2 meters. Put the scale on your graph.
5. Mark the transect and flag positions on the map.
6. Draw the waterline or bank by measuring from each flag directly to the water, placing a small dot on the map to show the waterline, then connect the dots with a dotted line to indicate the bank.
7. Put in the opposite bank or indicate the approximate distance to the opposite bank if known.
8. Use an arrow to indicate the direction of water flow or the inlet and outlet of your water body.
9. Create a key with symbols for special features found at your site. Use these symbols to indicate where special features are located on the map. Suggested features to include:

   - Within the sampling area: riffle areas, pools, vegetated areas, logs, rocky areas

mapping your hydrosphere site.pdf

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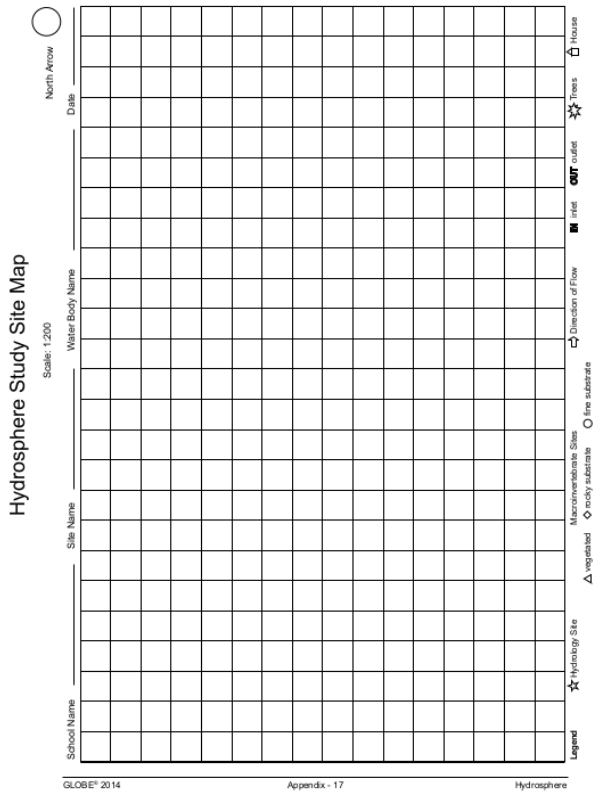
GLOBE site mapping sheet



hydrosphere site mapping sheet.pdf

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GLOBE introduction to the hydrosphere

Introduction

Hydrosphere

What is the condition of Earth's many surface waters – the streams, rivers, lakes, and coastal waters? How do these conditions vary over the year? Are these conditions changing from year to year?

Through the GLOBE Hydrosphere Investigation, you can help address these questions by monitoring the waters near your school. Our knowledge of global trends in water measurements is based on sampling at very few sites. This sampling has generally been done only a few times. For example, our information on many lakes is based on sampling done only once or twice more than ten years ago.

In order to evaluate water changes, we need access to reliable information on current and past conditions. If changes are already taking place, comparing multiple sites at different areas can help us understand what is happening.

Why Investigate the Surface Waters?

We do not just drink water; we are water. Water constitutes 50 to 90 percent of the weight of all living organisms. It is one of the most abundant and important substances on Earth. Water sustains plant and animal life, plays a key role in the formation of weather, helps to shape the surface of the planet through erosion and other processes, and approximately 70% of Earth's surface is covered in water.

Measures of dissolved oxygen and pH directly indicate how hospitable a body of water is to aquatic life. It is interesting to both follow the annual cycle of water parameters, such as dissolved oxygen, alkalinity and pH, and to make comparisons between different water bodies. We can ask such questions as: are dissolved oxygen levels always at the maximum allowed by the temperature of the water, or are they depressed during part of the year? If they are low, we want to know the cause. We can see if pH becomes depressed right after a rain or when there is a lot of snowmelt running off into the lake or stream. If we do find a depression in pH, we would expect this water to have a low level of alkalinity. In fact, we would expect waters with a low alkalinity to have a depression in pH following rainfall or snowmelt. But we must take the measurement to confirm whether or not this really happens. Developing a database of water measurements will allow us to answer such questions.

Despite its abundance, we cannot use most of Earth's water. If we represent Earth's water as 100 liters, 97 of them would be seawater. Most of the remaining three would be ice. Only about 3 mL out of the whole 100 liters would be fresh water that we can consume; this potable water is pumped from the ground or taken from fresh water rivers and lakes.

In most countries current measurement programs cover only a few water bodies a few times during the year. We hope the GLOBE measurements you take will help fill this gap and improve our understanding of Earth's natural waters. This knowledge can help us make more intelligent decisions about how we use, manage and enjoy these resources.

Welcome | Introduction | Protocols | Learning Activities | Appendix

hydrosphere introduction.pdf

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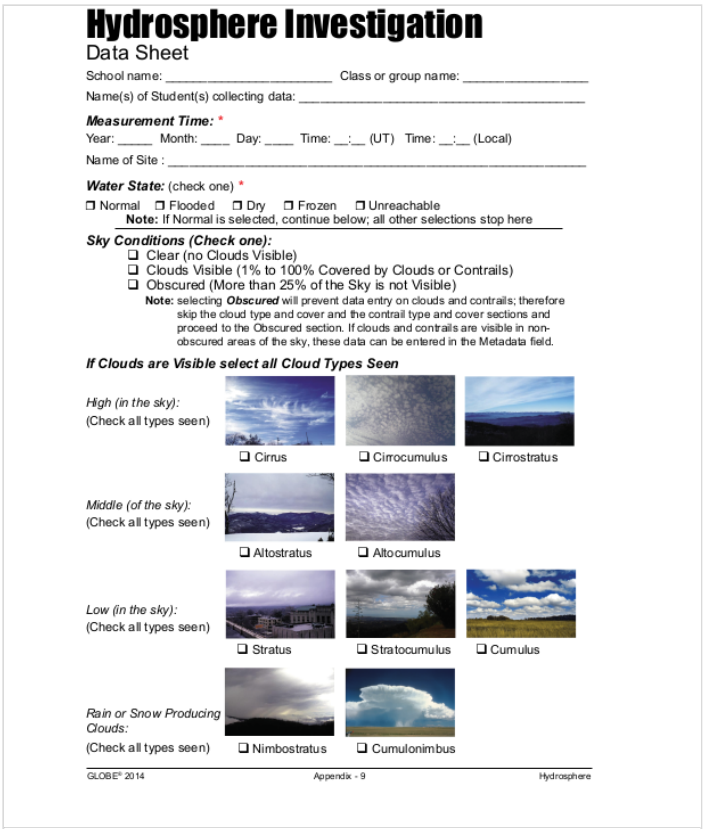
GLOBE hydrosphere data sheet



Hydrosphere Investigation

Data Sheet

School name: _____ Class or group name: _____

Name(s) of Student(s) collecting data: _____

Measurement Time: *

Year: _____ Month: ____ Day: ____ Time: __:__ (UT) Time: __:__ (Local)

Name of Site : _____

Water State: (check one) *

❒ Normal ❒ Flooded ❒ Dry ❒ Frozen ❒ Unreachable

Note: If Normal is selected, continue below; all other selections stop here

Sky Conditions (Check one):

❑ Clear (no Clouds Visible)

❑ Clouds Visible (1% to 100% Covered by Clouds or Contrails)

❑ Obscured (More than 25% of the Sky is not Visible)

Note: selecting ***Obscured*** will prevent data entry on clouds and contrails; therefore skip the cloud type and cover and the contrail type and cover sections and proceed to the Obscured section. If clouds and contrails are visible in non-obscured areas of the sky, these data can be entered in the Metadata field.

If Clouds are Visible select all Cloud Types Seen

High (in the sky):
(Check all types seen)

❑ Cirrus ❑ Cirrocumulus ❑ Cirrostratus

Middle (of the sky):
(Check all types seen)

❑ Altostratus ❑ Altocumulus

Low (in the sky):
(Check all types seen)

❑ Stratus ❑ Stratocumulus ❑ Cumulus

Rain or Snow Producing Clouds:
(Check all types seen)

❑ Nimbostratus ❑ Cumulonimbus

GLOBE® 2014 Appendix - 9 Hydrosphere

hydrosphere data sheet.pdf

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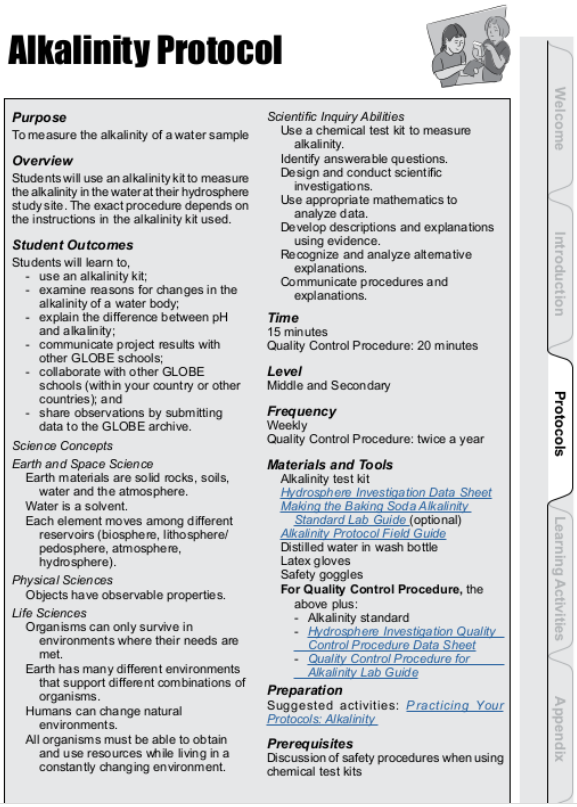

Alkalinity Protocol

Welcome | Introduction | Protocols | Learning Activities | Appendix

Purpose

To measure the alkalinity of a water sample

Overview

Students will use an alkalinity kit to measure the alkalinity in the water at their hydrosphere study site. The exact procedure depends on the instructions in the alkalinity kit used.

Student Outcomes

Students will learn to,

- use an alkalinity kit;
- examine reasons for changes in the alkalinity of a water body;
- explain the difference between pH and alkalinity;
- communicate project results with other GLOBE schools;
- collaborate with other GLOBE schools (within your country or other countries); and
- share observations by submitting data to the GLOBE archive.

Science Concepts

Earth and Space Science

Earth materials are solid rocks, soils, water and the atmosphere.

Water is a solvent.

Each element moves among different reservoirs (biosphere, lithosphere/ pedosphere, atmosphere, hydrosphere).

Physical Sciences

Objects have observable properties.

Life Sciences

Organisms can only survive in environments where their needs are met.

Earth has many different environments that support different combinations of organisms.

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

Use a chemical test kit to measure alkalinity.

Identify answerable questions.

Design and conduct scientific investigations.

Use appropriate mathematics to analyze data.

Develop descriptions and explanations using evidence.

Recognize and analyze alternative explanations.

Communicate procedures and explanations.

Time

15 minutes

Quality Control Procedure: 20 minutes

Level

Middle and Secondary

Frequency

Weekly

Quality Control Procedure: twice a year

Materials and Tools

Alkalinity test kit

Hydrosphere Investigation Data Sheet

Making the Baking Soda Alkalinity Standard Lab Guide (optional)

Alkalinity Protocol Field Guide

Distilled water in wash bottle

Latex gloves

Safety goggles

For Quality Control Procedure, the above plus:

- Alkalinity standard
- *Hydrosphere Investigation Quality Control Procedure Data Sheet*
- *Quality Control Procedure for Alkalinity Lab Guide*

Preparation

Suggested activities: *Practicing Your Protocols: Alkalinity*

Prerequisites

Discussion of safety procedures when using chemical test kits

alkalinity.pdf

PDF document

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DAWN_CUMMINGS JUN 04, 2018 03:21PM

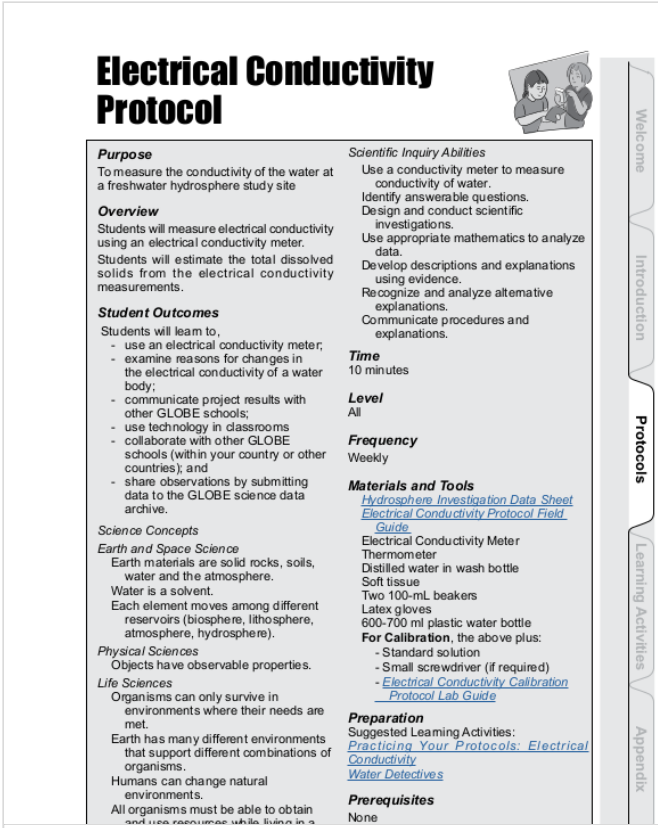
GLOBE hydrosphere protocols

alkalinity

DAWN_CUMMINGS JUN 04, 2018 03:22PM

GLOBE hydrosphere protocols

conductivity



Electrical Conductivity Protocol

Purpose
To measure the conductivity of the water at a freshwater hydrosphere study site

Overview
Students will measure electrical conductivity using an electrical conductivity meter.
Students will estimate the total dissolved solids from the electrical conductivity measurements.

Student Outcomes
Students will learn to,
- use an electrical conductivity meter;
- examine reasons for changes in the electrical conductivity of a water body;
- communicate project results with other GLOBE schools;
- use technology in classrooms
- collaborate with other GLOBE schools (within your country or other countries); and
- share observations by submitting data to the GLOBE science data archive.

Science Concepts
Earth and Space Science
Earth materials are solid rocks, soils, water and the atmosphere.
Water is a solvent.
Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).
Physical Sciences
Objects have observable properties.
Life Sciences
Organisms can only survive in environments where their needs are met.
Earth has many different environments that support different combinations of organisms.
Humans can change natural environments.
All organisms must be able to obtain

Scientific Inquiry Abilities
Use a conductivity meter to measure conductivity of water.
Identify answerable questions.
Design and conduct scientific investigations.
Use appropriate mathematics to analyze data.
Develop descriptions and explanations using evidence.
Recognize and analyze alternative explanations.
Communicate procedures and explanations.

Time
10 minutes

Level
All

Frequency
Weekly

Materials and Tools
Hydrosphere Investigation Data Sheet
Electrical Conductivity Protocol Field Guide
Electrical Conductivity Meter
Thermometer
Distilled water in wash bottle
Soft tissue
Two 100-mL beakers
Latex gloves
600-700 ml plastic water bottle
For Calibration, the above plus:
- Standard solution
- Small screwdriver (if required)
- *Electrical Conductivity Calibration Protocol Lab Guide*

Preparation
Suggested Learning Activities:
Practicing Your Protocols: Electrical Conductivity
Water Detectives

Prerequisites
None

Welcome | Introduction | Protocols | Learning Activities | Appendix

conductivity.pdf
PDF document
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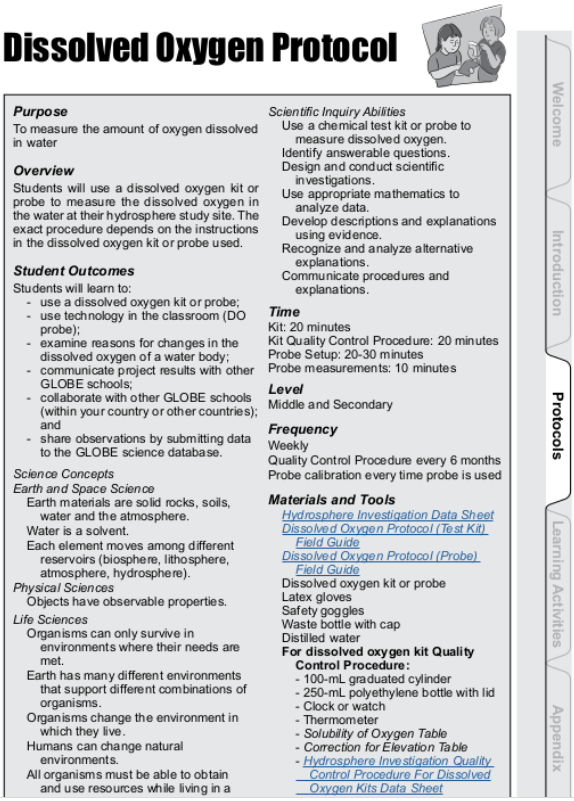

Dissolved Oxygen Protocol

Purpose
To measure the amount of oxygen dissolved in water

Overview
Students will use a dissolved oxygen kit or probe to measure the dissolved oxygen in the water at their hydrosphere study site. The exact procedure depends on the instructions in the dissolved oxygen kit or probe used.

Student Outcomes
Students will learn to:
- use a dissolved oxygen kit or probe;
- use technology in the classroom (DO probe);
- examine reasons for changes in the dissolved oxygen of a water body;
- communicate project results with other GLOBE schools;
- collaborate with other GLOBE schools (within your country or other countries); and
- share observations by submitting data to the GLOBE science database.

Science Concepts
Earth and Space Science
Earth materials are solid rocks, soils, water and the atmosphere.
Water is a solvent.
Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).
Physical Sciences
Objects have observable properties.
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.
All organisms must be able to obtain and use resources while living in a

Scientific Inquiry Abilities
Use a chemical test kit or probe to measure dissolved oxygen.
Identify answerable questions.
Design and conduct scientific investigations.
Use appropriate mathematics to analyze data.
Develop descriptions and explanations using evidence.
Recognize and analyze alternative explanations.
Communicate procedures and explanations.

Time
Kit: 20 minutes
Kit Quality Control Procedure: 20 minutes
Probe Setup: 20-30 minutes
Probe measurements: 10 minutes

Level
Middle and Secondary

Frequency
Weekly
Quality Control Procedure every 6 months
Probe calibration every time probe is used

Materials and Tools
Hydrosphere Investigation Data Sheet
Dissolved Oxygen Protocol (Test Kit) Field Guide
Dissolved Oxygen Protocol (Probe) Field Guide
Dissolved oxygen kit or probe
Latex gloves
Safety goggles
Waste bottle with cap
Distilled water
For dissolved oxygen kit Quality Control Procedure:
- 100-mL graduated cylinder
- 250-mL polyethylene bottle with lid
- Clock or watch
- Thermometer
- *Solubility of Oxygen Table*
- *Correction for Elevation Table*
- *Hydrosphere Investigation Quality Control Procedure For Dissolved Oxygen Kits Data Sheet*

Welcome | Introduction | Protocols | Learning Activities | Appendix

dissolved oxygen.pdf
PDF document
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DAWN_CUMMINGS JUN 04, 2018 03:23PM

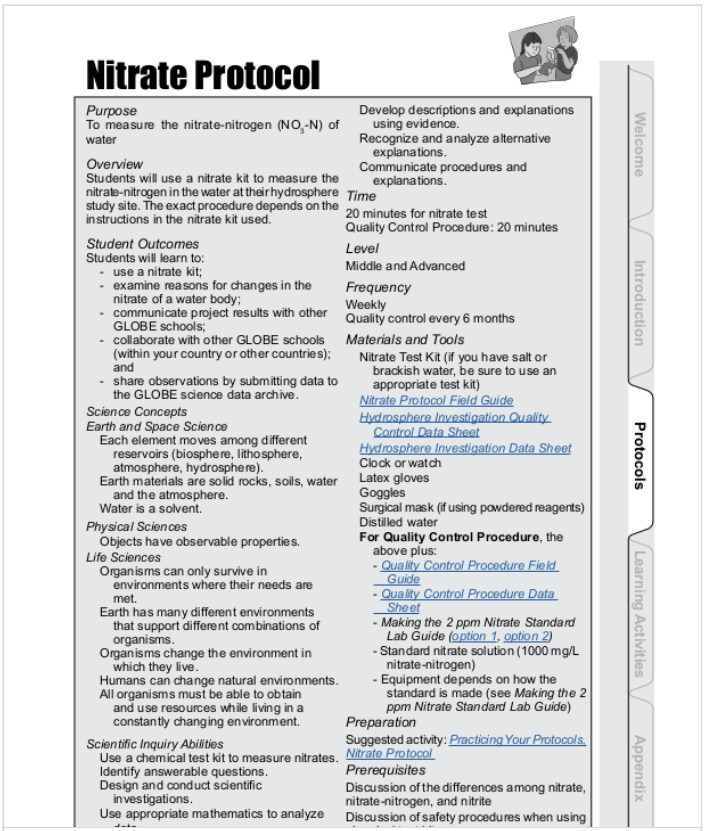
GLOBE hydrosphere protocol

Dissolved oxygen

DAWN_CUMMINGS JUN 04, 2018 03:24PM

GLOBE hydrosphere protocol

nitrates



Nitrate Protocol

Purpose
To measure the nitrate-nitrogen (NO_3-N) of water

Overview
Students will use a nitrate kit to measure the nitrate-nitrogen in the water at their hydrosphere study site. The exact procedure depends on the instructions in the nitrate kit used.

Student Outcomes
Students will learn to:
- use a nitrate kit;
- examine reasons for changes in the nitrate of a water body;
- communicate project results with other GLOBE schools;
- collaborate with other GLOBE schools (within your country or other countries); and
- share observations by submitting data to the GLOBE science data archive.

Science Concepts
Earth and Space Science
Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).
Earth materials are solid rocks, soils, water and the atmosphere.
Water is a solvent.
Physical Sciences
Objects have observable properties.
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.
All organisms must be able to obtain and use resources while living in a constantly changing environment.
Scientific Inquiry Abilities
Use a chemical test kit to measure nitrates.
Identify answerable questions.
Design and conduct scientific investigations.
Use appropriate mathematics to analyze
Develop descriptions and explanations using evidence.
Recognize and analyze alternative explanations.
Communicate procedures and explanations.

Time
20 minutes for nitrate test
Quality Control Procedure: 20 minutes

Level
Middle and Advanced

Frequency
Weekly
Quality control every 6 months

Materials and Tools
Nitrate Test Kit (if you have salt or brackish water, be sure to use an appropriate test kit)
Nitrate Protocol Field Guide
Hydrosphere Investigation Quality Control Data Sheet
Hydrosphere Investigation Data Sheet
Clock or watch
Latex gloves
Goggles
Surgical mask (if using powdered reagents)
Distilled water
For Quality Control Procedure, the above plus:
- *Quality Control Procedure Field Guide*
- *Quality Control Procedure Data Sheet*
- *Making the 2 ppm Nitrate Standard Lab Guide (option 1, option 2)*
- Standard nitrate solution (1000 mg/L nitrate-nitrogen)
- Equipment depends on how the standard is made (see *Making the 2 ppm Nitrate Standard Lab Guide*)

Preparation
Suggested activity: *Practicing Your Protocols, Nitrate Protocol*

Prerequisites
Discussion of the differences among nitrate, nitrate-nitrogen, and nitrite
Discussion of safety procedures when using

Welcome | Introduction | Protocols | Learning Activities | Appendix

nitrates.pdf
PDF document
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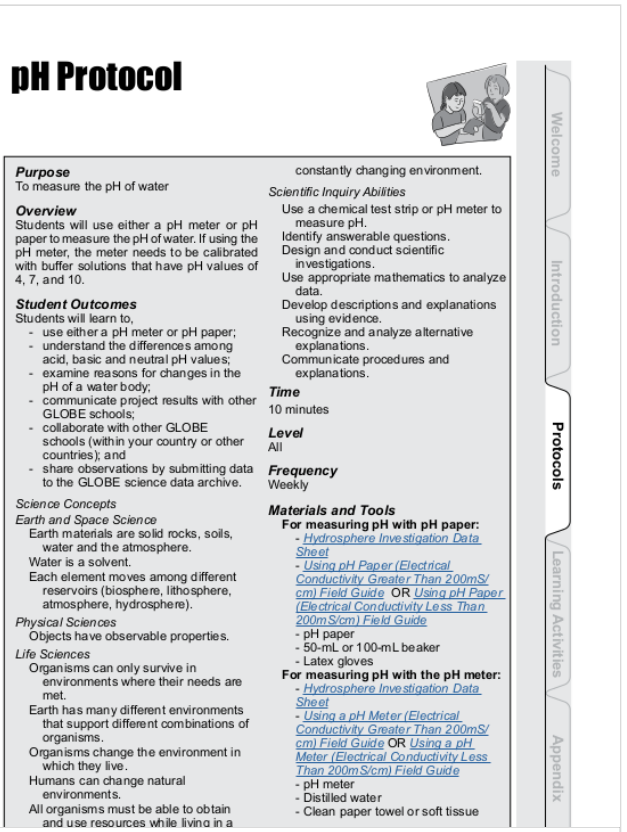

pH Protocol

Purpose
To measure the pH of water

Overview
Students will use either a pH meter or pH paper to measure the pH of water. If using the pH meter, the meter needs to be calibrated with buffer solutions that have pH values of 4, 7, and 10.

Student Outcomes
Students will learn to,
- use either a pH meter or pH paper;
- understand the differences among acid, basic and neutral pH values;
- examine reasons for changes in the pH of a water body;
- communicate project results with other GLOBE schools;
- collaborate with other GLOBE schools (within your country or other countries); and
- share observations by submitting data to the GLOBE science data archive.

Science Concepts
Earth and Space Science
Earth materials are solid rocks, soils, water and the atmosphere.
Water is a solvent.
Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).
Physical Sciences
Objects have observable properties.
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.
All organisms must be able to obtain and use resources while living in a constantly changing environment.
Scientific Inquiry Abilities
Use a chemical test strip or pH meter to measure pH.
Identify answerable questions.
Design and conduct scientific investigations.
Use appropriate mathematics to analyze data.
Develop descriptions and explanations using evidence.
Recognize and analyze alternative explanations.
Communicate procedures and explanations.

Time
10 minutes

Level
All

Frequency
Weekly

Materials and Tools
For measuring pH with pH paper:
- *Hydrosphere Investigation Data Sheet*
- *Using pH Paper (Electrical Conductivity Greater Than 200mS/cm) Field Guide* OR *Using pH Paper (Electrical Conductivity Less Than 200mS/cm) Field Guide*
- pH paper
- 50-mL or 100-mL beaker
- Latex gloves

For measuring pH with the pH meter:
- *Hydrosphere Investigation Data Sheet*
- *Using a pH Meter (Electrical Conductivity Greater Than 200mS/cm) Field Guide* OR *Using a pH Meter (Electrical Conductivity Less Than 200mS/cm) Field Guide*
- pH meter
- Distilled water
- Clean paper towel or soft tissue

Welcome | Introduction | Protocols | Learning Activities | Appendix

pH.pdf
PDF document
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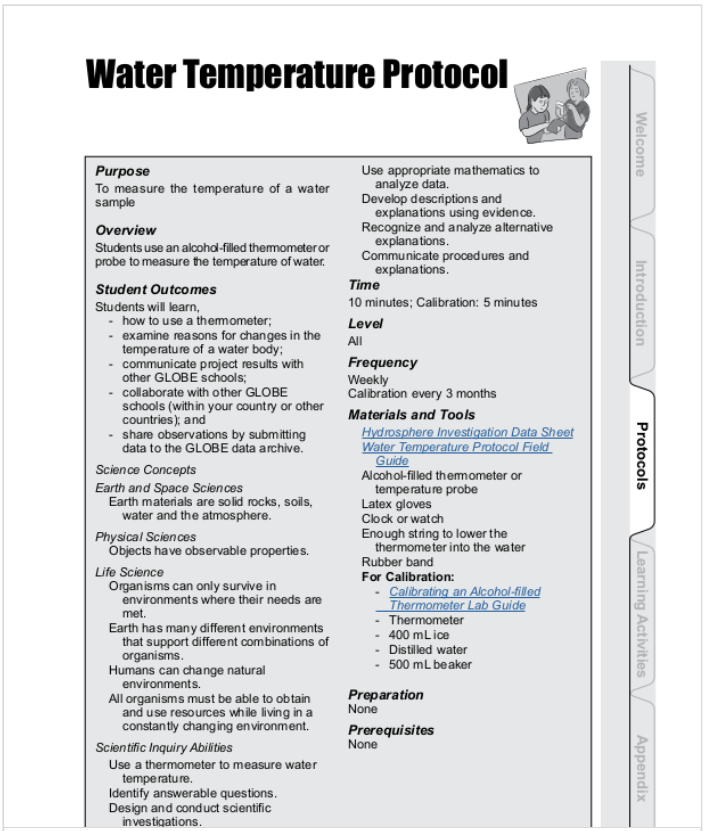
GLOBE hydrosphere protocols

pH

DAWN_CUMMINGS JUN 04, 2018 03:32PM

GLOBE hydrosphere protocols

temperature



Water Temperature Protocol

Welcome | Introduction | Protocols | Learning Activities | Appendix

Purpose
To measure the temperature of a water sample

Overview
Students use an alcohol-filled thermometer or probe to measure the temperature of water.

Student Outcomes
Students will learn,
- how to use a thermometer;
- examine reasons for changes in the temperature of a water body;
- communicate project results with other GLOBE schools;
- collaborate with other GLOBE schools (within your country or other countries); and
- share observations by submitting data to the GLOBE data archive.

Science Concepts
Earth and Space Sciences
Earth materials are solid rocks, soils, water and the atmosphere.
Physical Sciences
Objects have observable properties.
Life Science
Organisms can only survive in environments where their needs are met.
Earth has many different environments that support different combinations of organisms.
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
Use a thermometer to measure water temperature.
Identify answerable questions.
Design and conduct scientific investigations.
Use appropriate mathematics to analyze data.
Develop descriptions and explanations using evidence.
Recognize and analyze alternative explanations.
Communicate procedures and explanations.

Time
10 minutes; Calibration: 5 minutes

Level
All

Frequency
Weekly
Calibration every 3 months

Materials and Tools
Hydrosphere Investigation Data Sheet
Water Temperature Protocol Field Guide
Alcohol-filled thermometer or temperature probe
Latex gloves
Clock or watch
Enough string to lower the thermometer into the water
Rubber band
For Calibration:
- Calibrating an Alcohol-filled Thermometer Lab Guide
- Thermometer
- 400 mL ice
- Distilled water
- 500 mL beaker

Preparation
None

Prerequisites
None

temperature.pdf
PDF document
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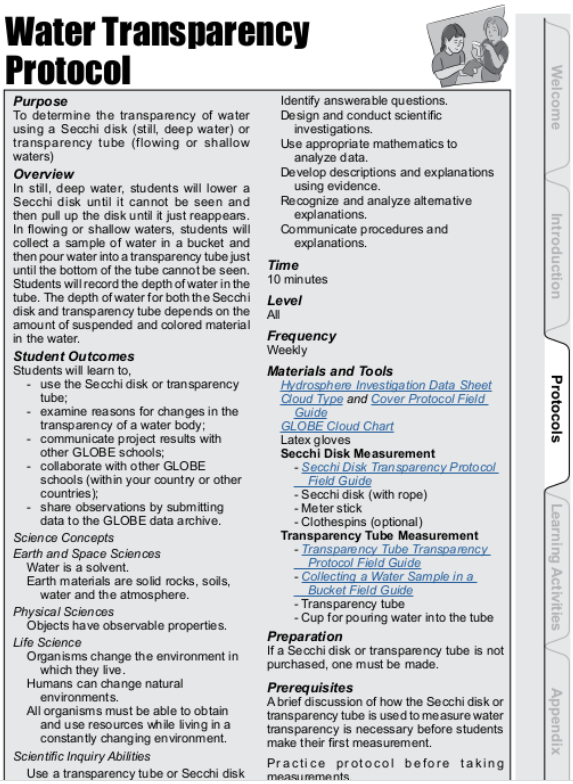

Water Transparency Protocol

Welcome | Introduction | Protocols | Learning Activities | Appendix

Purpose
To determine the transparency of water using a Secchi disk (still, deep water) or transparency tube (flowing or shallow waters)

Overview
In still, deep water, students will lower a Secchi disk until it cannot be seen and then pull up the disk until it just reappears. In flowing or shallow waters, students will collect a sample of water in a bucket and then pour water into a transparency tube just until the bottom of the tube cannot be seen. Students will record the depth of water in the tube. The depth of water for both the Secchi disk and transparency tube depends on the amount of suspended and colored material in the water.

Student Outcomes
Students will learn to,
- use the Secchi disk or transparency tube;
- examine reasons for changes in the transparency of a water body;
- communicate project results with other GLOBE schools;
- collaborate with other GLOBE schools (within your country or other countries);
- share observations by submitting data to the GLOBE data archive.

Science Concepts
Earth and Space Sciences
Water is a solvent.
Earth materials are solid rocks, soils, water and the atmosphere.
Physical Sciences
Objects have observable properties.
Life Science
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
Use a transparency tube or Secchi disk
Identify answerable questions.
Design and conduct scientific investigations.
Use appropriate mathematics to analyze data.
Develop descriptions and explanations using evidence.
Recognize and analyze alternative explanations.
Communicate procedures and explanations.

Time
10 minutes

Level
All

Frequency
Weekly

Materials and Tools
Hydrosphere Investigation Data Sheet
Cloud Type and Cover Protocol Field Guide
GLOBE Cloud Chart
Latex gloves
Secchi Disk Measurement
- Secchi Disk Transparency Protocol Field Guide
- Secchi disk (with rope)
- Meter stick
- Clothespins (optional)

Transparency Tube Measurement
- Transparency Tube Transparency Protocol Field Guide
- Collecting a Water Sample in a Bucket Field Guide
- Transparency tube
- Cup for pouring water into the tube

Preparation
If a Secchi disk or transparency tube is not purchased, one must be made.

Prerequisites
A brief discussion of how the Secchi disk or transparency tube is used to measure water transparency is necessary before students make their first measurement.
Practice protocol before taking measurements

transparency.pdf
PDF document
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GLOBE hydrosphere protocols

transparency

CASSIE HAYTER JUN 05, 2018 10:44AM

CoCoRaHS

https://www.cocorahs.org/
citizen science "**Volunteers working together to measure precipitation across the nations**"

JENNIFER JUN 05, 2018 11:07AM

Eco-Schools USA Watershed Audit

A large component of this audit is a macroinvertebrate study (both pre- and post audits)

file
WWW.NWF.ORG

Remote Sensing: Measuring Water Quality from Space

JANELLE JOHNSON JUN 01, 2018 11:30AM

NASA background info on remote sensing

REMOTE SENSING

Introduction and History

by Steve Graham
September 17, 1999

"AS WITH THE CAMERA, INFORMATION COULD BE OBTAINED ABOUT A SUBJECT WITHOUT BEING IN PHYSICAL CONTACT WITH IT."

The technology of modern remote sensing began with the invention of the camera more than 150 years ago. Although the first, rather primitive photographs were taken as "stills" on the ground, the idea and practice of looking down at the Earth's surface emerged in the 1840s when pictures were taken from cameras secured to tethered balloons for purposes of topographic mapping. Perhaps the most novel platform at the end of the last century is the famed pigeon fleet that operated as a novelty in Europe. By the first World War, cameras mounted on airplanes provided aerial views of fairly large surface areas that proved invaluable in military reconnaissance. From then until the early 1960s, the aerial photograph remained the single standard tool for depicting the surface from a vertical or oblique perspective.

Satellite remote sensing can be traced to the early days of the space age (both Russian and American programs) and actually began as a dual approach to imaging surfaces using several types of sensors from spacecraft. In 1946, V-2 rockets acquired from Germany after World War II were launched to high altitudes from White Sands, New Mexico. These rockets, while never attaining orbit, contained automated still or movie cameras that took pictures as the vehicle ascended. Then, with the emergence of the space program in the 1960s, Earth-orbiting cosmonauts and astronauts acted much like tourists by taking photos out the window of their spacecraft.

The term "remote sensing," first used in the United States in the 1950s by Ms. Evelyn Pruitt of the U.S. Office of Naval Research, is now commonly used to describe the science—and art—of identifying, observing, and measuring an object without coming into direct contact with it. This process involves the detection and measurement of radiation of different wavelengths reflected or emitted from distant objects or materials, by which they may be identified and categorized by class/type, substance, and spatial distribution.

Remote Sensing
Introduction and History
Radiation
Electromagnetic Spectrum
Absorption Bands and Atmospheric Windows
Spectral Signatures
Pixels and Bits
Color Images
Remote Sensing Methods
NASA Remote Sensing
Accomplishments
References

Related Data Sets:
Observation Deck

next: Radiation

REMOTE SENSING

Radiation

Unless it has a temperature of absolute zero (-273°C) an

Remote Sensing : Feature Articles.pdf

PDF document

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JANELLE JOHNSON JUN 05, 2018 10:42AM

USGS Landsat Activities

Images of change over time

Table Of Contents | Earthshots: Satellite Images of Environmental Change

Earthshots: Satellite Images of Environmental Change

USGS

JENNIFER BOURGEAULT JUN 06, 2018 08:30AM

Landsat Education Site

Resources

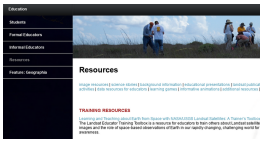


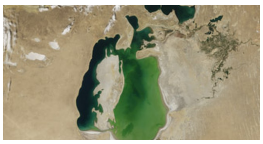
image resources | science stories | background information | educational presentations | landsat publications | classroom activities | data resources for educators | learning games | informative animations | additional resources | glossary Learning and Teaching about Earth from Space with NASA/USGS Landsat Satellites: A Trainer's Toolbox The Landsat Educator Training Toolbox is a resource for educators to train others about Landsat satellites, data, and images and the role of space-based observations of Earth in our rapidly changing, challenging world for career awareness.

NASA

JENNIFER BOURGEAULT JUN 06, 2018 08:32AM

NASA Earth Observatory - Change over Time Images

World of Change : Feature Articles



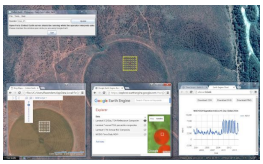
climate change, global climate change, global warming, natural hazards, Earth, environment, remote sensing, atmosphere, land processes, oceans, volcanoes, land cover, Earth science data, NASA, environmental processes, Blue Marble, global maps

NASA

JENNIFER BOURGEAULT JUN 06, 2018 08:33AM

Google Imagery Case Studies

Case Studies - Google Earth Engine



A team led by University of Maryland's Matt Hansen used Earth Engine to survey over a decade of global tree cover extent, loss, and gain. The study, published in Science, analyzed nearly all global land, excluding only Antarctica and some Arctic islands.

GOOGLE

JENNIFER BOURGEAULT JUN 06, 2018 08:37AM

NASA IMages of Change

You can click on the "Water" tab.

https://climate.nasa.gov/images-of-change?id=650#650-ups-and-downs-of-the-aral-sea — **JENNIFER BOURGEAULT**

JENNIFER BOURGEAULT JUN 06, 2018 08:41AM

Earthshots

You can choose certain environmental events or features to explore.

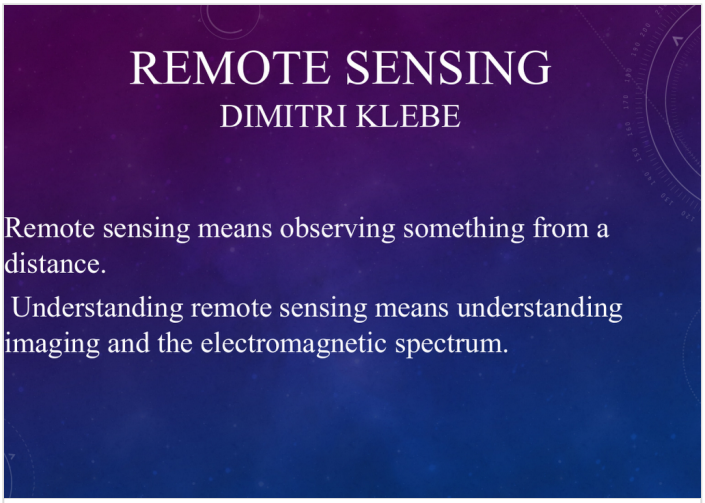
Table Of Contents | Earthshots: Satellite Images of Environmental Change

Earthshots: Satellite Images of Environmental Change

USGS

DIMITRI_KLEBE JUN 08, 2018 09:06AM

Remote Sensing ppt



Remote Sensing small.pptx

Powerpoint presentation

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Water Quality Testing Info

JANELLE JOHNSON MAY 23, 2018 03:00PM

Water Temperature

Water temperature measures the **surface temperature** of your water body. Water bodies have different temperatures depending on **latitude, altitude**, time of day, season, depth of water, and many other **variables**. Water temperature is important to **chemical, biological and physical processes**. It can help us understand what may be happening in the water body without directly measuring hundreds of variables.

JANELLE JOHNSON MAY 23, 2018 03:01PM

Dissolved Oxygen (DO)

Most living things depend on **molecular oxygen** to survive. Molecules of oxygen **dissolve** in the water. **Aquatic** animals can use this dissolved oxygen (DO) for respiration. In air, about 20 out of every 100 molecules are oxygen. In water, less than 20 out of every 1,000,000 molecules are oxygen. This is why dissolved oxygen is measured in **parts per million (ppm)**. Different kinds of organisms need different amounts of oxygen, but generally aquatic organisms require at least 6 ppm for normal growth and development.

JANELLE JOHNSON MAY 23, 2018 03:02PM

pH

pH indicates the acid content of water. The pH scale ranges from 1.0 (acidic) to 14.0 (basic) Neutral is 7.0. The pH of a water body helps determine what can live in it. Many amphibians, insect larvae and other types of aquatic life are very sensitive to low or high pH.

The scale is logarithmic. A change of one pH unit means 10 times the acid or base concentration. For instance, a change from 7.0 to 6.0 indicates water 10 times more acidic; a change from 7.0 to 5.0 indicates water 100 times more acidic.

JANELLE JOHNSON MAY 23, 2018 03:04PM

Nitrates

Nitrogen is one of the three major nutrients needed by plants. Most plants cannot use nitrogen in its molecular form (N2). In aquatic ecosystems blue-green algae are able to convert N2 into ammonia (NH3) and nitrate (NO3-), which can then be used by plants. Animals eat these plants to obtain nitrogen that they need to form proteins. When the plants and animals die, protein molecules are broken down by bacteria into ammonia. Other bacteria then oxidize the ammonia into nitrites (NO2-) and nitrates (NO3-). Under suboxic conditions nitrates can then be transformed by other bacteria into ammonia (NH3), beginning the nitrogen cycle again. Typically nitrogen levels in natural waters are low (below 1 ppm nitrate nitrogen). Nitrogen released by decomposing animal excretions, dead plants, and animals is rapidly consumed by plants. In water bodies with high nitrogen levels, eutrophication can occur. Nitrogen levels can become elevated from natural or human-related activities. Ducks and geese contribute heavily to nitrogen in the water where they are found. Man-made sources of nitrogen include sewage dumped into rivers, fertilizer washed into streams or leached into groundwater, and runoff from feedlots and barnyards. Nitrate levels are measured in parts per million (ppm) nitrate nitrogen. Remember that nitrate levels can change over time. So it is best to test fresh samples (less than 2 hours old) or refrigerated samples.

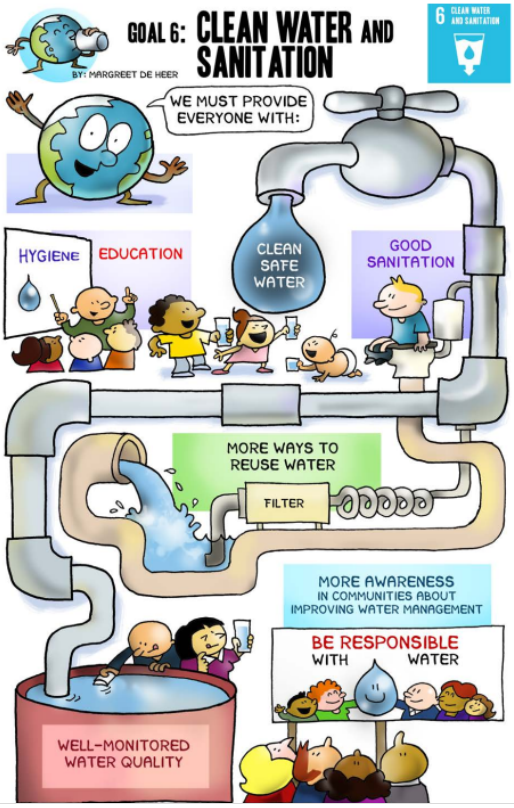
JANELLE JOHNSON MAY 23, 2018 03:03PM

Macroinvertebrates

Millions of small creatures inhabit fresh waters of lakes, streams, and wetlands. Macroinvertebrates, consisting of a variety of insects and insect larvae, crustaceans, mollusks, worms, and other small, spineless animals live in the mud, sand, or gravel of the substrate or on submersed plants and logs. They play a crucial role in the ecosystem. They provide an essential link in the food chain and are the source of food for many larger animals. Macroinvertebrates, such as freshwater mussels, help to filter water. Other types are scavengers and feed on decaying matter in the water, while certain macroinvertebrates prey on smaller organisms. Macroinvertebrates can tell us a lot about the conditions within a water body. Many macroinvertebrates are sensitive to changes in pH, dissolved oxygen, temperature, salinity, transparency, and other changes in their habitat. Habitat is a place that includes everything that an animal needs to live and grow.

JANELLE JOHNSON JUN 03, 2018 03:33PM

Clean water graphic



A-To-Do-List-for-the-Planet_Page_07_Image_0001.jpg 919×1,463 pixels.pdf
PDF document

PADLET DRIVE

JANELLE JOHNSON JUN 03, 2018 05:21PM

Dissolved Oxygen (DO)

Water temperature and pressure affect how much oxygen is in the water. Water that has as much oxygen as it can hold for its temperature and pressure (a function of altitude) is said to be in 'equilibrium'. Warm water cannot hold as much oxygen as cold water. At high altitudes, where there is less pressure, water cannot hold as much oxygen as at low altitudes.

The actual amount of DO in water may be higher or lower than the equilibrium value. Bacteria in the water use oxygen as they digest decaying plants or animals This can lower the DO levels of the water. Plants in the water produce oxygen during photosynthesis. This sometimes results in higher DO levels.

GIANNA_SULLIVAN JUN 06, 2018 08:26AM

GLOBE teacher guide w/ protocols:https://www.globe.gov/do-globe/globe-teachers-guide

This is the place to go to get to the hydrosphere (and all other) protocols.

Focal Students-Reflection

CATALINA VIZUETH JUN 05, 2018 09:27AM

This topic is very important, since human population requires water to survive and perform a variety of vital activities. Without good quality water resources, ecosystems will not stay healthy impacting our food resources, etc.

Learning about ways to assess water quality can greatly improve our lives.

> *Love the water cycle game. What a great way for my focal student to practice the water cycle in a fun way.* — APRIL_KELSO

ASHLEY GLENN JUN 05, 2018 02:30PM

The big take away for my focal ELL and special education students is that it doesn't really matter the outcome, but if they are excited about what they are doing and engaged, they are going to have an authentic learning experience and want to come back for more learning. I thought the water cycle game would be great for my 3rd grade students.
For my other focal student, I thought about giving them the

task of going an reading the rain gauge and reporting back to the class.

KATIE BARKSTROM JUN 05, 2018 02:33PM

Focal Student Reflection

The takeaway from this afternoon's stations is that providing a variety of activities can help each and every student experience success. These sorts of experiences can get students excited about science and learning, and also learn how to persevere when things don't work out the way we want them to. While the lack of structure and step by step directions can be challenging for some students, it is through these sorts of real-life experiences that students are able to connect to schema and experience learning in a memorable and authentic way.

JULIE PITZ JUN 05, 2018 02:34PM

Student V would struggle with these activities because he has some sensory issues and the idea of being outside and near water would probably be overly stimulating for him. He would do better with the Macro-invertebrates sort or just observing them under a microscope. These activties would really help Student G with vocabulary development and social language.

KATYA SCHLOESSER JUN 05, 2018 02:58PM

Focal students

The challenge for today's material was figuring out how to scaffold student's understanding on order to grasp some of the more complex concepts covered in the material. It made me want to teach a whole class on river/forest ecology! For student A (ELL tough guy) - lots of hands on activities like the water quality tests would be good to keep him on task and engaged. Student B (question asker) would benefit from leading a further investigation, and developing questions based on the data collected and designing a hypothetical research study. Student C (apprehensive quiet learner) might need to just focus on one of the analysis, and have additional reading resources and repetition of the topic.

NRAYNOR1 JUN 05, 2018 02:53PM

Mapping Your Hydrosphere Site

Working with student Z, who is a shy student with hardly no friends . Working on mapping will give him an opportunity to work in a group.
He will have the opportunity to give his input in a group situation. This project will get him and his fellow students outside to collect data and upload their result to Globe.

TERRI_LIRA1 JUN 05, 2018 09:35PM

Day

Student A would have problems focusing in on the activity at the creek. There would be too many distractions. Modifications: assign him a task that will last the length of the activity. Student B would struggle with reading and vocabulary. Modification: Pre-teach vocabulary and small group discussion before hands on activity. Student C "speed racer" This day would have been a great day for this student. Many things to do.

DEBORAH SHAWCROFT JUN 05, 2018 10:00PM

My focal students were about two individuals who would much rather work alone than with other students. I think the water quality activities that we did today in the cherry creek would be beneficial to these two kids as they could work in pairs and not be forced into working in larger groups. This could possibly ease them into the cooperative groups that we want to eventually get them into

LUEVANON052010 JUN 06, 2018 08:23AM

I like that we can keep the students monitored by picking the groups for them that helps with giving the focal students a group where they will participate. The different games were very hands on and fun as well. I would ask for parent help when doing different science science centers.

NIKOLE CALMEYN JUN 06, 2018 08:11AM

Reflection

I think the protocols we did today can be modified in Kindergarten to be a lot of model or small group simulations run by the teacher. My focal students would benefit from the exposure of the science academic language used during the protocols. Then the students can touch, learn, and explore on their own after modeled by an adult. My focal students would probably be engaged during these activities because they are

hands on. Although they may need assistance with understanding directions they would be able to learn on their own level by exploring through different water quality stations.

MARIA CROUSE JUN 06, 2018 08:15AM

I think this would give student J a chance to have some real world application of mathematics. J wouldn't be able to hide in the corner if we pulled everyone outside to gather data using these tools. I like the connections of graphing our findings. This would be a great way to represent the data and then make some observations.

ALYSSA CASILLAS JUN 06, 2018 08:11AM

Focal Student

With these applications, student L would enjoy the hands on experience because she does not enjoy carpet lessons.

GRACE_ELEE JUN 06, 2018 08:18AM

Comfortable

In my group yesterday, we discussed the fact that when we have outside activities, it is very unpredictable while the indoor stations are predictable which makes teachers feel more comfortable. I believe that my focal students would benefit from taking risks with outdoor activities.

LICETTE SMITH JUN 06, 2018 08:15AM

With my focal students I need to ensure they are engaged. I like implementing stations for students who tend to not be engaged.

EMILY HEINRICH JUN 06, 2018 08:16AM

PBL - Focal Students

For my students with focus issues PBL is such a powerful learning tool. The nature of fieldwork and constantly adjusting and problem solving keeps them engaged in the learning process.

ANONYMOUS JUN 06, 2018 08:24AM

Focal Student

I think that this activity would be great to get my student outside and working with a team. It would be less threatening for my student and help build his self confidence as he could interact with a small number of students as opposed to a whole class. The hands on microscope activity would engage my students because he loves to draw, so I would definitely have students draw what was seen under the microscope lens.

KAY BOLERJACK JUN 06, 2018 08:54AM

testing at the field

For my focal students, I think the time out at the field experience would be very engaging. I would give support for the graphing and procedures/protocols in the lab and the field. I think providing choice and options that reinforce the concepts will give them a level of independence and help them feel more confident in their work.

KAY BOLERJACK JUN 06, 2018 02:29PM

Field Experience

My focal students would be very engaged in the lab experience. They would be better about staying focused on the process. I would need to provide scaffolding for protocols and vocabulary. I think the opportunity for field work would build confidence in learning science.

JENNIFER GRADY JUN 06, 2018 09:57AM

Focal Students

For Student A and E. First I would have directions that could be done with pictures and give them and front load them with vocabulary. Also purposely develop small groups to encourage discussion with A, E and strong models.

TERRI_LIRA1 JUN 06, 2018 02:19PM

Day 3 wetlands

For all students I feel I would put together a dichotomous key to help identify plants. Each students would participate in the "Who Polluted the Platte." Would make sure to give Students C the job of monitoring items going into the "river."

JESSIE PAPKE OSTENDORF JUN 06, 2018 02:27PM

Focal EMJEE

Same as yesterday with hands on learning and involvement.

Independence of search And find with guide books wouldn't be difficult but having the flash card style really helped.

ROBIN STAKER JUN 06, 2018 02:45PM

Mapping the Hydrology Site

My low reader would have to be closely monitored while at the site during the drawing as not to get distracted. Perhaps a partner would be helpful. My shy girl would need has the measurement skills so I would put her in the group with the flags. My highly functional individual would possibly be placed as a type of monitor for the class. This would be to keep me posted as to the progress of the whole group.

LESLIE CORDOVA JUN 06, 2018 04:36PM

Focal student

The activities throughout the afternoon would provide a gopportunitye for this stwould provide

SJOSSELYN1 JUN 05, 2018 10:11PM

Focus person 1 (gangsta tough guy) The actual testing and getting into the stream would be awesome - even for him. The challenge would be to relate it to something important in his life. His life is so often in turmoil, that it is difficult to instill a spark of passion beyond the classroom and school. For student 2 (social "butterfly" who is a "pot stirrer") she cannot look like she even wants to get her hands and feet wet. She would need the right partner to convince her its okay.

CHAD SNIFF JUN 07, 2018 02:45PM

My students would do well with these activities. Anything hands on would be great with my students.

Career Connections

AMALIA_SOLLARS JUN 05, 2018 09:18AM

hydrologist, water quality technician, wildlife biologist,

CATALINA VIZUETH JUN 05, 2018 10:23AM

I agree with Amalia, and I think that we can add any other environmental related field, such as a hazardous waste specialist/inspector, conservation scientists, etc.

JENNIFER BOURGEAULT JUN 05, 2018 09:23AM

landscaper (ponds)

AMALIA_SOLLARS JUN 05, 2018 09:25AM

local policymakers, mayors, even governors and state legislature representatives

JENNIFER JUN 05, 2018 09:28AM

soil scientist and tech. lab tech, fish ecologist and techs, land managers, tourist businesses, especially those that rely on fishing, hiking and camping, park rangers

EPALMER99 JUN 05, 2018 11:29AM

Insurance adjuster? Actuary?

RICHARD WAGNER JUN 05, 2018 02:12PM

I am taking a course on water education with farmers, legislators, oil and gas reps, city managers, bankers, utilities, property developers, engineers. All learning about water quality and water law.

Tribal water resource mangement, — **NRAYNOR1**

AMALIA_SOLLARS JUN 05, 2018 02:36PM

Resource - Live webcasts of Scientists speaking sharing students

https://jason.org/live

DEBORAH SHAWCROFT JUN 05, 2018 10:06PM

Entomologist, Herpetologist

Literacy, Language, Learning

JANELLE JOHNSON JUN 05, 2018 09:13AM

Key terms

Cutaneous
Turbidity
Total suspended solids
Dissolved solids vs. suspended solids
Electrofishing
Evapotranspiration
Tributary
Hydrograph

Hietograph
Anode
Cathode
Groundtruthing

Clarity — **JENNIFER BOURGEAULT**

http://www.secchidipin.org/index.php/monitoring-methods/the-transparency-tube/#The%20Transparency%20Tube — **JENNIFER BOURGEAULT**

https://www.fondriest.com/environmental-measurements/parameters/water-quality/turbidity-total-suspended-solids-water-clarity/ — **JENNIFER BOURGEAULT**

Transparency — **JENNIFER BOURGEAULT**

hyetograph* — **CASSIE HAYTER

Electromagnetic spectrum — **CASSIE HAYTER**

Dissolved Oxygen (DO), pH, interpreting graphs with multiple axes — **JENNIFER TAYLOR**

JANELLE JOHNSON JUN 05, 2018 09:11AM

Cross-disciplinary Connections

Estimating and graphing populations (relative to fire)
Connections with communities
Multimetric Index (graph)
Mean, median, mode
Post timeline of events on wall (Can add images and/or news stories and/or student work

I was thinking about even more basic graphing skills for my 3rd graders. I could see using something like this for learning how to label axis, titles, and interpreting data. — **ASHLEY GLENN**

JENNIFER BOURGEAULT JUN 05, 2018 02:36PM

GLOBE Resources

This padlet of links and notes are resources from GLOBE that may be helpful to your overall GLOBE work. I will add to this throughout the week.

GLOBE Resources
This list of links and notes are resources from GLOBE that may be helpful to your overall GLOBE work.
PADLET

Questions? Needs?

CATALINA VIZUETH JUN 05, 2018 09:25AM

If testing equipment is so expensive, is there a nonprofit organization/ University, or other source from which schools can have access/borrow equipment to perform testing when implementing GLOBE protocols, or conducting research for PBIs, etc?

CIRES Education Outreach is also a GLObE partner and we have a GLOBE equipment lending library to help get Colorado area schools started with GLOBE PBL projects: http://cires.colorado.edu/outreach/projects/globe-program. Email me if interested in learning more! jennifer.l.taylor@colorado.edu — **JENNIFER TAYLOR**

GLOBE.gov partner Dixon Butler runs Youth Learning as Citizen Environmental Scientist (www.YLACES.org), a grant making, non-profit organization endeavoring to help improve science education through GLOBE. — **JENNIFER TAYLOR**

I would love resources for interactive means of accessing scientists in the field. — **ANONYMOUS**

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