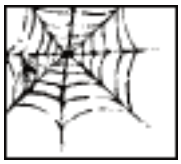

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Information About Estuaries and Near Coastal Waters
April 2000 - Issue 10.2

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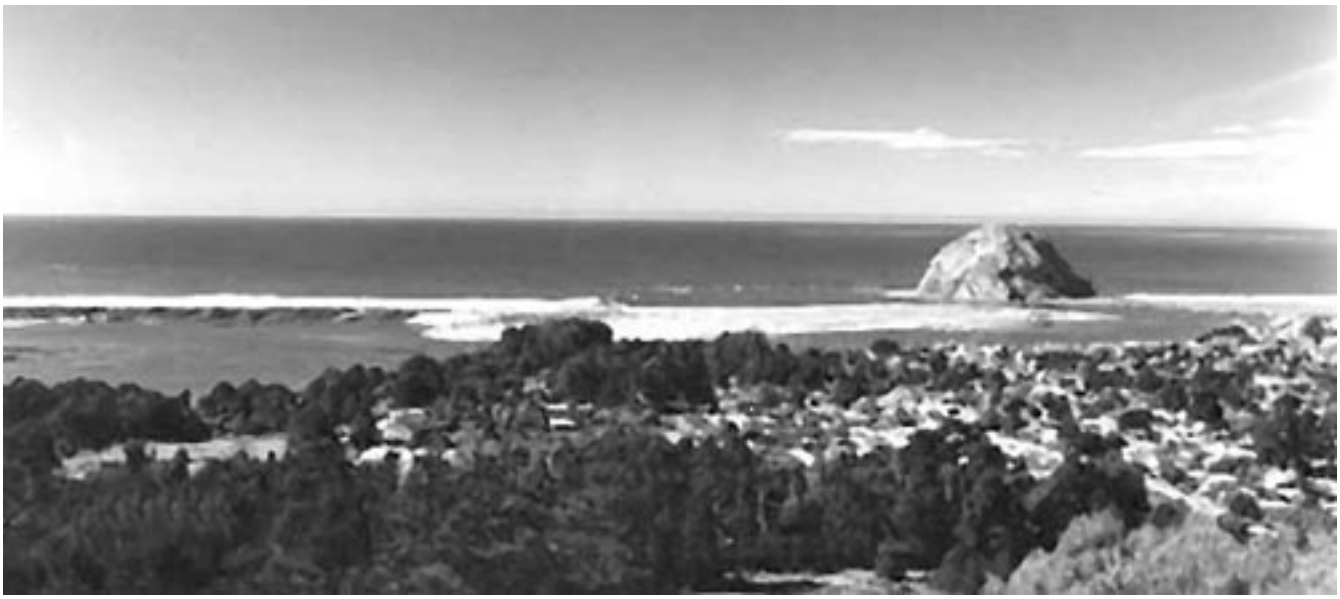
Two National Programs Work Together to Protect Morro Bay

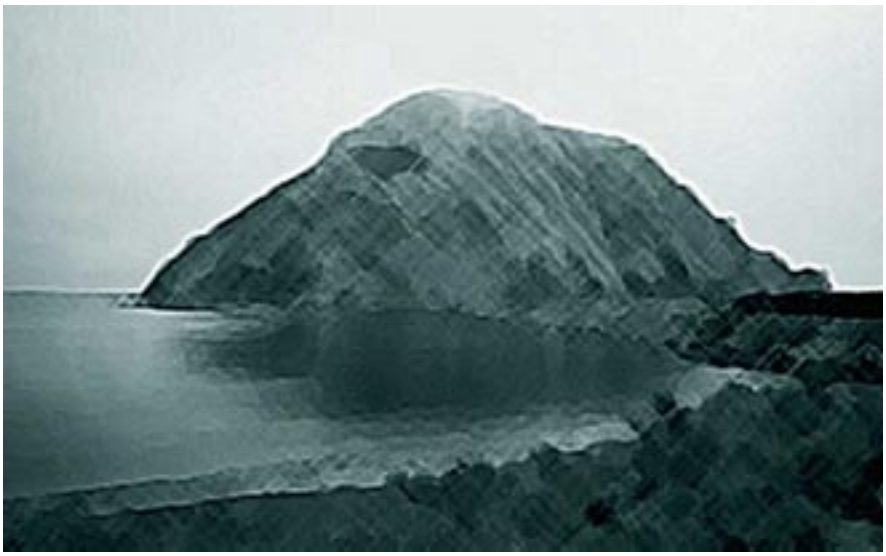


The U.S. Environmental Protection Agency (US EPA) administers both the National Monitoring Program and the National Estuary Program. The National Monitoring Program (NMP), administered through Section 319 of the Clean Water Act, is charged with providing credible documentation of the feasibility of controlling nonpoint source pollution, and improving the technical understanding of the effectiveness of nonpoint source control measures, such as Best Management Practices, or BMPs. North Carolina State University (NCSU) Water Quality Group provides technical expertise for projects that are part of the National Monitoring Program. The goals of the longer-term watershed studies (ideally at least seven to ten years) are to provide long-term baseline evaluation, b) high levels of landowner participation and c) post-BMP evaluation.

The National Estuary Program (NEP), administered under Section 320 of the Clean Water Act focuses on point and non-point source pollution in targeted, high priority estuarine waters. In this program, the US EPA assists state, regional, and local governments, landowners, and community organizations to develop a Comprehensive Conservation and Management Plan (CCMP) for their estuary. The CCMP characterizes the resources in the watershed and estuary and identifies specific actions to restore water quality, habitats, and other designated beneficial uses.

Morro Bay, California, was accepted into the NEP in 1995, and recently a public draft of the CCMP for Morro Bay was completed. The Morro Bay watershed was also chosen as a site for a long term National Monitoring Project in 1992. As part of the NMP, California Polytechnic State University partnered with the Central Coast Regional Water Quality Control Board (CCRWQCB) to design a "paired watershedstudy to evaluate Best Management Practices (BMPs) effect on improving water and habitat quality rangeland (See Coastlines February, 2000 Issue 10.1). Numerous BMPs have been implemented, including streambank restoration, riparian pastures and fencing, and cattle watering system improvements. A sediment retention project and a time-controlled grazing project are being monitored to document whether they result in improving water quality. These projects on private ranches also provide public outreach to landowners.

There are enormous benefits to having Morro Bay as a site for both of these national programs.



- The NMP project allowed managers to monitor the effectiveness of BMPs in improving water quality, while the NEP provided a forum to publicize the results.
- Data collected by the NMP project was utilized in the technical characterization of the watershed and in identifying and prioritizing actions in the CCMP.
- Landowner involvement in the NMP also helped in implementing the CCMP. A program of sharing the costs with landowners for the installation of BMPs was given a very high priority by NEP stakeholders.
- NEP funded technical studies that used data collected by the NMP project to create computer models for development of the CCMP and Total Maximum Daily Loads (TMDLs). In return, the NCSU's Water Quality Group involved in the NMP provided technical review of these models.
- At the NMP annual workshop held in Morro Bay in September 1999, the Morro Bay NEP hosted

a technical session featuring the methodology and results of the models.

- The Morro Bay NMP project provided a starting point for the development of the Central Coast Ambient Monitoring program for the entire central coast of California.

- Many other intangible benefits have also been reaped both locally and nation-wide by the collaborative efforts of the experts working in the field on the two projects.

Now that the ten-year funding cycle for the NMP project is coming to a close, the Morro Bay NEP has joined forces with a local advocacy group, the Friends of the Estuary. The "Friends" are gearing up to implement a long-term Volunteer Monitoring Program that will help evaluate the CCMP and the health of the estuary and watershed. The NMP project water quality monitoring stations have been monitored by citizen volunteers for the past several years, are integrated into the development of the Volunteer Monitoring Program.

In today's world of limited long-term funding, the joint forces of the NMP and NEP in Morro Bay has given land managers the tools they need to effectively manage the estuary and watershed. The many successes in the Morro Bay watershed are due to the emphasis on longer-term watershed projects, a focus on public involvement and education, and a dedication to improving the health of one of our nation's most precious estuaries.

For further information contact Katie Kropp, Environmental Specialist, Central Coast Regional Water Quality Control Board; Phone: (805) 549-3336 or E-mail: kkropp@rb3.swrcb.ca.gov.

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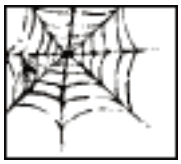
Academy 2000 Available Online

The EPA's Watershed Academy has developed a distance learning program available online called Academy 2000. The course consists of a set of training modules that provides a basic, broad introduction to the many facets of watershed management using a variety of Internet-based formats. The time and complexity of each module varies, but most are at the college freshman level of instruction. Completing a series of 15 of these modules earns the Academy 2000 watershed training certificate. Several of these modules are still under construction, but the 15 certificate modules should be online in the winter of 2000. The website and course are divided into six themes:

Introduction/Overview, Watershed Ecology, Watershed Change, Analysis and Planning, Management Practices, and Community/Social Context.

For further information, or to access Academy 2000 modules, visit the website at:
http://www.epa.gov/owow/watershed/wacademy/acad2000.html



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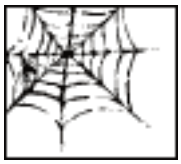
Environmental Contaminant Encyclopedia On-Line

The National Park Service's "Environmental Contaminants Encyclopedia" summarizes environmental fate and effects information on 118 toxic elements, compounds, and products. Entries include the 30 oil and petroleum products most commonly spilled into fresh and marine waters of the U.S., 63 other petroleum-related compounds, metals (mercury, cadmium, selenium, etc.), volatile organic compounds (VOCs), and chlorinated organic solvents.

The document will be useful to those who need to obtain information on environmental contaminants quickly. Contaminant specialists, environmental toxicologists, hazardous waste specialists, environmental risk assessors, natural resource assessors, contaminant researchers, spill responders, water quality specialists, and natural resource managers, are among the intended users. Libraries, academia, state governments, local governments, environmental consulting firms, and environmentally concerned members of the general public will also find this product useful.

Access the Encyclopedia on-line at http://www.nature.nps.gov/toxic. EXIT disclaimer



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New Book on Marine and Coastal GIS

"Marine and Coastal Geographical Information Systems", edited by Dawn J. Wright and Darius J. Bartlett, addresses basic and applied scientific problems in deep-sea and coastal science using Geographic Information Systems (GIS) and remote sensing technologies. It is arranged in two parts, covering the conceptual and technical issues associated with using GIS followed by several applications of GIS. The book also addresses data models for marine and coastal GIS, representation of variability in marine environmental data, coastal geomorphology 3-D GIS, and applications to fisheries management.

In addition, institutional issues such as managing coastal data sources, applications to maritime boundary delimitation, and information quality consideration are discussed. Mapping capability and other topics are also covered.

The book was published in 1999 by Taylor and Francis as part of the "Monographs in GIS" series. For further information visit the website at http://dusk.geo.orst.edu/book/. EXIT disclaimer

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GIS Class Offered for Coastal Resource Managers

Beginning and intermediate GIS classes for coastal resource managers are available through the NOAA Coastal Services Center. These two-day training sessions in Charleston, South Carolina, focus on using coast-related data and issues. Some of the classes are targeted toward particular coastal resource managers, such as those associated with the country's Marine Sanctuaries and Estuarine Research Reserves.

View the GIS class schedule for the year 2000 online at: http://www.csc.noaa.gov/text/upcome.html. EXIT disclaimer

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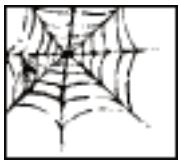
Identifying Fecal Contamination Sources

Washington State's Department of Ecology has published a review of methods for differentiating between human and non-human sources of fecal contamination in surface waters that describes some of the more promising tools for assisting water quality investigators with source identification. Included are sections on microbiological, chemical, and other methods for identifying sources of fecal contamination. Each method is briefly described and accompanied by examples of studies that used the technique as well as a description of its advantages and disadvantages. Also included in the publication are short descriptions of promising methods under development, including polymerase chain reaction and multiple antibiotic resistance.

The report concludes that there is no easy, low-cost method for differentiating between human and non-human sources of bacterial contamination. In addition, quantifying the contribution from different sources is still impossible.

Copies of this publication can be obtained by contacting the Washington State Department of Ecology's Publication Distribution Office; Phone: (360) 407-7472. Refer to publication number 99-345. The report is also available on Ecology's home page at http://www.ecy.wa.gov/biblio/99345.html. EXIT disclaimer



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Use of an Interactive GIS Tool in Decision Making

Each year thousands of decisions are made by regulators, scientists, environmental advocates, and citizens which affect the quality of our environment. While most of these decisions are made on the basis of the best available information, current decision making methods are often characterized by:

- *a-priori* decisions to narrow the multitude of options available
- lack, or perceived lack of public, and scientific input early in the process
- inadequate documentation of assumptions
- lack of a holistic view
- inadequate consensus among stakeholders, and
- the inability to review, revise and adapt decisions based on new information

With this in mind, a new decision making methodology was developed which utilizes Geographic Information Systems (GIS) as an interpretation tool.

Decision making is an inherently subjective process based on interpretations and perceptions of the

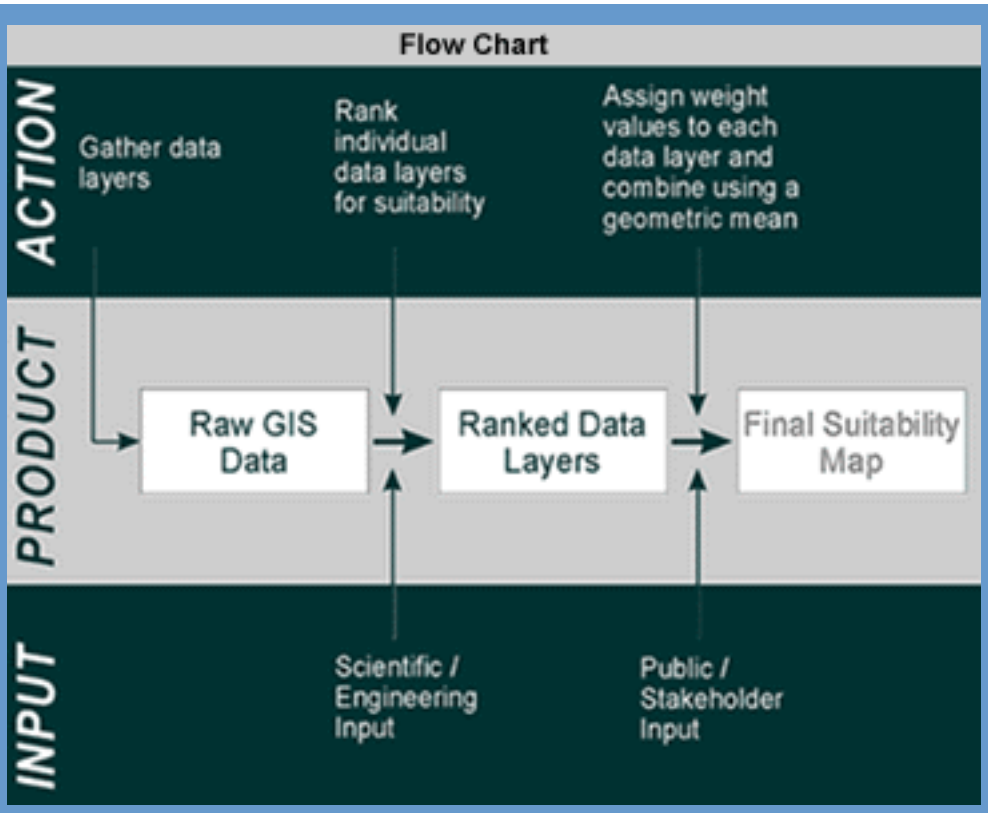
underlying science. To improve objectivity, a two-part process for evaluating, ranking, and weighting the information using GIS was developed. The first part focuses on using 'expert' scientific knowledge to rank individual "layers" of information. The second part of the decision making process involves the public, stakeholders, and decision-makers using an interactive GIS tool to weight, combine and evaluate all of the information available to produce a final suitability map. The process allows the public and decision-makers to analyze the interaction of the various data and to identify the trade-offs inherent in any decision.

Using an interactive GIS tool aids in visual analysis, offers a more holistic approach, and provides better documentation of the assumptions. It also allows the incorporation of values into decision making while building on good science and scientific interpretation of data. In addition, the interactive capability of GIS allows "what if" scenarios to be examined and allows users to immediately understand the various factors and tradeoffs involved in any decision.

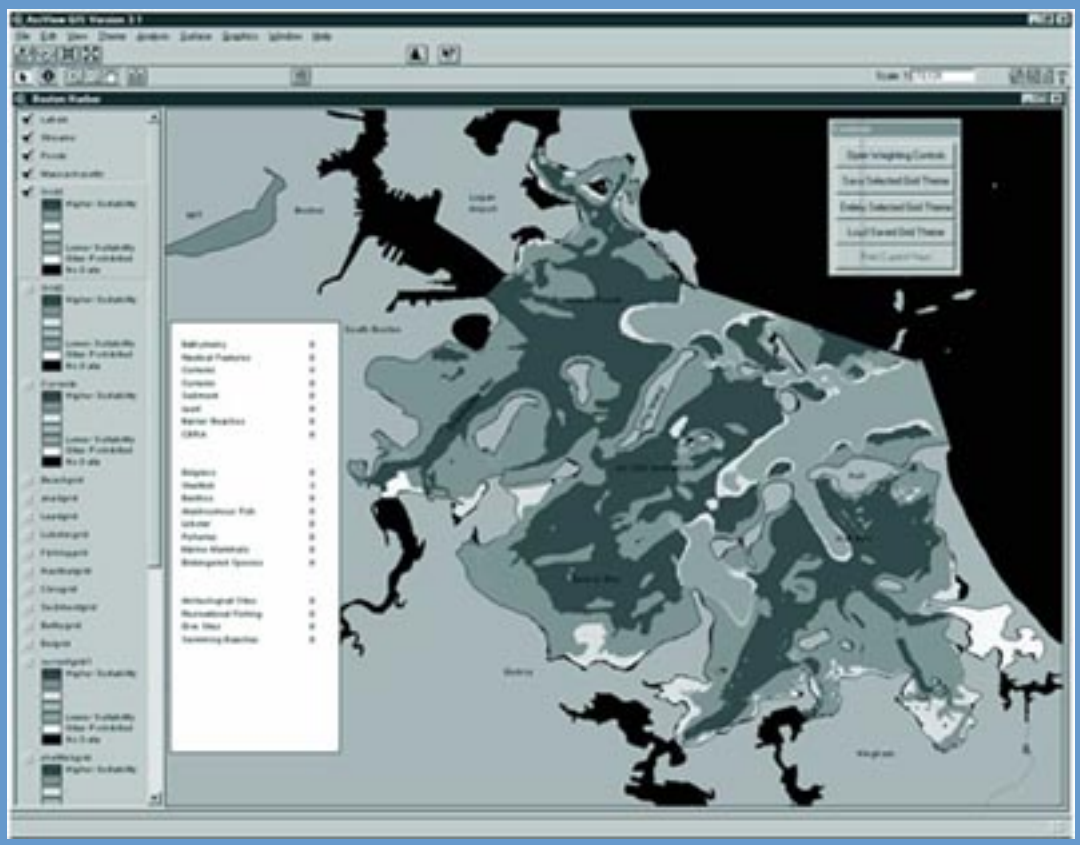
Positive feedback from public demonstrations of the method confirmed that this approach to decision making can add to the decision making process. Because it aids consensus building and fosters an interactive, adaptive management approach, this method has the potential to allow decisions to be made in less time, with less cost, and with greater numbers of stakeholders, citizens and decision makers satisfied that a good and proper decision was reached.

An example of how the process could be implemented is exemplified in the following case study done to locate future disposal sites for contaminated dredged materials in Boston Harbor.

Case Study: Boston Harbor Dredging



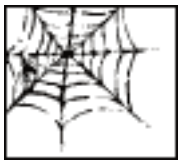
Currently, 1.1 million cubic yards (cy) of contaminated sediment are being dredged from the Boston Harbor channels and berthing areas. The disposal method chosen for disposal of the contaminated sediment consists of placing the dredged materials within in-channel confined cells. Future maintenance dredging of the harbor will require locating and identifying future sites due to the lack of capacity at the existing sites. The siting of future dredged material from Boston Harbor served as an example of how the proposed Interactive GIS tool could be used in the decision making process.



The first phase included the development of relevant scientifically and technically accurate data layers and a system to allow the data to be weighted. State agency shellfish experts ranked a data layer showing shellfish bed productivity. The weighted data layer displayed shellfish beds that were most productive (those nearest to the shoreline) as the least suitable for dredged material disposal, while those offshore (less productive) were rated as more suitable. The other data layer displayed areas that were less likely to be disturbed by storms, based on USGS current data. The user (regulator, public, or others) may then decide on the relative importance of each data

layer. Once the data layers have been weighted they are combined using a geometric mean and a suitability map is displayed. Additional data layers can be added and similarly evaluated. As new data layers and information become available, new scenarios can be run.

For further information please contact, Scott FitzGerald, Daylor Consulting Group, 10 Forbes Road, Braintree, MA 02184; Phone: (781) 849-7070; E-mail: sfitzgerald@daylor.com or Judith Pederson, Ph.D., Massachusetts Institute of Technology Sea Grant Program, 292 Main St., E38-300, Cambridge, MA 02139; Phone: (617) 252-1741; E-mail: jpederso@mit.edu.



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Pinpointing the Sources of Oil Spills

Conviction and Deterrence of Illegal Dumpers on the High Seas

On September 27, 1998, vessels steaming south from San Francisco Bay reported sighting an oil slick approximately 10 miles long and 1 1/2 miles wide off the California coast. The source of the mysterious spill was not readily apparent, and federal and state regulatory officials spent the next two weeks pursuing clues that might lead them to the culprit. The 3000-gallon "shipping lane" spill, as it came to be known, sullied two national marine sanctuaries, deposited over four tons of tarballs on San Mateo County beaches, and caused the death of over 170 marine birds and other wildlife.

At the outset of the investigation, the California Department of Fish and Game was determined to identify the source of this oil spill. "Orphan spills"--those large enough to require clean-up but for which no responsible party is ever found--had occurred regularly throughout the 1990's along Bay area beaches and caused extensive environmental damage. The cumulative risk and potential damage from these spills is great, because as many as 175 deep-draft vessels ply the shipping lanes into and out of San Francisco Bay every month, passing through or near a number of state and federal marine and coastal sanctuaries.

Such oil releases are a worldwide problem. From the Antarctic to the Baltic Sea, the impacts of chronic oil pollution are gradually being recognized as ecologically significant. The question is, how to prevent it? Effective enforcement can provide a strong deterrent to would-be dumpers.

In the case of the shipping lane spill, investigation began with analysis of oil "fingerprints" of samples collected from the spill. Chemical fingerprinting is routinely used to match petroleum spills with the cargoes or fuels of suspected dumpers. However, the term "fingerprinting" implies a level of precision that does not yet exist. As with its scientific cousin, DNA analysis, matches between oil samples can be made within a range of probability, but never with 100 percent certainty. Still, chemical fingerprinting provides much-needed scientific evidence to narrow the range of possible sources.

In chemical fingerprinting, lab technicians extract and dilute oil from samples of water, sand, oil, fur, entrails, or feathers. Subsequent analysis of petroleum compounds is done using a mass spectrometer, which provides a "signature" consisting of about 20 to 25 measurements with distinctive patterns. Spill fingerprint reports characterize samples as "consistent with," "similar to," or "not consistent with" a suspect sample. "Consistent with" is the finding required for conviction. Generally, the "consistent with" rating requires that each of the 20-odd measurements analyzed in a spill sample matches suspected sources within a 20 percent error, and all of the same compounds must be present in both the sample and suspected source.

The first step in making a match is to obtain a sample of the suspected source of oil for comparison with the actual spill--this is not always as simple as it sounds. In the case of the shipping lane spill, in addition to checking the logs of all ships in the vicinity of the spill near the time of the spill, regulatory authorities purchased satellite images from a commercial service that photographs the Bay Area at regular intervals. Use of satellite images to prevent and respond to oil spills is not new. Norwegian authorities regularly use satellites aimed at the Baltic Sea to spot the veil of smooth water that trails behind a ship disgorging oil, visible even at night when most dumping appears to occur. In this case, although satellite images had not captured the shipping lane spill at the time it actually occurred, photos did show that a certain ship, the T/S Command, was in the vicinity of the spill at about the right time.

Once suspected dumpers have been identified, the U.S. Coast Guard and state authorities collect samples from the ship(s), and attempt to make a "fingerprint" match. In this instance, the T/S Command, a Liberian tanker owned by a Greek shipping company, had accidentally spilled bunker fuel while docked in San Francisco Bay just three days before the spill along the coast. Analyses by both federal and California state labs confirmed that the T/S Command's oil signature matched the mystery spill, setting in motion a high-seas chase through international waters that culminated several days later, when the Coast Guard boarded the Command off the coast of Central America to inspect its cargo. The Coast Guard's use of methods normally employed to interdict drug smugglers was unprecedented for an oil spill.

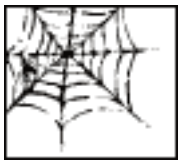
Oil fingerprint evidence played a key role in the trial that followed, leading to a guilty plea by the Command's captain on September 27, 1999 and a settlement of $9.4 million in penalties and damages. The funds will be used to reimburse $3.7 million in federal and state clean-up expenditures and for sorely needed environmental restoration.

Despite this success story, in many cases samples of suspected oil sources never become available to make a match with spills. If the Command had not already accidentally, and conveniently, spilled oil in

San Francisco Bay, then the shipping lane spill could easily have ended up an "orphan". To increase the chances of identifying and successfully prosecuting marine pollution crimes, staff within the California Department of Fish and Game are investigating expanded satellite coverage as a means of exposing illegal dumpers. Although this technology is not inexpensive, it could potentially pay for itself in one settlement from convicted polluters.

No major orphan spill incidents have hit Bay Area shores since the Command spill. As a result, several officials associated with this incident believe the example of the Command may have helped to staunch the flow of illegal oil hemorrhaging into the sea.

For further information, contact Gregg Elliott, a conservation policy analyst and freelance writer who lives and works in California, E-mail: gregg_elliott@hotmail.com or Steve Hampton, Resource Economist at the Oil Spill Prevention and Response Office of the California Department of Fish & Game; Phone: (916) 445-0045.



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Wastewater Reuse Program to Conserve Water and Protect Sarasota Bay

The Problem

Manatee County, Florida, and its neighboring coastal counties along the Southwest coast of Florida are currently facing a water supply crisis. The Southwest Florida Water Management District (SWFWMD) has jurisdiction over Manatee County and 15 other counties located on Florida's southwest coast whose surface and groundwaters flow west to the Gulf of Mexico. Recent scientific modeling has determined that groundwater withdrawals for agricultural, industrial, and public supply needs inland from the coast exceed the regional aquifer's natural ability for replenishment. Because large seasonal withdrawals for inland farm irrigation has caused historic declines in freshwater aquifer levels, SWFWMD has declared a large area of the district as a "water shortage area" encompassing all of Manatee County.

At the same time, the Sarasota Bay National Estuary Program's Comprehensive Conservation and Management Plan (CCMP), has also drawn attention to the impacts of wastewater discharge on Sarasota Bay. Upon completion of the CCMP in November, 1995, an action plan was adopted to develop a multi-county wastewater reclamation program to minimize discharge of treated wastewater to Sarasota Bay.

The Solution

In conjunction with its municipalities, Manatee County has developed a program to capture and reuse

nontraditional sources of water to respond to both the regional water supply shortage and the concerns of wastewater discharge into Sarasota Bay. These efforts rely heavily upon expansive reuse of treated wastewater for agricultural irrigation (Manatee Agricultural Reuse System - MARS).

Manatee County, Sarasota County, the City of Sarasota , the Sarasota National Estuary Program and many others have worked with the water management district to develop a regional program to reclaim and reuse treated wastewater in the water shortage crisis area. Many farms located in the immediate vicinity of the three county wastewater plants already use reclaimed water as a substitute for groundwater, encouraging agriculturalists in more distant areas to consider similar agreements. Two cities, Palmetto and Bradenton, are currently negotiating an intergovernmental agreement with the county to connect their wastewater discharge/reuse systems with the county system. Along with the contemplated connections, the cities are addressing other issues, such as construction cost sharing, product liability, and quality assurance concerns related to blended effluent systems. Working cooperatively, the County and its two largest municipalities hope to direct as much as 30 million gallons per day (mgd) to meet the inland farming irrigation needs.

The current program funding is $40 million. The revenues originated from the sale of water and wastewater services by the Public Utilities System Enterprise Fund (Department of Public Works), matching grants totaling $12 million from SWFWMD, and $7.2 million in congressional appropriations. Congressional appropriations were secured by Manatee County and SWFWMD, as part of a five-project "demonstration package" for alternative water source development for Southwest Florida, matching one dollar of federal grant with one dollar of state and local funds. User fees for reclaimed customers based on gallons used are anticipated to cover roughly 10 to 15 percent of the total local (non-grant) costs. The balance of local costs will be absorbed through rates paid by wastewater customers.

Lessons Learned

Working Proactively. The most important factor driving this program's early success was the proactive attitude of the Manatee County Board of County Commissioners. Strong County leadership is instrumental in keeping the administrative staff, stakeholders, and the general public aware of the long-term goals and economic value of a significantly expanded wastewater effluent reuse program.

Working Cooperatively. The County Commissioners, state water managers, and many community stakeholders were willing to work with a committee structure at the beginning of the crisis to identify cost-effective, alternative sources of lower quality water to use for irrigation purposes, instead of drawing upon sources of drinking water. County Commissioners encouraged SWFWMD authorities to provide financial assistance and staff resources to help plan and implement the wastewater reuse collection and distribution system.

Addressing the High Cost of Implementation for the Goal of Conservation. Project implementation for reclaimed water systems carries a high public cost for a greater public gain (water conservation). Although farmers are willing to pay a fee to use reclaimed water as a substitute for groundwater at a rate

near their actual cost of pumping "free" groundwater, this payment represents only a small fraction of the cost of making this water available. Local governments must be willing to subsidize the cost of reclaimed water systems provided to agriculture, allowing for adjusted rates that are affordable. Subsidies may be justified by considering the economic value attributed to:

- Reducing or eliminating discharges to surface water, keeping wastewater plant operations in compliance with state and federal rules governing discharge,
- Conserving groundwater supply and assuring a "reservation" of water for future potable use, and
- Supporting the local agricultural economic base with a viable alternative source of water.

Bridging Gaps With Financial Incentives. Traditional rules governing the construction and ownership of water lines between public utilities, developers and owners must be examined when considering reclaimed water for agriculture. Ordinarily, water or wastewater lines are constructed along public right-of-way to the boundary of private property by public utility. Developers or owners then extend these lines at their expense to service homes or businesses within their developments. In contrast, farmers, unlike developers, have little incentive to pay the cost of extending reclaimed lines across long distances from public rights-of-way to reach their existing producing wells. Public utilities who want farmers to substitute reclaimed water for well water must be willing to pay for the construction of transmission lines across great distances of privately held land, or seek out grant support from state or federal sources who share the same water conservation goals.

For further information please contact, Charles Hunsicker, Ecosystems Administrator, Manatee County; Phone: (941) 749-3070 ext. 6823; E-mail: Charlie.Hunsicker@co.manatee.fl.us.

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The Effect of Shipping on Air Quality in Coastal and Estuarine Regions

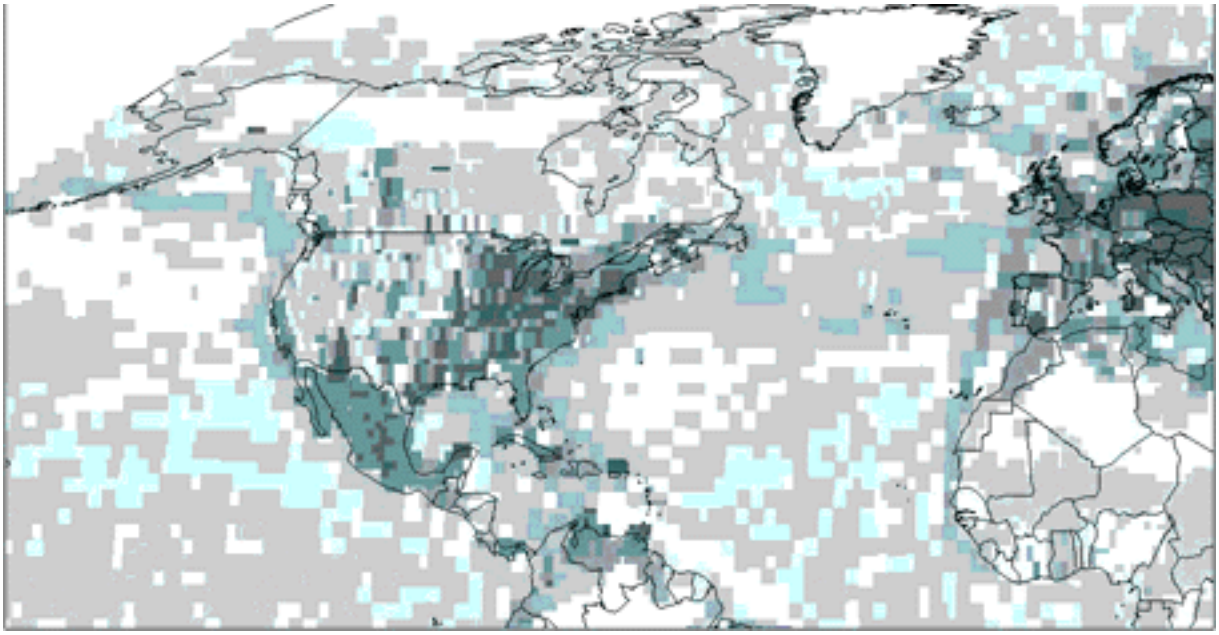
Oceangoing ships constitute a major global industry representing a crucial element of international trade and transportation. Until recently, nationwide shipping emissions inventories have been based on in-port emissions from inventories of a few ports, extrapolated to other ports and summed. However, more than 90% of navigable U.S. waterways (including inland rivers) occur outside of port regions. While this approach may be useful when considering local air-quality impacts, estimating regional effects requires consideration of vessel emissions occurring outside of port areas.

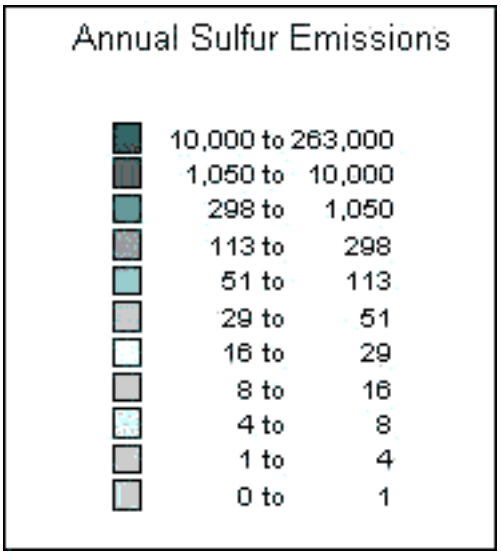
Recent research on the regional and global character of many air pollutants (including NOx and SOx) illustrates the importance of considering the impacts of emissions that may originate outside of poor air-quality areas. A recent comprehensive, geographically referenced emissions inventory, completed at Carnegie Mellon University, revealed three important findings. First, international ship emissions are an important and previously ignored part of the global inventory, which contribute approximately 2%, 5%, and 14% to world fossil fuel emissions of carbon dioxide, sulfur oxides, and nitrogen oxides, respectively. Second, modeling results that include this inventory show marine transportation emissions have significant impacts on global climate change. Third, ship emissions have the potential to impact air quality in many coastal and port regions along heavily traveled international trade routes, where annual sulfur emissions from ships equal or exceed those of adjacent land-based sources.

The world's ships are primarily powered by diesel engines, which although more efficient than the steam

turbine systems they replaced, produce high concentrations of NOx. Most marine fuels, or bunkers, are residual fuels. The concentration of sulfur in residual fuels averages approximately 3% by weight, although sulfur contents vary considerably by fuel type and by market. Seventy to eighty percent of international commercial shippers prefer to use the cheaper residual fuels. The combination of these high-NOx engines and high-sulfur fuels accounts for the larger fraction of nitrogen and sulfur emissions than carbon dioxide emissions.

On local and regional scales, previous studies have shown that ship sulfur emissions contribute to acid rain, which can pollute freshwater lakes and rivers and directly damage vegetation. Similarly, nitrogen emissions from ships react in sunlight with volatile organic compounds (VOCs) to produce tropospheric ozone, a significant air contaminant in many coastal regions. These effects contribute to the exceedance of ozone air quality standards in several U.S. port regions, including the South Coast of California.





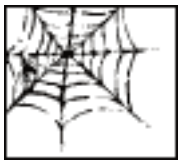
Sulfur modeling shows that the effect of international ship emissions is most evident in the northern hemisphere, where greater than 60 percent of sulfur dioxide concentration in the atmosphere and 30 percent of all sulfates can be attributed to ships. The southern hemisphere, not including the area encompassing Australia, is virtually unaffected due to less shipping traffic. Initial results from modeling the effect of ship NOx emissions on tropospheric ozone appear significant, although further research is needed to evaluate the complex patterns of tropospheric ozone formation from NOx and VOCs to confirm these results. This is most important for coastal cities in the northern hemisphere that suffer the brunt of the sulfur pollution.

However, the most important finding from this research may be that in addition to traditional greenhouse gases, nitrogen and sulfur emissions from ships play a significant role in understanding climate change. Ships have been known to contribute to the formation of clouds over the ocean. Sulfur emissions have a large role in the formation of aerosols (tiny particles) on which water condenses to form clouds. The interactions of aerosols and clouds have been identified as one of the most important uncertainties in understanding the rate of climate change, or global warming, because clouds reflect energy and thereby reduce the net warming effect of long-lived greenhouse gases. Since aerosols have a much shorter lifetime in the atmosphere (about a week compared to decades and hundreds of years for greenhouse gases), these effects have been difficult to quantify. Current research shows that sulfur from ships may be an important factor in solving this part of the global climate change puzzle.

Unlike other combustion sources, emissions from ship engines have never been regulated at the local, state, federal, or international levels. In 1997, the International Maritime Organization adopted the first regulations addressing air pollution from ships in MARPOL Annex VI; these standards have yet to be ratified. Last year, the U.S. EPA published the first regulations for commercial marine diesel engines that addresses the criteria pollutants. Federal standards take effect starting between 2004 and 2007, depending on the size of the engine.

Further research (by Carnegie Mellon researchers and others) has begun to examine the air pollution from waterborne commerce on inland river systems and to better include offshore emissions from international and domestic shipping in coastal regional models. Also, the U.S. EPA is developing a marine module that will be incorporated in its air pollution models. Regions that are currently assessing the impact of shipping on these larger, regional scales include the Puget Sound, the Houston Shipping Channel, the South Coast of California, San Francisco Bay, and several regions in the Northeast Atlantic coast.

For further information, contact James J. Corbett, Research Fellow, Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA, 15213; Phone: (412) 268-6826; E-mail: jcorbett@cmu.edu. Journal articles that describe parts of this work can be found in Science (1997) and Nature (1999). The Carnegie Mellon research received support from NSF grant SBR9521914, U.S. EPA, U.S. DOE, International Maritime Organization, and by academic funds, Department of Engineering and Public Policy.



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The Western Atlantic Shorebird Association's Interactive Website

The Western Atlantic Shorebird Association (WASA) partnership was formed to promote research, conservation, and education concerning shorebirds that migrate from Tierra del Fuego, at the tip of South America, to the Canadian Arctic. Partners include NOAA's National Estuarine Research Reserve System, the U.S. Fish and Wildlife Service, Manomet Center for Conservation Sciences, The Royal Ontario Museum in Canada, the Canadian Joint Venture and La Fundacion Inalafquen, a non-profit organization in Argentina funded by the US Fish and Wildlife Service.

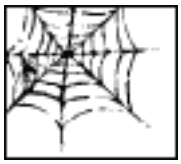
WASA has developed an interactive website to connect a hemispheric-wide monitoring network of volunteers from Tierra del Fuego to Canada, who are researching both the spatial and temporal migration patterns throughout the flyway. The website facilitates the transfer of information on shorebirds among researchers, managers, educators, and the general public. With the help of local citizens, researchers can acquire more data, which is then summarized graphically on the website through the creation of a flyway map.

The Web site is exciting for both researchers and members of the public. Researchers can access, query and download the databases via a password protected system. Data submitted to the database undergoes

quality assurance and control procedures. Members of the public who contribute data to the multilingual WASA website receive immediate feedback on the origin and date(s) of past banded bird sightings. Visitors to the WASA Web site and researchers can monitor the status of the migration in near-real time by observing the date and location points on the migration maps. The data can be viewed on a broad geographic scale, such as the flyway; at a regional or statewide scale, at a local scale, such as an individual beach. These points are interactive and link the viewer to observation data collected at that particular location.

This is the first year that the WASA website will be made available to the public. The migration for flyway year 2000 is about to begin, and WASA encourages the public to visit the site and begin observing shorebirds at all coastal localities along the flyway. Observations of both the presence or absence of birds is important. A data card is provided on the Web site for use in the field. Following this year of field experimentation involving the public, WASA will continue to improve the site and promote this model as a global approach to monitoring bird migration.

For more information, please contact Nina Garfield, NOAA's National Estuarine Research Reserve System, Phone: (301) 713-3141 ext. 171, or Gregory Breese of the Delaware Field Office of the U.S. Fish and Wildlife Service, Phone: (302) 653-9152 ext. 15. Visit the Web site at http://www.hopscotch.ca/shorebirds/index.html.en. 



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Fostering Coastal Stewardship in City Youth

Fostering environmental stewardship in low income, minority children poses a major challenge for environmental education and outreach practitioners. A recent program, created by the Partnership for Environmental and Safety Outreach (PESO) at Texas A&M University at Corpus Christi, Texas, and sponsored by Texas Parks and Wildlife, offers children from inner-city environments an opportunity to explore coastal environments within the Coastal Bend area of Texas.

Bringing the seine ashore to inspect the catch

Kayakers go ashore to do some exploring

Adopt-A-Wetlands instructor Kim Keplar identifies a specimen

The Coastal Bend in Texas is a diverse and sensitive environment with a variety of ecosystems, including bays, rivers and estuaries, coastal forests, barrier islands, and the Laguna Madre, a hypersaline lagoon. These diverse habitats support 3,178 species of plants and animals, 494 recorded species of birds and 35 state-listed endangered or threatened species. Educating local children on the value of these resources, stimulating an appreciation of the environment, fostering a sense of ownership, and promoting environmental stewardship are all critical to the future of the region.

In 1998, PESO received an Urban Leadership Collaborative (ULC) grant from the North American Association for Environmental Education. The mission of the ULC program is to provide environmental education to low-income, minority, urban communities. PESO began working with Corpus Christi's North Bay community to address environmental and safety concerns of the residents. This partnership led to the creation of a summer day camp program, combining kayaking with learning and exploring coastal environments. In early 1999, the project was awarded funding by Texas Parks and Wildlife, allowing the early stages of the program to proceed.

Kayak instructor Mark Arnold gives some pointers before beginning "on the water" instruction

Students and instructors pause for a group photo upon arrival at Fish Pass

The first day of the 3-day program included an overview of safety rules, swimming tests, and basic kayak training in a pool. On the second day the children were transported to Mustang Island State Park, where there are extensive tidal-flats and channels for kayaking and exploration. Additional kayak instruction was provided by local kayak experts to half of the group, while the other half learned about wetlands and field sampling with coordinators from the Adopt-A-Wetland program. The groups switched activities to complete the lessons and spent the remainder of the second day practicing kayaking, seining, sampling, and other field activities. On day three the skills and lessons the children had learned the previous day were put to the test by combining kayaking with field sampling. The group went to Fish Pass, where they paddled to a channel near the inlet to Corpus Christi Bay. Pulling a huge bag seine up the channel, the children captured a variety of fish, crabs, and other marine creatures. After retrieving the seine, the fish were identified with the assistance of a marine biologist from the Adopt-A-Wetlands program. The children also learned how to use dip nets, core samplers, and other equipment to obtain a wide variety of specimens.

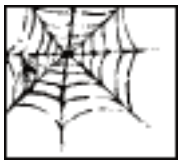
The camps were a success with the children, their families and teachers, and even caught the attention of the local news media. Few of the children had ever had a boating experience and none had been kayaking. The programs' success lies in providing children an opportunity to experience the beauty of their coastal home through means they may not have experienced previously. Program participants returned to their city environs with a true sense of ownership of the environment.

The program will be offered again this summer for students from the same schools, with the addition of an advanced camp and an adaptive camp. The advanced camp will be geared toward returning students and offer further field study activities as well as additional time with local scientists exploring other sites. The adaptive camp was added at the request of a local Children's Hospital to share this experience with disabled children. Special modifications will be made to allow disabled children to participate in all the camp activities.

Partnering with other organizations was instrumental in making these programs possible. Government agencies, industries, local businesses, and community groups were united to accomplish this common goal for the children of the community. Partners included Texas Parks and Wildlife, Koch Refining, Citgo Refining, Central Power and Light, the North Bay Community Advisory Council, Corpus Christi

Independent School District, Adopt-A-Wetlands, Texas A&M University's Recreational Sports Program, local businesses, and many generous individuals share the credit for the success of this program.

For further information contact, Dr. Jim Needham, Texas A&M University-Corpus Christi University Outreach; Phone: (361) 825-2778 or E-mail: jneedham@falcon.tamucc.edu or visit the website http://www.tamucc.edu/~outreach/peso/. EXIT disclaimer



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Supplemental Guidance for the Award of Polluted Runoff Grants in FY 2000

EPA has published guidance directed at upgraded state nonpoint source programs to implement watershed restoration action strategies in priority watersheds, a key action of the President's Clean Water Action Plan. The guidance provides information about grant allocations to states, the $2,500,000 in grants now available to tribes, eligibility of clean lakes assessment and restoration activities, and grants reporting and tracking. For a copy of the guidance visit http://www.epa.gov/owow/nps/Section319/fy2000.html

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USGS Database on World Wide Web

The Biomonitoring of Environmental Status and Trends (BEST) program is designed to assess and to monitor the effects of environmental contaminants on biological resources. As part of this program, threats from contaminants and other anthropogenic activities to terrestrial vertebrates living in or near Atlantic, Pacific and Gulf coast estuarine ecosystems are being evaluated.

One of the many objectives of this project is to create a "Contaminant Exposure and Effects--Terrestrial Vertebrates" (CEE-TV) database. Summary information in the database includes species, collection date (1965-present), site coordinates, estuary name, hydrologic unit code, sample matrix, contaminant concentrations, biomarker and bioindicator responses, and reference source. The data is based on information obtained by computerized searches of published literature, review of existing databases, and solicitation of unpublished reports from conservation agencies, private groups, and universities. Currently, the CEE-TV database contains approximately 4,000 records containing ecotoxicological exposure and effects information on over 150,000 individuals representing 200 species of amphibians, reptiles, birds, and mammals residing in estuaries and their watersheds.

Potential uses of the database include focusing biomonitoring efforts on generating critically needed ecotoxicological data in the numerous "gaps" along the coast, reducing uncertainty about contaminant risk, identifying areas for mitigation, restoration or special management, and ranking ecological conditions of estuaries.

For further information, visit the website at http://www.pwrc.usgs.gov/ceetv. EXIT disclaimer

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Why Do (or Don't) Local Government Official's Participate in Watershed Planning Efforts

One of the problems facing any watershed planning effort is to get people from local governments engaged in the process. The National Estuary Program's (NEP's) Comprehensive Conservation and Management Plan (CCMP) framework encourages the involvement of Local Governmental Officials (LGOs) in both the planning and implementations phases. LGOs include both town or city employees (planners, managers, etc.) and citizen board members (boards of health, conservation commissions, selectmen, etc.). LGOs bring knowledge and expertise on local conditions and are uniquely positioned to rally the public support needed to implement management plan actions. Despite the significance of their role, very little is known about the factors that encourage or constrain their participation in environmental policy-making.

To reveal more about LGO participation in watershed planning we, a team of social scientists with the non-profit Social and Environmental Research Institute, developed a study focused on NEPs with funding through the National Science Foundation. Three NEPs were chosen to investigate LGO involvement: Massachusetts Bays, New Hampshire Estuaries, and Casco Bay. These three NEPs had expressed interest in pursuing this topic and had similar regional and political settings.

With assistance from the directors of the selected NEPs, we compiled a list of the participating LGOs and those who had been invited but had declined to participate. By definition of LGO, state and federal employees were excluded from the list. Regional or county government plays a smaller role in New

England; however, several people from Regional Planning Commissions were interviewed. Thirty-five LGOs were interviewed concerning the factors that entered into their decision to participate or not.

The results from our interviews can be grouped into three categories of factors influencing peoples' decision to participate or not. The first category included factors unique to an individual's experience, skills, interests, or beliefs. For example, important concerns in this category included knowledge of the other people involved in the project. Also significant were individual attitudes toward learning new things and meeting new people, and dealing with conflict. Some cited a strong environmental ethic or a sense of civic or social duty as important factors. Others spoke about whether or not their involvement would contribute to their own personal education and growth (Will I get anything out of this?) as well as the project's success (Are my skills needed here?).

"Are they just looking for free labor or will I get something from this?"

A second category of factors influencing LGO involvement were issues beyond the control of the individual that impinged upon his or her decision. These frequently related to social, political, or economic considerations. Some municipalities discouraged officials from participating because they "knew they had dirty laundry and did not want it aired." Other people were instructed by their Town Manager to attend as part of their job. Some people did not participate because citizen awareness of environmental problems with the estuary was low or nonexistent in their community. While a tradition of regional cooperation might be enough to encourage some LGOs to participate, others made a careful cost-benefit analysis of whether their time would be "worth it for the community."

"Is there another opportunity for me to participate in a different project, but one that will serve my interests better?"

"This is triage. I am focusing on what needs to get done. If I am re-directed to participate by the town, I will reconsider my non-participation."

The third group of factors related to the way the NEP was managed. A prominent issue was the ability to make real progress based on clear objectives and competent leadership. Participating LGOs attributed their involvement to good group dynamics, a positive sense of camaraderie, and regular face-to-face contact that builds friendships and strong working relationships. Non-participating LGOs attributed their lack of involvement to a feeling of a lack of respect or that their input was not valued. Some felt that the NEP did not care about local problems, but was taking advantage of free labor. Others complained of poorly facilitated meetings, needlessly acrimonious discussions, a measurable lack of progress, and inconvenient meeting times and locations.

"Was I directly invited? Was I called? When I arrived, was I welcomed? Was my input valued? Was I respected?"

What can coastal managers and watershed organizations like the NEP do to entice LGOs to participate?

Our study results suggest that efforts could focus on the first and third groups of factors. This means focusing attention on producing a working environment that respects all voices, builds a sense of camaraderie, gives real power to the participants, clearly states the objectives and timetable, and makes clear progress on these objectives. LGOs are more likely to participate if the watershed project first learns about local problems and incorporates these into the NEP's objectives. Going out into the communities, listening to concerns, and inviting local participation are much more productive ways to secure LGO involvement than merely sending a form letter to the Town Clerk, Mayor's Office, or County Commissioners.

NEPs and others should also use knowledge of the first group of factors to focus recruitment efforts on LGOs more disposed toward participating. This means seeking out people who have a strong environmental ethic, enjoy working collaboratively with peers, take a regional perspective, and who pursue goals linked to the project's objectives.

Invitations to new participants should include announcements listing existing participants and provide opportunities for networking and learning. For NEPs, Mini-grants have been tremendously successful because they enable an LGO to make progress on his or her local agenda while remaining connected to the watershed project.

"Lack of time" is everyone's first response to the question of why they don't become involved. But this research suggests that it is more a matter of setting priorities than the availability of time itself. People "make time" for things that are most important to them. The challenge for watershed planning efforts and community-based environmental protection is to invigorate local support by addressing local problems, but doing so in a coordinated manner that enhances mutual benefits and makes progress on regional problems.

A second phase of the research, just completed, revisits LGOs in each of the study NEPs and asks them to rank each factor. An article on these results will be published in *Coastlines* in a future issue.

For further information, contact Thomas Webler, Social and Environmental Research Institute, P.O. Box 253, Leverett, MA, 01054; Phone: (413) 625-9046 or E-mail: twebler@crocker.com.