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Information About Estuaries and Near Coastal Waters

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In this issue....

As we mentioned in *Coastlines 6.2*, Coastal Zone 97, perhaps the premier international symposium on coastal and ocean management, will be held in Boston, Massachusetts from July 20-26, 1997.

The goals of the conference are to reach out to a broad range of domestic and international participants to encourage them to address the increasing challenges of coastal management by sharing lessons learned from the past, and by identifying innovative and effective approaches of addressing unresolved issues for the future. Conference participants will include public and private policy makers, non-governmental organizations, planners, educators, industrialists, managers, and academics.

Three of the major themes emerging for the Conference Plenary Sessions include:

- Coastal Change and Public Health
- Sustainable Development along the Coast: Can it really be achieved?
- Rethinking Coastal Management

As a prologue to CZ'97, and because they are important issues to coastal managers everywhere, we will be devoting the next three issues of *Coastlines* to these topics.

In this issue, we address several aspects of Coastal Change and Public Health. Worldwide, vast numbers of people are flocking to an increasingly crowded and polluted coastal zone. Most of the world's largest cities are located on or near the coast, but even outside the cities, shorelines and coastal areas are crowded. Nearly 280 million people live in the United States and more than half live in the 10% of the land area which is incorporated into our coastal counties. The average population density has been reported to be almost 5 times greater in coastal counties than in non-coastal counties.

This density often brings with it contamination of coastal waters, be it from pathogenic bacteria or viruses, toxic chemicals, or excessive nutrients. Each of these can have public or environmental health consequences, often detrimental. The articles in this issue of *Coastlines* touch on various aspects of this important concern.

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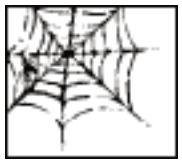

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Impervious Surface Coverage:
The Emergence of a Key Environmental Indicator

Water resource protection at the local level is getting more complicated, largely due to growing recognition of the threat of nonpoint source pollution, or polluted runoff. As nonpoint source pollution programs cascade down from federal to state to local governments, the technical complexities involved with combating this threat are further complicated by regulatory and management considerations.

How do local officials get a handle on protecting their local water resources? While no magic bullet exists to simplify all the complexities involved, an indicator is emerging from the scientific literature that appears to have all the earmarks of a useful tool for local officials--impervious surface coverage.

Impervious surfaces can be defined as any impenetrable material that prevents infiltration of water into the soil. While rooftops, roads and parking lots are the most prevalent and easily identified impervious surface, the list also includes sidewalks, patios, bedrock outcrops, and compacted soil. As development alters the natural landscape, the percentage of the land covered by impervious surfaces increases, initiating a chain of events that begins with alterations in the hydrologic cycle, works its way through physical and ecological impacts on riparian areas, adds on water pollution, and culminates in degraded water resources.

Pavement, Pollution, and Planning

Local officials wishing to protect their community's water resources against these threats may not know where to begin. Addressing polluted runoff seems to demand extensive technical information on such complex matters as pollutant levels, hydrologic models, and the specifications of an intimidating array of pollution control measures. This information is often difficult for local officials to acquire, let alone understand and use.

Enter impervious surface coverage. While this one factor cannot solve all problems, as a feasible and cost-effective indicator of water pollution it can often provide a solid foundation for a plan of action. Two major factors argue for the utility of impervious coverage to local officials attempting to address the twin issues of land use and water quality. First, imperviousness is integrative, indicating cumulative water resource impacts without regard to specific factors. Research from the past 15 years consistently shows a strong correlation between the imperviousness of a drainage basin and the health of its receiving stream. Second, impervious coverage is a readily identified, measurable aspect of the landscape, facilitating its use in both in planning and regulatory applications.

Strategies making use of impervious coverage can be grouped into three basic categories: community or watershed planning, site planning, and regulation. Researchers at the University of Connecticut have developed a project that operates on the community/watershed level. The *Nonpoint Education for Municipal Officials* (NEMO) project, funded by the United States Department of Agriculture's Cooperative State Research, Education and Extension Service, uses geographic information system (GIS) technology as a tool to educate local land-use decision-makers about the links between their town's land use and water quality.

At the heart of NEMO is an analysis of impervious cover. Current impervious coverage, estimated from satellite or aerial photo-based land cover, is contrasted with projected levels derived from a zoning-based build-out analysis [See *Coastlines* Issue 6.2, Spring 1996. Ed.]. The build-out allows town officials to visualize a possible future of their town, not in conventional terms of population or buildings, but in terms of impervious cover--and, by inference, the health of local water resources. Results of the impervious surface analysis can then help guide planning goals for local drainage basins.

At a finer scale, site planning is perhaps the least-explored approach to reducing water pollution. Impervious surface reduction and mitigation should be a key element of site planning. For example, reducing road widths is one of the best opportunities for reducing imperviousness in residential areas, while in commercial and industrial zones a major focus should be on reduction of parking areas. A viable consideration for many areas involves pervious alternatives to traditional pavement. These alternatives include various mixes of asphalt with larger pore spaces (e.g., "popcorn" mix), and systems based on open-framework pavers filled with sand, gravel, or turf.

Planning and design approaches can be reinforced with complementary regulations. Local officials can begin by reviewing their current land use regulations with an eye to imperviousness; for instance, many lot coverage limits, particularly for residential uses, refer to rooftops but do not include other impervious

areas like parking, sidewalks, and driveways. Where protection of a particularly important resource is desired, some local governments have imposed strict impervious coverage limits. Yet another regulatory approach gaining favor is the imposition of a tax or "impact fee" on impervious areas through a stormwater utility assessment, which uses impervious coverage as the basis for a rate structure that fairly distributes the cost of water treatment according to a property's contribution to runoff.

Integrating Water Resource Protection Into Community Planning

Making the connection between impervious coverage and water pollution often allows local officials to better see how protection of water resources relates to other issues currently "on the table." Road widths and curbing might be under discussion for reasons of cost or neighborhood character; landscaping requirements for commercial zones may be undergoing reexamination for aesthetic reasons; "big box" retailers may be a hot topic, with arguments centered around traffic congestion and the impact on local merchants--for all of these debates, water resource protection can be more easily folded into the mix through the connection of impervious coverage.

Cross connections of this type are important to ensuring implementation of any local initiative. For the professional planner, they create opportunities to reinforce complementary planning concepts from several different angles. Beyond the well-established concept of planning and designing with nature championed by Ian McHarg and others, there are many recent trends in transportation planning, subdivision design, and landscape architecture that go hand-in-glove with the reduction of impervious surfaces. Performance zoning is one example, as is "neotraditional" residential design, which promotes development patterned after traditional villages as a way to foster a sense of community. The open space subdivision designs promoted by Randall Arendt and others for land conservation are also a good fit, as are residential street layouts promoting "traffic calming" for a variety of safety, aesthetic, and sociological benefits.

Local officials should seize the opportunity to "piggy-back" water quality with these complementary initiatives, emphasizing the reduction of paved surfaces and their impacts in official policies, plans, and procedures. A further benefit of most of these initiatives is that while providing a "greener" alternative, they also frequently reduce the costs--fiscal, social, and psychological--associated with suburban sprawl-type development.

One last advantage of the cross-cutting nature of impervious coverage is that it seems to make sense to the average citizen. From our standpoint as educators, this feature is critical to the success of any local planning initiative. Education of citizens and local officials on the issues is a necessary and integral part of the process of changing land-use procedures. Volunteer commissioners on local land-use boards are particularly important.

In our experience, almost any narrowly-framed issue or problem (environmental or otherwise) brought before busy city, town, or county boards is already operating with two strikes against it. Few issues are isolated, yet they are frequently presented to communities as such, reflecting not the nature of community planning but that of regulatory agencies. A regional planner we work with has called this the

"environmental flavor of the month" syndrome. The result is that even legally mandated initiatives may be doomed to failure by the sheer inertia involved in integrating new and complex information into the busy world of local land-use decision-making.

Framing the issue of nonpoint source pollution in terms of imperviousness appears to be an effective way of enabling local decision-makers to grasp a complex issue sufficiently to take action. With imperviousness as a foundation, planning that begins with water resources often leads to character, design, and aesthetic issues that, taken together, define much of the overall quality of life in a community.

For further information about any of the issues raised in this article, contact Chester Arnold or Jim Gibbons at the University of Connecticut Cooperative Extension System, (860) 345-4511. Mr. Arnold may alternatively be contacted through his e-mail address; carnold@canr1.cag.uconn.edu. This article is adapted and condensed from an article published in the Journal of the American Planning Association 62(2), Spring 1996. For a copy of the full-length article (including references), contact either Mr. Arnold or Mr. Gibbons.

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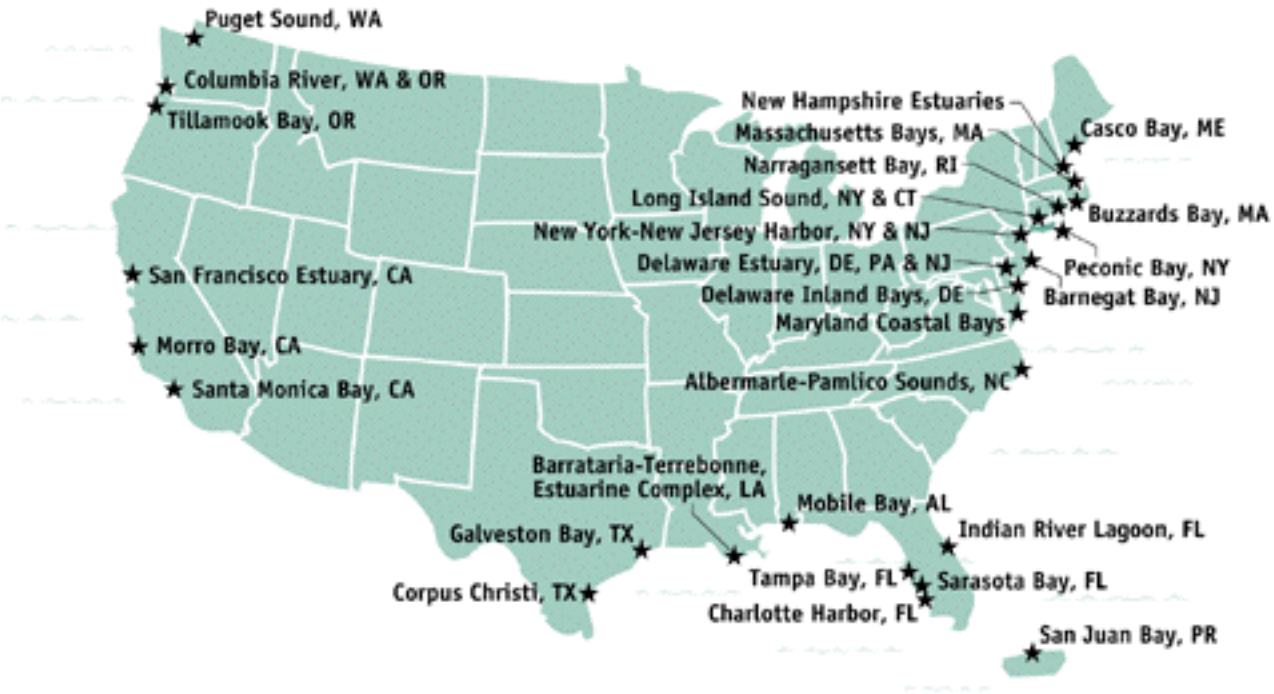
Association of National Estuary Programs Forms

The Association of National Estuary Programs, or ANEP, is a newly organizing, not-for-profit group whose purpose is to promote responsible stewardship and a common vision for the preservation of our nation's bays and estuaries. The Association plans to implement this national agenda by educating coastal constituents and decision-makers about estuarine issues and successful citizen efforts nationwide. Members include interested citizens, scientists, and agency staff involved in National Estuary Programs (NEPs) nationwide.

The mission of today's 28 NEPs is to develop and implement Comprehensive Conservation and Management Plans (CCMPs) for a network of "estuaries of national significance". The NEP process is "stakeholder-driven" and largely focused on the promotion and strengthening of public-private partnerships in resource management. Local citizen volunteers guide the development and implementation of these plans and work to leverage federal and state dollars with contributions from local governments and the private sector.

The NEPs work closely with coastal zone management and other programs to coordinate initiatives at the state level. Association members believe there is much to be gained from a more concerted effort to enhance that coordination at the national level as well. While the NEPs are truly "local programs", they face many common challenges that may best be addressed collectively.

In particular, the programs have identified a need to carry over the strong public/private partnerships created during the development of the management plans into the long-term implementation stage as a means to ensure that agreed-upon actions are carried out, change in the estuaries are monitored, and actions are redirected, as needed. It is also recognized that the exchange of information among the NEPs about approaches to resolving environmental and programmatic issues has proven valuable to all the programs, and a mechanism for more effective intercommunication is needed. Through ANEP, communication will be increased among the NEPs and with the larger resource management community in order to share the expertise and practical experience gained in the NEPs.



Mission of the Association of National Estuary Programs
Promote the formation and strengthening of the public/private partnerships that are key to the successful development and long-term implementation of the CCMPs.
Increase local, regional, and national support for developing and implementing CCMPs by educating constituents and decision-makers about estuarine issues, successes made by the NEPs in solving problems of the estuaries, the effectiveness of forming public/private partnerships in decision-making, and opportunities to participate in implementation of the CCMPs.
Coordinate information exchange among the NEPs regarding common environmental and programmatic issues, and opportunities for coordinating with other coastal-related programs to further the goals for the CCMPs.

Share the expertise and practical experience gained through the NEP in addressing technical, institutional, and political issues to other resource managers that will be useful in ensuring the long-term environmental and economic viability of those areas.

For more information, contact Richard Volk, Chair, Association of National Estuary Programs c/o CCBNEP, Natural Resources Center, #3300 6300 Ocean Drive, Corpus Christi, TX 78412, phone:(512)980-3420,fax: (512) 980-3437, e-mail:rvolk@tnrcc.state.tx.us

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DNA Library Would Give Investigators Inside Poop on Pollution Sources

Reprinted with permission from the Bay Journal, September 1996 issue.

Criminologists use DNA fingerprinting from blood, pieces of hair, bones, and other body parts to link suspects to a crime scene. So why not use DNA to identify the source of fecal material entering waterways? As unsavory as that may sound, it is something that researchers are beginning to do.

Such technologies could help pinpoint some sources of pollution that in the past have been written off as unidentifiable "nonpoint" sources.

George Simmons, a scientist with Virginia Tech, and colleagues are working at developing a "DNA library" that catalogs the kinds of *Escherichia coli* associated with wastes from humans and animals.

E. coli is a type of fecal coliform, or bacteria, found in the wastes of all warm-blooded animals. There are thousands of different strains of *E. coli*, some of which are harmless to humans. Some can cause sicknesses such as diarrhea, while others can cause fatal internal hemorrhaging. Different strains of *E. coli* are associated with different animals.

Simmons recently spent two years trying to find the source of contamination to a shellfish bed on a Virginia Eastern Shore creek. In that case, it was assumed that faulty septic systems were the source of pollution; it turned out to be an out-of-control population of wild animals. Identifying the source of pollution--and taking action to correct it--would have been quicker and easier if the source of *E. coli* collected from the water could have been identified.

Simmons suspects that shellfish bed contamination in many rural areas is caused not by septic systems, but by an overabundance of animals. "I have come to the conclusion that when I find elevated fecal coliforms, that tells me that there is one or more populations of animals out of control in the watershed," he said. "I may not know what it is, but we're working on it.

Scientists using DNA technology in an urban Seattle watershed with elevated *E. coli* levels had a similar surprise. Instead of linking the pollution to leaking sewer lines as was suspected, they found that animals, particularly household pets, were the culprits. The largest single source, they reported, resulted from people dumping pans of kitty litter on the ground and from wild cats.

What that means, Simmons said, is that money spent looking for sewer problems in that area would be better spent on public education efforts. Not all the animal sources in the Seattle watershed could be identified, but with more work, scientists may ultimately be able to comprehensively catalog what strains of *E. coli* are associated with what animals.

With that information, water quality managers may not only be able to identify previous anonymous sources of pollution, but they may be better able to assess the risk posed by different sources of contamination. Bacteria associated with the wastes of some animals, for example, may pose little risk to humans.

But Simmons cautioned that while science and technology may help identify pollution sources, the more difficult task is getting society to solve the problems.

"What do we do when several of the citizens in the watershed say they don't want the animals trapped or shot and prefer to sacrifice the water quality because no one is using it for economic gain anyway?" Simmons asked. "In other words, why kill the animals just for the sake of reducing the fecal coliform numbers?"

Similarly, he asked, what will happen in urban areas where cats and dogs are contributing to the problem? How many homeowners will now empty their kitty litter pans into a garbage bag and scoop their doggie-do and do likewise? If we can't educate citizens to reduce fertilizer loading on lawns, will we have any more success getting them to voluntarily take care of their pet poop?"

"This question is not unique to the fecal coliform issue," he added, " but somehow it must be addressed and answered if we are ever to save the bay."

For more information on this issue, contact the Alliance for Chesapeake Bay, 6600 York Road, Suite 100, Baltimore, MD 21212, (410) 377-6270, e-mail: acb@ari.net.

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Tracking Nonpoint Pollution in a Multi-Use Watershed at the Hudson River NERR

Best Management Practices, or BMPs, implemented to reduce nonpoint source pollutants in any given watershed, are usually selected based on the assumption that the dominant land use is the principal source of the target pollutants. This approach is necessitated by the costliness of water chemistry analysis but runs the risk that the real pollutant source may be "missed" and measurable improvement may not result from the effort. Identifying the dominant sources of nonpoint pollution in a watershed before BMPs are selected and implemented increases the likelihood that the management effort will eliminate those sources contributing most to local water quality problems.

Research suggests that most streams in the U.S. receive the majority of their nitrogen and phosphorus from nonpoint sources. Identifying these sources of nutrient pollution in a watershed dominated by a single land use is fairly straightforward, and management decisions can be based on assumptions with a high degree of confidence. But multi-use watersheds, mosaics of diverse land-use types, demand a different approach. This is also supported by the fact that in many parts of the country atmospheric deposition has been shown to be a major contributor to nitrogen loading. This makes separating local from regional sources considerably more difficult.

Water resource managers can identify sources of pollution by following the response of watershed streams to dissolved chemicals during a storm. Increased concentrations of dissolved nutrients in streams may be attributed to nonpoint inputs during precipitation and decreased concentrations to dilution by precipitation of continual point source inputs. Consequently, watershed planners can track the chemical response of a stream to a storm to determine which sources of pollution predominate in a watershed. By choosing water sampling locations within a watershed that correspond to watershed sub-catchments dominated by a particular land use, managers can use stream storm response to distinguish between multiple nonpoint sources.

Such an approach was used by the Hudson River National Estuarine Research Reserve in the Saw Kill drainage basin, a 26.6 square mile watershed in Dutchess County, New York. The major land uses/cover types in the watershed include forested (51.1%, predominantly deciduous), agriculture (25.8%, mostly hayfield, row crop, pasture, and orchard), and urban (16.5%, mostly low and medium density residential). Wetlands, ponds, and streams make up the remaining 6.6%.

From April through November 1993, the chemical response of surface waters in the Saw Kill watershed to storms was studied. Eight sampling sites were selected using a geographic information system for the watershed developed by Beth Reichheld and Dr. Paul Barten at the Yale School for Forestry and Environmental Studies. Five sampling sites were located within sub-catchments dominated by each of five major land uses in the watershed: forested, row crop agriculture, orchard agriculture, residential, and solid waste disposal (landfill). The remaining sampling sites were located on the mainstem of the Saw Kill to identify cumulative responses of the stream to storm events as the stream passed from a forested area through multiple land use/cover type areas.

Sampling was conducted before and for several (3-6) days following major spring and fall storms. Dissolved oxygen, salinity, conductivity, temperature, and stream flow were measured with field meters. Water samples were laboratory analyzed for total nitrates, phosphates, sulfates, chlorides, and suspended solids.

Storm event monitoring in the Saw Kill watershed helped to identify residential lands, which make up 16.5% of the watershed, as the major contributors of nitrates. Residential lands were also highly linked to the observed phosphate concentrations. The residential sub-catchment contributed the highest nitrate loading and had the highest concentrations of phosphates and nitrates during an April rain event. The response of nitrate concentrations in surface waters draining the residential sub-catchment indicated a point source was responsible (concentrations dropped through dilution after the rain, then rebounded), but, since there are no municipal or industrial point sources in the area, a single input was unlikely. However, all of the homes in this sub-catchment, as well as in the entire watershed, are on septic systems, which effectively act as continual point sources of nitrate associated with each home. This sewage source of nitrate is consistent with other studies that have shown sewage loading within watersheds to have a great influence on nitrate concentrations exported from their rivers.

Phosphate concentrations were also positively correlated with residential land use, but the concentration

of phosphate increased with precipitation, pointing to an origin other than septic systems. This typical nonpoint source response may be a reflection of home lawn and garden practices associated with residential land use.

With such monitoring data in hand, the Hudson River Research Reserve and New York State Department of State's Coastal Zone Management Program have embarked on a joint nonpoint source education project focusing on septic system impacts on water quality in the Saw Kill. Other cooperating partners in the project include New York Sea Grant, the Water Quality Coordinating Committees from Dutchess and Columbia counties, as well as the Columbia County Planning Department, the Dutchess County Soil and Water Conservation District, the Dutchess County Environmental Management Council/Cornell Cooperative Extension, and the Red Hook Conservation Advisory Committee.

For more information on this project, its scientific bases, or the Hudson River National Estuarine Research Reserve, contact Dennis Mildner--Education Coordinator or Chuck Nieder--Research Coordinator, Hudson River NERR, NY State Department of Environmental Conservation, c/o Bard College Field Station, Annandale, NY 12504-5000, (914) 758-5193, fax: (914) 758-5192.

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P.O.R.T.S. Metering System Improves Navigational Safety in Bay-- It also helps with oil spill cleanup and environmental monitoring

Texas decision-makers have a new intelligence-gathering ally in the effort to quickly assess and contain oil spills in the Galveston Bay system. The new high-tech metering system's data on current speeds and directions and water levels is already helping barges and vessels more safely navigate in Galveston Bay waters. But if a spill does occur, that same real-time data can be a key to efficiently mobilizing containment and cleanup efforts.

Other data from the Physical Oceanographic Real Time System (P.O.R.T.S.), like water temperatures, salinity levels, and other ecological parameters have far-reaching uses for scientists, natural resource managers, and environmentalists. Galveston Bay is the first location in the country to use this extensive monitoring system. Several other bays have smaller systems.

During an oil spill, data supplied by P.O.R.T.S. is plugged into oil-spill simulators, which then predicts what the spill will do. The resulting information lets containment and cleanup crews know where to go and tells them when they are there.

P.O.R.T.S. played a major role in fighting the 5,000 barrel oil spill that occurred near Bolivar Peninsula in March of 1996. High winds and heavy currents made containing the spill very difficult, but the monitoring data helped determine landfall and guide cleanup crews.

P.O.R.T.S. consists of three Doppler metering devices, one placed in each of three locations in the bay. The collected data are transmitted to the Department of Marine Transportation at the Texas A&M University campus in Galveston. The information can then be accessed by telephone or by on-line computer.

Several recreational groups are taking advantage of this new resource. For example, the information can provide a competitive edge to participants in sailing regattas. Flounder fishermen also require accurate information about the tides. According to a 1989 study by NOAA, traditional tide tables, based on sun and moon variables, are only about 50% accurate for Galveston Bay. The volume of fresh water entering the system, wind speeds, and other factors are not considered by the prediction tables. P.O.R.T.S. provides fishermen with more accurate information.

Scientists involved in oyster research are also logging in because salinity and currents impact oyster production. And from a practical standpoint, even the Mosquito Control District is tapping into P.O.R.T.S. Officials there use the information to determine what areas are likely to be ideal for mosquito breeding. They can make better decisions about needed chemical quantities and where to concentrate their efforts.

Regulators might use the information to determine the origin of pollution impacting a fishery. Scientists might determine how factors like water temperature, salinity, and current speeds figure into a fish kill.

The Houston Galveston Navigation Safety Advisory Committee prompted Congressional support of the P.O.R.T.S. concept. Congress authorized $750,000 of NOAA funding for the project. That price included the equipment, installation, and one year's operational budget. At the end of the year, local support will be required to continue the monitoring program.

The investment seems to be paying off for navigators. There have been instances when captains have called for real-time data and waited for currents to subside before proceeding through the tricky areas. Only two groundings have occurred there recently. Previously, an average of four to five groundings per month occurred. Fewer groundings could mean fewer spills and greater navigational safety--something that would benefit all Galveston Bay users.

A system like P.O.R.T.S., which seems to provide benefits to many user groups, may be one piece of technology which can result in a better Galveston Bay.

This article was excerpted from the May-June 1996 issue of Gulfwatch, "a cooperative venture of the National Association of Conservation Districts and the Gulf of Mexico Program". For further information, contact Leslie Sanderson, Gulfwatch Editor, NACD, P.O. Box 855, League City, TX 77574-

0855 or phone 1-800-825-5547.

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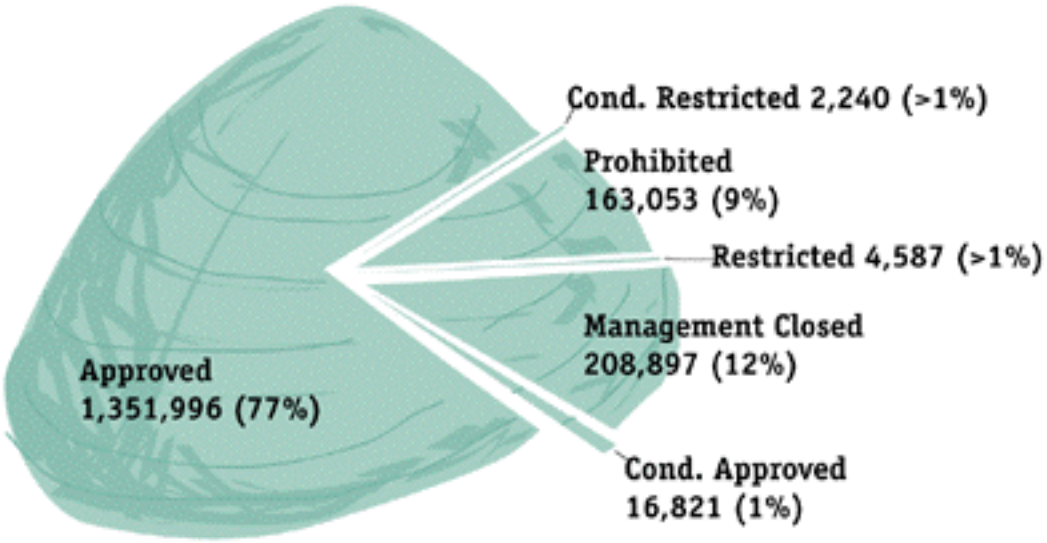
An Innovative Partnership for Shellfish Restoration

The Massachusetts Bays Program (part of the National Estuary Program) has spearheaded an interagency approach to shellfish bed restoration that aims to restore and protect shellfish beds in 12 communities (a 13th project is currently under development) along the shorelines of Massachusetts and Cape Cod Bays. According to 1993 statistics from the state Division of Marine Fisheries, approximately 60% of shellfish beds in Massachusetts and Cape Cod Bays are open to commercial and/or recreational harvesting. The remaining 40% are closed or restricted in some form. Statewide, approximately 77% of Massachusetts waters are approved for harvest.

This Shellfish Bed Restoration Program (SBRP) dovetails the regulatory and enforcement efforts of the state Division of Marine Fisheries and local Boards of Health with the pollution source identification, remediation, fundraising, and coordination skills of various other federal and state agencies. What was once a hit-or-miss proposition is now a systematic, goal-oriented, resource management program. Through the organizational efforts of the Massachusetts Coastal Zone Management Office and the Massachusetts Bays Program, the appropriate players in various federal and state agencies were brought together in a coordinated effort. The coastal management program lobbied for and helped facilitate a coordinated effort while the Bays Program provided the seed funding, staff support, and a home for the program. An interagency agreement signed by the main participating agencies has set the course for the SBRP work.



Currently, these partners are focusing their attention on cleaning up the shellfish beds in the communities shown on the map: Harwich, Falmouth, Plymouth, Kingston, Cohasset, Weymouth, Quincy, Revere, Salem, Gloucester, Essex, and Ipswich. The projects in these towns target what we now recognize as a major source of contamination to shellfish beds: non-point source pollution, especially discharges from storm drains. Although there are other important sources of shellfish bed pollution, project participants felt that remediation and restoration were more likely to be successful if a single, specific category of pollution sources was targeted.

The Restoration Program has also incorporated innovative technologies which specifically target remediation of contaminants associated with stormwater. Projects at two SBRP sites Gloucester and Harwich highlight the use of a new nonpoint source remediation technology, the StormTreat System , which consists of a sedimentation basin, a series of filter screens, and a constructed wetland to mitigate the pollution associated with stormwater runoff.

These shellfish bed restoration initiatives are supported in part through federal and state grant programs and in part through contributions by participating communities. Currently, the communities of Gloucester and Harwich have been awarded more than $71,000 through an initiative of the federal Clean Water Act Section 319 Non-Point Source Program grant.

Early Successes Toward Shellfish Bed Restoration

- In Cohasset Harbor, the local Board of Health placed an enforcement order on a home and business whose septic systems were polluting a tributary to the harbor. The resulting remediation by the property owners allowed the opening of approximately 400 acres of shellfish beds.

- The City of Quincy, with collaboration from the Massachusetts Bays Program and the Massachusetts Water Resources Authority (the water and sewer agency), installed a tidegate and

replaced defective sewer pipes, respectively. City officials have since extended their shellfish bed restoration efforts to identifying upstream as well as offshore sources of pollution to municipal shellfish beds.

- The Massachusetts Bays Program hosted a Quality Assurance Workshop for citizen shellfish monitors to teach residents how to ensure that reliable shellfish bed pollution data are collected to support municipal management decisions. Accurate data and citizen participation are important aspects of the SBRP since shellfish resource management is a home-rule issue in the Commonwealth. This workshop helped focus the diverse perspectives of the Bays Program, the Massachusetts Riverways Program, and the Massachusetts Division of Marine Fisheries on the specific problem of shellfish bed cleanup and maintenance at the local level.

Demonstration project grants from the Bays Program have also funded the testing and monitoring of technologies for shellfish bed restoration. Accomplishments associated with these grants include the following:

- The City of Gloucester was recently awarded $37,370 under Section 319 of the Clean Water Act to install and demonstrate the utility of StormTreat System remediation technology in the Jones River. The City will contribute $25,000 to implement this project.

- Gloucester's Board of Health continues to sponsor a dye-testing program which has already identified and repaired approximately 250 failing septic systems.

- The Town of Harwich is the recent recipient of Section 319 grant funds ($34,533) for remediation of a storm drain at the town wharf. The Town's share of the total project cost is $24,189. This demonstration project will examine the utility of the StormTreat Systems' (TM) nonpoint source remediation technology in a coastal environment that differs from that mentioned above in Gloucester.

- With the help of a grant from the Massachusetts Bays Program, the North and South Rivers Watershed Association installed a sand infiltration system along a section of the river in the spring of 1995. Recently, 200 acres of downstream shellfish beds were opened.

- The Town of Duxbury recently authorized a $150,000 bond to mitigate pollution associated with failing septic systems which have contaminated 85 acres of shellfish beds in the picturesque Bluefish River. The Massachusetts Bays Program's contribution of $32,000 to the Bluefish River Project provided engineering assessment and remediation design.

- The Bays Program contributed $15,000 toward the monitoring costs of a sediment infiltration system to help reopen shellfish in Barnstable. Since the system was installed, bacteria counts in waters overlying the shellfish bed have dropped measurably. This project has prompted the installation of similar systems in nearby communities.

The early successes of the Shellfish Bed Restoration Program have inspired other regions, among them the Gulf of Maine and Peconic Bay (Long Island), New York, to use this interagency approach as a model for their own shellfish bed cleanup efforts.

For more information about the Shellfish Bed Restoration Program, contact Roy Crystal, Massachusetts Bays Program, 100 Cambridge Street, Boston, MA 02202, (617) 727-9530 x 402, fax: (617) 727-7235.

Participants in the Shellfish Bed Restoration Program:

- The Massachusetts Bays Program (part of the National Estuary Program),
- Massachusetts Division of Marine Fisheries,
- Massachusetts Department of Environmental Protection (the state environmental regulatory program),
- Massachusetts Coastal Zone Management Office
- Natural Resources Conservation Service (from the US Department of Agriculture),
- Massachusetts Association of Conservation Districts, the Regional Planning Agencies, local community agencies and officials, and various citizens interest groups.

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Maryland Coastal Bays Program takes Initial Steps:

- **Names Director**
- **Establishes Citizens Advisory Committee**
- **Signs Management Conference Agreement**

The Maryland Coastal Bays Program was added to the US EPA's National Estuary Program in July of 1995 (See *Coastlines* Summer 1995, Volume 5 #3) as a means to protect the resources of the Isle of Wight, Assawoman, Sinepuxent, Newport, and Chincoteague Bays. The study area is bordered on the north by the Maryland-Delaware state line and on the south by the Maryland-Virginia line.

On June 24, 1996, federal, state, and local representatives signed an agreement initiating a joint effort to develop a Comprehensive Conservation and Management Plan for the bays. The plan will include actions designed to restore and protect the health of the coastal bays, thereby supporting economic and recreational opportunities for surrounding communities.

Signing the Management Conference Agreement, the document creating the Maryland Coastal Bays Program, were Environmental Protection Agency Regional Administrator Michael McCabe, Maryland Governor Parris N. Glendening, Worcester County Commission President James Barrett, Ocean City Mayor Roland "Fish" Powell, and Berlin Mayor Ronald Bireley.

As the officials in turn signed the agreement, each spoke of the importance of the coastal bays and the correlation between the ecological, recreational, and economic opportunities. Governor Glendening noted that approximately 12 million people visit the watershed area each year, and added that a decline in the water quality of the coastal bays could mean a decline in area tourism.

According to the Management Conference Agreement, vacationers spend in excess of $2.1 billion annually in the coastal bays area. Commercial fishing, boating and recreational fishing are also important contributors to the region's economy.

Another important step was taken in August when approximately 25 individuals were appointed to serve as members of the newly formed Citizens Advisory Committee (CAC). Members represent a broad cross-section of the diverse interest groups of the community including agriculture, industry, tourism, business, real estate and development, recreation, environmental and conservation groups, finance, and education.

Because the Bays Program is a consensus-based effort that requires the backing of the community to succeed, the CAC's primary responsibilities revolve around creating public support for the Program's goals, strategies and initiatives. Major roles members will play in the process include providing input into the Program, explaining the Program's process and progress to the public, and helping to develop an effective public education and participation program.

The CAC joins the previously-appointed Scientific and Technical Advisory Committee (STAC) and the Management Committee in comprising the structure of the Program. The make-up of the STAC is of particular interest as it includes several scientists who have been involved with the Chesapeake Bay Program and have considerable experience with science/management interactions.

Steve Taylor has been named Director of the Bays Program, moving over from the US EPA's Ocean and Coastal Protection Division in Washington, DC.

For additional information about the Maryland Coastal Bays Program, contact Steve Taylor (410) 974-3382, e-mail at sbtaylor@dnr.state.md.us.

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ANNOUNCEMENTS

New Materials Available from Washington State

The Washington State Department of Ecology has released a guide to wetland stewardship, entitled *Exploring Wetlands Stewardship: A Reference Guide for Assisting Washington Landowners*. To obtain a copy, contact Jane Rubey, Department of Ecology, (360) 407-7258.

Also in Washington State, The National Watershed Network has put together a planning kit to assist in conducting successful watershed tours. To obtain a copy of the "Wild on Watersheds" kit, contact Julie Spezia at (916) 447-7237.

Cleaner Marina Guide for NY State Waters

The New York State Department of Environmental Conservation offers a publication entitled *Marina Operations for Existing Facilities*, which offers general advice and guidance to help marina operators evaluate their facilities and take action to minimize water pollution. The pamphlet lists some of the potential sources of pollution arising from routine activities at marinas and recommends practices to prevent pollutants from entering the waters of New York State.

To obtain a copy, contact NY Department of Environmental Conservation, Bureau of Watershed Management, 50 Wolf Road, Albany, NY 12233-3508; phone: (518) 457-3707; e-mail: tom.boekeloo@dec.mailnet.state.ny.us

Protecting Minnesota Waters: Keeping Our Shores

The Arrowhead Water Quality Team is offering an award-winning video and fact sheet series which focuses on practices that can be easily adopted for Great Lakes shorelands to protect both water quality and property values. The package is designed for shoreland property owners, lake associations, planning and zoning departments, real estate agents, and natural resource managers.

The 15-minute video, produced by the Minnesota Arrowhead Water Quality Team and Parth, Productions in Duluth, highlights the importance of filter strips, septic system maintenance, Best Management Practices for recreation, and working together as a shoreland community.

The series of fact sheets comes in a handy folder with a section for record-keeping. Topics include: maintaining safe septic systems, ensuring a safe water supply, minimizing impacts from recreation, reducing runoff and erosion, caring for lawns and gardens, and limiting the spread of exotic species.

The video and fact sheet series were produced by the Arrowhead Water Quality Team which includes Minnesota Sea Grant. The video recently won an award of merit from the MN Association of Government Communicators and two awards from the Lake Superior Advertising Club for computer graphics and public service.

The package is available for $20. (Quantity discounts are available.) To purchase, call Lake County Soil and Water Conservation District at (218) 834-6638.

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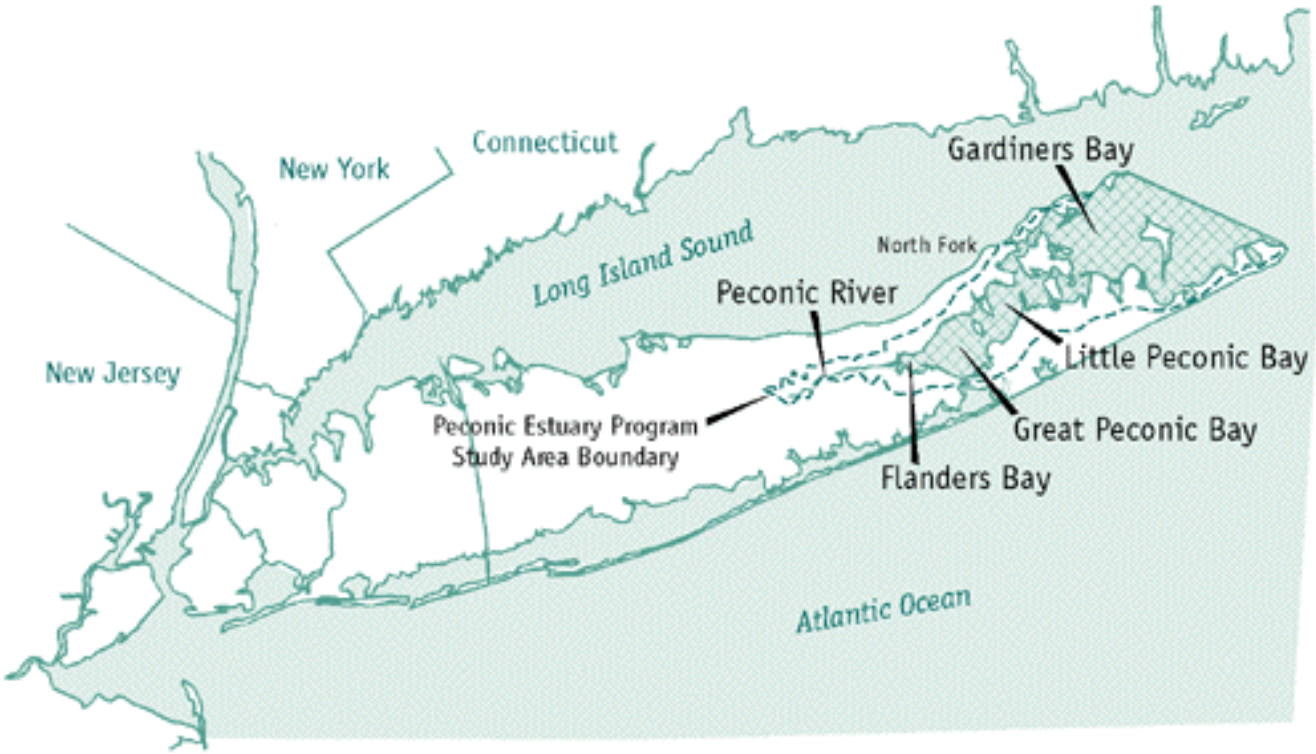
Controlling Nitrogen Inputs into the Peconic Estuary



The Peconic Estuary Program on eastern Long Island, New York (part of the National Estuary Program) is implementing several nitrogen management initiatives, based largely on detailed, integrated ground water and surface water monitoring and modeling efforts. Previously, management approaches have primarily focused on attainment of dissolved oxygen standards in coastal waters, but now they are being linked with other natural resources concerns such as submerged aquatic vegetation.

Investigations sponsored by the Peconic Estuary Program have resulted in some surprising findings, including the low priority for mitigation of ground water contamination in the environmentally sensitive western portion of the estuary, relative to the need to control point sources. Studies have shown, however, that preventing ground water degradation is of critical importance in the Peconic River area. In eastern portions of the estuary, ground water quality is important with regard to management of peripheral creeks and embayments and preservation of high quality surface water in the main bays.

Prior to the establishment of the Peconic Estuary Program, the ground and surface water quality of the estuary and its surrounding watershed had been extensively characterized, with the primary emphasis being the western estuary (Peconic River and Flanders Bay), the most poorly flushed part of the system.

Ambient surface water quality was characterized through an extensive, multi-year monitoring program of surface waters, point sources, and tributaries. An assessment of pollutant loadings was performed for all point and nonpoint sources, such as stormwater runoff and ground water underflow. This assessment was largely based on the monitoring program, comprehensive, detailed land use analyses, direct measurements of sediment nutrient flux and stormwater runoff, and quantitative estimates of loadings.

Ground water was among the most important sources of nutrients studied. To obtain quantitative estimates of ground water nitrogen inputs, thousands of ground water samples from ongoing programs were used, and ground water underflow discharge estimates were provided by the USGS. Sediment cores from the bays were also analyzed to characterize seepage into the estuary.

Most notable among the ground water quality findings were significantly elevated nitrogen concentrations along the North Fork (typically 5 to 7 mg/l) due to agricultural and residential influences. Ground water in the Peconic River area was of very high quality, attributable mainly to substantial vacant (developable) land and open space (e.g., parkland, nature preserves) in that portion of the watershed. Vacant land and open space cumulatively comprise about one-half of the western study area.

The Peconic River, a major freshwater source to the estuary, was studied extensively. It is a ground water-fed stream that discharges to Flanders Bay at the westernmost portion of the estuary and it reflected the high quality ground water which feeds it. Among the cleanest surface waters in Long Island, the river has a total nitrogen concentration below 1 mg/l--which is near the quality of rainfall in the area.

Through an analysis which related nitrogen concentrations to chlorophyll-a levels, and then related these to diurnal dissolved oxygen levels, a threshold level of total nitrogen ("nitrogen guideline") of 0.5 mg/l was established in the tidal Peconic River and Flanders Bay. Keeping nitrogen below the guideline level is expected to prevent excessive dissolved oxygen depression. This guideline is routinely exceeded in the western estuary and occasional, localized dissolved oxygen depletions have occurred there. Thus, although nitrogen inputs to Flanders Bay have decreased over the last two decades, due mainly to cessation of discharges from duck farms, elevated nitrogen levels remain a problem. Eastern main bays water quality is considered excellent.

Because ground water nitrogen loading to the western estuary was relatively high (almost 600 pounds per day), some observers speculated that it was the most important manageable source of nitrogen to the system. However, further investigation found this observation to be inaccurate. Water quality/hydrodynamic computer modeling indicated that ground water really was not a major management priority for mitigation due to its diffuse nature. The most significant of all of the controllable nitrogen loadings was a municipal sewage treatment plant, due to its discharge location at the mouth of the Peconic River, even though it contributes only 140 pounds per day of total nitrogen. Because of its quantitative input of freshwater to a poorly flushed area, the Peconic River's role is very important. If quality of the ground water in the river corridor was to degrade, even marginally, the impacts on the bay could be serious.

The Peconic Estuary Program has adopted the nitrogen guideline and point source "no net increase" nitrogen loading recommendations for the tidal Peconic River and Flanders Bay. This nitrogen level "freeze" is being implemented through point source discharge permits for the three sewage treatment plants in the area. The long-range goal of nitrogen reduction in the western estuary, for both point and nonpoint sources, is being studied.

In the river corridor, land use controls, a public education and outreach campaign, and demonstration

projects are critical parts of the management strategy.

While mitigation is the long-range focus in the western estuary, the Peconic Estuary Program has adopted a "water quality preservation" policy for the main bays of the eastern estuary. With relatively few point sources, ground water underflow and nonpoint sources will be key management components of the latter areas.

An extensive technical program, including land use analysis, sediment nutrient flux and accretion studies, and surface water monitoring and modeling, will support these management initiatives. The water quality efforts are also being linked to living resources such as submerged aquatic vegetation, by conducting restoration trials, developing habitat criteria, and modeling light extinction due to algal shading and total suspended solids.

For more information, contact Vito Minei, Program Manager or Walter Dawydiak, Peconic Estuary Program, Suffolk County Department of Health Services, Office of Ecology, County Center, Riverhead, NY 11901, (516) 852-2077, fax: (516) 852-2743.

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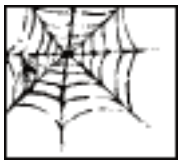

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Restore America's Estuaries

Restore America's Estuaries is an alliance of eleven regional nonprofit organizations working to protect and restore the threatened habitats of estuaries. Tens of thousands of acres of coastal wetlands, shellfish beds, beaches, and sea grasses are degraded or destroyed every year. RAE's mission is to stop estuary habitat loss and to actually increase, through restoration, one million acres of estuary around the nation by 2010.

The members of Restore America's Estuaries include:

- Chesapeake Bay Foundation,
- Coalition to Restore Coastal Louisiana,
- Conservation Law Foundation (Gulf of Maine),
- American Littoral Society (Hudson-Raritan Estuary),
- Save The Bay (Narragansett Bay),
- North Carolina Coastal Federation,
- People for Puget Sound,
- Save the Sound (Long Island Sound-New York & Connecticut),
- Galveston Bay Foundation (Texas),
- Save San Francisco Bay Association, and

- Tampa BAYWATCH.

The Alliance points out that about 28 million jobs in the U.S. depend on healthy estuaries, and in 1993 alone, nearly 70% of the *entire* U.S. population--180 million people--visited an estuary. They emphasize the extent of estuarine habitat loss with the following figures:

SanFrancisco Bay-	95% of its original wetlands are gone,
Chesapeake Bay -	90% of its sea grass meadows are gone,
Galveston Bay -	85% of its sea grasses are gone,
Puget Sound -	73% of its original salt marshes are gone, and
Louisiana Estuaries -	continue to lose 25,000 acres of coastal wetlands each year.

Through their Estuary Habitat Restoration Campaign, the organization aims to catalyze the restoration of one million acres of threatened estuary habitats by 2010, and in doing so, hopes to rehabilitate the productivity and vitality of the nation's bays, sounds, and lagoons.

To help achieve their restoration goal, they have drafted national legislation to help local groups and others restore important habitat sites in estuaries. The bill would create an estuary habitat restoration program to identify top priority sites and make grants to governmental and non-governmental organizations to carry out the restoration projects. The group proposes that initial appropriations start at $100 million annually, with increases in future years tied to a comprehensive needs assessment for habitat restoration in estuaries.

For their brochure and more information, contact Naki Stevens, Executive Director at (202) 289-2379, or Melissa Sagun, Assistant Director at (202) 289-2380, or write to Restore America's Estuaries, 1200 New York Avenue, NW, Washington DC 20005, fax: (202) 842-4932, e-mail: restore@estuaries.org or http://www.estuaries.org.

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Please let us know how we are doing, if you have something you would like to include in an issue, or what we can do to make *Coastlines* even better as we go along. You can contact us at:

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Buzzards Bay "SepTrack" Initiative

Demonstrating Practical Tools for Watershed Management Through the National Estuary Program

Characteristics:

- The Buzzards Bay watershed includes 432 square miles comprised of significant portions of 17 municipalities, with nearly 236,000 people living therein. Approximately half of the homes utilize on-site, subsurface sewage disposal systems (cesspools or septic systems) to dispose of sanitary wastes.

- Government in Massachusetts is generally done by "home rule" through cities and towns. Virtually all decisions related to on-site septic system installation and maintenance is done at the local community level by an elected Board of Health.

- Failing on-site systems may lead to contamination of waters of tributaries to the bay and smaller embayments around its margins, resulting

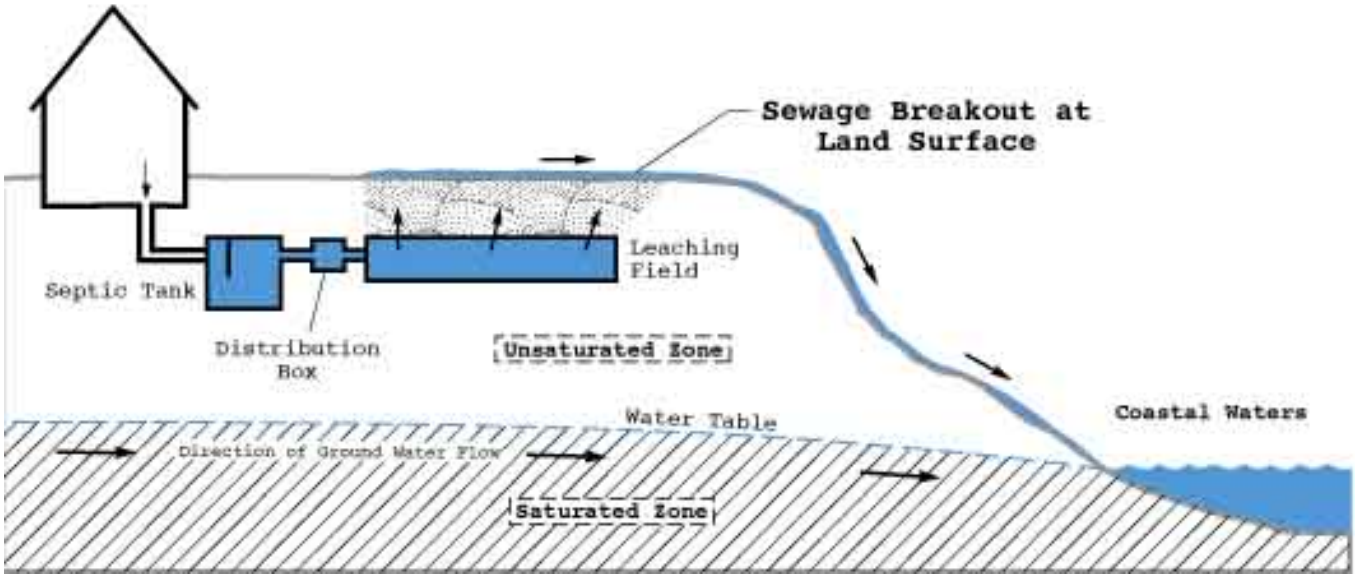
in the closure of shellfish beds and possibly other water-contact recreation activities because of threats to public health.

The Problem:

Local Boards of Health typically lack the ability to efficiently and effectively monitor septic system permits and inspection and maintenance information due to insufficient staffing and information-processing equipment and systems.

The Project:

The SepTrack Demonstration Project was designed to provide computers and specialized software to communities to allow them to better manage information related to on-site septic systems, thereby freeing staff time for better design review and enforcement and helping identify patterns of failure.



Buzzards Bay extends for 28 miles between the western shore of Cape Cod and the mainland of southeastern Massachusetts. Its 210 miles of shoreline provide a widely diverse habitat of salt marshes, sandy beaches, eelgrass beds, small embayments and tidal streams, and urban ports. The waters of the bay are used for shellfishing, swimming, and boating as well as marine transportation.

Buzzards Bay, as a whole, is still considered a relatively healthy waterbody. However, the waters of the smaller, fringing embayments are threatened by increasing amounts of contamination. Pollution associated with residential development and other land uses, indicated by fecal coliform bacteria and elevated nitrogen concentrations, contributes to a decline of water quality in some locations.

Cesspools, failed septic systems, and high densities of septic systems contribute to the closure of swimming beaches and shellfish beds, contaminate drinking water supplies, and cause eutrophication of ponds and coastal embayments. For these reasons, improved implementation of septic system regulations and promotion of better functioning alternatives are important objectives in the Buzzards Bay Comprehensive Conservation and Management Plan.

Can computers and software protect the environment and public health? The Buzzards Bay Project of the National Estuary Program thought so. In Massachusetts, municipal Boards of Health are responsible for implementing and overseeing state regulations for on-site wastewater disposal systems (septic systems). These boards, composed of elected volunteers, and sometimes lacking professional staff, are typically overburdened just keeping up with new permits. Keeping track of past permits, past orders of non-compliance, and reviewing pump-out reports submitted by sewage treatment facilities are tasks that sometimes fall to the bottom of the pile. Add to this workload new state requirements such as septic system inspections within six months of property transfer and soil evaluations before system installation, and clearly Massachusetts Boards of Health face a sizable information management problem. In some towns, the problem is especially difficult since records are filed away in storage boxes and computers are unavailable-even for word processing. These are the issues the SepTrack project was designed to address.

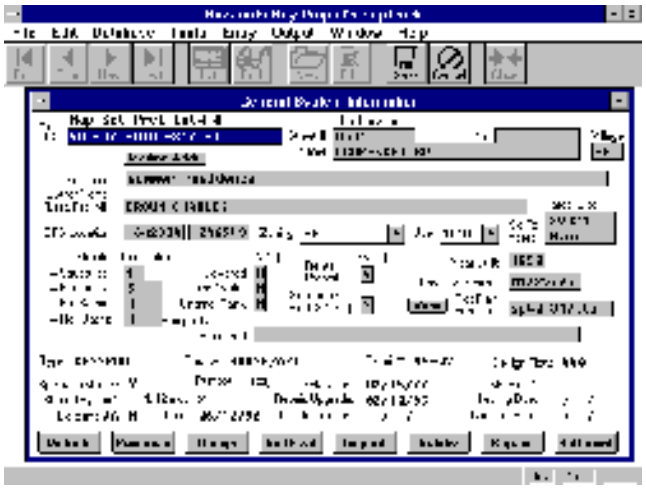
The purpose of this initiative was to better enable each Board of Health to track septic system permits and inspection and maintenance information. The Project's goal was to reduce information management and retrieval burdens on Boards of Health, thereby allowing time to enhance protection of public health and the environment.

To achieve this end, in 1996, the Buzzards Bay Project provided computers and specialized software to 11 municipal Boards of Health in the Buzzards Bay watershed.

The Buzzards Bay Project developed the concept for a Windows-based database management software application and hired a software development firm to produce the package. Project staff had a clear sense of what kind of information Boards of Health wanted to track, but to ensure that the software met the needs of area municipalities, the Project set up a panel of health officials to test and evaluate early versions of the software. The outcome of this effort is known as SepTrack, an easy to use Windows program that enables health officials to track information on every property in their community. More than 180 categories of information are tracked in the database ranging from septic system design, leachfield type, number of bathrooms, presence of wetlands, and pumpout frequency-essentially all the information routinely supplied to towns in building and health permits. At a click of a mouse button, data on any lot will be available to municipal staff, allowing them to be more responsive to information requests and help towns process permit applications more quickly. The program has the ability to display graphics files of site plans and engineering designs.

To help towns adopt and use the new software package, the Buzzards Bay Project provided funding for assessors' data in each community to be transferred into the SepTrack database. The Project also hired a student intern to work in each town on a rotating basis to enter old permit information and septic pumping records. Once this historical information is entered, health office administrators merely have to spend a few minutes a day entering new permit data.

SepTrack (Vers. 1.0) was written to run as an application under the database manager, Microsoft FoxPro for Windows (Vers. 2.6). However, because this software package is being phased out by Microsoft, the Buzzards Bay Project is now making available a special, compiled, stand-alone version of SepTrack (Vers. 1E.0) that can run in Windows even if FoxPro is not installed. Both versions operate identically, but Version 1E.0 is not able to run certain advanced features that are available through FoxPro. (FoxPro, Windows, and MS-DOS are trademarks of the Microsoft Corporation.)



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Funding for this work was provided by the U.S. Environmental Protection Agency as part of a grant to the Buzzards Bay Project through the Massachusetts Coastal Zone Management Office.

Is SepTrack protecting the environment? It may be too early to tell, but one thing is clear, SepTrack is becoming very popular. Buzzards Bay towns seem very pleased and enthusiastic about the software. Even before SepTrack was installed in most towns around the bay, the Project was getting calls from municipal Boards of Health in other parts of the state wondering if they, too, could receive a copy. Inquiries about the software increased this fall when the Buzzards Bay Project's sister Estuary Program, the Mass Bays Program began helping its South Shore communities implement the data management system as part of a pilot program. Generating even more interest in the software was a series of workshops around the state by the Massachusetts Department of Environmental Protection highlighting SepTrack as one of two applications for boards to manage septic system data (the other was a spreadsheet application).

Recent revisions to Massachusetts' septic system regulations bode well for the future, but only if the regulations are successfully implemented at the local level. The true utility of SepTrack will be in helping Boards of Health to be more productive and responsive, and freeing staff for much-needed field inspections, enforcement, and pressing health and environmental issues. In a very practical sense, SepTrack is allowing Massachusetts Boards of Health to systematically track, for the first time, the permitting, inspection and maintenance of septic systems. But SepTrack is doing more than just telling municipal officials if grease traps and tight tanks are being pumped regularly. A glimpse of some of the other benefits of SepTrack is provided by these examples.

Most Boards of Health receive a monthly report from sewage treatment plants detailing dozens of pumpouts reported by septage haulers. (In Massachusetts, septage haulers must report the source of their septage.) In the past, most boards have simply filed this information because it is too time-consuming to search out properties frequently pumped (often a sign of a failing septic system). With SepTrack, at a click of a mouse button, towns are now seeing a list of these frequent pumpers, and the results have, in some cases, been eye-opening. Surprisingly, in one town, the most frequently pumped system turned out to be a town-owned property. Towns are also discovering that septage hauler information does not always appear to be complete or accurate.

For house renovations, Boards of Health tend to rely on information provided by engineers on permit applications, such as number of bedrooms in a residence, presence of private wells nearby, and other important data. In one town, the staff person for the Board of Health seldom checked the assessors' records to see if the number of bedrooms listed was, in fact, correct because the data were not easily accessible. With SepTrack in place, the staff person quickly realized that the numbers of bedrooms reported on permit applications were often inaccurate (fewer bedrooms means a smaller-and cheaper-septic system). After these "errors" were consistently caught, construction firms and engineers became much more consistent with assessors' records.

The Buzzards Bay Project had been working with one town to reduce high fecal coliform concentrations in stormwater discharges contributing to shellfish bed closures. This town hired a college student to enter public works water and sewer data into the SepTrack system to complement Board of Health data. Much to the surprise of the health officials, 200 homes along one embayment had never been connected to a sewer line. Most homes in the area were sewered years earlier because they had cesspools and the water table was high. Ironically even the residences had been charged a sewer betterment fee for years, but the homeowners at the time did not want to pay a $300 sewer connection fee. The Board of Health is now requiring these homes to connect to the existing sewer.

Early in its existence, the Buzzards Bay Project learned that you cannot simply offer computers and software to a town to solve a problem. Technical assistance and support are also vital. To ensure the success of this effort, the Buzzards Bay Project hired an intern to spend time at each town hall training municipal staff and entering data. Entering old permit data was an especially important task because Board of Health staff were reluctant to use the software if the old data were not present. Perhaps not surprisingly, with the old data in place, the towns became almost enthusiastic about keeping up with the entering of new permit data.

Another lesson learned is that a good software program and computer are not substitutes for good office management. In one town, poor management and personnel relations have resulted in the SepTrack computer being relegated to a dark corner.

Overall, the Buzzards Bay Project has found this initiative so successful that it has begun a similar initiative with municipal Planning Boards. In the latter case, the Project is providing computers, training, software, and data layers to the municipalities to create parcel-level GIS information to assist with planning growth, developing open space plans, and protecting water quality and habitat in the many sub-watersheds of Buzzards Bay.

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