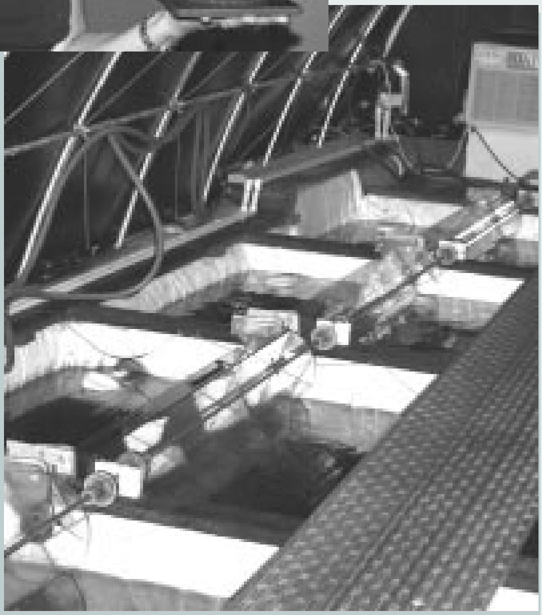

Top: *Wally Fulweiler, URI oceanography doctoral student, inspects a sediment core taken from the mesocosm tanks* (middle photo). Bottom: *Fulweiler and URI student Adam Pimenta using their newly designed core sampler.* Photos by Malia Schwartz.

NEW Sea Grant research may hold the answer to $100 million question

Researchers in Scott Nixon's Coastal Ecology Laboratory want to know what's going to happen to Narragansett Bay when nitrogen discharges from the Bay's sewage treatment plants are markedly reduced over the next few years. This reduction is following already documented increases in temperature due to global climate change and important changes in phytoplankton composition and abundance, at least in the mid-Bay. "The Bay is poised to become the subject of a great but uncontrolled experiment in which both climate and nitrogen are changing," says Nixon, URI oceanography professor. "During the past 25 years, it appears that the changing climate has reduced the amount of phytoplankton in the Bay. Now the nitrogen reductions are designed to reduce the plankton even more." Phytoplankton need nitrogen to live. But excess dissolved nitrogen can lead to excessive plankton growth and oxygen depletion when the plankton die—a process called eutrophication. While eelgrass losses, nuisance algal blooms, and fish kills have been blamed on eutrophication, no one is sure what a significant reduction in nitrogen will mean for water quality, habitat, or the organisms that live in the Bay.

The sewage treatment facilities at Field's Point and Bucklin Point have agreed to reduce nitrogen discharges from May through October by going to tertiary treatment with denitrification—at a pricetag for Narragansett Bay Commission ratepayers of some $100 million.

In a new Rhode Island Sea Grant–funded study, Nixon and colleagues have taken a bit of the Bay into the lab to determine what's happening in Bay sediments and in the sediment-water interface (the water layer just above the bottom sediments).

This past spring, the team took large box cores—akin to using a huge cookie-cutter—of the Bay bottom and placed them in each of nine mesocosm tanks—a series of holding tanks used to replicate the Bay environment. The mesocosm facility is adjacent to the lower West Passage of the Bay at the URI Graduate School of Oceanography campus, so Bay water can be circulated through the tanks. To simulate natural lighting conditions of the Bay bottom—actually, it's dark down there—the team erected a Quonset Hut–type dome over the tanks. Using an elaborate system of paddles and flow-regulation, researchers control the water in the tanks to mimic Bay conditions.

Every month, to each of the mesocosm tanks, they added either a full dose (estimated from historical data) of spray-dried phytoplankton, a half-dose of that historical input, or no plankton (control). The additions were meant to simulate bottom depositions from phytoplankton blooms. Juvenile winter flounder and quahogs were also added to the tanks to see how they would fare under the three treatment conditions.

The rate at which the bottom communities consumed oxygen and regenerated nutrients was measured each month, and the sediments were also sampled at the end of summer using a newly designed sediment-core sampler that measures the exchange of nitrogen gas across the sediment-water interface. "The improvement in our core sampler over older models is that ours preserves that delicate interface layer, which is where the action is," says Robinson "Wally" Fulweiler, a Ph.D. candidate in Nixon's lab. Researchers are now analyzing the cores to see how nutrients cycle between the water and sediments and to determine how changes in available nutrients impact the Bay's benthic (bottom) life.

Look for the results of this research in an upcoming issue of *41°N*, or visit *seagrant.gso.uri.edu.*

—Malia Schwartz