Youth Stewardship Programming 2010/2011

Goals: To work with local youth to develop a sustained interest in the environment. To equip students with knowledge of the environment, the know how to identify the environmental risks and take part in advocating for a cleaner and more sustainable environment.

The following document is a toolkit for community groups and schools to use to replicate a similar program using the natural environment as an "outdoor classroom". This program was conducted by the Rockaway Waterfront Alliance with 25 local students aged 10-14 along the shores of Jamaica Bay and Rockaway Beach as part of an environmental youth stewardship program conducted during the summer and after school in 2010/2011.

The program focused on both stewardship and environmental advocacy. The science-based portion of the program consisted of marine debris removal, wetland restoration, monitoring local wildlife habitat, water quality, and oyster gardening. Each month the RWA educator assisted students in monitoring changes and collecting regular data. The other portion of the program focused on environmental advocacy so the students were able to share what they learned with family and peers and have a clear idea of how to advocate for legislation to improve the water quality of the NYC watershed.

The following curriculum and lesson plans were used in this program:

Water Quality
Objective: Identify ways in which to improve water quality on Jamaica Bay

Build a Habitat
Objective: Understand the importance of habitat to a species' survival.

Invasive Species
Objective: What are the issues concerning invasive species

Hazardous Chemicals
Objectives: Understand how hazardous chemicals affect human health and the environment

The Living Environment
Objective: How can various conditions affect an ecosystem

Osprey Identification
Objective: Recovery effort of Osprey Habitat

Water Usage
Objective: Watching our water use

Bird Mapping
Objective: Monitoring changes in wildlife habitat

Which Fishes Where?
Objective: Use data on fish collection to conclude where specific species of fish live

Water Cycle
Objective: Understanding weather conditions and how water travels

Community Workshop Station Lesson Plans:

- Littoral Zone- Seining/collection of marine life
- Observation Painting
- Shoreline- Water testing/oyster gardening
- Upland- Found Objects- Living vs Non living

RWA Environmental Education Resource List

Websites
Magnifier.com - Small 1" magnifier boxes/ bug specimen jars
Ben Meadows.com – Forestry and water quality supplies
Forestry-suppliers.com- forestry field equipment
Educational Innovations, Inc www.teachersource.com
Kelvin.com - for science, technology and engineering school supplies
Saltwatertides.com- tide predictions. For Rockaway use Jamaica Bay- Norton Point, Head of Bay

Videos

Whales Tales- American Red Cross Water Safety Video for children K-6th for purchase at www.redcross.org

Get'em Outside- About No child left inside act and benefits to youthWhitewash by Trespass productions. Documentary on struggles and history of back surfers

Bull frog films.com - source for educational dvd's and videos on environment, climate change

Trashed- The story of garbage. American style

11th Hour- is a 2007 documentary on the state of the natural environment and climate change

Fixing the Great Mistake: Autocentric Development

Green "The American Dream"- By Robert Sarnoff

The Cycle of Insanity" The real story of Water by Surfrider Foundation

Our today is Forever

HOME- a film by Yann Arthus-Bertrand www.home-2009.com

The story of Bottled Water(2010)

Gasland- documentary on drilling for natural gas and the dangers this causes.

Rise above plastics

“Crash” A Tale of Two Species on Nature Program- About fate of horseshoe crab

A Crude Awakening- The oil Crash

Who Killed the Electric Car?- A lack of Consumer confidence or conspiracy

Organizations & Government Agencies that have environmental education materials:

Alley Pond Environmental Center www.alleypond.com

American Littoral Society Headquarters, North East Chapter www.alsnyc.org

Bayside (Queens, NY) Fishing Club www.baysideanglers.com

Bigger Better Bottle Bill Campaign www.nybottlebill.org

Brooklyn Bird Club www.brooklynbirdclub.org

Coastal Research and Education Society of Long Island www.cresli.org

The Council on the Environment of New York City www.cenyc.org

Diamondback Terrapin Survey www.people.hofstra.edu/terrapin

Discovery Education www.discoveryeducation.com

Environmental Defense Fund www.edf.org

Jones Beach Power Squadron http://wakeupjbps.net

The Linnaean Society of New York http://linnaeannewyork.org

New York City Audubon Society www.nycas.org

New York City Department of Environmental Protection www.ci.nyc.ny.us/dep

New York City Department of Parks and Recreation www.nyc.gov/parks

New York City Waste Less www.nycwasteless.org

New York Historical Society www.nyhistory.org

New York League of Conservation Voters www.nylcv.org

NY Sea Grant www.seagrant.sunysb.edu

New York State Department of Environmental Conservation www.dec.state.ny.us

New York State Department of State www.dos.state.ny.us

New York State Marine Educators Association www.members.aol.com/nysmea

Queens Botanical Gardens www.queensbotanical.org

Rockaway Waterfront Alliance wwww.rwalliance.org

Riverhead Foundation www.riverheadfoundation.org

Save the Sound www.savethesound.org

Scenic Hudson www.scenichudson.org

Sebago Canoe Club www.sebagocanoeclub.org

Shore Walkers www.shorewalkers.org

Siemens www.wecanchange.com

Trust for Public Land www.tpl.org

The Urban Trail Conference Inc. www.urbantrail.org

For more information on RWA Youth Stewardship Curriculum, contact:

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Lesson Plan 1: Water Quality of Jamaica Bay

Objective: Identify ways in which to improve water quality of Jamaica Bay.

Part I: Background Information

Water treatment facilities continue to put millions of gallons of waste water into Jamaica Bay each year, raising nitrogen levels and affecting the habitat of Jamaica Bay. Have students research the following questions:

Algae Blooms

1. What are they and why they form?
2. Under what conditions do they form and what are the problems associated with them?
3. How might these affect the habitat of Jamaica Bay?

Anoxic Water

1. What causes anoxic conditions in Jamaica Bay and where?
2. How does it affect the wildlife habitat of the bay?
3. How can these conditions be monitored visually?
4. How can these conditions be corrected?

Shellfish

1. What types of shellfish live in Jamaica Bay?
2. What function do oysters and mussels have to improve water quality?
3. Are there ways in which they can be used on Jamaica Bay?

Part II: Monitoring

1.Observe the amount of algae blooms observed on a monthly basis in Norton & Sommerville Basin. Is it affected by the temperature of the water?

2. Log data on the growth and mortality rate of oysters in the oyster gardens located at Norton and Sommerville Basin
3. Are the two affected by one another?

Part III: Public Education

Develop an educational message about nitrogen reduction on Jamaica Bay. Your message must include the following information:

1. What is nitrogen overload?
2. What causes it?
3. When is it at its highest level?
4. What can the public and city agencies do to reduce it?
5. Agencies to contact for additional information.

(Ideas: video commercial, radio announcement, signage, pamphlets, other creative ideas)

Lesson Plan 2: Build A Habitat

Issue: Demonstrate the importance of habitat to an animal's survival.

Objective: Define the term habitat and ecology. Construct an appropriate habitat for a particular animal out of found objects.

1. Have students do research on the word: **Habitat**.
A habitat is the place where an animal or plant lives – it is like the plant's or animal's home. A habitat is the place where a living thing finds the food, water, shelter, and space it needs to survive.

A habitat is often named for a physical characteristic or the major type of plants it includes. For example, a grassland is dominated by many kinds of grasses. A rain forest refers to the amount of precipitation (up to 300 inches of rain a year) the forest receives.

2. Have the students research the word: **Ecology**.
Ecology is the study of how living things interact with each other and with the nonliving things around them such as air, soil, and water.

3. Ask students the following questions: *Can anyone living thing in a habitat exist without the other elements? Why or why not?* Have the students give some examples from their habitats to support their answers. If your students are having difficulty answering the questions and providing examples, ask them: *Can a squirrel exist without water or trees?* No, because it must drink to survive, it eats nuts from the trees, and uses the trees for shelter. *Can the sunflower exist without rain, the minerals it gets from the soil, or bees?* No, because it needs water and minerals from the soil to make its own food; without bees it could not reproduce more of its own kind.

4. Have the students identify a specific animal that lives in Jamaica Bay and do research on the animal, its characteristics and habitat. Why do they live there? Do they have any predators?

5. Have the kids work in groups to build a habitat made of found materials for their animal (specific above).

6. Have the students present a report on their animal along with the built habitat to the group. The presentation must include:
• Name the group's animal or plant
• The elements required for the animal to survive
• Identify the environmental materials they chose to use.

Teacher's Note
If this activity is too materials intensive, ask all of the students to vote for one animal they want to build a habitat for as a class project.

Lesson Plan 3: Invasive Species of the Rockaway Peninsula

Issue: What are the issues involving invasive species?

Objective: Identify the invasive species of Jamaica Bay. Create a poster or video to inform the general public of the importance or challenge related to these species.

1. Mugwort, phragmites and Japanese knotweed are all invasive plants that are found along the Jamaica Bay shoreline. Have students work in groups to create a poster demonstrating the important aspects of these and other Invasive Species (animals or plants) of Jamaica Bay. Each member of the group will be required to find an article in the library about the Invasive Species, and use it as a resource for their poster. Each student will present their research and poster to the class. The poster should include:

- Pictures of the invasive species
- A map of where the invasive species is found
- Answers the following questions:
  - Where is the invasive species found?
  - Where did the invasive species originate from?
  - Are there any natural predators for the invasive species in its native habitat?
  - How and when did the invasive species get to the United States?
  - What type of habitat does the Invasive Species prefer?
  - What kind of impact (positive or negative) does the invasive species have on their new environment?
  - Are the invasive species successful in their new environment…if so, why…if not, why not?
  - Do any organisms benefit from the presence of the invasive species…if so, how…if not, why not?
  - Is there a method in place to remove the invasive species…if so, what is it…if not, are they working on one?

Lesson Plan 4: Consequences of Urban Planning

Issue: What are the ecological issues involving poor city planning?

Objective: Game to evaluate the environmental, political & economic consequences of poor urban planning. Understand that government decisions affect one another because water and air pollution move between watersheds.

Discuss the idea of human connections between climate change, land use disease, and biodiversity loss. Humans have created change on all these fronts, often heightening the impacts on ecosystems. What happens to water quality, air quality and biodiversity when a community decides to build a housing development or build a park? How do these decisions affect the health of local residents?

Determine the best decision-making problem to determine the optimum solution and issues at the local level and plan and carry out a remedial course of have resulted in major pollution of air, water, and soil. Pollution has global warming, or ozone depletion. Human-accelerated environmental change helps us understand why ecologists can rarely pinpoint one cause behind a particular environmental issue.

Furthermore, this lesson helps students understand the complexities of environmental citizenship. This game can reinforce knowledge about environmental impacts, give them a taste of the difficulties town planners face and help them see that by careful analysis we can create positive change. We have found that this more realistic approach to environmental issues has helped teachers answer student questions and frustrations, because they are able to point to the connections among our environmental impacts and how those impacts cascade into complex environmental issues.
Lastly, we have found that this game is particularly successful in teaching about watersheds and airsheds. Therefore, activities like conducting a stream study, researching local pollution issues, building watershed models or finding your watershed address would fit well before or after using this game in the classroom.

Setting: Classroom
Duration: up to 2 hours, can be broken up into 3 sessions
Materials for this lesson (http://www.ecostudies.org/ed_curricula_ecochoices.html)
1. Student Instructions
2. Graph paper – there are 2 versions, one version uses the icons to build the graphs, the other version requires students to draw on a smaller version of the bar graph.
3. Icons & money
4. Town Descriptions
5. Town Choices
6. Thinking Chart
7. Decision Chart
8. Large watershed map
9. City Decisions

Lesson Preparation:
1. Prepare one packet for each town. The packet should include the student instructions, graph paper(s), town descriptions, starting number of icons and money (found at the top of

the town description), thinking and decision charts, county decision choices.
2. Print and laminate extra icons and money, to make a “bank”.
3. Either print the large watershed map, or draw on a large poster paper.

Lesson
1. Use the powerpoint, available online, to begin the game.
2. Break up the students into 5 groups, give them their packets and ask them to open the instruction booklet and begin the game accordingly. You will need groups of at least 2-3 students per group.Ideally, you will have enough students in each group so that you can have a Banker, Recorder, Graphkeeper, and Speaker.

Part 1
a. Students should carefully read through their town description and fill in the constraints and considerations table, which is designed to help them make decisions appropriate for their town (even if they personally feel otherwise). Visit each group to make sure they have understood their town “identity”. For younger students, creating a town slogan/cheer helps with this aspect.
b. Be sure that they fill in the first graph which represents where they stand before making any choices. Older students can draw the bar graphs, while younger students may benefit from having large graphs which they visualize with the help of the icons. Positive and negatives are represented on the same graph, but with different colored icons. Poor quality=red colored icons, while the white icons are positive or good quality of water, air, biodiversity, and health.
c. Students will now make decisions on water, air, and land in their town. The Recorder should write down all the options on the “Thinking Chart”, and make final decisions on the “Decisions Chart”, which needs to be signed off on by a teacher. At this point, you can check in with each group to make sure they are keeping the main goals of the game in mind, and not just focusing on the numbers of icons they will gain or lose. Asking students “Why did you make that decision?” or “How will that improve your ecosystem?” will help them think through their choices.
d. Once students have made their decisions, they will visit the Banker (an adult or a trusted student) to get the money they need, and the icons that have changed as a result of their decisions.
e. Students should fill in the next graph before going to the whole-class activity of looking at the watershed map. Using different colored paper for the various stages of the game graphs helps students keep track, but is not necessary.
f. All icons should get the name (or the first letter) of the town written on the back with wet-erase marker. This will help identify the pollution in the next step.

4. Part 2
a. Gather students around the large watershed map, where they have placed poor (red) water and air quality and positive (white) human health and positive (white) biodiversity. All icons should have the town name on the back of the originating town, so that students will know where the pollution came from.
b. Starting with the concept of watersheds, remind them what direction water flows and then begin moving water pollution cards in that direction, while removing human health and biodiversity cards. Move one red card at a time; this portion of the game will be different each time as students make different decisions. A red water quality card will affect downstream towns by reducing their biodiversity and human health. You can decide “how much” each red card will affect each downstream (or downwind) town. You can also add “pollution” from outside the county if the towns were environmentally friendly and didn’t create any pollution.

c. Do the same for the airshed by moving air pollution cards along the direction of the prevailing winds while removing human health and biodiversity cards that the pollution crosses on its path.

d. Students now take all the cards that are in their town back with them, and create a new graph accordingly. Since all icons have town names on the back, students will know who caused pollution in their town. This will help them think about who should reduce pollution at the county-level decision making process.

5. Part 3 – 5 years later!
a. Important: When each town calculates the amount of money they have 5 years in the future, you may or may not want to make them pay back the loan. It is important that at least 3 towns have money going into Part 4. So, if the towns are relatively cash rich, they should pay back their loan. If they are relatively cash poor, you can let them defer loan payment! These are all interest free loans.
b. Students now split up into county level decision making teams; one representative from each town meets with the other towns. In these county level groups, they will choose which county level decision is best, and return to their town teams with their decision. The town has to approve the county-level choice, and determine how much money to provide to the county for the action to move ahead. Now, the county-level debate can begin.
6. Part 4 – County Decision
a. This last part of the game often lends itself to heavy debate. It is important to stress the real world context in this portion. The decision they are fighting for should not just depend on number of cards, but the concepts of watershed and airsheds, as well as the what people in their town would support or not. This is also an opportunity to bring in any regional issues or decisions (a proposed wind farm or increase in farmer's markets, for example) in your area to help bring this game into the real world of the students.

Lesson Plan 5: Hazardous Chemicals In Your Community

Lesson Objectives: Understand how hazardous chemicals affect human health and the environment.

Students will be able to:

1) Understand hazardous chemicals, their effect on human health and the environment.
2) Explain the importance of cleaning up hazardous waste.
3) Identify facilities in their neighborhoods that deal with hazardous chemicals.
4) Recognize local and federal agencies responsible for environmental hazards in their communities.

Materials:
1) Internet Access
2) Chart Paper & Colored Pencils

Introduction

Chemical manufacturing companies played a vital role in the industrial revolution of the modern world. During the past two hundred years many new chemical elements and compounds were discovered and they formed an essential part of our day-to-day life.

Many household items such as plastics, paints, batteries, metallic appliances, pharmaceutical products, petroleum products all contain chemicals directly or indirectly. As a byproduct of all the great developments in the industrial world, there came the problem of environmental pollution due to hazardous chemicals being used in the manufacturing processes. Some of these chemicals, leaked into the environment or ingested by people, can cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions and physical deformations. The cost to plant and animal life can also be high.

Due to the high cost of cleaning up industrial pollution, some companies who spill chemicals into the environment have abandoned their sites leaving behind hazardous waste and polluted soil, water and air.

Nowadays there are numerous environmental protection agencies all over the world, whose job it is to prevent pollution of local and national areas. The U.S. Environmental Protection Agency (EPA) is one such group.

In 1979 the EPA estimated that there were thousands of inactive and uncontrolled hazardous waste sites in the country that could pose a serious risk to public health. Chemical spills posed another danger. Environmental damage resulting from such spills can result in massive death of fish, destruction of wild life, air pollution and loss of livestock by contamination of drinking water. Spills also resulted in loss of life and direct threat to human health from toxicity, fires and explosions.

Some of the examples of environmental damages due to hazardous chemicals are cited below.

1) Love Canal, Niagara falls, New York
Hooker Chemical Company used this Canal during 1940s and 1950s to dump 82 different chemical compounds, 11 of them suspected carcinogens. In 1953 the canal was covered with earth and sold to the city for one dollar. It was a bad buy. Through the 1960s and 70s, residents, whose homes were built above the polluted canal, reported odors and incidents of chemical residues seeping in to their basements and lawns. The contamination caused miscarriages, birth defects, respiratory ailments, and cancer.

2) Bridgeport, New Jersey
In 1977 sparks from a welder torch ignited an accumulation of chemicals including benzene, toluene and PCBs (Polychlorinated Biphenyls) at a waste storage facility. Six people died and 35 were hospitalized.

3) Toone, Tennessee (1978-79)
A chemical company dumped pesticide waste into a landfill. Six years after the landfill is closed, the drinking water is found contaminated and the city of Toone is required to provide an alternative water supply to residents living within three miles radius.

4) Riverside, California (1978)
Erosion of the retaining dam for a waste pit threatened eight million gallon torrent of waste materials including DDT (Dichloro Diphenyl Trichloroethane), nickel, lead, chloroform and trichloro ethylene.

In order to deal with the hazardous waste problem, Congress proposed the creation of a "Superfund" - a multi-million dollar federal toxic waste clean-up initiative. On December 11, 1980 President Jimmy Carter signed the new Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or "Superfund."

The responsibilities of the Superfund program were to:

- Determine the number of sites where potentially significant contamination existed;
- Assess who was responsible for the waste;
- Develop a structure to enforce CERCLA;
- Determine the contaminants and quantities dumped;
- Research where the contaminants were coming from;
- Calculate the actual human exposure to contaminants and the potential health risks; and
- Create technologies to remove or control contaminants.

Procedure

1. Introduce the lesson hazardous chemicals. Ask the students about their knowledge of environmental damage due to hazardous chemicals.

2. Briefly explain the role of the EPA and ask them about their knowledge of any industries dealing with hazardous materials.

3. Ask students how they would identify hazardous chemicals and the facilities that make them. Hopefully students should come with answers such as "do research" or "refer to books" etc.

Activity 1

1) Divide students into small groups of three each. Direct students to the EPA's Cleanup Process page (http://www.epa.gov/superfund/action/process/sfproces.htm) and an EPA list of hazardous chemicals, their sources and effects on health.

2) In small groups have the students answer the following questions:

1. What are hazardous chemicals? Write 5 examples
2. When did the EPA begin its Superfund program? What were the reasons for its establishment?
3. What are the responsibilities of the Superfund program?
4. What were the environmental effects of Love Canal tragedy? Who was responsible for the tragedy?
5. What are the four important pathways used by Hazard Ranking System (HRS) to score a hazardous site?
6. What are the health effects of PCBs?
7. What are the sources of mercury contamination? What are its health effects?
8. What chemical contaminants are present in dry cleaning agents? What are the potential health effects?
9. List five health effects of pesticides?
10. Where should you report environmental damage or health effects due to any facility dealing with hazardous chemicals in your neighborhood?

Activity 2 - Role Play

1. Divide students into three groups. One group acts as victims of the Love Canal tragedy (residents of the area) and the second group acts as EPA officials, local authorities and political leaders (examples may be mayor of the town, congressmen, senators etc.). The third group acts as the owners of a mid-sized chemical manufacturing plant being sued for millions of dollars for leaking chemicals into the ground. This group knows that if they lose the case, they may be forced to pay out millions and will definitely go bankrupt. If they come up with some less drastic solution, they will be able to stay in business and maybe give the affected individuals some sort of compensation and lead the cleanup effort. However, this scenario, in which they admit to leaking the chemicals, could cost them lost business because of bad publicity.

2. Encourage students to volunteer themselves to join anyone of the groups.
The first group will explain their sufferings due to the effect of hazardous waste materials. They will make a case for why it should be cleaned and why they should be compensated. The second group then reacts to their collective tragedy and articulates ways to help and compensate the victims and suggest methods to prevent such accidents from occurring again in the community. The third group tries to come up with the least costly alternative to cleanup.

Each student in the first group can tell fake stories based on the following themes:

1. A man who began suffering from asthma after he moved to the area. He can also talk about the frequent asthma attacks of his neighbors.
2. A woman experiencing blurred vision.
3. A woman explaining her children's seizures and those of the other kids in the neighborhood.
4. A man in the neighborhood complaining about unpleasant odors and his burning eyes.
5. A woman complaining about birth defects in her children and other kids in the area.
6. A woman experiencing several miscarriages in herself and other women in the area.
7. A man describing his rare form of cancer.

The second group of students acting as community leaders and authorities can react to the above grievances. Each student in this group can give lectures based on the following themes:

1. Mayor can talk about the lawsuit he is filing against the company that dumped the hazardous waste and getting compensation for the victims.
2. EPA official can talk about the steps being taken to clean up the site and the precautionary measures to be taken by the public.
3. Congressman can talk about rehabilitation and medical care for the victims.
4. Senator can talk about the steps taken by the federal government to prevent such accidents in the future.
5. Community leaders can talk about an awareness campaign among the residents of the area to report health problems.

The third group represents officials of a mid-sized chemical manufacturing plant, which is being sued for leaking chemicals into the ground. Each student in this group can defend the company by giving fake lectures based on the following themes:

1. The chief executive officer of the company can explain the chemical leakage as an accident and not an intentional occurrence. The officer may also empathize with the victims of the tragedy.
2. The vice president of the company can talk about the help being provided by the facility to the affected people around the area in terms of medical services and monetary benefits.
3. The general manager can talk about the recent efforts of the company to clean up the chemical leakage in the surrounding areas.
4. The public relations officer can talk about the importance of the company for the area in terms of job creation and economic growth.
5. The chief engineer can talk about the new safety equipment being installed in the company to protect the employees and the environment.
6. Another public relations officer can talk about publishing a monthly environmental report of the company including air quality, water quality and soil analysis for the awareness of general public.
7. The manager can talk about the creation of a new safety committee for the company that includes the representatives of the local communities.

At the end, the teacher can add some final comments based on the progress of the role-play activity. Highlight the positive and negative aspects of the activity and reward them by giving all participants an appropriate grade for their contribution and performance.

Extension Activities

1.Using the EPA's "Where You Live" Web site (http://www.epa.gov/epahome/commsearch.htm), have students research the environmental quality of their own neighborhood, write up their findings and share them with the class. Students may use an Internet search engine such as Google to find additional information about the affected community. If possible, have students contact current residents of the site and interview them about the effects of hazardous waste in their community.

Lesson Plan 6: For the Living Environment

Goal: How can a freshwater ecosystem be developed?

How can biotic and abiotic factors be observed in a freshwater ecosytem?

How can various conditions affect a freshwater ecosystem?

Objectives:

a. Students will define ecosystems and describe the components of an ecosystem.

b. Students will identify and describe biotic and abiotic factors of a freshwater ecosystem.

c. Students will describe the types of relationships that exist in an ecosystem between biotic and abiotic factors.

d. Students will collect specified data from their ecosystems and show how specific factors affected the data.

e. Students will show a degree of knowledge on utilizing computer programming to interpret their gathered data.

Teacher's Instructions :

a. Students are to be assigned the necessary vocabulary words:

1. ecology
2. ecosystem
3. biotic
4. abiotic
5. photosynthesis
6. decomposers
7. heterotrophic
8. autotrophic

b. Materials to be purchased/ordered prior to lesson(s)

1. "half pint" bottles of Poland Spring Water or Deer Park's "Chugs" (depending on your class size, one "pint" per group of 4 students.
2. small freshwater snails from Carolina Biological Supplies
3. sprigs of *Elodea* which may be ordered from Carolina Biological Supplies.

4. permanent markers
5. 200ml beakers to gather materials
6. *tweezers*

c. Instructions on how to construct a freshwater ecosystem are to be placed on an overhead transparency for students to copy and discuss.

Students' Instructions:

1. Students will gather into groups of 4.
2. Within each group, students will be assigned specific roles:
   a. group recorder
   b. ecosystem engineer
   c. materials gatherers (2)
   d. all are assigned the title "observer"
3. The following activities must take place:
   a. The materials gatherers will acquire the necessary materials from the teacher's desk: a sprig of *Elodea*, 2-3 small snails, a bottle of spring water, marker, and beaker.
   b. The recorder will write down the types and quantity of materials gathered. The recorder will also label the group's bottle of spring water.
   c. The ecosystem engineer will uncap and pour out about 20 ml of the spring water from the bottle into the beaker. The ecosystem engineer will place the snails and *Elodea* into the bottle of spring water. The cap will be replaced on the newly constructed ecosystem.
   d. The observers will use the following questions to observe and analyze their ecosystems for the next few days.

Questions/Observations:

Day 1:

1. If bios means life, define biotic.
2. Which components of your ecosystem are biotic?
3. How can you prove that your chosen components are biotic?
4. If the letter "a" in the front of the word makes the word opposite of what it means, define abiotic.
5. Which components of your ecosystem are abiotic?
6. Why did the ecosystem engineer pour out some of the water from your bottle? What did it create in your bottle?
7. Why do you need to keep your bottle by the window?

8. How do the biotic and abiotic factors relate to one another in your ecosystem?
9. Define ecosystem.

Day 2:

1. Why was *Elodea* placed in the ecosystem?
2. Why were snails placed in the ecosystem?
3. Based on the types of nutrition you have learned classify your biotic factors.
4. How does *Elodea* rely on abiotic factors such as oxygen, carbon dioxide, water, pH, temperature and light?
5. Why is the snail important for the *Elodea's* survival?
6. How does the snail rely on the *Elodea?*
7. How does the snail provide fertilizer for the *Elodea?*

Day 3:

Different environmental conditions will be created to see the effects on the specific ecosystems.

Condition #1: Addition of salt. This is to recreate how salt used for de-icing affects nearby organisms and in upstate New York, our reservoirs.

Condition #2: Addition of motor oil. This is to recreate how oil spills/ illegal dumping in our sewer systems affect aquatic organisms.

Condition #3: Removal of light by adding sediments to the ecosystem. This is to recreate how soil erosion leads to the clouding of nearby streams, lakes, and rivers.

Condition #4: Addition of fertilizer. This is to recreate how fertilizers leach into ponds and lakes and increase algae blooms.

Students will observe and record the changes that develop in their ecosystem. The groups will discuss the changes and possibly explain them. Each group will present their results and relate to current environmental problems that humans have introduced.

Lesson Plan 7: Ospreys

See "*The Return of the Fish Hawk Project Osprey Curriculum*," A Cooperative Project of Public Service of New Hampshire, Audubon Society of New Hampshire and New Hampshire Fish and Game Department: http://www.friendsofblackwater.org/osp_curr.pdf

Lesson Plan 8: Water Usage

See "*Caring for Planet Earth: The Great Lakes* (Volume 1)" by Grand Rapids Community College. Go to the following website and download the free sample lesson on "Discovering Water": http://www.great-lakes.net/teach/teachers/details.html?mid=3.

Lesson Plan 9: Bird Mapping

Objective: *Students will study New York State Breeding Bird Atlas maps to learn where different bird species nest and how their distributions have changed over time so they can* understand:

- how maps serve as representations of a geographic region;
- how the distribution of animals varies geographically based on habitat requirements;
- how the distribution of animals changes over time as environmental conditions change, often in response to human activities.

Background: Maps usually show terrain, political regions, roads, towns, and similar features of the natural and built landscape, but can also show other information linked to geography. This lesson explores maps from the New York State Breeding Bird Atlas. The Atlas was created using data on nesting birds collected by more than 1,200 volunteers in 5,332 blocks-sections of U.S. Geological Survey maps-that together formed a mosaic covering all of New York.

The distribution of breeding birds is tied to the availability of suitable habitat. Their distribution can change as habitat is altered. Examples include the disappearance of grasslands due to urbanization, an increase in forest cover as farm fields are abandoned, and milder winters due to climate change. Other factors influencing bird distribution include application of toxic pesticides, shooting, and introduction of non-native species.

Students will view actual Breeding Bird Atlas maps to learn how such factors play roles in bird distribution. By comparing data collected over two decades, they will see how this distribution can vary over time. They will answer document-based questions about information in these scientific figures. The maps are unaltered except for being reduced in size and-most likely-converted to black and white in photocopying.

On each map, blocks in which a species occurred are colored to show the bird's breeding distribution. The color of the block shows how likely it was that the species did nest. Finding a nest in use or babies would confirm breeding, indicated by a blue block. Possible breeding means only that the bird was seen in the right nesting habitat, indicated by a yellow block. Because color distinctions may be lost in copying to black and white, the worksheet for this lesson does not address this feature of the maps.

Activity:

1. Review vocabulary words and point out that the lesson will look at where birds nest in New York. The maps do not show where birds migrate, nor do they include non-breeding species.
2. Compare an Atlas map to the state relief map showing counties. Point out the location of major topographic features such as the Adirondacks, Catskills, Atlantic

Ocean, Great Lakes, and Hudson River. On the Atlas map, find the county in which your school is located.

Assessment:

- Select other Atlas maps for students to analyze. Suggestions: double-crested cormorant, golden-winged warbler, peregrine falcon, ring-necked pheasant, ruffed grouse, upland sandpiper, and whip-poor-will. Fact sheets on the web (see Resources) explain increases or declines in these species.

Vocabulary:

- **atlas:** a book of maps
- **breeding:** producing young by hatching or live birth
- **data:** factual information (plural of datum)
- **habitat:** the particular sort of place where a given plant or animal lives
- **landscape:** a region's set of landforms, viewed as a whole
- **native:** belonging in a particular place by birth; not brought in from another region
- **pesticide:** a substance used to kill creatures or plants considered to be pests
- **population:** a group of individuals of one species living in a particular region
- **relief map:** a map that shows the topography of an area
- **scientist:** a person skilled in science
- **species:** a class of living things of the same kind and same name

Resources:

The Department of Environmental Conservation's Breeding Bird Atlas data website provides access to all the Breeding Bird Atlas maps. Scroll down to the table "Breeding Bird Atlas - Maps By Species." In the row labeled "Alphabetic Order" select 1980-1985 or 2000-2005 to see a list of species. (To see maps from both time periods on one page, select "Alphabetic Order" in the row labeled "Compare Maps"). Clicking on a name in the list—duck, for example—opens a table listing one or more species in that category; click on a species name to see its map.

You can see a list of breeding birds found in your area. First, visit the Breeding Bird Atlas Survey Blocks website to find your atlas block. In the search menu on the left side of the page, select "Town/City/Village" and enter your community's name. Click "Find" to zoom the map in to your locality. It should be covered with a grid. Each square in the grid is labeled with a block number - four numerals followed by the letter A, B, C, or D. Choose the block in which your school or home is located and write down its number. Now go to Breeding Bird Atlas data website, scroll down to the "Species List Inquiry" section, and enter the number in the indicated box. Choose the years for which you want to see the list, and then click "Submit."

Lesson Plan 10: Which Fish Where?

Objective: Use fish collection data to draw conclusions about where fish live in the Hudson Estuary and Jamaica Bay. Students will use data in tables and graphs to:

- interpret organized observations and measurements;
- recognize simple patterns, sequences, and relationships;
- understand environmental factors that influence where fish live.

Background:Jamaica Bay is home to a great variety and abundance of fishes. Each kind is found in certain parts of the bay depending on its habitat and salinity preferences. Some of the bay's fish are found only in salt water, seahorses for example, others only in fresh, like sunfish; a few can live in either, like hogchokers.

Activity:

1. Review the definition of estuary, brackish water and salt front with the students.
2. Introduce the Hudson River Miles system.

Assessment:

1. Find your community or the nearest community on the Hudson River Miles map. Have students predict which fish they would be most likely to catch at this location.

Vocabulary:

- **community:** a group of living things that interact and are located in one place
- **estuary:** a body of water in which fresh and salt water meet
- **fresh water:** water that is not salty
- **Hudson River Miles:** distance north from the Battery at Manhattan's southern tip
- **salt front:** the leading edge of seawater entering an estuary
- **salt water:** seawater or other water that contains salt
- **seine net:** a fishing net that hangs vertically between floats and weights
- **upriver:** towards a stream's source

Resources: For illustrations of and information about the fish described in this activity, visit the DEC's Freshwater Fishes web page.

Lesson Plan 11: Exploring YOUR Water Cycle

OBJECTIVE: Understanding how water travels

Part 1: Precipitation-How much, and where does it go?

1. Go to www.wunderground.com . At the top of the screen, you'll see "Local Weather" and a lot of different topics to choose. Select "History Data".

2. On the next page, type in your location and the date you are interested in. Click "Submit".

3. You'll see information for the Daily Summary. There are tabs at the top which allow you to select weekly, monthly, or custom. Select "Custom".

4. Type in the date range you would like to see. For precipitation, we recommend looking at a full year to get an average. For New York, the average annual precipitation is about 40 inches.

5. Using this information you can begin to construct a water budget for your school. You can use the "School Water Budget" lesson plan and worksheet, which can be found in the Changing Hudson Project's curriculum materials for the Pollution unit (www.caryinstitute.org/chp.htm). You will also have to find out how much water your school uses, and the different types of surfaces around your school.

6. You can use Google Earth to get photos of your schoolyard, neighborhood, or town in order to classify permeable surfaces. In general, no water is absorbed by impermeable surfaces, 50% is absorbed by soil, and 50% is absorbed by vegetation. These numbers will change depending on your local situation: the type of soil in your region, the amount of rainfall, the amount of solar radiation, etc. You could conduct some basic studies with your students to measure infiltration rates in your area.

Part 2. Streamflow

1. Go to http://water.usgs.gov/data/ and click on "real time stream flow:
2. Describe the trend in stream flow for the United States: which parts of the country have lower than normal stream flow, and which parts have higher than normal stream flow? What could be the reason for higher than normal stream flow? Lower than normal?
3. Click on the state where you live. Describe the stream flow conditions in your state. If there are areas that are experiencing low, or much below normal flow, think about how you could explain that situation.
4. Visit this site on the same day of each month, throughout the school year and keep track of high and low flow conditions for your state.

Part 3: Drought

1. Go to: http://water.usgs.gov/data/ and click on "Real-time drought data".

2. Describe the areas of the country that are currently affected by drought. Which parts of the country have more severe drought conditions? Explain why you think this might be taking place.

3. Visit this site on the same day of each month, throughout the school year and keep track of drought conditions for the U.S. and/or your state.

Part 4: Ground Water

1. Go to: http://water.usgs.gov/data/ and click on "Real-time ground-water levels".

2. Find an area of the country that has a "red dot". That means that the ground water is much below normal. Click on the state that has a red dot.

3. Once the state pops up, click on one of the red dots that you see within that state.

4. On the next page, you get information about the specific well that is below normal. If you scroll down on the page, you'll see a type of hydrograph, which explains the changes in the water level over a specific time period (usually a year). Based on this graph, for how many months does the water level in the well drop below the yellow (below normal) or red (much below normal) level? What do you think might be causing this low water level?

5. Keep track of the ground water levels throughout the year. Different people in your class could keep track of different wells in your state, and compare them with another state, throughout the year.

Part 5: Water Quality

1. Go to: http://water.usgs.gov/data/ and click on "Real-time surface water quality".

2. This map of the United States shows you the sampling locations of the USGS. The colors of the triangles refer to measurement that is being taken. It first shows you temperature (red colors indicate warmer temperatures).

3. To change the measurement, in the upper left hand side of the page, click on the arrow next to the "Measurement" box. You can select turbidity, dissolved oxygen, pH, discharge (stream flow), and specific conductance. For more information about these water quality indicators, you can find background readings at the high school level at: www.caryinstitute.org/chp.html in the Resources section.

4. If you click on any of the triangles, you can get more specific information for a particular location, including graphs of the data.

Community Workshop Lesson Plans

Make stations on shoreline of bay that people can take 10-15 minutes to make observations/collect data at each station. Have community members and families work together as teams to take down data together.

Station #1 Littoral Zone- Seining/collection of marine life

Equipment:

- Identification sheets with pictures of marine life
- Golden books
- Tide charts(salt water tides.com)
- Flags
- Glass/plastic jars for collection of fish and marine life
- Magnifying glass and specimen boxes

Instructions:

1. Put flag at waters edge at beginning of seining and make note of the water level (tide)at start of seining and again at end of class

2. After net is pulled to shore- collect marine life and put in jar with water to observe

3. Use golden books and id ref chart to identify 3 living creatures or marine life

4. Put 3 items in small magnifying box and write down on sheet

5. Draw what the items look like in the magnifying jars and describe in detail below drawings

6. Return creatures to water?

Station #2 Watercolor- draw/paint a landscape "what you see" at shoreline

Station#3 Shoreline- Water testing/Oyster gardening

Equipment:

- Identification sheets with pictures of marine life/golden books
- Bucket with water from Bay/beach
- Rope to throw bucket in water

- thermometer on cord
- oyster data sheets
- rulers
- log data on water quality
- pull oyster cage

Instructions:

1. Fill bucket with water to observe and add thermometer to water

2. Add information on data sheet

3. Count oysters alive and measure- add to oyster data sheets

Station #4 Upland- Found Objects- Living vs Non Living

Equipment:

- Golden books
- Debris collected from shoreline site-glass, shells, wood, fish line, hooks, plastic bottles, rubber, plastic, glass, Styrofoam
- Chart showing how long it takes for things to disintegrate
- DOS recycling chart showing different categories of trash

Instructions:

1. Collect things on shoreline and put them in two piles - living and non living

2. Write down the items in both lists, use books as reference

3. For non living items arrange items along the timeline of disintegration 1 to 1,000 years

4. Beside each item write how long they take to disintegrate

5. Write down group that each item should be under for trash

Group #1 Paper & Cardboard / Group #2 Cans, Metals & Foil / Group #3 Everything else

How Long Does Litter Last

Orange peel	2-5 weeks
Banana peel	2-10 days
Apple core	2 months
Foil	Never
Paper bag	1-5 months
Plastic Bag	500-1,000 years
Cigarette butt	(up to 5 years)
Leather shoe	25-45 years
Plastic bottle	430 years
Aluminum can	200-500 years
Diaper	500-800 years
Glass bottle	Approx. 1-2 million years
Styrofoam	1 million years
Thread	3-4 months
Cotton	1-5 months
Polystyrene	500 years
Rope	3-14 months
Drink packets	5 years
Nylon clothes	30-40 years
Aerosol bottle	200-500 years

Fishing line	600 years

OYSTER PROGRAM OBSERVATION SHEET
2010-11

1. Net # (Required):
Observer's Name:
Site Name:
Date (mm/dd/yyyy):

2. Measuring Your Oysters' Growth

Using a sub-sample of 50 oysters, measure the height of each one in millimeters (remember, one centimeter = TEN millimeters.) Do not measure dead oysters. You will have blank spaces below representing dead oysters.

______	mm	______	mm	______	mm	______	mm	______	mm
______	mm	______	mm	______	mm	______	mm	______	mm
______	mm	______	mm	______	mm	______	mm	______	mm
______	mm	______	mm	______	mm	______	mm	______	mm
______	mm	______	mm	______	mm	______	mm	______	mm
______	mm	______	mm	______	mm	______	mm	______	mm
______	mm	______	mm	______	mm	______	mm	______	mm
______	mm	______	mm	______	mm	______	mm	______	mm
______	mm	______	mm	______	mm	______	mm	______	mm
______	mm	______	mm	______	mm	______	mm	______	mm

Overall average: #DIV/0! **Range:** 0.0 - 0

3. Mortality (percentage of dead oysters in sub-sample): ________
Total number of live oysters in your net (including sub-sample): _______

4. Observations about weather, water, and organisms in and around your oyster float:

Please monitor once a month:

1. Print a new blank sheet for recording in the field each month.
2. Enter your data into the appropriate month's sheet in your Excel file.
3. Email the file to oysterdatasheets@gmail.com.

If you are unable to use Excel, please enter your data into the word processing version of this file available at www.urbanoysters.org or email a scan of your hand-written data sheet. Don't forget to enter your averages.

View all data for all NYC locations online by following the 'data' link at www.urbanoysters.org

TRASH CHART

Record all the trash you generate in one full day – that is ANYTHING you throw away, no matter how small! Take a second right after you throw anything in the garbage to place a checkmark next to the type of trash it was. Start when you first get up, and keep it up for one day. This includes school and any other place you go today! Don't worry about figuring out percentages or whether something is recyclable yet. It will be discussed in class.

WHAT'S IN YOUR TRASH??

Type of Trash	Checkmark	Percentage of Total Trash	Is it recyclable?
Newspaper			
Paper or cardboard			
Plastic			
Paper/plastic combinations			
Aluminum (cans, foil, foil packaging)			
Glass (bottles)			
Metal			
Wood			
Old clothes or other cloth items			
Other			

Delivery Time to Lab_____

RWA WATER MONITORING FORM

A form must accompany all samples. **A separate form is not need for Sample Duplicates**. Submit form to NRWA staff.

SITE NUMBER: _____ **COLLECTION DATE** (mo/dy/yr)_____/_____/_____ **COLLECTION TIME**_____

SITE DESCRIPTION:_____ **MONITOR INITIALS(S):** _____

SAMPLE DUPLICATE COLLECTED?(circle) YES NO (Refer to Schedule to see if duplicate is required)

Please describe any problem(s) or challenges encountered during monitoring _____

CURRENT WEATHER (Circle): Clear Partly Cloudy Overcast Drizzle Light Rain Downpour Off/On Rain/Drizzle Other____

¼ inch (estimate) of rain since Thursday morning? (Circle): NO YES, mostly: Steady Hard Off/On Hard Steady Light Off/On Light

WATER TEMPERATURE:_____C **AIR TEMP**_____C **TUBRIDITY** _____ **PH**_____ **DO** _____

RELATIVE FLOW (refers to the level of water above the stream or river bottom) : _____ feet OR Very Low Low Normal High Very High
Please provide digital photos of different flow levels at your site whenever possible and describe **low flow** conditions below.

SPEED OF WATER: (circle) Quick Moderate Slow Almost Still Still Other_____

WATER CLARITY: (circle) Clear Slightly Murky Moderately Murky Highly Murky Other_____

WATER COLOR IN E.COLI (clear) BOTTLE: (circle) Clear Grayish Tea Mud Puddle Other_____

OBSERVATIONS: (circle all that apply and elaborate below)

(1) Birds (2) Land Wildlife: Sightings/ Tracks (3) Aquatic Insects (4) Aquatic Plants (5) Algae (6) Fish (7) Beaver activity/ chewed twigs

(7) Erosion (8) Debris or Trash in water or land (9) Odors (10) Vegetation Removal (11) Invasive Plants (land or aquatic)

Please elaborate and provide digital pictures whenever possible:

_____

_____

Become an advocate of Rockaway as a clean and open public space.

Be an EnvironMentor.

Environmental Justice (EJ)

ENVIROmentors

A Rockaway Waterfront Alliance Educational Program

Artists, scientists and environmentalists work with students to show them the many forms advocacy can take to raise awareness and influence change against potential environmental hazards in the Rockaway waterfront community.

Rockaway Waterfront Alliance announces the EnviroMentor Environmental Justice After-School Program which will introduce students to the principles of Environmental Justice.

Students will interact with local scientists in workshops and learn to conduct scientific research. Students will also learn about renewable energy, revitalization of public space and marshland restoration to create a more sustainable Rockaway community.

WHO:
Open to all middle school students attending NYCHA/Ocean Bay Community Center.

WHEN:
Wednesdays, 3:30pm-5:00pm.

WHERE:
5710 Beach Channel Drive
(@ Beach 57th Street)

ROCKAWAY WATERFRONT ALLIANCE

www.rwalliance.org