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New Hampshire Estuaries Project

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The Impacts of Impervious Surfaces on Water Resources



What Are Impervious Surfaces?

Impervious surfaces are areas covered by material that impedes the infiltration of water into the soil. Examples of impervious surfaces are buildings, pavement, concrete, and severely compacted soils.

How Do Impervious Surfaces Affect Water Resources?

Altering the Natural Flow of Water: The addition of impervious surfaces, especially coupled with urban drainage systems (i.e. curbs, gutters, and storm drain pipes), alters the natural hydrology in a watershed by increasing the volume of stormwater runoff and reducing groundwater recharge. The result is more frequent flooding, higher flood peaks, lower base flow in streams, and lower water table levels.

Aquatic Habitat Loss: Impervious surfaces and urban drainage systems add to the volume of stormwater during rain events and can reduce stream flow in dry weather. These hydrologic extremes can damage plant, fish, and invertebrate habitat. The increase in water volume during storm events causes erosion of stream banks and changes the stream channel's shape. The released sediment can smother habitat and stress aquatic organisms. During dry periods, low flows reduce deep water and swift-flowing habitats. In addition, stream edge habitat and stream channel protection is lost when the natural, vegetated stream buffer is replaced by impervious surfaces.

Decreased Water Quality: Impervious surfaces and urban drainage systems accelerate the delivery of pollutants from the watershed to rivers, lakes, and estuaries. For estuaries and their freshwater tributaries, the pollutants of greatest concern are fecal coliform bacteria and nutrients. Shellfish beds are commonly closed to harvesting after rainstorms due to elevated amounts of fecal coliform bacteria washed into the estuary by stormwater. Excessive nutrients from backyard and farm fertilizers, septic systems, and animal wastes, can cause algae blooms, which block sunlight, deplete dissolved oxygen, inhibit the growth of other aquatic plants, and can adversely affect recreational activities. Other pollutants of concern are toxic contaminants, such as metals and oil, from vehicles and business or homeowner activities, that are washed off impervious surfaces into waterbodies by stormwater.

Loss of Biological Diversity: The Center for Watershed Protection reports that hydrologic alteration, habitat loss, and decreased water quality "stresses aquatic species and collectively diminishes the quality and quantity of habitat." Therefore, increasing impervious surface coverage generally results in reduced biological diversity, changes in the biological community, and a shift toward pollution-tolerant species.

How Much Is Too Much?

Various studies from around the country show that stream ecosystems and water quality become degraded as impervious surfaces increase. Impairment to streams often occurs when more than 10% of the land within a watershed is covered with impervious surfaces. However, sensitive species can be affected in watersheds with less than 10% imperviousness, especially when impervious surfaces are located adjacent to water bodies. When the percentage of impervious cover exceeds 25%, most watersheds experience severe habitat and water quality impairment.

What Can Towns Do To Reduce the Impacts of Impervious Surfaces?

A community should consider their existing natural resources, development, regulations, and priorities before planning to address the impacts of impervious surfaces. For assistance, the New Hampshire Estuaries Project recommends that towns work with the Regional Planning Commissions on strategies to minimize the effects of development on natural resources.



There is no single solution; however, some steps a community may take include:

- **Conducting a Natural Resource Inventory (NRI):** A NRI in your watershed will help communities identify protection priorities and the best areas for development.
- **Targeting Conservation Efforts:** A recent study by the NH Coastal Program and the US Geological Survey found that impervious surfaces near water bodies have a greater impact on water resources than impervious surfaces that are farther away.
- **Considering Conservation Design Alternatives:** Conservation designs for development minimize the amount of land disturbed, maintain significant ecological areas in a natural state, and reduce the amount of impervious surface created.
- **Managing Existing Impervious Surfaces and Stormwater Drainage Systems:** From planting vegetative buffers, to keeping parking areas clean of debris, to capturing stormwater for treatment or groundwater recharge, there are many approaches communities can pursue to reduce the impacts of impervious surfaces.
- **Providing Community Outreach:** Educating your community about the impacts of impervious surfaces and what they can do will not only get residents on board for new local regulations, but will also reduce impacts from existing developed areas (see box below). Municipalities in the New Hampshire coastal watershed that are under the federal Phase II Stormwater Management Program can use this information to assist them with meeting the federal requirements.

How Homeowners Can Reduce the Impact of Impervious Surfaces

- Minimize lawn areas by planting shrubs, groundcovers, and trees at the border of the property. Studies have indicated that lawn areas recharge groundwater less efficiently than planted landscaped areas.
- Limit the amount of impervious surface, e.g., sidewalks, roofs, driveways, and patios, on your property.
- Direct rainwater runoff from gutter drains to areas that are landscaped. This provides the plants with the moisture that is needed for survival and increases groundwater recharge.
- Sweep driveways and walkways instead of hosing them down.
- Encourage your local government to adopt ordinances that protect water quality and enhance the quality of life in your community.

For More Information

The New Hampshire Estuaries Project (NHEP) is a program involving federal, state, and local government, non-governmental organizations, businesses, university researchers, and the public to protect, enhance and monitor the environmental quality of the State's estuaries. The NHEP works with various planning and conservation organizations to provide assistance and resources to towns in New Hampshire's coastal watershed. To learn more about the NHEP, go to www.nhep.unh.edu.

For more information about impervious surfaces and what towns can do to minimize their impacts on water resources, contact at the Rockingham Planning Commission at 778-0885 or the Strafford Regional Planning Commission at 742-2523. For information on the Natural Resources Outreach Coalition (NROC), a coalition of organizations that assists communities in identifying and protecting natural resources, contact Amanda Stone, NROC coordinator, at the University of New Hampshire Cooperative Extension at 364-5324. Most of the information on impervious surfaces and their impacts is from *Impacts of Impervious Cover on Aquatic Systems*, Watershed Protection Monograph No. 1. Center for Watershed Protection, Ellicott City, MD. March 2003, (available at www.cwp.org). The UNH Stormwater Center (www.unh.edu/erg/cstev) provides detailed information for stormwater practitioners, local government officials and others that need technical assistance on stormwater management issues. Impervious surface maps for coastal watershed communities can be ordered from the NHEP at Contact.NHEP@unh.edu.