

Currents

• A Quarterly Newsletter of the Casco Bay Estuary Project •

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INTRODUCTION

In this newsletter we focus on two of the Casco Bay Estuary Project's five priority issues: stormwater pollution in Casco Bay, and toxic sediment contamination. We invite you to learn more about these important environmental issues. The upcoming Casco Bay Plan, due for completion at the end of 1995, will contain numerous actions to address these problems.

Stormwater in Casco Bay

Water is always on the move. From the ocean it evaporates into clouds, and returns to the earth as rain, and flows back to the ocean. This hydrologic cycle provides us with stormwater - the water running along the ground after a rainfall. Stormwater is not generally a problem when soil and plants absorb the water, and the lumpy texture of the earth disperses and slows its flow. The soils filter and clean the slowly percolating water before discharging it to the sea.

But in developed areas where pavement, hard surfaces, and flattened lawns replace the naturally porous terrain, stormwater will pick up sediments, toxic chemicals, nutrients and bacteria as it rushes across residential and commercial areas, parking lots, roads, industrial sites, lawns, and landfills.

Today stormwater runoff is the single greatest contributor of contaminants to Casco Bay. The ingredients of stormwater in an urban area can be a veritable "witch's brew". Nationwide, studies have identified bacteria and viruses, heavy metals like copper and lead, PCBs (polychlorinated biphenyls), PAHs (polynuclear aromatic hydrocarbons), oil and grease, and pesticides in urban stormwater. The quantity and types of pollutants carried by stormwater depends upon the severity of the storm and the kinds of places the water flows across.

It is important to note that although water quality of Casco Bay has improved over the last twenty years (largely because of constructing sewage treatment plants and restricting discharges directly into water bodies) there are still problems. During rainy weather, for example, Casco Bay waters in the Portland area fail to meet minimum water quality standards.

Why is there still more pollutant-laden stormwater reaching Casco Bay? The reason is simple: because there are more roads



The hydrologic cycle

and buildings. In the last twenty years the amount of developed area within the lower Casco Bay watershed almost doubled. Between 1970 and 1990, the 25 municipalities below Sebago Lake, which together form the lower watershed, grew by 51,000 people (24%) and 37,000 housing units (47%). This has contributed to an increase in polluted stormwater runoff from nonpoint sources and point sources.

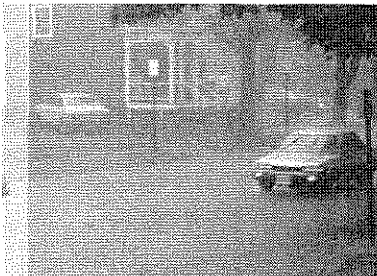
Nonpoint source pollution.

Nonpoint sources doesn't originate from a specific "point", like a pipe. It comes from a variety of places:

- Stormwater from urban development transports sediments, toxics, pathogens (bacteria and viruses) and nutrients (nitrogen and phosphorus) to coastal waters. Runoff from roadways, parking lots and driveways contributes oils and greases and metals such as lead, zinc, copper, cadmium and chromium.

- Homes and apartments add to stormwater: bacteria and viruses from failing septic systems and pet wastes; nutrients from septic systems, fertilizer and eroding sediment; and toxics such as pesticides, paints and other commonly used household cleaners and solvents, and oils, greases and metals from vehicles and home and garden equipment.

- Construction activities can carry significant loads of sediment,

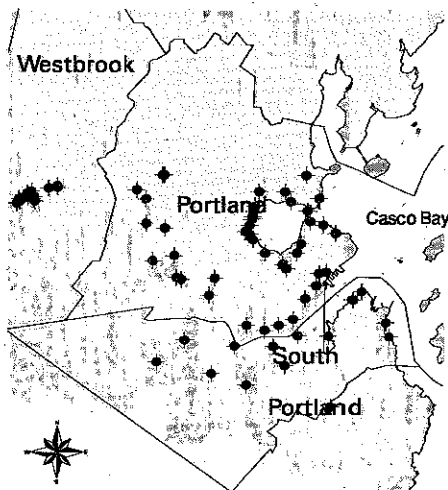


nutrients, and toxic materials from the development site into nearby water bodies.

- *Stormwater from roads and parking lots are major sources of PAHs, oils and greases, sediments, lead, copper, cadmium, and chromium.*
- *Leaky storage tanks, improperly disposed chemicals, and uncovered work areas can leach oil and a variety of other toxics into surface runoff and groundwater.*
- *Farming activities contribute nitrogen to stormwater through fertilizing crops and animal wastes. Manure is also a significant source of pathogens. Pesticides are a source of toxics.*

Point Source Pollution. Point source pollution comes from specific discharge points. It include storm drains and storm sewer pipes. These collect stormwater from roadways, parking lots and other built-up areas. Stormwater drainage systems may convey stormwater alone, or in combination with sanitary wastes, as is the case with the combined sewer overflows (CSOs). Combined sewer overflows are a major problem in the Portland area of Casco Bay. Each of greater Portland's sewage treatment plant is designed to efficiently treat the waste flow from a certain population size. A dramatic increase in flow, such as during a storm, can overload the plant. When this occurs, in order to avoid damage to the plant, some water containing both sewage and stormwater, must be discharged untreated into the river or Casco Bay.

Some 65 CSOs have the potential to discharge into Casco Bay or its tributaries



Economic Impacts. Water quality degradation resulting from contaminated stormwater is costing the Casco Bay region millions of dollars. Clamming, fishing, and recreational swimming are sometimes not safe in portions of Casco Bay. Periodic dredging of Portland Harbor is necessary to maintain depths for vessels, but disposing of contaminated dredged

materials from areas such as the inner harbor is ten times the cost of disposing of clean materials. The Cities of Portland, South Portland, and Westbrook expect to spend tens of millions of dollars to construct facilities which will reduce the flow and provide treatment for stormwater before it enters Casco Bay.

Fortunately much has been learned about stormwater in recent years. Many new techniques for taming its contents and flow have been tested and proven, and we have an opportunity to apply those lessons to Casco Bay. It will take responsible action on behalf of homeowners, business owners, developers, and municipal officials to protect the health of Casco Bay.

The Casco Bay Estuary Project is proposing a range of actions to reduce polluted stormwater runoff to Casco Bay. Here is a sample:

Action: Establish a technical assistance program for municipal staff and boards to undertake stormwater management planning.

Action: Train contractors, public works crews, road commissioners, and municipal boards and other staff in the use of "Best Management Practices" (BMPs).

Action: Develop a comprehensive stormwater monitoring program to measure the impacts of stormwater on the water quality and resources of Casco Bay.

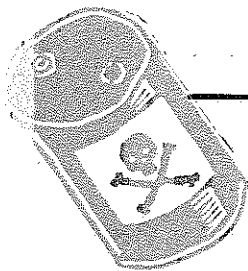
Action: Support the Maine Department of Environmental Protection's pollution prevention program in its efforts to conduct pollution prevention audits for businesses.

Action: Support the adoption of minimum standards for stormwater quality in all state and municipal regulatory programs

Action: Support the use of the best management practices described in the state's manuals for all development and land use activities permitted under state laws and local ordinances.

Action: Support the efforts of Portland, South Portland and Westbrook to implement their CSO reduction/treatment plans.

This article is based on the Project's more detailed report titled "Stormwater in Casco Bay". For your copy call the Casco Bay Estuary Project at 828-1043. Comments are invited.



Toxic Pollution in Casco Bay

Scientists first took a careful look at the bottom of Casco Bay in 1980. What they found concerned the residents of Greater Portland. What they thought was a pristine environment in fact turned out to be home to a broad variety of toxic contaminants: Polychlorinated biphenyls (PCB's), polynuclear aromatic hydrocarbons (PAHs), lead, cadmium, copper, nickel, chromium, and zinc.

The Casco Bay floor was studied again in 1989 and 1991. More answers have emerged about how serious the problem is, how the contaminants got there, and what can be done to reduce their effect in the future.

But First, What Are Toxic Pollutants?

What makes a substance "toxic" is a complicated issue. It depends upon the substance's chemical form, its amount, and its availability to living organisms. For example, mercury is relatively non toxic in its elemental form, but highly toxic in its methylated form. Some metals are essential for a healthy diet in low concentrations (i.e., iron, magnesium), but can be deadly in high doses. Some animals accumulate toxic pollutants faster than others. Some toxic pollutants combine to produce a more deadly effect. Even so, the presence of toxic pollutants in animal tissues is not always an impending health hazard.

Despite the scientific complexity, the basic issue is clear. If a chemical known to have potential toxic effects at high doses is accumulating in an environment like Casco Bay -- even if the precise source of the chemical is unknown and its immediate effect on animal life unclear -- it is cause for concern and preventive action.

There are two basic types of toxic pollutants: heavy metals and organic chemicals.

Heavy metals, as the name implies, are metallic elements that in pure form are literally heavy (dense). They include lead, mercury, arsenic, cadmium, silver, nickel, selenium, chromium, zinc, and copper. They may occur naturally in a watershed, and wash into the sea through the rains. But many heavy metals found in places like Casco Bay are the result of vehicle discharges and industrial processes, historic and current.

Organic chemicals are, by definition, a bonded form of carbon, hydrogen, and other atoms. The number of possible arrangements is infinite. A few occur naturally. Several hundred thousand more have been developed by chemists; these are known as "organic compounds". They are used in materials such as oils, paints, pesticides, cleaners, solvents, insula-

tion, and fire retardants. Organic compounds polluting the sediment of Casco Bay include polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), pesticides, butylins (organometallic compounds) and dioxins (organochlorines).

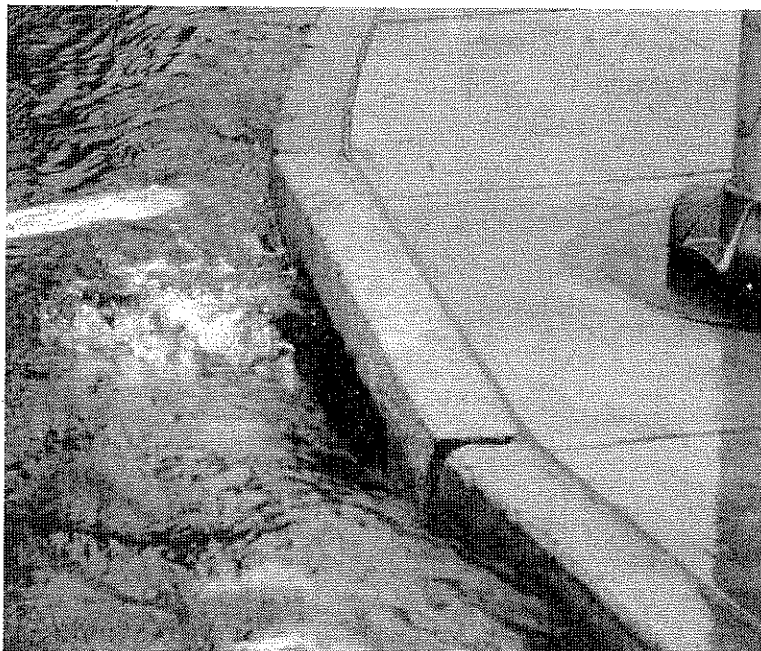
What Is Their Occurrence In Casco Bay?

Two classes of compounds are present at potentially toxic levels to bottom dwelling animals in at least one site in Casco Bay -- PCBs and hydrocarbons. PAHs are considered "high" in a number of locations when compared to bays around the country. Chlordane is considered "high" at two locations using the same comparison. Four heavy metals -- lead, cadmium, mercury and silver -- are considered "high" in some locations in the Bay when compared to bays nationwide.

Where Do They Come From?

The majority of the toxic pollutants in Casco Bay are hydrocarbons (PAHs), and come from the combustion of petroleum products such as car and truck exhausts, and industrial and residential chimneys.

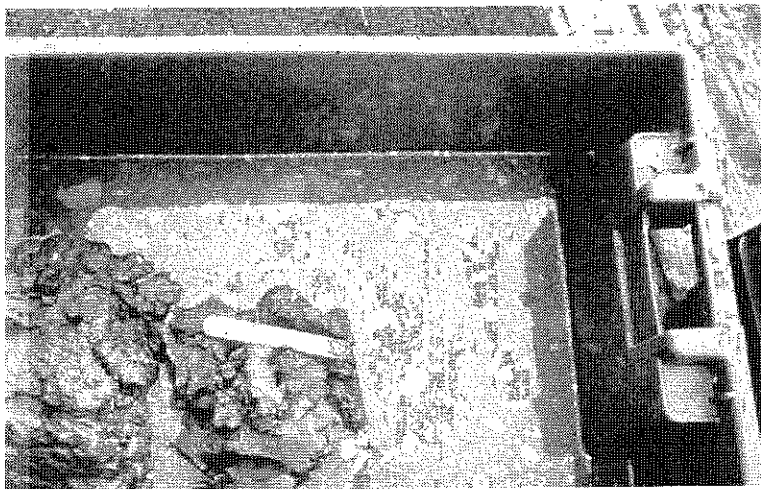
Combined sewer overflows and storm drains carry hydrocarbons washed from roads and parking lots into Casco Bay. Historical sources, such as coal tar from the gasworks next to the Million Dollar Bridge, add contamination to the Fore River. The greatest source of contamination is probably from sediments washing over the built-up portion of the watershed.



Heavy rainstorms carry pollutants to the Bay.



Oil spills contribute to hydrocarbon pollution. Statewide, there are about 70 reported spills per year in Maine coastal waters, including spills from vessels other than tankers and barges. Most of the spills are small, averaging 20 gallons. According to the US. Coast Guard, the average most-probable spill in Portland Harbor is a 45-gallon diesel oil spill caused by a fishing vessel overflowing its tanks. The largest oil spill in Casco Bay was the Tamano spill in 1973, which struck Soldier's Ledge in Hussey Sound and spilled 100,000 gallons of heavy industrial fuel.



This sediment sample, taken from the Fore River near the Million Dollar Bridge in 1989, reveals oily contamination caused by the now-forgotten coal gas production plant.

Metals in the Bay are concentrated near Portland Harbor. Like oil-related contaminants, the sources are numerous, including vehicles and old industrial sites -- where most of the buildings are long gone, but the silent legacy of pollution endures below-ground.

DDT and chlordane, two now-banned pesticides, could have come from old dumps, illegal disposal by homeowners or business people, or runoff from residential areas.

PCBs are present in the Fore River at a high level. PCBs were banned in the 1970s because they were found to be potentially cancer-causing. Though the sources of the Fore River contamination are unknown, they probably include old dumps and filled-in areas.

Sources of dioxin include papermaking, incineration, industrial processes and forest fires.

How Do They Move Around?



Particles of soil wash across the land during storms picking up oils, metals, pesticides and other contaminants. Other con-

taminants attach to particles in the air before landing on land or water. Water may pass underground through polluted sites on the way to the Bay.

Once in the Bay, the contaminants adhere to sediments and particles of organic matter. These particles tend to settle to the bottom near where they enter marine waters; over time some are more widely distributed in the Bay by tides, currents, and storms. Dredging also can stir up and relocate toxic sediments within the Bay.

What Are the Environmental Impacts?

The benthos, or community of organisms inhabiting the muddy bottom of the Bay, plays a vital role in the Bay's ecosystem. The benthos recycles the organic matter from plants and animals that drift to the bottom as they die. Nutrients are released from this organic matter by bacteria and may be incorporated into new plant life with the next algae bloom. In addition to being decomposers, these bacteria form the basis of a benthic food chain. Small crustaceans (shrimp-like), worms, mollusks (e.g., clams), and echinoderms (e.g., starfish and sea urchins) are food for bottom-feeding fish (flounder, cod, haddock).

One of the principal concerns about sediment contamination is the potential effect on the fisheries in Casco Bay. Fish and lobsters may absorb toxics directly by exposure to contaminants in the water and/or indirectly by eating contaminated food -- particularly the benthos that live and feed among the sediments at the bottom of the Bay. Lobster, crabs, and bottom-feeding fish such as flounder are most at risk.



Mammals and birds are also at risk from contaminated sediments. A seal may feed on contaminated fish, and over the course of a lifetime accumulate a toxic level of chemicals. Shorebirds, waterfowl, wading birds and other birds feed in



Casco Bay. Among their most important feeding areas are the inner Fore River, the Back Cove, and the Presumpscot River; these areas also have the highest levels of contaminated sediments in the Bay.

Signs of environmental impacts on Casco Bay's living communities include:

The animal community in the flats of Back Cove is altered. Some of the animals that would be expected to be found on these flats are missing.

In the inner Fore River the benthos already has been dramatically impaired and for this reason the river does not meet State water quality standards. In bottom samples taken in 1989 hardy worms were present in much smaller numbers than would be expected, while mollusks and crustaceans were not present. Some of the worms had oil on their "feet" (parapodia).

Blue mussels collected in 1987 in the outer Fore River had elevated levels of lead in their tissues; in the Presumpscot River they had elevated levels of mercury.

The livers of flounder caught off the Kennebec River were found to have elevated levels of lead, copper, zinc, and PCBs in 1984. Experiments have shown that flounder are particularly susceptible to developing tumors after eating worms contaminated by petroleum by-products.

Dioxin levels in lobster meat were elevated slightly; however, dioxin in the tomalley was greatly elevated (20-30 times greater than the meat). In February 1994, a consumption advisory was issued for consumption of tomalley for the entire coast.

What Are the Trends?

Historically industrial development in the Portland area, which started in the 1840s, contributed a myriad of pollutants to Casco Bay and has left a legacy in the sediments. With the passage of the National Environmental Policy Act in 1970, the stage was set to protect the air, land and water. Constructing sewage treatment plants, requiring industry to treat their discharges, and better management of solid waste have all contributed significantly to the clean-up of Casco Bay.

The limited evidence available appears to indicate that toxic contamination is still entering Casco Bay, but at a much lower rate than in earlier decades. However, work is still needed to reduce the level of sediment contamination.

The Casco Bay Estuary Project is developing recommendations to reduce the amount of contaminated sediments entering Casco Bay. The final recommendations will be part of the Casco Bay Plan. Here is a sample of what we're recommending:



Action: Develop consensus about disposal of dredged materials in Casco Bay that are contaminated from toxic pollution.

Action: Develop sediment quality standards that are applicable to Casco Bay.

Action: Support efforts to develop sediment quality discharge limits that are applicable to Casco Bay.

Action: Develop biological/environmental indicators.

Action: Establish a monitoring program to conduct periodic sampling (e.g., in 5 years for sediments and more frequently for tissues) to assess whether or not sediment and/or tissue quality is improving.

Action: Sample "hot spots" identified in the sediment contamination study and other areas that may be potential "hot spots" in Casco Bay.

Action: Establish a toxic pollution program for Casco Bay communities and small businesses.

Action: Do not remediate existing contaminated sediments in Casco Bay.

This article is based on the Project's more detailed report titled "Toxic Pollution in Casco Bay". For your draft copy call the Project at 828-1043. Comments are invited.





Bay links



Casco Bay's Clams and Pollution - Protecting an Economic Resource

May 16, 1995 - 6:45 PM - 9:00 PM

Beam Classroom, Visual Arts Center, Bowdoin College,
Brunswick Co-Sponsors: Casco Bay Estuary Project, Friends of
Casco Bay, Harpswell Marine Resources

Clams and Casco Bay - they go hand in hand. But over 36% of Casco Bay's clam flats are closed to harvesting largely because of pollution, creating an economic loss to the Casco Bay region. Join us for a presentation by biologist and researcher Chris Heinig, who will present his recent findings about the previously unknown economic value of clam flats in Casco Bay. What will it take to open the flats and realize the benefits? A representative from the Town of Harpswell will talk about how motivated volunteers successfully re-opened flats closed by pollution. Krista Longnecker of Friends of Casco Bay will talk about potential pollution threats to an urban clam flat, and her organization's program to re-open closed flats in Casco Bay.

After the presentations you are invited to discuss your thoughts about the Casco Bay Estuary project's draft recommendations to protect and open closed shellfish flats.



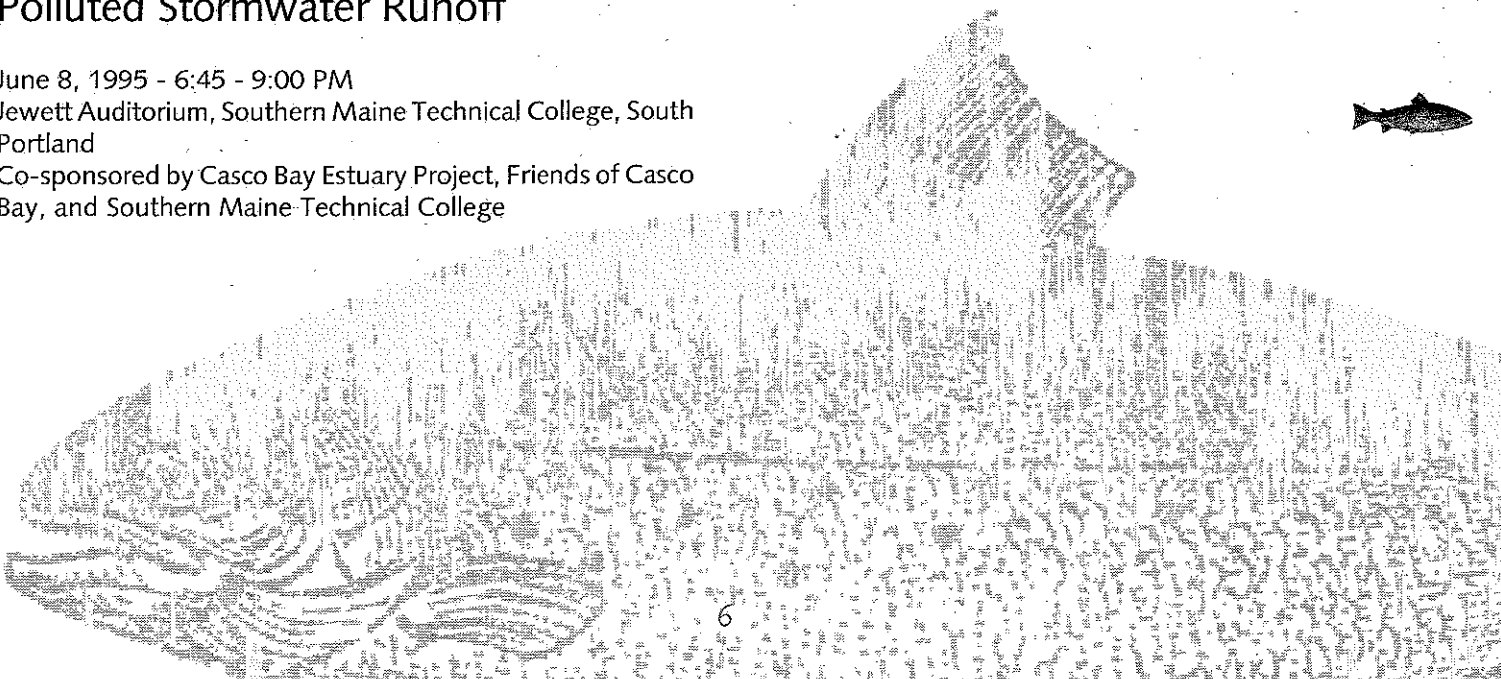
The Invisible Problem in Casco Bay - Polluted Stormwater Runoff

June 8, 1995 - 6:45 - 9:00 PM

Jewett Auditorium, Southern Maine Technical College, South
Portland

Co-sponsored by Casco Bay Estuary Project, Friends of Casco
Bay, and Southern Maine Technical College

One of the largest pollution threats to Casco Bay comes from nonpoint source polluted stormwater runoff, which can carry a witches brew of pollutants from urban areas, agricultural lands, and suburban landscapes. But fortunately we're learning more about this invisible problem in Casco Bay. Join Horsley & Witten scientists for a presentation on their stormwater runoff study of Maquoit Bay in Brunswick, which focused on nutrients and pathogens. This study will serve as a model for other communities who want to better protect their coastal waters. Dufresne-Henry engineer Kevin Feuka will then talk about their just-completed case study manual on cost-effective environmental measures that towns and homeowners have taken to reduce polluted stormwater runoff. After the one-hour presentation you are invited to discuss your thoughts about the Casco Bay Estuary Project's draft recommendations to reduce polluted runoff in Casco Bay.

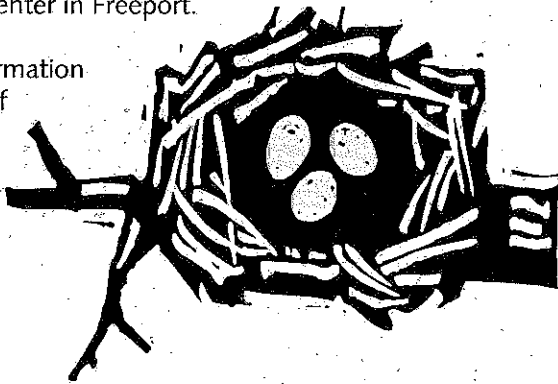


Maine Coastal Nesting Islands Forum on May 30

Several hundred of Maine's coastal islands provide vital habitat for a wide variety of seabirds, wading birds, and even eagles. With human pressure on nesting islands increasing, discussion about current issues and voluntary methods of protecting and managing the islands in a way that balances nature and human activity has become more critical.

On May 30, the U.S. Fish and Wildlife Service's Gulf of Maine Project and other conservation organizations and government agencies are co-sponsoring a public forum entitled "Maine Coastal Nesting Islands...into the 21st century". This forum will be on Tuesday, May 30 at 7:00 PM at LL Bean's Casco Conference Center in Freeport.

For more information call the Gulf of Maine Project at 781-8364.



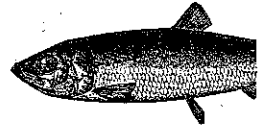
Pumped Your Septic Tank Lately? Call us for a discount coupon!

If your house is hooked up to a city sewer, read no further. But if you're using a septic system, there are a few important things you should know. Proper maintenance can save you a lot of money, and a large-scale mess. One of the most important things you can do is to have your septic tank pumped out every three to five years. This simple precaution can add years to the life of your system, and save you a bundle in the long run. From an environmental perspective, you'll be doing your local water supply a world of good by pumping out your tank regularly.

To encourage residents to maintain their septic systems, a coastal-wide education program has been launched by the Casco Bay Estuary Project, the Maine State Planning Office, the Department of Environmental Protection, and the Department of Economic and Community Development. To motivate septic system owners a \$10-off coupon for septic system inspection and pumping from participating companies is available.

For your \$10-off coupon and names of participating septic system cleaning companies in your area, call the Casco Bay Estuary Project at 828-1043.

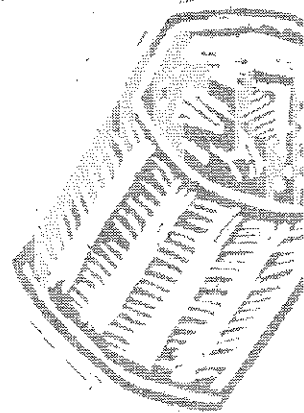
Volunteers Needed for Land-Sea-Land Debris Clean-Up On June 17



The third annual "Land-Sea-Land" clean-up, a spring event aimed at cleaning up accumulated winter debris along Portland's waterfront and on Casco Bay islands, is happening on Saturday, June 17 in Portland. The Casco Bay Estuary Project is joining with the Friends of Casco Bay, Maine Island Trail Association, Portland Harbor Marine Debris Council, USM Recycles, and the Aqua Diving Academy to comb the waterfront in Portland and South Portland and on Little Chebeague Island. Individuals, land trusts, lake associations, yacht clubs, conservation commissions, and businesses are also encouraged to organize local teams.

Volunteers will meet at the Whale Wall at the State Pier on Commercial Street in Portland at 9:00 AM on June 17. From 9:00 to about noon teams will clean up the waterfront piers, and collect water-borne debris. From 1:00 - 5:00 PM a team will do a beach clean-up on Little Chebeague Island in Casco Bay. Volunteers are encouraged to participate in either or both clean-ups, and should bring gloves, a windbreaker, lunch, and wear sturdy shoes. Divers are encouraged to participate! Those participating in the island clean-up need foul weather gear, a life jacket, and an adventuresome spirit.

For more information call the Friends of Casco Bay (799-8574) or the Maine Island Trail Association at 761-8225.





Address Correction Requested

04103

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Casco Bay Estuary Project



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Editor's note: The winter issue of Currents included a map illustrating data the U.S. Fish and Wildlife Service's Gulf of Maine Project is using in conducting its analysis for the Casco Bay Plan. Data sources for the map were inadvertently omitted, and the Gulf of Maine Project wants to gratefully acknowledge that data was provided by the Maine Office of GIS and Maine Department of Inland Fisheries and Wildlife.

Special Thanks to Randall Landry for Design & Layout