

Enviroscape Background

Introduction

The term pollution refers to any unwanted substance introduced into the environment. Among the types of pollution, water pollution has existed longer than any other. Many unwanted substances are deposited into our water bodies on a daily basis, polluting our drinking water and possibly creating health hazards for humans.ⁱ

Point and Non-point Sources

The Environmental Protection Agency (EPA) separates water pollution into two categories, point and non-point sources. Point sources are those that have a known stationary source, for example a sewage treatment plant. Non-point sources (NPS) are those pollutants that come from many separate sources. NPS pollution occurs when water moving over or through the ground picks up pollutants and carries them to a nearby water source.ⁱⁱ Sources of water pollution vary for every water-body, but the main culprits are non-point sources.

NPS pollution is a widespread problem in the United States. Water moving over the land collects agricultural runoff, sediments from construction sites, oil and gasoline from parking lots, and littered trash. Eventually these pollutants are carried to a nearby water body. The largest percentages of NPS are sediments and nutrients from agricultural fields, animal feeding operations, and construction sites. High levels of sediments in the water can block the sunlight from reaching bottom plants and can clog the gills of fish.ⁱⁱⁱ

The Water Cycle

The movement of water over the land is only one step in the Earth's water cycle. Water moving through the environment has many stages, all of which can transport pollution. For example, besides collecting pollutants while moving over the land, water can pick up pollutants in the air from the emissions of cars and factory smokestacks. Precipitation then carries these pollutants back down to the earth's surface, known as acid rain. Acid rain changes the pH levels in water bodies adversely affecting the aquatic organisms within it, and thus causing a loss of biodiversity for that ecosystem. For example, at pH 5, most fish eggs cannot hatch. At lower pH levels, some adult fish die.^{iv} In NYS, the freshwaters of the Adirondack and Catskill mountains have been significantly impacted by acid rain. In addition, some of this acidic water is absorbed by the soil affecting plants such as trees; it can also leach into groundwater sources.

Aquifers

An aquifer system is a water bearing layer of permeable rock, sand or gravel. Long Island, NY, sits on top of four aquifer systems, the Upper Glacial Aquifer, Jameco Aquifer, Magothy Aquifer, and Lloyd Aquifer.^v Half of Nassau and all of Suffolk County residents get their water from the Magothy Aquifer and approximately 10% of Nassau receives their water supply solely from the Lloyd Aquifer.^{vi} According to the EPA, in recent years the quality of the aquifers is deteriorating due to the introduction of NPS; nitrates, detergents, and thermal and industrial waste pollution. Nitrates, from sewage and the leaching of chemical fertilizers, are the main causes of deterioration for Long Island's aquifers. To protect Long Island's water resources for future generations, a drilling moratorium was established in 1986 for the Lloyd Aquifer.^{vii}

Bioaccumulation

Long Island, New York's Great South Bay (GSB), has been greatly impacted by the introduction of NPS pollution. The GSB is fed by several major rivers and tidal tributaries, and encompasses an area of almost 45 miles in length. Known for its clam beds, the GSB once supplied almost half of the United States with this succulent seafood. The reason for their decline is due to the movement of pollution through the food web. Clams play an integral role in an ecosystem; they filter out pollutants in the water such as heavy metals, coliform bacteria from sewage contamination, and oil.^{viii} However, when pollutant levels are high, they will buildup inside the clam, concentrating the toxic substances. When other organisms, such as blackfish, eat the toxic clam, they take that toxin in their bodies. The toxin then accumulates from species to species. Eventually the levels of toxins are higher in the organism than its surrounding environment. This process is known as bioaccumulation. Bioaccumulation is the buildup of a toxic substance inside an organism.^{ix} Due to increased development on Long Island, an increase in storm water runoff and other NPS, the clam beds of the GSB have been severely damaged.^x Clams are just one example of bioaccumulation in an ecosystem.

What Can We Do?

There are many actions an individual can take to address the growing concern for our water resources. Common actions include recycling and simply throwing trash away; however most important, an effort can be made to stop the pollution before it starts. By keeping animal waste, litter, and debris out of street gutters, there is a decrease in the amount of polluted storm water runoff entering water bodies and wetlands.

Households generate hazardous liquid waste as well as solid municipal waste. This includes oil, antifreeze, paints, and household cleaning products. Residents should check in with their town for accurate disposal methods and rules in order to dispose of unwanted chemicals properly. Residents can also become involved with local construction projects by going to town meetings. To cut down on sediment pollution, citizens can encourage local government officials to develop erosion and sediment control plans for large construction projects.^{xi} Finally if residents witness any illegal dumping or unwanted substances entering a water body, they should immediately report it to their environmental state agency. In the state of NY, call the NYSDEC's Environmental Conservation Officers at 1-800-TIPS.

Additional Resources

Suffolk County Water Authority
<<http://www.scwa.com/education/watercycle.cfm>>.

Vocabulary

- Aquifer: A water-bearing stratum of permeable rock, sand, or gravel
- Evaporation: Process by which water goes back into the atmosphere
- Groundwater: Water located below the ground; when it rains some runoff seeps into the ground and becomes ground water
- Runoff: Flow of water from rain, snow or other sources; carries polluted water
- Water body: Drainage basin; where the water flows to
- Watershed: A region or area draining to a particular watercourse or body of water

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- ⁱ “Pollution: an overview” Cornell University Law School. Wex. 26 November 2008
<<http://topics.law.cornell.edu/wex/pollution>>.
- ⁱⁱ “Water Pollution”. U.S. Environmental Protection Agency. November, 2008. 26
November 2008 <<http://www.epa.gov/ebtpages/watwaterpollution.html>>.
- ⁱⁱⁱ “Non-Point Source Pollution. The Nation’s Largest Water Quality Problem.” U.S.
Environmental Protection Agency. November 2008. 26 November
2008, <<http://www.epa.gov/owow/nps/facts/point1.htm>>.
- ^{iv} “Effects of Acid Rain – Surface Waters and Aquatic Animals.” U.S. Environmental
Protection Agency. November 2008. 29 November 2008
<http://www.epa.gov/acidrain/effects/surface_water.html>.
- ^v “Nassau-Suffolk Aquifer System.” U.S. Environmental Protection Agency. November
2008. 26 November 2008
<<http://www.epa.gov/region02/water/aquifer/nasssuff/nassau.htm>>.
- ^{vi} “Yatauro, Nassau lawmakers, and environmentalists call for the protection
of the Lloyd aquifer” Nassau County Government. County Legislature. 14 July 2006.
26 November 2008
<<http://www.nassaucountyny.gov/agencies/legis/LD/18/NewsRelease/2006/071306lloydaquiferdy.html>>.
- ^{vii} “Long Island Aquifers.” NY Department of Environmental Conservation. 2008.
26 November 2008 <<http://www.dec.ny.gov/lands/36183.html>>.
- ^{viii} “Hard Clam Restoration.” Great South Bay Reclamation Project. Nature Conservancy.
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<http://www.nature.org/initiatives/marine/files/ny_great_south_bay_clam_march_2008.pdf>.
- ^{ix} “Bioaccumulation.” USGS Toxic Substances Hydrology Program. . 14 December 2006
26 November 2008.
<<http://toxics.usgs.gov/definitions/bioaccumulation.html>>.
- ^x “About Hard Clams.” New York Sea Grant Hard Clam Research Initiative.”
26 November 2008
<<http://www.seagrant.sunysb.edu/hclam/article.asp?ArticleID=181>>.
- ^{xi} “What you can do to prevent NPS pollution.” U.S. Environmental Protection Agency.
7 March 2008. 26 November 2008
<<http://www.epa.gov/owow/nps/whatudo.html>>.