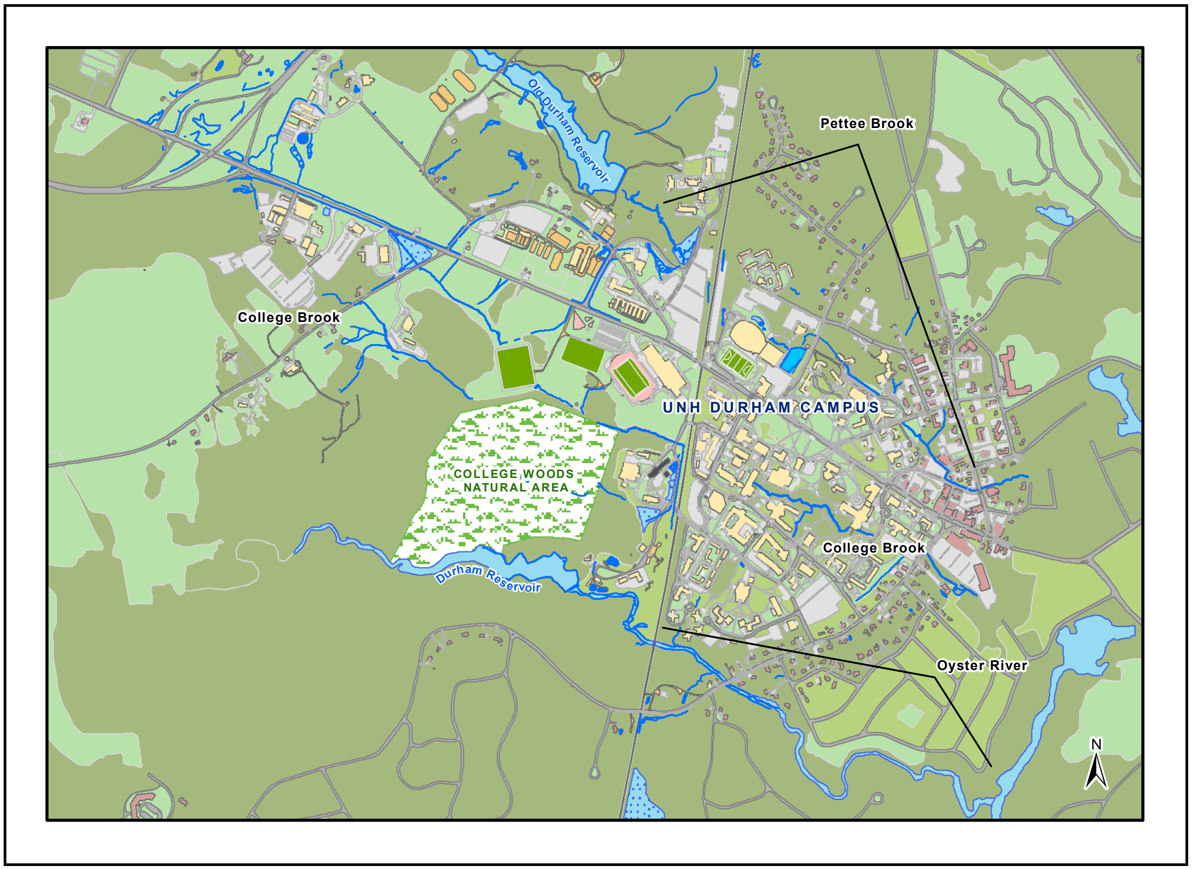
# State of the Watershed at UNH




## CHLORIDE IMPAIRMENTS OF THE OYSTER RIVER WATERSHED AT THE UNIVERSITY OF NEW HAMPSHIRE

As part of the Biodiversity Education Initiative at the UNH Office of Sustainability, we are concerned with the impacts of campus operations on the Oyster River Watershed and those that are dependent on its health. To address these and other ecosystem related issues, UNH has formed an Ecosystem Task Force (EcoTF) to assess the state of the university's ecosystems and to recommend policy that protects and enhances ecosystem services on campus and in the region.

This report was undertaken to assess the most significant issues impacting the watershed that is home to UNH. Currently, the most pressing issue is chloride

### Impervious Surfaces

Impervious surfaces are the paved areas that disallow rainwater to filter down through to the underlying groundwater system. Parking lots, roads, driveways and pedestrian walkways are all examples of impervious surfaces.

During a storm event, rain that falls on an impervious surface picks up pesticides, fertilizers, sediment, oil, road salt, heavy metals, trash, toxins, microbes and heat on its way to drainage systems. This runoff water, called nonpoint source pollution, is eventually carried into streams, creeks, rivers, estuaries and coastal harbors. Polluted water degrades the water quality in the watershed and negatively impacts not only aquatic organisms, but human health as well.

For example, the Pettee Brook microwatershed, which runs through university lands to the Oyster River, is covered by 25-52% impervious surfaces, resulting in heavily impaired water quality in receiving waters and a loss of water recharge to the groundwater system.

One answer to the problem of impervious pavement is being studied here at the UNH Stormwater Center. Porous asphalt pavement allows water to drain directly through the surface to the underlying substrate, significantly reducing runoff volume, thus improving water quality in surrounding areas. Porous asphalt also speeds snow and ice melt, substantially reducing the need for salt use during the winter months.

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*Deicing Treatment on a roadway*

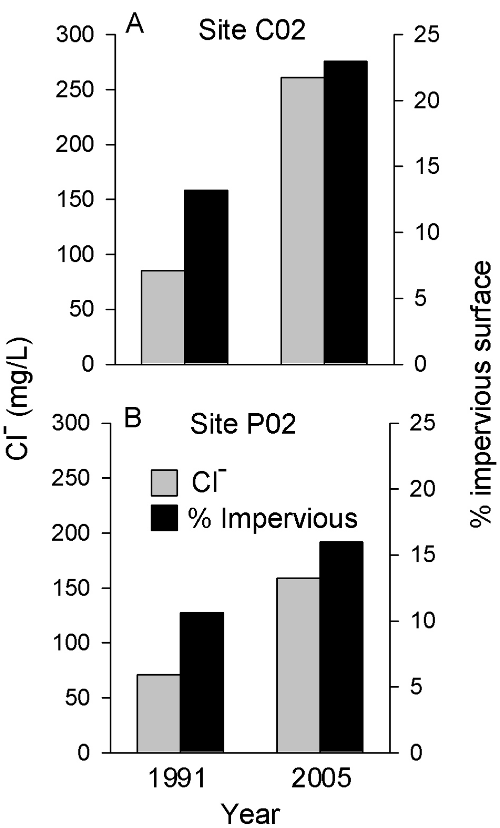


*Fig. 1. Mean Cl- concentration and % impervious surface at sites CO2 (College Brook, A) and PO2 (Pettee Brook, B) in 1991 and 2005.*

impairment. The goal of this report is to educate the UNH community on the threat of chloride that has become increasingly important over the last 60 years.

The Pettee Brook and College Brook micro-watersheds, which drain to the Oyster River through UNH lands, are severely impaired by high levels of chloride. These impairments are negatively impacting aquatic life such as benthic macro-invertebrates, fish, and amphibians.

In the 1940s, New Hampshire was the first state to create a policy of keeping all roads snow- and ice-free in winter. Due to the increase of impervious surface cover and the use of road salt (NaCl) as a deicing agent at the university since that time, levels of surface water chloride (Cl-) have risen appreciably.

Increased Cl- levels are an environmental concern as they adversely affect human health and cause toxicity to aquatic organisms and roadside vegetation. For example, amphibians that breed in vernal pools can be particularly susceptible to road salt in urbanized areas, where salty runoff from roads directly enters the ponds (Karraker et al. 2008). Also, the denitrification and mineralization rates in debris dams of forested streams (Hale and Groffman 2006) and acidification of surface waters (Environment Canada 2001) is altered by the dissemination of road salts.

The current Environmental Protection Agency (EPA) standard for protection of aquatic life is 230 mg/L for long-term exposure and 860 mg/L for acute exposure. Daley et al. (2009) found that Cl- concentrations in Pettee and College Brooks exceeded the EPA chronic toxicity level with only 23% impervious surface. From 1991 to 2005, Cl- concentrations tripled in College Brook (CO2, Fig. 1A) and doubled in Pettee Brook (PO2, Fig. 1B) with concomitant increases in impervious surface by 174% and 151%, respectively (Fig. 1A, B).

## Sources

Daley, M.L., J. D. Potter and W.H. McDowell. 2009. Salinization of urbanizing New Hampshire streams and groundwater: effects of road salt and hydrologic variability. J.N.Am. Benthol. Soc.

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