Chemistry Vocabulary

Dissolved Oxygen – the amount of oxygen dissolved in a body of water as an indication of the degree of health of the water and its ability to support a balanced aquatic ecosystem.
PH – the measurement of the acidity or alkalinity of a solution on a scale of 0 to 14.
Nitrates -
Aquifer - Geological formation in which ground water is stored and circulates taking advantage of the porosity and fissures of the rock it is found in.
Wetland - a lowland area, such as a marsh or swamp that is saturated with moisture, especially when regarded as the natural habitat of wildlife.
Karst Topography - an area of limestone terrain characterized by sinks, ravines, and underground streams.
Limestone - a sedimentary rock consisting or mainly calcium that was deposited by the remains of marine animals.
Groundwater - the water beneath the surface of the ground, consisting largely of surface water that seeped down: the source of water in springs and wells.
Pollution - the introduction of harmful substances or products into the environment.
Runoff - water that does not become absorbed by the earth but flows across the surface of the land into a stream or lake.
Contaminate - to make impure or unsuitable by contact or mixture with something unclean, bad, etc.
Algae bloom – rapid increase in the population of algae in an aquatic system.
Eutrophic – an abundant accumulation of nutrients that support a dense growth of algae and other organisms.
Oligotrophic – a lack of nutrients and plant life resulting in sparse algae growth and other organisms.
Ecosystem - The interaction between organisms and their environment.
Habitat - A place that is natural for the life and growth of an organism.
Acid – having a pH value of less than 7.
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Point source pollution –Pollutants discharged from any identifiable point, including pipes, ditches, channels, sewers, tunnels, etc.
Non-point source pollution - pollution that occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into ground water.
Chemical reaction - Change that takes place when two or more substances (reactants) interact to form new substances (products)
Tannins - pigments in plants responsible for brown colors
Confluent – place where different waters mix or merge.
Detritus – newly dead or decaying organic matter covered in bacteria.
Natural resources – Any material produced by nature that can be used to produce goods or provide services
Watershed – an area of land that is drained by a river or river system.

Post Visit 1
Chemistry
9-12

Mapping your watershed

Purpose/Objective

Students will be able to read a topographic map
Students will be able to identify where water will flow in their watershed using topographic maps

Materials

Topographic map of your area (downloaded free at http://store.usgs.gov/b2c_usgs/b2c/start.do)
Markers
Information sheet on USGS topographic maps

Procedure

1. Distribute maps and information sheets.
2. Show students how to interpret the maps i.e what's water, what's vegetation, what the brown lines mean. The USGS website has more information on how to use their maps, if time permits allow the students to explore the resources on that site.
3. Have students locate their home or your school on the map
4. Have them identify any water bodies near their home/school
5. Using the contour lines, have students determine if water falling on their home/school will run into those water bodies
6. Have students repeat steps 3-5 for industry sites, new construction, land fills, water treatment plants, etc.
7. Discuss how this information can be used and what government agency may be interested in their findings.

What is a Topographic Map?
A map is a representation of the Earth, or part of it. The distinctive characteristic of a topographic map is that the shape of the Earth's surface is shown by contour lines. Contours are imaginary lines that join points of equal elevation on the surface of the land above or below a reference surface, such as mean sea level. Contours make it possible to measure the height of mountains, depths of the ocean bottom, and steepness of slopes.

A topographic map shows more than contours. The map includes symbols that represent such features as streets, buildings, streams, and vegetation. These symbols are constantly

refined to better relate to the features they represent, improve the appearance or readability of the map, or reduce production cost.

Consequently, within the same series, maps may have slightly different symbols for the same feature. Examples of symbols that have changed include built-up areas, roads, intermittent drainage, and some lettering styles. On one type of large-scale topographic map, called provisional, some symbols and lettering are handdrawn.

Reading Topographic Maps

Interpreting the colored lines, areas, and other symbols is the first step in using topographic maps. Features are shown as points, lines, or areas, depending on their size and extent. For example, individual houses may be shown as small black squares. For larger buildings, the actual shapes are mapped. In densely built-up areas, most individual buildings are omitted and an area tint is shown. On some maps, post offices, churches, city halls, and other landmark buildings are shown within the tinted area.

The first features usually noticed on a topographic map are the area features, such as vegetation (green), water (blue), and densely built-up areas (gray or red).

Many features are shown by lines that may be straight, curved, solid, dashed, dotted, or in any combination. The colors of the lines usually indicate similar classes of information: topographic contours (brown); lakes, streams, irrigation ditches, and other hydrographic features (blue); land grids and important roads (red); and other roads and trails, railroads, boundaries, and other cultural features (black). At one time, purple was used as a revision color to show all feature changes. Currently, purple is not used in our revision program, but purple features are still present on many existing maps.

Various point symbols are used to depict features such as buildings, campgrounds, springs, water tanks, mines, survey control points, and wells. Names of places and features are shown in a color corresponding to the type of feature. Many features are identified by labels, such as "Substation" or "Golf Course."

Topographic contours are shown in brown by lines of different widths. Each contour is a line of equal elevation; therefore, contours never cross. They show the general shape of the terrain. To help the user determine elevations, index contours are wider. Elevation values are printed in several places along these lines. The narrower intermediate and supplementary contours found between the index contours help to show more details of the land surface shape. Contours that are very close together represent steep slopes. Widely spaced contours or an absence of contours means that the ground slope is relatively level. The elevation difference between adjacent contour lines, called the contour interval, is selected to best show the general shape of the terrain. A map of a relatively flat area may have a contour interval of 10 feet or less. Maps in mountainous areas may have contour intervals of 100 feet or more. The contour interval is printed in the margin of each U.S. Geological Survey (USGS) map.

Bathymetric contours are shown in blue or black, depending on their location. They show the shape and slope of the ocean bottom surface. The bathymetric contour interval may vary on each map and is explained in the map margin.
://erg.usgs.gov/isb/pubs/booklets/symbols/

Post Visit 2
Florida Chemistry
9-12

Site visit

Purpose/Objective

Students will collect water samples and analyze them for nitrate, dissolved oxygen, and pH levels

Materials

Water collection cups
Water testing equipment
Data sheets
Computer with internet access

Procedure

1. Allow students to choose one of the water bodies they identified from post-visit activity 1 that may have a water quality issue due to run off.
2. Instruct students to collect three samples from the site, from three different locations in the water body.
3. In the classroom lab, using all proper safety protocols, students will test for nitrate, pH, and dissolved oxygen levels. If other test kits are available students can test for phosphate, chlorine, etc.
4. Each sample should be tested 3 times for accuracy.
5. All results will be recorded on the data sheet.
6. Students will research historic data of water quality in the area.
    a. ://water.usgs.gov/
    b. ://www.dep.state.fl.us/water/monitoring/data.
    c. ://www.swfwmd.state.fl.us/data/
7. Have students compare their results with the historic results for the region
8. If students find a discrepancy between their results and historic results, have them research and contact the agencies that maybe interested in their results.

Post Visit 3
Chemistry
9-12

Careers

Purpose/Objective

Students will be able to identify careers that involve water quality
Students will conduct interviews with professionals, via email, about water quality and their profession

Materials

Computer with internet access
Email account or access to one
Envelope, stamps, paper

Procedure

1. Brainstorm and list all the jobs that may monitor water quality or be directly affected by water quality. These may include:
    a. Environmental engineers
    b. Environmental toxicologist
    c. Life guards
    d. Fishing guides/fisherpersons
    e. USGS
    f. SWFWMD
    g. Research Biologists
    h. Artists
2. Students will select one of the careers from the list or another that they are interested in.
3. They will contact a local person in the profession that they have chosen. This should be done via email, not in person, unless permission is granted by the principal and the parent of the student.
4. Students should ask the professional at lest five questions that pertain to the profession and to water quality and or monitoring.
5. Each student should put together a 5-10 minute presentation for the class about the profession they investigated and the interview they conducted.

Post Visit 4
Chemistry
9-12

How can you help

Purpose/Objective

Students will identify wetland health projects going on in their community or state

Materials

Guest speaker
Computer with internet access

Procedure

1. Have students research government, volunteer, and non-profit organizations in their county whose focus is wetland conservation and restoration (EPA, Tampa bay watch, hands on Tampa bay etc)
2. Once the groups have been identified, have the students write a letter (or email) to a contact person in that organization inquiring about up coming volunteer opportunities.
3. Invite someone from one of these organizations to come and speak to your class about the importance of volunteers and wetland health.

Post Visit 5
Chemistry
9-12

How to fight the problem

Purpose/Objective

Students will be able to explain what current technology exists to fight high levels of nutrients in water
Students will be able to explain what is currently being done to fight all types of water pollution

Materials

Computer with internet access
Poster making supplies

Procedure

1. Ask students if they have ever done volunteer work, if so what have they done.
2. Make a list of environmental volunteer opportunities.
3. In groups or individually have students pick one of the opportunities on the list and research it. They should find out:
    a. Where in the state it occurred last year and where it will occur this year
    b. A contact person
    c. Dates and time
    d. The organization organizing the event or opportunity
    e. What to expect

4. Have students design a poster advertising the opportunity or event to be hung around the school.
5. If possible offer extra credit to students who actually participate in one of the opportunities are events

Pre Visit 1
Chemistry
9-12

Vocabulary Search

Purpose/Objective

Students will use internet searches to find vocabulary terms used in context on reputable websites

Materials

Vocabulary list
Computers with internet access

Procedure

1. Discuss what makes a website a reputable or trust worthy website. This activity should be completed using sites that end in org, edu, or gov. Dictionary sites are not acceptable for this activity
2. Have students in groups or individually search for the terms on the vocabulary list
3. Students will write down the sentence in which the word appears and the website they found it on.
4. List all the different sites that the students found this information on
5. Mark any trends that you see (EPA, water department, education, research)

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Pre Visit 2
Chemistry
9-12

Wetland Habitats

Purpose/Objective

Students will research different habitats common to Florida Wetlands

Materials

Computers with Internet Access
Field guides and reference books
Projector screen

Procedure

1. Students will research Florida Wetlands. The goal of the research is to identify different habitats found in wetlands, choose one do further research.
2. Once students have picked a habitat to research further, they should find out all of the follow and anything extra that they want:
    a. Prominent plant types
    b. Wet season
    c. Animals found there
    d. Biggest threat
    e. Forms of conservation or restoration
    f. 3 places it is found in Florida

3. When the research is complete it will be presented to the class in some way:
    a. Poster
    b. Power Point
    c. Video tour, etc

Pre Visit 3
Chemistry
9-12

Dissolved Oxygen

Purpose/Objective

Students will be able to explain three ways that oxygen is dissolved in water

Materials

5 sealable containers per lab group (large test tubes)
1 sprig of hydrilla or elodia per group
Dissolved oxygen testing equipment
A way to boil water: can be done by lab group or have boiled water available
Thermometer
Large beaker
Ice
Grow light (one for the class or one per lab group)
Masking tape

Procedure

1. Discuss and define Dissolved Oxygen and its significance
2. Ask how oxygen gets into the water (plant photosynthesis and surface agitation)
3. What other factors may affect dissolved oxygen levels (temperature, algae growth, etc.)
4. In lab groups:
    a. Obtain a sample of water (enough to fill the tree large test tubes)
    b. Test and record the water temperature and dissolved oxygen level.
    c. Fill 3 Large test tubes with equal amounts of water
    d. With masking tape, label the tubes, control, plant, agitation
    e. Seal ‘control’ and set it aside for 20 minutes, careful not to shake it.
    f. At the end of 20 minutes, record temperature and oxygen levels.
    g. Place a sprig of hydrilla or elodia in the tube labeled ‘plant’ and seal it and place it under the grow light.
    h. Leave it under the light or 20 minutes
    i. At the end of 20 minutes, record any observations about the water in the test tube or the plant itself.
    j. Open the tube and record the temperature, careful not to stir or agitate the water.
    k. Perform a dissolved oxygen test on the water and record.

l. Stir the ‘agitation’ test tube constantly for 20 minutes. Without spilling any water, the stirring should cause splashing. Alternate side to side, around, up and down movements.
m. At the end of 20 minutes, record temperature and dissolved oxygen levels.
n. Fill 2 test tubes with equal amounts of hot water
o. Using what equipment you have in your lab, heat one test tube for 20 minutes, stir the sample every 2 minutes USE CAUTION WHEN HANDLEING BOILING WATER
p. Place one test tube into an ice bath for 20 minutes, stir the sample every 2 minutes
q. At the end of 20 minutes, record the temperature and oxygen levels of each test tube.

5. In a class discussion or in lab reports, discuss the results of the experiment. Which yielded higher levels of dissolved oxygen? What implications may this have in a real world situation? What agencies/professionals would find this information useful?

Pre Visit 4
Chemistry
9-12

pH of run off

Purpose/Objective

Students will make a chart listing the pH of different chemicals common in household runoff and wastewater

Materials

pH testing kit
several test tubes per lab group
several common household chemicals that maybe found in run off and wastewater (ie bleach, fertilizer, car wash soap, pet shampoo, chlorine, laundry/dishwashing detergent)
distilled water

Procedure

1. Review pH, what it measures, why it's an important water quality indicator, the scale.
2. As a class list as many household items as you can that may be found in run off yard water or waste water flushed or sent down drains.
3. Collect as many of the items as the students have come up with, with permission ask students to bring in some of the items from their own homes.
4. In lab groups: CHECK ALL LABELS FOR SAFETY CONCERNS BEFORE CONDUCTING THE EXPERIMENT
    a. Place equal amounts of distilled water and a household chemical into a test tube.
    b. Stir the contents of the test tube until combined
    c. Test and record the pH level

5. When all the chemicals have been tested, make a 0-14 pH scale placing each item at the appropriate place on the chart.
6. As a class discuss who would find this information useful, how can this help them in their daily lives or on their up coming field trip to Crystal Springs Preserve.

Pre Visit 5
Chemistry
9-12

Implications

Purpose/Objective

Students will know how water chemistry can affect wetland plants and animals

Materials

Research materials
Computer with internet access

Procedure

1. As a class brainstorm all the things can cause bad water quality (increased nitrates, decreased oxygen, pollution in general, algae blooms, storm water run off, etc.)
2. In groups, students will research the outcome of these problems (what happen when nitrates increase. Dissolved oxygen decreases, algae blooms)
3. When the research is complete, have students present the information to the class via power point, posters or some other presentation method.