

Super Stream Keeper's

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Objective of the Lesson:

This lesson is designed to introduce students to:

- ✧ Delaware's waterways as precious resources used for drinking water, water for agricultural and industrial uses, recreational areas, and as habitats for wildlife.
- ✧ Wastewater discharges, storm water runoff carrying pollutants, and disruption in stream habitat that often degrade streams.
- ✧ Frequent abuse of streambanks by the dumping of unwanted things like grass clippings, leaves, trash.
- ✧ Water protection and methods of protection.

Standards Addressed:

Science

K-3	4-5	6-8
Standard 1 <i>Nature and Application of Science and Technology</i> A-1, A-2, A-3, A-4	Standard 1 <i>Nature and Application of Science and Technology</i> A-1, A-2, A-3, A-4	Standard 1 <i>Nature and Application of Science and Technology</i> A-1, A-2, A-3
Standard 5 <i>Earth's Dynamic Systems</i> A-1, A-3	Standard 5 <i>Earth's Dynamic Systems</i> A-3	Standard 5 <i>Earth's Dynamic Systems</i> A-4 B-2 C-1
Standard 8 <i>Ecology</i> A-1, A-3	Standard 8 <i>Ecology</i> A-1 B-3	Standard 8 <i>Ecology</i> D-2

Agriscience

6-8
Exploring Agriscience Careers Standard 2 <i>Leadership and Decision Making</i> A-4
Exploring Agriscience Careers Standard 7 <i>Natural Resource and Environmental Careers</i> B-1, B-4

Materials Needed:

Water Quality Test Materials:

- ✧ Buckets
- ✧ River Water taken from on site
- ✧ Water Test Kits Borrowed from DE Nature Society
- ✧ Safety Gloves
- ✧ Safety Goggles

Visual Aids:

- ✧ Where on Earth is Water? Poster- Pie Chart (Oceans, Land, Glaciers, Groundwater, Lakes, Soil Moisture, Rivers, Atmosphere)
- ✧ Poster of Hydrologic Cycle
- ✧ Technical Monitoring Stream Watch Survey (Poster size to fill out at the stream)

Teaching Tips:

- ✧ Work in groups of about 4-6 students. Each group or student should write down his or her physical characterization of the stream.
- ✧ This lesson is separated into four (4) segments in which students will discuss the hydrologic cycle, physically characterize the stream, chemically analyze the stream and report their data. Approximate times for each segment are included, but may be altered for convenience.

Procedure:

1. Introduction (approx. 5 min):
 - o Discuss hydrologic cycle and where the water is on earth (using visual aids); discuss importance of healthy streams and clean water.
2. Physical Characterization of the Stream (approx. 10 min):
 - o Take the group to a stream. Conduct stream watch survey including weather conditions, depth, bottom type, visual water condition (odor, color, etc.), vegetation and litter.
 - o Collect water sample at this time.
3. Chemical Characterization of the Stream (10 min):
 - o Use water test kits from Delaware Nature Society to test chemical properties of water in the stream. Depending on amount of kits available you may wish to have each group test the nitrate, dissolved oxygen, pH and phosphorus of the stream water. If not, half of the groups may test 2 characteristics and the other half may test the other two. After testing the groups should share the data collected.
 - o Group A will test:
 - Dissolved Oxygen
 - Nitrate
 - o Group B will test:
 - pH
 - Phosphorus
4. Discuss Results (approx. 5 min):
 - o Have group report findings. Record them on a poster and discuss what they indicate about the stream.

Check for understanding:

Possible Questions

1. What are the four major functions of the hydrologic cycle?
2. What would happen to the planet if the hydrologic cycle stopped functioning?
3. Where is the majority of Earth's water stored?
4. What types of pollution may affect your stream?

Suggested Answers

1. The exchange of water between earth and the atmosphere is the hydrologic cycle- hydro means having to do with water, *logos* is a Greek word meaning knowledge of. Hydrology is the study or knowledge of water. The four major functions of the hydrologic cycle are the following: evaporation, transpiration, condensation, and precipitation. Evaporation occurs when the sun's energy turns liquid water on the earth's surface into water vapor. Water vapor enters the atmosphere. Water also enters the atmosphere through transpiration, the process of the sun's energy pulling water from plants and releasing it into the atmosphere as vapor. Condensation happens when water vapor in the atmosphere cools to form clouds full of liquid droplets or particles of ice. Then these droplets or particles become heavy enough to fall to earth, precipitation occurs.
 2. All living things need water to live. The hydrologic cycle transports and exchanges water between surface and subsurface parts and between living and nonliving parts. Therefore, it is essential for life.
 3. At any point in the hydrologic cycle, more than 97% of the water is contained in the ocean. Approximately 2.5% is stored on land and 0.001% is contained in the atmosphere. While the amount of the water in the atmosphere seems very low, it is a very active part. It is estimated that the atmosphere recycles its water every 8 to 10 days. Of the 2.5% stored on land, approximately 79% is ice, 20% is in the ground, and 1% is on the surface. The ground and surface water not tied up in ice is the watershed water that your stream depends on.
 4. Pollutants come in many forms, including: man-made chemicals such as pesticides and herbicides; heavy metals from mining activities; excessive additions of naturally occurring substances such as sediment and nutrients. Water pollution can result from any activity which changes the flow characteristics of streams or alters stream temperatures.
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Summary of learned material:

Streams and rivers are invaluable. They provide vital habitat and a source of fresh water for fish and wildlife. Streams also provide humans with water for drinking, irrigation, industrial supplies, power production, transportation, flood control, fishing, boating, and swimming. Serving so many human uses has led to the modification of streams and their surrounding watersheds. Most of our streams and rivers have been dammed to create reservoirs and provide power. Removing streamside vegetation and constructing impervious surfaces, like parking lots and streets, has increased runoff, slowed the ground water recharge, and added a variety of pollutants from automobiles. Collectively, we humans are the primary cause of degradation to stream systems. But we can also create solutions! By becoming a stream keeper and monitoring the health of your stream, you become an important player in your stream's future condition. You can become an extra set of eyes and ears that government agencies need to ensure that your stream is looked after

on a regular basis. Your inventorying and monitoring data can serve as the basis for protecting your stream from potentially harmful land use decisions, or restoring your stream if it is already degraded.

Additional Resources:

General Water Sites:

<http://ga.water.usgs.gov/edu/mearth.html>

General Dissolved Oxygen sites:

<http://h2osparc.wq.ncsu.edu/info/do.html>

<http://www.state.ky.us/nrepc/water/wcpdo.htm>

General Nitrogen Sites:

<http://www.state.ky.us/nrepc/water/wcpno.htm>

http://ll.terc.edu/tapwater/content_students/session05/session05_01/s05_page02.cfm

Ideas for Reducing Nitrogen in farming communities in the Midwest:

http://www.idea.iastate.edu/idea/marketplace/pdf/fs_waving.pdf

General pH sites:

<http://www.state.ky.us/nrepc/water/wcp-ph.htm>

<http://ga.water.usgs.gov/edu/phdiagram.html>

General Phosphorus Sites:

<http://water.nr.state.ky.us/ww/ramp/rmpo4.htm>

<http://www.extension.umn.edu/info-u/environment/BD282.html>

Delaware Groundwater and Water Concerns:

<http://www.gwpc.org/gwreport/Acrobat/delaware.pdf>

<http://ag.udel.edu/dwrc/concerns.html>