

TURN THE TIDE

spring 2005

A PARTNERSHIP TO RESTORE THE HEALTH OF DARTMOUTH'S COASTAL ESTUARIES AND RIVERS
SLOCUMS/PASKAMANSETT RIVER, LITTLE RIVER AND APPONAGANSETT BAY WATERSHEDS



We hope that through this newsletter, parents and all watershed residents will gain a better appreciation of how Lloyd Center education professionals are using local history, environmental conditions, and current Turn the Tide research to transfer fundamental, scientific skills and principles to Dartmouth 5th graders in ways that are both relevant to their everyday world and also enjoyable. We also hope that the photographs in this newsletter are able to convey some of the excitement and sense of discovery that the students show when they go out in the marsh looking for fiddler crabs, put on waders to go along the estuary shore to net small fish, or screen some estuary mud to find and identify the worms and shellfish that reside there.



TURN THE TIDE PARTNERS



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www.town.dartmouth.ma.us



LLOYD CENTER FOR THE ENVIRONMENT
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MET GRANTS

This newsletter was funded by a generous grant from the Massachusetts Environmental Trust to Turn the Tide. The MET Environmental Education Grant has two goals: to develop and pilot the Turn the Tide curriculum in the Dartmouth Public schools and to publish and distribute to all watershed residents information focusing on 5th graders' experiences in both the classroom and in field studies.

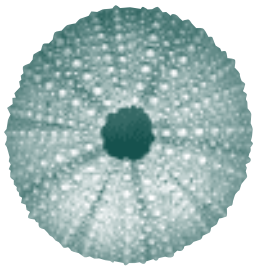
This May, the Massachusetts Environmental Trust provided another generous grant which is providing the primary financial support for the continued implementation of the Turn the Tide 5th grade programs for the 2005-2006 school year, and will fund planning to expand the program to other school districts. Many thanks to the Trust!



BIG FISH VISIT THE 5TH GRADE

This Spring Executive Office of Environmental Affairs Secretary Ellen Roy Herzfelder and State Representative John Quinn visited the James M. Quinn Elementary school to participate in the Turn the Tide classroom sessions as a celebration of National Environmental Education Week. Secretary Herzfelder and Representative Quinn worked with students on water chemistry and on a wave tank model that helped students explore the dynamics of ocean and estuary wave motion and how landforms influence the movement of water and pollutants along the coast.

Secretary Hertzfelder and Representative Quinn presented a large aerial color photomural of the Quinn School and its surroundings, created by information specialists at the Massachusetts Office of Geographic and Environmental Information. Turn the Tide scientists at the Lloyd Center and at SMAST frequently make use of the maps, aerial photos and digital data layers that are available from the Mass GIS archives.



TURN THE TIDE EDUCATION PROGRAM



The goals

Environmental education for the next generation is critical to ensure the protection of our estuaries and their watersheds. By raising students' awareness and understanding of our fragile coastal resources and the importance of these special environments to the quality of life around Buzzards Bay, we hope these 5th graders will grow to become active and knowledgeable stewards for this region.

The Turn the Tide Education Program is an innovative science curriculum, designed by Lloyd Center education professionals to involve Dartmouth and New Bedford students in local watershed remediation efforts while educating them about local coastal ecology and the threats it faces. The program provides a unique combination of environmentally focused scientific resources that integrate Turn the Tide's applied research with the Lloyd Center's 25 years of experience with environmental education and outreach.

Keeping records of the data collected.



How does it work?

Our staff visit each 5th grade classroom five times to teach lessons and lead the students on two critically important field trips. The program curriculum draws methods and data from the scientific assessments of Turn the Tide scientists to illustrate: a) how watersheds and estuaries are interrelated; b) how land use and human habitation have affected the watersheds; and c) how scientists measure and characterize the health of the estuaries. In order to make the learning continuous, the teachers integrate other lesson plans developed by the Lloyd Center into their science classes throughout the school year. All the program studies have been carefully designed to support the Massachusetts Curriculum Frameworks and the Massachusetts Environmental Education Plan.

Exploring the salt marsh for animal and plant inhabitants.



What are students learning in class?

The new Dartmouth 5th grade curriculum focuses on coastal habitats, issues and oceans. Students are led to discover and understand what makes an estuary a unique and fragile environment. For example, they now know that estuaries are an important area of transition from the land to the ocean and that conditions in the estuaries are vital to the health of their inhabitants, like birds, fish, clams, worms and plants. To illustrate the variability of estuary salinity resulting from the mixing of freshwater from rainfall, streams and rivers with sea water, the 5th graders use scientific-grade refractometers to measure a range of salinities typical for coastal habitats.

Another critical physical characteristic of estuarine waters is the level of dissolved oxygen in the water. Dartmouth students become familiar with the same dissolved oxygen testing kits that have been used by The Coalition for Buzzards Bay's BayWatchers to document water quality around the Bay for the past 10 years. Current SMAST research is used to explain the complex relationship between the varying levels of dissolved oxygen, water temperature and the daily cycles of sunlight and photosynthetic plankton. The connection between the observed low oxygen conditions and excessive nitrogen entering the estuaries is also discussed using graphs.

In employing these measurement techniques, the 5th graders also learn the importance of recording their observations and of comparing results from different instruments and

Dissecting quahogs to understand animal anatomy.





Checking the wind speed.



Measuring the varying salinity of estuary waters.

What happens during the field study trips?

Field studies were conducted at two locations: Demarest Lloyd State Park and the 55 acre Lloyd Center coastal property. Field studies occurred both in the Fall and Spring to provide differing seasonal conditions for the students to measure and observe.

Students are divided into small groups to visit all 4 study stations (estuary, benthic organisms, salt marsh and water quality). Each station is located and designed to provide basic concepts of science and ecology while exposing the children to environments they may be unfamiliar with.

At the estuary station, students use nets to sample for fish and invertebrates. Students use picture guides to identify the names of the critters they have just caught. Their catch is then counted twice: first, as the number of different critters found (richness or diversity); and second, the total numbers of each type of critter (abundance).

At the benthic station, 5th graders sample estuary bottom sediments. They dig up muddy sand and screen the material to collect and identify the benthic animals that live there, like worms, clams, and small burrowing animals. They also count the animals and record their names and number. Using their findings, the students are comparing the distribution and abundance of filter feeders to detritus feeders. Scientists have shown a correlation between the increase in nitrogen loading of estuarine systems and the dominance of filter feeding animals.

For the water quality station, students collect weather data such as air temperature, wind speed, the extent of cloud cover and cloud types. They test the water samples for dissolved oxygen, pH, temperature and salinity and can compare their data to that of the

Using dip nets to collect estuary animals.



TTT scientists. Students will also determine if there are seasonal differences in these water quality parameters and how they relate to species composition, distribution and abundance.

In the salt marsh, students lay out a transect line and learn to identify the characteristics of the low marsh, high marsh and upland plant groups. They collect, examine and identify animals living in each zone with the aid of illustrated field guides. During the fall trips students collect more species and greater numbers of organisms (end of the summer) compared to the spring (end of the winter) and can compare the data from the two trips to discover seasonal changes in species composition, abundance and distribution as well as changes in water quality parameters.

Identifying shellfish anatomy using field guides.



differing physical settings such as streams and ponds as contrasted with estuary and ocean conditions.

To encourage the children to become familiar with typical estuary inhabitants, Lloyd Center educators set up a saltwater aquarium in each 5th grade classroom (14 classrooms). These aquaria were stocked with local estuarine fish and invertebrates (black sea bass, sea stars, periwinkles striped killifish, spider crabs, green crabs, mummichogs, mussels, quahogs, etc.)

The classroom measurements, record keeping and discussions also prepare the 5th graders for the two days of field studies.





Discussing the effects that variable estuary water chemistry has upon the estuary's animal inhabitants.



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Turn The Tide is a partnership between the Town of Dartmouth, UMass School for Marine Science and Technology, The Coalition for Buzzards Bay, and the Lloyd Center for the Environment to restore the health and vitality of Dartmouth's waters. During the next three years, the project will:

-  Identify and understand all sources of pollution to the Slocums/Paskamansett River and Apponagansett Bay watersheds and how each contributes to the degradation of our waters;
-  Develop a comprehensive restoration strategy for removing pollution and restoring water quality, shellfish populations and wildlife in Dartmouth's waters;
-  Begin to remediate known sources of pollution on the Paskamansett River and Buttonwood Brook;
-  Educate citizens about the health of our waters and what they can do to reverse the decline.

TURN THE TIDE NEWSLETTER IS MAILED TO THE 12,250 HOMES IN DARTMOUTH AND NEW BEDFORD THAT LIE WITHIN THE WATERSHEDS OF THE SLOCUMS RIVER AND APPONAGANSETT BAY AND IS PUBLISHED BI-ANNUALLY.

WHAT'S HAPPENING WITH TURN THE TIDE RESEARCH TASKS?

As you can see from the accompanying bar chart we are in the home stretch of the three-year task of data gathering to understand the sources of pollution within Dartmouth's estuaries and watersheds. We have finished the major task of measuring how much nitrogen gets into our estuaries from watershed streams. This summer will be a time of intense field work by SMAST and Lloyd Center scientists. Remaining tasks to be completed include: the second of two seasons of measurement of nitrogen recycling in the estuaries; a toxics survey

of estuary sediments; and the three-year bacterial contamination assessment will also conclude. The Natural Resources and Biodiversity surveys are also nearly done, with work winding up on a year-long, monthly finfish count and a summer stream animal and insect assessment.

One of the pleasures we derive from the Project's progress is seeing how our education specialists have been using stories from the scientific data to give the local 5th graders relevant, up-to-date examples of the conditions in their "back yard" estuaries and how the watersheds really need our help. To that end, as we look beyond this summer to 2006, SMAST scientists will be using the completed data sets and assessments to create models that will describe the movement, change and recycling of nitrogen and bacterial pollution that has degraded Dartmouth's estuaries. As the products of these models are refined, SMAST scientists and Coalition for Buzzards Bay will begin a series of public meetings and discussions with Town residents and officials to present the Project findings, exchange ideas and agree on the most appropriate remedies for the estuaries. As that process proceeds, the most critical work of Turn the Tide will be underway.

TURN THE TIDE PROGRESS ON TRACK

2003-2005 work has focused on collecting the scientific data needed to develop a clear Restoration Strategy for Dartmouth's waters.

