The Falmouth Pond Watchers

A Case Study in Volunteer Monitoring Programs

On a warm Cape Cod summer day in 1990, Brian Howes, a marine biologist at the Woods Hole Oceanographic Institution (WHOI), received a phone call from a local Falmouth resident. "The water in the pond is white!" the caller reported. The pond he was referring to was Green Pond, a coastal salt pond in the Town of Falmouth.

Left: Pond Watcher volunteers (from left) Alicia, Nancy, and Jon Soderberg prepare to gather water samples from Bournes Pond. *Photo by Len Rubenstein.*

Like so many coastal ponds in Massachusetts and throughout New England, salt ponds in the Town of Falmouth are showing signs of diminished water quality and ecological stress. With their extensive shorelines and generally restricted circulation and flushing patterns, these ponds are usually the first indicators of nutrient pollution along the coast.

Howes responded quickly to the call by setting into motion a "rapid response sampling," which involves going to the pond and testing it for oxygen and nutrient content, among other things. The caller is part of a network of citizen volunteers who, in addition to conducting hands-on sampling in the ponds, have become the "eyes, ears, and noses of the ponds," monitoring daily events in five of Falmouth's coastal salt ponds. What Howes and his colleagues found at Green Pond that day were very low levels of dissolved oxygen in the pond water, a stratified water column, and a high nutrient level—conditions of the area's coastal salt ponds all too familiar to Howes.

Salt Ponds

Coastal salt ponds, by their very nature, are highly productive biological environments that are rich in fish and shellfish. While these ecosystems are usually quite tolerant of high nutrient conditions, a combination of high productivity, low flushing rates, and excessive nutrient inputs can upset their ecological balance. The result is declining ecological health due to excessive eutrophication of these waters—a natural response of aquatic systems to nutrient loading.

Unfortunately, the amount of nutrient loading that causes ecological stress is ecosystem-specific and is dependent on water circulation, depth, and stratification of the system. In fact, the same addition of nitrogen may have different effects, depending on where it enters the pond. "Nutrients entering at the head of a circulation-restricted coastal pond system may have a far more negative impact than nutrients entering at the mouth of the pond, where circulation and flushing are generally increased and vertical mixing may be greater," said Howes. "This is true for both natural inputs of nutrients as well as nutrients entering the ponds via groundwater—for example, nitrogen that comes from residential and commercial development, such as septic systems, lawn fertilizers, or road runoff."

"It was hoped that by involving citizen volunteers, the project would draw community attention to the increasing effects of human activity and development on these coastal resources."

—Alan White, former WHOI Sea Grant Marine Advisory leader

Concern for Ponds Addressed

In April 1987, concern about the increasing eutrophication of Falmouth's coastal salt ponds was voiced at Falmouth's annual town meeting. Unable to appropriate funding necessary for a diagnostic study of these ponds, the town did its best by allocating "seed" money to help initiate a water quality study under the auspices of the town planning board. David A. Ross, WHOI Sea Grant Coordinator and a town meeting member, suggested that WHOI Sea Grant might be able to help by providing supplemental funds.

That summer, Ross, Howes, Dale Goehringer, a research associate in Howes' laboratory, and Alan White, former WHOI Sea Grant Marine Advisory leader, developed plans for a water quality study of three different ponds. As a two-part project, plans called for a preliminary survey conducted by WHOI personnel, followed by a comprehensive two-year water quality monitoring study involving the participation of citizen volunteers. The project proposed a somewhat unique partnership between citizens, town officials, environmental managers, and a research laboratory.

"The project was designed to provide the Town of Falmouth with an ongoing, comprehensive database of water quality conditions in the ponds in preparation for the Coastal Pond Overlay Bylaw, which went into effect the following year," recalls White. The goal of the bylaw, which specifies annual mean threshold values for total nitrogen concentrations in Falmouth's coastal ponds, is to protect the ponds from nutrient-related declines that result from increasing nutrient inputs caused by development. With information from the project in hand, the town felt that it would be better prepared to assess future management options—such as enlargement and improvement of the ponds' outlets to the sea, increased limitations on lawn fertilization disposal, installation of denitrifying septic systems, rezoning, or construction suspensions. "Additionally," said White, "it was hoped that by involving citizen volunteers, the project would draw community attention to the increasing effects of human activity and development on these coastal resources."

Volunteers Make Project Possible

With financial support from the WHOI Sea Grant Program, the project was off to a good start, but the issue of identifying volunteers to conduct the sampling remained unanswered. It was then that the project organizers appealed to the citizens of Falmouth for help through newspaper articles and by radio and television announcements. "The response was swift and positive," recalls White. "Within just a few weeks, 55 people had volunteered their help."

Training sessions for volunteers were held at WHOI. Volunteers were briefed on the ecology of the ponds and the potential changes they might see, issued sampling kits, and told of the goals of the sampling program. Volunteers would conduct monthly samplings, using their own boats, throughout the summer and early fall. Water-column samples would be collected—one at the surface and others at varying depths. Physical measurements such as water color, total depth at sampling site, temperature, and light penetration would also be taken.

On Sunday morning, July 17, 1988, the first citizen volunteers—officially named Pond Watchers—rowed out to sample their ponds. What began as a two-year project has continued into 1992, due in large part to the enthusiasm of the volunteers. "The group has taken on an energy of its own," said Goehringer. "They enthusiastically support a long-term program." With continued support from the town and WHOI Sea Grant, the project has grown each year. In 1990, two additional ponds were added to the study. Future plans include monitoring a local harbor.

The combination of scientific effort, volunteer enthusiasm, and financial support from WHOI Sea Grant and the Town of Falmouth has been crucial to the continuation of the study. The town is using the project data to test the validity of nitrogen level limitations dictated in the Coastal Pond Overlay Bylaw—something that, without the efforts of volunteer monitors, would be far too expensive for a limited town budget. The volunteers also make it possible to sample each of the five ponds simultaneously, under the same conditions of weather and tide, enabling invaluable pond-to-pond comparisons.

To date, the Pond Watchers have logged more than 1,000 hours of volunteer time. In those hours, 24 samplings have been conducted on the three original ponds—Oyster, Green, and Little ponds—and eight samplings on the two ponds added to the program in 1990—Bournes and Great ponds. In total, almost 10,000 analytical determinations have been made in the lab and more than 4,000 readings in the field.

As if the sampling program wasn't enough, the volunteers have encouraged the idea of ancillary studies designed to monitor habitat quality. These included a study to assess the degree to which the ponds would support the growth of oysters and the initiation of a fish census study.

Volunteers Invaluable to Town and Scientific Community

Aside from the routine sample collections and ancillary studies, the volunteers—most of whom are members of the original group of Pond Watchers—have become the constant

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monitors of the ponds, reporting unusual colors, smells, or fish kills, explained Goehringer. "The cooperation and communication within the group shows the willingness of private citizens to protect their environment."

The contributions by the citizens and the scientists involved are valued by the town above and beyond their obvious benefits for Falmouth. In a letter to the chairman of the WHOI biology department, Falmouth Town Planner Brian Currie wrote, "The Pond Watcher Program is a model of nationwide applicability on how the scientific community and local government can work together to solve important environmental issues. The success of the program is certainly a source of pride to the community."

An example of this collaborative effort has been the formation of a group that meets regularly over lunch to talk about the ponds. The lunches, organized by Don Bourne, president of the local chapter of the American Littoral Society, are attended by Howes and his colleagues, town conservation commission officers, town planning office representatives, local citizens, Pond Watchers, and other invited guests. Attendees hear presentations and participate in scientific discussions about the ponds. A successful result of these lunches was the recent appropriation of funds from the town and WHOI Sea Grant to devise a planning document for Oyster Pond, based on the data obtained from the Pond Watcher study.

Because the data obtained from the study is comprehensive and includes ponds with a variety of nutrient and flushing conditions, ongoing data collection and results can be applied to other coastal pond ecosystems in the region. Currently, a monitoring program for Nantucket is being developed based on the Falmouth effort. In fact, Howes has submitted a proposal to WHOI Sea Grant for funds related to the Nantucket work, as well as for the continuation of the Pond Watcher project. "We have a five-year database, which doesn't sound like much," said Howes, "but I have been told that it is one of the longest data sets of its type."

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—Esperanza Stancioff, marine associate at the University of Maine Cooperative Extension

Similar Efforts Taking Place Throughout Northeast

Throughout the Northeast, volunteer monitoring efforts similar to the Falmouth Pond Watchers Program have proven equally beneficial for the communities in which they are being conducted. The New Hampshire Sea Grant Extension is involved with a citizens monitoring program known as Great Bay Watch, coordinated by Ann Reid, in which approximately 40 volunteers sample the estuarine waters of Great Bay twice each month.

"We have volunteers from all walks of life, including high school students and teachers," said Sharon Meeker, New Hampshire Sea Grant Extension marine educator.

Great Bay Watch will begin its third season in 1992. Like Howes at Woods Hole, Meeker feels that the most important aspect of the project is to establish a long-term database.

In Maine, Esperanza Stancioff serves as the statewide advisor to volunteer monitors who conduct fecal coliform tests and do the lab work on their own. In 1988, high fecal coliform counts in local estuaries forced the closure of several shellfish beds that had no prior history of closure. The events sparked the interest of high school teachers, aquaculturists, and citizens, who contacted the University of Maine Cooperative Extension, where Stancioff serves as a marine associate. A monitoring program was initiated in 1989. The program involved volunteers who performed the actual fecal coliform analyses, which eliminated the need to send the samples to the state for analysis. "Sampling for the state would have limited us to state-designated sites—sites that are important for classification of shellfish-growing areas," explained Stancioff, adding that the purpose of the volunteer program was to look at sources of contamination and input areas. "There is no way anyone other than volunteers can monitor input areas, based on the labor-intensive nature of the sampling required."

With financial support from the University of Maine Sea Grant Program, Maine's Department of Environmental Protection, the Maine Aquaculture Innovation Center, and the University of Maine Cooperative Extension, the program has grown since its inception. High school students throughout Maine use their school laboratories to analyze the samples. Because these labs are not state-certified, the state cannot use the results to make regulatory decisions. The state has looked at the data, however, to help determine classification purposes for certain areas. The program is also able to offer duplicate samples, which allows outside groups or state agencies the luxury of acquiring data without having to go into the field and conduct sampling. Stancioff reports that a great deal of community involvement and interest has given the group positive publicity, even among groups once skeptical of volunteer monitoring.

Heather Crawford, coastal resources educator at the University of Connecticut Sea Grant Marine Advisory Program, is the contact person for a group she has named "Dock Watchers"—a handful of residents from a single town in Connecticut who "shoot" the coastline. Volunteers take photographs of the Connecticut coastline to document illegal structures. "They are primarily interested in docks that have been built without permits," said Crawford, "but they also have found some incidences of illegal filling." The program is still in its infancy, but it has already generated interest among local municipality leaders, the state Department of Environmental Protection (DEP), and certainly Crawford. So far, the group has compiled a portfolio and reported cases of illegal docks and filling to the DEP.

A number of volunteer monitoring groups are located in Rhode Island. The Salt Pond Watchers Project, after which the Falmouth Pond Watchers project is modeled, monitors eight estuarine inland bays in five southeastern Rhode Island towns. Fifty volunteers sample the waters for a variety of water quality parameters, including all of those sampled by the Falmouth Pond Watchers, as well as two others: eelgrass-wasting disease and waterfowl populations. Samples and data are analyzed by the R.I. Department of Health and the U.S. Food and Drug Administration (FDA).

Like the Falmouth Pond Watchers, the Rhode Island Salt

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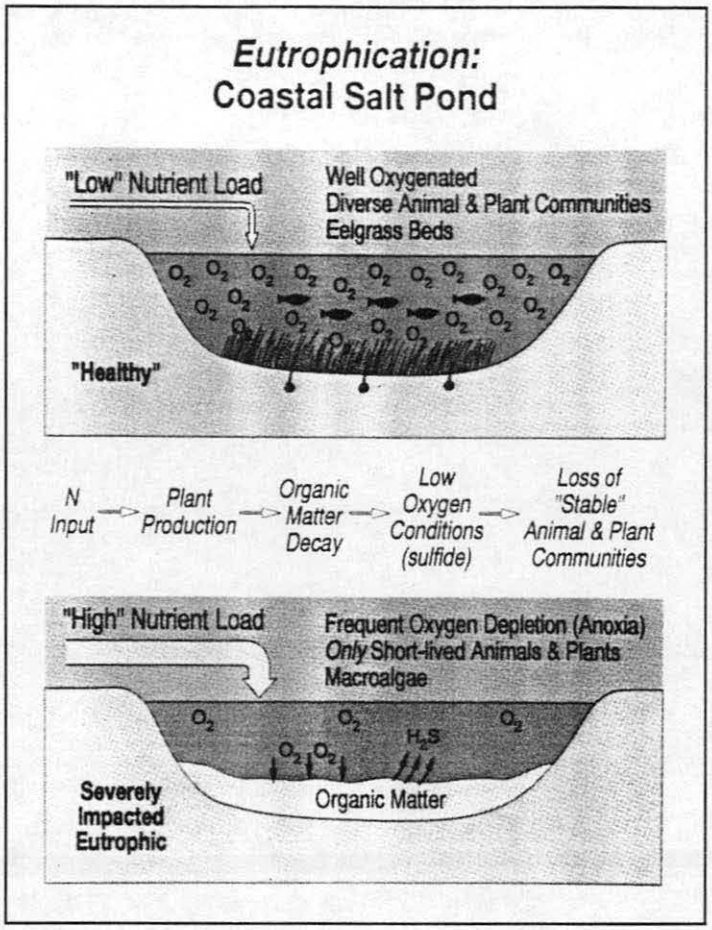
—Dale Goehringer, WHOI research associate



Right: The process of eutrophication is as follows: high levels of nutrient loading cause an overproduction of phytoplankton and submerged aquatic plants, such as algae and eelgrass. When these plants overproduce and decay, the oxygen supply can become depleted. It is the depleted oxygen supply that causes fish kills and loss of valuable eelgrass and shellfish beds.

Pond Watchers provides its results to governing agencies responsible for making management decisions. Since 1985, project data have been used in local town zoning board decisions, the development of harbor management plans for boat mooring locations, community planning processes, and the development of wastewater management districts for non-sewerage areas. The Salt Pond Watchers also produce a quarterly newsletter, "Salt Ponds," and have been active in getting additional private funding from foundations, civic associations, individuals, and local fire districts. Support for the program is provided by Rhode Island Sea Grant, the University of Rhode Island (URI), the R.I. Department of Health, and the FDA, where coliform bacteria analyses are conducted free-of-charge for the project.

Both the Falmouth Pond Watchers project and the Rhode Island Salt Pond Watchers project have proven their merit not only to the local communities they serve, but to a national audience as well. Both projects are listed in the 1991 Environmental Success Index (ESI), published by Renew America. The ESI is a national clearinghouse of information for public and private groups involved in solving environmental problems.

The River Rescue project is another ongoing volunteer monitoring project in Rhode Island. Funded by Rhode Island Sea Grant, URI, and Citizens Bank, the River Rescue Project is a new initiative undertaken to begin a monitoring program for urban rivers. According to Virginia Lee, coastal management coordinator for the Rhode Island Sea Grant Advisory Service and URI's Coastal Resources Center, the program is among the first to explore the potential of a public/private partnership. River Rescue involves some rather sophisticated parameters for measuring the water quality of rivers. "This is the first comprehensive effort to look at concentrations of nutrients, petroleum hydrocarbons, and toxic metals entering monitoring stations at the mouths of the rivers and upstream," says Lee.

River Rescue volunteers are involved in debris and watershed characteristic mapping and "pipe detecting"—checking to see if any of the hundreds of old pipes located up and down the rivers could be discharging directly into the rivers and, if so, mapping them. "Because the state does not monitor the rivers, there is no existing data on record. We have seen great improvements, however, since various sites were measured by a number of disparate research programs back in 1980," says Lee.

The common feature of the Northeast volunteer monitoring programs is the transfer of data. Not only has this data been used to inform and educate the volunteers, it has proven its worth to the scientific community and local decision-makers many times over. Depending upon available time and funds, Howes of the Falmouth effort envisions the development of an instruction guide to help other coastal communities establish their own monitoring system, with guidelines on sampling techniques and protocols, as well as basic information to increase the fundamental understanding of these systems necessary for interpreting the data. "Our focus has not just been salt ponds in Falmouth," explains Howes. "Our goal is to develop an approach that provides high quality data necessary for environmental evaluation and management that can be sustained over the long term. The environmentally active citizens and planners in Falmouth are generating a model program that we hope will be applicable to communities throughout the Northeast."

For a more complete listing of volunteer programs in the Northeast, see Nor'easter, *Vol. 1, No. 1, Spring 1989. For more information about volunteer monitoring throughout the country, please refer to the Rhode Island Sea Grant/EPA* National Directory of Citizen Volunteer Environmental Monitoring Programs, Third Edition, *available from the Rhode Island Sea Grant Program. There is also a national newsletter devoted to the topic, available by writing to: "The Volunteer Monitor Newsletter," 1318 Masonic Ave., San Francisco, CA 94117.*

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FALMOUTH POND WATCHERS: Working Toward a Common Goal

The local citizens who make up the volunteer monitoring group in Falmouth, Mass.—better known as the Pond Watchers—come from diverse backgrounds and professions. With their concerns for local ponds in common, these individuals have formed new friendships, gained worthwhile knowledge about the environment, and have proven themselves invaluable in the work they have done for the Town of Falmouth and the scientific community as a whole.

A cross section taken of Pond Watchers reveals people of all ages and interests. For example, Alicia Soderberg, a high school student interested in science; Ed Wessling and Armand Ortins, retired neighbors and concerned citizens; John Dowling, a biologist at Harvard University and the Marine Biological Laboratory; Bob Livingstone, a retired ichthyologist; Julie Rankin, a marine biologist and educator; and Jack Shohayda and Jane Carter, local business people. Together, they form an enthusiastic and energetic group that has worked together for the good of science, town management decisions, and community outreach and education.

Several Pond Watchers have taken active roles in the group known as FACES, which stands for Falmouth Associations Concerned with Estuaries and Salt Ponds. Pond Watchers Jim Begley, Steve Molyneaux, and Mike Kinney have been with the project since its beginning, and have played key roles in the summer samplings, oyster growth experiment, and fish census study. Livingstone has written several articles about his backyard pond, Oyster Pond, and orchestrated the 1991 fish habitat study—an effort that he feels "just skimmed the surface" of the wealth of information that the ponds have to tell.

Soderberg, a high school freshman, is working on a science project that is based on the information she has gained from her involvement in the project. "I've learned a lot about how much the ponds are affected by us; how to conduct tests, such as measuring oxygen levels; and how much the animals are affected by the pond conditions." Soderberg, along with her parents, help to monitor Bourne's Pond, one of three ponds added to the study in 1990. "We live right on the pond and never really questioned things that were going on. I think it's neat that the pond is being monitored. Now we discuss what we've learned with the neighbors and other Pond Watchers."

Shohayda built his home across the street from Little Pond—then a freshwater pond—in 1958. His neighborhood was once a pasture, and animals drank from the pond. At that time, the pond served as a drainage spot for a cranberry bog, which has since been replaced by a shopping mall. He said the pond was once inhabited by snapping turtles, ducks, cattails, and lily pads. And it served as a spawning ground for sea-run trout. Shohayda remembers when, just a few years later, a petition came around the neighborhood to open the pond to Vineyard Sound and make it a saltwater body. He refused to sign it.

"Many residents just wanted it open so that they could get their boats in and out of the pond to the ocean," he recalls. "Little Pond, at the deepest part, is only 1.8 meters deep!" Eventually the pond was opened to the ocean and now serves as home to such saltwater creatures as blue crabs, eels, and mummichogs. Over the years, homes have been built along the pond, many with lawns running down to the pond's edge. After a rainstorm, these lawns serve as a direct route for lawn fertilizers to enter the pond.

Joe Johnson has been a Pond Watcher for the last four years. He says the group has provided him with insight as to the biological processes taking place within the pond. As a retiree who has a home on Little Pond, Johnson often writes letters to the editor of a local newspaper about the changes he witnesses. "Every time I go by, I take a look and see how it's doing. Little Pond is the worst pond there is," he says, referring to the incessant need for the pond to be dredged. Johnson has witnessed a lot of development along the pond since it was opened to the ocean and made a saltwater pond. "A lot of homes have been built across the street on postage stamp–size lots, with postage stamp–size septic systems," he said, indicating what he believes to be a main contributor to the pond's problems.

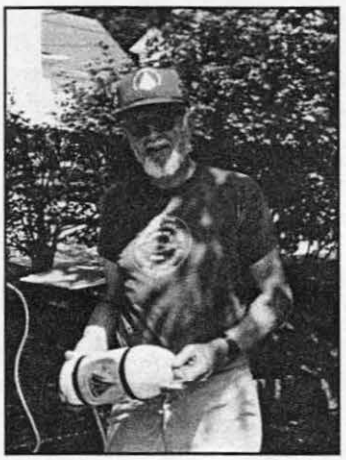
Wessling has been a member of the Pond Watchers since the inception of the group. He built his home on Green Pond in 1963. Like Shohayda and Johnson, he too has seen changes over the years. "There used to be scallops galore and oysters under the bridge. The water was clearer, too."

Wessling and many of the Pond Watchers share the frustration of not being able to identify the causes of the problems in a way that would force the town or state to establish regulations or restrictions. "There is nothing for them to base a decision on," Wessling said. "Fertilizers, road runoff, septic systems—they all contribute, but to what extent? What can be done about it?"

Johnson concurs. "The town 'dredges' Little Pond with a backhoe. They really don't have the right equipment. To do it properly, they would have to rent equipment, and that would be expensive."

Despite their sense of frustration, Wessling, Shohayda, Johnson, and fellow Pond Watchers feel they have gained something through their involvement in the program—whether it be personal satisfaction (Shohayda terms it "doing civic good"), or becoming a more-informed citizen. Johnson regards the Pond Watchers as important because they are obtaining historical data. "In the fall, the town plans to put in stone groins along the entrance to Little Pond. The information and data we collect will show if the work was done right.

"I've learned that the majority of people in this town are interested in conservation. They're willing to donate their time as long as they feel it's appreciated."



Top: Pond Watchers Armand Ortins (left) and Ed Wessling conducting a sampling of Green Pond.

Bottom: Pond Watcher Bob Linvingstone with the largest of the two fish traps used in the 1990 fish census conducted by the volunteers in conjunction with routine water quality sampling.

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FEATURES

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