REVEALING SECRETS ABOUT...

natural water purification

WATER PURIFICATION: An Essential Ecosystem Service

We All Need Water to Survive

Water Purification is one of the many services provided by ecosystems. Pollutants such as metals, viruses, oils, excess nutrients, and sediment are processed and filtered out as water moves through wetland areas, forests, and riparian zones. This purification process provides clean drinking water and water suitable for industrial uses, recreation, and wildlife habitat.

- **Economic Benefits.** The U.S. spends more than $2 billion annually for clean water initiatives. It is much easier to prevent pollution than to clean contaminated water. For example, rather than spend $8 billion on a water treatment facility in New York City, New York State opted to spend $1 billion to restore the watershed that provides the City's drinking water.
- **Health.** Once in water, pathogens that are harmful to humans can be difficult to remove; but natural purification processes can often keep them from even reaching source water. Giardia, an intestinal parasite that is difficult to remove from drinking water sources, occurs in higher concentrations in water receiving urban pollution than water flowing through protected forested watersheds.
- **Eutrophication Reduction.** The excessive input of nutrients, eutrophication, is a major cause of fish kills. It accounts for about half of the damaged lake area and 60% of the damaged rivers in the United States.
- **Recreation.** More than half of all U.S. adults hunt, fish, birdwatch, or photograph wildlife. U.S. fishing related expenditures alone totaled more than $37 billion in 1996. The U.S. Fish and Wildlife Service estimates that up to 43% of threatened and endangered species rely directly or indirectly on wetlands for their survival.

How Natural Water Purification Works

Water purification depends on filtration and absorption by soil particles and living organisms in the water and soil. Human activities that compact soil, contaminate the water or alter the composition of organisms, degrade the purification process and can accelerate movement of unfiltered water through the system and into our water supplies.

- **Wetlands**. Wetlands can remove 20 to 60% of metals in the water, trap and retain 80 to 90% of sediment from runoff and eliminate 70 to 90% of entering nitrogen. Many types of plants are specially adapted to different kinds of wetlands, and a large percentage of the nation's imperiled plants and animals depend on wetlands for at least part of their life cycle.
- **Riparian Forests.** Riparian (streamside) forests act as "living filters" that intercept and absorb sediments, and store and transform excess nutrients and pollutants carried in runoff from adjacent lands. They can reduce the nitrogen concentration in water runoff and flood-water by up to 90%, and can reduce phosphorous by as much as 50%.
- **Microorganisms.** Microorganisms are the natural chemical engineers of the ecosystem. Bacteria and other organisms utilize or break down nutrients, metals, and other chemical contaminants in the water.
- **Constructed Wetlands.** Constructed wetlands mimic some of the filtration power of natural systems. They can be cost efficient for small communities but cannot replace natural wetlands, and may not provide the many other wetland services (such as flood control and fish and wildlife habitat).

"Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land." — LUNA LEOPOLD

Communicating Ecosystem Services

What Obstructs Natural Water Purification?

- **Paved Roads.** Paved parking lots, roads, and highways can funnel contaminated water into lakes, streams, rivers, and coastal waters. They accelerate run-off—increasing the threat of flooding. Urban development and sprawl are constant threats to natural wetlands and forest ecosystems. In 1997, there were 3.9 million miles of paved public roads in the United States.
- **Altered Waterways.** When water is diverted for agricultural, industrial, or navigational use, natural aquatic systems may not have enough water for effective purification. In the last 100 years, the world's freshwater waterways altered for navigation purposes have increased more than 50 times.
- **Loss of Riparian Areas.** The removal of riparian forests for streamside agriculture or impervious surfaces such as roads and parking lots reduces rivers' and streams' natural ability to cleanse themselves.
- **Invasive Species.** The introduction of exotic species of plants and animals can eliminate native species and alter an aquatic system's productive capabilities and its ability to cycle nutrients. Florida alone spends an annual $7 million to combat invasive aquatic weeds.
- **Nitrogen Pollution.** Excess nitrogen can result in acidification, changes in plant and animal life and loss of biodiversity, decrease in soil fertility, and conversion of nitrogen into forms that can lead to greenhouse gases and smog.

What You Can Do

The key to maintaining the services of water purification is to protect and restore the ecosystems that provide these services.

- Avoid overfertilizing your lawn and overtreating with pesticides.
- Do not pour pesticides, oil, fertilizers, and other toxic wastes in sewers or drains.
- Support parks and other natural areas.
- Volunteer to monitor and clean a waterway and help plant vegetation along waterways.
- Help to balance human and ecosystem needs for water quality and quantity.
- Support the protection and restoration of wetland and riparian systems.
- Support proper planning that considers impacts on waterways as part of all urban, industrial and agricultural development.

FOR MORE INFORMATION

This fact sheet is part of a series of materials on ecosystem services available through the Ecological Society of America and the Union of Concerned Scientists' "Communicating Ecosystem Services Project." For more information about the project, contact:

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Union of Concerned Scientists

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ADDITIONAL RESOURCES:

- *Nature's Services: Societal Dependence on Natural Ecosystems.* G. C.Daily, Ed., Island Press, 1997.
- *Successes,Limitations,and Frontiers in Ecosystem Science.* M.L.Pace & P.M.Groffman, Springer Press, 1998.
- North Carolina State University Water Quality Group, Watersheds: *http://h2osparc.wq.ncsu.edu/*

LOCAL RESOURCES:

- National Association of County Governments. *http://www.naco.org/links/index.cfm*
- Local government environmental assistance network page on wetlands. *http://www.lgean.org/html/hottopics2.cfm*