Draft Inventory of Environmental Monitoring Programs in the Gulf of Maine and Long Island Sound

Supplement: Program Entry Outlines

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As of December 2003, a program entry outline was completed for 21 of the 295 monitoring programs listed in the full version of this draft inventory. This supplment provides the program entries for these programs. The 25 entries for each program are as follows:

1. Country
2. State/Province
3. Marine/Coastal/Freshwater/Terrestrial
4. Watershed/Water Body/Feature (Estuary/Bay/Basin/River/Lake/Bog/Heath/Mountain/etc.)
5. Title
6. Sponsor
7. Program
8. Website/Information Links
9. Contact
10. Goals
11. Purpose
12. Summary/Conclusions
13. Future
14. Needs
15. Sample Collection Collaboration
16. Resource/Parameters
17. Materials and Methods
18. Sample Locations
19. Sample Numbers
20. Sampling Frequency
21. Years Monitored
22. Program Status
23. Species/Common Names
24. References
25. Additional Information/Comments

2. GLOBAL SEAGRASS MONITORING

Program Entry Outline:

1. SeagrassNet is international in scope, with monitoring sites in 14 countries around the globe, including the Philippines, Indonesia, the USA, Brazil, Australia, and several nations in the Western Pacific. There is a SeagrassNet location in the Gulf of Maine, one of 22 locations around the world and one of two locations within the US.
2. The SeagrassNet site in the Gulf of Maine is located at Fisher's Island in Portsmouth Harbor and is accessed from the town of Kittery, Maine.
3. SeagrassNet involves the long term monitoring of seagrasses and trends in seagrass habitat; seagrasses occur on the coasts of all continents except Antarctica and grow from the intertidal zone to depths of 30m and more in some clear water areas.
4. SeagrassNet monitoring occurs most often in nearshore locations in marine bays, estuaries, and shallow coastlines. In the Gulf of Maine, the SeagrassNet site is located on a shallow intertidal flat vegetated with eelgrass (Zostera marina) within Portsmouth Harbor.
5. SeagrassNet, a Seagrass Monitoring Network
6. Funding for SeagrassNet has come from a variety of sources. The David and Lucile Packard Foundation provided an initial grant to develop the monitoring protocol and to make an initial test of the monitoring project in the Western Pacific. The Packard Foundation continues to fund the program. Other participants in the SeagrassNet program which provide either funding or material support include: The University of New Hampshire, and UNH's Jackson Estuarine Laboratory
7. SeagrassNet is a program with many facets: long term monitoring of seagrass habitat to detect trends, but also education of marine scientists and managers throughout the globe about the functions and values of seagrass. Also there is a community element: scientists establishing a SeagrassNet site and training those who will monitor that site make a point of talking with community leaders and members about the value of the seagrass resource and the reasons for SeagrassNet monitoring. Community-based monitoring of seagrasses is now occurring in twelve locations throughout the Western Pacific, with citizens of these locations monitoring a suite of seagrass parameters.
8. www.SeagrassNet.org
9. Frederick T. Short, SeagrassNet Project Director, University of New Hampshire, Jackson Estuarine Laboratory, 85 Adams Point Road, Durham, NH 03824 603-862-2175 <fred.short@unh.edu
10. The main goal of SeagrassNet is to implement and expand global monitoring of seagrass habitat with generic methodologies that are used world-wide. The SeagrassNet monitoring protocol is a standardized set of methods which yield comparable results. Additional goals include: 1)training of SeagrassNet participants, building a scientific monitoring team with the capacity to continue quarterly monitoring and reporting of data after training, 2) ongoing submission of data from across the globe to a web-based SeagrassNet database at the University of Maryland, 3) establishmennt of monitoring sites in each participating country, where quarterly monitoring is conducted along fixed transects within seagrass areas, 4) the inclusion of a community-based monitoring component, with training of community members in a simplified version of the SeagrassNet protocol for ongoing monitoring, and, 5) expansion of the SeagrassNet program to as many countries with seagrass habitat as possible.
11. The purpose of SeagrassNet is to assess change in seagrasses globally, both to determine long term trends in the important seagrass habitat itself and to use seagrass habitat change as a measure of more general trends in global climate and ocean health. In conjunction with long term assessment of the seagrass ecosystem worldwide, SeagrassNet seeks to raise awareness of seagrasses and the many functions seagrass habitat provides within the world's oceans.
12. SeagrassNet to date is a successful monitoring program, providing the foundations for a long-term database that can evaluate the impact of human activity on the coastal ocean as well as global climate change.
13. SeagrassNet seeks to expand within the Gulf of Maine, the US, and globally. SeagrassNet seeks to expand to further countries and to multiple sites within countries. As longer-term data is generated and analyzed, SeagrassNet will be producing a "report card" on the global health of the coastal oceans.
14. SeagrassNet seeks long-term funding and consistent support for the program. Additionally, SeagrassNet seeks collaborative institutions and research groups to organize regional monitoring programs.
15. SeagrassNet recruits monitoring teams at all its sampling sites. Teams include graduate students, coastal managers, scientists, community leaders, and staff of laboratories and NGOs. Also, for the community-based monitoring, SeagrassNet recruits and trains people from the community to participate. The SeagrassNet site in the Gulf of Maine is being monitored quarterly by graduate and undergraduate students at the Jackson Estuarine Laboratory, University of New Hampshire.
16. SeagrassNet monitors seagrasses (density, biomass, % cover, canopy height, species compostition, and extent) as well as temperature (continuous data logging), light, and salinity.

17. Detailed materials and methods for SeagrassNet are laid out in Short, F.T., McKenzie, L.J., Coles, R.G. and Vidler, K.P. (2002) SeagrassNet Manual for Scientific Monitoring of Seagrass Habitat (QDPI, QFS, Ciarns) 56pp. Broadly, SeagrassNet monitoring involves measurement of seagrass habitat for distribution, species composition, and abundance. Monitoring includes setting up a permanent transect with three cross-transects in seagrass habitat, taking photographic records and voucher specimens, and measuring seagrass cover, biomass, shoot density, reproductive plant parts, latitude and longitude, the distance to the edge of the bed. Water depth, tidal information, and environmental data (water temperature, salinity, underwater light levels, and sediment characteristics) are also taken.
18. The SeagrassNet sampling sites are located throughout the world, most in the Western Pacific, but with locations in Australia, Africa, Brazil, and the United States in Maryland and Maine.
19. SeagrassNet samples take several forms: seagrass herbarium specimens are collected of various seagrass species. These are pressed and sent to the Smithsonian in Washington, DC. Photographs are taken of sampling quadrats at the permanent stations. Seagrasses are sampled for biomass and shoot density determinations. Sediment samples are taken. Other measurements do not produce a physical sample (salinity measures and visual estimates of seagrass cover, for example) but are important data that becomes part of the SeagrassNet database. In total, 36 samples are collected at each site four times a year.
20. SeagrassNet monitoring occurs quarterly at all established SeagrassNet locations.
21. 2001, 2002, 2003 with plans for continued monitoring at all sites, plus additional sites.
22. Ongoing
23. There are approximately 60 species of seagrass worldwide. SeagrassNet samples all species present at any monitoring location. In the Gulf of Maine, eelgrass (Zostera marina L.) is monitored at the SeagrassNet site. Shoalgrass (Ruppia maritima) is a seagrass species found in the Gulf of Maine.
24. References:

    Short, F.T. and R.G. Coles. 2001. Global Seagrass Research Methods. Elsevier Science B.V., Amsterdam.

    Short, F.T., McKenzie, L.J., Coles, R.G. and Vidler, K.P. (2002) SeagrassNet Manual for Scientific Monitoring of Seagrass Habirat (QDPI,QFS, Ciarns) 56pp.

    Short, F.T., R.G. Coles, E.Koch, and M. Fortes. 2002. SeagrassNet: Western Pacific Pilot Seagrass Monitoring Project. Year 1 Report. University of New Hampshire. 31pp.

    Green, E.P. and F.T. Short (eds.) 2003. World Atlas of Seagrasses: Present Status and Future Conservation. University of California Press. Berkeley.
25. N/A

16. CANADIAN SHELLFISH SANITATION PROGRAM

Historical Responsibilities (pre April 1997)

The Canadian Shellfish Sanitation Program (CSSP) is a federal program jointly administered by the departments of Fisheries and Oceans (DFO) and the Department of the Environment (DOE). The main aim of the CSSP is to ensure that all bivalve molluscan shellfish (i.e., clams, mussels, oysters, whole and roe-on scallops and other bivalve molluscs) growing areas meet approved federal water quality criteria, that pollution sources to these areas are identified and that all shellfish sold commercially are harvested, transported and processed in an approved manner. In Canada, the legal authority for the CSSP is provided by the Management of Contaminated Fisheries Regulations under the Fisheries Act and the Fish Inspection Regulations (FIR) under the Fish Inspection Act.

DOE Canada is specifically responsible for carrying out sanitary and bacteriological surveys of the shellfish growing areas according to the procedures, standards and protocols of the CSSP Manual of Operations. The Department of Fisheries and Oceans is responsible for the control of commercial harvesting, licensing, handling, storage, transportation, processing and labelling of shellfish including imports, and the patrolling of closed areas. It regularly tests commercially harvested shellfish for bacterial contamination and maintains a biotoxin surveillance program of shellfish growing areas.

Current Status (post April 1997)

With the transfer of Fish Inspection Directorate activities to the Canadian Food Inspection Agency (CFIA) the February, 1990, Memorandum of Understanding (MOU) between Fisheries & Oceans Canada and Environment Canada has been revised to reflect the specific roles of the three organizations with respect to the CSSP.

The Fish, Seafood and Production Division, Canadian Food Inspection Agency

- Regulates the import and export, processing, packaging, labelling, shipping, certification, storage, repacking of shellfish to protect against contamination and product quality degradation, to maintain source and lot identity and integrity. Suspends operations or decertifies shellfish processors on the basis of unacceptable operating and sanitation conditions.
- Regulates the depuration (i.e., controlled purification) of shellstock, verifies product quality and purification effectiveness, maintains production and product quality records,
- Evaluates laboratories performing shellfish analyses in accordance with the requirements of the CSSP and maintains a biotoxin surveillance program of shellfish growing areas in support of DFO and CFIA activities.
- Environment Canada classifies all actual and potential shellfish growing areas as to their suitability for shellfish harvesting on the basis of sanitary quality and public health safety.

Fisheries & Oceans Canada, Fisheries Management

- Controls the harvesting of shellfish from areas that are classified as contaminated or otherwise closed.
- Patrols growing areas.
- Apprehends and prosecutes persons violating restrictions.
- Regulates and supervises relaying, transplanting and replanting.
- Restricts harvesting of shellfish from actual and potentially affected growing areas in a public health emergency.
- Regulates licenses, harvesting locations and times and minimum harvest sizes for stock management purposes.

Program Entry Outline

1. Canada
2. New Brunswick and Nova Scotia
3. Marine, coastal and freshwater.
4. Yarmouth, St. Mary's Bay, Annapolis Basin, Avon River, Shubenacadie River, Minas/Cobequid, Cumberland Basin, Shepody Shore, Fundy Shore, St. John River, Magaguadavic Bay, St. Croix River
5. Atlantic Canada Shellfish Water Quality Protection Program
6. Environment Canada
7. Canadian Shellfish Sanitation Program (CSSP)
8. http://www.ns.ec.gc.ca/epb/sfish/sfish.html
9. Amar Menon, Environment Protection Branch, Environment Canada, 45 Alderney Drive 16th Floor, Tel: (902) 426-9003 Fax: (902) 426-3897, email: amar.menon@ec.gc.ca, www.ns.ec.gc.ca/epb/sfish/sfish.html
10. This program is designed to protect consumers of shellfish from health hazards associated with bacterial contamination through the monitoring of shellfish growing waters
11. The purpose of the CSSP is to ensure that all bivalve molluscan shellfish growing areas meet approved federal water quality criteria, that pollution sources to these areas are identified and that all shellfish for human consumption are harvested, transported and processed in an approved manner.
12. Monitoring data and results are published in departmental reports.
13. This is an on going program and it will be continued in 2003.
14. This monitoring program is limited by operational budget and would benefit by increased funding and collaboration with our partners in sampling and analysis.
15. The water sampling program along the New Brunswick coastline of Gulf of Maine is carried out under the cooperative bacterial monitoring program with the local community group (Eastern Charlotte Waterways Inc).
16. Water samples are analyzed for fecal coliform bacteria (Most Probable Number [MPN] per 100ml, using the 5-tube MPN method). Other parameters such as water temperature and salinity are also measured. Other relevant observations such as pollution sources, weather, antecedent precipitation, shellfish resource and aquaculture sites, tidal conditions, etc. are also maintained in the database.
17. Water samples are collected from selective stations as prescribed by the Canadian Shellfish Sanitation Program - Manual of Operation. These samples are collected on a random basis in an attempt to encounter as wide a variety of tidal, meteorological, and other conditions as possible in areas where shellfish harvesting is likely to occur. Samples are collected in steriled Nalgene bottles and transported on ice to the laboratory for analysis. Analytical techniques for fecal coliform and quality assurance procedures are in accordance with Canadian Shellfish Sanitation Program guidelines.
18. There are approximately 900 sampling stations along the coast of Nova Scotia and New Brunswick in the Gulf of Maine. The sampling sites are concentrated on where the shellfish resource are located and where problem areas are known or suspected. Sampling locations are established with GPS with geo-reference (longitude/latitude and UTM) and descriptions.

19. There are approximately 900 sampling stations.
20. A comprehensive sanitary and water quality surveys are conducted for each new shellfish growing area prior to its approval for the harvesting of shellfish. A minimum of 15 sampling runs are required for the initial classification. Each approved shellfish growing area is re-evaluated every 3 years with a minimum of five samples at each sampling site. Conditionally approved areas are sampled monthly each year when they are in the open status.
21. This program was initiated in the 1940's and continued through the 2000's.
22. Ongoing
23. Clams, oysters, mussels and scallops.
24. References:
    Recommended Procedures for the Examination of Sea Water and Shellfish, American Public Health Association (1970),
    Standard Methods for the Examination of Water and Wastewater, APHA, (1999)
    National Shellfish Sanitation Program (1995),
    Canadian Shellfish Sanitation Program, Manual of Operations (1992)
25. N/A

45. NEW BRUNSWICK FINFISH AQUACULTURE MONITORING PROGRAM

Program Entry Outline

1. Canada
2. New Brunswick
3. Marine
4. Passamaquoddy Bay, "West Isles" Region
5. New Brunswick Department of the Environment and Local Government - Aquaculture Approvals Program
6. Province of New Brunswick. New Brunswick aquaculture site operators, as a legal requirement for regulatory Approval
7. Provincial Regulatory Program
8.
9. Darrell Welles, Aquaculture Approvals Officer, New Brunswick Department of the Environment and Local Government, P.O. Box 6000, Fredericton, NB E3B 5H1, Tel (506) 453-6633/ Fax (506) 453-2390, darrell.welles@gnb.ca
10. To provide a yearly assessment of the benthic sediment conditions directly below marine finfish aquaculture facilities in New Brunswick.
11. To determine the compliance status of each marine finfish aquaculture facility with respect to the environmental quality limits imposed by each facility's Approval to Operate (Water Quality Regulation – New Brunswick Clean Environment Act).
12. Summary/Conclusions: Not applicable.
13. The program was implemented in 2002 and will continue for the foreseeable future. The program may change over time as need arises.
14. Not applicable
15. Not applicable
16. Sediment Quality: Oxidation-Reduction Potential normalized to the hydrogen electrode (Redox reported in mVNHE). Sulfide concentration (reported by micromolar concentration). Visual assessment by dive team. Video recording of benthic conditions.
17. Sampling is conducted by marine aquaculture site operators or their consultants. All work is required to be carried out in accordance with a detailed "Standard Operating Practices" document that was designed around the methodology of Wildish et al. (1999).
18. Sampling is required at each of the active marine finfish aquaculture sites in the province of New Brunswick. The actual number of active sites will vary yearly. Each site is required to establish transects below the net-pen structures in accordance with the Department's "Standard Operating Practices". There is a minimum of two transects per site, with each transect yielding three sample points with multiple subsamples depending on sediment depth.
19. Variable
20. Yearly
21. 2002
22. Ongoing
23. Not Applicable

24. References:
    Wildis, D. J., Akagi, H. M., Hamilton, N., and Hargrave, B.T. 1999. A Recommended Method for Monitoring Sediments to Detect Organic Enrichment from Mariculture in the Bay of Fundy. Can. Tech. Rep. Fish. Aquat. Sci. 2286:31p.
25. This program is a revised version of an earlier program carried out by the New Brunswick Department of Agriculture Fisheries and Aquaculture.

70. DISPOSAL AREA MONITORING SYSTEM (DAMOS)

Program Entry Outline

1. USA
2. New England
3. Marine, Coastal
4. New England coast, from Long Island Sound to Maine
5. Disposal Area Monitoring System (DAMOS)
6. U.S. Army Corps of Engineers, New England District
7. Disposal Area Monitoring System (DAMOS)
8. http://www.nae.usace.army.mil/environm/damos/splash_page.htm
9. Dr. Tom Fredette, 978.318.8291, thomas.j.fredette@usace.army.mil; Gail French, 978.318.8077, gail.t.french@usace.army.mil
10. To effectively manage disposal events and disposal sites to ensure minimal environmental impact.
11. The DAMOS program monitors dredged material disposal sites using an interdisciplinary approach to understand the interactions between physical, chemical, and biological parameters that occur following disposal operations and to assess the impact of disposal on the ambient environment. Questions addressed include distribution and behavior of dredged material, relation and recovery process to biological succession, how much disturbance to permit at any one time, quantification of short- and long-term effects, capping issues, the identification of abnormal events, and others. This information is used to manage disposal events and the disposal sites to help ensure minimal environmental impact.
12. To date, extensive monitoring has demonstrated that effects of dredged material disposal are generally only short-term. When monitoring data suggest unacceptable contamination, management actions can be taken to contain the sediment. Contaminated sediment can be effectively isolated from the marine environment by capping with clean sediment and/or placing it in the center of planned depressions or by burying it in-place (Confined Aquatic Disposal [CAD] cells). We continue to use monitoring data to refine these techniques and develop new techniques.
13. We will continue to monitor disposal events and disposal sites and to develop new techniques for safely disposing of dredged material unsuitable for unconfined ocean disposal.
14. More effective methods to collect and measure field bioaccumulation in small benthic organisms.
15. Studies executed by DAMOS contractors and shared with general public. DAMOS is always ready to discuss collaboration with others on scheduled Program surveys.
16. Sediment, benthic organisms, water column.
17. Techniques used include bathymetry, side-scan sonar, sediment profile images, sediment cores, and others.
18. Western Long Island Sound Disposal Site, Central Long Island Sound Disposal Site, Cornfield Shoals Disposal Site, New London Disposal Site, Buzzards Bay Disposal Site, Cape Cod Bay Disposal Site, Massachusetts Bay Disposal Site, Cape Arundel Disposal Site, Portland Disposal Site, Rockland Disposal Site, and others
19. N/A
20. Varies
21. Since 1977 under DAMOS program; earlier relevant studies conducted by Corps of Engineers, New England District
22. Active
23. N/A
24. Reports dating back to 1999 are available on our web site in electronic format. Others are available in paper format.
25. N/A

83. NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM-WIDE MONITORING PROGRAM

Program Entry Outline

1. United States
2. 21 coastal states (including ME, NH, MA, RI and NY).
3. Marine and coastal
4. Estuary
5. National Estuarine Research Reserve System-wide Monitoring Program
6. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS)
7. Ocean and Coastal Resource Management, Estuarine Reserves Division
8. http://www.ocrm.nos.noaa.gov/nerr/. Data can be downloaded at: http://cdmo.baruch.sc.edu
9. Maurice Crawford, Science Coordinator, NOAA's Ocean Service, N/ORM5, Estuarine Reserves Division, 1305 East-West Highway, Silver Spring, MD 20910, Phone: 301.713.3155 ext. 165, Fax: 301.713.4363, Email: maurice.crawford@noaa.gov
10. To develop quantitative measurements of short-term variability and long-term changes in the water quality, biotic diversity, and land-use / land -cover characteristics of estuaries and estuarine ecosystems.
11. Provide information that will contribute to more effective coastal management.
12. See references.
13. Future phases include monitoring land use/habitat change and biological monitoring.
14.
15. The National Estuarine Research Reserve System is a partnership between NOAA and the states where NOAA provides funds that are matched by the states.
16. Water quality: pH, conductivity, temperature, dissolved oxygen, turbidity and water levels. Also nutrients (ammonium, nitrate, nitrite and ortho-phosphate) and chlorophyll a are collected. Weather: Temperature, wind speed and direction, relative humidity, barometric pressure, rainfall and Photosynthetically Active Radiation.
17. Water quality data are collected using YSI 6600/6000 data sondes. Weather data are collected using Campbell Scientific Weather Stations. Nutrient data are collected by grab samples.
18. There are 25 National Estuarine Research Reserves located in 21 states and a territory (Puerto Rico).
19. Each of the 25 reserves operate four data sondes and a weather station for a total of 100 water quality stations and 25 weather stations.
20. Water quality data are collected every thirty minutes. Nutrient and chlorophyll data are collected monthly. Weather data are collected every fifteen minutes.
21. Water quality data have been collected since 1996. Nutrient and chlorophyll data have been collected since 2001. Weather data have been collected since 2001.
22. Water, nutrients and weather data collections are operational.
23. N/A
24. References:

    Wenner, E.L. and M. Geist. 2001. The National Estuarine Research Reserves Program to Monitor and Preserve Estuarine Waters. Coastal Management 29:1-17.

    E. L. Wenner, A. F. Holland, M. D. Arendt, Y. Chen, D. Edwards, C. Miller, M. Meece and J. Caffrey. 2001. A Synthesis of Water Quality Data from the National Estuarine Research Reserve's System-wide Monitoring Program. Final Report to The Cooperative Institute for Coastal and Estuarine Environmental Technology NOAA Grant Number: NA97OR0209SC. South Carolina Department of Natural Resources, Marine Resources Division, Contribution No. 459, 299 p. Available as a pdf at: http://www.ocrm.nos.noaa.gov/nerr/monsys.html

    Sanger, D.M., M.D. Arendt, Y. Chen, E.L. Wenner, A. Holland, D. Edwards and J. Caffrey. 2002. A Synthesis of Water Quality Data: National Estuarine Research Reserve System-wide Monitoring Program (1995-2000). National Estuarine Research Reserve Technical Report Series 2002:3. South Carolina Department of Natural Resources, Marine Resources Division, Contribution No. 500, 135 p. Available as a pdf at: http://www.ocrm.nos.noaa.gov/nerr/monsys.html
25. N/A

97. CASCO BAY AIR DEPOSITION MONITORING PROJECT

Program Entry Outline

1. Country: USA
2. Maine
3. Coastal
4. Casco Bay
5. Casco Bay Air Deposition Monitoring Project
6. Casco Bay Estuary Project
7.
8. http://www.cascobay.usm.maine.edu
9. Karen Young, Director, Casco Bay Estuary project, University of Southern Maine, 49 Exeter Street, Portland, Maine 04104, 207/780-4820, kyoung@usm.maine.edu
10. Measure deposition of pollutants via the air at a coastal site in Casco Bay. Compare to the deposition rates at inland sites in Maine and other locations to assess the relative role of atmospheric deposition in pollution loading to the Bay. Determine the relative inputs from different potential emission sources surrounding the bay.
11. Develop atmospheric deposition loading estimates to guide water quality and air quality management decisions.
12. Key findings to date are as follows:

- Atmospheric deposition of inorganic nitrogen is a significant source of pollution to Casco Bay. Wet deposition directly to the Bay surface accounts for 200 to 246 tonnes/yr. Dry deposition (inferred from pollutant concentrations in ambient air) is 146 to 182 tonnes/yr. The total direct deposition is 30 to 40% of the overall nitrogen loading to the Bay.
- Atmospheric deposition of mercury is the dominant source of mercury emissions into the Bay. Wet deposition to the bay surface accounts for 10 to 16 lbs/yr. Dry deposition (inferred) totals 4 to 16 lbs/yr. The total direct deposition equals 84 to 92% of overall mercury loading to the Bay.
- Sixteen species of PAHs were measured in 1998-2201. The mean wet deposition rate was 831 ng m-2cm-1 and was attributed to regional sources. The mean dry deposition was 9.3 ng m–2h –1. The low rate was attributed to the absence of local emission sources.

13. Maine DEP intends to continue to fund the Freeport coastal site as part of its ongoing network of MDN, IMPROVE and NADP monitoring sites.
14. EPA has funded analysis of data collected through 2002. Additional funding will be required for data analysis in subsequent years.
15. Maine DEP
16. Wet deposition of mercury (MDN network), wet deposition of nitrogen (NADP network), wet and dry deposition of polycyclic aromatic carbon and deposition of fine particulates (IMPROVE network). In 2002, a sampling train to collect arsenic, selenium, cadmium, nickel, vanadium and chromium was added to the MDN collector. This station is critical to gaining a broader understanding of the potential for deposition of pollutants into the bay. The site is located in a hay field, on a peninsula, 1/4 mile from Casco Bay (see attached map). The location provides an opportunity to determine the relative inputs from different potential emission sources surrounding the bay.
17. NADP, MDN and IMPROVE national protocols followed. QAPP for the trace metals sampling available.
18. The Study's long-term monitoring station has been located on Wolfe's Neck Farm, an organic beef farm in Freeport, ME. The site is located in a hay field, on a peninsula 1/4 mile from Casco Bay.
19. **NADP collector:** weekly wet deposition samples collected every Tuesday, total of 52 samples/year. **MDN Collector:** weekly wet deposition samples collected every Tuesday, total of 52 samples/year. **PAH Collector** (March 1998 – March 2001 only): twelve weekly samples each of wet and dry deposition collected monthly, total of 24 samples/year. In 2000, seasonal samples of wet and dry deposition were collected weekly during one month per season (January, April, July, October) **IMPROVE sampler:** one sample (three filters, one each from Module A, B, and C) collected every six days, total of 156 samples/year.
20. See #19
21. 1998 -2003
22. Ongoing (with the exception of PAHs, which were sampled 1998 – 2000)
23. N/A
24. References

Ryan, Patrick A., Hilary Hafner, Steven G. Brown. "Deposition of Air Pollutants to Casco Bay," Casco Bay Estuary Project, 2003

Golomb, Dan. "Atmospheric Deposition of Polycyclic Aromatic Hydrocarbons near New England Coastal Waters," Atmospheric Environment, (35) 6245 – 6258.

25. N/A

100. CASCO BAY LOBSTER TISSUE ANALYSIS

Program Entry Outline

1. USA
2. Maine
3. Coastal
4. Casco Bay
5. Casco Bay Lobster Tissue Analysis
6. Casco Bay Estuary Project
7.
8. http://www.cascobay.usm.maine.edu
9. Karen Young, Director, Casco Bay Estuary project, University of Southern Maine, 49 Exeter Street, Portland, Maine 04104, 207/780-4820, kyoung@usm.maine.edu
10. Monitor bioavailability of toxics to lobsters over time.
11. Assess variation in toxic contaminants in lobster meat and tomalley in Casco Bay over time and throughout the bay, to guide water quality management and public health decision-makers.
12. Analysis by the Maine state toxicologist indicated that levels in meats are acceptable, toxics (PCBs, PAHs, pesticides, cadmium and arsenic) are elevated in tomalley. Signal for south of Jewell Island (outer Casco Bay) and the inner New Meadows estuary in Eastern Casco Bay are similar, suggesting a similar source.
13. Program assessed annually. Supplement sampling via National Coastal Assessment sampling program data.
14. N/A
15. Maine DEP, National Coastal Assessment
16. Heavy metals, PAH, PCBs, co-planar PCBs, pesticides, dioxins/furans and organotins.
17. Separate composite samples of meat, tomalley. QAPP is available.
18. Upper Eastern Casco Bay, Outer Casco Bay (reference site)
19. 20 per site
20. Every other year
21. 1997, 1999-2000
22. Reevaluated annually
23. Homarus americanus
24. N/A
25. Sampling is conducted by Maine Department of Environmental Protection, results compared to state Surface Water Ambient Toxics Monitoring Program for lobsters. Lee Doggett at Maine DEP can be contacted at 207/287-7666.

101. CASCO BAY MUSSEL TISSUE ANALYSIS

Program Entry Outline

1. USA
2. Maine
3. Coastal
4. Casco Bay
5. Casco Bay Mussel Tissue Analysis
6. Casco Bay Estuary Project
7.
8. Website/Information Links – http://www.cascobay.usm.maine.edu
9. Karen Young, Director, Casco Bay Estuary project, University of Southern Maine, 49 Exeter Street, Portland, Maine 04104, 207/780-4820, kyoung@usm.maine.edu
10. Monitor bioavailability of toxics to mussels over time

11. Assess variation in toxic contaminants in tissues over time and throughout the bay to guide water quality management and public health decision-makers.
12. Samples were assessed by Maine state toxicologist. Lead, PAHs, PCBs and dioxins/furans were above the Maine health "Action" levels for shellfish at various locations in the bay. Dioxins/furans were above action levels at Freeport, Portland, Phippsburg, and outer Casco Bay. Total PCB levels were above the action level at Falmouth, Portland, Brunswick and Phippsburg. Elevated dieldrin levels were later confirmed to be a result of analytical error.
13. N/A
14. A pilot study of human consumption rates of wild mussels was conducted in summer 2001 in Casco Bay. Further data is needed.
15. Supplements Gulfatch sampling, Maine DEP Marine Environmental Monitoring
16. Heavy metals, PAH, PCBs, co-planar PCBs, pesticides, dioxins/furans and organotins
17. Replicate composites of food size and quality, cooked before analysis. QAPP is available.
18. Rotating sites in Casco Bay (e.g., Quahog Bay, Back Cove, Harraseeket, Maquoit Bay, upper New Meadows River estuary, Middle Bay, Mussel Cove, East End Beach, Falmouth Town Landing, Wolfe Neck State Park)
19. 20 animals per composite sample (50-60 mm in shell length)
20. Every other year
21. 1996, 1998, 2000-2001
22. Reassessed annually
23. Mytilus edulis
24. Gulfwatch Project: Standard Procedures for Field Sampling, Measurement and Sample Preparation by J. Sowles and R. Crawford for the Gulf of Maine Council Monitoring Committee, 1994
25. Sampling is conducted by the Maine DEP, compared to state reference levels. Lee Doggett at Maine DEP can be contacted at 207/287-7666.

102. CASCO BAY SEDIMENT SAMPLING

Program Entry Outline

1. USA
2. Maine
3. Coastal
4. Casco Bay
5. Casco Bay Sediment Sampling
6. Casco Bay Estuary Project
7.
8. http://www.cascobay.usm.maine.edu
9. Karen Young, Director, Casco Bay Estuary project, University of Southern Maine, 49 Exeter Street, Portland, Maine 04104, 207/780-4820, kyoung@usm.maine.edu
10. Monitor levels of toxics in sediments throughout Casco Bay and over time.
11. Informed management of the resources of Casco Bay requires an understanding of the sources and loading of contaminants to the estuary. Sediments, as a repository of contaminants derived from human activities, provide a mechanism to assess the present status of contamination.
12. The Casco Bay Estuary Project has funded a comprehensive inventory and analysis of contaminants within the surface sediments of the Bay. In 1991, 65 surface sediment samples were collected and analyzed for metals, PAHs, pesticides, PCBs, total organic carbon and percent silt-clay. Undisturbed sediment samples were collected and analyzed for trace metals, aliphatic and polycyclic aromatic hydrocarbons (PAHs), pesticides and PCBs (polychlorinated biphenyls). The location of the sampling stations was intended to include representative benthic (sediment-dwelling) communities, provide good areal coverage, and include sediments of varying ages and textures (Kennicutt, et. al., 1993). For the purpose of the study, the Bay was divided into five zones: Inner Bay (which includes the densely populated Portland area), the West Bay, which includes the Wolfe's Neck area of Freeport, the East Bay, Cape Small and the Outer Bay. Aliphatic hydrocarbons and PAHs were detected at all sampling stations. The PAHs were predominantly highly condensed ring structures with few alkylations, indicating a pyrogenic or combustion source. Total concentrations of PAHs ranged from 16 to 20,778 ppb. Contaminants tended to decrease in concentration with distance from densely populated areas in the Inner Bay. Levels in the Inner Bay, which includes the Portland and Fore River area, were considered high on a national basis and

comparable to other contaminated estuaries. They were above the PAH concentrations considered toxic to marine benthic organisms (> 35,000 ppb). There were also regionally elevated sites in East Bay and Cape Small (See Map 2). PCBs and pesticides were also present in highest concentrations in the Inner Bay, although, even in the Inner Bay, they were not considered high on a national basis (Kennicutt et. al., 1992, 1993) . In addition, in 1994, 28 of the original 65 sampling stations were tested for tributyl tin, dioxins/furans, and planar PCBs and five additional sites were added. Two of the new sites were sampled for dioxins/furans and planar PCBs while the other three were sampled for butyltins. The additional sites were along the Presumpscot River, the Royal and Cousins Rivers and a marina at Falmouth Foreside. The Casco Bay Environmental Monitoring Program calls for the retesting of sediments every 10 years. Because of the opportunity to coordinate with Coastal 2000, the Casco Bay Estuary Project resampled the sediments at thirty stations in the year 2000, with the remaining stations to be sampled in 2001, 2002.

13. Analyze 2000-2002 samples and compare to 1991, 1994 data to establish trends. The Casco Bay Estuary Project will compare the sediment contamination results against NOAA's NS&T program results, other Maine sediment data, and ERL and ERM criteria. The sediment toxicity testing that is part of Coastal 2000 will be useful complementary information for the Casco Bay Estuary Project to use to assess the status of toxic contamination in Casco Bay.
14.
15. National Coastal Assessment
16. Metals, PAHs, pesticides, PCBs, total organic carbon, percent silt-clay, tributyl tin, dioxins/furans, and planar PCBs.
17. QAPP available
18. Throughout Casco Bay
19. 70 stations
20. Single sampling event/ site during summer/fall index period.
21. 1991, 1994, 2000-2002
22. Ongoing, sampling to be repeated in 2010
23. N/A
24. References

Kennicutt, M.C., II, Wade, T.L., Presley, B.J., Requejo, A.G., Brooks, J.M., Denoux, G.J., Sweet, S., McDonald, T.J., Martin, D., and Paul, D., Assessment of Sediment Contamination in Casco Bay: Interpretive Report and Appendix A, Geochemical and Environmental Research Group and the Department of Oceanography, Texas A&M University, 1992, Technical Report #92-157, 113 pages plus Appendix.

Kennicutt, M.C., II, Wade, T.L., Presley, B.J., Requejo, A.G., Brooks, J.M., and Denoux, G.J., "Sediment Contaminants in Casco Bay, Maine: Inventories, Sources, and Potential for Biological Impact," Environmental Science and Technology, 1994, 28, 1-15

25. N/A

120. LOBSTER POSTLARVAL SETTLEMENT AND JUVENILE SURVEYS

Program Entry Outline

1. USA
2. Maine, Massachusetts, Rhode Island, New Brunswick, CA
3. Marine/Coastal
4. Estuary/Bay/Headland
5. New England Lobster Settlement Index
6. Maine DMR, Mass Marine Fisheries, RI DEM, DFO Canada, Sea Grant in initial stages
7.
8. www.bigelow.org
9. Richard A. Wahle
10. Forecasting populations trends, understanding determinants of variable recruitment, stock assessment, environmental impact monitoring.
11. see Attached News letter
12. see Attached News letter
13. see Attached News letter
14. Consistent year-to-year funding; dedicated small vessel (20')

15. Collaborators contact – Carl Wilson (MEDMR), Robert Steneck (UMaine), Robert Glenn (MassMF), Peter Lawton (DFO, Hunstman Marine Lab).
16. Population density of lobsters (all sizes, and young-of-year), crabs, associated fauna.
17. Diver based suction sampling of 0.5m2 quadrats at some 65 sites from Pt. Judit, RI to Beaver Harbor, New Brunswick
18. see attached
19. 12 quadrats per site
20. Once per year at end of lobster settlement season (early fall)
21. Since 1989 at the longest monitored sites, since 2000 at the most recent sites
22. Continuing, expanding
23. Homarus americanus (Am. lobster), Cancer irroratus (Rock crab), Cancer borealis (Jonah crab), Carcinus maenas (green crab), various xanthid crabs, benthic fishes.
24. see attached
25. see www.bigelow/org

123. MAINE LOON SURVEY

Program Entry Outline

1. US
2. ME
3. Freshwater
4. Most freshwater lakes south of the 45th parallel, selected lakes in northern Maine (total of about 300+ lakes, can send you a list of those if you are interested)
5. Loon Count
6. Maine Audubon, Maine Loon Project
7.
8. www.maineaudubon.org
9. Susan Gallo
10. To provide a yearly population estimate of the loon population in the southern half of the state of Maine.
11. To document the long-term population of loons (adults and chicks) in Maine each summer.
12. For twenty years, the loon count has shown the population of Maine adult loons to be slowly but steadily increasing. Current population is about 2,500 adults, up from around 1,700 when the count started in the early 1980s.
13. N/A
14. N/A
15. N/A
16. N/A
17. N/A
18. N/A
19. N/A
20. N/A
21. N/A
22. N/A
23. Common Loon
24. N/A
25. N/A

126. MAINE VOLUNTARY ANGLERS

Program Entry Outline

1. United States
2. Maine
3. Freshwater
4. Lakes and rivers statewide

5. Maine's Voluntary Anglers
6. Maine Department of Inland Fisheries & Wildlife
7. N/A
8. N/A
9. Forrest Bonney, Maine Dept. Inland Fish & Wildlife, 689 Farmington Road, Strong, ME 04983
10. This program solicits sports fish catch information from anglers who keep diaries of their fishing trips. The data yield statewide information on the number, size, and species composition of the catch; catch rates; and the contribution of stocked fish.
11. This program provides data to supplement sampling efforts by the Department's fisheries staff. The data reveal trends in the quality of the sport fishery over time and help identify potential management problems and concerns.
12. An estimated 600 anglers report on 35,000 angler trips expended on more than 400 waters annually.
13. This program will be continued indefinitely because it returns high yields for the relatively small costs that include providing diaries, mailing them to and retrieving them from anglers, and summarizing data.
14. Participants are now recruited opportunistically. An organized recruitment methodology would increase the number of participants.
15. Participants visit a wide distribution of water bodies and could be solicited to collect other data.
16. Water and date fished; number of fish caught (legal, sublegal) and kept/released by species; hours fished; lengths and weights of fish kept; and origin (wild or stocked).
17. Data are solicited, collected, and managed by Region (there are seven Fisheries administrative regions within the state). Anglers are mailed diaries semiannually (winter and summer seasons); the return of the diaries is solicited at the end of the fishing season with a letter of thanks and a SASE; follow-up letters are sent to delinquent participants. Data are compiled at the Regional offices after which the booklets are returned to the anglers to keep. Regional summary statistics are forwarded to our Research office semiannually or annually for compilation into statewide summaries. Anglers are rewarded by art prints issued by the Department.
18. N/A
19. N/A
20. N/A
21. 1970's to present.
22. Ongoing.
23. All inland sport fishes.
24. N/A
25. N/A

148. SHORE STEWARDS CLEAN WATER PARTNERS IN MONITORING

Program Entry Outline

1. United States
2. Maine
3. Coastal sand beaches
4. Southern Maine sand beaches: Long Sands (York) Ogunquit (Ogunquit), Wells (Wells), Drakes Island (Wells), Laudholm (Wells), Goochs (Kennebunk), Goose Rocks (Kennebunkport), Biddeford Pool (Biddeford), Fortunes Rocks (Biddeford), Ferry (Saco), Kinney Shores (Saco), East Grand (OOB), Western (Scarborough), Scarborough (Scarborough), Higgins (Scarborough), Willard (S Portland), Mile (Georgetown)
5. Southern Maine Beach Profile Monitoring Program
6. Maine Sea Grant, Maine Geological Survey, University of Maine, Maine Coastal Program
7. Shore Steward Program
8. http://www.geology.um.maine.edu/beach/, http://www.ume.maine.edu/ssteward/
9. Kristen Whiting-Grant, Marine Extension Associate, Maine Sea Gant and UM Cooperative Extension, WNERR, 342 Laudholm Farm Rd, Wells, ME 04090
10. To promote a broad understanding of beach processes and erosion trends along Maine's sand beaches and dunes.
11. Purpose(s) [Objectives]
    - To combine meteorology and oceanography with beach profile data to better understand why, when and how fast Maine's beaches are changing and to anticipate the severity of beach erosion and dune flooding using storm

forecasts.
- To present results at the annual State-of-Maine's Beaches Conference to key beach stakeholders (including volunteer monitors, coastal property owners, state and municipal officials, environmental interests and scientists) for informed beach management.
- To improve citizen knowledge of current beach conditions.
- To promote community leadership among monitoring volunteers.

Conflicts among towns/beach communities and scientists/regulators regarding beach management have resulted from poor communication, despite common goals of preserving healthy beaches. Many sand beaches in southern Maine are being rapidly degraded by impacts from shoreline engineering (sea walls, jetties, dredging, etc), sea-level rise and coastal storms. The data collected by this research/monitoring project in 1999 – 2000 will provide a baseline against which future data can be measured. It is important that monitoring become on going because it is critical that data be collected BOTH before and after significant storms. Without this type of long-term geological record, post-storm data alone is of little utility. Users of this long-term data will include:

- State-level – Legislators, MGS, MDEP need this data to calculate potential losses when measuring the economic impact of southern Maine beaches.
- Municipal-level – Town managers, planners, conservation commissions, comprehensive planning committees need this data when updating local land use ordinances, redrafting comprehensive plans, etc.
- Community-level – Local stakeholders such as coastal property owners and beach planning committees need this data in order to make informed home purchasing and improvement decisions and in the development of regional beach management plans.
- Scientists and researchers nationally and locally

12. Summary of 1999 – 2001 data: Moderately and highly developed beaches experienced more change.In geological time, two years cannot be considered a trend. But the first patterns to emerge suggest that moderately and highly developed beaches experienced more change overall during these first years of beach profile monitoring, while undeveloped beaches exhibited less change or appeared to be more stable overall.
13. Maine Sea Grant Extension has dedicated staff to the program. Maine Geological Survey is currently in the process of assuming responsibility for data management from UM. In 2003, an on-line data entry system will be implemented, allowing monitoring volunteers to enter their monthly data to the database.
14. Staff, student or intern to enter backlogged data to database.
15. In the long-term, the Maine profiling program hopes to inspire similar programs throughout the GOM in an effort to provide information on regional trends.
16. Beach profiles collected on a monthly-basis throughout the year by volunteers; wave and current data collected by off-shore meters.
17. Emery beach profiling method using 2, 1.5 meter stakes connected by a 3 meter rope using the horizon for leveling.
18. Towns listed in field 4; aerial photos available upon request identify locations of profile lines in each monitored beach.
19. 16 monitored beaches, most with 4 profile lines per beach.
20. Monthly throughout the year and also frequently following severe storms.
21. 4 years in April, 2003
22. On-going
23. N/A
24. Emery, K.O., 1965, A Simple Method of Measuring Beach Profiles, Liminology and Oceanography, V.6 No. 1, pps. 90 – 93.
25. N/A

154. WEATHER AND SEA TEMPERATURE MONITORING

Program Entry Outline

1. United States
2. Maine
3. Coastal
4. Boothbay Harbor
5. Environmental Monitoring Project

6. Maine Department of Marine Resources
7. N/A
8. N/A
9. Mark Lazzari, PO Box 8, West Boothbay Harbor, ME 04575, Mark.lazzari@maine.gov
10. The Environmental Monitoring Program is operated by the Maine Department of Marine Resources with the goal of maintaining a continuous source of high-quality physical environmental data for the Maine coast.
11. Currently, observations of air temperature, barometric pressure, precipitation, sea surface and bottom temperature, solar radiation, relative humidity, tide height, wind speed and wind direction are recorded at hourly, and daily intervals. Monthly and yearly summaries of the first six observations listed above are distributed to various U.S., Canadian, and state governmental agencies, academic institutions, aquaculture companies, and environmental consulting firms. Sea surface temperature data are reported daily to the U.S. Naval Air Station in Brunswick and a variety of data are provided on request to the public, news media, and university and government researchers.
12. Ongoing
13. N/A
14. N/A
15. N/A
16. Currently, observations of air temperature, barometric pressure, precipitation, sea surface and bottom temperature, solar radiation, relative humidity, tide height, wind speed and wind direction are recorded at hourly, and daily intervals.
17. Several statistics are calculated for the monthly and annual summaries. Mean values for periods of one month and one year are calculated from daily means. Extreme values reported in the annual summary (i.e. highest, lowest) are instantaneous extremes observed to the nearest minute but reported in summary form only to the day of occurrence.
18. The station is located at the Department's Fisheries Laboratory in West Boothbay Harbor, Maine (43°50'40" N, 69°38'30" W). All of the station's sensors are deployed at or near the laboratory pier in a sheltered cove on the west side of Boothbay Harbor. The main harbor is very sheltered and the cove is more so. Wave heights during a severe storm may reach three or four feet in the main harbor but rarely reach even two feet in the cove. Mean tide range has been calculated by the National Ocean Service at 8.8 feet and the spring tide range is given as 10.1 feet.
19. N/A
20. Currently, observations of air temperature, barometric pressure, precipitation, sea surface and bottom temperature, solar radiation, relative humidity, tide height, wind speed and wind direction are recorded at hourly, and daily intervals.
21. In 1905, the U.S. Bureau of Commercial Fisheries began the Environmental Monitoring Program at the fish hatchery in Boothbay Harbor. Air and sea surface temperatures were recorded three times daily from 1905 until 1949, when instruments were installed and data were recorded continuously on strip charts. Environmental observations were expanded in the 1960's to include other physical oceanographic and meteorological variables in addition to temperature. In 1973, the program was transferred to the Maine Department of Marine Resources and computerized data collection, processing, and storage began in 1986.
22. Ongoing
23. N/A
24. N/A
25. N/A

170. MONITORING ALEWIFE RUNS IN NORTHEASTERN MASSACHUSETTS

Program Entry Outline

1. USA
2. Massachusetts
3. Coastal/Freshwater
4. Little River (Gloucester), Saugus River (Saugus), Parker River (Georgetown and Newbury), Ipswich River (Ipswich), Essex River/Alewife Brook (Essex)
5. North Shore Volunteer River Herring Counts
6. Riverways Programs, Massachusetts Audubon Society, Ipswich River Watershed Association, Parker River Clean Water Association, Saugus River Watershed Council, the Eight Towns and the Bay Committee, City of Gloucester
7. Great Marsh Initiative, Anadromous Fish Team
8. http://www.massaudubon.org, http://www.parker-river.org

9. Tim Purinton, Massachusetts Audubon Society (978) 927-1122 ext. 2704 tpurinton@massaudubon.org
10. Build stewardship and awareness, improve habitat, restore historic fish runs, optimize fishery management, evaluate accuracy of volunteer counts vs. actual run statistics
11. Assess condition of river herring runs across a defined region
12. River herring on the North Shore are below historic levels and below potential spawning population totals
13. Expand volunteer counts across Gulf of Maine
14. Funding for outreach, technical and staff assistance
15. Ongoing data and technical collaboration with Massachusetts Division of Marine Fisheries
16. Upstream Migrating Fish (alewife and blueback), Water and Air Temperature, Cloud Cover, Time
17. Thermometer, Onset Data Recorders, Data Sheets
18. 1 or 2 sites per watershed at the furthest downstream point
19. Approx. 150-400 samples per watershed per year
20. 10 minutes per hour intervals during daylight, from approx. April 1 – June 15th
21. Parker River: 1997-2003, Ipswich River: 1999-2003, Little River: 2000-2003, Saugus River: 2003, Essex River-Alewife Brook: 2001-2003
22. Funding till July 1st 2003
23. Blueback Herring (Alosa aestivalis), Alewife (Alosa pseudoharengus)
24. References:
    Belding, D.L., 1921. A report on the alewife fisheries of Massachusetts. Marine Fish. Ser. No. 1. Massachusetts Division of Fish and Game.

    Bigelow, H. and Schroeder, W.C., 2002. Fishes of the Gulf of Maine, 3rd Edition, Smithsonian Institution Press

    Reback, K. and DiCarlo, J. 1970. "Completion Report, Anadromous Fish Investigations", Massachusetts Division of Marine Fisheries

    Stevenson, R., Mountain, D. and Roolf, B. 1999. "Parker River Alewives Count in Massachusetts". Shad Journal, Vol. 4. Number 1, Winter 1999, the Shad Foundation
25. Data available on request in spreadsheet format.

176. NEW HAMPSHIRE ANNUAL EELGRASS DISTRIBUTION

Program Entry Outline

1. SeagrassNet is international in scope, with monitoring sites in 14 countries around the globe, including the Philippines, Indonesia, the USA, Brazil, Australia, and several nations in the Western Pacific.There is a SeagrassNet location in the Gulf of Maine, one of 22 locations around the world and one of two locations within the US.
2. The SeagrassNet site in the Gulf of Maine is located at Fisher's Island in Portsmouth Harbor and is accessed from the town of Kittery, Maine.
3. SeagrassNet involves the long term monitoring of seagrasses and trends in seagrass habitat; seagrasses occur on the coasts of all continents except Antarctica and grow from the intertidal zone to depths of 30m and more in some clear water areas.
4. SeagrassNet monitoring occurs most often in nearshore locations in marine bays, estuaries, and shallow coastlines. In the Gulf of Maine, the SeagrassNet site is located on a shallow intertidal flat vegetated with eelgrass (Zostera marina) within Portsmouth Harbor.
5. SeagrassNet, a Seagrass Monitoring Network
6. Funding for SeagrassNet has come from a variety of sources. The David and Lucile Packard Foundation provided an initial grant to develop the monitoring protocol and to make an initial test of the monitoring project in the Western Pacific. The Packard Foundation continues to fund the program. Other participants in the SeagrassNet program which provide either funding or material support include:
    The University of New Hampshire, and UNH's Jackson Estuarine Laboratory
    The University of Maryland
    The government of Brazil and the University of Rio de Janeiro
    The Northern Fisheries Centre of the Department of Primary Industries,
    Queensland, Australia
    The University of the Philippines
    The University of Dar es Salaam

The Nature Conservancy
The World Wildlife Fund

7. SeagrassNet is a program with many facets: long term monitoring of seagrass habitat to detect trends, but also education of marine scientists and managers throughout the globe about the functions and values of seagrass. Also there is a community element: scientists establishing a SeagrassNet site and training those who will monitor that site make a point of talking with community leaders and members about the value of the seagrass resource and the reasons for SeagrassNet monitoring. Community-based monitoring of seagrasses is now occurring in twelve locations throughout the Western Pacific, with citizens of these locationsmonitoring a suite of seagrass parameters.
8. www.SeagrassNet.org
9. Frederick T. Short, SeagrassNet Project Director, University of New Hampshire, Jackson Estuarine Laboratory, 85 Adams Point Road, Durham, NH 03824 603-862-2175 <fred.short@unh.edu
10. The main goal of SeagrassNet is to implement and expand global monitoring of seagrass habitat with generic methodologies that are used world-wide. The SeagrassNet monitoring protocol is a standardized set of methods which yeild comparable results. Additional goals include: 1)training of SeagrassNet participants, building a scientific monitoring team with the capacity to continue quarterly monitoring and reporting of data after training, 2) ongoing submission of data from across the globe to a web-based SeagrassNet database at the University of Maryland, 3) establishmennt of monitoring sites in each participating country, where quarterly monitoring is conducted along fixed transects within seagrass areas, 4) the inclusion of a community-based monitoring component, with training of community members in a simplified version of the SeagrassNet protocol for ongoing monitoring, and, 5) expansion of the SeagrassNet program to as many countries with seagrass habitat as possible.
11. The purpose of SeagrassNet is to assess change in seagrasses globally, both to determine long term trends in the important seagrass habitat itself and to use seagrass habitat change as a measure of more general trends in global climate and ocean health. In conjunction with long term assessment of the seagrass ecosystem worldwide, SeagrassNet seeks to raise awareness of seagrasses and the many functions seagrass habitat provides within the world's oceans.
12. SeagrassNet to date is a successful monitoring program, providing the foundations for a long-term database that can evaluate the impact of human activity on the coastal ocean as well as global climate change.
13. SeagrassNet seeks to expand within the Gulf of Maine, the US, and globally. SeagrassNet seeks to expand to further countries and to multiple sites within countries. As longer term data is generated and analyzed, SeagrassNet will be producing a "report card" on the global health of the coastal oceans.
14. SeagrassNet seeks long-term funding and consistent support for the program. Additionally, SeagrassNet seeks collaborative institutions and research groups to organize regional monitoring programs.
15. SeagrassNet recruits monitoring teams at all its sampling sites. Teams include graduate students, coastal managers, scientists, community leaders, and staff of laboratories and NGOs. Also, for the community-based monitoring, SeagrassNet recruits and trains people from the community to participate. The SeagrassNet site in the Gulf of Maine is being monitored quarterly by graduate and undergraduate students at the Jackson Estuarine Laboratory, University of New Hampshire.
16. SeagrassNet monitors seagrasses (density, biomass, % cover, canopy height, species compostition, and extent) as well as temperature (continuous data logging), light, and salinity.
17. Detailed materials and methods for SeagrassNet are laid out in Short, F.T., McKenzie, L.J., Coles, R.G. and Vidler, K.P. (2002) SeagrassNet Manual for Scientific Monitoring of Seagrass Habitat (QDPI, QFS, Ciarns) 56pp. Broadly, SeagrassNet monitoring involves measurement of seagrass habitat for distribution, species composition, and abundance. Monitoring includes setting up a permanent transect with three cross-transects in seagrass habitat, taking photographic records and voucher specimens, and measuring seagrass cover, biomass, shoot density, reproductive plant parts, latitude and longitude, the distance to the edge of the bed. Water depth, tidal information, and environmental data (water temperature, salinity, underwater light levels, and sediment characteristics) are also taken.
18. The SeagrassNet sampling sites are located throughout the world, most in the Western Pacific, but with locations in Australia, Africa, Brazil, and the United States in Maryland and Maine.
19. SeagrassNet samples take several forms: seagrass herbarium specimens are collected of various seagrass species. These are pressed and sent to the Smithsonian in Washington, DC. Photographs are taken of sampling quadrats at the permanent stations. Seagrasses are sampled for biomass and shoot density determinations. Sediment samples are taken. Other measurements do not produce a physical sample (salinity measures and visual estimates of seagrass cover, for example) but are important data that becomes part of the SeagrassNet database. In total, 36 samples are collected at each site four times a year.
20. SeagrassNet monitoring occurs quarterly at all established SeagrassNet locations.
21. 2001, 2002, 2003 with plans for continued monitoring at all sites, plus additional sites.

22. Ongoing
23. There are approximately 60 species of seagrass worldwide. SeagrassNet samples all species present at any monitoring location. In the Gulf of Maine, eelgrass (Zostera marina L.) is monitored at the SeagrassNet site. Shoalgrass (Ruppia maritima) is a seagrass species found in the Gulf of Maine.
24. References

Short, F.T. and R.G. Coles. 2001. Global Seagrass Research Methods. Elsevier Science B.V., Amsterdam.

Short, F.T., McKenzie, L.J., Coles, R.G. and Vidler, K.P. (2002) SeagrassNet Manual for Scientific Monitoring of Seagrass Habirat (QDPI,QFS, Ciarns) 56pp.

Short, F.T., R.G. Coles, E.Koch, and M. Fortes. 2002. SeagrassNet: Western Pacific Pilot Seagrass Monitoring Project. Year 1 Report. University of New Hampshire. 31pp.

Green, E.P. and F.T. Short (eds.) 2003. World Atlas of Seagrasses: Present Status and Future Conservation. University of California Press. Berkeley.

25. N/A

204. OPEN OCEAN AQUACULTURE DEMONSTRATION PROJECT MONITORING PROGRAM

Program Entry Outline

1. United States
2. New Hampshire
3. Marine
4. New Hampshire inner continental shelf
5. University of New Hampshire Open Ocean Aquaculture Project Environmental Monitoring Program
6. National Oceanic and Atmospheric Administration and the University of New Hampshire Cooperative Institute for New England Mariculture and Fisheries (CINEMAR)
7. Open Ocean Aquaculture Project
8. http://cinemar.unh.edu/; http://ooa.unh.edu
9. Larry G. Ward, Department of Earth Sciences and Jackson Estuarine Laboratory, University of New Hampshire, Durham, NH 03824, Tel 603 862-2175, lgward@cisunix.unh.edu
10. Open ocean aquaculture activities on the New Hampshire shelf requires an understanding of the geology and biology of the seabed (substrate characteristics), as well as the physical and water quality characteristics of the water column. The goal of this project is to describe the benthic environment (surficial geology, benthic organisms), physical oceanography, and water quality in the vicinity of the New Hampshire Open Ocean Aquaculture Project field site and to monitor the area to determine if any environmental changes occur.
11. See #10
12. Detailed descriptions of the field area (geology, physical oceanography, water quality and benthic environments) and the results of environmental monitoring to date are available in technical reports and publications listed on the UNH CINEMar and OOA web sites.
13. The environmental monitoring program is part of the infrastructure of the UNH Open Ocean Aquaculture Project and will continue as part of that program to meet permitting and environmental needs.
14. N/A
15. N/A
16. Benthos: benthic organisms (infauna and epifauna), sediment grain size, sediment organic content; Water Quality: suspended sediments, chlorophyll, dissolved nutrients; Physical oceanography: currents, waves, water temperature, conductivity, salinity, density, dissolved oxygen, light transmissivity, fluorescence, and photosynthetic available radiation
17. A complete description of the methodologies are given in the environmental monitoring reports on the UNH OOA web site.
    - Benthos: Surficial sediments were collected using either a box corer or a grab sampler. Infauna (> 0.5 mm mesh sieve) from each sediment sample were normally identified to the level of Family. A subsample from all samples was analyzed for organic content (loss-on-ignition). Grain size was determined on selected samples. Grain size was determined by standard sieve and pipette analyses as described by Folk (1980). The organic fraction of each sample was estimated by loss-on-ignition (LOI) after Ball (1964).
    - Water Quality: Water samples were collected with Niskin bottles and analyzed for total suspended sediments, particulate organic matter (loss-on-ignition), chlorophyll a, and dissolved inorganic nutrients (ammonium, nitrate-

nitrite, phosphate) following procedures described in Strickland and Parsons (1968), Lachat Instruments (1991), Langan (1992a, b), and Wolf and Langan (1992).

- Physical Oceanography: The physical characteristics of the water column were determined with Sea-Bird instruments SBE-37, SBE16p, SBE16, and SBE-25 with integrated sensors. Water temperature, conductivity, salinity, density, dissolved oxygen, light transmissivity, fluorescence, and photosynthetic available radiation were measured. Temporal characteristics of the water column were observed with an environmental mooring system deployed at the OOA field site that measured surface wave characteristics, water current velocity, water temperature, salinity, turbidity and fluorescence over various time periods.

18. The primary sampling area is located is located ~2 km south of the Isles of Shoals (White Island) and approximately ~12 km southeast of Portsmouth Harbor, New Hampshire. Water depths at the field site are between 50 to 55 meters.
19. During each cruise normally between 5 and 8 stations were sampled for benthos, 1 to 3 for water quality, and 1 to 10 for physical characteristics.
20. Benthos and water column sampling has been done from monthly to every three months. The instrument buoy has been deployed periodically since 1999.
21. 1997 through present
22. Ongoing
23. N/A
24. References:

Ball, D.F. 1964. Loss-on-ignition as an estimate of organic matter and organic carbon on non-calcareous soils. Journal of Soil Science 15:84-92.

Folk, R.L. 1980. Petrology of Sedimentary Rocks. Hemphill Publishing Company, Austin, Texas, 185 pp.

Lachat Instruments. 1991. Operating Manual for the Quick Chem Autoanalyzer, Lachat Instruments. Milwaukee, Wisconsin.

Langan, R. 1992a. UNH JEL SOP 1.05, Standard operating procedure for water sampling for suspended solids, chlorophyll, and nutrients. In: Mueller et al. (eds.) Standard Operating Procedures and Field Methods Used for Conductinig Ecological Risk Assessment Case Studies. USEPA, US Navy (NRaD) Technical Document 2296.

Langan, R. 1992b. UNH JELSOP 1.06, Standard operating procedure for water sampling for water sample filtration and analysis of total suspended solids, chlorophyll, and phaeopigments. In: Mueller et al. (eds.), Standard Operating procedures and Field Methods Used for Conductinig Ecological Risk Assessment Case Studies. USEPA, US Navy (NRaD) Technical Document 2296.

Strickland, J.D.H. and T.R. Parsons. 1968. A Practical Handbook of Seawater Analysis. Fisheries Research Board of Canada, Ottawa.

Wolf, J. and R. Langan. 1992. UNH JEL 1.08, Standard operating procedure for water sampling for analysis of seawater samples for phosphate using wet chemistry. In: Mueller et al. (eds.) Standard Operating Procedures and Field Methods Used for Conducting Ecological Risk Assessment Case Studies. USEPA, US Navy (NRaD) Technical Document 2296.

25. N/A

232. NYPA ICHTHYOPLANKTON AND JUVENILE FINFISH SAMPLING

Program Entry Outline

1. United States
2. New York
3. Marine/estuary
4. Raritan Bay, New York Harbor, lower Hudson River, East River, Long Island Sound
5. New York Power Authority ichthyoplankton and juvenile fish sampling
6. New York Power Authority
7. Assessment of power plant effects
8. None
9. Dennis Dunning, Ph.D., New York Power Authority, 123 Main Street, White Plains, New York 10601, Tel. 914 681-6401, dennis.dunning@nypa.gov
10. Determine the spatial and temporal distribution of ichthyoplankton and juvenile fish in Raritan Bay, New York Harbor, lower Hudson River, East River, and Long Island Sound. The data will be used to calculate conditional mortality rates for

ichthyoplankton entrained and fish impinged at the Charles Poletti Power Plant on the East River in New York City.

11. The numbers of ichtyoplankton entrained are estimated to be in the hundreds of millions and the fish impinged are estimated to be in the hundreds of thousands, annually. The purpose of the study is to give perspective to those numbers by calculating the fractional reduction in abundance at the end of the first year of life, absent density dependent effects, based on the relative abundance of ichthyoplankton and fish collected in Raritan Bay, New York Harbor, lower Hudson River, East River, and Long Island Sound.
12. Preliminary spatial and temporal distributions of ichthyoplankton and juvenile fish have been prepared. Additional data analyses are underway.
13. Data were collected in 2002 and were scheduled to be collected in 2003 and 2004. However, no data will be collected in 2003 and 2004 because an agreement was reached to close the Poletti Power Plant by 2010 unless significant co-funding is obtained.
14. Significant co-funding for field sampling in 2003 and 2004.
15. No additional field sampling is scheduled but all samples collected in 2002 have been archived.
16. Water quality: Water temperature, dissolved oxygen, and salinity. Biological: Ichthyoplankton and juvenile fish.
17. Water quality: Yellow Springs Instruments (YSI) Model 85 handheld monitor. Biological: 1-m2 epibenthic sled, 1-m2 Tucker trawl, 3-m beam trawl, and baited traps.
18. Randomly selected from within three depth strata and nine geographic regions.
19. A total of 100 epibenthic sled samples and 100 Tucker trawl samples were collected during each surevey. Epibenthic and Tucker trawl sampling was conducted in three depth strata and nine geographic regions.
20. 11 biweekly surveys from March through July.
21. 2002
22. Field sampling for 2003 and 2004 has been cancelled.
23. N/A
24. N/A
25. N/A

240. ADULT AMERICAN SHAD AND RIVER HERRING MONITORING

Program Entry Outline

1. US
2. Rhode Island
3. Freshwater/Coastal
4. (also covers #12, 15, 17, 18, 20, 21)
   Annaquatucket River: River herring
   Biweekly adult monitoring(observations), spring
   Juvenile abundance index (Trap). 1999-2001, fall
   Gilbert Stuart/ Pausacaco Pond: River herring
   Daily adult counts (electronic fish counter or direct counts) 1986-present, spring
   Juvenile abundance index (trap) 1988-1992 (observations) 1993-present, fall
   Hunt River: River herring
   Biweekly adult monitoring(observations), spring
   Nonquit Pond/Almy Brook: River herring
   Daily adult counts (solar operated electronic fish counter) 1998-present, spring
   Juvenile abundance index (trap) 1998-present, fall
   Saugatucket River: River herring
   Biweekly adult monitoring(observations), spring
   WarwickPond/ Buckeye Brook: River herring
   Volunteer based direct count program for monitoring returning adults, spring
   Wood/ Pawcatuck River: River herring / American shad
   Daily adult counts (daily direct counts for RH and AS, captured in the fish ladder trap)79-present
   Juvenile abundance index (seine survey) 1986-present (electrofishing) 1998-present, fall
   In addition, river herring and American shad are sampled from the systems mentioned above for biological data.
5. Restoration and Establishment of Sea Run Fisheries

6. RI Department of Environmental Management, Division of Fish and Wildlife
7. N/A
8. N/A
9. Phillip Edwards, RIDEM/F&W, PO Box 218, West Kingston RI 02892
10. To restore or create self-sustaining runs of American shad and river herring to selected river systems in Rhode Island and to manage them for maximum public benefit.
11. See #10
12. Monitoring results are reported each year in Federal Aid Sportfish Restoration performance reports.
13. This monitoring program is renewed every five years.
14. Obtain additional adult river herring brood stock to transplant into restored systems.
15. Water level, temperature, and dissolved oxygen are recorded on a routine basis at various systems.
16. N/A
22. On going
23. American shad (Alosa sapidissima), River herring=alewife (Alosa pseudoharengus) and blueback herring (Alosa aestivalis)
24. References:

Edwards, P.A. 2001. Restoration & Establishment of Sea Run Fisheries. Performance Report. F-26-R-35. Rhode Island Division of Fish & Wildlife. 29p.

Gibson, M.R. 1992. Alewife Restoration Studies. Performance Report. Project F-26-R-27. Rhode Island Division of Fish & Wildlife. 59p.

O'Brien, J.F. 1986. Shad Restoration Studies. Performance Report. Project F-26-R-2. Rhode Island Division of Fish & Wildlife. 15p. Appendix.

Powell, J.C. 1997. Restoration & Establishment of Sea Run Fisheries. Performance Report. F-26-R-32. Rhode Island Division of Fish & Wildlife. 25p.

25. Marine monitoring programs include net surveys (trawl, gillnet, fyke net) which record alosid data in Narragansett Bay and Block Island Sound. The division has operated a truck and transplant restocking program for restoring river herring and American shad to extirpated systems since 1966.

249. BEACH MONITORING PROGRAM

Program Entry Outline

1. United States
2. Rhode Island
3. Marine and Freshwater
4. Atlantic Ocean, Beach Pond, Bowdish Reservoir, Browning Mill Pond, Butterfly Pond, Carr Pond, Cedar Pond, Cookie Pond, Coomer's Pond, Flat River Reservoir, Georgiaville Pond, Gorton's Pond, Gorton Pond, Gosham Farm Pond, Greenwich Bay, Hope Pond, Killingly Pond, Lake Adams, Lake Aldersgate, Larkin's Pond, Little Nini Pond, Little Pond, Mishnock River, Mount Hope Bay, Narragansett Bay, Narrow River, New Pond, Oak Swamp Reservoir, Olney Pond, Pascoag Reservoir, Point Judith Pond, Sakonnet River, Sand Pond, Saw Mill Road Pond, Schoolhouse Pond, Slack's Pond, Social Pond, Spring Lake, Tiogue Lake, Upper Sprague Reservoir, Wakefield Pond, Watchaug Pond, Waterman Lake, Wenscott Pond, Worden Pond, Yawgoog Pond
5. Rhode Island Department of Health Beach Monitoring Program
6. US Environmental Protection Agency
7. BEACH Program
8. http://www.health.state.ri.us/environment/beaches/index.html
9. **National:** Charles Kovatch, USEPA, 1200 Pennsylvania Ave. NW - 4305T, Washington DC 20460, T:202-566-0399, F: 202-566-0409

   Region 1 Contact: EPA Region 1, Matt Liebman, BEACH Program Coordinator, U. S. Environmental Protection Agency, Region 1, One Congress St. Ste. 1110 - CWQ, Boston, Massachusetts 02114-2023, Phone (617) 918-1626, liebman.matt@epa.gov

   Rhode Island Contact: David Burnett, Beach Program Administrator, 3 Capitol Hill, Room 203, Providence, Rhode Island 02908, (401) 222-7727, (401) 222-4775 fax, davidb@doh.state.ri.us
10. This program is monitoring bacteria levels at licensed bathing beaches throughout the state of Rhode Island. Beach are sampled at varying frequency and intensity according to historical results, distance from known sources of contamination,

length of coastline monitored, and the annual number of bathers. Beach water quality is evaluated through state water quality standards and if waters violate this standard, the facility is closed until water quality standards are met.

11. The Rhode Island Department of Health's Beach Monitoring Program intends to minimize the public health threats associated with swimming in contaminated bathing waters. To accomplish this goal the Beach Monitoring Program targets areas of highest risk to the public.
12. Levels of bacteria in Rhode Island's beaches are related to rainfall, CSO's, and the presence of waterfowl. In periods of dry weather water quality at beaches is consistently within acceptable limits. In periods of wet weather, decreased water quality warrants the closure of several beaches located in the upper reaches of Narragansett Bay and Greenwich Bay.
13. The Beach Monitoring Program has secured funding through the 2003 season, and expects to have several additional years of funding available. Rhode Island is currently testing bathing waters for fecal coliform and enterococci. Starting in the 2004 bathing season Rhode Island will be using the EPA recommended indicator of enterococci to monitor beaches. One more season of baseline enterococci data is needed before the change in indictors will be made.
14. This monitoring program is limited to its federal budget. No state funds are currently allocated to monitoring beaches in the State of Rhode Island. The available federal funding does not provide money to monitor freshwater beaches.
15. All bacteria samples collected through the Beach Program are available through our website (http://www.health.state.ri.us/environment/beaches/index.html) or by contacting the program administrator.
16. Water Quality: fecal coliform, enterococci
17. Samples were collected, stored, transported, and processed according to an EPA approved Quality Assurance Project Plan.
18. There are approximately 250 sample stations at licensed beaches throughout Rhode Island. For lat/longs of those locations please contact the program administrator.
19. The number of samples per beach varies according to the length of coastline monitored. There are approximately 1500 grab samples collected annually, each grab sample is test for both fecal coliform and enterococci.
20. Samples are collected May to September. Each beach is sampled at a varying frequency according to conditions (frequencies range from monthly to four times weekly).
21. 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003(expected)
22. Ongoing-contingent on federal funding
23. N/A
24. N/A
25. N/A

261. JUVENILE AMERICAN SHAD AND RIVER HERRING MONITORING

Program Entry Outline

1. US
2. Rhode Island
3. Freshwater/Coastal
4. Also covers #12, 15, 17, 18, 20, 21.

Annaquatucket River: River herring
Biweekly adult monitoring(observations), spring
Juvenile abundance index (Trap). 1999-2001, fall
Gilbert Stuart/ Pausacaco Pond: River herring
Daily adult counts (electronic fish counter or direct counts) 1986-present, spring
Juvenile abundance index (trap) 1988-1992 (observations) 1993-present, fall
Hunt River: River herring
Biweekly adult monitoring(observations), spring
Nonquit Pond/Almy Brook: River herring
Daily adult counts (solar operated electronic fish counter) 1998-present, spring
Juvenile abundance index (trap) 1998-present, fall
Saugatucket River: River herring
Biweekly adult monitoring(observations), spring
Warwick Pond/ Buckeye Brook: River herring
Volunteer based direct count program for monitoring returning adults, spring
Wood/ Pawcatuck River: River herring / American shad

Daily adult counts (daily direct counts for RH and AS, captured in the fish ladder trap)79-present
Juvenile abundance index (seine survey) 1986-present (electrofishing) 1998-present, fall.

In addition, river herring and American shad are sampled from the systems mentioned above for biological data.

5. Restoration and Establishment of Sea Run Fisheries
6. RI Department of Environmental Management, Division of Fish and Wildlife
7. N/A
8. N/A
9. Phillip Edwards, RIDEM/F&W, PO Box 218, West Kingston RI 02892
10. To restore or create self-sustaining runs of American shad and river herring to selected river systems in Rhode Island and to manage them for maximum public benefit.
11. See #10
12. Monitoring results are reported each year in Federal Aid Sportfish Restoration performance reports.
13. This monitoring program is renewed every five years.
14. Obtain additional adult river herring brood stock to transplant into restored systems.
16. Water level, temperature, and dissolved oxygen are recorded on a routine basis at various systems.
19. NA
22. On going
23. American shad (Alosa sapidissima), River herring=alewife (Alosa pseudoharengus) and blueback herring (Alosa aestivalis)
24. References:

Edwards, P.A. 2001. Restoration & Establishment of Sea Run Fisheries. Performance Report. F-26-R-35. Rhode Island Division of Fish & Wildlife. 29p.

Gibson, M.R. 1992. Alewife Restoration Studies. Performance Report. Project F-26-R-27. Rhode Island Division of Fish & Wildlife. 59p.

O'Brien, J.F. 1986. Shad Restoration Studies. Performance Report. Project F-26-R-2. Rhode Island Division of Fish & Wildlife. 15p. Appendix.

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25. Marine monitoring programs include net surveys (trawl, gillnet, fyke net) which record alosid data in Narragansett Bay and Block Island Sound. The division has operated a truck and transplant restocking program for restoring river herring and American shad to extirpated systems since 1966.