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Information About Estuaries and Near Coastal Waters
Summer 1996, Volume 6, Number 3

Table of Contents:

In this Issue:

Features:

Regular Departments:

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How Safe is it to Swim in Santa Monica Bay? Epidemiology Study Assesses Health Risks

Concerned beachgoers and other advocates for Santa Monica Bay now know more than ever before about how safe it is to swim there, thanks to a landmark epidemiology study conducted by the Santa Monica Bay Restoration Project, part of the National Estuary Program.

The results, announced in May before a diverse audience of government agencies, environmental organizations, local dignitaries, and media representatives, confirmed what health experts have long suspected but lacked the supporting data to definitively proclaim: To stay healthy, bay swimmers should steer clear of flowing storm drains.

Study findings revealed that individuals who swim in front of flowing storm drains are 50 percent more likely to develop a variety of symptoms than those who swim 400 yards away from the same drains.

The epidemiology study, commissioned and co-designed by the Santa Monica Bay Restoration Project and conducted by epidemiologist Dr. Robert Haile of the University of Southern California School of Medicine, is the first in the country to examine whether there are adverse health effects associated with swimming in marine waters contaminated by urban runoff. According to study participants, the findings could also apply to any urban area in the country with recreational areas that are impacted by urban runoff.

As a $750,000 cooperative venture partially funded through the nonprofit Santa Monica Bay Restoration Foundation, the study included significant contributions of cash, grants, and in-kind services from a variety of federal, state, and local agencies, private organizations, and community groups.

The epidemiology study is one of 74 priority actions included in the Bay Restoration Plan, a blueprint to guide the recovery of Santa Monica Bay which was created by the Bay Restoration Project, and approved by Governor Pete Wilson in 1994 and by US EPA Administrator Carol Browner in 1995.

"One of the reasons the Santa Monica Bay Restoration Project was created in the first place was because people were concerned about the possible health risks of swimming in the bay," said Project Director Catherine Tyrrell. "For years, swimmers and surfers have complained about eye, ear, skin, and stomach problems which they believe stem from their contact with the bay, but we lacked the proof to make the connection. With this study, we finally know that people can get sick from swimming in front of flowing bay storm drains."

The study is a follow-up to an earlier multi-phase research project conducted by the Bay Restoration Project between 1989 and 1992. That effort found enteric viruses in runoff at three widely separated bay storm drain locations, indicating that human fecal waste was present in the storm drain system. Because of the findings, signs have been posted since 1992 near storm drain outlets on beaches along the bay, cautioning bathers to stay at least 100 yards from flowing drain outlets.

The Study

During the course of the study, which was conducted from June through September 1995, a team of bi-lingual interviewers questioned 15,492 beachgoers of all ages who swam at three Santa Monica Bay beaches located near flowing storm drain outlets. They contacted the swimmers again 9-14 days after their initial questioning to inquire as to the presence of a variety of symptoms, including: fever, chills, earache, skin rash, nausea, stomach pain, coughing, sore throat, a group of symptoms indicative of "highly credible gastrointestinal illness", and "significant respiratory disease".

In addition, daily water samples were collected at and near the studied storm drain locations and analyzed for total and fecal coliform bacteria, enterrococci, and E. coli. Water samples were also collected at storm drain sites and analyzed for enteric viruses.

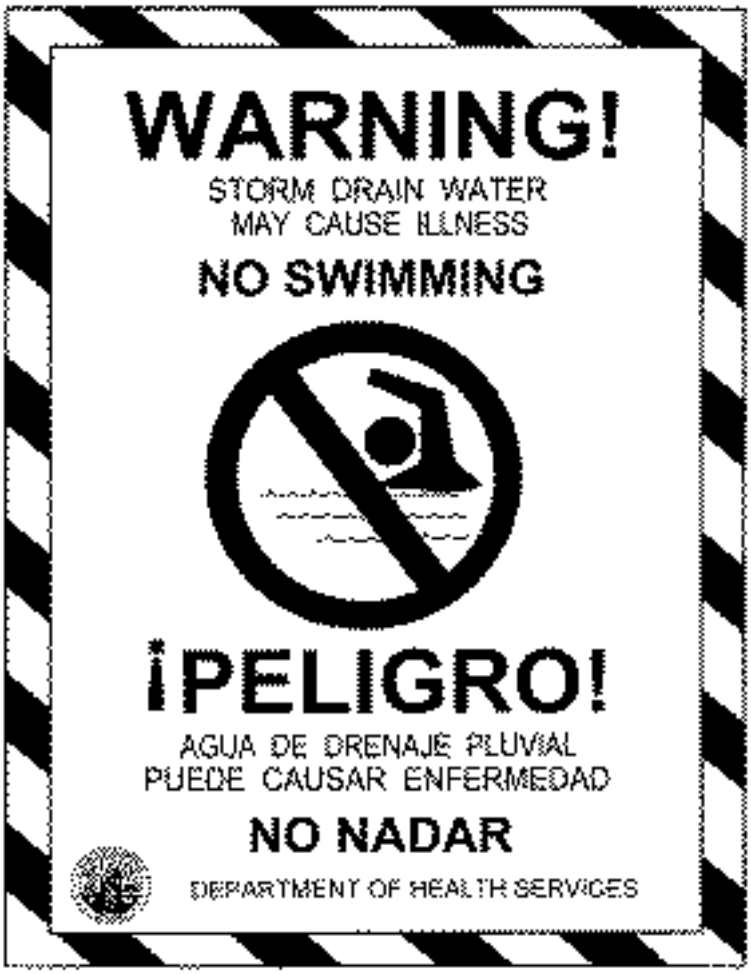
Findings

According to Dr. Haile, swimmers who do not follow the advice to steer clear of flowing drains could experience an increased risk for a broad range of adverse health effects including fever, nausea, and gastroenteritis, as well as cold and flu-like symptoms such as nasal congestion, sore throat, fever and/or cough. "Some 373 people out of every 10,000 can develop any of these symptoms if they swim in front of a flowing storm drain," said Dr. Haile. Increased health risks were also associated with swimming in areas with high bacterial indicator counts, and on days when water samples tested positive for enteric viruses.

Epi Study Action Agenda

The Bay Restoration Project outlined a list of actions that agencies have agreed to implement as a result of the study's findings. Designed to better inform and further protect the public on several fronts, these actions will be carried out by a variety of government agencies. Prominently featured in the Epi Study Action Agenda are tasks which expand on efforts to educate and advise the public regarding safe

swimming choices.



Strikingly colored, new bilingual warning signs have been created which read "WARNING! STORM DRAIN WATER MAY CAUSE ILLNESS. NO SWIMMING." They will be posted on either side of all flowing storm drains in Los Angeles County, and will also be accompanied by crossed warning flags. In addition, lifeguards will actively warn swimmers away from areas directly in front of storm drain outlets when swimming.

Other actions that will be carried out by local agencies include implementing source control measures to reduce the input of pathogens (organisms that cause disease in humans) and other contaminants into stormwater runoff. Diverting dry-weather flows from problem storm drains to wastewater treatment facilities, investigating and correcting malfunctioning septic systems, and improving response to and control of sewage spills are among the tasks to be undertaken.

The Epi Study Action Agenda also calls upon regulatory agencies to incorporate findings of the study into monitoring programs, and for revising recreational water quality standards/criteria, if appropriate. In addition, members of the public are being asked to practice "good housekeeping" at their homes and workplaces to help prevent bay pollution.

For further information on the Santa Monica Bay Restoration Project epidemiology study, please request a copy of the full technical document or the 13-page Public Summary by e-mail at SMBRP@earthlink.net, or by mail at 101 Centre Plaza Drive, Monterey Park, CA 91754.

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EPA - Marine Debris

More than just an eyesore, marine debris harms wildlife, poses risks to vessels, threatens human safety, and results in economic losses to coastal communities. In this context, the term "marine debris" refers to any man-made substance that enters our oceans or waterways and does not readily biodegrade. The most commonly seen are plastic items--according to the results of the International Coastal Cleanup Campaign coordinated by the Center for Marine Conservation.

Problem:

As more people move into coastal areas and increasingly vacation at the shore, they bring with them more and more processed, manufactured, and packaged goods. The overall result is an increase in persistent (synthetic) solid wastes, some of which end up in the marine environment. According to the EPA, each year millions of seabirds, turtles, fish, and marine mammals become entangled in marine debris or ingest plastics mistaken for food. The Marine Mammal Commission 1995 Report to Congress lists 267 marine species that have been reported entangled or having ingested marine debris. Unfortunately, to many sea creatures, plastic in the water looks like food, and it appears that even more animals are likely to ingest plastics than become entangled in it. Turtles mistake plastic bags for jellyfish; birds eat plastic pellets and pieces, mistaking them for fish eggs; or marine debris is ingested accidentally with other food.

As debris drops out of the water column and onto the bottom, it causes different problems. Plastic film, sheeting, or other like material, settling on the bottom, can smother plants and animals, rendering areas of the sea floor uninhabitable and unproductive. Debris has been observed wrapped around living coral, smothering the animals, and breaking up their coralline structures.

Humans can also be directly affected by marine debris. There are reports of swimmers and divers becoming entangled in fishing line and netting. Beach users can be injured by broken glass, rusted metal, or exposure to medical wastes.

Marine debris can become a navigational hazard by entangling propellers or clogging cooling water intakes, potentially leaving boaters adrift. Vessel repairs due to debris, as well as the valuable time lost making repairs, costs marine operators considerable sums annually. According to insurance statistics, the Japanese fishing industry lost 4.4 billion yen (more than US $41 million) in 1985 due to marine debris.

An estimated 31,600 pots were lost in Alaska's Bristol Bay king crab fishery in 1990 and 1991. If each "ghost" trap caught and killed just one legal-size crab per year, the annual loss would be 205,400 pounds of king crab. New England fishing communities lost $250 million of lobster traps in 1978. In some cases, these traps continued "ghost fishing", resulting in a loss of catch and the unnecessary death of lobsters and other marine organisms. It should be noted that most current traps include a means for the trap to open after being unattended in the water for a while.

Debris in beach areas can have major economic consequences as well. Floating debris, either in slicks or as dispersed items, is visually unappealing and can influence a tourist's decision to visit an area, resulting in lost revenues. In 1987-1988, New Jersey and New York beach communities lost an estimated one to four billion tourist dollars because of beach closures after the discovery of garbage and medical wastes along the shore. New Jersey now spends $1 million per year to clean up their beaches and $40,000 per year to remove debris from the New York/New Jersey Harbor.

Marine debris can be useful to resource managers in ascertaining

- early warning signs of possible human health risk from pollution,
- biological health risks to wildlife, such as entanglement, smothering, or ingestion,
- limits on coastal recreation and fishing,
- the effectiveness of programs to control or prevent marine debris,
- the aesthetic value of a coastal area and the economy it supports,
- ambient conditions,
- human health risks through entanglement injury or exposure to medical wastes, and
- fishing and shellfishing closures. For example, the presence of tampon applicators or condoms may indicate the presence of untreated sewage wastes in the water.

Sources of debris:

There are two major sources of marine debris: from the ocean and from the land. Ocean-based sources include fishing gear from commercial and recreational fishing, wastes from oil rigs and mining platforms, and ocean disposal of trash. Fines for the latter, such as the $500,000 mulct imposed on Princess Cruise Lines in 1993, and the New York City garbage barge debacle receive a lot of media attention. Recent surveys and observations, however, indicate that as much as 80% of marine debris comes from land-based activities, which include inadequately treated municipal discharges, stormwater discharges, runoff, improper solid waste disposal, and litter from land-based recreational activities such as beach and shore use.

Activities at the Federal Level:

In June of this year, 14 federal agencies met to coordinate efforts in addressing marine debris. This group will meet annually with industry, environmental organizations, state and local governments, and other interested parties to find creative solutions to the marine debris problem.

The Sea Keepers Campaign, sponsored by the U.S. Coast Guard, is an educational program dedicated to enhancing the nation's infrastructure by providing educational opportunities to increase public awareness of marine environmental protection issues. It covers issues such as the proper disposal of boating wastes, safety, current laws, and the timely detection, reporting, and cleanup of discharges.

What you can do:

At the heart of the marine debris problem lie the great quantities of trash generated in our daily lives. Clearly, through proper waste disposal, the amounts of litter reaching coastal waters can be reduced. Re-use and recycling efforts, reductions in packaging materials, improved solid waste collection, and public education have helped a great deal, but more can be done:

- Volunteer coastal cleanups and public education efforts can help to reduce the amount of debris reaching our waterways, partly as direct removal of debris and partly as education tools. It has been said that once someone spends three hours picking up other people's trash, that person will never again be a part of the problem. Doing a trace-back of a debris item to its source can assist in the teaching of the watershed approach. There are many communities which participate in the annual International Coastal Cleanup in the fall. In 1995, 43 states participated. Others, such as Texas, also have Memorial Day or spring cleanups to kick-off the opening of the beach season.

- Encourage marinas to start recycling programs. Marinas in Maine have recently begun a net recycling program. Others offer recycling for engine oil, fishline, glass, aluminum cans, and plastics.

- Is beach litter a problem? Some communities have removed trash receptacles from beaches and established a carry it in, take it out practice. They often provide recycled plastic bags to visitors in which to place their debris and take it home.

- Stencil storm drains in your watershed to remind people not to dump trash or wastes of any type into the drain because it feeds into local waterways. Often neighborhood associations or schools utilize this activity to teach watershed protection.

- Participate in a monitoring program. The National Marine Debris Monitoring Program is designed for volunteers to help answer two specific questions: (1) is the amount of debris on our coastlines decreasing?, and (2) what are the major sources of the debris? This five-year program,

coordinated by the EPA, will eventually monitor 30 specific types of debris on 180 beaches throughout the U.S. While this is a national survey, trend analysis will be computed for individual regions allowing for the identification of problems specific to those areas, as well providing a national picture of the marine debris problem. The program started on Earth Day, 1996, in two regions in the Gulf of Mexico. This first year will be used as a pilot prior to expansion to seven other regions. It offers a great opportunity for coastal communities and volunteer groups to participate in a national program that can also identify problems in their own back yards. Please note that because this is a national monitoring effort utilizing statistically valid protocols to determine trends, each beach monitored must meet certain criteria to be included in the program.

- Participate in the 1996 International Coastal Cleanup Campaign on September 21, 1996! Call 1-800-CMC-BEACH or contact your local cleanup coordinator.

For more information on the Sea Keepers Campaign, contact your local Coast Guard Reserves or Linda Reid at: U.S. Coast Guard, (G-MOR-1), 2100 2nd St. SW, Washington DC 20593, (202) 267-6891.

For more information on the National Marine Debris Monitoring Program, contact Ms. Jill Goodman, Project Manager, Center for Marine Conservation, 306A Buckroe Avenue, Hampton VA 23664, (804) 851-6734.

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PIER CONSTRUCTION CRITERIA FOR WEEKS BAY, ALABAMA

The Weeks Bay National Estuarine Research Reserve (NERR) is located on the eastern shore of Mobile Bay in Baldwin County, Alabama. This shallow sub-estuary is a critical nursery for shrimp, fish, and shellfish which end up in the Gulf of Mexico.

During the past two years, the Weeks Bay NERR has had first-hand experience in addressing a significant resource protection issue that has arisen in many other parts of the country. In the space of one week during the summer of 1994, Reserve staff responded to six public notices from the U.S. Army Corps of Engineers (Corps) for permit applications to construct private piers in Weeks Bay. These applications proposed enormous and elaborate piers, ranging in length from 260 to 350 feet with terminal decks that included gazebos, toilet facilities, and boathouses up to 4,800 square feet.

A recent subdivision of several large tracts of land along Weeks Bay led to the potential for a large increase in the number of piers proposed. The Reserve staff took the initiative by organizing an inter-agency Task Force to address the anticipated increase in privately-owned piers and their potential damage to the fringing marsh, aquatic vegetation, and general ecological health of the bay. Membership consisted of state and federal agencies including the Corps; the Alabama Department of Conservation and Natural Resources (DCNR), the state agency which manages submerged lands; the Alabama Department of Environmental Management, the state CZM permitting and enforcement agency; the Dauphin Island Sea Lab, a marine research consortium of universities in Alabama; and the Weeks Bay NERR.

The goal of the Task Force was to develop a set of pier construction criteria that could be approved by the state and incorporated into the Corps' general permitting process for applications in Weeks Bay. The Task Force sought to balance reasonable riparian access with the ecological integrity of the Reserve, navigation rights, and public ownership of submerged lands.

Over a one-year period, the Task Force agreed on a set of criteria for pier construction in Weeks Bay (see sidebar). Since DCNR approved and the Corps adopted the Task Force's recommended criteria in January 1995, all Corps general permit applicants for pier construction have modified their proposals to conform with the criteria. To date, the affected public seems to accept the new criteria as part of a way to protect local resources.

While the Weeks Bay NERR played an important role in facilitating this successful practical management application the real strength of the project was in the cooperation and input from all of the relevant agencies. The Task Force recognized that, because of its protected status, Weeks Bay represented an ideal site to test more stringent pier construction criteria. Results of this pilot study may lead to a broader application of the pier criteria in the newly established Mobile Bay National Estuary Program.

Criteria for Pier Construction in Weeks Bay, Alabama

Pier or Walkway:

The length of the entire structure may extend no further than 20 feet beyond the point where water is 3 feet deep at mean low water, or 300 feet from mean high water (MHW), whichever is shorter. The pier may be no wider than 5 feet and must be at least 5 feet above MHW. In crossing a marsh, the pier may be no wider than 5 feet and at least 5 feet above the marsh surface. Spacing between the wooden decking of the pier or walkway over a marsh must be at least 3/4 inches, and decking boards may be no wider than 12 inches. Light penetration may also be provided by metal grating.

Pier Deck Area:

There may be no more than one deck area per single owner pier and it shall be no larger than 10 x 10 feet. It may be covered and screened but cannot have enclosed or solid walls. No plumbing or toilet facilities are allowed on the pier or deck.

Walkways Crossing Wetlands:

Adverse impacts to the marsh must be avoided during construction and during subsequent use. Support pilings shall be installed by hand with no heavy machinery operating in the marsh. Any material excavated for installation of the pilings shall be removed with no resulting changes in marsh elevations.

Boat Berthing Areas:

No more than two, uncovered, unenclosed boat berths are allowed for single owner piers. A maximum of 6 mooring pilings may be installed. Boat berthing areas may be up to 20 x 26 feet and pilings may be no further than 20 feet waterward of the access dock.

Construction Requirements:

All structures shall be set back at least 25 feet from the lateral riparian rights line; if there is insufficient space, this may be waived to a minimum of 10 feet.

Water Access Rights:

Permit applicants must demonstrate riparian ownership during the application process and structures must not infringe upon or restrict rights of others.

Dredging:

No dredging to create channels, or any other bottom disturbance, shall be permitted.

Aquatic Vegetation:

Pier construction must be done so as to prevent damage to aquatic vegetation. A survey of aquatic vegetation may be required.

Shoreline Protection:

Shoreline protection shall only be considered in areas where the riparian vegetation proves inadequate in preventing erosion. Shoreline protection is limited to placement of riprap. Filter cloth is required.

Community piers:

Communal areas which share riparian ownership may construct a "community pier" to provide access. The permitting process will take into consideration the number of riparian owners involved in the project.

For more information about the process or a copy of the criteria, contact Nathalie Peter, NOAA/OCRM, 12th Floor, 1305 East-West Highway, Silver Spring MD 20910, (301) 713-3132, ext. 119, E-mail at: npeter@ocean.nos.noaa.gov; or Bob McCormack, Weeks Bay Reserve, at (334) 928-9792.

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REEF relief

(Portions of this article have previously appeared in print. They are reprinted with permission of Billy Causey, Superintendent of the Florida Keys National Marine Sanctuary.)

Florida Keys

Even reefs within a reserve can be loved to death. Those that fringe the Florida Keys, for instance, are for the most part protected within the Florida Keys National Marine Sanctuary. Only a tenth of the size of the Great Barrier Reef, they are visited by ten times as many people--more than four million a year.

By the 1980s, anchor damage was becoming a serious problem. Coral grows slowly; it takes about 25 years for a brain coral to grow as big as a person's head. Moreover, once an area of reef is shattered by a heavy anchor, it becomes more susceptible to predators and diseases. And to make matters worse, many tourists were rifling the reefs for coffee table souvenirs. (When confronted, some said they had no idea that they were injuring a living organism. "I thought it was just a piece of rock," replied one culprit.)

Over the past decade, however, a local organization has helped curb the vandalism. Realizing that part of the problem was simply lack of information, in 1986 a group called Reef Relief launched an education project to raise awareness among tour operators and tourists throughout the Keys. By 1992, the group had also designed and installed 120 mooring buoys for boats. This campaign has greatly reduced damage across the entire reef.

Puerto Rico

On another front, mooring buoys are also being considered to protect the reefs surrounding Puerto Rico. But there is a complication that makes this effort a bit dicey--the sea floor around many of the most beautiful reefs is littered with hazardous explosive ordnance, according to the staff for Coralations, Inc., a non-profit ocean conservation organization. Paradoxically, these unexploded bombs could be the salvation of the reefs and the fish by preventing anchoring, and regulating diving and commercial fishing due to obvious safety concerns.

Founded in Puerto Rico by scientists concerned about the degradation of local coral reefs and the rapid decline of local marine fish populations, Coralations, Inc. is currently approaching the federal government for legislation and funding in order to establish marine reserves in these dangerous areas. This includes, but is not limited to 1) obtaining funds for mooring buoys demarcating "no anchor" zones, 2) establishing no touch, no spear, no take policies for safety reasons, and 3) obtaining funds for effective enforcement.

Coralations, Inc. and the Department of Natural and Environmental Resources of Puerto Rico are working together on a mooring buoy project supporting local dive shops. The objective of this project is to facilitate placement of mooring buoys at frequently visited dive sites. Sea Grant is providing educational programs for the local commercial fishermen in an effort to reduce any potential conflicts the buoys present. Under the expert guidance of Reef Relief of Florida, they have minimized mooring buoy expense and maintenance without compromising the safety of these anchoring systems.

Coralations, Inc. has also obtained the local distributorship of environmentally friendly artificial reef modules known as "reef balls" (see Coastlines Winter 1996, Issue 6.1, page 8), which enables them to assist in constructing offshore artificial reefs at greatly reduced cost while providing visible and educational community activities.

For further information on the Florida Keys, please contact Billy Causey, Superintendent, Florida Keys National Marine Sanctuary, P.O. Box 500368, Marathon FL 33050, phone: 305-743-2437, e-mail: bcausey@ocean.nos.noaa.gov.

For more information on Puerto Rico, contact Mary Ann Lucking, Project Coordinator, Coralations, Inc., Amopolo 14, Suite 705, Isla Verde PR 00979, (809) 791-7372.

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Aquatic Invaders Update

In the Winter 1996 issue of Coastlines (Issue 6.1), we printed an article dealing with the issue of foreign, or exotic, species being released from ships' ballast. Subsequently, we have learned about legislation that was introduced to Congress in March that seeks to control ballast water discharges.

The legislation is being sponsored by Representatives Wayne Gilchrist, R-MD, Connie Morella, R-MD, and Phil English, R-PA. A Senate version of the bill is being co-sponsored by Senators Paul Serbanes and Barbara Mikulski, both Maryland Democrats. These legislators from the Chesapeake Bay area have a good reason to get these bills passed--the ports of Norfolk and Baltimore have been deemed "hot spots", as combined they receive three billion gallons of ballast water annually, more than any other east coast area. Currently, scientists believe that over 100 aquatic non-indigenous species are living in the bay.

The National Invasive Species Act of 1996 would require the U.S. Coast Guard to establish voluntary guidelines that encourage ships entering U.S. waters to first exchange ballast water at sea so that species picked up in foreign and other U.S. ports would be killed when pumped into the higher-salinity waters of the ocean. Conversely, if ballast exchange takes place at sea, ocean-dwelling organisms taken into the tanks would be exterminated when pumped out into the less saline near-coastal waters.

The legislation would also establish standards for ballast exchange, sampling techniques, and record-

keeping procedures. Mandatory ballast water exchange programs could also be established for any regions that do not comply.

The U.S. Coast Guard established a voluntary compliance program for the Chesapeake more than a year ago. The agency has produced educational materials, pamphlets and video training packages, and has held meetings with members of the transportation industry. Voluntary compliance has risen greatly from about 25 to 30% at the beginning of 1995, to about 80% recently. According to a Coast Guard spokesperson, compliance is not difficult if vessel operators plan ahead. And, once they understand the importance, vessel operators seem willing to cooperate.

We will continue to follow this issue and keep you up to date.

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Keeping Trouble Out of Paradise

"Seaweed stench....sewer, rancid-like smell....inundated with seaweed....thousands of flies." This is how the Maui (HI) newspaper described local beaches last summer. Sounds like trouble in paradise.

Algae blooms along the coast of Maui have been the subject of complaints for the past ten years. They received national attention in 1989 and 1991 when a massive bloom of Cladophora smothered corals and washed up onto pristine resort beaches. Several unique features distinguish Maui's algae problem from coastal eutrophication observed in many places around the world. These blooms are not restricted to semi-enclosed bays and estuaries; they occur along open coastline on both the windward and leeward sides of the island. Three species of macroalgae occur in nuisance accumulations on beaches. These include *Cladophora* (only a problem in 1989 and 1991), *Ulva fasciata*, and an introduced alga, *Hypnea musciformis*. These nuisance blooms only occur in areas where there is development and/or fertilized agriculture.

The West Maui Watershed Project has begun implementing several innovative programs in conjunction with public and private entities--the goal being to keep trouble out of paradise. A community-based project, formed in 1993 to promote watershed management and to protect and restore water quality and ocean resources, the Watershed Project is taking a broad approach to improving land and water management practices, ranging from promoting new technology for cleaning beaches, to improving urban stormwater management and developing pollution prevention programs for agriculture, boats, and hotels. The following are a few examples of projects that not only work in Maui, but could be put to use in any coastal area.

The Hawaii Department of Health is providing start-up funds to develop a new commercial enterprise that will clean drifting algae from nearshore waters and find a viable use for the seaweed. They issued a request for proposals seeking a realistic and reasonable business plan that would meet these goals. The winning company, Oceanit Laboratories, Inc., will harvest drifting *Hypnea* using a boat equipped with a suction pump and divers with flexible suction pipes. The seaweed will be processed into two products; a liquid foliar fertilizer, and a potting soil for market to the horticulture and organic-food industries on the islands. Competing products are presently shipped in from mainland distributors and are, therefore, more costly. Seaweed harvest will begin in late 1996.

The tourism industry is the most important sector of Maui's economy and a large number of hotels have sprung up to support this industry. The Watershed Project, working with the Maui Hotel Association, has conducted pollution prevention training for hotels and condos. The local leader is the Royal Lahaina Resort's "Malama ka'Aina" (take care of the land) program. This employee-based program has identified and implemented over 50 changes to conserve water and electricity, reduce waste, recycle materials, and use fewer hazardous substances. Examples include offering guests the option of how often they want to have sheets and towels changed, using cold water in the laundries, and eliminating air conditioning in some open-air areas. These steps not only help to protect the island's resources, they also save the resort over $100,000 each year.

Another related project starting this year will provide technical assistance to resorts and condos in implementing pollution prevention. A "green" certification program will be designed to recognize participating properties. The Kaanapali Resorts are retrofitting their golf course and resort irrigation systems to use reclaimed water. This step is part of an overall initiative to improve environmental conservation and to market Kaanapali as an environmentally responsible resort.

Educating the "keiki" (children) has also been a priority. The West Maui Watershed Project assisted the Hawaii Department of Education in developing a series of five interactive TV classroom programs called "Kidscience Waterwatch" for grades 4-6. Through a series of activities and exercises, kids learn about natural watersheds and how people's activities alter them, the importance of water, impacts of introduced species, water quality and what impacts it, and protecting watersheds. The series was broadcast nationally on PBS in April and May 1996. Videotapes are available.

Other priorities for the Watershed Project in the coming year are to work with County government to incorporate urban runoff controls into the grading ordinance and drainage standards. A "Watershed Owner's Manual" will include best management practices for homes, landscaping, agriculture, and boats.

For more information about the West Maui Watershed Project, contact Dr. Wendy Wiltse, Lahaina Comprehensive Health Center, 1830 Honoapiilani Highway; Phone & Fax: (808) 661-7856; E-mail:

wwiltse@maui.net.

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Of Docks and Scallops

Reprinted with permission from Connecticut Currents Newsletter, Winter 95-96 Sea Grant Connecticut, by Nancy Balcom

I had the pleasure this summer to spend a couple of days at Cedar Island Marina in Clinton, CT sitting on the dock recording bay scallop measurements as they were called out by my caliper-wielding companions. We were checking the progress of a Sea Grant-funded pilot study to determine the feasibility of growing bay scallops in cages suspended beneath marina docks.

This is a relatively new idea in aquaculture, first proposed in the late 1980s. A pilot study was conducted by the New York Sea Grant Extension Program and Cornell Cooperative Extension of Suffolk County in 1991 to make a preliminary assessment of the suitability of this activity for Long Island marinas.

In that study, 7,500 seed scallops were placed in pearl nets initially, and later in mesh bags housed in wire cages, all of which were suspended underneath a dock. A hatch cut into the dock provided easy access to the cage. The study resulted in a five-fold increase in average shell height, with mortality losses averaging 19.5%. Unfortunately, 60% of the scallops were lost from the nets and bags due to Hurricane Bob and two subsequent northeasters, which stirred things up a bit.

The conclusion was that marinas do have potential as possible field nursery sites for the culture of shellfish, both from a marina operations and biological standpoint.

In the spring of 1995, Jay Tanski of New York Sea Grant Extension and I met with two marine biologists

with the Cedar Island Marine Research Laboratory, Matt Mroczka and Paul Dinwoodie, to discuss the potential for conducting a similar pilot study at the marina in Clinton, CT. The Marine Research Laboratory is part of Cedar Island Marina.

Connecticut Sea Grant provided $1,800 in supplies for the project--materials to build the cages and purchase the bags of various mesh sizes to hold the bay scallops. The bay scallop seed, 6,000 in all, were provided by scientists from the National Marine Fisheries Service (NMFS) Laboratory in Milford, CT, who have been leaders in conducting studies to develop and refine bay scallop culturing techniques.

When the project began in June 95, seed scallops were put into Durathene small-mesh bags and placed on shelves in several wire cages (resembling lobster traps) suspended underneath one of the outer docks at the marina. The bags were closed using PVC pipe split along the long edge to form a tight seal to prevent "escapees." The marina docks already had hatches cut into them, and rails running underneath from which the cages were suspended.

The cages were pulled up monthly between July and December 95 to measure the volume of scallops and the shell heights of 50 individuals in each bag, and to look for mortality losses. The scallops were then divided into two or more larger mesh bags to prevent overcrowding, and placed back in the cages.

The scallops grew very well, many reaching marketable size by early December with few losses due to mortality. The scallops were tested for contamination but no contaminant levels above public health standards were found. However, because it is prohibited to harvest shellfish from marina areas,when they reached marketable size, more than 8,000 were removed from the dock areas and seeded in natural and enhanced eel grass beds within and outside Clinton Harbor. After six months of depuration, the shellfish can be marketed. Additionally, scientists hope that the scallops will spawn and help to re-establish their populations in the harbor. Mroczka kept some of the scallops to try and overwinter them in the cages.

Because results of the pilot study were so encouraging, the marina researchers will try to expand the operation to commercial size in 1996.

All in all, with the attention being directed to bay scallop culture in this state, things are looking up for the scallop with the "baby blues" and in turn, for Connecticut seafood consumers.

For more information, please contact Nancy Balcom, Interim Program Leader, Sea Grant Marine Advisory Program, University of Connecticut at Avery Point, Connecticut Sea Grant, 1084 Shennecossett Road, Groton, CT 06340-6097, (860) 445-8664, e-mail: nbalcom@aol.com.

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Recycling Sediment

America's waterways need to be--indeed, must be--dredged.

Strong national commerce and defense are critical reasons, yet environmental and public health concerns often restrict port and waterway dredging. After a century of industrial, agricultural, and other pollution discharged into our waters, dredging stirs up waste and yields contaminated material in large volumes. The problem is exemplified in the Port of New York which pays $118 a cubic yard to haul and dump contaminated material in Utah.

But dredged materials, either clean or contaminated, do not have to be a disposal problem. There are other options. Rather than looking at these materials as something to be disposed of, there are those who see them as a potential resource. Beneficial uses of sediment date to ancient times when dredged clay was used for dikes. Of course, many issues make today's demands more difficult to resolve. To deal with modern complexities, there are a number of existing and emerging technologies to cope with contaminants in sediments, virtually all of which provide some form of de-contaminated end-product. Thus, the distressful "Where can we put dirty sediment? in the future may evolve into "How can we use clean and cleaned sediment?"

Some of the potential uses of sediment thus far identified include:

- As an ingredient in concrete-like products for:

  Park and recreation facilities (tennis courts, bike paths, walkways, benches)

  Civil works (breakwaters, retaining walls, dikes, containment islands to store sediments)

  Marine construction (floats, pilings, docks)

  Substitutes for products which may pose environmental problems (wood-treated pilings)

- Enhanced soils with uses such as:

  Highway median and right-of-way plantings

Dredged materials are cleaned by various means, some available for use today and others still in the laboratory test stage. In some techniques, bacteria are injected into the dredged sediments and contaminants break down through biological processes. In other systems, chemicals are added which react with contaminants to render them harmless. Physical methods such as high heat (or "burning") can break down pollutants, or encapsulation with materials like cement will remove them from contact with the environment. In each of these cases, the "decontaminated" sediments produce sometimes significant amounts of residual materials--materials that can be put to good use.

With this as an impetus, the US Army Corps of Engineers has funded a study to define uses for cleaned sediment. Early results suggest that mixing sediment with other materials--for example, with cementious materials for concrete-like products or with organic water material for manufactured soils--is highly promising. The usefulness of the product may provide sufficient economic incentive to develop cooperative marketing and research. With improved techniques and applicability, the use of sediment recycling may be able to lessen environmental problems. As dredging occurs, the contaminated materials will not merely be moved to another location but could be destroyed or otherwise rendered inert and then utilized in a beneficial way.

A key to any of these options is education. Many engineers and other waste, construction, and scientific specialists have not thought about the possibility of using cleaned, dredged materials as a resource. Once alerted to the nature and availability of these materials, and the understanding that they are sufficiently clean to avoid both public health and regulatory problems, they often show a keen interest.

Soil erosion control

Agriculture

- Mine reclamation, such as by:

  Lining mines by pumping cementious sediment (perhaps mixed with wastewater) into them to prevent ground water contamination

  Forcing in processed sediment to prevent collapsing or mine fires

- Highway construction, such as using fillers and aggregates for road beds

- Landfill cover

- Artificial reefs from vitrified sediment

- "Fast" land, such as:

  Creating islands for docks in deep water so that tankers don't have to come into ports thereby reducing the need for maintenance dredging

  Extending land near the sea for commercial ventures

- Fill for:

  Excavation holes from digging and hauling contaminated soils, such as at industrial sites

  Mixing with "raw" or unprocessed sediment to extend it in its many applications, or blending with mildly contaminated sediment to

dilute contamination to an acceptable level

- Creation of settling ponds or fish farms

Clearly, use will be driven by many factors--technological ability to make material in the necessary particle size, strength, and adaptability for different uses; cost competitiveness at several levels, including transportation and handling; flexibility of end-products to meet new and existing market demands; cost-to-benefit perception; available supply of demanded specifications; and integration of research and marketing. But when the environmental factors are included, this may tip the balance in favor of recycling.

For further information on recycled cleaned sediment or this project in particular, please contact Anne Montague at M&S Associates, 131 Dodge Street, Beverly, MA 01915, (508) 927-2082, fax: (508) 921-1627.

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Blurbs

Estuaries Day--Saturday 21 September 1996

Estuaries Day is an annual celebration of the nation's estuaries. This year it falls on Saturday, September 21st. This activity is a part of CoastWeeks which run from mid-September through the end of October.

Estuaries Day is, in many locations, a day full of entertaining and educational activities. Contact your nearest National Estuary Program or National Estuarine Research Reserve for a listing of their scheduled events, or contact your state coastal management office for information on their entire CoastWeeks schedule.

EPA Publication available...

Watershed Tools Directory (841-B-95-005) is a useful collection of 250 one-page watershed tool summaries, each including key information such as a description of the tool, contact names and phone numbers, and information about intended users. These tools were canvassed from EPA headquarters and regions, other federal agencies, states, and watershed organizations. If you have a watershed tool you would like to include in the next update of the Directory, please see the form in the Directory's introduction. Updates will be completed as new tools are received.

The Directory was developed primarily for watershed stakeholders in the field, but may also be a valuable tool to anyone interested in watersheds. A copy of the Directory can be obtained by mailing or faxing a request with your name, address, and telephone number to:

NCEPI
11029 Kenwood Road, Building 5
Cincinnati, OH 45242
(513) 489-8695

The Directory is also on the internet at http://www.epa.gov/OWOW/watershed/tools.

For more information about the Directory or about adding your tool(s) to the collection, contact Chris Laabs with EPA's Office of Wetlands, Oceans, and Watersheds at (202) 260-7030.

New Head of NOAA National Estuarine Research Reserves and National Marine Sanctuaries Announced.

In late May, Ms. Stephanie Thornton was appointed to the position of Chief of the Sanctuaries and Reserves Division within the NOAA Office of Ocean and Coastal Resource Management. In this role she will serve as the director of the National Estuarine Research Reserve and the National Marine Sanctuary Programs. Ms. Thornton comes to NOAA from California where she spent eight years as the executive director of the California Coastal Resources Center.

The 22 Estuarine Research Reserves collectively protect almost 425,000 acres of coastal wetlands and surrounding watersheds, using these areas for research to support effective coastal management, education and outreach. The Marine Sanctuaries encompass 17,500 square miles of kelp forest, coral reef, open ocean, and sandy bottom habitats.

3rd Biennial State of the Estuary Conference
October 10-12, 1996
Golden Gate Club, Presidio of San Francisco, CA

The San Francisco Estuary Project announces the 3rd biennial State of the Estuary Conference which will serve as an update on the current state of the San Francisco Bay-Delta Estuary through technical presentations, policy discussions, poster sessions, Dr. Science, innovative management programs, a CCMP implementation report card, and more.

For more information on program details and registration, call (510) 286-0460.

New Manual About Best Management Practices Available

A new booklet about the cost-effectiveness of best management practices (BMPs) has been prepared by the Casco Bay Estuary Project. This free booklet will be especially useful to town governments, businesses, developers, and shorefront property owners. The booklet features case studies of Maine homeowners, businesses, and municipal officials who have used BMPs and believe they are cost-effective.

To obtain a copy of the booklet, call the Casco Bay Estuary Project at (207) 828-1043.

Massachusetts Bays NEP and Barataria-Terrebonne NEP Release CCMPs

The Massachusetts Bays National Estuary Program's Comprehensive Conservation and Management Plan (CCMP) was recently accepted by Governor William Weld and forwarded to the EPA in Washington for formal approval--after which the Program will enter the implementation stage.

The CCMP summarizes the issues in five coastal regions abutting Massachusetts and Cape Cod Bays extending from the border with New Hampshire to Cape Cod. It addresses such diverse issues as septic system management, toxics use reduction, and dredged material disposal. So far, 40 of the 49 coastal communities in the regions have signed a resolution expressing their support for participating in CCMP implementation.

For more information, please contact Diane Gould at the Massachusetts Bays Program, 100 Cambridge Street, #2006, Boston, MA 02202, (617) 727-9530, fax: (617) 727-2754.

The Barataria-Terrebonne National Estuary Program in Thibodaux, Louisiana has announced the release of its Comprehensive Conservation and Management Plan (CCMP), consisting of 51 action plans. The CCMP addresses the estuary's priority environmental problems of hydrogeologic modification, reduction of sediments, changes in living resources, habitat loss/modification, eutrophication, pathogen contamination, and toxic substances.

To obtain a copy of the CCMP, please contact Steve Mathies, Program Director, or Lynn Woods Schonberg, Public Participation Coordinator, at Barataria-Terrebonne NEP, P.O. Box 2663, Thibodaux, LA 70310, (504) 447-0869, (800) 259-0869, or fax: (504) 447-0870.

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About Coastlines...

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

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