Cookbook of Innovations in Coastal Protection

U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds
Oceans and Coastal Protection Division
June 1994

Exhibit contents:

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- Listing by Author
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Revised May 6, 1997

URL: http://www.epa.gov/OWOW/coastal/cookbook/

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Introduction to the Cookbook

"Innovations in Coastal Protection: Searching for Uncommon Solutions to Common Problems," more commonly referred to as the "coastal cookbook," is an organized collection of successful coastal protection initiatives - recipes - from across the country. Project summaries of successful initiatives are included in three general topic areas including:

Public Education and Outreach Approaches
(e.g., using techniques such as citizen monitoring or storm drain stenciling)

Management Approaches
(e.g., overlay zoning, transfer of development fights, wetland banking and conservation easements)

Scientific and Technical Approaches
(e.g., using wetlands for wastewater treatment or use of viral transport, nitrogen loading or flushing models)

The following collection is the result of a "call for recipes" made in the summer of 1993. The response was overwhelming. Hundreds of submissions were received from widely varying groups across the country. The abstracts included here were limited to two pages and were grouped into one of the three general categories noted above.

Three peer groups (coinciding with the three general categories) were established to review the submissions with each group consisting of between four and seven experts in their respective fields. These peer groups helped select those recipes most broadly applicable in a wide range of settings.

The body of the book itself is also grouped according to the three categories listed above. Minimal editing was done (primarily for format and to fit the two page limitation) so that the authors could tell their own stories. For each of the submissions a number of key words were extracted - these are shown on the band across the top of the page. Also shown is a locator map noting the site of the project.

Appendices are provided for a list of projects sorted by author, by key words, and by state, and an address list for authors.

It is our strong hope that this document will serve as a beginning rather than an endpoint. We hope that others who have a story to tell will do so. With your help, this project will continue to grow.

Program and contact information provided may have changed since 1994. If the reader is unable to contact the program or person listed, contact the specific National Estuary Program for further information: National Estuary Program Capsule Summaries.

The Editors
June 1994

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Acknowledgements

The Editors would like to thank all the authors who submitted articles. The range and quality of the submissions were truly remarkable. We would also like to particularly thank the members of the peer review groups listed below who shared their wisdom and experience in the selection of the enclosed articles.

Management Approaches

Darrell Brown, US EPA
Charles App, US EPA
Nancy McKay, Puget Sound Water Quality Authority
Clement Lewsey/Joelle Gore, NOAA Office of Ocean and Coastal Resource Management
LaVerne Smith/Jill Parker, US Fish and Wildlife Service
William M. Eichbaum, World Wildlife Fund
Mark Curran, Battelle

Technical and Scientiric Approaches

Steve Glomb, US EPA
Judith Weis, Rutgers University, Department of Biological Sciences
Norman Rubenstein, US EPA, Narragansett Lab
John Armstrong, US EPA, Region X

Public Education and Outreach

Ray Hall, US EPA
Janet Pawlukiewicz, US EPA
Frances Flanigan, Alliance for the Chesapeake Bay
Diane Barile, Marine Resources Council, Florida

Mary Sue Maurer, Santa Monica Bay Restoration Project

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Section 1: Public Education and Outreach Approaches

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San Francisco Bay-Delta Estuary, California

Multicultural Anglers Project

Marcia Brockbank

Purpose

The San Francisco Bay-Delta Estuary is one of the most threatened estuaries in the nation. The region discharges an estimated 5,000 - 40,000 metric tons of at least 65 pollutants into the Estuary each year. Pollution is particularly acute in the highly industrialized South San Francisco Bay, which receives 60 percent of all point source pollution discharged into the entire Estuary. Both federal and state health authorities have issued warnings about the risks associated with consuming tainted fish caught in the Estuary.

Pollution in the Estuary poses a hidden hazard to people of color and immigrants, who often supplement their protein intake by catching and eating local fish. Because health warnings are seldom visible at fishing sites and are printed only in English, many anglers are unaware of these hazards. They are even less aware of their fight to participate in the decision-making processes that will determine the process whereby the Estuary is made safe for fishing.

In response to this situation, Citizens for a Better Environment (CBE) developed its Multicultural Anglers Project (the Project), funded in part by a grant from the San Francisco Estuary Project. Through the Project, CBE prepared multilingual education and outreach materials and disseminated them to people who regularly fish for food in South San Francisco Bay. CBE also identified, informed, and involved a new and multiracial set of Estuary advocates among people who regularly fish in the South Bay.

Background

In spring 1992, CBE conducted a survey of anglers who fish in the South Bay. CBE discovered that the majority are low income residents, people of color, and immigrants who depend upon the Bay for food, but are unaware of the toxic contents of their catch. Approximately six months later (fall 1992), CBE hired a field organizer and initiated the Multicultural Anglers Project.

To spearhead the Project, CBE hired one field organizer, who is supervised by' CBE's campaign organizer. The field organizer also receives CBE administrative staff support. In addition, the field organizer and Project benefit from the support of numerous volunteers from community organizations and the Project's constituency.

CBE's field organizer is in daily contact with the Project's constituency and supporting community organizations. This outreach occurs on the fishing piers, at meetings, and via telephone. This type of consistent outreach has been integral to the Project's success. The cost of the Project was $23,938.

Key Players

- Citizens for a Better Environment - provides technical (research) support.
- Southbay Anglers for Environmental Rights (SAFER) - a CBE chapter; as the main organizing vehicle for the Project, SAFER is responsible for distributing educational materials to the Project's constituency and involving anglers in the Project's outreach efforts.
- Various Bay Area Community Organizations (over 20 are involved) - help facilitate educational outreach efforts to the Project's constituency.

Methodology

To implement its Multicultural Anglers Project, CBE used the following methodology:

- **Step 1** - Analyze Information Needs: Using existing research materials, CBE determined the health and environmental information and translation needs of South Bay anglers. CBE also prepared angler fishing surveys in English, Spanish, Korean, Vietnamese, Tagalog, Chinese, and Laotian and began distributing them at bait shops and piers throughout the South Bay. These surveys served to gather demographic and fish consumption information at the grassroots level.
- **Step 2** - Prepare and Translate Written Materials: CBE prepared and translated information sheets in English, Spanish, Korean, Vietnamese, Tagalog, and Chinese. These information sheets highlight the California Environmental Protection Agency's official health warning on eating the Bay's tainted catch, outline additional health risks to which anglers can be exposed from consumption, identify which individuals and agencies anglers may contact for more information on the South Bay's pollution problems, and suggest solutions to these problems.
- **Step 3** - Talk to Anglers Directly: CBE's field organizer is currently distributing the educational materials and the surveys on an ongoing basis at bait shops and piers throughout the South Bay.

- **Step 4** - Distribute Information to Institutions and Leaders: As a response to poor and unsafe fishing conditions, CBE initiated Southbay Anglers for Environmental Rights (SAFER), a chapter of CBE comprised of anglers who are concerned about the degraded state of the South Bay and the threats to their health from toxic pollution in the Estuary. It will serve as the Multicultural Angler Project's main organizing vehicle and will help open up the environmental decision-making process to individuals from multicultural communities who often experience the worst effects of toxic pollution.

The Project is receiving enthusiastic support from numerous community-based ethnic and environmental organizations around the Bay Area. To date, 24 organizations have formally endorsed a CBE-drafted resolution that asks various state agencies to post multilingual health warnings about the hazards associated with eating fish caught in the Bay. The resolution further asks these agencies to devise a proactive plan that addresses the Bay's pollution problems. Due to the efforts of CBE and SAFER, the U.S. Fish and Wildlife Service has posted multilingual health warnings at two piers over which it has jurisdiction. Representatives of CBE, SAFER, California EPA, and the Department of Fish and Game met recently to discuss the need for multilingual health warnings and their respective concerns.

Lessons Learned

Translation of the Project's educational materials into the appropriate languages was key to the Project's success, as was direct and consistent contact with the Project's constituency. Ongoing surveys and interviews of affected anglers helped to define the constituency and the parameters of the problem that the Project sought to address. Those working on the Project did not encounter any contentious situations or experience events that should be avoided by others. If others were to undertake this type of project, a priority should be to make direct contact with the affected constituency and ensure that this constituency is integrally involved in the project's efforts.

Related Materials

For further information, please contact:

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Chesapeake Bay; Virginia, Maryland, Pennsylvania

Chesapeake Bay Citizen Monitoring Program

Marcy Judd

Purpose

The Chesapeake Bay Citizen Monitoring Program was designed to determine:

- 1. if volunteers could gather water quality data that met rigorous quality control standards;
- 2. if data collected at nearshore locations reflected the water quality of the river in general;
- 3. what were the most reliable sampling procedures, reporting formats and data management systems; and
- 4. if it was feasible to include a permanent, bay-wide citizen monitoring network among the long-term Bay management strategies of the state and federal governments. Since its beginning, the Program has grown to more than 150 volunteers at over 110 sites on the Lynnhaven, Elizabeth, James, York, Rappahannock, Piankatank, and Potomac Rivers, as well as on the creeks and embayments of the Eastern Shore in Virginia; the Patuxent, Middle, and Severn Rivers in Maryland; and Conodoguinet Creek and the Conestoga River in Pennsylvania.

Background

The Alliance for the Chesapeake Bay has conducted a volunteer water quality monitoring program since 1985. In June, 1985 the pilot program began with 12 monitors on the James River in Virginia and 16 monitors on the Patuxent River in Maryland with one regional coordinator. The project was budgeted at $47,000 for the first year.

Methodology

The parameters tested are: air and water temperature, Secchi disk depth and total depth, salinity, pH, dissolved oxygen, ammonia, and precipitation. Monitors also record wildlife observations, field observations of water conditions and color, weather, and general conditions of the site. Monitors sample weekly throughout the year. In addition, nutrient sampling began at 11 sites in Maryland in 1990 and at ten sites in Virginia in 1992 in conjunction with the' Department of Natural Resources and the Department of Environmental Quality. The Maryland sites were chosen to track the water quality changes after sewage treatment upgrades on the Patuxent River. Ten sites were chosen in areas of submerged aquatic vegetation (SAV) in Virginia. Monitors collect and filter samples which are analyzed in a laboratory for dissolved inorganic nitrogen and dissolved inorganic phosphorus. Results will be used to help evaluate present status and future trends of nutrient concentrations in SAV growing areas. Concentrations can be compared to SAV habitat growing criteria developed by the Chesapeake Bay Program. Recently seven monitors have begun to monitor for Zebra Mussels in Virginia. An atmospheric deposition study and a riparian inventory were conducted in Pennsylvania.

Citizen monitoring sites are located in near-shore areas. The data gathered are being used by the Chesapeake Bay Program to compare water quality in these relatively shallow waters and the mid-channels of major rivers. Data generated by this program are also being used by the Virginia Department of Environmental Quality in its surface water assessment program. The wildlife observations, made referring to a field guide, provide input to the Virginia Department of Game and Inland Fisheries' "Biota of Virginia" database of sightings of common or ordinary species.

Key Players

It took four months to implement the project following approval of the proposal by the Implementation Committee of the Chesapeake Bay Program. A small group of research scientists worked on the citizen monitoring program plan and proposal for about one year. Full time coordinators work to maintain the program, implement projects and motivate volunteers. An important motivator is the documentation of the use of data to the volunteers.

At the outset, some researchers and state managers were not convinced that volunteers were capable of collecting quality data. Others were only interested in data gathering and were not concerned with the public involvement and educational value of the program. Changing their minds was one obstacle. In planning a project like this it is important to allow for plenty of time to implement phases of the project. Plans may need to change and this takes time.

Recently, to better manage the expanded program, a data management software program was developed, field tested and revised to enter data and create graphic reports. The program was presented at the second annual Virginia Environmental Education Conference, Third National Citizen Monitoring Conference

and the Coastal Society Conference. Data from the field is imported to a central computer where it is available for individual reports to monitors. This software, called CitMon*MAN, makes it possible for monitors to see the seasonal trends in their data and is a great tool for motivating volunteers. All data are also sent on disk to the Chesapeake Bay Program Office in Annapolis where it is accessed by state agencies. The data management program is now being distributed to new monitoring programs around the nation.

Also, the watershed coordinator system was developed as a way of decentralizing management tasks. The 100-site monitoring network in Virginia was divided into 10 smaller units each containing approximately 10 monitors. Ten volunteer watershed coordinators were recruited to act as managers taking requests, troubleshooting, acting as liaisons to the Virginia Coordinator and most importantly, managing the data generated by the watershed group. The data collected by each watershed coordinator from approximately 10 monitors is sent to the Richmond office central computer on disk where it is compiled and prepared for inclusion in state agency reports.

Lessons Learned

In 1992, Chesapeake Bay Citizen Monitoring Program data were for the first time included as a component in Virginia's 305(b) Report to EPA and Congress. Given the distribution potential of the network's sampling sites it is anticipated that the data will be of particular value to local governments and jurisdictions throughout the Commonwealth. The Board's Ambient Water Quality Monitoring Network cannot cover all waters of the state. In an effort to increase the assessment coverage of the report and to give a more accurate portrayal of water quality in these areas, data generated by the Alliance for the Chesapeake Bay's Citizen Monitoring Program were used. For the first time, citizen- generated data were used to make water quality assessments on waterbodies not previously covered by the state.

Related Materials

For additional information, please contact:

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Nationwide

Officer Snook Marine Project

Jennifer Sevin, Student

Purpose

Officer Snook is a cartoon character who symbolizes the importance of environmental protection. Officer Snook is an environmental program aimed at making students aware of marine pollution, the effects pollution has on our water content, animal and plant populations, and human safety. By educating our youth about toxins and marine debris, I am hoping to open young eyes to the problems facing our world today and encourage children to make a difference for the world of tomorrow.

Background

The Officer Snook Program consists of a 45 minute presentation which includes Center For Marine Conservation slides and a video entitled "Trashing Our Oceans". The program also includes oral presentations and a United States Coast Guard representative who speaks and answers questions. All students participating in the program receive a complimentary Officer Snook coloring and activities book. An Officer Snook T-shirt is given to selected students who participate in the essay and drawing contest.

Methodology

The Officer Snook Program, since its inception, has taken two years to implement. After creating the coloring and activities book, a copy was sent to the United States Coast Guard in Washington, DC, asking for approval and support. Following their approval a proposal was submitted to the Dade County

Public School Board for further approval for use in county schools. I proceeded to promote the coloring book by making numerous calls to various organization, making presentations to schools across the county, and publicizing the program through newspaper articles and radio interviews.

Key Players

The Coast Guard has recently approved the program for national distribution, however, much financial sponsorship is needed in order to keep the program in operation. Royal Crown Cola sponsored the printing of the first ten thousand books at a cost of approximately $2,500. These funds were used and additional funding is currently being sought. I have just graduated high school and will be attending the University of central Florida in the fall of 1993. I have been giving workshops to other students who will continue to present the program In addition, I have written a curriculum booklet and, in the future, plan to make an Officer Snook video and board game. In the Project, I encourage people everywhere, but especially students, to get involved in preserving our environment. I hope others will create projects such as mine to help educate our young people. It takes hard work, patience, and dedication, but I believe' it is all worthwhile. By combining all elements of the program, I hope to accomplish my goals. The Officer Snook program shows that all people will celebrate a better, cleaner future.

Special thanks to Admiral Leahy, Commander Dillon, and Ensign Lang of the Seventh Coast Guard District and Heidi Lovett of the Center for Marine Conservation.

Related Materials

For further information, please contact:

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North Carolina

Videos Demonstrating North Carolina's Computer-Based Geographic Information System

Joan Giordano

Purpose

The widespread computerization of data on land uses, pollution sources, wetlands, and other factors that affect local planning has led to the creation of sophisticated planning instruments known as Geographic Information Systems (GIS). In many areas, GIS is revolutionizing local planning by making it easier for officials to visualize the potential impacts of new development on the environment and therefore able to minimize those impacts.

Background

In many rural counties of eastern North Carolina, however, there exists little money for planners and little knowledge of the capabilities of GIS. Spreading the word of the state's extensive GIS is an important step in getting developers and small local governments to take advantage of the services available. To help promote the state's GIS program, the Albemarle-Pamlico Estuarine Study (APES), a National Estuary Program, produced two videos which describe GIS and demonstrate ways it can enhance planning and expedite permitting processes.

Methodology

The first video, "A Coastal County in 201 0: Planning with GIS", describes the capabilities of GIS and shows how planers can manipulate data layers to better visualize the impacts of various activities. The 13-minute video also provides insight from planners who have used the system and gives advice on ways that local governments or persons without their own GIS can utilize or access the state system.

The second video, "Planning the Future", follows a developer through a simulated case history of finding a suitable location for a coastal development. This 10-minute video demonstrates how GIS can overlay data on an area map to indicate the presence of wetlands, shellfish beds, or other resources that would likely restrict the development allowed in certain vicinities or require lengthy permitting processed. In turn, areas where little permitting would be necessary would also be defined, thus helping the developer identify sites. where pre-construction activities would be kept to a minimum.

Key Players

In addition to producing these videos and distributing them widely to local governments and civic organizations to help promote use of GIS, APES has helped expand the data layers available through the system as well by providing over $1 million in funding to the NC Center for Geographic Information and Analysis (CGIA), which administers the GIS. APES is also encouraging more access to GIS by recommending that systems be made available on a regional basis, thus making it easier for officials from smaller rural counties to utilize the data.

Actual production of the videos cost about $12,000 and $13,500 respectively, and each required about three months to film and edit.

Lessons Learned

Nothing seems so much in demand in environmental management as the ability to see into the future. While GIS does not provide that, it does greatly enhance the planning process. Helping more people understand how GIS can help and how they can gain access to it will bring a much needed element of predictability to the often confusing arena of local planning.

Related Materials

For further information, please contact:

Videos Demonstrating North Carolina's
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Massachusetts

Falmouth Pond Watchers Water Quality Monitoring Program

Tracy I. Crago

Purpose

The citizen volunteer monitoring effort for the coastal ponds of Falmouth, Massachusetts, better known as "Falmouth Pond Watchers Program," was initiated in 1987 in response to concern over apparently deteriorating water quality of circulation-restricted coastal salt ponds. The fundamental purpose of the program is to provide quantitative, high quality environmental data for the development of management plans. This is accomplished by a unique partnership between scientists at the Woods Hole Oceanographic Institution (WHOI), the WHOI Sea Grant Program, the Town of Falmouth, and citizen volunteers. The objectives of the study are to provide the Town with information on water quality conditions in the ponds, to help plan watershed land use and to help guide potential remediation plans. In addition, the project was designed to involve local citizens directly in determining the ecological health of their coastal ponds and harbors, as well as to draw community attention to the increasing human pressures on our fragile coastal resources.

Background

In 1987, concern about increasing eutrophication of coastal salt ponds was voiced at Falmouth's annual town meeting. Unable to appropriate funding necessary for a diagnostic study of these ponds, the town did its best by allocating "seed" money of $5,000 to help initiate a water quality study under the auspices of the town planning board. Dr. David A. Ross, WHOI Sea Grant Coordinator and a town meeting member, suggested that WHOI Sea Grant might be able to provide supplemental funds. That summer,

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

The project was designed to provide the Town of Falmouth with an ongoing, comprehensive database of water quality conditions in the ponds in preparation for the Coastal Pond Overlay Bylaw, which went into effect the following year. The bylaw specifies annual mean threshold values for total nitrogen concentrations in Falmouth's coastal ponds to protect them from declines that result from increasing nutrient inputs caused by development. With information from the Pond Watchers project, the town felt it would be better prepared to assess future management options - such as enlarging and improving the ponds' outlets to the sea, increased sewering, limits on lawn fertilization, installation of denitrifying septic systems, re-zoning, or building moratoria.

Key Players

With financial support from the Town and the WHOI Sea Grant Program, the project was off to a start, but the issue of volunteers to conduct the sampling remained unanswered. The project organizers appealed to the citizens of Falmouth for help through newspaper articles, radio and television. Quickly, 55 people volunteered. Six years later, most of the volunteers are "originals," and several new recruits have joined each year. Volunteers range in age from high school students to retirees. Some live on or near the ponds sampled in the study; others drive several miles to participate in the sampling.

Methodology

An advantage of the Pond Watchers program over other types of monitoring programs revolves around sampling methodology. Because of the large number of volunteers, simultaneous sampling is conducted at 34 stations on each sampling date. This provides data collected under the same conditions of weather and tide, critical to making system to system or station to station comparisons.

Training is held each year, prior to the start of the sampling season. At these sessions, volunteers are briefed on the ecology of the ponds and potential changes they might see, issued sampling kits, and told of the goals of the sampling program. Volunteers use their own boats to collect water column samples - at the surface, and varying depths - and record oxygen and temperature readings. Additional water samples are collected and taken to the laboratory for more in-depth testing. Physical measurements such as water color, total depth at sampling site, temperature, and light penetration are also taken. In addition to the summer sampling schedule, year-round rain gauge data, bird census, and general observations are conducted by the volunteers.

Lessons Learned

The effectiveness of the Pond Watchers Program lies both in the enthusiasm and dedication of the Pond Watchers and the unique partnership developed between the citizens, local government, and scientists, whereby information gained from the research can be swiftly and directly applied toward effective management decisions for these fragile environments.

The importance of long-term data sets in evaluating trends in coastal water quality cannot be understated. Without year to year comparisons of ecological conditions it is impossible to evaluate apparent changes in water quality relative to natural processes (such as storms or natural shoreline changes) or anthropogenic (such as development) impacts. The consistent and high quality data provided by the Falmouth Pond Watchers are now enabling evaluation of various potential management directions for each individual system relative to both cost and ecological effectiveness.

Another important aspect of the Falmouth Pond Watcher Program is its wide-ranging applicability to other types of coastal systems. Techniques and methods used by the Pond Watchers have been specifically designed so that virtually any coastal community can undertake this type of effort efficiently but at low cost. The success of this program is reflected in its adoption as a model for the EPA Bays Program/Buzzards Bay Project Citizen's Monitoring Program, and a number of other communities currently exploring mechanisms to establish similar programs for their own harbors and ponds. The program was also recognized nationally in 1991 when the National Environmental Awards Council cited the Pond Watchers Program for a National Environmental Achievement Award. In 1992, Renew America recognized the program as an innovative model for grassroots environmental protection programs and included it in its Environmental Success Index for 1992.

The Pond Watchers Program has been relatively free of problems, although important lessons have been learned. It was apparent from the start that a basic understanding of the science underlying the design of the monitoring regime was important to insuring samples were collected correctly by the participants. Careful measures have been taken to educate volunteers about the ecological processes at work, so that, should sampling problems occur on-site, Pond Watchers are able to make decisions about how to handle them. To reinforce this principle and build confidence in the volunteers, the Pond Watchers are presented with basic ecological principals governing the ponds as well as an overview on how the incoming data relates to these principals - on an annual basis, prior to the sampling season.

Other bits of advice: have an organizational strategy. Pond Watcher's are divided into subgroups (by Pond); each pond has a designated "Pond Captain" to oversee each group. This strategy maximized efficiency of the sampling logistics and minimized the amount of time required for distribution and collection of sampling gear and samples, while providing an avenue for increased cooperation between each group of volunteers. Lastly, data collected by volunteers should always be interpreted by qualified personnel.

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Massachusetts

Shorewatch Video Series for Cable Television

Tracey I. Crago

Purpose

During the last decade, the popularity of video as a media form has become akin to the introduction of television in the 1950s. Recognizing the opportunities afforded by such a versatile media form, many organizations have chosen to use video to get their message out to intended audiences.

Included in the thousands of videos produced each year are many excellent productions on issues dealing with marine and coastal topics. Most of these are not readily available to the public, due to limited funding for publicity, limited distribution capabilities, or other reasons. The Woods Hole Oceanographic Institution's (WHOI) Sea Grant Program and the Massachusetts Coastal Zone Management Office (MCZM) have teamed up to bring such video productions to the-general public via cable access television channels, where they can be enjoyed by a large audience at no charge to the producer or the viewer. This project accomplishes one of the key objectives of the WHOI Sea Grant Program and MCZM: public outreach and education about issues pertaining to wise use and enjoyment of the coastal and marine environment.

Background

The Sea Grant-MCZM partnership has been successful in not only acquiring numerous videos but also permission to show them on cable access television stations throughout Cape Cod, Martha's Vineyard, and Nantucket. The effort has been named SHOREWATCH: A Forum for Coastal Issues and Outreach,

and is now carried on six cable access channels, with plans underway to expand to the rest of the Massachusetts coastline. The SHOREWATCH series makes use of numerous publicly-funded videos produced by organizations such as the National Oceanic and Atmospheric Administration (NOAA), EPA, Sea Grant Programs, as well as videos from private production companies. Videos included in the SHOREWATCH series fit under the themes of Resource Preservation, Coastal Erosion, Wetlands and Wildlife, Water Re-source Management, Fisheries Management, Recreational Boating & Fishing, Aquaculture, Marine Debris, Hurricanes, and other miscellaneous productions that involve the marine and coastal environment. Each "episode" lasts approximately 30 minutes.

Key Players

In the Spring of 1992, the WHOI Sea Grant Program was exploring ways to distribute more information to the public through the media. While its relationship with print media and radio was established, there was no history of work with video or television. At this time, the Sea Grant Program was looking into use of videos produced by other Sea Grant Programs within the National Program network for use in local schools. At the same time, the Cape Cod office of MCZM was investigating similar uses of videos.

Learning of the mutual interest in video productions, SHOREWATCH producers Tracey Crago, Communicator at WHOI Sea Grant and MCZM Regional Coordinator Pam Rubinoff, met with the programming director of Cape Cod Community Television (C3TV), who offered the use of C3TV facilities and station volunteers. SHOREWATCH was created as a result of that meeting. In September, 1992, a mini-SHOREWATCH series (4 videos) on hurricanes debuted on C3TV. Within one year, three complete 13-week series of SHOREWATCH were cablecast, and five stations added, coveting nearly every town on Cape Cod as well as Martha's Vineyard and Nantucket.

As with most cooperative projects, there are many key players. Each of the programming managers at the community cable stations that we work with have been extremely cooperative, supportive, and flexible. Producers and environmental organizations throughout the U.S. have graciously donated their productions. The generosity and willingness of groups and individuals to cooperate for the sake of educating and informing the public about various coastal and marine issues continues to amaze the SHOREWATCH producers. The SHOREWATCH series concept has been well-received by video producers, funding agencies, cable station programming managers, the coastal communities, schools, and environmental organizations.

Costs for the SHOREWATCH series have been minimal; the idea for the series came in the middle of the funding cycles for both MCZM and WHOI Sea Grant and, therefore, SHOREWATCH was not a budgeted project. This has actually become a plus; producers have made use of volunteers and interns, and continually rely upon the generosity of cable station personnel and volunteers. Virtually every video used in the series has been donated at no charge to the project; purchased videos have been acquired at a reduced rate. Duplication of the videos, for distribution to the six cable stations now participating, has been done by volunteers using equipment at C3TV studios and SHOREWATCH producers are charged only for the actual cost of the videotapes, not the labor or use of the facilities. To date, the main cost

incurred is the producers' time. For three complete 13-week series' and the introductory 4-week hurricane series, the budget has been approximately $2,800 (including travel and salary time for producers).

Methodology

During the evolution of SHOREWATCH, many questions were asked. Are there good video productions out there that deal with coastal and marine issues? Is there sufficient interest among the general public to learn more about these issues? How would an average citizen find out about such productions or go about obtaining a copy or viewing it? Can WHOI Sea Grant and MCZM play a role in getting these productions and making them available to the public? What format or forum should we look at to make the connection between these productions and the general public? How can we do it so that all sides will feel they are gaining something? The format of cable access/ community television stations emerged as most attractive for a number of reasons: it does not involve a fee; most towns have either a community television station or a local cable channel; such stations have either an obligation and/or interest in programming that can be considered informational, educational, and that pertains to local issues; and, community television stations are readily available to a wide portion of the general public and schools. A drawback, certainly, is that cable access channels do not have a large viewing audience. We have tried to overcome this obstacle by heavily advertising the series in newsletters, newspaper and magazine calendars, tourist guides, and other publications that have wide distribution on Cape Cod and the Islands.

Lessons Learned

One of the few difficult situations that the SHOREWATCH series faced was in dealing with small, private production companies. Understandably, they were hesitant to part with productions for free, since their livelihood depends on sales. Although we did not overcome each of these hurdles, often we have been granted permission to use such productions as long as we include a trailer at the end of the production which listed information about purchasing the video. Bits of advice to anyone interested in putting together a similar program in their town: have a legal agreement drawn up which clearly spells out the "terms and conditions" of the series and how the production will be used, and have the producer or owner of the production sign it, date it, and return it before you include the production in the series. It is extremely important to abide by any restrictions place on your use of productions. Lastly, be careful that you aren't inadvertently "selling" a concept, product, or opinion by including a production that may be biased or contain inaccurate information. The best way to avoid such a situation: screen all productions and, if necessary, have them reviewed by someone knowledgeable about its subject matter.

Shorewatch Video Series for Cable Television
Tracey I. Crago, Communicator
WHOI Sea Grant Program
Woods Hole Oceanographic Institute
Woods Hole, MA 02543
508457-2000x2665/508-457-2187 Fax

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Rhode Island

Home Guide for Medical Waste Disposal

Diann J. Miele

Purpose

Waste disposal is an on-going problem for many communities. In recent years, medical waste disposal has posed even more difficulties with the appearance of needles, syringes, and other similar items on our beaches. Reports produced in the aftermath of the 1987 and 1988 Northeast beach washups indicated that most of this waste was not from health care facilities, but rather resulted from illegal drug use and from medical items (syringes) used in the home. Public pressure has resulted in the enactment of facility-based medical waste regulations in forty-nine states, but few states regulate home-generated medical waste.

Background

In Rhode Island, it was found that diabetics and others routinely flush used syringes down their toilets. For the patient, this practice seemed an inexpensive, safe, and easy solution to dispose of a potentially dangerous waste item. However, the syringes flushed down the toilet do not disappear; the effluent from the Rhode Island wastewater treatment system eventually goes directly into Narragansett Bay and then into the Atlantic Ocean. Plastic items, such as syringes, are considered "floatables" and are not easily removed in the wastewater treatment process. Hence, these home-generated syringes reappear, rather than disappear.

Methodology

To alleviate this environmental and public health hazard, the Rhode Island Department of Health (DOH)

along with the Rhode Island Department of Environmental Management (DEM) have developed a pamphlet describing better ways to dispose of home-generated syringes. The pamphlet is entitled, "Home Guide for Disposal of Medical Wastes", and was funded in part by the United States Environmental Protection Agency (EPA). The pamphlet presents a safer and more environmentally-friendly way to handle, store, and dispose of home generated-medical wastes.

Key Players

The "Home Guide" project took one year from the initial development idea to the final printed copy. The copy was written by DOH and DEM staff, while the pamphlet's graphics were done by a professional firm. Some ideas presented in the pamphlet were borrowed from the EPA and other state agencies' brochures. A draft of the guide was reviewed by other divisions in the DOH and the DEM, including the Acquired Immune Deficiency Syndrome/Sexually Transmitted Diseases Division of the RI DOH and the Environmental Coordination Division of the RI DEM. Private home health agencies were also invited to comment on the draft

After these comments were incorporated, 2,000 copies of the brochure were printed and sent to all municipal waste handlers, home health care agencies and hospital outpatient clinics in the state. (Police departments were sent the guide at a later date.) Along with the guide was a questionnaire asking for any other comments and requesting an estimate of the number of guides that each group would anticipate distributing over one year. Responses received ranged from 20 guides to 1500 guides needed per month. From this information, an additional 10,000 pamphlets were printed in anticipation of a one year supply. The total cost of printing the 12,000 guides was $1,000.

Lessons Learned

One problem was encountered when the original guide recommended the use of empty 2-liter soda bottles as a container for sharps. That recommendation was based on a Washington State Department of Ecology's research project designed to find the toughest and most easily accessible container to store and dispose of home syringes. The PET plastic 2-liter soft drink bottle was found to be the best container for used home-care syringes in that study. However, the Rhode Island recycling law mandates that PET bottles be recycled. It was thought that these containers, full of syringes, would end up in the recycling facility, causing harm to both workers and machinery. After much discussion, the PET containers were removed from the guide.

Another problem involved the cost with printing. The DEM had funds available for these two printings, but that will probably be all. Funding from other sources (i.e., private foundations) will be needed in order to print more guides when this supply runs out. On a similar note, many agencies have requested this pamphlet in Spanish, but there are no translation services available. The concern is that others will copy the guide when the supply is diminished and by doing so the guide will lose the quality that it now has.

Both the DEM and the DOH believe that the "Home Guide for the Disposal of Medical Wastes" aids in solving many of the health and environmental problems created by the disposal of home-generated medical wastes. This guide employs basic, simple, and inexpensive solutions to avoid a potential threat to our coastline.

Related Materials

For further information, please contact:

Home Guide for Medical Waste Disposal
Diann J. Miele, Environmental Scientist
Office of Health Risk Assessment
State of Rhode Island Department of Health
Cannon Building, Three Capitol Hill
Providence, RI 02908-5097
401-277-3424

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Pacific Northwest

Fish Net Collection and Recycling

Fran Recht

Purpose

This program addressed the solid waste problem posed by the need to dispose of 500,000 or more pounds of old nylon gill net each year by salmon and herring fishermen in the Pacific Northwest. This netting material is a hassle to landfill operators as it ensnares their equipment. In some remote Alaskan sites, where no landfills are available, the nets create health and fire risks when they are burned. This program sought to work with fishermen, cities, and ports to establish on-going community collection efforts for the used net material and to assure that this nylon was recycled into useful secondary products.

Background

The first shipping container of 47,000 lbs of nets was marketed overseas and made into bicycle seats in January 1992, about three years after the program was first established. These nets came primarily from collection areas in two fishing ports, but nets were also contributed from two other ports. 14 areas are now collecting nets and participating in the program. A second shipment of 47,000 lbs of nets was marketed about a year after the first, and within that same time frame another like quantity was collected in the various sites, but had not yet been consolidated for shipping. Work with local project coordinators, fishermen, ports, and the recycler is necessary until the program is smoothly and routinely operating. Clear signage, notices, and periodic press articles are also necessary. 16 people are the direct contacts for this effort, though many city and port officials, fishermen, fishing groups, and fish processing plant operators in each community and port area are involved. Though this effort has been supported by a $20,000 National Marine Fisheries Service and a $30,000 Environmental Protection Agency grant, the economics are such that once the collection efforts are established, the recycling effort will be self

sustaining.

Key Players

National Marine Fisheries Service and the Environmental Protection Agency provided funding. The Pacific States Marine Fisheries Commission initiated and coordinated this effort. The Ports of Bellingham, Seattle, Anacortes, and Everett, Washington provide space for the collection containers and day to day oversight of the collection areas. The Cities of Cordova, Naknek, Kenai, and King Cove, Alaska are involved through the baling of the nets or the collection of nets at their landfills. A citizen volunteer effort in Cordova has been crucial to that program's success and the Cordova District Fishermen United helps efforts by coordinating an "adopt a bin" program. Petersburg Fisheries, a seafood processing company and individual fishing boats coordinate the transport of the nets to the Seattle area. The Chamber of Commerce is involved in recycling efforts in Dillingham, Alaska. The United Cook Inlet Drift Association, a fishing organization, has worked with processing plants, the city, and the refuse and recycling contractor to coordinate collection efforts on the Kenai Peninsula. Individual fishermen work in Wrangell and Haines, Alaska and in Cathlamet, WA (on the Columbia River) to coordinate efforts with their peers. Skagit River Steel and Recycling, the recycling company which has worked with the project from the start and has provided technical and logistical recommendations and support, and marketing expertise, has worked with cities to encourage a comprehensive recycling program which involves handling nets as well as the more standard recyclables.

Methodology

- 1. Identified the type of nylon used in the webbing.
- 2. Located markets for the materials.
- 3. Established collection sites in those port areas where there were high levels of fishing activity and in those which could serve as centralized collection points.
- 4. Worked with a recycler who was willing to experiment with baling the nets, working with the ports and communities, and finding markets for the nylon.
- 5. Worked with local coordinators who could promote the program, worked with local fishermen, city, port, recyclers to get bins in place and work through problems. Also worked directly with some port managers.
- 6. Worked to assure a collection system which minimized net handling and collection container moving.
- 7. Purchased and placed collection bins and signage.
- 8. Widely promoted the program through notices, press articles, and industry meetings and shows.

Lessons Learned

- 1. Project is positive p.r. for all involved.

- 2. Coordinators in each collection site are essential.
- 3. Quality control is critical--netting must be clean, If ever in doubt, fishermen should throw it out.
- 4. Removal of gear from nets and cooperation from fishermen to this end is essential. Reminders necessary.
- 5. Need to keep program visible and to check back with all players periodically for any necessary problem solving.
- 6. Streamline collection to help assure program continuity.
- 7. Work to establish and maintain a good relationship with the recycler. Understand and relay the recycler's need for strict quality control.

Related Materials

A report on initial collection efforts with suggestions for others is available from National Marine Fisheries Service, Marine Entanglement Research Program. 7600 Sand Point Way NE, Bin C15700, Seattle, WA 98115-0070. 206-526-4004. Progress reports are available at the address below:

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Fish Net Collection and Recycling
Fran Recht, Project Manager
Habitat Education Program
Pacific States Marine Fisheries Commission
P.O. Box 221
Depoe Bay, OR 97341
503-765-2229/also Fax
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Oregon

Marine Debris Collection and Recycling Program

Fran Recht

Purpose

This program worked with west coast ports and the fishing community to assure awareness of the marine debris problem and applicable laws. The program worked with ports to assure the provision of convenient refuse collection facilities and the initiation of recycling efforts.

Background

A year and a half pilot program was conducted in the Port of Newport, Oregon (from 1987-1988) in an effort to understand the means by which compliance with the anticipated marine debris laws could be accomplished in a fishing port. This program involved an advisory committee made up of commercial and recreational fishing interests, the port and marina operators, the refuse company, Coast Guard and state and local enforcement officers, Sea Grant extension agents, a teacher and other community members. Fishermen's involvement in the program lead to peer pressure, industry pride, and competition to bring back all their refuse. The port provided additional refuse containers, recycling bins and a convenient recycling barge for cardboard, metal, wood, and nets - the large bulky items that otherwise would have increased port refuse costs. These items were either recycled (metal and cardboard) or offered to the community for re-use (nets and wood). A promotional campaign utilizing the slogan "Don't Teach Your Trash To Swim!" and the logo of a fish caught in a six pack ring (which has since been used nationwide) was initiated. Though these efforts resulted in a large increase in the garbage being returned to port, increased attention to port refuse handling efficiency and recycling resulted in an overall

reduction in port refuse costs. Due to this project's success the Pacific States Marine Fisheries Commission (PSMFC) encouraged fishermen's involvement and guided the establishment of recycling efforts in other ports between 1988 and 1990. At least 20 west coast ports now have on-going recycling programs.

Key Players

National Marine Fisheries Service provided funding for the pilot project and for follow-up efforts in other ports. Extension agents working with Oregon Sea Grant and a local area fisherman, Barry Fisher, helped initiate the project. These people and a committed steering committee provided guidance throughout. The willingness of the harbormaster and employees at the Port of Newport to experiment with recycling was critical. Their success and pride in their efforts led to a willingness to relate their experiences to other ports. This in turn led to the initiation of similar efforts elsewhere. The Pacific Coast Congress of Harbormasters and Port Managers, through their newsletters and meetings, provided a vehicle for sharing information. Industry support was critical too. Fishing trade publications published articles and wrote editorials supporting fishermen's protection of the environment and cheering their efforts at compliance. National Fisherman magazine provided free booth space at their trade shows to promote the marine debris clean-up effort.

Methodology

Worked with the ports to assure their awareness of the laws and their responsibility to provide convenient refuse containers. Urged the placement of refuse collection containers at the head of each dock access ramp or as near the boats as possible. Encouraged recycling as a way to increase the services available to fishermen and to lower recycling costs. Tried to assure that the recycling program could fit in with established recycling collection programs in the community. Employed the assistance of respected fishing industry leaders to help generate industry pride in being environmentally responsible and to encourage fishermen's cooperation with port recycling efforts. Used articles and mailings to inform fishermen of the laws, the reasons for the concern about marine debris, to provide placards and sample waste management plans to facilitate compliance, and to promote the good workings of the various port and fishermen efforts.

Lessons Learned

Convenience of facilities and peer pressure are essential. Organizing an advisory group to set up a port recycling and education program provides the needed focus to accomplish goals, generates a cooperative spirit, and makes the effort fun. The program works best and continuity is most assured if it can be tied into other community recycling efforts and programs. Even if items can't be recycled many items can be re-used by others. For example, nets are in great demand for decoration, baseball backstops, and gardening while fishing "troll" line wire makes great picture frame hanging wire, and wood can be

provided for home heating. Fishermen like the recycling bins too because they often find items that are useful when they are making boat repairs. It is necessary to work closely with the fishing industry to assure awareness of and support for the program and cooperation with port efforts. Ports and the recyclers have to be a little patient with the bins at first, for they may not be kept well-sorted and garbage-free, but continual efforts between all will pay off.

Related Materials

A videotape called Port of Newport Marine Debris Project, a report entitled: "Report on a Port-Based Project to End Marine Debris" and a guidebook for others entitled: "MARPOL Annex V, A Reference Guide For Ports," are available from NOAA's Marine Debris Information Office, c/o CMC, 1725 DeSales St. NW, Washington, DC 20036. 202-429-5609. A list of ports and their recycling efforts is available at the address below:

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Marine Debris Collection and Recycling Program
Fran Recht, Project Manager
Habitat Education Program
Pacific States Marine Fisheries Commission
P.O. Box 221
Depoe Bay, OR 97341
503-756-2229/also Fax
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Nationwide

Fisherman Promote Habitat Education and Protection

Fran Recht

Purpose

The F.I.S.H. Habitat Education Program involves fishermen nationwide in efforts to educate their peers, school children, and the public at large about the habitat problems facing coastal fish and what can be done to curtail this loss. This program provides, to interested fishermen and others, written materials, videotapes, displays, and information focusing in on the values of wetlands to fish, water pollution, pollution prevention, and the problems caused by water diversions and dams.

Background

The concept for this program was initiated during Earth Week 1990, when it was recognized that fisherman, though concerned over habitat loss, did not often participate in such events and did little to make others aware of the need to protect habitat for fish. In approaching various fishing groups, eagerness was expressed in having outreach materials and information available to their members, but these groups had little time to develop the same. The program seeks and makes available existing resources, develops new materials where needed, and works to inform fishermen about habitat problems, the availability of these resources, and the need for their involvement. Pollution prevention efforts encourage fishermen to work with their ports and fuel docks to curtail vessel related sources of pollution and to promote the Spills Aren't Slick! oil spill prevention education campaign. The program also seeks to bring the environmental community and the fishing community together to work towards common habitat aims. Cooperative work on educational and habitat protection and restoration efforts is

encouraged. This program is grant supported, with most money providing for staff time for two employees to conduct outreach efforts and to produce and distribute educational packets, videos and other materials.

Key Players

Donations from individual fishermen and the fishing industry--including National Fisherman, Harbor Seafoods, National Fisheries Institute, Pacific Coast Fishermen's Wives Coalition, Pacific Coast Coalition of Fishermen's Associations, as well as grants from National Fish and Wildlife Foundation, Sport Fish Restoration Program, Northwest Pollution Prevention Research Center, Packard Foundation, World Wildlife Fund and others fund this work. Small oil spill prevention efforts have been coordinated with WA Dept of Ecology, WA Sea Grant , Oregon Dept. of Environmental Quality, CA Dept of Fish and Game, British Columbia Environment, & the B.C./States Oil Spill Task Force. The Atlantic States Marine Fisheries Commission has initiated a similar program with the Gulf states expected to follow.

Methodology

Meetings with fishermen in coastal communities, presentations to fishing groups at their meetings, displays at sport and commercial fishing trade shows, and mailings and phone calls are used to communicate with fishermen in the region. Information packets and videotapes concerning habitat problems and remedies are provided to fishermen and educators and a periodic "habitat hotline" newsletter keeps fishermen and conservation groups current on issues affecting fish habitat. The program also initiated efforts to help coordinate the Activities of the region's state and provincial agencies towards promoting a common Spills Aren't Slick! oil spill prevention education program for fishermen and boaters and to establish a uniform and easy-to-remember oil spill reporting number for the west coast of N. America (1-800-OILS-911).

Lessons Learned

- 1. An "outsider" may be more successful than a local person (if that person is perceived as coming from one interest group or another) in convening a habitat meeting that involves many sport, commercial, environmental interests. These meetings stimulate local cooperation and network building and are perceived as valuable.
- 2. A regional fishing group can also provide the needed push and distance to bring the various state agencies together for common aims; agencies which otherwise might tend to have more "turf" problems.
- 3. Fishermen and their groups will use the educational materials if provided and will seek these materials out when they are organizing harbor festivals, free fishing days, or other such events.
- 4. Fishing groups and community groups often do not think of contacting each other when organizing clean-ups, wetlands walks or other such awareness building events. Many community

groups do not know how to reach interested fishermen because many fishermen are not affiliated with any organized group. A list of fishing group contacts can be provided to others. Little effort is now being exerted to build these coalitions, but given the pace of coastal population growth and the impact on land and water resources in the area, such collaboration is essential.

- 5. A pollution prevention effort, which encourages individuals to curtail their own contribution to water quality problems encourages people to act by outlining tangible steps to take.

Related Materials

A brochure, newsletters, and flyers describe program efforts in more depth. Educational materials about coastal habitat problems and pollution prevention are available. Write Pacific States Marine Fisheries Commission, 45 SE 82nd Drive, Gladstone, OR 97207-2522 or for further information contact:

Fisherman Promote Habitat Education and Protection
Fran Recht, Project Manager
Habitat Education Program
Pacific States Marine Fisheries Commission
P.O. Box 221
Depoe Bay, OR 97341
503-765-2229/also Fax

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California

Marine Sanctuary Watch

Laura McShane

Purpose

Save Our Shores (SOS) has initiated Sanctuary Watch to educate people about the resources and regulations of the newly-designated Monterey Bay National Marine Sanctuary (MBNMS) and to provide a toll-free number to report sightings of suspected threats to the Sanctuary. We, in turn, communicate this information to Sanctuary management and to the appropriate enforcement agencies.

Marine Sanctuary Watch was created as a way to ensure that the MBNMS, which is underfunded and understaffed, is truly a sanctuary and not just lines on a map. It is our hope that through this community awareness program, we can teach people about the delicate marine ecosystem and how they can act to protect it.

The Sanctuary Watch Project has three objectives:

- 1. To serve as the principal watchdog of the Monterey Bay National Marine Sanctuary
- 2. To ensure that modifications of sanctuary regulations occur with full public scrutiny
- 3. To form a national coalition of organizations working to secure the level of government funding necessary for a thriving nationwide marine sanctuaries system.

Background

With ten sanctuaries in existence and more planned, the National Marine Sanctuary Program is currently

under-funded. Funding for the MBNMS, therefore, is woefully inadequate. As a result, the Monterey Bay National Marine Sanctuary will be able to afford only one enforcement officer, one Sanctuary Manager, and one assistant to regulate an ocean area of 4,024 square nautical miles. Clearly some measure of supplemental violation reporting will be necessary to maintain the integrity of the Sanctuary. In the summer of 1992, prior to the designation of the Sanctuary, SOS began laying the groundwork for Sanctuary Watch, which began in October, 1992. This was accomplished through the work of Dan Haifley, then Executive Director of SOS, and many volunteers, and involved communicating with the National Oceanic and Atmospheric Administration (NOAA), local governments, and other conservation groups. Costs for the program in its first year included printing of four thousand one-page fliers and bumper stickers, and setting up the toll-free hotline, and were funded by a $20,000 grant from the Packard Foundation and a $4,000 grant from the GAP Foundation. The project budget for 1993 was $42,500.

Key Players

Through Sanctuary Watch, SOS works with a number of government agencies and marine conservation groups. Communications with NOAA regarding the scope and purpose of Sanctuary Watch were necessary to avoid duplication of effort, and ensure that any information received would go through the proper channels. Procedures were set up to ensure information flow between SOS and National Marine Fisheries Service (NMFS), the enforcement an-n of the Sanctuary. SOS works with other local conservation groups to disseminate our information to their constituents. We continue to work closely with Sanctuary management staff in Monterey, reporting incidents and analyzing programs and regulations.

Methodology

The toll-free number and its purpose were publicized via frequent press conferences, Public Service Announcements and other publicity. In late September and early October, 1992, SOS scheduled four public information briefings in Half Moon Bay, Santa Cruz, Monterey, and Morro Bay to familiarize the ocean users and the public with the program and the toll-free hotline. Once the Project began, public education continued through frequent workshops for various organizations, and as part of a slideshow presented in schools for grades K-12.

When a call comes in to our hotline, it is entered, with as much detail as possible, onto our Incident Log Sheet by SOS staff or volunteers. The information is then transmitted to the appropriate agency, depending on the type of incident (oil spill, thrill craft, injured marine mammal, etc.). A copy of each incident is forwarded to the Sanctuary Enforcement Officer at NMFS, to be used in evaluating Sanctuary programs and policies. SOS is currently developing a database to be used for incident tracking. SOS follows up when possible to determine if enforcement was carried out, or if any further investigation is necessary. In addition, SOS has begun recruiting volunteers for a Marine Fleet, which will consist of citizens that use the Sanctuary _ boaters, kayakers, surfers, and other various marine users, and is

therefore seen as a logical contact for marine issues.

Lessons Learned

The success of Sanctuary Watch depends on the participation and concern of local citizens. The key to making this happen is an effective outreach program. SOS uses the media, the classroom, and contacts with local organizations as a way to get the message out to the public. In addition, SOS is highly visible in the media on various marine issues, and is therefore seen as a logical contact for marine issues.

There were two contentious situations at the outset of this program. We received an angry phone call from someone who felt that the purpose of Sanctuary Watch was to encourage people to spy on others and "turn people in." There was also a confrontation at one workshop with fishing groups who feared, incorrectly, that their livelihood would be impacted by current Sanctuary regulations. Both incidents resulted from a misunderstanding of our program and its purpose. In the first incident, there could perhaps have been more emphasis on the positive aspects of the program - education and stewardship - than on the enforcement aspect. In the second situation, previous communication with fishing organizations could have cleared up any concerns regarding fishing within the Sanctuary.

One final lesson learned from our project so far is to establish a definite flow of information to the various agencies involved in enforcement and management of the Sanctuary. Defining the necessary players and the specific types of information they require and having a clear chain of command at the outset will ensure that all of the necessary steps are being taken to address problems when they happen.

Related Materials

The following materials are available: "Taking Care of Your Marine Sanctuary", which lists Sanctuary regulations and incident reporting procedures; Incident Log Sheet,; Bumper Sticker; "What You Can Do To Protect Your Coast", part of classroom educational materials. For further information, write:

Marine Sanctuary Watch
Laura McShane, Executive Assistant
Save Our Shores
P.O. Box 1560
Santa Cruz, CA 95061
408-462-5660/408-462-6070 Fax

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

California

BayKeeper: Prototype for Citizen Environmental Protection

Michael Herz

Purpose

During its first four years, BayKeeper has mounted an exciting and important campaign to reduce pollution of San Francisco Bay, in order to restore its health and productivity. Since the 1970's, legislation has existed for Bay protection, and yet water quality and wildlife habitat have suffered serious deterioration. BayKeeper staff and volunteers are working to stop this decline.

Background

Recently designated as part of an International Biosphere Reserve because of its bio- logical diversity, San Francisco Bay is under unprecedented pressure from oil spills, filling of wetlands, point and non-point source pollution, dredging, and diversion of freshwater. Although existing legislation gives the impression that the Bay is being ad- equately monitored, in fact, agency budget cuts and staff losses have meant that none of the responsible agencies now conduct routine, on-the-water environmental enforcement programs.

The San Francisco BayKeeper's mission is to protect, preserve, and enhance the resources and health of the ecosystems and communities of the San Francisco Bay/Delta region. Specific objectives are:

- 1) to monitor water quality and report pollution incidents,

- 2) to advocate and, as necessary, institute litigation against violators,
- 3) to serve as an antenna for citizen complaints and as a deterrent to illegal activities on the Bay, and
- 4) to create an informed voting constituency which is aware of both the Bay's unique value and current plight.

METHODOLOGY

Originally modeled on New York's Hudson Riverkeeper program, BayKeeper, uses volunteers to patrol the Bay and its shorelines on foot, via aircraft, and by boat to detect violations of environmental law. In four years, the BayKeeper has created an outstanding record of successes, including:

- Receiving more than 450 reports of pollution and illegal activities and pursuing them to fines, abatements and other penalties;
- Documenting a toxic dredging case which resulted in the first federal criminal indictment for an environmental crime in the Bay Region in more than a decade;
- Pressuring local regulatory agencies to regulate previously unregulated areas of toxic pollution such as the dumping of heavy-metal-laden bottom paints from boatyards;
- Uncovering agency laxness in penalizing polluters, and mounting a major challenge which promises to change penalty practices of bay Conservation and Development Commission, the most important bay protection agency.
- Completing a 10-week training program for 40 volunteers (including classes on the gathering and analysis of water samples, hydrology, evidence gathering, and other topics) and attracting more than 350 potential volunteers;
- Creating heightened public awareness about the deterioration of the Bay through stories in more than 80 magazines and newspapers, coverage on more than 40 major media stations, and by distributing "WANTED" posters throughout the region;
- Increasing grassroots citizen involvement and awareness through provision of a "hotline" to report pollution incidents (1-800-KEEPBAY) and publicizing its availability.;
- Providing advice and technical assistance to potential and existing "baykeeper" and "riverkeeper" programs in more than 30 locations throughout the country.

BayKeeper currently has 7 major programs. These are:

- 1. Regulatory Agency Reform
- 2. General Incident Response and Investigation Program
- 3. Water and Sediment Monitoring (Bacteria and Toxins)
- 4. Incident Tracking and Analysis
- 5. Bay Health Resources Index (Fish Contamination) Study
- 6. Public Education
- 7. Legal and Legal Clinic Development

Key Players

Members of the Board of directors include Bay experts, such as Alan Ramo, a practicing attorney who is a former Legal Director for Citizens for a Better Environment, Gregory Thomas, who heads the Natural Heritage Institute, has taught environmental law at UCLA, and served as an attorney for the Sierra Club in Washington and NRDC in San Francisco, and Will Siri, who is past President of Save the Bay Association and the Sierra Club.

BayKeeper's Executive Director and founder is Dr. Michael Herz,, a research scientist, "baywatcher" and activist for more than 20 years. Herz, who founded Oceanic Society Chapters in four cities, served as Senior Research Scientist at the Tiburon Romberg Center, and led the right to prevent scuttling of obsolete nuclear submarines off the California coast, has also served on numerous local, state, and federal boards and advisory commissions, including the Alaska Oil Spill Commission following the Exxon-Valdez spill.

Lessons Learned

In just four years, BayKeeper has captured public attention and placed important pressure on agencies to enforce existing environmental laws. Its program of ongoing Bay patrols and monitoring provides an outstanding example of the way in which citizen action can reduce environmental degradation.

Related Materials

For further information, please contact:


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BayKeeper: Prototype for Citizen Environmental Protection
Michael Herz, Executive Director
San Francisco BayKeeper
Building A, Fort Mason
San Francisco, CA 94123
415-567-4401/415-567-9715 Fax
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New York

Training Student Organizers Local Waters Program's Local Waters Initiative (TSO-LWI)

Michael Zamm

Purpose / Background

Student groups, led by their classroom teacher and an environmental education staff member from the Council on the Environment's TSO program, have been working diligently to protect and maintain better water quality conditions for New York City's urban creeks and waterways. TSO trains high school students and some elementary, intermediate and college students to organize environmental improvement projects in their schools, homes and neighborhoods. Students have been using a combination of outreach, public education and field activities and events in order to gather support and resources for their projects.

Methodology

One key aspect of the TSO-LWI has been the bimonthly monitoring of the chemical, physical and biological characteristics of the water. Another resource is to utilize a nearby existing environmental group or agency who can help track and manage data collected and who can supply and organize sampling procedures and protocols. In most of our TSO-LWI sites, we have utilized the resources of the NY/NJ Harbor Estuary Baykeeper. Another aspect of the LWI is to promote better care and support by the local community living near the water body. One way in which this has been accomplished is to talk about Combined Sewer Outfalls (CSO's) and how what gets dumped down the storm drain sewer often ends up contaminating and polluting the water. Storm drain stenciling has been a hands-on approach that

communicates a clear message to the public that says, "Don't Dump - This Drains to the Bay, [or Ocean, or Creek, etc...]. These stencils have been obtained by the local Sea Grant Office of New York State, State University of New York at Stonybrook

Another important facet of this on-going initiative is to educate and coordinate the students to write letters voicing their concern to their local elected officials and agencies. Some of the letters sent in the past have touched on issues which range from upgrading of water body classifications to more trash receptacles, better enforcement of existing laws, and guard-rails to reduce litter and vandalism of the buffer areas near these water bodies.

Field trips have been provided as a means of motivation. Students have visited nearby wastewater treatment plants, oceanographic research vessels and institutions and have hosted awareness outings and clean-up efforts at these different sites. During these frequent outings, students have, in tandem with local parks and environmental protection agencies, planted native vegetation in order to increase shoreline stabilization and ecological habitat diversity. They have worked with local community, civic, scouting, and other special interest groups to do this. They have mentored other nearby school groups with presentations and field demonstrations in order to involve younger and older members of the public in their efforts as well.

The students have put together and sent out several "before and after" press releases about their efforts, constructed and placed habitat boxes (bird boxes) for local populations, hosted round table discussions within their school and at the nearby aquarium and other marine research related facilities. Some of these young people have even gone on to fulfill summer employment opportunities dealing with water quality by working for the City Parks or other environmental agencies or groups. They have coordinated and participated in a training symposium held yearly to educate, further motivate and involve young people.

Key Players

Some of Council of the Environment of New York City's TSO-LWI school sites and water bodies involved are:

- 1. John Dewey High School, Brooklyn - Coney Island Creek/Bayview Beach
- 2. James Madison High School, Brooklyn - Gerritsen Creek/Marine Park
- 3. High School For Environmental Studies (HSFES), Manhattan - Murry Hill Bay (East River)

Related Materials

For additional information, please contact:

`Training Student Organizers Local Waters`

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Texas

A Citizen Pollution Reporting System

Frank S. Shipley, Ph.D.

Purpose

Galveston Bay is greatly affected by the three and a half million people who reside on its tributaries and near its shores. In this industrial, urbanized watershed, numerous sources of pollution affect conditions in the estuary. The Citizens' Pollution Reporting and Response System (CPRRS) was conceived by the Galveston Bay National Estuary Program (GBNEP) as a response to shortcomings in the existing pollution reporting mechanisms. In Texas, pollution response agency mandates are complex and fragmented. Prior to this project, emergency contact numbers were narrow in scope, and reporting pollution was overwhelming and costly (in terms of time and money) to the average citizen. The GBNEP determined that a workable solution to these problems should include:

- A 24-hour toll-free number for citizens to report air, land, and water pollution;
- A user-friendly referral system that takes the burden of identifying and contacting the correct agency/individual from the citizen caller;
- Cooperative relationships among agencies so that response is timely and complete, with direct contact made between the citizen and agency f necessary;
- Prompt feedback to the citizen on the disposition of the incident; and,
- Unified reporting of incidents to create a single data base for use by resource managers in solving the problems brought to light by citizens.

The project was accomplished using funds from the U.S. EPA and State of Texas, through the Texas Water Commission.

Background

Pollution response agency mandates in the Galveston Bay watershed are complex and fragmented among some 20 agencies. For example, The Texas General Land Office has jurisdiction over oil spills in coastal waters, while the Texas Water Commission - the agency charged with the responsibility of ensuring the water quality of the state - has jurisdiction over chemical or oil spills on land, unless the spill is directly related to petroleum or gas exploration, development, or production, in which case the Railroad Commission of Texas has jurisdiction. Emergency contacts for pollution events have traditionally dealt with either very limited geographic areas or limited kinds of pollution.

Fragmented jurisdictions create a hit-or-miss approach to pollution reporting that tends to overwhelm the patience of the average citizen before the correct agency (and sometimes correct individual) can be identified and contacted. Experience during the project indicated that numerous calls are often required for the fight connection to be made by a citizen seeking to report a pollution incident. It takes the response coordinator, who is knowledgeable about agency responsibility, an average of 5.4 calls to resolve a pollution report. In addition to the amount of time required to make a pollution report, citizens must often make one or more long distance phone calls in order to reach the appropriate response agency.

In addition to confusing the public, this diversity of jurisdictions results in the lack of comprehensive data concerning where, when, what, and how much pollution enters the Galveston Bay System. Although each agency keeps track of incidents within its jurisdiction, there is no coordination among agencies as to how these reports are recorded or what they contain.

Key Players

The diverse nature of environmental regulation and incident response in Texas made inter-agency coordination a key requirement for success of the CPRRS. In order to ensure this coordinated effort, the GBNEP sought and obtained formal Memoranda of Understanding (MOUs) from several state and federal agencies, for example:

In the process of establishing these MOUs, the GBNEP program staff participated in extensive meetings and communications with the agencies to discuss the practical aspects of increased coordination of efforts. This coordination paid off in the later administration of the program: federal, state and local agencies have all effectively worked with the CPRRS Response Coordinator to ensure that appropriate information is obtained from the citizen, follow-up with the response agency is efficient, and pollution laws and response capabilities are understood. These countless conversations have helped to refine the referral process with each agency and have greatly increased the efficiency of the CPRRS.

Methodology

Creation of the CPRRS was a five-step process:

- Completion of a project development study to plan the system;
- Establishment of a 24-hour "hotline" at the GBNEP Program Office for a demonstration phase;
- Development of inter-agency agreements to ensure coordination among responding entities;
- nitiation of a publicity campaign to create community awareness of the service; and
- Implementation of the response system as a permanent function of an appropriate agency or institution.

These actions enabled citizens to report pollution incidents involving air, land or water, with a single phone call-regardless of which government agency is involved in the response process. In using the CPRRS, the citizen reports pollution to a Response Coordinator who then follows through with the appropriate agencies, assuring that results get back to the citizen. In facilitating the response, the Response Coordinator also compiles information about pollution incidents for a five-county region surrounding Galveston Bay. This information (the only data set of its kind) further helps environmental managers to solve problems.

Lessons Learned

Five hundred and twenty-four calls were received by the CPRRS during its first year. The most significant factor that affected monthly call frequency was publicity. The highest call frequencies were clearly related to periods of high media interest and directed publicity by the GBNEP. The nature of calls varied greatly. Some were simple requests for information, many were legitimate reports of significant environmental incidents, and some, inevitably, were citizens who just wanted to air their general concerns. Overall, about 62 percent of the calls were referable to a response agency. Many of these calls represented pollution incidents that would have passed unreported if it were not for the existence of the CPRRS.

In order to evaluate the effectiveness of the CPRRS, two user survey polls were conducted during the demonstration period. Each poll indicated that about three fourths of all callers felt "very satisfied" with the service they had received. In each case more than 95% of the system users indicated they would use the service again, citing "one-stop shopping" and user-friendliness as reasons. Both surveys indicated that citizens who have used the service are overwhelmingly in favor of seeing the program continue. In developing this program, coordination of the numerous entities posed a major challenge, but the project has now proven extremely successful and is being permanently implemented by the Texas Water Commission.

Related Materials

Prince, K.P., F.S. Shipley, and M. Nelson. 1993. Citizens' Pollution Reporting and Response System. GBNEP Draft Final Report.

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A Citizen Pollution Reporting System
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Texas

The Galveston Bay Foundation; The Estuary Sampling Team (GBF TEST)

Linda Shead

Purpose

GBFTEST (The Estuarine Sampling Team) is the Galveston Bay Foundation's (GBF) volunteer citizen water quality monitoring program. Based on the pilot work developed by the Galveston Bay National Estuary Program (GBNEP), TEST now includes 31 monitors at 23 sites in Galveston Bay in the tidally influenced portion of its tributaries. The parameters currently being measured include dissolved oxygen, pH, temperature, salinity, water clarity, and observational data.

As concern grows about the health of the Galveston Bay system, there is a need to learn more about the many variables acting on the Bay and their impacts on water quality. Local water resource agencies and researchers are working hard to learn more about the dynamics of the estuarine system, but their resources for monitoring and data gathering are limited. In the Galveston Bay area, and all over the nation, there is a new resource which addresses the need for more water quality data concerned citizens who are eager to get involved in efforts to conserve their local waters.

Volunteer monitors conduct the tests on a weekly basis and report the data to GBF where it is processed. The program has two important purposes: (1) to increase the amount of water quality data available to water resource agencies allowing them to make better resource management decisions, and (2) to inform the monitors and general public about water quality in Galveston Bay.

The nature of the project is that it needs, and benefits from, the involvement of everyone with an interest

in the Bay. For the project to evolve into a program that will be long-term and successful, GBF relies on the continued interest of the general public, technical advice from the scientific community, and support from monitoring agencies.

Background and Key Players

A two-year pilot project on Armand Bayou began in FY1991 with $25,000 per year to the Texas Water Commission(TWC) from the Galveston Bay National Estuary Program (GBNEP). The actual monitoring component of the project was implemented quite quickly (five months into the project) because the program was largely adapted from an existing volunteer monitoring pro- gram coordinated by the Chesapeake Bay Alliance. During the second year of the state project, the Galveston Bay Foundation had a $15,000 grant from U.S. EPA to adapt the pilot project for a bay-wide program. Again, the GBF project was able to have monitors on site within 5 months of beginning the project by using the Armand Bayou program as a base. By the third year of citizen monitoring in the Galveston Bay area, GBF had 19 monitors at 15 sites, and GBNEP had 9 monitors at 6 sites on Armand Bayou. GBF provided $28,000 for GBF to coordinate and expand to a bay-wide program, including incorporating the Armand Bayou monitors into GBFTEST.

Several agencies and organizations are involved in this program on a variety of levels. The EPA has served an important role by assisting with program design and approving the project plan so that data users can be assured of the data's quality. The TWC has provided logistical support for citizen monitoring programs throughout Texas, and has established a division within TWC to continue to guide and support volunteer monitors throughout Texas. Other agencies (e.g., Texas Parks and Wildlife and the U.S. Fish and Wildlife Service) and industry serve an important role by providing technical advice.

Methodology

The goal of the citizen monitoring program is to produce accurate water quality data. To achieve this goal, it is vital to be thoroughly quality-oriented in the program design. The first year of GBNEP's Armand Bayou project was dedicated to designing a pilot project for the program, including how to recruit and train volunteers; which parameters would be useful in determining water quality; which testing methods would be appropriate, i.e., reliable, easy for volunteers to implement, and cost-effective; and how to ensure thatdatawould be of the necessary quality. Assurance of quality data is especially important: If agencies are to use data to determine water quality, the data have to be reliable, meeting the same EPA standards as any approved laboratory would. By the second year of GBNEP'S pilot project and during the first year of GBF TEST, monitors were collecting data at their sites, and work continued on the refinement and implementation of the procedures for training and Quality Assurance and Quality Control (QA/QC).

Lessons Learned

To date, the citizen monitoring program has been a successful venture. The success can be attributed to several factors: (1) The community has been very responsive and is eager to get involved, and (2) the agencies and technical community have demonstrated great support for citizen monitoring and are helping the program continue to grow. A few skeptics exist in the scientific community regarding to the value of data collected by citizens. GBF will continue to consistently implement QA/QC measures, and overtime the direct comparison of citizens' data with agency data will show the accuracy and precision of the volunteers' work.

To other groups interested in implementing a similar program, GBF offers the following suggestions: (1) There are existing monitoring groups for every kind of water. Build on what they have done, and don't try to re-invent the wheel. (2) Begin work early on the data management aspect of your program because it is important to analyze and use the data being collected by the volunteers.

Overall, this is a valuable project. It produces important water quality data, and provides a means for Galveston Bay area residents and monitoring agencies to work together toward the common goal of protecting the precious Galveston Bay estuary.

Related Materials

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Oregon

Concerned Citizens Protecting the Coquille River and Estuary

Pam Blake and Krystyna Wolniakowski

Purpose

The Coquille River (Oregon) and Estuary Near Coastal Water Pilot Project provides a dynamic example of what a little forethought, a lot of cooperation, an a vested interest in preserving a community's natural resources can do for the environment and for those who depend on its health. The Coquille Project reflects a successful demonstration of political, community, and scientific efforts to protect our nation's coastal resources.

Background

The Coquille Project has derived its recent success from many areas. First, and perhaps most importantly, members of the project team worked hard to respond to the concerns of local citizens whose initial outlook on State and Federal involvement in the Project was characterized in large part by fear of overregulation without local input. As a result of these efforts, however, the project team was able to elicit a positive change in public perception.

In turn, this change in public perception resulted in even greater public involvement, which has lasted throughout the duration of the project and should continue in the future. The citizens of the Coquille community, having an obvious interest in preserving the environmental and economic well-being of the place they call home, took the project to heart. Through the Coquille Community Advisory Committee (CCAC), they have cooperated substantially and effectively with representatives of the Oregon

Department of Environmental Quality (DEQ), including collecting and analyzing monitoring data, developing action plans for environmental projects, and determining policy guidelines for recreational, commercial, and industrial activity within the Coquille system.

Through all the extensive cooperation and involvement by different parties and officials of the Coquille Project team, many tangible results have begun to surface. The CCAC launched five local water quality initiatives ranging from wetland reconstruction to streambank erosion stabilization efforts. In turn, there has been some evidence that environmental improvements have recently emerged.

Coquille residents and Oregon officials wasted no time in launching the Coquille Bay Pilot Project. First, the Oregon DEQ began to monitor water quality in the Coquille system. Despite various local initiatives, monitoring results still showed an increase in water quality problems. Armed with this initial base of raw data, DEQ and EPA launched the official Coquille study and pulled together a local community coalition. Expectedly, local people feared increased regulation and steep costs as a result of the project. Commercial businesses and industries in the Coquille area assumed that State and Federal officials would impose tight controls on the community as a price for funds to protect the system. This fear would have to be overcome in order for the team to reach its goals. Only then could EPA, DEQ, and local citizens begin to work together to protect this precious estuary, filled with resources vital to and prized by the residents of the community.

METHODOLOGY

The Action Plan for Oregon Estuary and Ocean Water proposed a statewide management framework for protecting the environmental quality of Oregon's coastal waters. This project would complement the planning activities required under the 1987 Oregon Ocean Resources Management Act and existing regulations such as the Coastal Zone Management Act. To develop and refine an approach for all Oregon coastal waters, DEQ would assess the problems and investigate management strategies for one estuary and then move on to others. The Coquille River Estuary was selected because it encompassed a variety of problems representative of other Oregon estuaries. Studies that would be conducted in the Coquille Estuary included:

- Synthesizing existing data on environmental conditions to better characterize water quality and biological conditions and identify trends;
- Evaluating the effects of relocating the Bandon STP outfall from environmentally sensitive tideflats to deeper water,
- Documenting wetland resources and investigating the feasibility of wetland restoration projects;
- Evaluating the role woody debris plays in protecting fish habitat in navigation channels, and designing alternative methods for improving that habitat; and
- Conducting appropriate water quality and sediment sampling to modify best management practices to minimize toxicants and nonpoint pollutants.

Key Players

Critical to the ultimate success of the Project, DEQ officials recognized the importance in involving citizens and transforming public perception into a positive outlook. Consequently, DEQ formed the CCAC, selecting 31 members representative of local interests ranging from cranberry growers to dairymen. Their selection to the committee helped guarantee the project's success, in that these representatives effectively took ownership of the projects, problems, and results. Meeting monthly for three years, the commit- tee studied various topics and discussed the issues which would impact their own lives as well as those of living resources within the estuary.

These efforts resulted in the development of a local workplan to improve the environmental quality of the Coquille system. The first major element of the workplan focused on monitoring the water quality of the system. The project team took test samples from the headwaters of the system to the mouth of the estuary. DEQ studied the Coquille system for two years intensively, measuring the following parameters: temperature; nutrient, bacteria, and dissolved oxygen levels; the health of the biological community; suspended particles; and toxics.

Lessons Learned

After a significant amount of monitoring data had been collected, the CCAC made a number of determinations. First, they concluded that summertime dissolved oxygen levels may be too low to adequately support aquatic life. Secondly, the data suggested that currently high levels of fecal coliform and bacteria may pose a threat to public health. Thirdly, the CCAC recognized that the designs of sewage treatment plants at Coquille and Myrtle point, built in 1950, had become obsolete; in turn, the plants were the primary sources of the estuary's dissolved oxygen problem. Finally, they reasoned that nonpoint source runoff from farmlands and overloaded sewage treatment plants had led to the increase in the bacteria level.

The Near Coastal Waters Pilot Project was an extensive effort that really served as only the beginning of a new program for Oregon's coastal waters. The various components helped both public officials and private citizens understand the Coquille River and Estuary more thoroughly and assisted other agencies by providing data to them for their programs. DEQ and other state and federal agencies have already indicated that they are looking forward to continuing the effort to build on the experience and knowledge gained in this pilot project.

Related Materials

For further information, please contact:

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California

Chollas Creek Watershed Protection Project

Laura Hunter

Purpose

The goal of the Chollas Creek (California) Watershed Protection Project was to measurably improve the quality of water entering San Diego Bay from its watershed and to provide a model protection plan which could be adapted to other watersheds. To reach this goal the following objectives were established.

Increase community awareness of:

- 1. the nature and importance of a watershed;
- 2. the connection between the community and the receiving waters downstream;
- 3. the nature of nonpoint source pollution: the types of pollutants, the possible sources, and the hazards;
- 4. proper disposal options available for household hazardous waste, small generator wastes, and industrial wastes;
- 5. techniques to reduce the use of hazardous materials in the home and the workplace; and to:
- 6. increase community pride and create a sense of belonging to the watershed;
- 7.develop materials which can be easily modified or duplicated for other watersheds.

Background

The goals of the Chollas Creek Watershed Protection Project were aligned with the goal of Environmental Health Coalition (EHC) - to reduce pollution and environmental degradation caused by toxic chemicals. EHC was ideally suited to address watershed and storm water pollution issues for a variety of reasons. Prior to the beginning of the project, EHC had:

- 1. Expertise in the problems caused by the use and disposal of hazardous materials
- 2. Pre-existing base of support in the target community
- 3. Existing pesticide use reduction campaign
- 4. Existing San Diego Bay protection campaign
- 5. Existing safer substitutes and household hazardous materials programs and educational materials
- 6. Served as Community Education Contractor for the San Diego Regional Household Hazardous Material Program
- 7. Education and product specialists on staff
- 8. Expertise in Right-to-Know process and legislation

As a result, the project could capitalize on all of EHC's existing resources by integrating various elements of our programs. In the same way that a watershed connects all activities and land areas within it, the watershed protection program provided a link among all of EHC's toxics use and source reduction programs. We also heavily utilized community members and donations from local businesses. The total cost of the project in the first year was $129,000. This project was funded by the U.S. Environmental Protection Agency through the California State Water Resources Control Board with funds from the Storm Water Management Program (Section 319) and the California Regional Water Quality Control Board, San Diego Region, the City of San Diego, and The Nathan Cummings Foundation.

Key Players

Representatives from the Regional Water Quality Control Board, County Health Department, area schools, parent teacher organizations, and parents were all involved in the project. A Citizen Advisory Committee was established with members from educational institutions, community members, elected officials, and regulatory agencies to advise EHC on the implementation and progress of the Project.

Methodology

EHC developed a strategy for this demonstration project that was highly localized and had a strong emphasis on community education. We also capitalized on EHC's expertise and involvement in other programs such as the San Diego County Household Hazardous Materials Program, and EHC's own Clean Bay, Pesticide Use Reduction, and Toxic Free Neighborhoods Campaigns. We actively involved community members in developing and implementing the plan. By soliciting input of community organizations at the onset of the project, they were involved in the development and review of the printed materials and plans for structural changes that would reduce pollutants and, at the same time, enhance

community recreational resources. Through the involvement of community organizations based in the Chollas Creek Watershed, we attempted to reach each of the approximately 80,000 persons living in the watershed through direct mailings, student activities, community fairs, and business cooperation programs. We developed a variety of materials:

- 1. Watershed Protection Calendar with children's an and monthly information on reducing nonpoint source pollution
- 2. Watershed Protection Kit for school use
- 3. Watershed Protection fact sheets
- 4. Watershed Poster
- 5. BMP manual for incidental users of toxic materials
- 6. BMP plan for an area cemetery
- 7. Watershed Protection window decals and stickers
- 8. Classroom activities
- 9. Site specific structural improvements plan for a site within the watershed
- 10. Bilingual materials
- 11. Urban Runoff Media Packet
- 12. Watershed Poster Contest
- 13. Installed watershed protection signs in the area.

We also held news conferences and wrote articles on related subjects for local newsletters and incorporated information on NPS in our annual fundraising run - the Clean Bay 10K. In-service training, as well as public and classroom presentations were all pan of our public outreach.

Related Materials

A complete report of the first year of the project is available in our 100-page report "How to Create a Storm Water Pollution Prevention Campaign". This document contains samples of all products and a discussion of lessons learned and recommendations for future watershed protection campaigns.

For further information contact:

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Section 2: Management Approaches

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Louisiana

Policy Considerations for Recycling Wastewater Through Hydrologically Altered Wetlands

Andree M. Breaux and John W. Day

Purpose

The two major environmental problems that currently most affect Louisiana are a high rate of coastal wetland loss and high levels of surface water pollution. The application of secondarily treated wastewater to wetlands is proposed as a means of dealing with these problems. The benefits of wetland wastewater treatment include improved surface water quality, increased accretion rates to balance subsidence, improved plant productivity, and decreased capital outlays for conventional treatment systems.

Wetland treatment systems can be designed and operated to restore deteriorating wetlands to previous levels of productivity. Hydrologically altered wetlands in the Louisiana coastal zone have been selected as appropriate for receiving municipal and some types of industrial effluent.

Background

While the U.S. Environmental Protection Agency has determined that wetland wastewater treatment is effective in processing municipal effluent, it has discouraged the use of natural wetlands for this purpose. As a result, hydrologically altered wetlands in the Louisiana coastal zone are being neglected and ultimately lost while scarce funds are being applied to the construction of artificial wetlands to treat

municipal effluent. Effluent discharge to existing wetlands can be incorporated into a comprehensive management plan, similar in scope and objective to river diversion projects, designed to increase sediment and nutrient input into subsiding wetlands in the Louisiana coastal zone.

Methodology

Criteria were developed for selecting both appropriate industries as dischargers to wetlands and appropriate receiving wetlands. Industries were chosen based on the biodegradable nature of their effluent, on their current discharge into polluted surface water bodies, and on their proximity to wetlands. Wetlands were selected based on an absence of priority uses, on the degree of isolation and hydrologic alteration, on a size large enough to accommodate conservative hydraulic loading rates and provide back-up receiving wetlands, on the rate of subsidence to ensure permanent burial of nutrients, and on the presence of spoil banks, or similar features, that could provide gradients suitable for nutrient removal.

To illustrate the potential for secondarily treated effluent to enhance degraded wetlands, three case studies are presented, including one food processor and two municipalities. The food processor produces potato chips and has been discharging its secondarily treated effluent to a partially impounded forested wetland for the past seven years. The impoundment appears to have led to the deterioration of one segment of the forest, although not adversely affecting an adjacent segment. Results of field studies indicate that nutrient levels in the effluent decreased with passage through the wetland and that the effluent has filled in the open water area and encouraged the replacement of former-but-dying woody vegetation with young woody vegetation.

The second case study involves the City of Thibodaux, Louisiana, where a cypress-tupelo swamp of low productivity receives secondarily treated effluent from a population of about 17,000 people. A baseline study was carried out for two years, measuring primary components of the ecosystem before effluent application began in March of 1992. Preliminary data indicates mean reductions in nitrate of 98%, and 44% in phosphate, from the effluent pipe to the wetland discharge point approximately 1,600 meters away.

The third wetland wastewater treatment study is being conducted at a site receiving municipal effluent from the town of Breaux Bridge, Louisiana, population 6,000, for almost 40 years. No visible stress is evident from the vegetation in the immediate vicinity of the current discharge pipe. A two-year study will analyze the productivity of the vegetation and compare it to other cypress-tupelo swamps in the southeastern United States. Parameters to be measured include stem growth, litterfall, herbaceous biomass, water and soil nutrient levels, benthos, and nekton.

Lessons Learned

Wetland treatment systems, such as the three described above, can be established in hydrologically altered areas as experimental systems designed to imitate the critical functions of previously healthy

wetlands nourished routinely by sediments and nutrients. In attempting to replace wetlands, whether they were lost due to human alterations of the environment or naturally-occurring subsidence, the addition of sediments and nutrients to wetlands through effluent application constitutes a form of wetland restoration. The authors' basic hypothesis is that wetlands improve water quality and that added sediments and nutrients will benefit subsiding wetlands. Maintaining coastal wetlands will prevent the loss, not only of water purification functions, but also of flood control benefits, wildlife habitat and diversity, direct economic use, education, and research.

Related Materials

For additional materials, please contact:

Policy Considerations for Recycling Wastewater
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Washington

Washington Coastal Erosion Management Strategy

Douglas J. Canning

Purpose

The purpose of the Washington Coastal Erosion Management Strategy (CEMS) project is to develop and provide local government with guidance on erosion management for Puget Sound shorelines including engineering and geotechnical standards, environmental impact assessment, site-specific regulatory alternatives, and regional management alternatives. The guidance is to be implemented through local Shoreline Master Programs as mandated by a 1991 legislative amendment to the Washington Shoreline Management Act.

Background

In 1991, three local governments requested that the Washington Department of ecology (Ecology) investigate the effects of wide-spread shoreline armoring and prepare a programmatic environmental impact statement on the cumulative effects of bulkheading and other forms of armoring. These elected officials were reacting to the large numbers of bulkhead permit applications in recent years, and were voicing concern over their uncertainty about the wisdom of permitting large scale unmitigated shoreline armoring.

In an action unrelated to the local government requests, the Washington State Legislature in 1992 passed Engrossed Senate Bill 6128 amending the Shoreline Management Act to require that local governments adopt erosion management standards in their Shoreline Master Programs. These Master Programs

address both structural and non-structural methods of erosion management. The standards must give a preference for permitting of erosion protection measures for residences occupied prior to January 1, 1992 where the erosion protection measure is designed to minimize harm to the shoreline natural environment.

The legislature was unable to provide local governments or Ecology with the funds necessary to carry out the intents of ESB 6128 because of reduced tax revenues. Fortuitously, Shorelands was successful in obtaining a grant of funds under the federal Coastal Zone Management Act section 309 program to carry out the CEMS project. The 3-year grant of $370,000 (primarily for consulting services) was supplemented by two staff each working about halftime on the project.

Key Players

The lead agency is the Washington Department of ecology's Shorelands and Coastal Zone Management Program. An informal advisory committee includes representation from the US Army Corps of Engineers, US Fish and Wildlife Service, Washington Department of Fisheries, and local government planning agencies, plus coastal construction contractors and shoreline property owners. The principal consulting team is composed of CH2M Hill Northwest and Battelle Memorial Laboratories Human Affairs Research Centers and Sequim Marine Laboratory.

Methodology

Task 1. Inventory and Characterization of Shoreline Armoring, Thurston County, Washington, 1977 - 1993. This study provides quantitative estimates of the rate and character of shoreline armoring which are not readily available for most of Puget Sound.

Task 2. Engineering and Geotechnical Standards for Shoreline Protection in Puget Sound. The generally accepted engineering and geotechnical standards for selected erosion management alternatives (bulkheading, rip rap, beach nourishment, no action, etc.) appropriate to the tidal range, wave energy, and geologic conditions characteristic of Puget Sound are assessed.

Task 3. Shoreline Armoring Effects on Physical Coastal Processes in Puget Sound. The key assumptions and questions about the effects of shoreline armoring on coastal processes are evaluated based on the technical literature, and sensitized to Puget Sound conditions. Selected local case examples arc provided.

Task 4. Coastal Erosion Management Regulation: Case Examples and Critical Evaluation. Regulatory approaches to coastal erosion management in Puget Sound and other states are evaluated, and policy alternatives for Washington are assessed.

Task 5. Shoreline Armoring Effects on Biological Resources and Coastal Ecology in Puget Sound. Following on from Task 3, the direct effects of shoreline armoring and the secondary effects of changes

to coastal processes and conditions upon biological resources are assessed. Selected local case examples are provided.

Task 6. Coastal Bluff Management Alternatives for Puget Sound. A large measure of bulkheading is in reaction to slope failures, not shoreline erosion per se. Slope instability is caused by a combination of inherent geologic weaknesses, ground water loading, and toe erosion. Following on from Task 4, this task addresses coastal bluff management alternatives.

Task 7. Regional Approaches to Coastal Erosion Management. Traditionally, shoreline management and erosion control permitting has been on a case-by-case basis. Many soft approaches to erosion management (e.g., beach nourishment) or mitigation for adverse effects must be carried out on a regional basis to be effective. Following on from Tasks 4 and 6, this task addresses both the technical and political feasibility of regional erosion management.

Task 8. Study program integration: Programmatic Environmental Impact Assessment. This task will integrate the special study reports into a programmatic environmental impact assessment.

Task 9. Coastal Erosion Management Recommendations for Puget Sound. Based largely on the foregoing studies, this task will formulate specific model elements which can be recommended as amendments to local Shoreline Master Programs.

Tasks 1 - 4 were carried out in 1992-93. Tasks 5 - 7 will be completed in 1993-94, and Tasks 8 and 9 in 1994-95. Local governments will amend Shoreline Master Programs in 1995-96.

Lessons Learned

CEMS was aided by frequent informal and semi-formal contact between project staff and members of the advisory committee. Typical of complex and potentially contentious issues involving private property issues and public resource management mandates, constant attention to the concerns and perceptions of key players and the affected public was necessary.

Related Materials

Write or FAX a request for the current CEMS mail order form for currently available project reports or to receive the CEMS Project newsletter, use the address below:

Washington Coastal Erosion Management Strategy
Douglas J. Canning, Project Manager
Shorelands and Coastal Zone Management Program
Washington Department of Ecology

P.O. Box 47600
Olympia, WA 98504-7600
206-459-6785/206-438-7537 Fax

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

New Jersey

The Sewage Infrastructure Improvement Act Program

Laurie Sands

Background / Purpose

The New Jersey Cooperative Coastal Monitoring Program, a summer beach monitoring program, concluded that stormwater run off is the principal source of bacterial contamination causing beach closings in New Jersey. Approximately 80% of all beach closings in New Jersey are attributed to elevated levels of bacteria found in stormwater discharges during and after storm events. In an attempt to address these problems, the New Jersey State Legislature adopted the Sewage Infrastructure Improvement Act (SIIA) , N.J.S.A. 58:25-23 et seq., in August of 1988. The SIIA furnishes a vehicle for public entities to begin to locate and correct pollution problems plaguing the coast of New Jersey. Under the SIIA, 94 municipalities in Monmouth, Ocean, Atlantic and Cape May counties are required to map their stormwater and sanitary sewer system, locate and correct any interconnections or cross- connections between the stormwater and sanitary sewer systems, perform quarterly monitoring of all outfalls that discharge to salt waters and abate nonpoint sources of pollution entering surface waters.

Key Players

The New Jersey Department of Environmental Protection and Energy (the Department) was charged with the responsibility of implementing the SIIA. As a result of the extensiveness of the mapping and monitoring requirements, the Department approached SIIA implementation in a phased manner.

METHODOLOGY

Phase 1:

Phase I was designed to give municipalities a better understanding of their stormwater sewer system. Under Phase 1, municipalities were required to locate all stormwater outfalls and stormwater management facilities. Municipalities were also required to provide information about the outfalls and stormwater management basins including size, type and land use draining to pipes and basins. In addition, municipalities inventoried all studies, reports and other relevant information on their stormwater and sanitary sewer systems. The Department allocated $1.045 million to Phase I which is now complete.

Phase 11:

Municipalities are now working on Phase II of the SIIA. Approximately $6 million has been allocated for this process. In Phase II,coastal municipalities are (1) mapping their stormwater and sanitary sewer systems, (2) performing investigative bacterial sampling to identify interconnections and cross-connections between the stormwater and sanitary sewer systems and (3) beginning quarterly monitoring. More specifically, Phase II maps include stormwater and previously mapped sanitary sewer lines, stormwater appurtenances, all sanitary manholes, recycling facilities, industrial facilities, hazardous waste facilities, solid waste facilities and areas serviced by septic systems.

To ensure mapping quality, municipalities are required to use base maps that meet national map accuracy standards. All features placed on the map must be accurate to within 10 feet of its actual location. Municipalities are required to supply information on how they accomplished the mapping. This will provide insights into methods that may be utilized to perform similar mapping in the future. Unfortunately, the Department did not require that mapping be generated digitally. Even though a majority of the mapping is being completed digitally, some are being produced manually. For digital products, the Department will be able to convert the information into the GIS. The Department is working with the counties to recruit their assistance in transfer- ring manual mapping into the GIS. In the future, digital maps will be requested.

To locate interconnections and cross-connections between stormwater and sanitary sewer systems, bacterial sampling of the discharge of all stormwater outfalls must be conducted. Due to the lack of standards for stormwater discharges, the Department is using New Jersey's ambient Surface Water Quality Standards, N.J.A.C. 7:9-4.1 et seq., to trigger an investigation of the system to locate potential problems. The Department recognizes that ambient standards are low for stormwater discharges, and in many cases, sample analysis will indicate an exceedance of the standards thereby requiring an investigation of the system. The Department feels that this level of investigation will insure integrity of the system and allow municipalities to more readily identify future problems. The Department will examine data collected under Phase II of the SIIA and attempt to establish variables that can be used to identify a problem in the system rather than using ambient Water Quality Standards.

By late 1993, a majority of community maps were completed. The Department has also received monitoring data and is analyzing them to provide assistance to municipalities in establishing the intensity of investigation that must be performed to identify and correct interconnections and cross-connections and to determine background levels of bacteria in discharges,

Phase III:

Mapping and monitoring information will be used to develop nonpoint source control and stormwater management plans under Phase III of the SIIA. The Department is developing rules for Phase III and will be soliciting public input on all stages of their development. There are $2.8 million available for implementation of Phase 111. In this stage, all affected municipalities will receive a base grant to develop and begin to implement stormwater management and nonpoint source control plans. In addition , certain areas in the coast will be targeted for more intensive studies, including monitoring and modeling to determine pollutant loads and impacts of nonpoint source pollution. Best management practices will be implemented in targeted areas and monitoring to evaluate effectiveness of the controls will be performed.

Lessons Learned

Coordination has been a very important component to the success of the SIIA program. Within the Department, offices involved in planning, monitoring, financial assistance and enforcement have participated in the implementation of this program. Each group brings an important piece to the whole, Without the various functions working together, the accomplishments seen through the SIIA program would not have been possible.

An obstacle to progress of the SIIA program was a lack of administrative funding for the Department to implement the SIIA. As a result, the Department had to rely on funding from other sources causing the SIIA to become lower in priority than many other programs. In addition, the legislation required the Department to provide funding only to municipalities. It would have been more effective if the Department was able to provide funding for counties to assist with the monitoring, data management, technical advice and enforcement aspects of the SIIA.

New Jersey's coast is an ecologically vital resource, as well as a valuable recreational and economic asset. Pollutant impacts caused by stormwater runoff are a major threat to this resource. Through the SIIA, New Jersey is implementing a comprehensive program that is a partnership of state, county and local efforts to identify and control sources of stormwater contamination. Furthermore, the SIIA provides a valuable framework upon which New Jersey can build a comprehensive statewide nonpoint source and stormwater pollution control system. The knowledge gained through the implementation of the SIIA will be a valuable tool for other coastal states facing similar problems.

For further information, please contact:

The Sewage Infrastructure Improvement Act:
Addressing Pollution Problems in New Jersey's Coastal Zone
Laurie Sands, Principal Environmental Specialist
New Jersey Department of Environmental Protection and Energy
Office of Land and Water Planning
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Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Massachusetts

Wellfleet Harbor Mini-Bay Project

Elizabeth McEvoy and Susan Schneider

Purpose

The Wellfleet Harbor Mini-Bay Project is one of three embayment-based environmental protection efforts sponsored by the Massachusetts Bays Program. The project received funding in 1991 and will be supported over a five year period ($50,000/year) to address critical water quality, habitat protection, coastal access, and public health issues that effect the embayment.

Background

The Massachusetts Bays Program (MBP) established the Mini-Bays program to encourage communities to work cooperatively to protect and enhance their shared natural resources. By providing technical and financial support to these three projects, the Bays Program is promoting a natural-system based approach to environmental management. The Wellfleet Harbor Mini-Bay is one of three MBP-funded Mini-Bays projects; the other two are Plum Island Sound/Rivers System and the Fore River Estuary.

Wellfleet Harbor is the most pristine of the three projects. This area has been designated an "Area of Critical Environmental Concern" (ACEC), and is one of Massachusetts' most important aquaculture sites, the location of more than 30% of the state's aquaculture grants. However, Wellfleet has experienced a 43% growth in population over the past two decades.

The project's focus is on issues that are vital to maintaining and preserving the resource: pathogen contamination and nutrient loading are big issues for this harbor, especially as it effects their use of the nationally known Wellfleet oyster.

Key Players

Like the structure of the National Estuary Programs, the Mini-Bay projects have management and advisory committees comprised of citizens, scientists, educators, local officials, and business people. The players each bring a specific expertise to the program elements of research, public outreach, planning, and implementation. The primary cooperating organizations involved in Wellfleet are: the Town of Wellfleet, the Barnstable County Cooperative Extension System, and the Barnstable County Health Department.

Methodology

The Wellfleet Harbor Mini-Bay has been using a variety of techniques to research problem issues and educate the public. Research efforts have included collecting data on land use, water quality, and living resources to estimate the loading and critical concentration of pollutants in the embayment. For example, a nitrogen loading model developed by the Buzzards Bay Project (a National Estuary Program), a development build-out analysis will be coupled with information on tidal exchange (such as flushing rate, residence, time, and volume) and estimated contributions of contaminants from the bays into the harbor. This information will be used to estimate the maximum concentration of nitrogen that can be expected in the future given existing zoning, helping to guide resource management decisions for the health of the embayment.

Another innovative technique involves studies of the diversity, abundance, and distribution of finfish, shellfish, and vegetation. With a 50 foot seine, a catch of fish is gathered to estimate populations and species composition of finfish. But rather than pulling it in and risking high mortality rates of the fish, researchers are photographing the sample in large format film, and counting the species on the photograph.

Public involvement has and continues to be an important element of the project: in order to successfully implement the management plan, public support will be needed. Shoreline walks and workshops are held frequently, and a resource library and newsletters are just two of the many outreach efforts.

Lessons Learned

Since the project is only in its second year, many specific conclusions are still under investigation. However, a very important lesson learned thus far is the importance of communication. One of the project organizers states, "Whether it's outreach or research activities, early communication with all interested parties is essential." By speaking with the internal committees and external audiences (agencies, non-profits, schools, citizens, etc.) duplicative efforts can be avoided, problem issues can be met head-on, and collaborative/cooperative improvements can be made.

For example, the project's oyster cultch program (whereby shells were purchased and used as seed to stimulate oyster propagation), involved many parties ranging from restaurant owners, fishermen, shellfish officers, and community residents. If any one of these audiences had been left out, the project may have faltered. Project organizers attribute the success of this effort to the thorough communication link that had been previously established.

Related Materials

To find out more about the Wellfleet Harbor Mini-Bay Project, the MBP Grant Programs fact sheet and MBP newsletters arc available, Please call 1-900-477-BAYS or write to the address below:

Wellfleet Harbor Mini-Bay Project Pg. 46
Elizabeth McEvoy, Director of Public Outreach and Education,
and Susan Schneider, Public Information Specialist
Mass Bays Program
100 Cambridge Street, Room 2006
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Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Michigan

Mitchell Creek Watershed Nonpoint Source Pollution Study

Deb Allen

Background

Grand Traverse Bay is one of the few remaining oligotrophic embayments in the Great Lakes, and arguably, has the highest water quality of the larger Lake Michigan Bays. The bay serves as the focal point of northwestern Michigan's recreationally-based economy and high quality of life. Unfortunately, the Bay's popularity has resulted in increased economic development and urbanization within its watershed, which can potentially increase the input of nutrients and other pollutants into the Bay. However, despite the likelihood of increasing nutrient inputs resulting in localized problems, water quality of the Bay remains in overall good condition. Mitchell Creek is a prime example of a watershed contributing increased nutrient loadings into the Bay.

Purpose

Because many existing and potential sources of pollutants to the Bay are nonpoint sources, pollution control is not easily implemented and will require a watershed approach to identify and prioritize actions needed to remediate or prevent degradation. Within the Mitchell Creek Watershed, agricultural and recreational land uses and increasing urbanization either are degrading, or have the potential to degrade, surface and ground water quality. Increasing land development within the watershed will likely lead to increased pollutant loadings and increased potential for stormwater runoff carrying contaminants.

Thus, protection of Mitchell Creek's surface and ground water resources is vital to Grand Traverse

County's quality of life and ecological integrity. Because the creek is the most significant tributary to the southern portion of the east arm of Grand Traverse Bay, uncontrolled development and land use practices within its watershed could significantly degrade this valuable economic and aesthetic resource. Protection and intelligent land management of the Mitchell Creek watershed will therefore have a beneficial effect on Grand Traverse Bay and on the entire region.

Key Players

The Final Report: Mitchell Creek Watershed Nonpoint Source Pollution Study examines the current extent of nonpoint source pollution in the Mitchell Creek Watershed and its relationship to Grand Traverse Bay. It also predicts future impacts of urbanization and offers remedial and preventative solutions to these impacts. The work was commissioned by the Grand Traverse County Drain Commissioner under a Section 319 (Clean Water Act) grant from the Michigan Department of Natural Resources (MDNR) and the Environmental Protection Agency.

The following objectives formed the basis of recommendations in this report:

- Protection of surface water quality
- Provision of flood control
- Protection of ground water supplies and integrity

Methodology

Generally, Mitchell Creek water quality is good, showing few signs of degradation. Streambank erosion was not problematic in this watershed as the steeper, erodible upland subwatersheds of Mitchell Creek are largely undeveloped. Non-storm event baseflow observations found high dissolved oxygen, low BOD, low suspended solids, and relatively sediment-free stream beds necessary to maintain the MDNR-designated cold water habitat.

Some evidence of nutrient loading to Mitchell Creek and Grand Traverse Bay was observed. Total phosphorus and nitrate concentrations may be occasionally elevated enough to impact localized portions of Grand Traverse Bay, chiefly through the stimulation of offshore weedbed growth.

Recommendations for controlling and reducing both current and future nutrient loads to Mitchell Creek include the following:

- Preservation of the form and function of wetlands
- Creation of 50 foot riparian buffer zones along sections of perennial and intermittent stream channels
- Creation and preservation of forest cover

- Control of soil erosion
- Agricultural and golf course Best Management Practices (BMPs) which integrate soil erosion and sedimentation control with nutrient and pest management plans
- Urban stormwater BMPs which provide water quality treatment and maintain the existing water balance within the watershed, while providing flood control
- Sanitary sewers and community wastewater treatment for all new residential developments

Implementation of the Mitchell Creek Watershed Management Plan will be accomplished by a three-pronged approach of planning, education, and special ordinance creation. Planning efforts will involve the modification of zoning ordinances and master plans. Education will be integrated with the curricula of the two elementary schools and new junior high school within the watershed. Special educational materials will also be mailed to residents of the Mitchell Creek Watershed, particularly riparian landowners. Adoption of the draft Grand Traverse County Soil Erosion and Stormwater Runoff Control Ordinance will develop the necessary foundation for implementing urban BMPs. An amendment to the ordinance can establish additional requirements for agricultural and golf course BMPs.

Lessons Learned

An effective and low-cost method to implement nonpoint source control in Mitchell Creek watershed has been accomplished by the review and modification of the zoning and land use ordinances of Traverse City, East Bay, and Garfield Townships. Specifically, the ordinances were revised to include provisions that will protect the watershed.

For example, language that requires special use permits for golf courses has been added to the zoning ordinance. The special use permit process will provide the vehicle to mandate BMPs. Furthermore, careful planning and ordinance revisions can be used to limit the number of potentially threatening activities to the stream's water quality along an individual tributary.

Other ordinance modifications directed at nonpoint source control could include:

- Vegetated buffer strips along streams and ponds
- Encouragement of forest conservation
- Mandating on-site stormwater control (regional control, where applicable).
- Encouragement of municipal sewer construction instead of septic systems to prevent dissolved contaminants from entering the groundwater and eventually Mitchell Creek or Grand Traverse Bay
- Require urban stormwater BMPs for future developments along new major roadways
- Require residential developments to develop a site specific turf BMP program as a condition of zoning approval. The BMP program should contain mandatory notification of its practices to potential lot purchases and grounds-keepers.

Conservation casements may also be a useful tool for protection riparian corridors, woodlands, wetlands, recharge areas, and other sensitive areas. Conservation easements allow land owners to lower real estate taxes on their property and to restrict land use changes. Easements have been successfully employed for endangered species protection and open space preservation. Easements in the Mitchell Creek watershed could be coordinated through one of the local land conservancies.

For further information, contact:

Mitchell Creek Watershed Nonpoint Source Pollution Study
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Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Ohio

Equipment Buy-Down Project, Maumee River Basin, Ohio

Eva Hottman

Purpose

In the early 1970s, phosphorus was identified as the major cause of eutrophication in Lake Erie. Immediate efforts were focused on reducing point source loadings from municipal sewage treatment plants. Between 1972 and 1982, phosphorus loadings from municipal sources were reduced by 85 percent. Consequently, it soon became clear that further reductions in phosphorus entering Lake Erie would have to come from nonpoint sources, specifically agriculture. As a result, the State of Ohio adopted a Phosphorus Reduction Strategy for Lake Erie with an annual nonpoint source phosphorus reduction goal of 1,390 metric tons, of which 900 metric tons were allocated to agriculture.

The single largest contributor of phosphorus and sediment to Lake Erie is the Maumee River basin. The basin contributes 46 percent of the phosphorus and 37 percent of the sediment entering Lake Erie while providing only 3 percent of the inflow. In 1985, the International Joint Commission (IJC) identified the Maumee River as one of 43 Areas of Concern (AOCs) in the Great Lakes Basin.

Background

The Ohio portion of the Maumee River basin drains about 4,850 square miles (3,104,000 acres) and covers portions of 17 counties. About 80 percent of the land surface in the basin is cropland. While erosion rates are relatively low, the soils are high in clay content. The clay particles easily suspend in water and have chemical and physical properties that strongly absorb phosphorus, thus creating a major

water quality problem for Lake Erie.

Key Players

To address this water quality problem, an inter-agency team composed of representatives from the Ohio Environmental Protection Agency (Ohio EPA), the Soil Conservation Service (SCS), and the Ohio Department of Natural Resources (ODNR) developed an implementation strategy addressing agricultural runoff in the Maumee River basin. This strategy was based on recommendations from the Maumee River Remedial Action Plan (RAP) Stage 11 Report, the State of OHIO Phosphorus Reduction Strategy for Lake Eric, Ohio's Nonpoint Source Management Program, and local phosphorus reduction strategies from county phosphorus reduction committees in the Maumee River basin. All of these documents identified land use practices, specifically conservation tillage and winter cover residue, as the best way to maximize reduction of sediment and phosphorus in the shortest period of time. Consequently, the implementation strategy emphasized "buying down" or lowering the cost a farmer pays for farm equipment that leaves more plant residue on the soil surface.

In October, 1991, the Maumee RAP Implementation Strategy was approved as a demonstration project and awarded a $641,000 Regional 319 Set-Aside grant from the U.S. EPA. With these funds the implementation of the strategy began to take shape.

Methodology

Specific project guidance was developed. It included targeted critical areas, a list of residue-enhancing equipment and land treatments approved for cost-share, maximum cost-share amounts and minimum acreage requirements for each cost-share item, and criteria for selection of applicants. Within these broad project guidelines, Soil and Water Conservation Districts (SWCDs) in the Maumee River basin were given the latitude to design programs that would address local concerns. In addition, each SWCD was allocated a portion of the grant based on the percent of targeted cropland in the county and was permitted to approve or disapprove applications from farmers in the county. Having this type of local involvement helped to create the essential element of local project ownership.

A Joint Advisory Board, consisting of one representative from each county in the Maumee River basin, was formed to provide local input and direction to the project. The creation of the Board helped to balance individual county agendas with the larger goal of improving water quality for the entire Maumee River basin.

After the first year of this three-year project, it was very clear that the project was experiencing widespread acceptance by the agricultural community. Further-more, it was well on its way to exceeding estimated water quality benefits. The following items present a snapshot of the project after its first year:

- 477 farmers from 15 counties volunteered to participate in the project.

- 89 percent of the total $641,000 award was allocated to farmers in the form of equipment cost-share payments.
- The $573,020 of federal cost-share allocated during the first year, generated $4.9 million of matching funds from farmers, which in turn, had a significant effect on local economies.
- The 477 farmers committed an average of $10,000 of their own money in pollution control equipment.
- Every federal dollar allocated to nonpoint source pollution prevention generated a $7 to $10 local commitment to pollution control from the farmers
- Farmers purchased the following pieces of equipment through the program: 206 no-till drills, 145 planter retrofits, 21 chisel plows, 5 chisel plow retrofits, 19 chisel harrows, and 176 chaff spreaders. Land treatment acres included: 20 subsoiling acres, 7 filter strip acres, and 3 winter cover crop acres.
- At a minimum, 122,808 acres were treated the first year, resulting in a savings of 94,752 pounds of phosphorus and 74,938 tons of soil.

Lessons Learned

The high number of farmers volunteering to participate and the large amount of local matching funds for this project, indicates that farmers are willing to shoulder more of the costs of pollution prevention and abatement programs. Moreover, this project demonstrates that a limited supply of federal dollars can be used to focus the resources of many farmers on a common goal, such that significant water quality improvements are achieved and rural economies are stimulated. By knowing how and where to apply limited federal dollars, farmers can be encouraged to voluntarily adopt improved and environmentally sound management practices, thereby demonstrating that government and the agricultural community can work together to find environmentally sound, economically viable, and socially acceptable solutions to water quality issues.

Related Materials

For further information, please contact:

Equipment Buy-Down Project, Maumee River Basin, Ohio
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Massachusetts

Ecologically-Based Environmental Management

Brian L. Howes and Dale D. Goehringer

Background

Steadily increasing nutrient inputs associated with increased coastal development poses one of the most serious long-term threats to the health of our coastal waters. Through a unique collaborative effort between private citizens, scientists at the Woods Hole Oceanographic Institution, land management specialists and local governments, we are integrating state-of-the-art coastal and watershed ecological approaches with land use planning, policy concerns and education objectives for coastal management. Unlike some programs which gather data "of use to managers", the Nantucket Harbor (Massachusetts) Project directly carries the information gained by basic research through to the level of environmental management. In addition, the program maintains a substantial public education component to increase public understanding of the fragile ecology of our coastal environments. Our goal is to develop and implement a new approach of ecosystem-based environmental management which will serve as a model for other coastal communities in their efforts to balance utilization with long-term protection of their valuable coastal resources, and to redirect environmental management approaches at local, State and Federal levels.

The Nantucket Harbor Project is actually the culmination of many years of scientific investigation into nutrient dynamics in a variety of coastal ecosystems, from eutrophic and heavily impacted coastal salt ponds and harbors to pristine marine-derived lake ecosystems in Antarctica. The overall goal of the program is to develop management and monitoring strategies based on quantitative data to provide the most cost effective yet ecologically sound approaches toward nutrient related water quality problems. Nantucket Harbor was selected as the location for this work based upon several advantages over other

coastal ecosystems: 1) Nantucket Harbor supports the variety of ecosystem types representative of coastal ecosystems along the Mid and North Atlantic coast enabling application of the results to a wide variety of coastal environments; 2) unlike some coastal systems, this harbor is only recently beginning to show signs of significant nutrient-related stress (as opposed to systems already in advanced stages of deterioration which confounds the ability to determine cause and effect required for management); 3 approximately 1/3 of the watershed of Nantucket Harbor is developed, with another third preserved in land trusts and conservation. The final third, however, is currently under pressure for development and therefore increases in the rate of nutrient loading to the harbor are occurring which may double the current loading over the long term. This gives us the opportunity to determine at what location and to what degree development can best continue without serious negative impacts to harbor ecosystems; and 4) the direct partnership between public citizens, local governments, land management specialists and scientists enables swift and direct application of results to management objectives for these systems.

Purpose

The objectives of the Nantucket Harbor Project are to promote management programs to preserve the functioning of ecosystems, not merely the attempt to preserve species (eg. clams, scallops, etc.) or to deal with environmental problems on a "crisis by crisis" basis. High water quality is crucial to many economic activities along the coast, notably commercial fishing and shellfishing and the variety of recreational activities that attract tourists and seasonal residents alike, as well as the aesthetic value of these resources which are fundamental to most tourist-based economies along the coast. In many communities, however, coastal systems have already so deteriorated that multi-million or even billion dollar remedial projects are being undertaken in attempts to partially restore water quality. Sound environmental policy for coastal waters and harbors must be grounded in an understanding of their ecology and the impacts of activities in the surrounding upland, an understanding crucial to management decisions yet generally lacking in the general development of most coastal management plans. The goals of this program, environmental management of coastal waters based upon ecological assessment - watershed evaluation - direct community involvement is a new approach to coastal planning, and ultimately the only approach that will adequately deal with the long-term consequences of coastal pollution.

Methodology

The project is unique in that it strives to increase our basic understanding of the workings of coastal systems to provide the basis for cost effective, inexpensive monitoring programs that can be undertaken by virtually any coastal community at low cost. It also strives to differentiate between those alterations to water quality due to natural versus man-related sources, an important component of understanding alterations to any natural system. To obtain detailed scientific understanding of the ecosystem dynamics within these systems, the Woods Hole laboratory runs additional highly specialized measurements and analyses for the very purpose of being able to provide fundamental information on nutrient cycling that will allow interpretation of baseline data in other ecosystems.

Key Players

The multi-disciplinary nature of this project has resulted in a multi-component funding structure. Start-up funds for the program came from the Rotary Club of Nantucket and the Nantucket Land Council, a local non-profit conservation organization to support an initial monitoring program providing needed baseline data. The direct benefits to the Town of Nantucket have resulted in a commitment of funds from the town/county, local conservation organizations, and over half from private fundraising events such as sailing regattas and sale of shirts to benefit the study. Significant in-kind support has been provided by various groups such as the University of Massachusetts' Nantucket Field Station, Nantucket Marine Department and Board of Health, and the Nantucket Land Council. The great interest of local citizens in the project has been demonstrated by their commitment of both time and financial support.

Lessons Learned

This project benefits all sectors of the community as all citizens gain, both economically and aesthetically, by maintaining the health of their nearshore waters. More, importantly, however, is the wide ranging application of the information gained in this effort to other coastal towns, both in New England and all along the East Coast of the Unites States, as more and more communities recognize the serious long-term threats posed to the health of their coastal waters and are seeking assistance with the development of their own "environmentally guided" management plans. Although the monitoring is designed for nearshore coastal waters, it could easily be tailored for any aquatic system, either fresh or salt water. Finally, these efforts are making a significant contribution to ongoing scientific research efforts aimed at understanding how these nearshore coastal systems respond to increased nutrient loading from increased development pressure, a serious problem faced today by virtually every coastal city and town.

Related Materials

For further information contact:

Ecologically Based Environmental Management: Whole
Ecosystem Approaches to Coastal Water Quality Problems
Brian L. Howes, Associate Scientist,
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California

Neary Lagoon: Neglected Marsh Restored to Wildlife Refuge

Rick Hyman and Dena Robertson

Purpose

This innovative project is the preparation and implementation of a comprehensive wetland management plan. The purpose is to restore a neglected and historically abused marsh into the wildlife refuge for indigenous and migrating species that it once was before the negative impact of human development. Additionally, the Neary Lagoon (California) Management Plan offers unique opportunities for the public to view and experience a variety of habitats without disruption to these sensitive ecosystems.

The Neary Lagoon Management Plan provides direction for creating a balance among the lagoon's various purposes for wildlife values, public use and safety, flood protection, water quality, mosquito control, and aesthetics. Achieving this balance of purposes requires a detailed level of on-going management that is comprehensive and adaptive to changes. Without such restoration and management, the lagoon would continue to be degraded and would lose the valuable resources for both wildlife and the people of the Monterey Bay region,

Background

Although preparation of the Neary Lagoon Management Plan commenced in 1975, there was a long hiatus until the mid 1980s. Components of the Plan were prepared between 1986 and 1990. Serious work on comprehensively completing the Plan resumed in 1991. A City-wide Task Force was formed to review and edit the Plan and a series of public workshops were held in 1991. The Plan was approved by

the California Coastal Commission in 1992. Since that time, the Plan has been in the implementation stage.

Key Players

The work on the Neary Lagoon Management Plan involved the entire community: adjacent neighborhoods, environmental groups, city staff, and community leaders, as well as various agency representatives including the Coastal Commission, the California Department of Fish and Game, and a number of expert assistants. Literally hundreds of people were involved.

The Coastal Commission has regulatory and plan review authority, and required the preparation of the Plan as a condition of the construction of projects at the lagoon involving some wetland fill, including a park and a wastewater treatment plant. The City of Santa Cruz has planning and regula- tory authority as owner of the lagoon itself, and of adjacent land which it dedicated to the construction of an award-winning low income housing project. Both agencies were, and are, committed to the health of the lagoon, and to balancing the various needs of adjacent developments while protecting the habitat from disruption.

Methodology

The following steps were taken to ensure that the management plan was prepared and implemented in a manner to accomplish its intended purposes:

- The requirement to prepare the Plan included as a first step that an outline be prepared that all parties would agree to.
- As time went on, the required elements of the Plan were updated to reflect changed circumstances and the requirements were repeated in subsequent regulatory and planning decisions.
- Advance components of the Plan were completed to address immediate adjacent development proposals and ensure adequate buffers.
- A consultant was hired to write the plan.
- An advisory task force was formed to oversee Plan preparation and hold public meetings.
- Close coordination occurred between City and the Coastal Commission staff.
- An implementation chapter with budgeting and timing was a key component of the Plan.
- Funding for preparation and implementation of the Plan was derived from the wastewater fund, since the expansion of the Plant occurred adjacent to the lagoon.

Lessons Learned

- The need for the persistence of staff and a commitment to the Coastal Act and environmental goals.
- The need to create community consensus around the preservation of the lagoon and the

environmentally sensitive habitat in the face of seriously threatening adjacent developments, notably the wastewater treatment plant and the affordable housing project.

- As a result of the persistence of the staff of the Coastal Commission and the City, the seemingly conflicting goals of achieving affordable housing and meeting wastewater treatment needs were reconciled. These competing needs were reconciled through a consensus building process. All the players were able to perceive the environmental value of the lagoon habitat and were therefore willing to make compromises in the design, location and landscaping of the adjacent developments.
- One example of how such a commitment to and appreciation of the environment of the lagoon was created, is the use of the JTPA (federally-funded) summer youth employment program. This program, targeted at teens at risk of delinquency and disadvantaged teens, was utilized to hire a crew of youths to work at the Neary Lagoon Refuge. They not only removed invasive species from the marsh and grassland areas, but they also painted out graffiti and conducted a whole series of wildlife surveys. Using local environmental groups, these teens were taught how to identify and record sightings of rare and endangered waterfowl and birds, to monitor the flow and level of the lagoon, and to generally gain an appreciation of the many ecosystems in the area.

Related Materials

- "Initial Study/Negative Declaration Neary Lagoon Management Plan. February 18, 1992.
- Background documents/components for the "Neary Lagoon Management Plan".
- "Neary Lagoon Birds and Waterfowl". 1993.
- Coastal permits for park improvement, wastewater plant expansion, and affordable housing projects.

For further information, please contact:

Neary Lagoon: Neglected Marsh Restored to Wildlife Refuge
Rick Hyman, Coastal Planner
California Coastal Commission
725 Front Street, Suite 300
Santa Cruz, CA 95060
408427-4863/408-4274877 Fax
and Dena Robertson, Associate Planner
City of Santa Cruz Department of Parks
323 Church Street
Santa Cruz, CA 95060
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California

A Management Strategy to Protect an Endangered Coastal Sand Dune Ecosystem

Lillian Y. Kawasaki

Purpose

This project has leveraged funding from multiple sources and existing programs to revegetate approximately 200 acres of coastal sand dunes in California. This innovative effort combined job creation for young people with environmental education and community involvement. Almost all of the labor to complete the effort was provided by economically disadvantaged youth and community group based volunteers.

Background

The El Segundo Sand Dunes are the last bastion of what was once a vast coastal sand dune ecosystem in Southern California and are home to a number of rare and endangered species, including the El Segundo Blue Butterfly. For nearly 40 years, the area was also a residential neighborhood overlooking the Pacific Ocean,

The dunes are located at the west end of the Los Angeles International Airport (LAX) and, between 1928 and the mid-60s they played host to a residential housing tract. By the late 1960s, residents had elected to have their land purchased by the City and turned into a noise and safety buffer zone. Approximately 800

homes were removed from about 300 acres of land, the area was fenced and navigational equipment was placed on site.

In the early 1980s, the California Coastal Commission encouraged the City of Los Angeles, Department of Airports to contract a biological study to evaluate the habitat. The Department of Airports approved $200,000 of expenditures between 1985 and 1992 for studies and initial restoration. Most of the homes on the dunes had been landscaped using non-native vegetation. Some plants, like iceplant, now covered many acres and had almost completely overgrown native sand dune vegetation.

The City of Los Angeles, Environmental Affairs Department began seeking grants to fund the restoration work, and developing partnerships with community groups, technical experts and youth employment programs. This approach was extremely cost-effective and also provided mentors for the young people, who were able to work side-by-side with scientific experts. The California Coastal Conservancy granted $75,000 for the revegetation of 10 acres in 1991-92, and the California Department of Transportation granted $430,000 for restoration through September of 1994. These funds will revegetate about 200 acres of the habitat.

Key Players

The City of Los Angeles, Department of Airports and the Environmental Affairs Department have worked closely with local City Councilwoman Ruth Galanter to provide some City resources and to apply for grant funding. The State of California has provided much of the funding and the California Coastal Commission has provided the necessary permits to perform the work. The Los Angeles Conservation Corps has provided work crews using federal matching dollars to increase the number of young people able to work on the site. Local non-profit organizations, primarily Rhapsody in Green and Heal the Bay, have spearheaded "Day at the Dunes" events regularly. The most important players of all are the many volunteers who have given so much of their time.

Methodology

The project was funded through transportation enhancement grants, and efforts were made to leverage dollars at every step. The contractor was asked to not only provide the technical facilitation of the project but to also include the environmental education and monitoring components needed to complete the work using young people and volunteers. More than $100,000 was allocated to volunteer recruitment and management of the work crews and volunteers, and to provide environmental education. The Summer Youth Employment Program (SYEP, City of Los Angeles) provided paid internships at the dunes for economically disadvantaged inner-city youth.

Lessons Learned

The biggest lessons learned during the project were to be flexible in dealing with multiple agencies and to look for opportunities to leverage dollars and utilize existing programs which would lead to job training and promote stewardship with the youth throughout the process. The project has vividly illustrated that public-private partnerships are wonderful ways to strengthen community bonds.

One recommendation would be to start the volunteer recruitment as soon as is also important to look for employment opportunities and add job skill training whenever possible.

Related Materials

The consultants are continuing to develop materials to help raise awareness for this unique ecosystem. Existing materials include the history of the area, newsletters to volunteers, and technical papers associated with the restoration. In addition, press releases were written and news conferences were held to promote the effort.

For further information, please contact:

A Management Strategy to Protect an Endangered
Coastal Sand Dune Ecosystem
Lillian Y. Kawasaki, General Manager
City of Los Angeles Environmental Affairs Department
200 North Spring Street, Room 1500
Los Angeles, CA 90012
213-237-0352/213-485-9657 Fax

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

California

The Grass Valley Creek Watershed Story

Kathy Simpson

Background

According to the old-timers in Trinity County, California, "there was a time when you could walk across the (Trinity) River on the backs of the fish." Renowned for its salmon and steelhead populations, the Trinity River - which drains the 23,000-acre Grass Valley Creek Watershed and empties into the Pacific Ocean, attracted many anglers and campers, making tourism one of the foundation industries in this northern California county.

Approximately 17,000 of the 23,000 acres of the Grass Valley Creek Watershed is underlain by decomposed granite parent materials. These materials weather into some of the most highly erosive forest soils in the Western U.S.

When the Trinity portion of the Central Valley Project was completed in 1963, involving the construction of the Trinity and Lewiston dams, the result was the diversion of nearly 90% of river flows for other uses. In the absence of these flushing flows, decomposed granite sediment from Grass Valley Creek Watershed began to build up in the river, causing the loss and degradation of much of the fish and wildlife habitat. It has been suggested that more than 800,000 salmon and steelhead trout annually came upriver before 1960 and that as few as 7,000 were found in 1992.

Key Players

The Trinity River Restoration Project was funded in 1984 which spearheaded by the Trinity River Task Force (TRTF), a group of 14 federal, state, local and tribal agencies. These agencies are the U.S. Bureau

of Reclamation (BoR), Wildlife Service, Humboldt County, Trinity County Board of Supervisors, U.S. Forest Service, USDA-Soil Conservation Service, National Marine Fisheries Service, Hoopa Valley Tribe, California Department of Fish and Game, California Department of Water Resources, California Water Re- sources Control Board, and California Department of Forestry and Fire Protection. The goal of the TRTF is to restore the fish and wildlife populations to pre-dam levels.

Methodology

The U.S. Soil Conservation Service (SCS) conducted a comprehensive inventory of the Grass Valley Creek Watershed in 1991 in which they located over 1100 site-specific sediment sources. The Trinity River Restoration Program, working through the National Heritage Institute and the Trust for Public Land, leveraged a buy-out of 17,000 acres of land owned by Champion International, a timber management corporation. After the buy-out, the management of the land was turned over to the Bureau of Land Management, whose focus is to stabilize the watershed and to halt logging on the fragile and highly erodible soils.

The Trinity County Resource Conservation District, (TCRCD) working with SCS and utilizing restoration funds administered by the BoR, is now implementing an erosion control and restoration program including biotechnical stabilization techniques. The TCRCD employs over 30 full-time staff, and uses local equipment contractors, California Conservation Corps crews, and state inmates to implement the work.

One of the keys to success has been the cooperation of all the agencies and best solutions possible, peer reviews have been instituted and frequent tours have been conducted to inspect the work and get professional input from the technical experts and agencies involved. This resulted in recognizing the futility of turf battles and the benefits of concentrating their energies into, working toward the goals of the project.

The Trinity River Restoration Program budget is planning for funds into at least 1996 and possibly beyond. The original amount allotted for restoration was $2.3 million. The buy-out phase cost $9.2 million. And another $9 million is expected to be expended, including sheet and rill erosion work for which the SCS has written a proposal.

Lessons Learned

The Adopt-A-Watershed educational program is a unique part of the restoration efforts and has been flourishing in the Trinity River Basin. The Task Force recognized the value education as a means to insure long-term restoration efforts and provided a budget of $299,000 to initiate a formal pi lot project for developing curriculum for Kindergarten through 12th grades. Students have helped plant trees, work with resource professionals to do restoration projects in the watershed, and studied the streams, plants and wildlife. Their data are collected and will present a picture of changes over time and a basis for

comparison with other areas.

The efforts to stabilize and revegetate the mountainous decomposed granitic areas have provided many challenges and opportunities to try state-of-the-art techniques. Many groups have been drawn into the process, including the California Department of Transportation, which has placed more emphasis on maintenance of roadways including drainage and erosion control systems, and the Pacific Gas & Electric Company which is working with the TCRCD on erosion problems on powerline right-of-ways.

Related Materials

The TRTF has compiled a library of materials which is housed in the Trinity County Free Library on the different aspects of the Grass Valley Creek Watershed project.

The author can be reached at the following address:

The Grass Valley Creek Watershed Story
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Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

California

Sonoma County Wetlands Enhancement Program

Lee Erickson

Purpose

The problem: Long-term, ongoing degradation of unique coastal estuary wetlands in fjord-like settings in two coastal California watersheds by upstream sediment loading from dryland agricultural grazing areas.

Overall objectives: Elimination/reduction/control of point-source and nonpoint source sediment in tributary watersheds.

Background

Project Implementation: This program was unique in that a special coastal resource impacted by upstream watershed activity was protected by work completed within the watershed on private property with voluntary cooperation of landowners. Over 50 individual repair projects were completed with 40 cooperating landowners. Additional technology transfer to the agricultural community and public included tours, publications, a range seminar day, static displays for public events, and VIP tours for interested agencies and groups.

Specific repairs included the following categories:

- 1) Multi-purpose gully grade control structures that stabilize gully walls, trap upstream sediments

and bedload, provide gully crossings, livestock water, riparian habitat, and incidental game and non-game species wildlife benefits.
- 2) Livestock culvert crossings.
- 3) Fenced gullies and stream areas.
- 4) Shaped/unshaped rock-armored headcuts and channel linings.
- 5) Contour diversion ditches with pipe drop inlet systems or armored headcut chutes for hillside surface runoff.
- 6) Vegetation restoration and enhancement in work areas.

Program Maintenance Efforts: Individual repair projects have legally-binding deed restrictions requiring landowner maintenance. Repair designs followed US Department of Agriculture, Soil Conservation Service (SCS) criteria, resulting in high-quality, conservatively designed structures with little or no maintenance required.

Involvement: Cooperative working relationships were formed with the Key Players noted below.

Project Cost: $8,000 planning grant to CRP from the California Coastal Conservancy. $1.2 million implementation grant over 5 years to the Gold Ridge Resource Conservation District (GRRCD) from State bond funding provided California Coastal Conservancy. $150,000 grant over 1 year from offshore oil spill mitigation fine provided by Sonoma County Planning Department. $120,000 supplemental appropriation provided by Conservancy administration based on demonstrated performance and need. Total budget approximately $1.478 million. In-kind staff contributions from SCS, California Department of Fish and Game, GRRCD, others.

Key Players

Agencies/Organizations/Individuals

California Coastal Conservancy (funding, oversight), Circuit Rider Productions, Inc. (concept, initial study, partial admin., fencing/revegetation), Gold Ridge Resource Conservation District (all aspects implementation, admin), USDA Soil Conservation Service (technical assistance), Santa Rosa CA Field Office (advisory panel, tech assistance), State Engineering Office, California (design review, contract specs), Sonoma County Planning Department (additional funding), California Department of Fish and Game (site/design evaluation, permitting), Marin Resource Conservation District (portion of work area), Citizen's Advisory Committee (program oversight), 40 cooperating landowners within watershed work areas (individual projects).

Methodology

- Survey watersheds to inventory erosion sites (CRP Inc, 1986).
- Develop restoration program proposal for Coastal Conservancy funding. (CRP, GRRCD)

- Develop site selection criteria for repairs/enhancement.
- District staff generates annual work load proposal on voluntary basis with landowners.
- Advisory Committee, Board evaluate, select approx 1/3 of proposals for funding.
- Site selection based on benefit/cost analysis, feasibility, landowner ok, other criteria.
- License/Maintenance agreements (deed restriction with sunset clause) with landowner.
- Repairs designed, reviewed, approved using USDA-SCS criteria, inter-agency cooperation.
- Public noticed, competitive bids for licensed, bonded, insured contractors at prevailing wage.
- Construction, inspection, documentation by District staff.
- Maintenance by landowner on as-needed basis.

Lessons Learned

Large-scale point source erosion sites in dryland agricultural settings continue to degrade without intervention. Unstable gullies are generally perpetuated by forces beyond the control of the landowner. Local agricultural producers have generally good stewardship objectives with limited economic resources for implementation of repairs. Wide-scale voluntary cooperation with individual private landholders can be achieved with appropriate formulation of site-specific implementation strategies. Essential factors include:

- 1) One-on-one communication with landowners,
- 2) Staff with agricultural background and sensitivity to traditional community practices and values,
- 3) Development of solutions benefiting both Program and Landowner, and
- 4) Sensitivity to management skills and practices of individual cooperators.

Public resource agencies can work together in implementing a watershed-based enhancement strategy with landowners. Interagency cooperation brings together sometimes competing philosophies for technical approach or delivery method, requiring a clear delineation of management structure and hierarchy for successful program implementation. Open communication and lack of hidden agendas between key players is essential. While more difficult and time consuming to accomplish, Program implementation with multiagency inputs results in a better overall product as problems and opportunities are viewed from a broader perspective.

Additional opportunities remain for watershed-based enhancement of estuarine wetland resources. Grant funding constraints resulted in emphasis on point-source erosion control with demonstrable immediate benefits and tangible benefit-cost ratios. Other management tools like widespread adoption of innovative pasture management/improvement techniques have good potential for sediment reduction, but require adoption of intangible philosophical changes in range management strategies by numerous landowners. Time constraints, management skills, landowner motivations, financial constraints, and economic incentives are among the factors affecting such changes.

Related Materials

GRRCD Annual Reports, static display materials, and annual progress reports to the Coastal Conservancy are available from the:

Sonoma County Wetlands Enhancement Program
Lee Erickson, Project Engineer
Gold Ridge Resource Conservation District
874 Gravenstein Highway South, Suite 6
Sebastopol, CA 95472
707-823-3037/707-823-1436 Fax

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

California

Marine Resource Mitigation Program for the Impacts of a Coastal Nuclear Power Plant

Linda Locklin

Purpose

In 1991, the California Coastal Commission (the Commission) voted to require Southern California Edison (SCE) to restore 150 acres of tidal wetland, and create a 300-acre artificial kelp reef. The mitigation program was designed to address the impacts of the operation of the San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 on the marine environment. The program also includes a requirement to install fish barrier devices at the SONGS Units 2 and 3 water intakes and a requirement to partially fund a white sea bass fish hatchery.

Background

The mitigation program is the result of a 15-year study of the impact of the plant that was conducted by the Marine Review Committee (MRC), a panel of scientists established as a result of the Commission's original permit action in 1974. The MRC found that the plant's cooling system caused significant adverse impacts to the kelp community in the San Onofre Kelp Bed by discharging turbid water over the kelp bed, and caused a significant reduction in the standing stock in a number of midwater fish populations in Southern California Bight as a result of the intake of fish eggs and larvae with the cooling water.

Methodology

The mitigation program is innovative because it includes a number of elements that were specifically designed to minimize the risk that resources lost or damaged by the power plant would not be adequately mitigated. The following are key elements of the mitigation requirements:

- explicit performance standards will define the success of the mitigation projects;
- a long-term independent monitoring program will measure the success of the constructed reef and wetland in meeting performance standards;
- a failure to meet a performance standard can, over the life of the project, trigger a requirement for remedial action to improve the ability of the project to meet the standard;

- the mitigation program incorporates ongoing scientific guidance and review.

Key Players

The program is also innovative in the roles it gives SCE and the Commission in carrying out the program. The permit requires that each party consult with the other party at key decision points. The Commission's role is to oversee SCE's design and construction work, ensure that SCE complies with the terms of the permit, approve plans, take the lead in monitoring operations, judge the success of the projects, and determine if remediation is necessary. SCE is responsible for the planning and construction phases. SCE is also responsible for the success of the mitigation projects, and is given reasonable latitude in making decisions about the projects' designs. In addition, responsibility for remediation provides an incentive for SCE to take extra care in planning and designing the mitigation projects.

Lessons Learned

The mitigation program represents a long-term commitment by both the Commission and SCE. In requiring monitoring and remediation of the reef and wetland over the life of the power plant, the permit recognizes that a user of coastal resources is responsible for the resulting adverse impact, as long as the use continues. Although SCE and the Commission have distinct roles in the program's implementation, the two parties share an important goal - that the mitigation projects will be successful. The performance standards for the wetland and reef will both define and focus the user and regulator on this goal and help to ensure that the mitigation achieves full resource compensation.

The mitigation program is in its early stages. In the future, the program will produce technical data that should prove very useful in designing and constructing other kelp reefs and tidal wetlands. In addition, the program should, provide guidance in setting mitigation policy and designing mitigation requirements.

Related Materials

For more information please contact Gabriela Goldfarb at the California Coastal Commission, 45 Freemont, Suite 2000, San Francisco, CA 941105-2219. 415-904-5200. The author can be reached at:

Marine Resource Mitigation Program for the Impacts of a Coastal Nuclear Power Plant
Linda Locklin, Access Program Manager
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Florida

Watershed Management Initiatives of the Tampa Bay National Estuary Program

Mary Hoppe

Background

The future of Tampa Bay (Florida) depends upon the ability of local residents to prudently manage the region surrounding it. While the Bay itself covers 398 square miles, land draining into the Bay spans a five-county area almost six times its size. It is here, within Tampa Bay's 2,300 square mile watershed, that bay management and restoration ultimately begins. While some damage to the bay occurs as a result of activities on the water, most of the pollution and practices that adversely affect the health of the bay originate on land.

Purpose

Improvements in overseeing land-based activities that may damage the bay or cause pollution is the foundation of a master plan for watershed management now being developed by the Tampa Bay National Estuary Program (NEP), a partnership of local, state, and federal agencies.

While water quality traditionally has served as the barometer for the success of protection efforts, the Tampa Bay NEP's strategy emphasizes a critical next step by linking water quality standards to the environmental requirements of the bay's most important habitats and the aquatic communities they support.

The Tampa Bay NEP has targeted the bay's five most essential habitats for restoration and enhancement, including tidal marshes, mangroves, seagrass and other submerged aquatic vegetation, nonvegetated bay bottom, and open water or pelagic communities.

Methodology

Recognizing the diverse environments within the bay and its rivers, the Tampa' Bay NEP will select aquatic plants and animals vital to each segment as indicator species. Monitoring the health of these plants and animals will be critical in determining the overall health of their portion of the bay. Seagrass, which provides food and shelter to many important species of fish and shellfish, offers an excellent example of the procedure to be followed for almost all targeted habitats. Specific goals for seagrass recovery, documented in terms of acreage, will be set by recording historic levels and identifying permanently altered areas that would prevent or limit growth. Maps of current seagrass meadows represent protection targets, where healthy grass beds are now growing and must be maintained. Long term goals for restoration enhanced by reducing pollution or other physical impacts, such as boating and dredging.

While enhancing structural habitat is important, the ultimate measure of success is whether these habitats are functional, supporting healthy aquatic communities. New monitoring standards, that look for indicators of the health of the bay's living resources, are now being developed by the Tampa Bay NEP.

The Tampa Bay NEP is completing a comprehensive review of conditions in the bay, as well as scientific studies which will define the environmental requirements of essential bay habitats and animals. Concurrently, we are conducting in-depth research to quantify the level and concentrations of pollutants now being discharged into Tampa Bay.

The Tampa Bay NEP and other agencies are creating mathematical models which will predict improvements in water quality as pollutant levels are lowered. Although numeric goals for water quality are not the final objective of the bay restoration plan, they will be used as interim criteria. Numeric objectives for reducing pollution will be set for each major section of the bay based on the long-term goals for enhancement and restoration of habitats and animals.

Finally, a watershed action plan outlining specific commitments, timeliness and funding sources from government agencies participating in the Tampa Bay Program will be developed and included in the overall plan for bay management.

Key Players

Watershed protection ultimately depends on all citizens of the region. Florida Neighborhoods, a program developed by the Tampa Bay National Estuary Program and administered through the county cooperative extension offices in the Bay Area, brings concepts of environmental stewardship to the home and yard.

The Program, which is now in its pilot phase, pairs neighborhoods with teams of experts trained to assist residents in preventing pollution from stormwater, conserving water, and restoring native habitat. Florida Neighborhoods begins with a two-part environmental check-up - a survey of homeowners to determine landscaping and homecare practices and an on-site neighborhood assessment by a team of experts. Following the check-up, the team develops a 12-month action list identifying ways that residents can improve the local environment. Hands-on assistance is provided through a series of workshops that teach conservation and

environmental landscaping techniques.

Efforts such as these, that make watershed protection a part of our daily lives, are crucial to the long-term protection of the bay.

Related Materials

For more information please contact:

Watershed Management Initiatives of the Tampa Bay National Estuary Program
Mary Hoppe, Public Information Coordinator
Tampa Bay National Estuary Program
111 Seventh Avenue
South Saint Petersburg, FL 33701
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California

Garcia River Watershed Enhancement Project

Alan Mohr

Background

The North Coast of California is famous for its picturesque rugged coast. In Mendocino County, 120 miles north of San Francisco, the coastal range gives rise to several coastal rivers known for their outstanding salmon and steelhead sport fisheries and unique fishing villages. Small towns located at the mouth of these rivers depend upon tourism, commercial and sport fishing, logging, farming, and gravel extraction. This dependence upon scenery on one hand and resource use on the other creates a fragile balance, and conflict in the communities themselves. Nowhere is this more apparent then on the Garcia River flowing from headwaters high in coastal range to a small estuary surrounded by potato fields and dairy lands. The tranquillity here belies deeper issues between those that depend upon traditional uses of the watershed's resources, and environmental interests. It is the process of finding common ground among such opposing viewpoints that makes the Garcia River Watershed Enhancement Project an innovative leader in coastal protection efforts.

The Garcia River drains 114 square miles. The upper watershed is steep forestland, much of which is scarred by erosion from past logging. The more gently sloping lower reach is used for farming and grazing. The small estuary (80 acres of open water and mud flats) serves as an important habitat for anadromous fish, shore birds and waterfowl, and other wildlife. Until ten years ago, the river was widely known for its large Coho salmon and its excellent steelhead fishery but the combined pressures of a long drought and degraded spawning habitat have resulted in a serious decline in the anadromous fish population.

Purpose

In 1990, residents from the Garcia River watershed approached the Mendocino County Resource Conservation District (District) with the idea to develop a plan that would stem the decline in the river and address the visible impacts of past land use activities. The District is set up under state law to provide soil and water conservation assistance to landowners in Mendocino County. It is a local county agency managed by an appointed five member volunteer board of directors; it is assisted by technical staff provided by the USDA, Soil Conservation Service. The community request was timely, the District had worked for ten years restoring the Tomki Creek watershed, an inland area, and felt it was time to undertake a similar project in a coastal watershed.

Key Players

While the people that approached the District were largely from the environmental community, the District felt it would need a range of landowners working together so that all interests could become stakeholders in the results. The success of the project hinged upon understanding and responding to the needs and visions of the property owners of the watershed, regardless of their positions. To this end a Watershed Advisory Group (WAG) was formed; its 12 members represent major interest groups in the watershed including: gravel operators, the timber industry, environmentalists, agricultural and tribal representatives, and commercial and sport fishermen. In addition, technical advisors from several agencies were involved, including the Soil Conservation Service (SCS), the Department of Fish and Game, the North Coast Regional Water Quality Control Board, the Mendocino County Water Agency, the County Extension and the Bureau of Indian Affairs.

Methodology

Development of the watershed plan was supported by a $100,000 grant from the California Coastal Conservancy, awarded in 1991. The WAG met throughout the 18 month planning process to develop goals, review and make recommendations for the Plan. Every recommendation was agreed upon by consensus of the members. The Plan was completed in October 1992, with the stated purpose of fostering conservation, restoration and sound management of the Garcia River's natural resources. The main objective of the WAG and the Plan is to restore the salmonid fishery in the River by treating areas of accelerated erosion that impact water quality and fisheries habitat.

One of the first major obstacles to confront was the issue of gravel extraction, an extremely divisive issue that threatened the ability of the WAG to forge any agreement. The District was aware that the gravel issue was being examined on a county-wide basis, and decided that it had a broader scope, being subject to state and federal regulatory authority. The Plan was based on voluntary cooperation; regulated activities needed to be treated differently. As gravel operations were an important part of the river's complexion, the District compromised by developing a scope of work for a Gravel Management Plan for

the river and turning this information over to the County for completion of a separate plan that would become a model for the entire county. To do so, the District asked SCS to provide a team of hydrologists and river planning experts to recommend the tasks needed to develop a comprehensive gravel management plan. The SCS Hydrologic Unit Planning (HUP) Team from Davis, California provided a clear outline of the needed tasks and the District assisted the Mendocino County Water Management Agency in obtaining an EPA 205(j)(5) planning grant in the amount of $75,000 to prepare the Gravel Plan to be completed in December 1993. On the contentious gravel issue the District was able to turn what could have been a quagmire into a positive long term solution to help the river and the wider resources in the County.

Although the District relied heavily on the WAG to provide community input, it also wanted to ensure that all landowners and residents would be able to provide their views. Public outreach was a critical part of the planning process - it was the goal of the District to ensure that by the time the Plan was complete everyone would know what was happening. To keep the landowners informed of the Plan's progress, The Garcia River Update, a four page bulletin outlining issues and noticing WAG meetings, was distributed quarterly to 250 landowners in the community. As a result, WAG meetings were regularly attended by 20 to 30 landowners. By the time of the Public Hearing to adopt the Plan and throughout the California Environmental Quality Act process (an environmental review requirement similar to federal NEPA), there were no adverse comments from landowners. The District had proved that by ensuring full public participation, few, if any, felt uncomfortable with the outcome of the Plan.

Lessons Learned

With the first step complete, the District has moved toward implementing plan recommendations. While planning can be difficult, implementation is the true test. Implementation has been initiated through funding received from AT&T and the District Attorney's Office. This funding was a windfall that can largely be attributed to the existence of the Plan and the perseverance of the District and the WAG. In July 1992, AT&T contractors installing a fiber optic line under the river accidentally spilled several thousand gallons of drilling mud into the river. The District and the WAG members negotiated with AT&T regarding the mitigation for the accident and were rewarded with close to $200,000 in implementation funds. While these funds are nowhere near the amount needed to fully fund the projects of the Action plan, they will serve as match for other grant monies as well as fund some smaller projects. One of the large timber landowners, Coastal Forest Land has agreed to initiating restoration projects on its land and will assist with matching funds. The Conservancy has pledged to provide additional implementation funds; and the local environmental group, Friends of the Garcia (FrOG) has been able to secure foundation grants for small projects. The District has made a long term commitment to restore the Garcia River. At least ten more years of funding sources will be needed but, the community and the District are ready to stay the course. The Garcia River and coastline are too precious for anything less.

Related Materials

Copies of the Garcia River Watershed Enhancement Plan and Action Plan are available from the Mendocino County Resource Conservation District at the address below. The cost is $10 per copy.

Garcia River Watershed Enhancement Project
Alan Mohr, District Chair
Mendocino County Resource Conservation District
405 Orchard Avenue
Ukiah, CA 95482
707-468-9223/707-468-1292 Fax

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Hawaii

Hanauma Bay Management Plan

Robin C. Bond

Purpose

Hanauma Bay is one of Hawaii's most popular and significant recreation areas and tourist attractions. Visitor use since 1980 has grown to over 3,000,000 per year and with that have come numerous problems impacting on this fragile environment. Some of the major problems were overcrowding, water pollution, damage to coral reefs, uncontrolled fish feeding and a general lack of management of a very important resource.

The objective of the Hanauma Bay Management Plan was to regain control of the bay through a series of management controls.

Background

In early 1989, the City and County of Honolulu, Department of Parks and Recreation formed a task force to develop a management plan. Working with other state and local government agencies and numerous environmental and concerned groups, the plan was developed and implemented in July, 1990.

Methodology

The management plan was completed in six (6) phases:

- 1. Identify the natural resources associated with Hanauma Bay.

- 2. List all current and potential users of Hanauma Bay.
- 3. Establish goals and objectives based on State and City criteria.
- 4. Formulate policies, regulations and controls to support the goals and objectives.
- 5. Identify current problem areas and implement solutions to minimize or eliminate the negative impacts on the bay.
- 6. Monitor the plan and fine tune as necessary.

The management plan included a number of important actions:

- 1. Hired a full-time professional manager to direct the day-to-day operations at the bay.
- 2. Established strict rules and regulations on public use and enforced them to ensure that activities are compatible with goals and objectives.
- 3. Developed and implemented a public educational program to teach the public how to use and protect the park.
- 4. Closed the park at night to prevent vandalism and illegal fishing.
- 5. Made major improvements in the park sewer system.
- 6. Established a master plan for specific improvements that would enhance and improve the natural qualities of the park.
- 7. Implemented traffic and parking controls.
- 8. Made major improvements in the parks maintenance program.

Lessons Learned

The most important recommendation is that governmental agencies should establish management plans and be proactive in managing environmentally sensitive areas before they get out of control. A few important comments on establishing a management plan are:

- Establish realistic, written goals and objectives
- Enlist the aid of knowledgeable groups and individuals
- Keep the task force in a manageable size
- Keep administration informed of all important developments
- Keep an open mind but be prepared to stand your ground on certain sensitive areas

Related Materials

For more information please contact:

Hanauma Bay Management Plan
Robin C. Bond, Administrative Assistant
City and County of Honolulu
Department of Parks and Recreation

650 South King Street
Honolulu, HI 96813
808-527-6078/808-523-4823 Fax

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Massachusetts

Mass Bays Local Action: Local Governance Committees

Elizabeth McEvoy and Susan Schneider

Purpose

The local governance committees (LGC) of the Massachusetts Bays Program (MBP) were formed in 1992 to ensure that a local voice was brought to the Program and that MBP resources were directed appropriately for local action. In Massachusetts, where home rule prevails and local decision-making can have a great impact on the environment, local officials were considered key players. The LGC is divided into five regional groups from Cape Cod to the Upper North Shore of Massachusetts, with officially appointed representatives from the 49 coastal communities.

The LGC has direct input into development of the Comprehensive Conservation and Management Plan, advises the Program on local issues of concern, works on priority projects within their regions and with other MBP committees, and promotes natural resource-based planning and management.

Background

Early on, the MBP recognized the need to actively involve local government in order to respond to local concerns across the region. Five committees make up the full local governance committee: "8 Towns and the Bay", representing the upper north shore; "Salem Sound 2000", representing communities surrounding Salem Sound; the Metropolitan Boston LGC; the South Shore LGC; and the Cape Cod Coastal Resources Committee. Each has its own workplan developed to complement the Mass. Bays Program management plan priority actions. The LGCs have helped personalize the activities of the

Massachusetts Bays Program on a local level.

Key Players

The LGC has a region-wide membership of more than 100 people; approximately 20 members per regional committee. The members include local elected officials, town planners, harbormasters, shellfish wardens, health advisors, and appointed residents of Mass. Bays communities.

Methodology

The local governance groups have developed specific projects in their regions to respond to local environmental concerns. Technical staff were hired through the regional planning agencies who are integrating the MBP concepts into their own agendas. LGC projects include water quality monitoring programs, sanitary surveys, shellfish bed restoration projects, resource guide publications, community organizing of water quality task forces, establishing oil collection centers, funding remedial studies for removal of a noxious alga, and sponsoring local workshops on coastal issues of concern. Projects are well received by the communities and have generated tremendous media attention.

Lessons Learned

To date, the LGCs have learned the value of cooperative efforts in cleaning up shared resources. Surrounding communities are working together on projects that could never be accomplished without the focused attention of all communities that contribute to the problem. On the South Shore, for example, 11 towns have developed a program for shellfish bed protection by focusing on four rivers and embayment systems in their region in a collaborative effort with the state Division of Marine Fisheries. The project will hopefully serve as a model for shellfish bed protection across the state.

In Salem Sound, the communities of Salem, Beverly, Marblehead, Peabody, Danvers, and Manchester are conducting a shoreline survey to assess the 48 miles of the shoreline of Salem Sound. This effort is largely volunteer and has succeeded to date because of the collaborative approach that's been established among the many interests involved in Salem Sound 2000. Local government, business, citizens, and scientists have come together for the first time to protect this precious resource.

Related Materials

Call the Massachusetts Bays Program for more information on the local governance committees at 1-800-447-BAYS or contact Elizabeth McEvoy and Susan Schneider at the address below:

Mass Bays Local Action: Local Governance Committees

Elizabeth McEvoy, Director of Public Outreach and Education
and Susan Schneider, Public Information Specialist
Mass Bays Program
100 Cambridge Street, Room 2006
Boston, MA 02202
617-727-9530x424, x408/617-727-2754 Fax

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

California

Tomales Bay Watershed Restoration

Laurel Marcus

Background

Tomales Bay is a large coastal embayment on the California coastline which receives sediment and freshwater from a 225-square mile watershed. This watershed is largely agricultural land which serves as grazing lands for cattle, sheep, and dairy operations Most of the watershed is in private ownership.

Purpose

Tomales Bay is shrinking in size. Sediment from its two largest tributaries are filling in the sub- and intertidal areas of the bay at an alarming rate. One tributary, Walker Creek has a delta which grows at a rate of 50 feet per year. The source of this filling is erosion in the watershed. Recognizing the connection between watershed erosion and loss of bay tidelands, the California Coastal Conservancy began a watershed restoration program in Tomales Bay in 1982. The first efforts were small: repairing stream banks and gullies along the shoreline resort area of Inverness and the residential area of Lagunitas Creek.

Key Players

In 1986 the Conservancy approved a $1.2 million grant to the Marin County Resource Conservation District (RCD) to repair critical erosion sites on Walker Creek, the largest and most problematic tributary to Tomales Bay. The grant would fund a six- to eight-year program. Each year a landowner committee would nominate several projects for construction. The RCD would review these and submit a yearly work plan to the Conservancy for approval. Projects were selected from a master inventory of erosion

sites completed for the watershed.

Since this inventory included many more projects than could be funded, several criteria were applied: severity of erosion, the likelihood for natural restoration vs. the need for structural control measures, proximity to a waterway, willingness of the landowner to cooperate, and cost effectiveness of repair.

Methodology

All projects were done on private land and required that a notarized landowner authorization be recorded onto the property for a period of 10-20 years, depending upon the "life" of the repair. Each year RCD contracted for 10-15 large repair projects consisting of gully stabilization projects, streambank repairs, road regrading, experimental range management projects and one large-scale landslide stabilization project. Project designs were completed in conjunction with landowners who agreed to maintain the projects. In some cases the project was designed to provide a new stream crossing or a watering pond as an ancillary use when no conflict with the erosion control purpose of the project occurred. The RCD, made up of long-time residents of the area, served a pivotal role in making a "government" project acceptable to private landowners.

Lessons Learned

The project has served to reduce sediment into the bay by controlling it at the source, the most cost-effective answer. In many instances riparian vegetation was included in the design providing added wildlife benefits and habitat for the much diminished steelhead and salmon fishery of the creek system. Many of the projects also involved a match of services from the landowner, either by use of heavy equipment, construction of fences or other contributions. This project exemplifies the kind of successful partnerships that can occur between government and private landowners.

Related Materials

For more information contact Laurel Marcus:


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Tomales Bay Watershed Restoration
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California

North Richmond Shoreline

Melanie Denninger

Background

The San Francisco Bay community of North Richmond consists of an isolated low-income residential area, an oil refinery and other heavy industry, whole-sale nurseries, a landfill and sewage treatment plan, a crescent-shaped shoreline with sweeping vistas of the bay and coastal hills, and about 600 acres of remnant tidal marshes and vacant uplands, most of which are in private ownership. In 1988, with completion of flood control improvements and the imminent construction of a new arterial linking North Richmond to freeways, the City of Richmond and Contra Costa County were faced with the prospect of a deluge of proposals for new development and the need to generate jobs for residents and income for the City and County. On the other hand, citizens and community groups were demanding a cleanup of the shoreline, a stop to illegal filling of wetlands, and opportunities for recreational use of the shoreline.

Purpose

In response to these challenges, the City, the County, and the California Coastal Conservancy agreed to work together to prepare a North Richmond Shoreline Specific Plan for approximately 900 acres along 4 miles of the North Richmond shoreline. The goals of the agencies and an advisory group of environmentalists, residents, and business representatives were to set aside valuable natural resource areas, provide shoreline access for residents and visitors, and promote compatible development that would create jobs. By preparing a comprehensive, parcel-specific plan that, when adopted by the City and County, would have the force of law, we hoped to avoid the further losses of wildlife habitat, disjointed public access facilities, and years of disputes and delays to development that would almost certainly result if only the existing general plans and zoning ordinances were available for guidance in

responding to development proposals.

Methodology

By the middle of 1993, both the City and County had adopted the specific plan and amended their general plans to incorporate it. The specific plan provides for new development that is expected to yield 8,700 to 12,100 new jobs at build out. Almost 600 acres are reserved for natural resource protection, parks and open space, or public access. Detailed design guidelines set out standards for the appearance of new private and public development and also control the potential impacts - such as light and noise - of allowable development on nearby recreation and wildlife areas. An implementation element identifies appropriate uses for conditions that may be placed upon development approvals, including securing public access to the shoreline and dedications of real property interests for the purpose of protecting wildlife habitat. The implementation element also identifies a series of employment development programs, specifies the responsibilities of the City and County for circulation and infrastructure improvements and proposes a financing plan for these improvements, and makes detailed recommendations for restoring disturbed wildlife habitat.

Key Players

The City, the County, and the Coastal Conservancy are now working with other public agencies and the Trust for Public Land to implement the portions of the specific plan that require public funding. Some privately-owned areas that specific plan designates for resource protection will be purchased by public agencies. While eventual dedication of these areas could be required as a condition of development approval, there are several reasons to pursue acquisition, all of which are related to the market for development being much slower than had been anticipated when planning began in 1988. First,if certain landowners are not compensated for the portions of their property that are designated for resource protection, City and County decision-makers can be expected to respond favorably to landowners' demands for more extensive and intensive development. Second, public purchase of the undevelopable portions of certain properties may improve the economic feasibility of developing the remainder. Such development is desirable both to provide jobs and revenue and to discourage the illegal filling and dumping that has plagued the area. Third, restoration of the disturbed tidal marshes and adjacent uplands which are habitat for two endangered species is contingent upon public ownership. Other public agency actions that may be taken to implement the plan include trail construction, wildlife habitat restoration, and marketing to encourage development.

Lessons Learned

The success of the specific plan will depend largely upon the resolve of City and County decision-makers to honor the plan and keep it intact when faced by pressure to accommodate more development. In addition, it remains to be seen how quickly new development will create the anticipated jobs, and

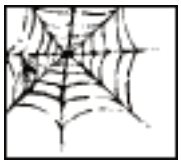
whether or not agencies and environmental groups concerned about protection wildlife habitat will continue to support all of the new development that the plans provide.

Related Materials

For copies of the North Richmond Shoreline Specific Plan contact:

North Richmond Shoreline
Melanie Denninger, Project Manager
California State Coastal Conservancy
1330 Broadway, Suite 1100
Oakland, CA 94612
510-286-1015/510-286-0470 Fax

Section 3: Scientific and Technical Approaches



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Oregon

Reduction of Foam Debris: Foam Encapsulation for Floating Structures in Oregon

Valerie F. Hoy

Purpose

Oregon's waterways are an important resource that should be protected and enhanced for generations to come. To prevent polystyrene foam from littering Oregon waters, Oregon enacted a law in 1991 requiring the encapsulation or covering of the foam used to support floating structures.

The concept behind this new legislation was to enhance water quality, protect fish and wildlife resources and decrease the amount of plastic debris dispersed into our coastal and inland waterways.

Background

In the spring of 1992, the State Marine Board developed program rules, gathered information on encapsulation products, and implemented a Certification Form (permit). The rulemaking process included builders, owners, and foam manufacturers of floating homes and floating structures.

Encapsulation products that were approved by the Board include; resin coatings, concrete, plywood, hard plastics, fiberglass, plastic sheets 7 mils in thickness shrink wrapped and galvanized steel. Coverings that are discouraged include steel drums, household paints and the use of garbage bags or thin plastic sheets.

These products were specifically approved by the Board in order to meet the ten year requirement on the encapsulation material used to cover the floatation. The ten years was set as benchmark for the least amount of time an encapsulation material should endure marine conditions.

Polystyrene foam is a small bead foam that is manufactured from resin pellets that is expanded with steam into round puffed beads. For water applications, these puffed pellets are then molded with heat into large square or round buoyancy billets.

These billets are then pushed/placed underneath a new dock or floating home to give it support and buoyancy. However, it quickly becomes apparent that this foam in raw form has the potential to degrade and break into small fragments under normal marine conditions.

Environmental conditions, such as wake, wave and grounding out may cause large chunks and many small foam beads to break away and become a pollution problem. Muskrats, waterfowl and marine life such as snails, worms and mollusks will burrow into the polystyrene foam to make a nest, thereby helping to weaken an already stressed floatation system. Polystyrene foam particles do not decay naturally for reuse by the environment. Waterfowl and fish may mistake the foam for food and ingest it. This could result in a false sense of satiation for the animals and possible weakening or ultimately starvation.

Methodology

The first year, the emphasis was to educate industry and builders, spend time visiting Floating Home and Yacht Club type organizations to provide information on the new program.

The implementation of the Certification Form became a key component in tracking installation of foam floatation throughout the state and use of encapsulation materials. The form must be completed for all new construction projects, and for certain maintenance repair, alteration and additions to existing floating structures.

Key Players

One of the biggest keys to the success of the Polystyrene Foam Encapsulation Program in Oregon, is the early involvement of polystyrene foam bead manufacturers. Since they were informed and given ample time to provide encapsulation materials and retrofit their plant, they were willing to work with the Board to implement the program and relay the benefits of the program to builders and owners of floating structures.

Also, enforcement of the foam encapsulation law proved to be a good deterrent for local builders who wanted to skirt the issue. In the spring of 1993, the Board hired a diving firm for two days to dive floating structures on two highly developed waterways. As a result of the diving inspection, a local floating structure builder was found to be in violation of the law and had to replace the foam in two structures.

Notice of the violation was also printed in a local marine newspaper called "Freshwater News". Word spread quickly throughout the moorage industry and we believe this proved to be an effective means of compliance.

Lessons Learned

At this time, the Board is developing new standards and reviewing encapsulation materials. As with any new program, details must be worked out constantly to ensure the program is continuing to meet the intent of the legislation.

One of the main short comings of the program was the clause in the enabling legislation calling for the "grandfathering" of existing structures placed in the water before January of 1992. If possible, this clause should be avoided.

Oregon's program can serve as a model for other states to follow.

Related Materials

For more information contact:

Reduction of Foam Debris: Foam Encapsulation for Floating Structures in Oregon
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South Carolina

Natural Wetlands for Control of Coastal Water Quality

Robert L. Knight, Ph.D.

Background

Population growth and increased tourism in the Grand Strand area of Horry County, South Carolina has resulted in increasing demands on the assimilative capacity of coastal waters. Locations to dispose of additional wastewater effluents are extremely limited because of sensitive environmental and recreational concerns. Ocean outfalls are not practical because of the importance of the beach-front resource, and the Intracoastal Waterway has poor mixing and dilution capabilities. Well-drained upland areas suitable for land application are equally scarce in Horry County.

Purpose

These constraints led planners and engineers to an innovative wastewater treatment/disposal option that meets the needs of the Grand Strand. On the basis of extensive site selection studies, CH2M HILL recommended utilizing natural, isolated wetland basins known locally as "Carolina bays" for final polishing of treated municipal wastewaters. The addition of secondary treated wastewaters to these Carolina bays was expected to enhance and conserve their wetland functions, further reduce concentrations of oxygen-demanding and eutrophying constituents in the treated wastewater, and recycle this purified water back to the freshwater/estuarine system.

Key Players

The Carolina Bay Natural Land Treatment Project underwent extensive scrutiny and review during the eight-year planning and implementation process. Agencies that were involved in these reviews included the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the South Carolina Department of Health and Environmental Control, the South Carolina Coastal Council, the South Carolina Wildlife and Marine Resources Commission, the South Carolina Water Resources Commission, the South Carolina Land Resources Commission, and the Waccamaw Regional Planning Council. The U.S. EPA provided grant funds to the local wastewater utility, the Grand Strand Water & Sewer Authority, for planning, pilot testing, and full-scale implementation of the project. All of these agencies were very active in reviewing technical findings, commenting on study plans and designs, and developing permit criteria that would be protective of the unique environmental resources of the area.

Methodology

A new concept in developing environmental standards was pioneered with the Carolina Bays Natural Land Treatment project. Biological criteria were developed to achieve a consensus on allowable levels of change for key biological features of the Carolina bays that receive the treated wastewater. These criteria protect the structure of the plant communities in the Carolina bays by mandating that these systems will retain their plant diversity and character as forested and shrub-dominated ecosystems. Allowable change thresholds were determined individually for each of the four Carolina bays in the project area based on their level of previous impacts from forestry, mining, and power-line crossings. These biological criteria have been tested during the past six years of treated wastewater discharge to the Carolina bays, and while serving as a yardstick of changes, have not been violated.

Lessons Learned

The Carolina Bays Natural Land Treatment System represents a low cost, low energy solution to providing advanced wastewater treatment in an environmentally sensitive coastal area. It has resulted in the public ownership of over 600 acres of Carolina bays, a landform endangered in South Carolina because of drainage, farming, forestry, and mining practices. Operation of this system is relatively simple, involving biologists to monitor water quality and the biological criteria, and infrequent rotation of effluent discharge between the alternate Carolina bays. Ultimately, these Carolina bays provide protection of surface water quality, the most important coastal resource in Horry County.

These innovations led to the Carolina Bay Natural Land Treatment System being awarded the Engineering Excellence Award, Best of Show, from the Consulting Engineers of South Carolina and the prestigious Grand Conceptor Award in 1991 from the American Consulting Engineers Council. On a more humble but perhaps more important note, the Carolina Bay Natural Land Treatment System serves as a living classroom for local school children while providing habitat for plants and wildlife including the threatened Venus flytrap and black bear, in an area of accelerating human development.

Related Materials

For more information please contact:

Natural Wetlands for Control of Coastal Water Quality
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Louisiana

Marsh Terracing

Dr. Bill Good

Purpose

From late, 1989 to early 1993, the Louisiana Department of Natural Resources completed the feasibility analysis, construction, implementation, and monitoring for an innovative coastal marsh restoration project. In response to critical coastal land loss, the pilot project was launched to test a technique for restoring wetlands in an area where sediment inflow is minimal. Funding was provided by both the State of Louisiana and the Environmental Protection Agency.

Background

Louisiana's wetlands comprise 41% of the nation's total loss and provide essential habitat to support an annual $680 million commercial fishing industry, a recreational fishery valued at $300 million annually, and an annual fur harvest exceeding $17 million. These wetlands provide additional benefits by diminishing hurricane surge effects, which can cost coastal communities millions of dollars. Presently, Louisiana experiences the most critical coastal erosion and land loss in the United States, accounting for about 80% of the national coastal marsh loss. More than 25 square miles of Louisiana wetlands disappear every year as a result of a variety of compounding problems such as erosion, subsidence, saltwater intrusion, and dredging.

The potential for creating and restoring these resources depends upon a number of factors including proximity to available freshwater and sediment sources. Where these sources are inadequate, such as in the Chenier plain of western Louisiana, restoration efforts must be innovative. A study site was selected in the Sabine National Wildlife Refuge to demonstrate a technique called bay bottom terracing.

Methodology

Bay bottom terracing uses existing bay bottom sediment to form a baffle system of ridges or "terraces" at marsh elevation, after settlement. The terraces were constructed in an open-ended checkerboard design to allow for transport of aquatic organisms. A backhoe shovel mounted on a marsh buggy dredged to approximately 1.52 meters below the shallow bay bottom. The dredged material was then placed on top of the adjacent bottom forming a levee or terrace, the top of which was level with the marsh surface after settlement. The terraces were dredged on alternating sides to avoid creating continuous canals which could cause increased scouring. A total of 128 terraces were constructed in three test areas.

Raising bay bottom elevations above water level provided an opportunity to determine the cost-effectiveness of several planting techniques for smooth cordgrass (*Spartina alterniflora*). The combination of terrace construction and vegetation plantings was intended to:

- 1) promote deposition and retention of suspended sediments;
- 2) reduce turbidity;
- 3) increase fisheries production by increasing the length of marsh edge;
- 4) reestablish emergent marsh vegetation;
- 5) reduce marsh fringe retreat by reducing fetch; and
- 6) increase overall primary productivity.

Series of ridges designed to encourage sedimentation have been an essential component of the sedimentation fields used for hundreds of' years in the Netherlands to reclaim lands from the Wadden Sea. Breakwaters have been used around the world to reduce wave erosion of the leeward sides of shores. Planting vegetation to stabilize dunes or newly created dredged material deposits has long been recognized as a viable component of marsh restoration practices. However, when these techniques were combined in a design specified for shallow, Louisiana coastal marshes with low sediment inflow, the results were greater than the sum of the individual components.

Lessons Learned

Data analyzed from aerial photography, on-site surveys, and readings from satellite-linked data collection platforms have shown that the technique is a success and the marsh is coming back strongly. The terraces were quickly and completely vegetated, shoreline retreat was reversed, and annual primary productivity was increased.

Marsh terracing is a restoration technique which could be employed in other areas of Louisiana where the soil composition is appropriate, as well as in other states. Based on information from this project, the USDA Soil Conservation Service is in the process of developing national standards for construction and design of marsh terraces and is planning on further construction demonstrations.

Related Materials

For additional information contact:

Marsh Terracing
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Louisiana Department of Natural Resources
Coastal Restoration Division
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Texas

Restoration and Construction of Coastal Wetlands

Linda Shead

Purpose

The Galveston Bay (Texas) system is not unlike many of our nation's coastal bays and estuaries in that wetland habitat has been declining over recent decades as human uses of the Bay's resources have taken their toll. Over 25,000 acres of wetlands were lost around Galveston Bay between 1956 and 1979 alone. Erosion, subsidence, coastal development and dredging are some of the physical forces that have played a role in changing the face of the bay system. Pollution from municipal and industrial wastes and nonpoint sources has added a chemical component to the factors affecting the Bay. Galveston Bay is adjacent to the Houston/Galveston urban complex with 4 million people in the 4 counties which surround the bay system. It is the home of one-half of the nation's oil refining capacity and one-third of its chemical production. It is also the home of the nation's third largest recreational boating fleet.

Also not unlike much of the nation, the social, economic, and political history of Galveston Bay has centered around the use/exploitation of the region's natural resources - timber, oyster shell, fisheries, oil and gas. Recently, however, there is a growing awareness of the need to restore the balance. The Galveston Bay Foundation (GBF) is a citizen's organization formed in 1987 with the mission of preserving and enhancing Galveston Bay for its multiple uses, through education, conservation, research, and advocacy. Its Board of Trustees is composed of individuals and groups representing all the diverse users of the Bay.

Background

It is through the diversity represented in the Galveston Bay Foundation that some of the solutions to the Bay's problems are being found. Three years ago, a cooperative effort was begun to plant smooth cordgrass marsh for habitat creation and shoreline erosion protection. Smooth cordgrass (Spartina alterniflora) is the one plant that will grow successfully in the intertidal zone. Its marshes provide the habitat so essential for marine life, while at the same time absorbing wave energy that would otherwise pound the shoreline, contributing to erosion.

Key Players

The project has been guided from the beginning by two of our Advisory Trustees, Eddie Seidensticker from the Soil Conservation Service (SCS) and Bob Nailon, formerly of the Marine Advisory Service. From their early trial efforts, procedures were established for transplanting the cordgrass and providing suitable protection for the young transplants. Each brought their particular expertise - the botany and the marine biology - in a combination that proved to be indomitable in energy and commitment to the project.

Methodology

In 1989, an agreement was signed between the Galveston Bay Foundation and the Port of Houston Authority to plant cordgrass on islands owned by the Port in the San Jacinto River. In 1990, planting began, with the Port providing funding for equipment and supplies used for the project that year. The joint effort of local, state and federal agencies was supplemented by the volunteer labor provided through the Galveston Bay Foundation. Twenty volunteers from among the individual and organization members of the Foundation participated, representing conservation (Houston Sierra Club), recreation (Houston Canoe Club), and college service organizations. The two plantings were also assisted by volunteers from the Saltwater Anglers League of Texas (SALT), who provided their boats for transportation to the islands.

The second year of planting, 1991, brought an expanded array of volunteer organizations, an expanded role for SCS, and an additional site. In addition to the individual and organization members of GBF, new participants were recruited from agencies and local corporations: the Texas Water Commission, Exxon Chemical, Exxon Refinery, and Tenneco. A cooperative agreement between GBF and SCS provided volunteers for their project and insurance for the volunteers, who became part of the SCS Earth Team program. A new cooperative agreement with the U.S. Fish and Wildlife Service provided fencing materials and supplies to support a planting project to protect the shoreline of the Anahuac National Wildlife Refuge. With coordination by GBF volunteers and staff, seven plantings were completed that year, Five at the refuge (not requiring boating transportation) and two on the San Jacinto River. A total of 92 volunteers participated.

For 1992, the project received two additional boosts. The Texas Water Operators Association (the barge

industry) had funded the construction and operation of a boat for GBF: The Bay Ranger, with capacity for 16 volunteer workers, was christened in the fall of 1991. The availability of regular, safe boating transportation enhanced the opportunities. In addition, the Wray Trust, a local, charitable foundation, funded a part-time conservation intern for GBF, to coordinate the effort and to build in an educational component. Continued funding from the Port allowed for purchase of additional scientific equipment, as well as materials and supplies. Approximately 200 volunteers participated in 16 plantings at 6 sites, with over 20,000 square feet of marsh created.

Lessons Learned

The key to the program's success is inextricably linked to the partnerships developed with agencies, industry, conservation groups, and the general public. In each case, the overwhelmingly positive response of volunteers at the end of the day comes with the wealth of new knowledge they have extracted from the experience and the satisfaction from knowing that they have contributed to an improved ecosystem for Galveston Bay.

Related Materials

For more information please contact:

Cooperative Habitat Creation Efforts in Galveston Bay:
Restoration and Construction of Coastal Wetlands
Linda Shead, Executive Director
Galveston Bay Foundation
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North Carolina

Total Maximum Daily Load Case Study: Albemarle-Pamlico Estuary

Randall Dodd

Purpose

Over the past decade, North Carolina's Albemarle and Pamlico (A/P) Sounds have experienced increasing water quality problems ranging from fish kills to declining populations of aquatic vegetation. In response to these and other problems, the A/P Estuarine Study was initiated in order to characterize the basins and determine potential management strategies.

Background

Excessive nitrogen and phosphorus loadings were identified early on as key factors impairing the health of the estuary. As a first step to address this problem, the North Carolina Department of Environment, Health, and Natural Resources - Division of Environmental Management (NCDEM) developed a modeling approach which is currently being used to screen the A/P watersheds uses LANDSAT imagery and geographic information system technology to analyze land use within the basins, and then uses a combination of export coefficients and mass balances to calculate nutrient loadings from the 68 North Carolina watersheds and 44 Virginia watersheds within the study area.

North Carolina's Albemarle and Pamlico (A/P) basins comprise the second largest estuarine system in North America. With a total watershed area of 30,880 square miles, the basins are home to nearly 2 million permanent residents. The area is prized for its many recreational opportunities, including swimming, boating, fishing, and shellfish harvesting. The system is also a significant nursery area for

East Coast fisheries. The A/P fisheries industry comprises a substantial portion of the coastal and State economy, with an estimated value of processed fisheries products of $64.7 million in 1988. In recent years, the quality of this valuable resource has been declining due to human waste contamination, draining of wetlands, increased near-stream development, and agricultural and urban runoff.

Key Players

In response to these problems, and in light of the system's high recreational and commercial values, the A/P system was designated as an Estuary of National Significance in 1987 and was selected to be studied as part of EPA's National Estuary Program. The resulting Estuarine Study was initiated as a cooperative program between EPA and North Carolina's Department of Environment, Health, and Natural Resources (DEHNR). Its purpose is to evaluate the nature of the basins' environmental problems and to determine how the estuaries can best be preserved and managed.

Methodology

The 1991 Status and Trends report for the Albemarle/Pamlico Estuarine Study stated that accelerated eutrophication resulting from nitrogen and phosphorus to the estuary. In particular, the study found that nuisance algal blooms, anoxic events, and some fish kills have been associated with nutrient loading to the estuary. As a first step toward controlling nutrient loadings, the A/P Study developed a screening approach designed to narrow the focus of future nonpoint source (NPS) control efforts. The approach consists of developing nutrient budgets within the sub-basins comprising the North Carolina portion of the A/P study area (Research Triangle Institute, 1992). These budgets will then serve as a tool for screening out "critical" areas of high nutrient loading. The information gained from this process is valuable for total maximum daily load (TMDL) development and for targeting BMP cost share funding to areas causing the greatest nutrient loadings.

A mass balance approach was also used to calculate nonpoint source loadings. This approach attempts to account for and balance the input, output, and storage of nutrients in the system. Due to data limitations, this approach was only used for agricultural areas in the 16 gauged watersheds of the A/P study area. Inputs for the mass balance included fertilizer, precipitation, livestock wastes, and nitrogen fixation. Outputs included the nutrients in harvested crops, soil fixation, denitrification, loss to swamp forests, and river export.

Average annual total nitrogen (TN) and total phosphorus (TP) export was estimated for gaged watersheds. These estimates were based on STORET daily average flow and concentration data for the 1987-1989 water years. Average loading (flux) was calculated according to the equation:

$$W = w\ (Q/q)$$

where:

W = average flux (kg/y)
w = mean of measured flux*
Q = mean of daily average flow
q = mean of measured flow*
*on days when nutrients were sampled

Nutrient loadings for each of the 68 sub-basins in the North Carolina portion of the A/P Study area were summarized into charts depicting the data at various levels of spatial aggregation. Graphical analysis of nutrient loadings at each level were then used to compare relative impacts between basins, sub- basins, or land uses within a sub-basin.

Lessons Learned

As part of its new Basinwide Planning process, North Carolina intends to use the information obtained through the A/P screening to target areas for TMDL development. Watersheds showing high nitrogen and phosphorus loadings, especially those nearest the estuaries, will be selected for special management attention. The Tar-Pamlico Basin, in the central portion of the study area, has already been targeted for PS/NPS trading of nitrogen loads.

Once critical watersheds are identified, other small-scale nutrient and sediment models could be used in determining optimum BMP scenarios to reach desired reduction limits. The Nomini Creek TMDL Case Study discusses use of watershed-scale models with a Geographical Information System (GIS) in order to quantify loads and identify critical nonpoint source areas.

GIS technology is also expected to play a role in illustrating the need for controls to the agricultural community and municipal dischargers. In addition, the GIS will be used to study the use of riparian buffer protection and restoration to supplement on-the-farm BMPs, which alone may not achieve the desired nitrogen and phosphorus reductions in A/P watersheds.

The A/P databases and modeling results are being incorporated into "sub- basin profiles," which summarize characteristics of each sub-basin (e.g., land use, point sources, crop statistics, livestock operations, pollutant loading characteristics). This information has also been compiled into a PC database which will allow NCDEM users to have desktop access to watershed data previously available only through a mainframe or a GIS.

Other rural NPS models have been linked with GISs, but many are data- intensive and storm-event driven. The approach used in the A/P Study was chosen specifically for its ability to handle a large multi-basin area, while still providing output for screening at the sub-basin level. It is important to note that the A/P nutrient screening approach estimates annual loadings, which is suitable within a long-term context for nutrient management of basins draining to estuaries and lakes. Data requirements are such that small watersheds or large basins can be screened and management scenarios can be tested (e.g., combinations

of BMPs and PS control strategies). The A/P approach is, however, more data intensive than some screening models. Where nationally available data were out of date or unreliable (e.g., land use/cover information, some agricultural statistics) the latest data were acquired (e.g. the 1987-88 LANDSAT imagery and State-maintained crop statistics) to ensure that screening results would be credible to the decision makers and other stake- holders as well.

TMDL Case Study Albemarle-Pamlico EstuarY
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Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

South Carolina

Stormwater Management on the Isle Of Palms Connector

Joe Fersner

Background

On February 15, 1990 the South Carolina Coastal Council approved, with some interesting design provisions, a permit to construct a new bridge to the Isle of Palms. The unique provisions centered around the incorporation of a stormwater management system.

Purpose

Stormwater runoff from bridges is a serious problem and has generated concern for water quality and shellfish protection. Runoff can carry hydrocarbons, oils, greases, heavy metals, and other pollutants, but until recently, most bridges in South Carolina were built without appropriate measures to curb the detrimental impact of runoff. However, an increasing amount of information available on the effects of stormwater runoff has prompted many organizations to take another look at how this problem may be solved or at least reduced.

Methodology

In the case of the Isle of Palms connector, an innovative combination of fiberglass collection pans was proposed along with a closed pipe system which discharges into containment areas. This stormwater management system is designed to capture the first half-inch of rainfall or "first flush" which contains the

majority of the contaminants. Fiberglass pans or trays approximately 15 feet long, 2 1/2 feet wide and a foot in depth will be attached on both sides of the bridge for a distance of approximately 770 feet. A drain discharges into each pan. Through a separator outlet system, oil and grease is separated from the water to remain in the pan along with other settled pollutant particles.

Development of the fiberglass pan system evolved through a joint effort by the engineers of the S.C. Coastal Council and the S.C. Department of Highways and Public Transportation using a criteria / alternative design / evaluation approach. In other words, the basic criteria for the system was first established, and alternative designs which would accomplish the criteria were explored and evaluated to be accepted, rejected or modified. After a number of designs and many refinements, the fiberglass pan evolved as the design which met most of the basic criteria. It is not known if a similar system is used elsewhere.

The biggest concern in the design of the fiberglass pan system is the issue of maintenance. The system will not function if not regularly maintained. In response to this concern, the Highway Department agreed to implement a maintenance program which, at a minimum, will consist of vacuuming the pans clean every thirty days and the proper disposal of the material in accordance with the S.C. Department of Health and Environmental control procedures.

The system will also be inspected every two weeks, and an up-to-date log will be kept of both the inspection and the maintenance work. The Highway Department will also participate in a monitoring program to test the effectiveness of this stormwater management system for the protection of shellfish and water quality. If warranted, the Coastal Council and the Highway Department will modify the runoff pans to correct any problems.

The fiberglass pan system was not appropriate for the steeper section of the bridge that crosses the Atlantic Intracoastal Waterway. For a portion of this span, a closed pipe collection system will capture runoff and discharge into a diked retention area. The section of bridge directly over a dredged disposal area is designed with scuppers to discharge directly into this disposal area. The terminal section of the bridge at the Isle of Palms is designed to collect runoff in pipes and transport it to a dissipation / containment structure located under the bridge.

Key Players

Several organizations and individuals assisted the Coastal Council with the development of this stormwater management plan, including: South Carolina's Department of Highways, Wildlife and Marine Resources, the Department of Health and Environmental Control, and the Governor's office; Congressman Arthur Ravenel; Sierra Club; Coastal Conservation League; the Town of the Isle of Palms; the Federal Highway Administration; and many other concerned citizens and organizations.

Lessons Learned

Even though the Isle of Palms connector's stormwater collection system is an exploratory type of design, it is hoped that the concern for protecting our coastal waters and shellfish will continue to influence the implementation of proper runoff management practices on bridges. If successful, the connector's management system could have applications for future bridges.

Related Materials

For more information please contact Donna Gress at:

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Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Florida

Composting By-Products from Blue Crab and Scallop Processing Plants

James C. Cato

Purpose

The common practice of dumping residues from blue crab and scallop processing plants into landfills has created numerous landfill management and environmental quality problems in Florida. In fact, seafood waste disposal accounts for as much as 25% of the annual operating budgets of some Florida landfills. In an effort to solve these problems, the 1988 Florida legislature mandated that the practice of landfilling seafood wastes would have to end. Unfortunately, the requirement that residues be disposed of somewhere other than in landfills created severe economic hardships for many processing plants - particularly plants in rural areas that were already experiencing economic difficulties. Because of the economic importance of the seafood industry in these rural communities, the Florida Sea Grant College Program organized several projects to determine alternative methods for disposing of these wastes.

Background

When signed into law in 1988, Chapter 88-130 of the Florida Statutes mandated that alternatives to the landfilling of seafood processing by-products be explored. The sum of $500,000 was made available to the Department of Environmental Regulation (DER) to develop projects to demonstrate these alternatives. DE contracted with Florida Sea Grant to provide technical and management assistance and work began on the demonstration projects in June of 1989.

A number of meetings were conducted during which county officials, seafood processing plant operators, state regulatory agency officials, and university faculty identified the critical waste management

problems to be addressed and demonstration projects were identified. These early meetings established a spirit of cooperation that continued throughout the project and contributed heavily to its ultimate success. A total of 250 people were involved in the effort - these included paid personnel, as well as volunteers who donated more than 4,000 hours of work to the project.

Key Players

In order to insure the success of the effort, Florida Sea Grant combined the skills and interests of numerous agencies and individuals. For instance, DE contributed funding and review; officials from the counties of Taylor, Wakulla, and Brevard provided local coordination; Sea Grant Marine Extension Agents, supervised the composting projects in Taylor and Brevard counties; the Woods End Research Laboratory provided scientific expertise; the University of Florida's Institute of Food and Agricultural Sciences conducted analyses of the effectiveness of the resulting compost; the Suwannee River Resource Conservation Development Council, Inc. developed marketing plans for the final product; numerous seafood processing plants provided the raw materials required for the project; and Waste Management Inc. delivered the seafood waste by-products to the demonstration, sites.

Methodology

The basic methodology employed on the project was to first identify and then test the viability of various alternatives to the disposal of seafood processing wastes in landfills. The tested alternatives included in-plant methods (wet extrusion, compacting, and anaerobic bioconversion) and composting of blue crab and calico scallop residues. Actual testing of the various alternatives revealed that while the in-plant methods held promise, numerous problems would have to be resolved and further research would be necessary before any of the tested methods could be recommended as. a solution to the problem of what to do with seafood processing by-products. On the other hand, the composting projects clearly demonstrated the potential of this process for largely solving the disposal problems confronting blue crab and scallop processors in Florida.

For the blue crab composting project, a demonstration site was selected in Taylor County. Crab scraps were then transported daily to the site from crab processing plants in Wakulla, Franklin, and Taylor counties. Upon arrival, the scraps were added to various mixes of sawdust, pine bark, yard trimmings and other materials. 'Me resultant mixtures were arranged in windrows and were turned each day by a mechanical device. This turning process greatly accelerated the pace of composting and helped alleviate any offensive odors. A similar project was conducted in Brevard County using scallop viscera.

Over an 18-month period, nearly 1,000 tons of blue crab scraps and about 100 tons of scallop viscera were composted at the demonstration sites. The results showed conclusively that these seafood scraps could be economically converted to compost-thus alleviating the need to burden already stressed landfills with huge amounts of seafood wastes. In addition, the resulting compost was shown to be a marketable commodity that could be sold in both bagged and bulk quantities. As a result, a major coastal waste

management problem was solved while a usable product was produced.

Lessons Learned

The key to the success of this project was the spirit of cooperation that existed between all of the parties involved in it. The fact that all of the concerned parties were confronted with a problem that had to be solved (i.e. what to do with the seafood scraps when they could no longer be landfilled) helped galvanize support for the overall effort. The primary area contention involved the highly putrescible nature of the crab and scallop scraps and the odors that could emanate from the projects. These concerns were largely eliminated as a result of two "open houses" conducted during the project. Once the public got a chance to actually visit the site and collect samples of the compost, concerns about potential odor problems largely vanished. The need to involve all interested parties was clearly demonstrated and is highly advised for any organization considering similar demonstration projects.

Related Materials

"Composting and Using By-Products from Blue Crab and Calico Scallop Processing Plants in Florida", Sea Grant Report #107, provides a detailed look at the project. For further information, please contact:

Composting By-Products from Blue Crab and Scallop Processing Plants
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California

City of Arcata Wastewater Treatment Facility and Marsh and Wildlife Sanctuary

Julie Neander

Background

The Arcata Integrated Wastewater Treatment Facility and Marsh and Wildlife Sanctuary are located in the City of Arcata at the north end of Humboldt Bay in northern California. The project was completed in 1986 and is an on-going operation.

Purpose

Arcata's Wastewater Treatment Facility uses a unique approach to wastewater treatment which includes wetland wastewater treatment, wetland enhancement and salmon ranching. The project uses a marsh system to provide secondary treatment for the City's waste water, wildlife habitat and passive public recreation.

Methodology

Once primary treatment is completed the sewage is sent to three oxidation ponds where secondary treatment begins. From there the sewage enters three treatment marshes that are located at the treatment plant. After flowing through the treatment marshes the sewage is disinfected and pumped over to the Arcata Marsh and Wildlife Sanctuary. Secondary treatment is completed as the sewage flows through over thirty acres of marsh before it is returned to the plant for final disinfection and discharge to Humboldt Bay. The marshes are part of the 154-acre Arcata Marsh and Wildlife Sanctuary that includes two additional wetland restoration projects. There is also a small fish-rearing operation at the treatment plant that utilizes treated sewage. The aquaculture facility is operated by Humboldt State University under a cooperative agreement with the City.

The project was developed as an alternative to a proposed regional sewage facility that would have increased sewer

rates by 70%. Possible negative impacts on agricultural lands and in Humboldt Bay if the buried sewer lines ruptured were also of concern. Since the City had been conducting experiments using nutrients in the sewage to raise young salmon, the loss of waste water as a potential resource was also of concern.

Key Players

In 1974 the State of California enacted a policy that prohibited discharge into California's bays and estuaries unless the applicant could prove that the activity would "enhance" the resource. The following year the Humboldt Bay Wastewater Authority proposed a regional facility that would discharge into the ocean and was estimated to cost over $25 million. By 1978 the citizens of Arcata had organized to call for a local integrated waste water treatment plant that would utilize the natural treatment process of marshes. Soon after that the City obtained State approval to demonstrate "enhancement" with a two year pilot project designed to treat 10% of Arcata's wastewater. During this same time the City worked with the California Coastal Conservancy to complete the original 75 acre Arcata Marsh and Wildlife Sanctuary. The Sanctuary was completed in 1981. At that time the marshes were fed with well water. In 1983 the State Water Resources Control Board finally gave the City permission to upgrade its wastewater treatment plant, using wetland treatment/enhancement units. Discharge to Humboldt Bay was approved since the State determined that the project provided enhancement for wildlife and opportunities for research and education. The integrated wastewater treatment plant was completed in 1986 at a cost of $7.1 million. The project was financed using 75% federal, 12.5% state and 12.5% local funds.

Lessons Learned

Citizen involvement, municipal support and state and federal assistance were all critical components to making this project a success. Its ongoing success is due to the City's commitment to operate the Marsh and Wildlife sanctuary for wastewater treatment, wildlife habitat and public recreation. Continuing volunteer support from the community is another important factor in the project's ongoing success. A more detailed list of contributors can be found on the enclosed brochure.

Related Materials

For more information, please contact:

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California

Coastal Grassland Restoration, California Style

Charlette Epifanio

Background

Coastal Marin is part of the Gulf of the Farallones National Marine Sanctuary, internationally recognized as rare and valuable wildlife habitat. A significant threat to the waterbody is increasing levels of inputs of nutrients, especially nitrogen, which could lead to over-enrichment - eutrophication. One of the possible sources of nitrogen-based nutrients is from agricultural practices; nutrients are often released into the adjacent waterbody in runoff from tilled fields. **Purpose**

Use of a no-till seed drill helps reduce nitrogen pollution from animals and also soil erosion that ends up as sediment in the creeks that empty into Estero de San Antonio and Tomales Bay, Marin County, California. The no-till drill is used to improve or restore grasslands, and convert annual cropfields to permanent grassfields.

When done in conjunction with proper use and management, the no-till planting program can hasten the restoration of the perennial type grasslands that once dominated California. Native perennial grasses enhance biological diversity and many are more drought tolerant and less invasive than introduced perennials typically seeded. Several native perennial grasses are now commercially available.

Whether native or introduced, seeding perennial grasses and legumes are an improvement over the exotic annual grasses commonly present. Because roots of perennial grasses remain alive all year, they're able to respond with new growth to even slight amounts of moisture making them more drought tolerant.

Deep roots also help improve soil structure and fertility. As a result, productivity and quality of forage is higher; and because they stay greener longer, they help extend the grazing season. The perennials' massive root structure and typically dense growth habit also better protect the soil from erosion. These qualities, in turn, improve water infiltration and nitrogen uptake, thus helping reduce sediment and nitrogen runoff pollution.

After only two planting seasons, some 1000 acres of farmland have been seeded and plans are already underway for the Fall 1993 planting season.

Key Players

Marin County Resource Conservation District (MCRCD) and Marin Agricultural Land Trust (MALT) bought the $12,000 Tye Pasture Pleaser drill in 1991 to offer to ranchers and farmers to improve vegetation on the 119,000 acres of Marin County farmlands. As part of the cooperative effort of this program, Pt. Reyes National Seashore, University Cooperative Extension, and Soil Conservation Service rangeland specialists work with ranchers on seeding and grazing management recommendations.

Methodology

Unlike conventional seed drills, the no-till drill can seed without disturbing the soil thus reducing erosion. The drill, which can plant up to 15 acres a day, lightly disks, seeds and fertilizes, and thinly packs the seed in one pass! The soil is not disturbed because the drill contains several coulter blades that cut a small slot directly into existing vegetation into which the seed is dropped.

Also, because the soil surface is not disturbed, moisture is conserved which promotes greater seedling success. Compared to conventional methods, the drill saves time and reduces the seeding rate by 30-50% making restoration more cost effective.

Lessons Learned

One of the lessons learned from this program is that restoration of private grasslands can be accomplished on a broad scale if landowners are interested enough to become involved. It is apparent that when interested, landowners will seek out use of a program or tool that is helpful to them. Landowners become interested when they think there is a reasonable way that they can improve the resource and benefit their business. Another lesson learned is that follow-up assistance from a grassland specialist is important for providing information and enthusiasm for proper management of improved or restored grasslands.

Related Materials

Oltman, David; "No-Till Seed Drill Available to Landowners". California Farmer Magazine. Vol. 274, No. 18. November 23, 1991. p.23.

Brewster, Rod; "Putting Some Thrill in 'Till'". Argus-Courier Newspaper, Petaluma, CA. Vol. 137, No. 72, November 14, 1991. p.1.

McIsaac, Don; "No-Till Drill". Marin County Resource Conservation District Annual Report 1992.

Author unknown; "No-Till Seeding Drill Available". Marin County Resource Conservation District Annual Report 1991.

"Tye Pasture Pleaser Final Setup and Operator's Manual". The Tye Company, Lockney, TX. 1989. 14 pgs.

For further information please contact:

Coastal Grassland Restoration, California Style
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Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

California

Sonoma Baylands: Creating an Environmental Benefit out of The San Francisco Bay Dredging Crisis

Laurel Marcus

Background

The San Francisco Bay provides two important economic resources: maritime commerce and waterfront industry, and an estuary/wetland complex of worldwide significance. Over the past fifteen years, these two types of resources and their proponents have been at odds, resulting in a major shutdown of channel deepening and maintenance dredging projects. For the past two decades, Bay Area ports disposed of their dredged material at the in-bay Alcatraz aquatic disposal site. The site is not only filling up, but in-bay disposal is cited as a prime factor in the decline of fish species in the bay.

Purpose

Ocean disposal of dredged material is also problematic. Fishermen and environmental groups have blocked nearshore disposal and are critically evaluating a deep ocean site, sixty miles outside the Golden Gate. All these issues regarding aquatic disposal of dredged material point to the need for a different strategy. In addition, disposing of dredged material in either the ocean or the bay completely misses the opportunity to put this material to beneficial uses. The Sonoma Baylands tidal marsh project is located on a 322-acre diked historic wetland located along the northern shoreline of the bay next to the Petaluma River mouth. This region of the Bay saw extensive reclamation of tidal wetlands in the late 1800s to create agricultural land for hay production. The site is still in hay production and retains little wetland

character or value. As the site was diked, drained and kept dry, it gradually subsided. The average elevation is now four feet below sea level.

Methodology

The California Coastal Conservancy and the Sonoma Land Trust purchased this site and completed a design for a marsh which would provide wetland habitat for the endangered salt marsh harvest mouse and California clapper rail. If a perimeter levee were built and the site opened up to the tide, it would remain an open water basin for many years. Natural sedimentation, although high in this area of the bay, would require 40 to 50 years to reach elevations suitable for vegetated marsh. The endangered salt marsh harvest mouse and clapper rail both depend upon vegetated tidal marsh habitat and might not ever benefit from such a long-term restoration project.

By using dredged material, the time frame for development of the vegetated marsh habitats needed by these endangered species could be reduced to a mere ten years. This difference in restoration time for the dredged material marsh over the natural sedimentation marsh clearly favors the endangered species. Using clean dredged material to build marshes also provides a site for placement of 2.5 to 3 million cubic yards of dredged material. To create a successful marsh restoration project and protect the site from over filling a maximum fill elevation of +2.0 ft. National Goedetic Vertical Datum (NGVD) was identified. This elevation is well below those which sustain vegetated marsh and allows for the development of tidal sloughs to create a healthy, well drained system.

Key Players

As with most crisis situations, a new idea which can serve the purposes of both opposing factions can quickly gain support and bring divergent interests together. The Sonoma Baylands has provided a much needed answer for disposal of bay dredged material. The Port of Oakland, Bay Area Congressional delegation, labor unions, shipping lines, fishermen and environmentalists all have expressed their support.

Lessons Learned

Unfortunately, the law which authorizes most dredging projects - the Water Resources Development Act, or WRDA, as well as national Corps of Engineers policy does not favor projects such as the Sonoma Baylands. All the costs of site acquisition and on-site preparation must be borne by the local sponsor. In addition, when the Corps identifies the "National Economic Development Alternative" or the NED for the dredging project, it is likely to choose the cheapest aquatic disposal option available. All the costs for placing the dredge material at the Baylands which exceed this cheap option must also be paid for by the local sponsor. This type of approach fails to recognize the environmental benefits garnered from wetland restoration using dredged material or the environmental degradation caused by aquatic disposal. To

remedy this problem, Congress authorized the Sonoma Baylands project in the 1992 WRDA and directed the Corps to build it. Continued persistence at local state and federal levels appears to be convincing the Corps of the benefits of this approach.

Related Materials

For additional information, please contact:

Sonoma Baylands: Creating an Environmental
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California

Huntington Wetlands Restoration Project

Reed Holderman

Background

The Huntington Wetlands cover approximately 160 acres at the mouth of the Santa Ana River in Orange County, California. Although the project site is only 24.9 acres in size, it is part of the 160-acre degraded wetland known as the Huntington Wetlands. The site is bounded by the Pacific Coast Highway and the Orange County Talbert Valley Flood Control Channel. Historically, the wetlands covered a much more extensive area, over 2,000 acres. Encroachment from development and channelization of the Santa Ana River are the primary reasons for the decline in wetland acreage.

Lack of tidal flushing has degraded wetland habitats in the Huntington Wetlands. In 1978, tidal action was temporarily restored by installing culverts and excavating channels. The work was carried out as mitigation for an Orange County Flood Control project. Restoring tidal action greatly improved the health of the wetlands When the culverts were removed six months later (per the mitigation agreement), wetland habitat quickly declined.

Although the site did not experience tidal flushing for many years, it still retained many wetland values. In 1986, the California Coastal Conservancy (the Conservancy) awarded a grant to the Huntington Beach Wetlands Conservancy (HBWC), a local nonprofit organization, to prepare a wetland restoration plan for the 24.9 acre site owned by Caltrans, the Orange County Flood Control District, and the Orange County Sanitation District. The restoration plan took into consideration projects proposed by these three public agencies and the Army Corps of Engineers on adjoining properties.

Purpose

The purpose of this project was to restore tidal flushing to the project site and to create the right elevations for optimal salt marsh development and use. The plan proposed doing this by creating intertidal soil conditions suitable to establish and maintain a diverse salt marsh flora; providing mudflat and channel bank habitats for intertidal invertebrates; providing refuge area for juvenile fish; and increasing suitable habitat for waterbirds including the endangered Least tern, the California clapper rail, and Belding's Savannah sparrow. The Conservancy and HBWC also sought, given the sites urban location and land ownership, to increase public access and interpretation of the wetland by constructing walkways and observation areas, and to establish a habitat mitigation bank to compensate for the impacts resulting from adjoining public works projects. This last objective was crucial for gaining the landowners participation in the wetland restoration process, since they were the lead agencies for adjacent public works projects.

Methodology

The Huntington Wetland Restoration Project began in 1986, when the Conservancy gave the HBWC $40,000 to prepare a wetland restoration plan for the project site. In April 1987, the Conservancy approved the restoration plan and gave the HBWC another grant for $459,000 to acquire, in fee, 17 acres of the wetlands owned by Caltrans, and to begin plan implementation. In addition to these funds, Orange County Flood Control and Orange County Sanitation Districts contributed land to the project (i.e. conservation casements) and the flood district contributed over $l million in cash to construct a new flood channel through the wetlands. The County flood district and Caltrans also purchased wetland and sand dune mitigation credits created by the HBWC's project.

The HBWC operates and maintains the completed project and is required to submit annual monitoring reports to the Conservancy for at least five years. The first two years of reporting have shown a significant increase in fish and invertebrate use of the site and a significant increase in water quality and tidal flushing. An independent evaluation of this project (May 1993) also concluded that the site has been restored to tidal action resulting in a substantial increase in fish and wildlife habitat and use.

Key Players

The number of people involved in this project ranged between 20 and 500 people depending on which of the three stages of the project you arc examining. There was tremendous public involvement in the land use plan (LUP) phase of the project, which required the participation of the City of Huntington Beach and the regulatory agencies. The LUP covered the entire 160 acre area and the main players were the City, the Conservancy, and the five major landowners (i.e. Caltrans, OC Flood Control, Southern California Edition, and two private parties), The issues resolved were the extent of wetland acreage and buffer, development potential, and types of appropriate development. The LUP was approved and certified by the City and the California Coastal Commission in the Fall of 1986.

In the restoration project design phase, there was a much smaller group of people involved. Those agencies participating in the wetland design included the HBWC, the Conservancy, and the state and federal resource and regulatory agencies (i.e. CA Fish and Game, CA Coastal Commission, USFWS, NMFS, COE, etc.). Similarly, plan implementation also involved a small core group. The major players were the Conservancy, HBWC, and the landowners (i.e. Caltrans, OC Flood Control, and OC Sanitation District). The focus of this group was on developing the necessary agreements to facilitate the land-cash-credit transactions (i.e. mitigation bank) to carry out the restoration project.

The key to successfully implementing the restoration project and securing local approval of the land use plan, which restricted use on much of the 160 acres for conservation purposes, was the community's strong desire to preserve and protect the wetlands. Another key was that 50% of the landowners in the wetlands needed wetland mitigation to proceed with their projects. Normally, these owners would have opposed wetland creation, especially on their property. But when the restoration project satisfied their needs, reduced project, costs, and incorporated their design into a wetland enhancement project, they willingly supported the restoration project and participated in the land-cash-credit transfer arrangement proposed by the Conservancy.

Lessons Learned

The major lesson learned is to make sure you have local support for your project. Getting a few landowners "on-board" is particularly beneficial in carrying out a project and diffusing project opposition. Also, allow adequate time to meet with all parties and to resolve those issues which can be address with relative case before developing a wetland restoration project.

Related Materials

For further information, please contact:

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North Carolina

Reduction of Estuarine Nutrient Loading: Nitrogen and Phosphorus Removal in Coastal Swamp Areas

Edward J. Kuenzler

Background

Population growth and economic development cause increasing nutrient releases to streams and estuaries from agriculture, urbanization, and industrialization. More nutrients enter headwater streams in North Carolina than reach the estuaries, partly because of removal by swamps and bottomlands which border Coastal Plain streams, wetlands which are thus interposed between the watershed nutrient sources and the estuarine sinks. These wetlands along streams, termed riparian wetlands, normally have wide, flat floodplains which provide large areas of soil surface for processing nutrient loads. Nutrients not removed from the streams before reaching the estuary contribute to nuisance algal blooms, hypoxic bottom waters, decreased fish and shellfish harvests, and other problems.

Purpose

The goal of this study was to increase understanding of the efficiency with which Coastal Plain riparian wetlands strip out nitrogen and phosphorus from municipal wastewater effluents.

Methodology

The initial phase of this study was devoted to selection of sites representative of the forested wetlands impacted by municipal wastewaters in eastern North Carolina. A preliminary list of 35 municipalities was provided by the N.C. Division of Environmental Management. This list was shortened and sites were ranked based on information gathered on field trips to the wastewater treatment plants and associated streams and wetlands. A workshop with forested-wetland authorities of the Southeast provided perspectives useful in making final selection of study sites. The differences among the selected sites in the type of wastewater treatment, in the size and water quality of the receiving stream, and in the nature of the wetland system along the stream were representative of the variability in these factors in eastern North Carolina.

Two swamp-stream sites were selected for intensive study: Bridgers Creek, which receives wastewater from the town of Rich Square, and Deep Creek, which similarly serves Scotland Neck. Samples of water were collected at about ten stations above, at, and below wastewater outfalls every three weeks for two years. A more extensive study utilized seven additional sites near the towns of Clarkton, Pink Hill, LaGrange, Walstonburg, Enfield, Macclesfield, and Lewiston-Woodville. They were sampled only quarterly for one year to determine variability among bottomland systems. On the field trips, measurements were made of water temperature, conductivity, dissolved oxygen, and pH. At the two intensive sites, stream discharges were also estimated. Grab samples of water were collected and returned to the laboratory for determination of chloride, nitrate, ammonium, total N, phosphate, and total P concentrations. The chloride concentrations were used to correct for in-stream dilution, permitting calculation of net downstream changes in nutrient concentrations.

The water of the receiving streams, in most cases, had low concentrations of chloride and nutrients. The effluent generally increased in these parameters just below the outfall, but concentrations decreased again downstream more rapidly than expected from dilution of chloride. Such decreases which exceed the rate of simple solution represent net nutrient removal. Median net removal efficiencies for ammonium, total N, phosphate, and total P within about 4km of the Rich Square and Scotland Neck outfalls ranged from about 50% to 100% of the amounts in the effluent. About 80% of nitrate was removed in the Deep Creek wetland below Scotland Neck. Rich Square effluent had very low concentrations of nitrate; nitrate changes relative to the amount in the effluent ranged from very high to very low, with no significant median change below the outfall. The data base was small, but the sites in the extensive study also showed a pattern of net removals in the downstream swamp-stream systems. Ammonium removal was generally poor and inconsistent at the extensive sites, especially where effluent concentrations were low.

The efficiencies of nutrient removal at the intensive sites were generally similar to removals which have been measured in other N.C. Coastal Plain swamp streams. Furthermore, there was general agreement with results for other Southeastern states that riparian wetlands effectively trap sediments and nutrients from agricultural and municipal sources delaying and reducing their transport to the coast.

Good water quality in North Carolina's estuaries is important because of their economic, recreational, and aesthetic values. The forested bottomlands and swamps along Coastal Plain streams are multipurpose natural areas. Because of demonstrated capabilities of riparian forested wetlands to reduce nutrient loadings to the estuaries, it is critical that both the areal extent and the functional properties of the

riparian wetlands be maintained. They must be protected particularly from channelization and conversion to farmlands, a process which effectively destroys them. Consideration must also be given to protection from adverse changes to vegetative structure and soil properties, for example through unwise forestry practices, which will decrease nutrient removal capabilities. Finally, the riparian forested wetlands must be protected from damage caused by nutrient overloading. They appear to function will in removing modest amounts of nutrients, for example below properly-functioning wastewater treatment plants. However, heavier loads may exceed their removal capacity, allowing nutrients to continue downstream, and imposition of excessive loads may adversely change the wetland itself. The methods and data from this study may help development of relatively inexpensive methods for assessing wetland nutrient-removal abilities so that year-to-year changes in removal efficiency of many streams can be determined.

Lessons Learned

Additional research is needed regarding the relationships between nutrient loading and wetland functioning. One study which should be undertaken is measurement of the amount of change and potential damage to wetlands by municipal wastewater loads. It is likely that the additional nutrients, and in many cases the constant minimum stream flows, provided by the effluent will affect plant species composition. These changes attributable to the effluent probably also markedly affect the soil fauna, microbial populations, and perhaps vegetation structure, especially close below the outfall. A study of the rate of accumulation of phosphorus and other elements in the soils and biota below the outfall would be valuable. How long does it take under given waste loads for the soil to become so enriched that further removal ceases? Studies are also recommended having to do with land use in the watershed. For example, does increased concentration of suspended sediments from soil erosion increase or decrease the efficiency of removal from phosphorus from wastewater? How does logging of bottomland timber affect trapping of nutrients from agricultural and municipal sources? Finally, incorporation of the results into models of nutrient flux from the watershed to the estuaries will help predict maximum permissible wastewater discharges without damaging swamp functioning, thereby protecting estuarine water quality while urbanization of the Coastal Plain is increasing. Studies such as these will ultimately aid in making management decisions regarding the importance of wetlands to water quality.

Related Materials

For additional materials, please contact:

Reduction of Estuarine Nutrient Loading:
Nitrogen and Phosphorus Removal in Coastal Swamp Areas
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Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

North Carolina

Atlantic White Cedar Wetlands Restoration

L. K. "Mike" Gantt

Purpose

The purpose of the Atlantic White Cedar Wetland Restoration Project is to restore wetland hydrology and Atlantic White Cedar to twenty-five acres of cleared, ditched, and drained wetlands to revitalize wildlife and water quality attributes. Atlantic White Cedar is a wetland tree highly prized for its lumber that once covered vast acreage in coastal North Carolina but has been logged so extensively that it now exists only in isolated fragments.

Background

The restoration of hydrology on 392 acres and the planting of 8,000 Atlantic White Cedar on twenty-five acres was accomplished in three months. The seedlings were purchased for $2,000 and the ditch plugging cost $2,400.

Key Players

The site was a Farmers Home easement that had been transferred to the U.S. Fish and Wildlife Service (Service) Pocosin Lakes National Wildlife Refuge. The Service's Albemarle-Pamlico Bay-Estuary Program recognized the opportunity to restore these wetlands and initiated and coordinated this project. Weyerhauser, North Carolina Division of Forest Resources, and North Carolina State University

provided technical expertise on the tree planting and the U.S Soil Conservation Service and U.S. Army Corps of Engineers provided guidance on how the ditches should be plugged to restore wetland hydrology.

Methodology

Weyerhauser notified the Service of the availability of the seedlings. The Service recognized the opportunity and made funding available to purchase seedlings and restore hydrology. Atlantic White Cedar seedlings are not normally available, and this availability constituted a special opportunity.

Lessons Learned

The major obstacle in this example was the very short timeframe in which work had to be completed. Seedlings had to be planted before the onset of dry, hot, summer weather and needed to be accomplished quickly to ensure that planted seedlings had adequate soil moisture. This project proceeded smoothly because Atlantic White Cedar Wetland Restoration is broadly supported by the government, environmental groups and the timber industry.

Related Materials

Laderman, A.D.; 1989 "The Ecology of the Atlantic White Cedar Wetlands: A Community Profile". US Fish and Wildlife Service Biological Report 85 (7.21). 114 p.

For further information contact:

Atlantic White Cedar Wetland Restoration
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Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Maine

The Casco Bay Experience

Ray Hall

Purpose

The U.S. EPA and many state environmental agencies have discovered an increasing need for integrated geographic information management solutions to assist analysts and decision makers. For more than a decade Geographic Information System (GIS) technology has evolved to provide useful tools to organize, access, and maintain large volumes of geographic information. To realize the full potential of this technology, systems developers work with environmental managers to identify specific application requirements to satisfy user needs. In support of its Ocean Data and Evaluation System (ODES), EPA's Office of Wetlands, Oceans and Watersheds (OWOW), formerly, the Office of Marine and Estuarine Protection (OMEP), has coordinated with Maine's Department of Environmental Protection(DEP) to implement a GIS for the Casco Bay watershed.

Background

Following the designation of Casco Bay, Maine, to the National Estuary Program (NEP) in 1989, OMEP and DEP contracted for the design, development, and implementation of a GIS to evaluate the impact of pollutant discharges on shellfish beds and other critical habitat areas within the Casco Bay. For DEP, the primary goal of this project was to provide a GIS tool to meet the information needs of scientists, managers, and policy analysts representing DEP's water bureau, the University of Maine at Orono, regional planning agencies, and other state agencies. For OMEP, the resulting GIS would also serve as a prototype to encourage the development of similar applications for other estuaries, ideally, utilizing the existing ARC/INFO application shell.

Key Players

Project work began with the collection of existing marine and estuary data of the Casco Bay and Fore River Watershed study areas for the conversion of geographic coverages. This information includes shoreline details, wetland habitats, shellfish growing areas, shellfish classifications, critical habitat sites, spawning areas, permitted industrial outfalls, hydrology, highways and roads, and political boundaries. The data collection effort required the cooperation of several organizations to assemble the raw information into a format suitable for digitization. During this phase of the project, these organizations performed the following activities to gather the necessary NEP information to develop the appropriate geographic overlays:

- DEP assembled historical monitoring data for Casco Bay, which included results for benthic community sampling, bio-toxicity testing, sediment analysis, and metal detection;
- The Soils Conservation Service supplied digitized soil coverages for the study area;
- DEP obtained U.S. Geological Survey maps of the study area for subsequent digitization;
- The Greater Portland Council of Governments organized, assessed, and digitized data relating to solid waste landfills, shellfish resource inventories, underground storage tanks, and wetland areas;
- EPA provided National Oceanic and Atmospheric Administration(NOAA) coastline maps and additional data from the Permit Compliance System (PCS) relating to shellfish resources, upwelling zones, aquaculture lease-sites, spawning areas, bird-feeding areas, and fisheries harvesting sites; and
- Contractor support obtained and converted the remaining GIS data layers covering the Casco Bay region.

Methodology

Once the critical geographic data had been gathered and converted, the data was then ready for incorporation into the Casco Bay application. To develop the Casco Bay GIS baseline, EPA and DEP expanded and enhanced the capabilities of an existing application: the ODES/GIS Connection. Originally developed to evaluate marine monitoring data for Boston Harbor, this menu-driven application provides remote access to ODES data for graphic display and query of data pertaining to marine monitoring stations, permitted facilities, and other geographic data. To adapt the ODES/GIS application to the DEP's systems environment, DEP, through contractor support, enhanced the automatic transfer facility to ensure that all Casco Bay data stored in ODES could be easily transferred electronically between ODES and the Casco Bay GIS. Once all of the required data overlays were incorporated into the GIS, the menu-driven interface was redesigned to provide access to these information sources. With the completion of these tasks, the Casco Bay GIS was installed on a local work station.

The resulting system successfully incorporated the capabilities of the existing Boston Harbor GIS application to provide DEP with tools to effectively manage its Casco Bay marine and estuary data. But, more importantly, the Casco Bay GIS project successfully brought together several environmental

agencies to share resources and expertise. In close collaboration, each of these agencies contributed valuable information for exchange via the GIS application. Through continued commitment, an effective application was realized to meet the varied goals of the key players.

Lessons Learned

Since the development of the Casco Bay GIS, EPA and DEP have realized significant benefits. The ARC/INFO application provides decision makers with the ability to readily assess integrated coastal environmental data and identify the impact of point source dischargers on critical marine habitats. Scientists may use this tool to perform analysis and produce maps showing the spatial relationships of widely varied geographic data types. These maps also assist management and policy staff in relating data from different program areas for decision making purposes. The Casco Bay GIS project successfully establishes the model for the development of effective tools to support environmental monitoring.

Related Materials

For additional information about the Casco Bay GIS Experience, please contact:

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SECTION 2:

Management Approaches

Policy Considerations for Recycling Wastewater
Through Hydrologically Altered Wetlands
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The Sewage Infrastructure Improvement Act:
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Ecologically Based Environmental Management: Whole
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A Management Strategy to Protect an Endangered Coastal Sand Dune Ecosystem

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The Grass Valley Creek Watershed Story

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SECTION 3:

Scientific and Technical Approaches

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Sonoma Baylands: Creating an Environmental
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Training Student Organizers Local Waters Program's Local Waters Initiative

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Listing by Keyword

Citizen Monitoring

- A Citizen Pollution Reporting System
- Baykeeper: Prototype for Citizen Environmental Protection
- Chesapeake Bay Citizen Monitoring Program
- Falmouth Pond Watchers Water Quality Monitoring Program
- Galveston Bay Foundation: The Estuary Sampling Team (GBF TEST)
- Marine Sanctuary Watch
- Training Student Organizers Local Waters Program's Local Waters Initiative

Coastal Erosion

- Washington Coastal Erosion Management Strategy

Dredged Material

- Sonoma Baylands: Creating an Environmental Benefit Out of the San Francisco Bay Dredging Crises

Eutrophication

- Coastal Grassland Restoration, California Style
- Reduction of Estuarine Nutrient Loading
- Total Maximum Daily Load Case Study: Albemarle/Pamlico Estuary

Fisheries

- Composting By-Products from Blue Crab and Scallop Processing Plants
- Fish Net Collection and Recycling
- Fishermen Promote Habitat Education and Protection
- Marine Debris Collection and Recycling Program
- Marine Resource Mitigation Program for the Impacts of a Coastal Nuclear Power Plant
- Multicultural Anglers Project
- The Grass Valley Creek Watershed Story
- Wellfleet Harbor Mini-Bay Project

GIS

- The Casco Bay Experience
- Videos Demonstrating North Carolina's Computer-Based GIS

Habitat Management

- A Management Strategy to Protect an Endangered Coastal Sand Dune Ecosystem

Marine Debris

- Fish Net Collection and Recycling
- Home Guide for Medical Waste Disposal
- Marine Debris Collection and Recycling Program
- Reduction of Foam Debris: Foam Encapsulation for Floating Structures in Oregon

Marine Sanctuary

- Coastal Grassland Restoration, California Style
- Marine Sanctuary Watch

National Estuary Program

- Mass Bays Local Action: Local Governance Committees
- Multicultural Anglers Project
- The Casco Bay Experience
- Videos Demonstrating North Carolina's Computer-Based GIS
- Watershed Management Initiatives of the Tampa Bay National Estuary Program
- Wellfleet Harbor Mini-Bay Project

Nonpoint Source Pollution

- Equipment Buy-Down Project, Maumee River Basin
- Mitchell Creek Watershed Nonpoint Source Pollution Study

Public Outreach

- A Management Strategy to Protect an Endangered Coastal Sand Dune Ecosystem
- Baykeeper: Prototype for Citizen Environmental Protection
- Fishermen Promote Habitat Education and Protection
- Home Guide for Medical Waste Disposal
- Multicultural Anglers Project
- Officer Snook Marine Project
- Shorewatch Video Series for Cable Television
- Videos Demonstrating North Carolina's Computer-Based GIS

Public Participation

- Chollas Creek Watershed Protection Project
- Concerned Citizens Protecting the Coquille River and Estuary
- Cooperative Habitat Creation Efforts in Galveston Bay: Restoration and Construction of Coastal Wetlands
- Mass Bays Local Action: Local Governance Committees

Sedimentation

- Sonoma County Wetlands Enhancement Program
- The Grass Valley Creek Watershed Story
- Tomales Bay Watershed Restoration

Shoreline Management

- North Richmond Shoreline
- Washington Coastal Erosion Management Strategy

Solid Waste

- Composting By-Products from Blue Crab and Scallop Processing Plants

Stormwater Management

- Coastal Grassland Restoration, California Style
- Equipment Buy-Down Project, Maumee River Basin
- Mitchell Creek Watershed Nonpoint Source Pollution Study
- Reduction of Estuarine Nutrient Loading
- The Sewage Infrastructure Improvement Act Program
- Tomales Bay Watershed Restoration
- Total Maximum Daily Load Case Study: Albemarle/Pamlico Estuary
- Stormwater Management on the Isle of Palms Connector

Video

- Shorewatch Video Series for Cable Television
- Videos Demonstrating North Carolina's Computer-Based GIS

Wastewater Treatment

- City of Arcata Wastewater Treatment Facility
- Natural Wetlands for Control of Coastal Water Quality
- Policy Considerations for Recycling Wastewater Through Hydrologically Altered Wetlands
- The Sewage Infrastructure Improvement Act Program

Water Quality

- Chollas Creek Watershed Protection Project
- Ecologically Based Environmental Management
- Mass Bays Local Action: Local Governance Committee
- Mitchell Creek Watershed Nonpoint Source Pollution Study
- Watershed Management Initiatives of the Tampa Bay National Estuary Program

Watershed Protection

- A Citizen Pollution Reporting System
- Baykeeper: Prototype for Citizen Environmental Protection
- Chesapeake Bay Citizen Monitoring Program
- Chollas Creek Watershed Protection Project
- Concerned Citizens Protecting the Coquille River and Estuary
- Ecologically Based Environmental Management

- Falmouth Pond Watchers Water Quality Monitoring Program
- Galveston Bay Foundation: The Estuary Sampling Team (GBF TEST)
- Garcia River Watershed Enhancement Project
- Hanauma Bay Management Plan
- Mass Bays Local Action: Local Governance Committee
- Officer Snook Marine Project
- Sonoma County, Wetlands Enhancement Program
- The Casco Bay Experience
- The Grass Valley Creek Watershed Story
- Tomales Bay Watershed Restoration
- Total Maximum Daily Load Case Study: Albemarle/Pamlico Estuary
- Training Student Organizers Local Waters Program's Local Waters Initiative
- Watershed Management Initiatives of the Tampa Bay National Estuary Program
- Wellfleet Harbor Mini-Bay Project

Wetlands Management

- Atlantic White Cedar Wetland Restoration
- City of Arcata Wastewater Treatment Facility
- Cooperative Habitat Creation Efforts in Galveston Bay: Restoration and Construction of Coastal Wetlands
- Huntington Wetlands Restoration Project
- Marine Resource Mitigation Program for the Impacts of a Coastal Nuclear Power Plant
- Marsh Terracing
- Natural Wetlands for Control of Coastal Water Quality
- Neary Lagoon: Neglected Marsh Restored to Wildlife Refuge
- Policy Considerations for Recycling Wastewater Through Hydrologically Altered Wetlands
- Reduction of Estuarine Nutrient Loading
- Sonoma Baylands: Creating an Environmental Benefit Out of the San Francisco Bay Dredging Crises
- Sonoma County Wetlands Enhancement Program

Wildlife Management

- Neary Lagoon: Neglected Marsh Restored to Wildlife Refuge

Youth Activities

- A Management Strategy to Protect an Endangered Coastal Sand Dune Ecosystem

- Officer Snook Marine Project
- Training Student Organizers Local Waters Program's Local Waters Initiative

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Listing by State

California

- A Management Strategy to Protect an Endangered Coastal Sand Dune Ecosystem
- Baykeeper: Prototype for Citizen Environmental Protection
- Chollas Creek Watershed Protection Project
- City of Arcata Wastewater Treatment Facility
- Coastal Grassland Restoration, California Style
- Garcia River Watershed Enhancement Project
- Huntington Wetlands Restoration Project
- Marine Resource Mitigation Program for the Impacts of a Coastal Nuclear Power Plant
- Marine Sanctuary Watch
- Multicultural Anglers Project
- Neary Lagoon: Neglected Marsh Restored to Wildlife Refuge
- North Richmond Shoreline
- Sonoma Baylands: Creating an Environmental Benefit Out of the San Francisco Bay Dredging Crises
- Sonoma County Wetlands Enhancement Program
- The Grass Valley Creek Watershed Story
- Tomales Bay Watershed Restoration

Florida

- Composting By-Products from Blue Crab and Scallop Processing Plants
- Watershed Management Initiatives of the Tampa Bay National Estuary Program

Hawaii

- Hanauma Bay Management Plan

Louisiana

- Marsh Terracing
- Policy Considerations for Recycling Wastewater Through Hydrologically Altered Wetlands

Maine

- The Casco Bay Experience

Maryland

- Chesapeake Bay Citizen Monitoring Program

Massachusetts

- Ecologically Based Environmental Management
- Falmouth Pond Watchers Water Quality Monitoring Program
- Mass Bays Local Action: Local Governance Committees
- Shorewatch Video Series for Cable Television
- Wellfleet Harbor Mini-Bay Project

Michigan

- Mitchell Creek Watershed Nonpoint Source Pollution Study

Nationwide

- Officer Snook Marine Project
- Fishermen Promote Habitat Education and Protection

New Jersey

- The Sewage Infrastructure Improvement Act Program

New York

- Training Student Organizers Local Waters Program's Local Waters Initiative

North Carolina

- Atlantic White Cedar Wetland Restoration
- Reduction of Estuarine Nutrient Loading
- Total Maximum Daily Load Case Study: Albemarle/Pamlico Estuary
- Videos Demonstrating North Carolina's Computer-Based GIS

Ohio

- Equipment Buy-Down Project, Maumee River Basin

Oregon

- Concerned Citizens Protecting the Coquille River and Estuary
- Marine Debris Collection and Recycling Program
- Reduction of Foam Debris: Foam Encapsulation for Floating Structures in Oregon

Pacific Northwest

- Fish Net Collection and Recycling

Pennsylvania

- Chesapeake Bay Citizen Monitoring Program

Rhode Island

- Home Guide for Medical Waste Disposal

South Carolina

- Natural Wetlands for Control of Coastal Water Quality
- Stormwater Management on the Isle of Palms Connector

Texas

- Citizen Pollution Reporting System
- Cooperative Habitat Creation Efforts in Galveston Bay: Restoration and Construction of Coastal

Wetlands
- Galveston Bay Foundation: The Estuary Sampling Team (GBF TEST)

Virginia

- Chesapeake Bay Citizen Monitoring Program

Washington

- Washington Coastal Erosion Management Strategy