

The Maine Phytoplankton Monitoring Program

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Biographical Sketch

Esperanza has provided leadership in the organizational and technical development of coastal water quality, phytoplankton and marine habitat programs for citizen groups and schools statewide. She developed a statewide model for citizen groups and schools, the Maine Clean Water/Partners in Monitoring Program, to assess and remediate local coastal pollution problems. She received a B.S. in Marine Biology from Evergreen State College and a Masters in Environmental Education from the University of Maine.

Abstract

Maine has a long history of coastal monitoring for shellfish resources in protection of public health, both in water quality (since 1950) and for toxic algae (since 1958). The agency responsible for this monitoring is the Maine Department of Marine Resources (DMR). In 1989, DMR recognized that monitoring 5,000 miles of coastline during a state budget crisis and with limited resources would not be possible. At the same time, the Clean Water Program of the University of Maine Cooperative Extension (UMCE) was implementing a community-based water quality monitoring effort statewide. The two organizations, along with the Maine State Planning Office, and the Maine Department of Environmental Protection formed the Partners in Monitoring to support volunteers in collection of credible data.

Following the success of nine seasons of volunteer water quality monitoring, in 1996 DMR and UMCE formed an alliance with the US Food and Drug Administration and the Bigelow Laboratory for Ocean Sciences to conduct a phytoplankton monitoring program. The target organisms for the program are *Alexandrium spp.*, *Dinophysis spp.*, *Prorocentrum sp.*, or *Pseudonitzschia spp.* which may pose a threat to public health through ingestion of shellfish.

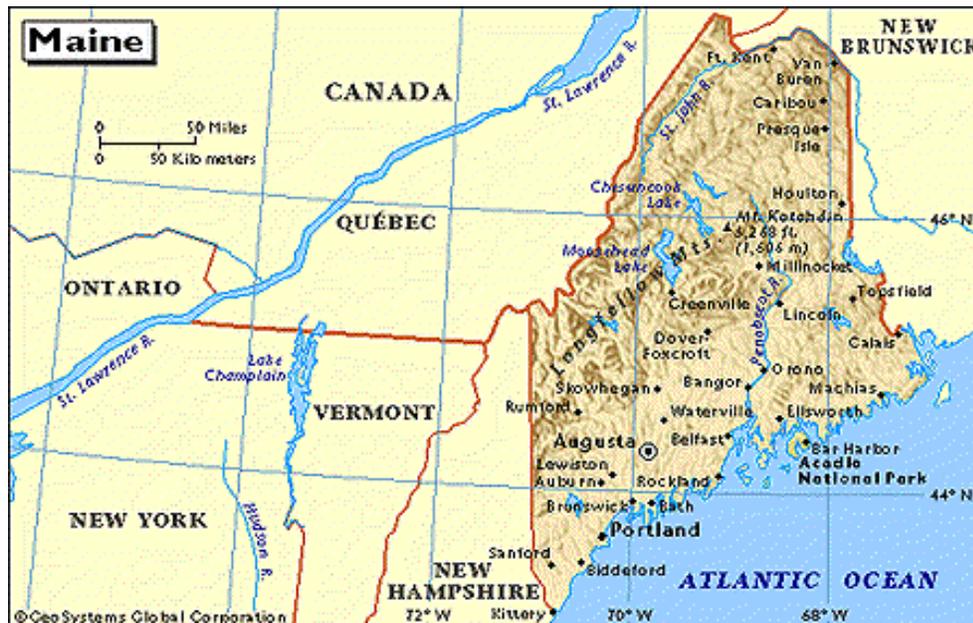
The objective with these data is to correlate the toxic phytoplankton in the water column with toxins present in shellfish, such as, mussels, surf clams, and soft-shell clams to serve as an early warning indication system for marine biotoxins. At this point the data collected is qualitative, however, this year a cell count methodology will be piloted by a volunteer group.

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Introduction

Since 1988, citizen volunteers have been successfully engaged in environmental monitoring along the Maine coast. It all began with two midcoast groups, that decided to investigate the nature of local water pollution problems by working in partnership with the University of Maine Cooperative Extension (UMCE) with technical support from the Department of Marine Resources (DMR) and the Department of Environmental Protection (DEP) to start their own local monitoring programs. This take-charge model of environmental stewardship soon expanded statewide as more communities saw that they too could make a difference in preventing or remediating pollution problems in their coastal areas. A primary concern and measurable result of these local efforts has been the reopening of shellfish growing areas.

By the late 1980s, DMR recognized this untapped, person-power resource and began calling on these local volunteers to assist with collecting water samples for analysis at the DMR labs to identify pollution sources and get more acres of shellfish flats open for harvesting. In 1998 and 1999, 42% of all the bacteria samples analyzed were collected by volunteers. Over 60,000 acres of clam-flats have been opened for harvest over the past four years in large part due to the efforts of the volunteers. The Maine Department of Marine Resources is the only state agency which is a member of the Interstate Shellfish Sanitation Conference that uses volunteers in the collection of data to classify shellfish growing areas.



In 1996 the University of Maine Cooperative Extension (UMCE), in collaboration with the Maine Department of Marine Resources (DMR) and the US Food and Drug Administration (USFDA) created an innovative volunteer-based phytoplankton monitoring program. The identified need was to enhance the capacity to detect harmful algal blooms (HAB's), that have caused closures of shellfish harvest areas Gulf-wide, due to possible lethal toxicity, which can result in extreme revenue loss to shellfish harvesters. Until this phytoplankton monitoring program was initiated, HAB monitoring at DMR was based solely on toxicity levels in shellfish. This program augments traditional biotoxin monitoring programs by looking for phytoplankton species in the water column that might be responsible for shellfish toxicity. This novel approach to HAB monitoring is not mandated by law, and has not been supported by governmental funds. This program has empowered citizens through their participation in providing vital information to decision-makers.

Potentially toxigenic species of phytoplankton have been detected in the Gulf of Maine, and are a potential threat to public health and economic resources. HAB's can also present serious issues to aquaculturists. Fish, particularly those reared in pens, are susceptible to oxygen depletion caused by some species of phytoplankton, skin damage and damage to gill tissue (Martin 1997). Scientists now believe that Harmful Algal Blooms (HAB's) are increasing in severity, geographic distribution, and in species being adversely affected.

The major goals of this project, which was modeled after the USFDA protocol used in other states, are to assist shellfish management agencies with marine biotoxin monitoring efforts by providing early-warning detection of toxic species of phytoplankton, and to determine if a correlation exists between potentially toxigenic phytoplankton in the water and a toxic event in shellfish through the collection of baseline data. To date the program has 25 monitoring groups covering 40 sampling locations along the coast of Maine with approximately 80 volunteers. Volunteers monitor weekly from April through October, and send data reports directly to the biotoxin team at the Maine Department of Marine Resources where to date there are over 1800 data entries on phytoplankton populations from the volunteers.

Volunteer groups have, each year, found *Alexandrium spp.* in the water column days before the shellfish were found to be toxic. This program has also proven to be an important educational tool for schools and citizens while collecting needed scientific data pertaining to phytoplankton and HAB's. Through the success of our program, we have been able to assist with the development of other phytoplankton monitoring efforts in the Gulf of Maine; aiding in the development of a new phytoplankton monitoring program in New Hampshire and providing support to the phytoplankton monitoring program in Massachusetts.

The monitoring groups have collected data on the abundance and distribution of phytoplankton in Maine waters that could potentially affect public health. Over time, these data will help scientists identify trends in abundance and distribution of phytoplankton. The amount of coverage volunteer monitors achieve through weekly sampling could not be replicated by the limited monetary and personnel resources available to the scientific and regulatory community.

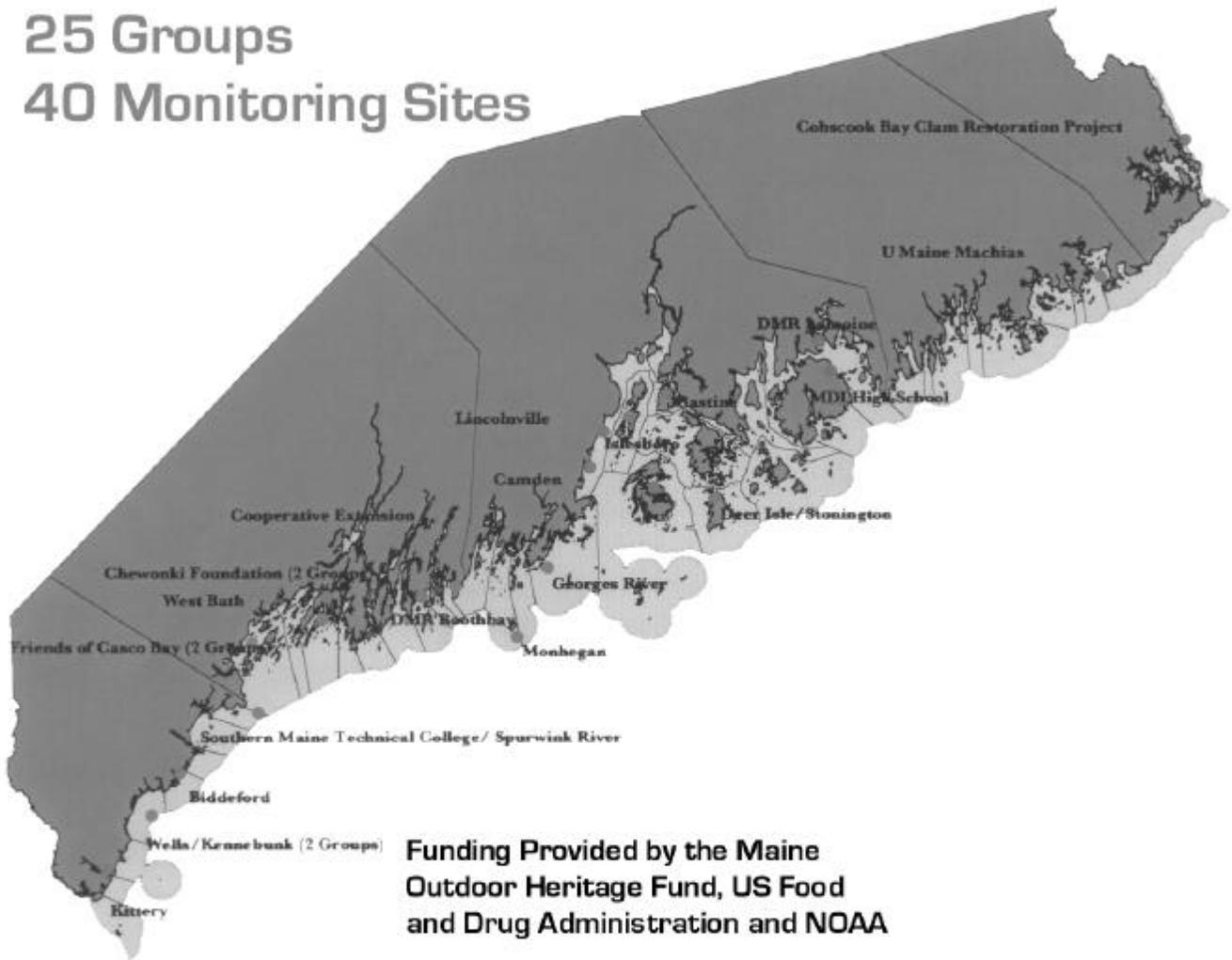
Data collected through our program has drawn the attention of research scientists currently working in the Gulf of Maine. In 1998, volunteers observed the presence of large numbers of *Dinophysis spp.* in Maine; a genus known to have species responsible for causing Diarrhetic Shellfish Poisoning (DSP). This prompted researchers to direct efforts to address these findings. The results indicated the presence of another toxic species in Maine, *Prorocentrum lima*, also known to cause DSP. This epiphytic species has a different life history, and we will be developing a protocol to sample for it this year. We are also participating in the ECOHAB project with WHOI by taking coastal quantitative samples. This relationship to the scientific community strengthens the credibility of the program, and empowers citizens by linking them to research in the Gulf of Maine.

The Maine Department of Environmental Protection (DEP) is interested in the phytoplankton data to determine the timing of spring and fall blooms in order to make regulatory decisions (e.g. holding off on dredging activities during bloom times). DEP is also interested in collaborating with the Phytoplankton Monitoring Program for acquiring data on transparency and temperature in order to follow trends over time along the coast as well as to look at differences between estuaries.

Maine Phytoplankton Monitoring 2000

25 Groups

40 Monitoring Sites



**A Program of the University of Maine
Cooperative Extension and the Maine
Department of Marine Resources**