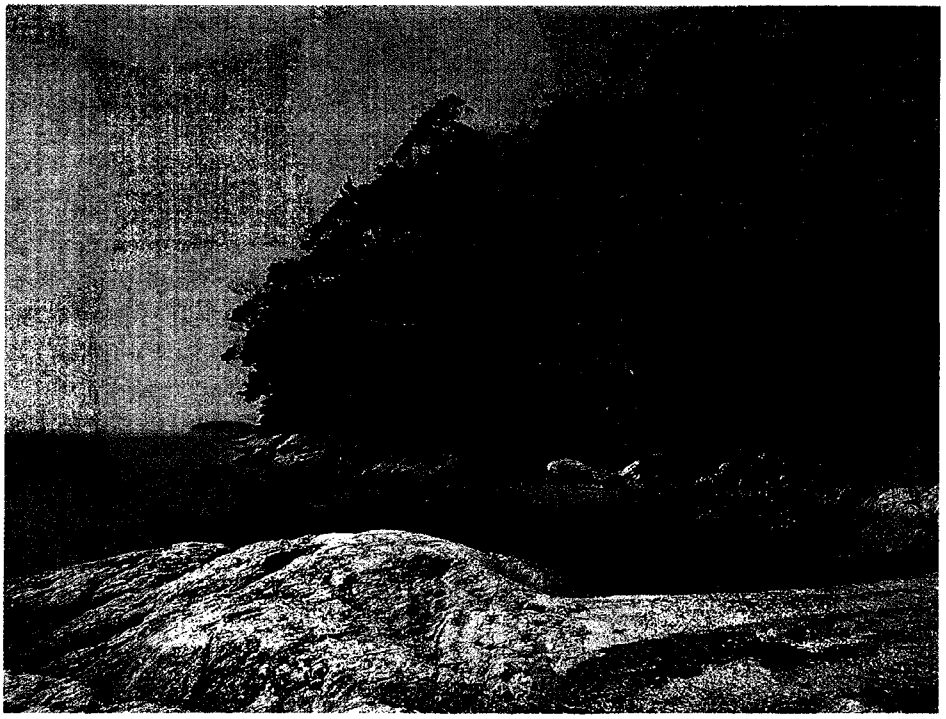

Casco Bay Estuary Project

Triennial Implementation Review

March, 2004

Casco Bay Estuary Project
Triennial Implementation Review, March 2004

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15 – *Partnerships in Action* A partial list of CBEP Partnerships

1. Annual Funding Guidance Reporting Requirements

a.) **Annual Workplans** – Annual workplans for our Implementation Years 6 (October, 2001 – September, 2002), 7 (October, 2002 – September, 2003), and 8 (October, 2003 – September, 2004) were submitted previously; Please also see the supplemental information for CBEP's Year 6 and 7 workplans submitted in March, 2004

b.) **GPRA** – Submitted previously

c.) **Implementation Tracking System** – (Attachment 1)

The Casco Bay Estuary Project (CBEP) has been using the attached Excel spreadsheet to track implementation progress on specific *Casco Bay Plan* (CCMP) action items for many years and has found it to be successful. This table is very useful in writing annual workplans, setting an annual budget, and tracking progress and achievements. The table is updated regularly and distributed to the CBEP Board of Directors, staff, and partners as a means of communication as well as a way to solicit feedback and additional information. The table is also posted on our website for a broader audience.

In addition, the Casco Bay Estuary Project publishes a "State of the Bay" report and hosts a "State of the Bay" conference for communicating progress and achievements to the public. The next "State of the Bay" conference and report are planned for 2005.

d.) **Environmental Progress Report**

As mentioned above, the Casco Bay Estuary Project is currently working toward the development of a "State of the Bay 2005" report.

The last "State of the Bay" report was published and distributed in 2000 and served primarily as an education and outreach document (Attachment 2). It was published as a full-color newspaper insert in the Maine Sunday Telegram which is circulated to 100,000 people in the region. In addition, the document was disseminated at the State of the Bay 2000 conference and through our partners.

The State of the Bay 2005 report is envisioned to contain significantly more quantitative environmental data and will reflect CBEP's new environmental indicators. We are currently analyzing our sediment toxics data and are working with the Friends of Casco Bay to analyze the last ten years of water quality data. We originally planned to publish the next State of the Bay report in 2004 but are currently undertaking a review of our environmental indicators and environmental monitoring plan for Casco Bay. The indicators developed through this process will provide the

foundation for the next State of the Bay report. As discussed below, we hope to have the evaluation of our environmental indicators completed by June, 2004.

e.) Environmental Indicators –

In 1995, prior to the beginning of CCMP implementation, the Casco Bay Estuary Project Technical Advisory Committee (TAC) developed an extensive environmental monitoring plan, *Measuring Progress: The Casco Bay Monitoring Plan* (CBEP, 1996), as a supplement to the *Casco Bay Plan* focused exclusively on monitoring. The CBEP environmental monitoring plan outlines eighteen indicators to be used to track environmental changes in the Bay. For the last eight years, this plan has guided the environmental monitoring efforts of CBEP and our partners. In addition, a number of additional indicators have been added since the 1996 monitoring plan was published; including: air deposition, benthic community monitoring, and additional water quality monitoring data.

CBEP has coordinated and/or funded key activities in support of this plan during the last eight years, including: 1) water quality monitoring throughout Casco Bay by the Friends of Casco Bay (FOCB) and volunteers; 2) targeted hypoxia monitoring in the New Meadows River by FOCB and the New Meadows River Watershed Committee (NMRWC); 3) water quality monitoring within the Casco Bay watershed by the Lakes Environmental Association, Presumpscot River Watch, and Friends of the Royal River; 4) air deposition monitoring at Wolfe's Neck in Freeport as part of the larger Maine Department of Environmental Protection (DEP) statewide air monitoring network; 5) sediment, mussel, and lobster tissue sampling for analysis of toxics; and 6) the statewide U.S. EPA National Coastal Assessment (NCA) monitoring program.

In 2003/2004, CBEP decided that it is timely to review our suite of indicators and environmental monitoring plan to 1) evaluate their success as indicators over the last eight years; 2) evaluate the need for additional or different indicators; 3) provide a foundation for the next "State of the Bay" report; and 4) ensure that CBEP's indicators fit with the framework of other regional indicators being developed (e.g. Gulf of Maine Council on the Marine Environment, Maine Coastal Program, and Northeast Coastal Indicators effort led by Barry Burgan, among others).

A technical advisory committee (TAC) was convened to review CBEP's environmental indicators and monitoring plan. The environmental indicators TAC includes many of the original TAC members and is being coordinated by Diane Gould from EPA Region I. Dr. Gould spends the majority of her time providing technical support to CBEP. The TAC met in March 2004 following the release of the results of the "Northeast Coastal Indicators Workshop" (held in Durham, NH, January 6-8, 2004, and initiated by Barry Burgan from EPA headquarters). This workshop brought together nearly 100 research, non-profit, and agency representatives from New York to Maine to select and prioritize coastal indicators for the entire northeast coastal region. The March 2004 CBEP TAC meeting was a very productive discussion and the group plans to meet monthly until June as needed to finalize the review of CBEP's environmental indicators. Attached please find the minutes from the initial TAC meeting (Attachment 3).

2. Implementation Review Executive Summary

A.) **NEP Achievements:** A more comprehensive and detailed summary of CBEP's achievements over the last three years is provided in our annual workplans, supplements to those workplans, and semi-annual grant reports to EPA Region I. The following partial list briefly highlights some of the major achievements relative to our *Casco Bay Plan* goals during that time period:

***Casco Bay Plan* Priority 1: Minimize pollutant loading from Stormwater**

- Through a collaborative effort with the Cumberland County Soil and Water Conservation District (CCSWCD) and with funding from an EPA Smart Growth/Alternative Futures grant ($30,000) and the Cumberland County Emergency Management Agency (CCEMA), CBEP facilitated the regional collaboration of the eleven municipalities facing NPDES Phase II stormwater regulation in the Casco Bay watershed (Portland, South Portland, Falmouth, Yarmouth, Freeport, Windham, Westbrook, Cape Elizabeth, Gorham, Scarborough, and Cumberland). The communities signed an interlocal agreement and have developed a regional stormwater management plan. The Casco Bay Interlocal Stormwater Working Group has formed a strong working relationship and is now working on a statewide stormwater education campaign as well as other aspects of implementation. CBEP will continue to work closely with this group.

- CBEP, together with the Maine Coastal Program/Maine State Planning Office and CCSWCD hosted the "*Stormwater Management in Cold Climates: Planning, Design, and Implementation*" conference November 3-5, 2003 at the Holiday Inn by the Bay in Portland, Maine (Attachment 4). This was the first North American conference of its kind and drew nearly 400 attendees from 5 countries and 22 U.S. states. National and international experts shared case studies and new technology on the specific challenges of managing stormwater in cold regions. The conference evaluation forms revealed that is was a huge success and conference proceedings may be found on our website at www.cascobay.usm.maine.edu/coldsw.html.

- CBEP convened a new CBEP Stormwater Committee that includes state and federal government agencies, municipalities, non-profits, CCSWCD, Maine Nonpoint Education for Municipal Officials (NEMO), and others. The Committee's current priority is to assist municipalities in the region with implementation of their NPDES Phase II stormwater management plans with funding, grant-writing and technical assistance. The Stormwater Committee is working closely with the *Casco Bay Interlocal Stormwater Working Group* to identify priority projects.

- In partnership with Friends of Casco Bay, CBEP provided funding and technical assistance for the development and publication of *Community Strategies to Improve the Bay* (Attachment 5), a document outlining targeted actions in each individual

coastal town to improve and protect water quality, wetlands, and habitat. Over eight years of intensive water quality, sediment and biological tissue data from CBEP's and FOCB's environmental monitoring programs provide the technical foundation for the plan. In addition, interviews were conducted with town officials to determine priority environmental issues and opportunities. *Community Strategies* serves as a companion document to the *Casco Bay Plan*, providing more detailed recommended implementation strategies at the town level. FOCB has been making community-specific presentations of *Community Strategies* to City Council members and town administrators or equivalent local leadership entities to secure municipal commitments for implementation of specific recommendations.

- CBEP funded three 6-week best management plan training seminars to enable professionals in site development to meet current stormwater management and erosion control laws.

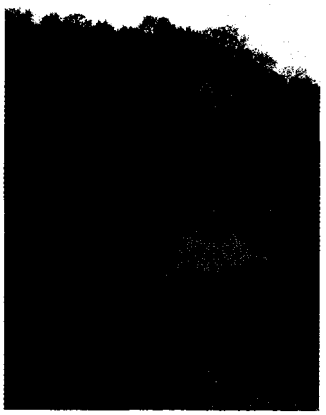
Casco Bay Plan Priority 2: Open and protect shellfish beds

- CBEP's Clam Flat project, *Expanding and Sustaining the Shellfisheries of Casco Bay*, funded under an EPA Sustainable Development Challenge Grant, improved water quality to re-open soft-shell clam resources closed to harvest and developed tools to support sustainable management of shellfisheries. To date, over 300 acres of clam resources (actual resource area not just habitat/flats) were reopened in Cumberland, Yarmouth, Freeport, Harpswell and Brunswick as a result of overboard discharge (OBD) removal and increased communication through this project. CBEP produced and distributed a fact sheet (Attachment 6) on the project and continues to work with the project's steering committee, the "Clam Team", to implement additional projects to re-open additional flats and further promote sustainable management. The project reports are available at www.cascobay.usm.maine.edu/clamreport.html

- CBEP continues to fund annual one-day trainings for septic system installers hosted by the Cumberland County Soil and Water Conservation District. The goal of the training is to ensure that installers are trained in proper septic system installation techniques to prevent discharges from improperly installed or failing systems that can cause water quality degradation and shellfish bed closure. The workshops have drawn over 650 participants over the last three years.

- CBEP continues to participate actively in and provide annual funding to support the *New Meadows River Watershed Committee* (NMRWC). The NMRWC has developed a Strategic Plan, State of the River Report, and Watershed Management Plan over the last several years. CBEP is also working closely with the NMRWC on a focused strategy to re-open shellfish beds in the watershed that are closed due to the presence of overboard discharge systems (OBD) and other fecal bacteria sources. During the past year, NMRWC conducted a watershed survey for non-point sources of pollution and is investigating the removal of a dam to restore natural tidal flow to a

flow-restricted coastal embayment. NMRWC has also been very active with education and outreach in the region. To learn more and to download these documents, please visit http://academic.bowdoin.edu/new_meadows/



Casco Bay Plan Priority 3: Protect and restore habitat

- The _Casco Bay Estuary Project (CBEP) Habitat Protection Fund (HPF)_ has assisted local land trusts and municipalities with permanent protection of over 2,500 acres of high value habitat in the last two years. The CBEP HPF provides up to $25,000 per project to assist with land acquisition or conservation easements and can be used for transaction costs, appraisals, surveys, and natural resource assessments, as well as to provide direct funding for acquisition or easements. This funding has helped to leverage larger funding sources by making funding available for necessary activities that other sources won't typically cover and by being an early donation in the process to help catalyze the project. CBEP works closely with the U.S. Fish and Wildlife Service and Maine Coast Heritage Trust to review proposals, evaluate the habitat values on each property, identify the highest priority projects for funding, and, most importantly, provide technical assistance to local land trusts and landowners. Please see Attachment 7 for fund guidelines.

- The Casco Bay Estuary Project recently launched a new Habitat Restoration Program which convened interested agencies and stakeholders to partner to facilitate restoration in the Casco Bay watershed. The Habitat Restoration Committee's first priority was to identify restoration needs in the watershed. The Committee produced a habitat restoration fact sheet (Attachment 8) that was distributed to over 200 stakeholders in an effort to identify local projects and partners. In addition, the Committee was recently awarded $25,000 from the Gulf of Maine Council on the Marine Environment to conduct an inventory of habitat restoration opportunities in the lower Presumpscot River watershed. The Committee is also currently working to improve alewife passage at the Highland Lake dam and has provided funding to the Outer Green Tern Restoration Project in Casco Bay.

- In 2000, CBEP brought the NEP model to the Presumpscot River sub-watershed when it convened a diverse group of stakeholders to develop a management plan for the river. The Presumpscot is a 22-mile river impounded by nine dams without fish passage that once boasted significant anadromous fish runs. At that time, major changes were taking place (i.e., the removal of the lowest dam on the river and the cessation of pulp mill discharges) and the river began making a dramatic recovery. The need for a management plan to address both the new opportunities and environmental challenges that resulted was apparent. For three and a half years, CBEP facilitated and funded technical support for the stakeholder group to develop three very detailed technical white papers that formed the foundation of the plan and,

ultimately, *A Plan for the Future of the Presumpscot River* (Attachment 9). The plan, which focuses on three areas: fisheries, open space, and cumulative impacts, was finalized in the fall of 2003 and the partners have already initiated implementation. A new coalition, the Presumpscot River Watershed Coalition (PRWC), has grown out of the original planning committee and is developing its own bylaws and organizational framework to accomplish its mission of implementing the plan. CBEP will continue to participate actively with PRWC through implementation.

***Casco Bay Plan* Priority 4: Reduce toxic pollution**

- CBEP was an active partner with the *Casco Bay Clean Boatyards & Marinas Program* launched in 2002 in partnership with Maine Marine Trade Association and a number of other organizations. The *Clean Marinas* program is a voluntary program to encourage marinas and boatyard owners in Casco Bay to become "green" by awarding them a special designation when they pass a detailed certification inspection. Eleven of the thirty Casco Bay businesses signed the *Clean Marinas* pledge and an additional five went through the full certification program to received awards for their environmental excellence. Five marinas received cost-share assistance grants to assist with the installation of new best management practices (BMPs). Multiple news articles and TV clips covered the story as new businesses became certified.

- The CBEP Air Deposition Project, funded through the Great Waters Program and EPA Office of Water, established an air deposition monitoring site in Freeport, Maine. The results of data collected over a four-year period indicate that atmospheric deposition of both mercury and nitrogen is a current and very significant source of pollution to Casco Bay (See Attachment 10 for the Executive Summary). A sampling train was added to in February 2002, to collect a suite of trace metals over a one year period that will be analyzed and compared to significant mercury depositional events to help track the sources of mercury entering the bay. The Project has also developed an air deposition loading estimation protocol which may be used by other community-based programs to quickly estimate the magnitude of air deposition of pollutants where field monitoring may not be practical. The loading estimates were developed for Casco Bay by applying the protocol compare favorably with the field monitoring data, suggesting that the estimation protocol is a useful tool. The project team wrote a paper entitled "Estimating Estuarine Pollutant Loading from Atmospheric Deposition using Casco Bay as a Case Study" (The paper is available at our website at www.cascobay.usm.maine.edu/estimate.pdf). The paper has gone through EPA peer review process and has been submitted to *Estuaries* for possible publication. The Maine Department of Environmental Protection (DEP) has agreed to continue funding sample collection and analysis at the Freeport site as part of a statewide and national air monitoring network.

- CBEP has periodically collected sediment samples from around Casco Bay over the last twelve years for analysis of toxic constituents. In 2001 and 2002, CBEP

collected sediments from 33 locations around Casco Bay including sites that were sampled ten years ago. Samples were analyzed for total organic carbon, grain size, a suite of metals, tributyl tin (TBT), dioxins, furans, and polychlorinated biphenyls (PCBs). The results of these analyses will be compared with those from ten years ago to assess changes in the chemistry of Casco Bay sediments and incorporated into a synthesis and reporting on all toxics data from Casco Bay collected since 1990.

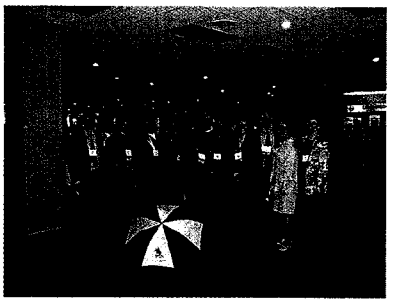
- According to a report written for CBEP by the State Toxicologist 1997, mussel tissue levels of lead, arsenic, dioxin, and total PCBs exceeded state health-protective action levels at several sites in the Bay. The report stated that "information on the extent of recreational ... harvesting of mussels in Casco Bay is needed to help in evaluate the need to issue an advisory." Following up on this report, CBEP re-sampled mussels in 2001 and applied for and received a $20,000 EPA Environmental Justice grant to determine whether minority and low income populations in Casco Bay were harvesting and eating mussels at a rate which would pose a health risk. While the sample size of the target population responding to consumption surveys was limited, it appeared that consumption of polluted mussels was probably not high enough to warrant posting warnings.

- Lobsters were sampled at selected sites in Casco Bay in summer 2002, analyzed for toxics, and the data was evaluated by the State Toxicologist. While the meat was found to be safe to eat, the tomalley was high in PCBs, PAHs, pesticides (mainly DDTs), cadmium and arsenic.

Casco Bay Plan Priority 5: Promote responsible stewardship

- CBEP continues to collaborate with the Friends of Casco Bay, Lakes Environmental Association, Friends of the Royal River, and Presumpscot River Watch to engage citizens in volunteer water quality monitoring throughout the Bay and its watershed.

- In partnership with the Cumberland County Soil and Water Conservation District (CCSWCD), and others, CBEP supports several annual educational programs for school-age children, the *Children's Water Festival*, and the *Envirothon*. The *Children's Water Festival* is a huge success annually, with over 800 fifth and sixth graders from the watershed participating in a day filled with environmental lessons and experiments. The *Envirothon* is a national competition focused on environmental themes, with teams participating from local schools. In addition, CBEP provides funding to CCSWCD annually to hire an environmental education coordinator to work directly with local schools to deliver environmental education programs in the classroom and to train teachers. During the 2001-2002 school year, the AmeriCorps Environmental Coordinator presented environmental science lessons to 2,604 students from 18 schools and organizations.



CBEP Organizational Goal 6: Sustain and promote the continued effectiveness of CBEP with necessary resources, appropriate organizational capacity, outreach, and stakeholder involvement

- CBEP launched its new Outreach Committee comprised of representatives from partner organizations, Board members, and staff. The primary goal of this committee is to raise awareness about CBEP, its partners, and activities and accomplishments toward implementing the *Casco Bay Plan*. The new outreach efforts are intended to complement the numerous ongoing education/outreach efforts by CBEP and our partners to the general public about the environment and stewardship. The new outreach effort is targeting legislators, the media, community and business leaders, funders and partners and is a key piece of CBEP's long-term funding strategy. The first project of the Outreach Committee was to develop a new outreach brochure/folder (Attachment 11) to describe who CBEP is, what our priorities and activities are, and was designed to be timeless, versatile, concise, visually engaging, and to highlight our website. The Outreach Committee is currently developing a new Outreach Strategy for implementation in the coming years (Attachment 12).

- CBEP has been successful in getting news coverage of a number of our projects in local and regional newspapers as well as statewide TV coverage on several projects. Please see Attachment 13 for selected news clippings.

- CBEP has worked through a number of avenues to develop a long-term funding strategy. Please see discussion on pages 14-16 for more detail.

- On-line since September 2000, CBEP continues to expand and improve our webpage, www.cascobay.usm.maine.edu. CBEP staff (Beverly Bayley-Smith) serves as web-master and updates the web page frequently, adding new grants, volunteer opportunities, and other links in addition to all new CBEP documents and fact sheets as they become available. The CBEP website is a resource used by many of our partners and others. During the months leading up to the Fall 2003 stormwater conference, the website received several hundred hits daily.

- In November of 2001, CBEP held a lively and well-attended two-day Board retreat. The group reviewed the first five years of implementation and set priorities for the future implementation of the Plan. Two areas were strongly recommended as priorities for future activities: stormwater management and habitat protection and restoration. In addition, the group discussed the search for a new Director and Board Chair in 2002. Congressman Tom Allen visited the retreat and thanked the participants for their efforts. Bob Varney (EPA Region1), Martha Kirkpatrick, Maine DEP Commissioner, and Congressman John Baldacci also sent thank you messages via video and telephone.

- CBEP has been working to strengthen and develop new partnerships with organizations such as Maine SeaGrant, the Wells National Estuarine Research Reserve, and the Maine State Planning Office, as well as businesses and faculty and others within the University of Southern Maine. A number of new collaborative projects have already been initiated.

CBEP Organizational Goal 7: Monitor and assess the effectiveness of *Casco Bay Plan* implementation

In addition to the toxics monitoring highlighted on pages 7 and 8 and the volunteer water quality monitoring programs discussed on page 8, CBEP conducts the following environmental monitoring:

- CBEP provides funding to support the Friends of Casco Bay (FOCB) volunteer water quality monitoring program that samples over 100 stations throughout Casco Bay. In addition, CBEP provides funding to FOCB to conduct focused dissolved oxygen (DO) monitoring to evaluate hypoxic problems in the Bay. Generally, the lowest DO concentrations were found in developed areas with potentially heavy nutrient loading and organic material. Low DO concentrations were, however, also observed in less developed areas where restricted circulation may exacerbate anthropogenic impacts (New Meadows River and Quahog Bay).

- CBEP manages the statewide environmental monitoring through the EPA National Coastal Assessment/Coastal 2000 program. CBEP hires local crew, captain and boat, coordinates training, and manages the project in Maine. Water, sediments and biota are sampled for a suite of parameters, to assess the general health of Maine coastal waters and compare them to the rest of the coastal waters of the nation. The benthic sampling is especially valuable because there is little data available on the benthic community of Maine's coastal waters and it provides the state with necessary data for the state 305(b) reports. In 2000-2001, the entire Maine coast was sampled. The goal of the subsequent three-year program (2002, 2003, and 2004) is to sample approximately 100 stations along the coast of Maine between early July and mid-September on a rotating schedule. The first year (2002) "Downeast" areas were sampled with an emphasis on Blue Hill Bay and a lesser emphasis on Cobscook Bay. The second year (2003) the midcoast will be sampled with an emphasis on Penobscot Bay and the third year (2004) southern Maine will be sampled with an emphasis on Casco Bay.

B.) Progress Addressing Previously Identified Challenges:

CBEP has made excellent progress toward addressing all of the challenges identified in previous reviews as summarized below.

Challenges identified in the 2001 Triennial Implementation Review include a need to:

- Explore long-term funding options;
- Document leveraging of in-kind resources dedicated to CBEP projects;
- Increase outreach on progress implementing the *Casco Bay Plan*, specifically, the inclusion of information on the CBEP website or "State of the Bay" report; and
- Provide better access to monitoring data.

As discussed on pages 14-16 (Section H), CBEP has invested a significant amount of time and resources in developing a long-term funding strategy. Building on the 2003 "Sustainable Financial Strategy for Casco Bay Estuary Project", CBEP hired a part-time graduate assistant to do grant-writing for projects. CBEP is also actively pursuing many of the other recommendations in this strategy as well in addition to researching additional potential funding sources at the state level.

During Year 7, CBEP participated in a study of leveraging. The study was funded by EPA and conducted by Kevin Dietly of Northbridge Consultants and finalized in January, 2003. This study covered two years of CBEP programs from October 1, 2000 to September 30, 2002 (Implementation years 5 & 6). The study found that the average leveraging of funds by CBEP over the two year period was a ratio of 2.72:1. However, the definition of which resources counted as leveraging used in this study was very conservative and thus, substantially underestimates the actual leveraging of resources by CBEP. CBEP now thoroughly documents leveraging of cash and in-kind resources as part of our annual workplans.

CBEP plans to include visual graphics highlighting progress toward implementing the *Casco Bay Plan* in the "State of the Bay 2005" report. In addition, our CCMP implementation tracking table is posted on our website.

CBEP now posts all of our significant reports on website, thereby providing much greater access to this information and the underlying data for each project. In addition, we are working specifically on two reports to get our monitoring data out to the public – a report summarizing all of our toxics monitoring data collected over the last ten years and the "State of the Bay 2005" report. CBEP believes that distributing data along with an analysis of it is the best format for distributing it to the lay public. In addition, CBEP is working closely with the Friends of Casco Bay to geo-reference their water quality monitoring data with the goal of making all of these data and summary maps available through their website with a link from our website.

Two challenges identified in the 1998 Biennial Implementation Review and addressed in the 2001 Review included a need to:

- Consider hiring additional staff; and

- Implement more projects in the watershed of Casco Bay.

CBEP has functioned very well by implementing most projects through its partners and keeping staff at a minimum in order to devote most of the organization's financial resources to on-the-ground projects. With the increase in federal funding beginning in Year 7 and the resultant increase in project activity, the Board of Directors plans to review the appropriateness of the current staffing level as part of the development of this year's (Year 9) workplan and budget.

CBEP continues to work actively throughout the Casco Bay watershed on projects. Several examples discussed previously include the development and implementation of *A Plan for the Future of the Presumpscot River* and partnerships with the Lakes Environmental Association on habitat conservation and lake water quality monitoring.

C.) New or Emerging Challenges or Priorities, plans for addressing them, and identification of ways EPA can support efforts to address them.

Priorities

During the Fall 2001 Board retreat, Board members, together with staff, reviewed CBEP's implementation progress over the first 5 years and selected two priority focus areas for the coming years – Stormwater and Habitat (both Restoration and Protection). The Year 7 and 8 workplans reflect these two priorities with a significant percentage of funding and other resources devoted to these two areas. As part of this new focus, three new Sub-Committees comprised of partners and stakeholders from agency, non-profit, municipal, business, citizen and other sectors have been established: Habitat Restoration, Stormwater, and Habitat Protection. To read further about the Committees' activities and other progress in these priority areas, please see pages 4-7.

Challenges:

1.) To a certain degree, funding always determines how much you can do relative to projects; however, non-federal funds for match are becoming increasingly scarce in the current depressed economy. In particular, a number of federal funding sources (e.g. NOAA, Army Corps, USFWS, Five Star, GOMC, etc.) are available to implement on-the-ground habitat restoration projects but most of these funds require significant non-federal match.

CBEP continues to be successful in finding match for our base funding and has also reached out to our local and state partners to explore all possible match sources for other grants but there is a dearth of local, regional and state matching funds right now. As a result, available federal funds are increasingly difficult to access – and in some cases have been totally passed over as potential funding sources – because there isn't enough match available. After all, volunteer commitments and other in-kind match sources can only go so far to help leverage large federal grants when state and local funds are not available.

If EPA's non-federal match requirements were loosened on both the NEP base funding and other grant funding, it would significantly increase opportunities to put those funds

into badly needed on-the-ground restoration projects and other projects with measurable environmental results.

2.) Marine Invasive species are a growing concern for the Casco Bay ecosystem, particularly given the importance of coastal tourism and the fishing and shellfishing industries to Maine's economy. Although Maine is a leader in fighting freshwater invasions, it has done very little to address or research the marine invasive species issue. Marine invasives are not mentioned in the *Casco Bay Plan* because the issue was not "hot" at the time it was written but, given that habitat is a top priority, CBEP has initiated an effort to raise awareness and stimulate activity on this issue in Maine. On May 5, 2004 CBEP, together with Maine SeaGrant, is co-hosting a day-long forum on marine invasive species, *Maine's Marine Invasion: A Forum on the Impact of Non-native and Other Invasive Organisms on Maine's Coastal Ecosystems* (Attachment 14). The morning plenary session will feature presentations on species present, potential impacts, vectors, and a management case study. The afternoon session, for invited professionals, will consist of concurrent working group sessions in four topic areas: research, management, monitoring, and education and outreach.

D.) The role of key stakeholders in supporting CCMP Implementation

One of the biggest strengths of the Casco Bay Estuary Project is its success with involving stakeholders in projects. CBEP operates as a compact of organizations and serves as the convener of interested parties to accomplish tasks for the common good of the natural resources and individuals who live in the watershed; thus, CBEP is really the sum of its partners. CBEP has very active Board Members, stakeholders, and collaborators in its projects. These active partnerships have allowed CBEP to maintain a very small staff (2.1 full-time equivalents (FTE)) while still making significant progress toward implementation. With the expansion of CBEP's budget, CBEP may need to consider a proportionate increase in staffing to manage project activities but will always continue to function as a partnership and will rely on the active participation of stakeholders in implementation.

One challenge posed by this arrangement is that working through this collaborative approach takes time. One way that EPA could help support CBEP is to provide facilitation services at critical junctures during collaborative processes.

Additionally, the close CBEP partnerships contribute to the challenge of maintaining a separate program identity and role in the eyes of the public, particularly in the case of organizations with similar names and missions (e.g. Friends of Casco Bay). The draft Outreach Strategy (Attachment 12) includes action items to help address this issue.

Please see Attachment 15 for a list of most of our partner organizations.

E.) Barriers to CCMP Implementation (political, institutional, etc.)

No major barriers - our state, federal, local and University partners continue to be very supportive of our efforts.

F.) How the NEP's organizational structure facilitates community-based environmental decision making (e.g. how the public is involved in the process)

The CBEP is governed by a 23-member Board of Directors that includes representatives of grassroots organizations, businesses, individual citizens, and municipalities as well as state, regional, and federal agencies and organizations. In addition to community involvement in CBEP governance, all of our committees and projects allow and, in fact, invite open participation by any interested stakeholders. We have many examples of community-based projects. Two examples are 1) the Presumpscot River Management Planning effort, which convened numerous river stakeholders including the business owner of all dams on the river, other businesses, key non-profit organizations, individual landowners, municipal officials and others, to develop a stakeholder-driven management plan for the river; and 2) the CBEP "Clam Team" which brought together local shellfish commission representatives, diggers, non-profits, state agencies and others to guide our effort to re-open softshell clam flats to harvest. Please see the attached list of partners (Attachment 15) for a partial listing of organizations involved.

G.) A Summary of the NEP's Education/Outreach Strategy or Program

In addition to the numerous educational initiatives that both CBEP and our partners undertake to educate and promote stewardship of the environment by the public, CBEP is developing a new outreach strategy to highlight the success of the CBEP partnership in implementing the *Casco Bay Plan.* It is hoped that this effort will serve to bolster our fundraising ability and to also help address CBEP's challenge of a lack of a separate identity. Please see the highlight on page 9 as well as the attached draft outreach strategy (Attachment 12).

H.) A Summary of the NEP's Finance Plan:

- **Highlight particularly successful efforts and approaches as well as challenges or difficulties in obtaining funding**
- **Describe current strategies for obtaining additional funding beyond the minimal match requirements; and**
- **Briefly describe the likelihood of continued public and private funding, program efforts to obtain dedicated public or private funding for the NEP (e.g. a state budget line item), and the likelihood of obtaining such dedicated funding; and**

Development of a new Funding Strategy:
In 1995, prior to implementation, CBEP outlined a funding strategy for implementation entitled *Casco Bay Estuary Program Finance Plan.* This strategy was re-visited in 2001-2002 with the help of assistance from EPA headquarters.

In 2001, CBEP hosted a northeast regional financing workshop in Portland, Maine with significant assistance from EPA. Several CBEP Board members attended the workshop in addition to the CBEP staff and representatives from the New Hampshire Estuaries NEP. Based on the ideas generated in this workshop and discussions among CBEP Board members, a Finance Committee was established to develop a new funding strategy. With

partial funding from EPA, the Committee hired and worked closely with two financial consultants to conduct an evaluation of potential funding sources for CBEP. The consultants conducted in-depth interviews with CBEP partners and potential funders to determine what CBEP's market is and what the potential for funding from various sources is.

In the 2002 "Sustainable Financial Strategy for Casco Bay Estuary Project", the consultants concluded that CBEP is doing an excellent job of building strong partnerships, keeping administrative costs low, leveraging, and focusing on the organization's mission. The organization's unique role and accomplishments are recognized widely by partner organizations. The recommendations that came out of the final report include:

- ❖ Continue to do what you are doing to maintain strong stakeholder relationships!
- ❖ Continue to cultivate Maine Department of Environmental Protection (DEP) as a support constituency;
- ❖ Continue to support projects through partnerships and leveraging;
- ❖ Consider hiring an outreach coordinator/grant-writer;
- ❖ Explore corporate funding and local foundations that do not compete with CBEP non-profit partners;
- ❖ Increase communication and outreach to municipalities;
- ❖ Strengthen partnership with the Muskie School of Public Service within the University of Southern Maine;
- ❖ Consider wastewater utility fees as a potential funding source but approach this very carefully because it is highly political.

1.) Success:
CBEP has been very successful in securing additional competitive federal and state grants (e.g. EPA Environmental Justice and Smart Growth/Alternative Futures grants, and 319 state watershed grants).

In addition, CBEP successfully fought a 100% state funding cut and secured $35,000 annually in addition to substantial in-kind match from Maine DEP during 2002 and 2003. Despite a reduction in our funding, this was a major success considering that the state was facing a one billion dollar state deficit (in a state of only about one million people!) that necessitated layoffs of state employees in 2002 and 2003. CBEP's success in securing this funding commitment was a direct result of CBEP's widespread support for the program among our partners and their members who appealed directly to state legislators for restoration of funding.

2.) Challenges:
The two primary challenges that CBEP faces with a long-term funding strategy are:

- ♦ Depressed state and local economies currently and limited funding potential in these arenas in the longer term; and
- ♦ A strong feeling on the part of CBEP's Board that, because CBEP operates as a compact, it should not compete with its non-profit partners for individual and corporate donations or private foundations that they receive funding from. In

addition, as a part of the University of Southern Maine, CBEP is restricted from competing with corporate and private University funding sources.

3.) Strategies:

CBEP frequently pursues regional, federal and state grant and other funding opportunities that fit with our priorities. As examples, this year, we submitted proposals to:

- The EPA Watershed Initiative grant for ~$850,000 for implementation of the Presumpscot River management plan;
- A state natural resource damage assessment (NRDA) settlement fund for restoration work in the Fore River watershed; and
- The Gulf of Maine Council on the Marine Environment for $25,000 for a habitat restoration inventory (this funding was recently awarded).

In addition, this year, we hired a doctoral graduate assistant, Brenda Zollitsch, with significant fundraising experience to assist part-time with grant-writing for a number of our projects; in particular, the Casco Bay Interlocal Stormwater Working Group. She is exploring opportunities with corporate and private foundations for implementation of specific projects.

CBEP partners are working actively with the state legislature to try to restore CBEP state funding to its previous level and in the longer term, increase that level (see discussion that follows). CBEP's draft outreach strategy directly supports this and other efforts.

4.) Dedicated Funding:

Since the beginning of implementation, CBEP has had a very strong partnership with Maine Department of Environmental Protection (CBEP) and has received cash match funding from Maine DEP annually. For the first six years, this funding amount was approximately $100,000 per year. As described previously, in 2002 this funding was cut to $35,000 annually during a state budget crisis. Based on CBEP's success in fighting a 100% funding cut, we are hopeful that we will eventually be able to restore our state funding to previous levels and, ideally, increase it beyond those levels in the long-term. However, the state is once again facing more than a one billion dollar deficit next year. In addition, CBEP's funding no longer comes through Maine DEP, our long-time partner, but through the University of Maine system. Therefore, CBEP needs to and is currently educating both the University and the state legislature's Education and Appropriation Committee members about our funding needs and the history of state funding. This presents a further challenge in an election year and in a state with short legislative term limits since the committee composition and leadership will likely change significantly in the next year. As mentioned previously, the outreach strategy that CBEP is developing directly supports these efforts.

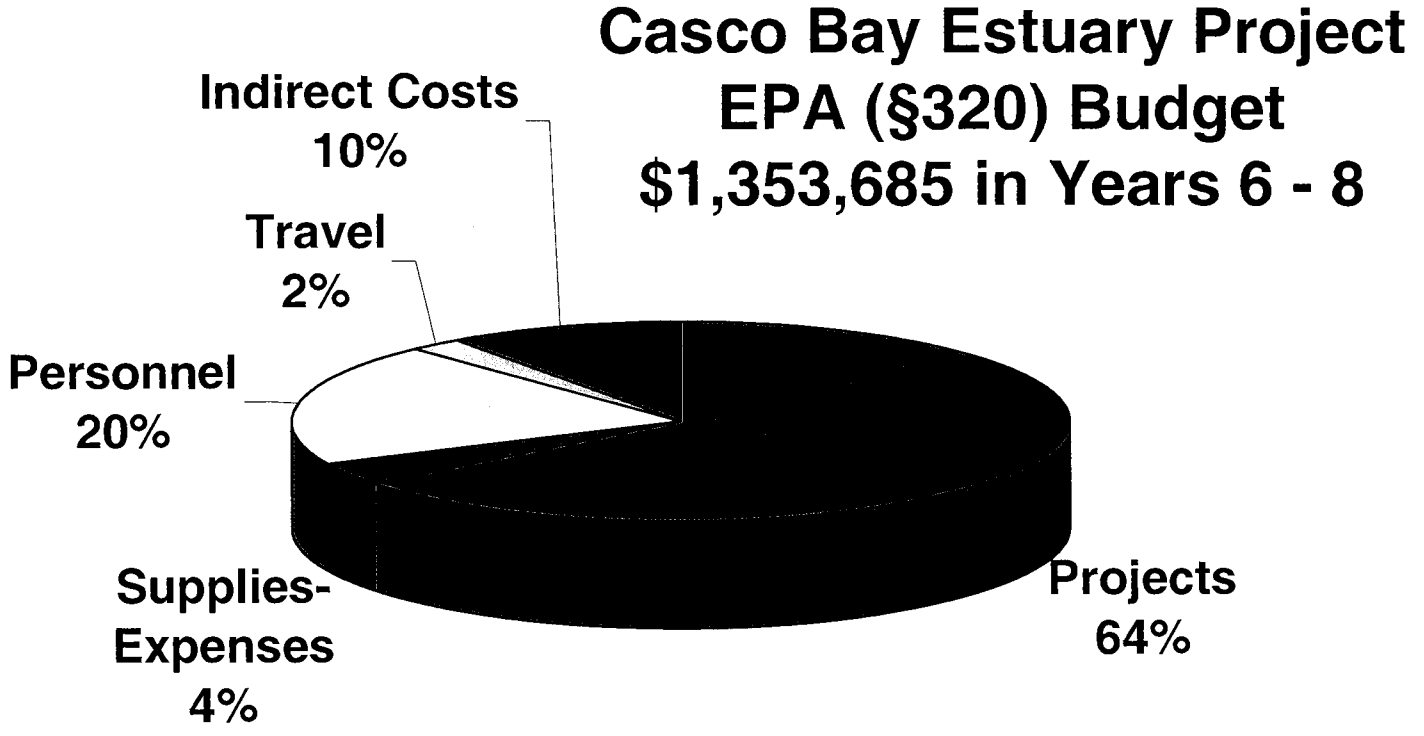
I.) A tabular or graphic summary with an accompanying brief narrative showing how EPA post-CCMP funding has been used since the last review. Include a breakdown of funds used for program staff as well as depicting the amount of funds spent on specific projects and other activities.

As you can see from the graphics and tables on the next several pages, the Casco Bay Estuary Project continues to use most of the funding that we receive for project implementation. CBEP's administrative costs are very low. Thanks to the contribution of half of CBEP's indirect costs by the University of Southern Maine, the overhead costs paid by grantors are particularly low. This allows CBEP to direct most of its funding to projects and the availability of project funds helps to draw partners to the table to collaborate on projects.

As the graphics reflect, the EPA 320 funding that we have received has been used to support a variety of projects in CBEP's five priority areas: Habitat, Stormwater, Clam Flats, Toxics, and Stewardship. In particular, the budget allocations reflect the more recent focus on two of these areas – habitat and stormwater.

* Other cash grants donations and addt'l USM contributions				
	Year 6	Year 7	Year 8	Total
Promoting Local GIS (State-SPO)	$ 16,304			$ 16,304
Promoting Local GIS (SPO IDC)	$ 2,696			
Promoting Local GIS (USM IDC)	$ 21,610			
Nature Preserve (Corporate-WalMart)	$ 11,141			$ 11,141
National Coastal Assessment (EPA)	$ 82,578	$ 82,578	$ 82,579	$ 247,735
National Coastal Assessment (EPA-IDC	$ 19,406	$ 19,406	$ 19,406	$ 58,218
National Coastal Assessment (USM-IDC	$ 19,406	$ 19,406	$ 19,406	$ 58,218
Smart Growth (EPA)		$ 26,512		$ 26,512
Smart Growth (EPA IDC)		$ 3,487		$ 3,487
Smart Growth (USM IDC)		$ 3,487		$ 3,487
Golf Course Workshops (State DEP)		$ 5,915	$ 5,915	$ 11,830
Golf Course Workshops (DEP IDC)		$ 825	$ 825	$ 1,650
Golf Course Workshops (USM-IDC)		$ 825	$ 825	$ 1,650
Invasives Forum (Federal ME Sea Grant)			$ 2,000	$ 2,000
Invasives Forum (Duclos)			$ 750	$ 750
Invasives Forum (USM IDC)			$ 1,116	$ 1,116
Habitat Restoration (State)			$ 17,124	$ 17,124
Habitat Restoration (State IDC)			$ 2,776	$ 2,776
Habitat Restoration (USM IDC)			$ 2,776	$ 2,776
Portland Water District			$ 2,500	$ 2,500
Nutrients (ME DEP)	$ 15,796			$ 15,796
Nutrients (DEP IDC)	$ 2,204			$ 2,204
Nutrients (USM IDC)	$ 2,204			$ 2,204
FOCB Match (Cash & In-kind)	$ 185,223	$ 133,194	$ 113,567	$ 431,984
FOCB IDC	$ 15,344	$ 10,655		$ 25,999
CCSWCD		$ 9,000	$ 15,000	$ 24,000
Air Deposition			$ 13,858	$ 13,858
Stormwater			$ 42,000	$ 42,000
Habitat		$ 250,000	$ 150,000	$ 400,000
New Meadows			$ 5,000	$ 5,000
Board members (in-kind)			$ 7,500	$ 7,500
Total	$ 393,912	$ 565,290	$ 504,923	$ 1,439,819

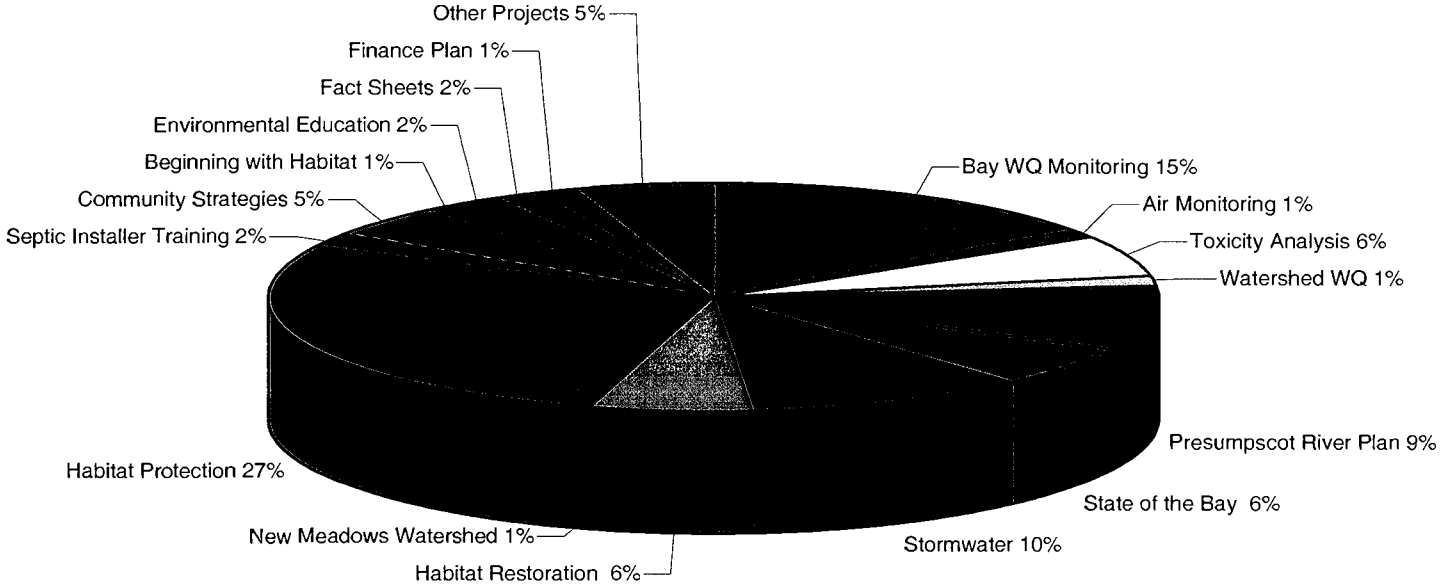
IDC = indirect costs
SPO = State Planning Office


Casco Bay Estuary Project
EPA (§320) Budget
$1,353,685 in Years 6 - 8
Indirect Costs
10%
Travel
2%
Personnel
20%
Supplies-
Expenses
4%
Projects
64%

Casco Bay Estuary Project
Section 320 Funding for Individual Projects Years 6, 7, 8

	Total	Year 6	Year 7	Year 8
PROJECTS				
Bay WQ Monitoring	$ 130,000	$ 50,000	$ 50,000	$ 30,000
Air Monitoring	$ 10,000	$ -	$ -	$ 10,000
Toxicity Analysis	$ 52,000	$ 40,000	$ 12,000	$ -
Watershed WQ	$ 12,000	$ 6,000	$ 6,000	$ -
Presumpscot River Plan	$ 80,000	$ 30,000	$ 30,000	$ 20,000
State of the Bay	$ 50,000	$ -	$ -	$ 50,000
Stormwater	$ 90,000	$ -	$ 80,000	$ 10,000
Habitat Restoration	$ 50,000	$ 20,000	$ -	$ 30,000
New Meadows Watershed	$ 9,000	$ 3,000	$ 3,000	$ 3,000
Habitat Protection	$ 235,000	$ 20,000	$ 125,000	$ 90,000
Septic Installer Training	$ 18,000	$ 6,000	$ 6,000	$ 6,000
Community Strategies	$ 40,000	$ 20,000	$ 20,000	$ -
Beginning with Habitat	$ 10,000	$ -	$ -	$ 10,000
Environmental Education	$ 15,000	$ 5,000	$ 5,000	$ 5,000
Fact Sheets	$ 15,000	$ 15,000	$ -	$ -
Finance Plan	$ 10,000	$ 10,000	$ -	$ -
Other Projects	$ 44,515	$ 9,426	$ 20,000	$ 15,089
Project Totals	$ 870,515	$ 234,426	$ 357,000	$ 279,089
Supplies-Expenses	$ 49,154	$ 9,450	$ 23,204	$ 16,500
Personnel	$ 271,106	$ 58,091	$ 63,929	$ 149,086
Travel	$ 30,000	$ 10,000	$ 10,000	$ 10,000
Indirect Costs	$ 132,910	$ 28,033	$ 47,867	$ 57,010
Total	$ 1,353,685	$ 340,000	$ 502,000	$ 511,685

CASCO BAY ESTUARY PROJECT
Section 320 Funding for Individual Projects Years 6, 7, 8



Status of Casco Bay Plan Implementation

(as of March, 2004)

#	Initiated?	Fully Implemented or Complete?	Ongoing?	Active Project?	*Casco Bay Plan* Action Item (1996)	Current/Updated Implementation Plan (2004)	Priority Issue Addressed	Status / Progress to Date	Partners
PUBLIC EDUCATION ACTIONS									
1	X	Fully implemented	X	X	1. Fund High School Students' Research		All	Friends of Casco Bay, one of our primary partners, involves high school students in work on their water quality monitoring and other programs.	Friends of Casco Bay
2	X	Fully implemented	X	X	2. Focus Post-Secondary Educational Programs on Casco Bay		All	CBEP employs at least one USM Muskie School of Public Service and/or UMaine Law School graduate intern (Two in Years 2 and 6) per year to work on projects related to Casco Bay	University of Southern Maine; University of Maine School of Law
3	X	Complete	X	X	3. Conduct a Comprehensive Campaign to Promote Sound Household Practices		Stewardship	Produced three public service announcements (PSAs) for TV and for radio related to BMPs for yards, the use of non-toxic materials in the home, and general awareness of Casco Bay and CBEP (Years 1 & 2). In year 3, brochures and fact sheets were mailed to watershed residents including information on hazardous waste (information wheels) and a "What is the Casco Bay Estuary Project?" fact sheet (mailed to 2,800 people) and other informational materials. In addition, three other fact sheets were also produced and distributed. In Year 4, additional funding was used to distribute these publications and others at the OpSail 2000 event in Portland Harbor. Also, the FOCB continues to promote and expand its "Bayscaping" program which is a very extensive campaign to reduce pesticide use by homeowners.	Friends of Casco Bay; 4 TV stations; 2 area High Schools; 1 area Church Youth Group; Portland Water District
4	X	Complete	X	X	4. Educate Boaters about Low-Impact Practices, Non-toxic Boat Products, and the Need to Protect Sensitive Harbors		Stewardship	Produced a Casco Bay boaters chart w/ environmental boating information on the back that was distributed beginning in 1998 through town boat registrations and other avenues. In Year 4, $7,000 was allocated to assist with the pump-out program for OpSail 2000. In Years 5 & 6, the Portland Water District made donations to CBEP that was used to assist the FOCB pump-out boat program. Beginning in Year 6, CBEP was an active partner in the Casco Bay Clean Boatyards & Marinas program. Natalya Kassatova, graduate assistant in Year 7 helped produce a BMP manual for this program.	MMTA; FOCB; Marina owners; DEP; PWD & others
5					5. Develop an Environmental Habitat Kit and Guide Maps to Casco Bay for the General Public		Stewardship	CBEP explored opportunities to transfer materials developed by the University of Maine Cooperative Extension. CBEP graduate intern, Joe Boski, developed a reference sheet to send to the interested pubic in response to information requests.	
6	X	Complete			6. Create an Educational Site Demonstrating How Vegetation Reduces Stormwater Runoff		Stormwater & CSOs	Using an EPA Five Star Restoration Program grant, a high-visibility site was created along the Back Cove Trail in Portland that includes demonstration plantings and educational signs; A CBEP graduate intern worked with the City of Portland in conjunction with their Back Cove restoration project and with other collaborators to develop the educational signs.	State Planning Office, 2 local businesses, City of Portland, USFWS, DEP, Americorps
7	X	Fully implemented	X		7. Hold "State of the Bay" Conferences		All	The first State of the Bay conference was held on Dec. 2, 1999 with over 150 people in attendance. The second one was held on June 19, 2002 with 100 participants. A third conference is planned for the Fall, 2004	CBEP Board members and other partners from numerous local organizations
8					8. Extend the State Planning Office's New "Marine Volunteer Program" to Casco Bay		Stewardship	Partnerships with Maine SeaGrant and the Clean Waters/Partners in Monitoring effort were explored but have not developed into a project to date.	
9	X	Fully implemented	X	X	9. Continue Friends of Casco Bay's Successful Volunteer Water Quality Monitoring Program		Stewardship	See Environmental Monitoring action item #1	Friends of Casco Bay, citizen volunteers, businesses

Attachment 1

Status of Casco Bay Plan Implementation

(as of March, 2004)

#	Initiated?	Fully Implemented or Complete?	Ongoing?	Active Project?	*Casco Bay Plan* Action Item (1996)	Current/Updated Implementation Plan (2004)	Priority Issue Addressed	Status / Progress to Date	Partners
TECHNICAL ASSISTANCE ACTIONS									
10	X	Fully Implemented		X	1. Provide Technical Assistance to Help Reopen Clam Flats		Clam Flats & Swimming Beaches	In Years 1 & 2, worked on clam flat restoration on three of the islands in Portland Harbor. In Year 3, CBEP was awarded a $185,000 EPA Sustainable Development Challenge grant to expand and sustain the shellfisheries of Casco Bay. The project spanned Years 3 - 7 and has resulted in the removal of 26 of 31 targeted Overboard Discharge Systems (OBDs) and the opening of over 300 acres of productive soft-shell clam flats in Casco Bay. In addition, work has been done to identify non-point sources of pollution and develop tools for the sustainable management of clam flats. On March 14, 2003 over 1500 acres of shellfish flats in Brigham's Cove and Round Cove were opened to clamming for the first time since the 1970's. Originally closed due to poor water quality caused by malfunctioning septic systems, gray water discharges, and licensed overboard discharge systems (OBDs), the opening was the result of five years of work by local watershed groups, state and municipal officials, property owners, and local volunteers to remove the seventeen sources of pollution affecting the flats. CBEP coordinated the efforts of the Maine Department of Environmental Protection's OBD Removal Program, the Towns of West Bath and Phippsburg, and property owners to remove the OBDs. Once the OBDs were replaced, the New Meadows River Watershed Project brought together Maine Dept of Marine Resources (DMR) staff with municipal officials to push for the removal of the remaining pollution sources. In October 2002, the clean-up was completed and local volunteers working in conjunction with the DMR conducted the necessary shoreline surveys that confirmed the area was pollution-free.	Municipalities, clam diggers, DEP, DMR, FOCB, etc.
11	X	Fully Implemented	X	X	2. Provide Technical Assistance to Monitor and Open Public Swimming Beaches		Clam Flats & Swimming Beaches	CBEP is participating in the Healthy Coastal Beaches committee. Activities and products include a website to inform and educate the public, a program to recruit new towns into the monitoring program, training for town and state park beach personnel, training for lab personnel, GIS maps of participating beaches and monitoring sites, an on-line database for monitoring data, and educational brochures, posters and signs. The two participating beaches in Casco Bay had no closures in 2003.	Municipalities, SPO, SeaGrant, DEP,
12	X	Fully implemented	X	X	3. Train Installers and Pumpers of Septic Systems		Clam Flats & Swimming Beaches	Cumberland County Soil & Water Conservation District, one of our many partners, conducts annual trainings for installers of septic systems, state evaluators, plumbing inspectors, and code enforcement officers which CBEP helps fund. In addition, CBEP prepared a report on the need to train pumpers of septic systems which recommended that the focus of training should be on the current target audience for the CCSWCD training and not on the pumpers.	CCSWCD, DEP
13	X	In progress	X	X	4. Provide Training in BMPs for Contractors, Farmers, Public Works Crews, Road Commissioners, and Municipal Boards and Staff		Stormwater & CSOs	Cumberland County Soil & Water Conservation District conducts workshops on BMPs for code enforcement officers and licensed plumbing inspectors. Lakes Environmental Association also conducted three trainings in the Spring, 1999 for contractors. Both of these trainings have continued in subsequent years. In addition - DEP and CBEP distribute BMP booklets.	CCSWCD, LEA
14	X	Fully Implemented	X	X	5. Establish a Reduction and Management Program for Toxic Pollutants in Casco Bay Communities and Small Businesses		Toxics	CBEP has been an active partner in the Casco Bay Clean Boatyards & Marinas program; Both DEP and the Clean Marinas program are developing BMP manuals for marina and boatyard owners; FOCB's Bayscaping program is an extensive campaign to educate homeowners and communities about the negative impacts of lawn chemicals; CBEP produced radio and TV PSAs about motor oil recycling, household hazardous waste (HHW), etc. Regional Waste Systems holds HHWcollection days for their communities and CBEP has been involved; DEP has an active pollution prevention (P2) program. CBEP and FOCB continue to distribute educational materials on this topic.	FOCB, DEP, MMTA, marinas & boatyards, RWS, etc.

Status of Casco Bay Plan Implementation

(as of March, 2004)

#	Initiated?	Fully Implemented or Complete?	Ongoing?	Active Project?	*Casco Bay Plan* Action Item (1996)	Current/Updated Implementation Plan (2004)	Priority Issue Addressed	Status / Progress to Date	Partners
15	X	In progress	X	X	6. Develop and Implement Action Plans for Subwatershed Areas		All	CBEP facilitated a 3 year stakeholder process to develop a management plan for the Presumpscot River and will continue to work with this group during implementation. In addition, CBEP is an active partner in the New Meadows Watershed Committee (NMWC); Other subwatershed plans and related activities that CBEP has been involved in include developing plans for the Royal River, Highland Lake, Capisic Pond, Long Creek, and Libby Brook.	NMWC, municipalities, citizens, DEP, DMR, non-profits, businesses, USFWS, CCSWCD, etc.
16	X	Fully Implemented	X	X	7. Provide Technical Assistance necessary for Habitat Protection		Habitat	In Yrs 1-2, CBEP funded the refinement of habitat maps for the 14 communities along Casco Bay and assisted Freeport with their habitat map for planning purposes. The statewide Beginning with Habitat project now provides detailed habitat mapping and technical assistance to communities for use in habitat protection and CBEP is exploring ways to assist this process. In addition, CBEP plans to update maps showing conservation lands in the 14 communities.	USFWS, land trusts, municipalities, BWH
17	X	Fully Implemented	X	X	8. Conduct Pollution Prevention Audits for Businesses/Industries that affect Casco Bay		Toxics	Coastal Enterprises Inc. worked with DEP's pollution prevention program (P2) on a Portland peninsula pollution prevention project that addresses these issues and presented this work to the Waterfront Alliance to reach out to additional business owners. DEP has a very active P2 program and CBEP is exploring partnership opportunities. CBEP is an active partner in the Casco Bay Clean Boatyards & Marinas project that conducts audits of these businesses as part of a voluntary program. In addition, CBEP formally recognizes businesses for their efforts in this area.	DEP, Coastal Enterprises, Waterfront Alliance
					REGULATORY/ENFORCEMENT ACTIONS				
18	X	In progress			1. Clarify the Use of the Natural Resource Protection Act for Habitat Protection		Habitat	The Beginning with Habitat Program works with communities, providing maps that identify High Value Plant and Animal Habitat. Municipalities are instructed to consult with the Maine Natural Areas Program and/or the Department of Inland Fisheries and Wildlife before making permit decisions based the maps, noting that many of the high value animal sites are candidates for designation as Significant Wildlife Habitat under the Natural Resource Protection Act.	BWH
19	X	In progress	X	X	2. Monitor Enforcement of Combined Sewer Overflow Reduction Plans in Portland, South Portland and Westbrook		Stormwater & CSOs	DEP, EPA, CBEP, and FOCB are working with the cities of Portland and South Portland on implementation of their Master Plans to remove CSOs and other stormwater projects. DEP has developed graphics and maps to illustrate the progress in reducing CSOs and provides an annual update on progress in March. Portland has 34 and S. Portland has 10 CSOs discharging into water bodies.	DEP, Cities of Portland and South Portland, EPA, FOCB
20	X	In progress	X	X	3. Adopt Minimum Standards for Stormwater Quality in State and Municipal Regulatory Programs	Together with CCSWCD, CBEP established the Casco Bay Interlocal Stormwater Committee to develop a regional stormwater management plan; CBEP will continue to work with this group during implementation of the stormwater management plan through its Stormwater Committee	Stormwater & CSOs	Municipalities are working with DEP and EPA to meet the new requirements of the NPDES Phase II program and CBEP is working with them on this and on stormwater more generally, instead of focusing on the original action item.	DEP, EPA, municipalities, CCSWCD, SPO
21	X	In progress	X	X	4. Comply with the Pumpout Law		Clam Flats & Swimming Beaches	A CBEP graduate intern (paid for by EPA) worked with marinas and boaters during the summer of 1998 to comply with the pumpout law and to educate boaters about sound environmental boating practices. In Yr 3, CBEP provided $7,500 in funds to help with pumpouts in Casco Bay. Andy Bertocci with FOCB worked very successfully with the marina owners to begin discussions on getting more pumpout facilities in Casco Bay. Plans are moving ahead with increased sites in the Bay. The State of Maine passed a no discharge bill that lays out the plans for increased pumpout facilities and the application for no discharge areas within the State. The State DEP has recommended submitting a request to EPA for designation of Casco Bay (with the exception of Portland)s a NDZ in spring, 2004.	SPO, DEP, FOCB, MMTA, marinas & boatyards, citizens, non-profits

Status of Casco Bay Plan Implementation

(as of March, 2004)

#	Initiated?	Fully Implemented or Complete?	Ongoing?	Active Project?	*Casco Bay Plan* Action Item (1996)	Current/Updated Implementation Plan (2004)	Priority Issue Addressed	Status / Progress to Date	Partners
22	X	In progress	X	X	5. Improve Local Enforcement of the Subsurface Wastewater Disposal Rules		Clam Flats & Swimming Beaches	A CBEP graduate intern, Max Bonecutter, prepared an analysis of this issue and presented it to the Board in 1998. As part of CBEP's Clam Flat project, nearly 30 overboard discharges (OBDs) in high value clam flat areas have been removed and replaced with appropriate systems. The Town of Brunswick, a leader in local environmental protection, created a Coastal Protection Zone which requires that certain sensitive coastal properties must account for a one foot rise in sea level of the life of their subsurface wastewater disposal system. It is further required that subsurface systems be pumped out at least once every three years and maintained.	DEP, EPA, municipalities
23	X	Complete			6. Require Proof of Legal Waste Disposal upon Transfer of Property		Clam Flats & Swimming Beaches	A State task force submitted initial language to the legislature for a bill however, the more strict language was deleted because of a lack of support for more regulation of this issue. This may be an initiative that is taken up on a town-by-town basis but there is not enough political support for it on a statewide basis.	
PLANNING AND ASSESSMENT ACTIONS									
24	X	In progress	X	X	1. Develop Municipal Programs to Protect Water Resources and Clam Flats from Septic System Discharges		Clam Flats & Swimming Beaches	See Technical Assistance action #1 (Provide technical assistance to help open clam flats).	Municipalities, clam diggers, DEP, DMR, FOCB, etc.
25	X	Complete			2. Develop a Comprehensive Management Strategy for Dredged Material		Toxics, Habitat	CBEP hired Normandeau Associates to conduct an alternatives study for the Portland Harbor dredge project. CBEP was part of a multi-agency task force that worked on developing a strategy for the Portland Harbor dredging project. This ultimately led to the relocation of 34,000 juvenile lobsters to avoid the impact of dredging and established a new procedure used in large dredging projects in the State, wherein if lobsters exceed a maximum density, they are relocated.	DEP & other state agencies, FOCB, municipalities, businesses
26	X	Complete			3. Review Implementation of the National Shellfish Sanitation Program		Clam Flats & Swimming Beaches	Since the development of the Casco Bay Plan, this task has been accomplished by DMR as a result of improved communication and coordination. The reason for shellfish closures is now included on the DMR maps.	FOCB, DMR
27	X	Complete			4. Research on the Impact of Tax Codes on Habitat Conservation		Habitat	A graduate intern (paid for by EPA), conducted research in this area and prepared a report with a series of recommendations. The report was forwarded to the Maine State Planning Office which reportedly has found it very useful as a reference.	SPO, Marine Law Institute
28	X	In Progress	X	X	5. Develop a Plan to Restore Degraded Habitat in Casco Bay	Now that CBEP has developed a restoration plan and established a Habitat Restoration subcommittee with numerous partners, we are helping to inventory and implement restoration projects.	Habitat	Diane Gould prepared a Habitat Restoration Strategy for CBEP in Year 6 that outlines a general strategy for restoring habitats in Casco Bay. In Year 7, CBEP convened numerous partners including SPO, DEP, NRCS, FOCB, NMFS and others to form a Habitat Restoration Committee that will solicit and implement habitat restoration projects. In order to identify projects, the committee developed a habitat restoration fact sheet and has distributed it to municipalities, conservation commissions, watershed groups, land trusts and other interested groups to solicit projects. Funding was awarded in February 2004 to a project which will restore terns to Outer Green Island and to a project which will restore fish passage to Highland Lake. In addition, CBEP was awarded $25,000 by NOAA/Gulf of Maine Council to develop an inventory of restoration sites on the lower Presumpscot River.	EPA, DEP, SPO, NRCS, FOCB, NMFS, GOMC
29	X	In progress	X	X	6. Develop Biological/Environmental Indicators		All	In Year 8, CBEP has convened a technical committee to determine appropriate environmental indicators for Casco Bay. In addition, SeaGrant, GOMC, EPA and others are also looking at this issue and CBEP is coordinating with their efforts. CBEP provided funding to Wells NERR for a study to look at fish communities as an indicator of salt marsh health. In addition, DEP is utilizing FOCB data on dissolved oxygen as an indicator and in criteria development. Other indicators that are currently being measured include parameters listed in CBEP's environmental monitoring plan (see below) and others including toxics in sediment and tissues, habitat, beach water quality data, and air toxics.	Wells NERR, DEP, FOCB, DHHS

Status of Casco Bay Plan Implementation

(as of March, 2004)

#	Initiated?	Fully Implemented or Complete?	Ongoing?	Active Project?	*Casco Bay Plan* Action Item (1996)	Current/Updated Implementation Plan (2004)	Priority Issue Addressed	Status / Progress to Date	Partners
30	X	Complete			7. Develop Sediment Quality Criteria and Sediment Quality Discharge Limits that Apply to Casco Bay		Toxics, Habitat	While EPA continues to be committed to assessment of contaminated sediments, at present EPA is not developing sediment quality criteria. Current efforts are focused on development of consensus guidelines for assessment of contaminated sediments. EPA's sediment contamination website is located at: http://www.epa.gov/waterscience/cs/	EPA, DEP
31	X	Fully Implemented	X	X	8. Develop a Grant Program to Support Local Habitat Protection Activities		Habitat	CBEP established a fund to assist with conservation projects beginning in Year 1 and the fund has continued to grow in response to increased need for assistance. In Year 7, detailed funding guidelines and application procedures were established. To date, over 2,000 acres of high value habitat have been protected with the assistance of the CBEP funds.	USFWS, MCHT, land trusts, municipalities
32	X	Complete			9. Research whether State Subsurface Wastewater Disposal Rules adequately prevent Coastal Pollution		Clam Flats & Swimming Beaches	A CBEP graduate assistant, Max Bonecutter, conducted research on this topic. In addition, see regulatory/enforcement actions 5 & 6.	DEP
33	X	Complete	X	X	10. Research the Contribution of Deposition of Pollutants from the Air		Toxics	CBEP established an air deposition monitoring site on Wolfe's Neck to measure the contribution of air pollutants to Casco Bay. The monitoring site has become part of DEP's statewide air monitoring network and the national NADP, MDN and IMPROVE networks. In addition, a deposition estimation method was completed in Year 7. Analysis of the monitoring data indicates that the air is a substantial source of nitrogen and mercury to Casco Bay. While CBEP's project was completed in 2003, monitoring will be ongoing through DEP. Analysis of supplemental trace metals data will be completed in September 2005.	DEP
					ENVIRONMENTAL MONITORING				
34	X	In progress	X	X	1. Combined Sewer Overflow Abatement Assessment		Stormwater & CSOs	The municipalities of Portland, South Portland, and Westbrook are continuing to work to eliminate their CSOs. DEP closely tracks this effort through their CSO management plans and has developed graphics and maps to illustrate progress in reducing flows. See also regulatory/enforcement action #2.	DEP, municipalities, FOCB
35	X	In progress	X	X	2. Stormwater Control Analysis	See regulatory/enforcement action #3	Stormwater & CSOs	As a CBEP partner, EPA provided laboratory services to analyze PAHs in stormwater as part of a major DEP study of Long Creek. See also regulatory/enforcement action #3	CCSWCD, DEP, EPA
36	X	Fully Implemented	X	X	3. Tracking Shellfish Harvesting Areas		Clam Flats & Swimming Beaches	CBEP worked with DMR and others to insure that the reason for shellfish bed closures is identified on DMR maps. In addition, CBEP conducted an assessment of actual resource areas closed by acreage vs. closure areas.	DMR, municipalities
37	X	In progress	X	X	4. Monitoring Swimming Beaches		Clam Flats & Swimming Beaches	A State task force is working to implement EPA's Beaches Bill activities in the State and CBEP is a partner in this effort. See technical assistance action #2.	Seagrant, SPO, municipalities, others
38	X	In progress	X	X	5. Tracking Regulated Activities		All	DEP is collecting and analyzing data on regulated activities (e.g. docks and piers, NRPA wetlands activities, shoreline disturbance) and has developed a digital, georeferenced database..	DEP
39	X	Fully Implemented	X	X	6. Assessing Habitat Loss		Habitat	CBEP worked with NOAA and a task force convened by SPO for C-CAP to conduct a change analysis using satellite imagery. CBEP will work with USFWS and the DEP, which has tracked changes in impervious surface, to assess changes over time.	SPO, USFWS, NOAA
40	X	In progress	X		7. Tracking Wetland Loss		Habitat	Maine SPO developed a wetland characterization pilot project.	SPO, DEP, NOAA
41	X	In progress	X	X	8. Evaluating Changes in Eelgrass Beds		Habitat	Trend analysis in Casco Bay, based on photography from 1999-2002 indicates a loss of eelgrass beds in portions of the bay, including north of Cousins Island. and west of Upper Chebeague Island. Mussel dragging, disease and/or changes in water quality may be responsible.	DMR, municipalities
42	X	Complete			9. Waterbird Survey		Habitat	IF&W recently completed a waterbird survey in Casco Bay . The State has committed to monitor waterbirds every 5 years.	USFWS, IF&W

Status of Casco Bay Plan Implementation

(as of March, 2004)

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43	X	Fully Implemented	X	X	10. Hypoxia (Dissolved Oxygen) Monitoring		Habitat	In Years 3-7, CBEP has supported additional DO monitoring in "hot spots" identified through FOCB's monitoring program. Target areas are Maquoit Bay and the New Meadows River. This monitoring resulted in the formation of the New Meadows River Watershed Committee focused on improving water quality in the river. In addition, Bowdoin College students are conducting research in Quahog Bay to look at possible cause of hypoxia as a follow-up to this monitoring.	FOCB, DEP, NMWC
44	X	Fully Implemented	X	X	11. Water Quality Monitoring (temperature, pH, salinity, dissolved oxygen, and clarity)		Clam Flats & Swimming Beaches	FOCB conducts this monitoring each year through its volunteer water quality monitoring program and profile monitoring in Casco Bay. Data from years 1993 - 1998 has been analyzed for trends and FOCB is planning a detailed study of the 1999-2003 data. FOCB has begun to collect chlorophyll and nutrient data. FORR, PRW, and LEA conduct volunteer water quality monitoring of lakes, rivers, and streams in the watershed. In addition, data on physical and biological parameters was collected in Casco Bay as part of the NCA in 2000 and 2001 and will be collected in 2004.	FOCB, PRW, LEA, FORR, municipalities, citizens
45	X	Fully Implemented	X	X	12. Water Quality Assessment		Habitat	DEP conducts and analysis of waters attainment as part of its 305(b)/303(d) reporting and these data are now available in GIS format through OGIS. DEP is currently preparing an updated 305b report.	DEP, EPA, OGIS
46	X	Fully Implemented	X		13. Identifying Protected Habitat		Habitat	CBEP led an effort to develop a protected lands map for the communities that rim Casco Bay through a partnership with land conservation organizations and municipalities. This map has proven to be very useful in assisting land protection efforts in the region.	USFWS, land trusts, municipalities, BWH
47	X	Fully Implemented	X		14. Sediment Contaminant Analysis		Toxics	Funding was set aside for this in Years 4-7 and sampling was conducted (in coordination with EPA's NCA) in 2000 and 2001. Results will be compared to data collected in 1991 and 1994. A report is due in October, 2004.	DEP, EPA
48	X	Fully implemented	X		15. Mussel Tissue Analysis		Toxics	CBEP conducted mussel tissue analysis in Years 1, 3, 5, and 7. These data were reviewed by the State toxicologist to determine human health risks. In Year 7, CBEP initiated a thorough analysis of all of its toxics data.	DEP, EPA, DHHS
49	X	Fully implemented	X		16. Lobster Tissue Analysis		Toxics	CBEP collected lobsters in Years 2 and 4 for analysis of toxics. None of the samples revealed levels of toxics that pose a risk to human health except in the tomalley samples. CBEP initiated a more thorough analysis of all of its toxics data in Year 7. As part of the National Coastal Assessment (NCA), whole body analysis of lobster tissues are being conducted statewide.	DEP, EPA, DHHS
50	X	Complete			17. Cormorant Tissue Analysis	This environmental monitoring parameter was discontinued.	Toxics	Parameter was discontinued.	
51	X	In Progress	X		18. Sediment Toxicity Bioassay	This environmental monitoring parameter was discontinued by CBEP in 1997 due to the lack of sensitivity. In 2000 and 2001, through the NCA, samples were collected in Casco Bay for sediment toxicity analysis.	Toxics	Parameters were not sensitive enough in the first round to make determinations; therefore, monitoring was suspended by CBEP in 1997. NCA sediment toxicity data was collected in Casco Bay in 2000 and 2001 and will collected again in 2004.	
53	X	In progress	X	X	19. Benthic Community Analysis		Habitat	CBEP oversees the National Coastal Assessment in Maine. Through the NCA, benthic community samples were collected in Casco Bay in 2000 and 2001 and will be collected again in 2004.	
					ADDITIONAL PROJECTS				
54	X	Fully Implemented	X	X	1. Environmental Education		Stewardship	CBEP is a partner in the Children's Water Festival, Envirothon, and in funding an Americorps education intern to provide education to students through the watershed.	CCSWCD, local schools

Status of Casco Bay Plan Implementation

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55	X	Fully Implemented	X		2. Data Management		All	As a result of a data management needs survey in 1998, the CBEP Board set data management priorities. These included analysis of Friends of Casco Bay water quality monitoring data, and enhancement of the CBEP website to include both the results of CBEP monitoring and projects, and links to data displayed on the websites of participating partner programs (e.g., FOCB Maine *DEP*). Additional priorities included development and distribution of biennial State of the Bay reports, and publication of fact sheets summarizing the results of CBEP data collection. Each of these has been implemented. New data and additional links are added to the CBEP website on an ongoing basis. A new State of the Bay report is in the planning phase.	EPA, USM, GPCOG
56	X	In progress	X	X	3. Community Strategies			Friends of Casco Bay gave a presentation on Community Strategies to South Portland in the Fall, 2002 that resulted in a commitment from the city.	FOCB, municipalities, citizens

Definitions:

Fully implemented - refers to an action item that has been completed at least once but is of an ongoing nature and will be repeated at intervals or on a continuous basis in the future.

Complete - refers to an action item that is a specific one-time project that has been completed but there is no plan to repeat or continue that action or to an action that was discontinued for practical reasons.

Casco Bay Estuary Project
Budget Summary for Year 6, 7, 8

	Year 6 (Oct 2001 - Sept 2002)					
	EPA (§320)	State DEP	USM	Subtotal	Other*	Total
Projects	$ 234,426	$ -		$ 234,426	$ 311,042	$ 545,468
Supplies-Expenses	$ 9,450	$ 10,364		$ 19,814		$ 19,814
Personnel	$ 58,091	$ 81,235		$ 139,326		$ 139,326
Travel	$ 10,000			$ 10,000		$ 10,000
Indirect Costs	$ 28,033	$ 12,778	$ 84,035	$ 124,846	$ 39,650	$ 164,496
Total	$ 340,000	$ 104,377	$ 84,035	$ 528,412	$ 350,692	$ 879,104

	Year 7 (Oct 2002 - Sept 2003)					
	EPA (§320)	State DEP	USM*	Subtotal	Other*	Total
Projects	$ 357,000	$ 20,907		$ 377,907	$ 507,199	$ 885,106
Supplies-Expenses	$ 23,204	$ -		$ 23,204		$ 23,204
Personnel	$ 63,929	$ 70,692		$ 134,621		$ 134,621
Travel	$ 10,000			$ 10,000		$ 10,000
Indirect Costs	$ 47,867	$ 12,778	$ 84,363	$ 145,008	$ 58,091	$ 203,099
Total	$ 502,000	$ 104,377	$ 84,363	$ 690,740	$ 565,290	$ 1,256,030

	Year 8 (Oct 2003 - Sept 2004)					
	EPA (§320)	State DEP	USM*	Subtotal	Other*	Total
Projects	$ 279,089	$ 29,000		$ 308,089	$ 457,043	$ 765,132
Supplies-Expenses	$ 16,500	$ 4,164		$ 20,664		$ 20,664
Personnel	$ 149,086	$ -		$ 149,086		$ 149,086
Travel	$ 10,000			$ 10,000		$ 10,000
Indirect Costs	$ 57,010	$ 1,836	$ 82,979	$ 141,825	$ 47,130	$ 188,955
Total	$ 511,685	$ 35,000	$ 82,979	$ 629,664	$ 504,173	$ 1,133,837

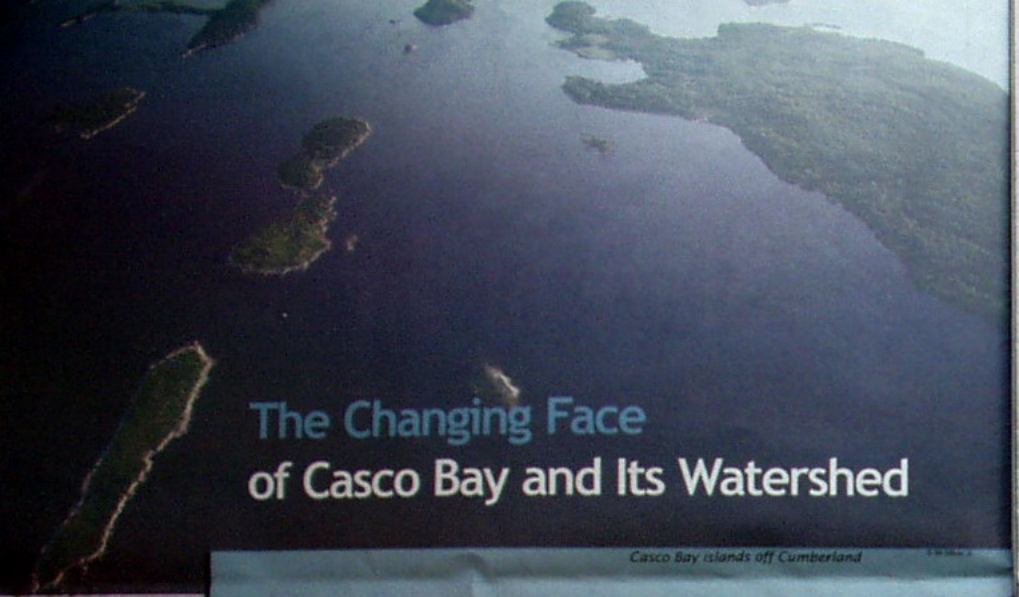
	Year 6 - 8 (Oct 2001 - Sept 2004)					
	EPA (§320)	State DEP	USM*	Subtotal	Other*	Total
Projects	$ 870,515	$ 49,907	$ -	$ 920,422	$ 1,275,284	$ 2,195,706
Supplies-Expenses	$ 49,154	$ 14,528	$ -	$ 63,682	$ -	$ 63,682
Personnel	$ 271,106	$ 151,927	$ -	$ 423,033	$ -	$ 423,033
Travel	$ 30,000	$ -	$ -	$ 30,000	$ -	$ 30,000
Indirect Costs	$ 132,910	$ 27,392	$ 251,377	$ 411,679	$ 144,871	$ 556,550
Total	$ 1,353,685	$ 243,754	$ 251,377	$ 1,848,816	$ 1,420,155	$ 3,268,971

State of the Bay

2000

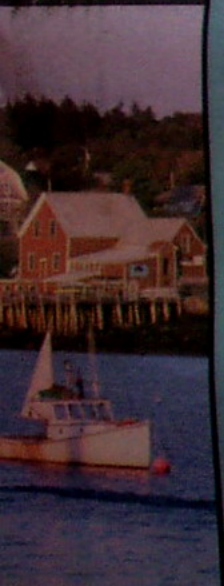
Casco Bay Estuary Project

Attachment 2



The Changing Face of Casco Bay and Its Watershed

Casco Bay islands off Cumberland



Life on the shores of Casco Bay brings constant change—the Bay is a dynamic ecosystem ceaselessly moving in response to weather, season and tide. Some of the change comes from natural cycles; some from human activity.

This flyer describes how we are affecting the Bay and its watershed—for worse and for better. Toxic pollution, degraded wildlife habitat and diminished water quality have taken a toll on the Bay's resources. Fortunately, the Bay has a tremendous human resource: a corps of devoted volunteers working to protect its health. The following pages describe what's in Casco Bay, how it got there, and what individuals and groups are doing to sustain the watershed.

Starting in 1990, citizens and groups joined forces to shape a plan for the Bay's future. The *Casco Bay Plan*, completed in 1996, now fuels collaborative projects around the watershed involving municipal and state officials, community groups, businesses and citizens. The Casco Bay Estuary Project, which coordinates these efforts, represents the sum of its partners—a dedicated group of people who work tirelessly to care for the Bay.

On the following pages, you'll read about what these partners have accomplished in the past four years—with generous support from the U.S. Environmental Protection Agency and the Maine Department of Environmental Protection.

Imagine how much more could be done if everyone in the watershed got involved. This flyer suggests ways you can help, from taking small household steps to joining in community projects. By changing our own actions, we can help sustain the health of Casco Bay.

Katherine Groves
Katherine Groves
Director, Casco Bay Estuary Project

When we look at maps of our home communities, we typically see town and county lines, roadways, and perhaps some waterways. Maps rarely show the boundaries of our watershed: all the terrain over which water travels when flowing into a particular river, lake or estuary. Major estuaries like Casco Bay have a large watershed that encompasses many smaller watersheds.

- The watershed of Casco Bay contains only 3 percent of Maine's land mass but a quarter of its population (270,000 people).
- The watershed encompasses 41 municipalities, extending over a 985-square mile area that reaches west to Bethel.
- Casco Bay has 578 miles of shoreline, including 758 islands. The Bay reaches from Two Lights in Cape Elizabeth to Cape Small in Phippsburg. The principal rivers that flow into Casco Bay are the Fore, Stroudwater, Presumpscot and Royal.
- A 1994 study estimated the value of Casco Bay's fishing industry at $120 million a year, with tourism and recreation around the Bay generating another $250 million a year.

Fishing contributes greatly to the Casco Bay region's economy.

What Is an Estuary?

Estuaries are coastal areas where fresh and salt water mix, creating some of the most productive habitats on earth. Estuaries act as "nurseries of the sea:" more than two-thirds of fish species depend on them during part or all of their life cycles. They provide vital habitat for wildlife and protect the land from storm erosion.

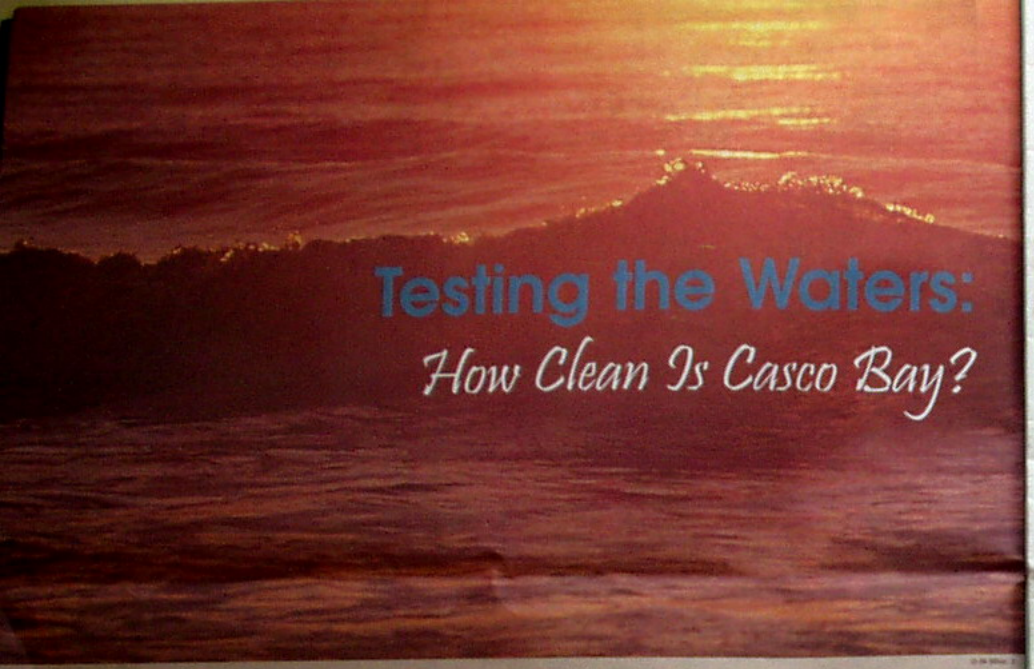
Many of the country's estuaries have been hard hit in recent decades by pollution, habitat loss and development. To help protect coastal waters, Congress established the National Estuary Program in 1987. Casco Bay is one of 28 estuaries that receives major funding from the U.S. Environmental Protection Agency for coastal research, public education and community action.

Casco Bay Estuary Project

The Casco Bay Estuary Project seeks to preserve the Bay's diverse values, collaborating with partner groups to ensure sound environmental stewardship through public involvement and cooperative management. In 1990, the U.S. Environmental Protection Agency designated Casco Bay "an estuary of national significance" and provided substantial support to help plan for the Bay's future. Area citizens worked closely with representatives of federal, state and local government, business and industry, and research institutions to develop a plan for managing the Casco Bay watershed. Since the *Casco Bay Plan* was adopted four years ago, area residents and groups have taken measures to:

Volunteers clean up Back Cove in Portland

- protect wildlife habitat;
- improve water quality;
- reduce pollution from stormwater runoff and combined sewer overflows;
- reduce toxic pollution; and
- protect and restore clam flats and swimming areas.



Testing the Waters:

How Clean Is Casco Bay?

Is the Bay's Water Quality Improving?

In assessing the health of Casco Bay, it's essential to know whether water quality is improving or declining. Friends of Casco Bay, with support from the Casco Bay Estuary Project, has begun creating a baseline of information, monitoring surface waters at 106 sites throughout the Bay. Since that effort began in 1993, 300 trained volunteers have tested water samples—from April through October—for water temperature, dissolved oxygen, pH, salinity, and water clarity.

Results from the last six years of testing represent the *only* long-term collection of Casco Bay water quality data, providing an invaluable resource for municipal and state planners and local conservation and shellfish commissions. Preliminary findings reveal that the Bay's water quality is generally good but cause for concern remains in certain areas. Ten sites in Casco Bay fell below the recommended state standard for dissolved oxygen, particularly near the mouth of rivers and where tidal flushing is limited (such as Quahog Bay and the New Meadows River). Results from the data analysis should help communities around the Bay clean up existing pollution sources and prevent future contamination from occurring.

Consistent water quality tests can help address concerns such as red tide, algal blooms and elevated bacterial counts that close areas to swimming and shellfish harvesting. One potential problem, low dissolved oxygen, occurs in warm weather when levels of dissolved oxygen drop naturally. Oxygen can fall to dangerously low levels in areas with increased nutrients and poorly mixed waters. These conditions were responsible for past pogy kills in the New Meadows River. The Casco Bay Estuary Project is funding ongoing tests for low dissolved oxygen around the Bay to help determine what role human actions might play in triggering these events.

Above: Scott Fletcher, volunteer monitor for Friends of Casco Bay, prepares a dissolved oxygen test. Left: Low oxygen levels brought about massive pogy kills in the New Meadows River during 1991-92.

What You Can Do

- √ Fix oil and gas leaks in your vehicles as soon as you notice signs of leakage.
- √ When boating, bring human waste and trash back to shore for proper disposal.
- √ Use nontoxic household cleaners and properly dispose of oil, gas, and paint.
- √ Volunteer to monitor water quality. Contact any of the following groups for further information:

Friends of Casco Bay, 799-8574 or jmillholland@cascobay.org

Friends of the Royal River, John MacKinnon at 829-4930 or jmackin1@maine.rr.com

Presumpscot River Watch, Helen Chabot at 822-6356

Friends of the Presumpscot River, 892-8381 or coveredbridge@skywizard.com

New Meadows River Watershed Project, Alan Houston at 725-6639

Lakes Environmental Association, 647-8580 or lakes@megalink.net

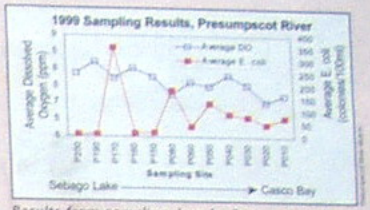
Volunteer Lakes Monitoring Program, 225-2070 or vlmp@megalink.com

Highland Lake Association, Keith Williams at 892-8491

Maine Department of Environmental Protection, Don Kale at 822-6319 or donald.kale@state.me.us

Portland Water District, Paul Hunt at 774-5961, x3322 or www.pwd.org

For more information on water quality testing, visit the Cooperative Extension website on water quality: www.umext.maine.edu/topics/waterqual.htm and the U.S. EPA's Surf Your Watershed site: www.epa.gov/surf



Results from sampling done by Presumpscot River Watch show a gradual decline in dissolved oxygen and rise in E. Coli bacteria at sites nearest the coast.

Who's Monitoring the Bay's Tributaries?

Casco Bay's water quality depends in large measure on what comes down the rivers. To assess the health of the Bay's tributaries, local volunteers conduct routine water quality tests. The largest freshwater input to Casco Bay comes from the Presumpscot River which drains 648 square miles. Volunteers with Presumpscot River Watch test water at 26 sites from Standish to Falmouth, analyzing them for temperature, dissolved oxygen and harmful *E. coli* bacteria. While most sites fall within state limits, several locations have high bacterial concentrations or low dissolved oxygen levels—especially those near the coast. Presumpscot River Watch, Friends of the Presumpscot River and other partners are working to draft a Restoration and Resource Management plan for the river.

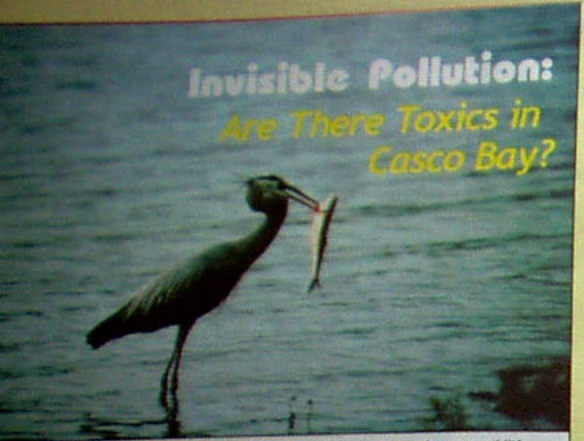
Along another tributary, Friends of the Royal River has compiled seven years of water quality data. The main stem of the river generally meets state standards for dissolved oxygen, but several tributaries have low levels. Monitors also have found abundant *E. coli* bacteria following storm events.

Representatives from five towns and the state have joined to study the New Meadows River watershed, and celebrate it with a Community Watershed Day this June. Throughout the Bay's upper watershed, volunteers with the Lakes Environmental Association and Volunteer Lakes Monitoring Program test lake water quality. The Portland Water District is also instrumental in testing water quality and working with landowners and communities on water quality issues. For more information on the work of these and other groups, see "What You Can Do."

Faces of the Bay

Brian Whitney, a volunteer water quality monitor for Friends of the Royal River, prepares a water sample for testing. Although the river generally meets state standards for dissolved oxygen, some tributaries have tested low.

Invisible Pollution: Are There Toxics in Casco Bay?



substances such as heavy metals and pesticides can pose a serious threat to wildlife humans. These pollutants can accumulate in the tissue of organisms, becoming more entrated as they move up the food chain.

hat Toxics Occur in Casco Bay?

1991, SCIENTISTS RECORDED ELEVATED CONCENTRATIONS of toxics throughout Casco Bay, with the ghest levels around Greater Portland. Toxics tend to settle into sediments close to where they r the Bay, and later may migrate on the Bay's currents. A diverse array of toxics appeared in sediment samples:

avy metals (such as lead, zinc, cadmium, mercury and silver) occur at elevated levels in some cations, primarily around Portland where contaminants are discharged through outfall pipes and mbined sewer overflows" (which release untreated sewage during heavy rains to prevent atment plant overloading).

- **Polychlorinated biphenyls (PCBs)**, banned in the late 1970s because they can cause cancer, are still found in sediments of the Fore River near Portland.
- **Pesticides**, including types banned decades ago, continue to affect Bay ecology through illegal disposal, leaching from old dumps, and polluted runoff from lawns, golf courses, managed forests and agricultural fields.
- **Tributyltin (TBT)**, used in anti-fouling paint on boats and piers, appears at highest concentrations around boating centers.

Dioxins and furans, discharged by industries, were detected at low levels throughout the Bay—with greatest concentrations near the Presumpscot River.

PAHs, polycyclic aromatic hydrocarbons, are the most prevalent form of toxics in Casco Bay. They are released in fuel spills and through burning of fossil fuels in vehicles, power plants, furnaces and incinerators. Many sediment sites around Casco Bay registered high levels of PAHs compared to other bays around the country.

WHILE MAINE WATERS may appear pristine, toxic pollution occurs in many coastal areas and can harm wildlife and humans. Some chemicals and elements persist for decades: Casco Bay still contains toxics from industries that operated more than a century ago.

To learn more about how toxics affect the Bay's health, the Casco Bay Estuary Project has studied contamination levels in surface sediments and in the tissue of blue mussels and lobsters.

The Casco Bay Estuary Project will conduct a second round of sediment sampling this summer. Through long-term testing, the Project can assess whether toxicity levels in the Bay are rising or falling. Other sections of this flyer describe ways that the Project is working to reduce toxic pollution that enters the Bay. Since toxic chemicals in soils and waters are difficult and expensive to remove, prevention is a less expensive and more effective approach.

Are the Shellfish Safe to Eat?

BECAUSE SHELLFISH ARE FILTER-FEEDERS, they concentrate pollutants from the water. By testing tissue of the native blue mussel, scientists can evaluate what the presence of toxics might mean for human health. The Casco Bay Estuary Project has monitored mussels at eight locations and lobsters at two sites. In some locations, mussel tissue exceeded the state level for posting health advisories (based on eating shellfish once a week) due to elevated lead, dieldrin (a pesticide), PAHs, PCBs, dioxin and furans. Further tests are being done to confirm these results.

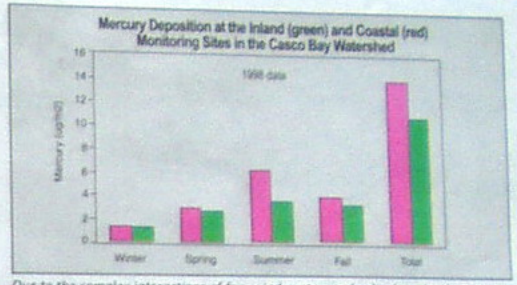
While lobster meat appears safe to eat, the liver (the green tomalley) may contain toxics. The State has issued an advisory recommending that people do not eat lobster tomalley (call 287-3281 for a copy).

Pollution from the Sky

TOXIC POLLUTANTS ARE FOUND in Bay sediments far from waterborne sources, suggesting that they may fall from the air as dry particles or in rain and snow. With grant funding from the U.S. Environmental Protection Agency and Maine Department of Environmental Protection, the Casco Bay Estuary Project has established a coastal monitoring site at Wolfe's Neck Farm in Freeport. Data from this site, along with results collected at an inland site in Bridgton, will help determine patterns of air pollution in the Casco Bay watershed. The monitoring program began in 1998 and will continue through 2000, tracking the deposition of mercury, cadmium and other trace metals, PAHs (polycyclic aromatic hydrocarbons), nitrogen, and the concentration of fine particulates.

Initial data (see graph at right) suggest that the atmosphere is a significant source of pollution for Casco Bay. Precipitation carries pollutants to the Bay, especially during the wetter seasons of spring and summer. Rainfall in Freeport contained PAHs, a common toxic pollutant in Casco Bay, at levels equal to an urban test site near Boston.

Motor vehicles produce airborne pollution that affects Casco Bay.



Due to the complex interactions of fog, wind, water, and salt where land and sea meet, the coastal site in Freeport registered higher levels of rainfall and higher concentrations of pollutants such as mercury (a toxic metal that can accumulate in fish and wildlife) and sulfates (the primary component of acid rain).

(NADP/MDN Monitoring Network, 1998 data)

What You Can Do

- √ Minimize driving and keep your car well-maintained. Choose a vehicle that is fuel-efficient.
- √ Make use of household hazardous waste collection days in your community. Take used oil to a service station or oil collection center. Most oil pollution in coastal waters comes, not from commercial tanker spills, but from careless dumping, small spills and stormwater runoff.
- √ Encourage workplace reduction of toxics. For advice on ways to prevent pollution from your business and potentially save money, call Chris Knudson at the State's Pollution Prevention Program, 287-7100.
- √ Use lawn and garden chemicals only as a last resort. For suggested alternatives, contact Friends of Casco Bay at 799-8574. You can learn more about farming and gardening without pesticides at the Maine Organic Farmers and Gardeners website www.mofga.org.
- √ Request a copy of the "Household Product Management Wheel" from the Casco Bay Estuary Project (CBEP, MSM, Room 408 Law School, PO Box 9300, Portland, ME 04104, tbsmith@usm.maine.edu), describing how to dispose of household chemicals and use less toxic substitutes.

Faces of the Bay

"Our system for capturing sediments before they enter the Bay has made us more attractive to potential clients because we can now market a cleaner facility. That marketing advantage, combined with the savings incurred from reduced housekeeping costs, makes sense from both an environmental and economic perspective."
P.D. Merrill, President of Merrill Industries

Merrill Industries has adopted many Best Management Practices on their property to reduce pollution entering the Bay, including installing oil and grease separators for stormwater, purchasing a sweeper to collect debris, and using silt fences and hay bales to reduce runoff pollution.

A Wealth of Wildlife: *Will it Last?*

Great blue heron

Harbor seals frolic in the surf

The Biological Diversity of Casco Bay

- Casco Bay is home to a tremendous variety of species. The Bay has 50 seabird nesting islands and six heron rookeries.
- Wildlife live in varied habitats around Casco Bay–including salt marshes, eelgrass beds, tidal creeks, islands, rocky shores, and richly mixed estuarine waters. The most prevalent habitat areas, intertidal mudflats, nourish important shellfish and worm species and provide food for migrating shorebirds.
- Casco Bay has the largest and densest concentration of eelgrass beds mapped along the coast of Maine. Eelgrass beds provide shelter for some small fish and food for wintering waterfowl.

What You Can Do

√ Plant native vegetation around your property to enhance wildlife habitat. For planting suggestions, call the Cumberland County Soil and Water Conservation District at 829-7829. If you own waterfront property, be sure to maintain a vegetative buffer along the shore.

√ Nearly every community surrounding Casco Bay has a land trust dedicated to protecting open space and maintaining wildlife habitat and recreational trails. Join and support your local land trust!

√ If you own land with significant habitat value or want information on the state's Farm, Forest and Open Space tax classifications, contact your local land trust or Forest Dillon at Maine Coast Heritage Trust (729-7366).

√ For information on ways to protect wildlife habitat, contact the U.S. Fish & Wildlife's Gulf of Maine Project (781-8364 or http://gulfofmaine.fws.gov) or Maine Audubon Society (781-2330 or www.maineaudubon.org)

What's the Primary Threat to Wildlife Habitat in the Casco Bay Watershed?

Sprawl: Before and After

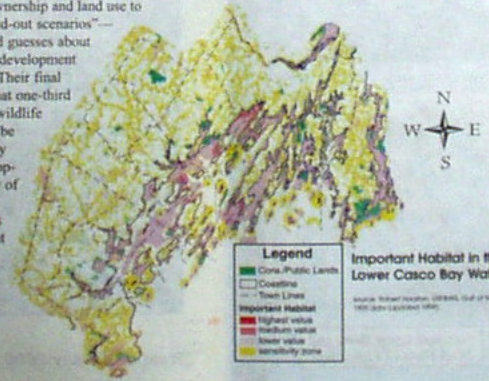
Above, 1976; below, 1995

THE FATE OF AREA WILDLIFE may be determined by sprawl, the pattern of residential and commercial development that spreads out from urban centers—overtaking farmland and open space. Sprawl endangers wildlife habitat through direct destruction and through degradation. Roads and buildings fragment large natural areas; developments of all kinds disrupt natural drainage patterns and increase runoff pollution (of road salt, petroleum products and other toxic materials); and homeowners introduce pets and non-native plants, apply pesticides and herbicides, and increase human disturbance. Already sprawl has taken a toll on wildlife around the Bay: a recent state report notes that almost all the land-based animal species on Maine's endangered and threatened species list are native to southern and coastal areas.

What can be done to prevent sprawl and protect important wildlife habitat? Municipal and regional planners should determine which areas are significant and develop ordinances that direct growth toward suitable areas. It's especially important to maintain open corridors that allow wildlife to move among undeveloped blocks of land. Private landowners can take action, placing legal restrictions called conservation easements on their property to limit future development. Landowners can also choose to participate in state programs that offer tax incentives for keeping their land in agriculture, forest or open space.

Which Habitats Are at Risk?

TO CONSERVE WILDLIFE HABITAT effectively, it's essential to know which areas are most sensitive. In 1995 the Casco Bay Estuary Project worked with the U.S. Fish & Wildlife Service's Gulf of Maine Project to assess which habitats in the lower watershed were at risk, mapping habitats of 27 significant species of coastal and marine plants, fish and wildlife. Using these data, researchers created a set of maps that depict where species overlap to form the Bay's most valuable habitats. Next they examined regional patterns of ownership and land use to produce "build-out scenarios"—well-informed guesses about where future development might occur. Their final map shows that one-third of the Bay's wildlife habitat could be endangered by human development, but few of the highest value habitats face imminent threats.



Important Habitat in the Lower Casco Bay Watershed

Protecting Valuable Lobster Habitat

SEDIMENTS CARRIED IN RIVER RUNOFF gradually accumulate on the Bay floor and can obstruct major shipping channels. To keep these passages open, the U.S. Army Corps of Engineers periodically conducts dredging—a process that disturbs bottom sediments and can endanger the lobsters that live there.

To address this concern in the recent dredging of Portland Harbor, the Casco Bay Estuary Project hired a contractor to conduct underwater video surveys of proposed dredge areas. The videos revealed important lobster habitat, even richer than had been realized. Consultants then developed a mitigation plan to protect the lobsters, which recommended timing the dredging to coincide with lobster migrations and relocating lobsters outside the dredge area.

Before dredging began, the consultants teamed up with staff and volunteers of Friends of Casco Bay, local lobstermen, a lobster pound owner, Maine Department of Marine Resources staff and others to move 34,012 lobsters of sub-legal length outside the harbor zone. The team also tagged 4,000 lobsters to help determine the project's success.

Seven months after the dredging ended, lobster density in certain areas had rebounded close to pre-dredging levels—suggesting that lobster relocation may help diminish the impacts of dredging and allow populations to recover more rapidly.

Sustaining Clamming in Casco Bay

Clams harvested from Casco Bay generate income for local residents, but pollution keeps many areas off-limits. A 'pumpout advertised, right operated by Friends of Casco Bay helps boaters keep waters clean and shellfish beds open.

Softshell clams are an important resource for the Casco Bay region, generating an estimated $12 million in economic activity (according to a 1994 study). While there is growing demand for Casco Bay clams, diggers are working on only half of the Bay's shellfish flats; the remainder are closed due to high bacterial levels that indicate a potential health risk for human consumption.

Over the past six years, 36,902 acres of formerly closed shellfish areas have been opened. The Casco Bay Estuary Project is working with state, local and citizen partners to reopen the flats that remain closed. This effort promises ecological and economic benefits: closed flats in Casco Bay could provide clam harvests worth $3.7 million/year. Beyond the potential for extra earnings, many local residents take great pleasure in harvesting their own food from the sea.

What Causes Shellfish Flat Closures?

- Failing septic systems discharge untreated sewage containing bacteria and viruses directly into groundwater, streams of coastal waters.
- Overboard discharge systems (see sidebar) release polluted effluent if not well-maintained.
- Boaters illegally discharge holding tanks close to shore.
- Stormwater runoff carries wastes from farm animals, domestic pets and wildlife.
- Overflow from wastewater treatment plants may be routed directly into coastal waters during heavy rainstorms.

High bacterial levels from any of these sources can force the State to close flats to harvesting. Because every open flat must be surveyed routinely to make sure it is free of harmful bacteria, lack of water quality data can lead the State to close flats as a precautionary measure. The State also closes flats periodically due to red tide, a microscopic plant that produces a toxin in shellfish that can threaten human health. Local municipalities may close flats to conserve small clams for future harvesting or to prevent overharvesting of adult clams.

The map below illustrates the extensive shellfish habitat in Casco Bay. Although some beds remain closed to harvesting because of pollution, over 36,902 acres of formerly closed areas were opened in the past six years.

Reopening Clam Flats in Casco Bay

The Casco Bay Estuary Project and its partners are working to reopen Casco Bay clam flats, building on work done by towns and state agencies to eliminate local pollution sources. A team of clam flat managers, scientists and environmental advocates joined with local clam diggers and consultants to identify the most productive shellfish beds and work to reopen them. In the first round, they targeted more than 140 acres of flats in Phippsburg, West Bath, Brunswick, Harpswell and Freeport. Determining the sources of contamination in each area required some detective work–reviewing water quality data under different conditions to pinpoint potential sources, and using shoreline survey results to identify illegal septic systems and straight pipes.

Now the team is developing strategies to ensure a viable clam flat population over time–including rotating flat closures, seeding mudflats with baby clams, and tracking clam populations to determine how many harvesting licenses to issue. Shellfish resources require collaborative regional management to remain productive and prevent overfishing. Harvesters and planners around Casco Bay recently formed a Softshell Clam Advisory Council to discuss the best means for sustaining good shellfish yields.

What You Can Do

- √ Maintain your septic system, having it pumped out every 3-5 years. If your system was installed before 1974, consider replacing it. Avoid using septic cleaners or additives.
- √ If you own a boat, dispose of waste at one of the Bay's boat pumpout facilities or use its mobile pumpout service (call 799-8574 for more information). With 1,900 boat slips and 3,400 moorings in Casco Bay, illegal boat discharges pose a major hazard for clammers and swimmers.
- √ If you own an old Overboard Discharge System, consider replacing it. There are state funds available to assist in this process. Contact your town office for more information.
- √ To find out more about the status of shellfish beds in your community, contact your local shellfish commission (through your town office). You can also contact the Department of Marine Resources to discuss getting a local clam flat onto the State's priority list for reopening. Call Laura Livingston at 633-9533 for more information.

What Is an Overboard Discharge?

Many clam flats are closed simply because they are located near an "overboard discharge" system (OBD). These sand-filtered septic systems were designed to treat effluent before discharge into local waters. Without routine maintenance, many systems fail and release untreated waste—which led to a ban on any new OBDs after 1987. Some older systems remain, however, contaminating local clamflats. In areas where OBDs cause clam flat closures, towns may receive state funds to help remove them.

Casco Bay has more than 200 OBDs. To help reduce this number, the Casco Bay Estuary Project formed an agreement with the Maine Department of Environmental Protection to manage their OBD removal program. The State had funds allocated but no staff to oversee this effort, while the Casco Bay Estuary Project had staff to help communities and landowners in removing the systems. This agreement benefited both parties and—most importantly—the clam flats of Casco Bay!

One alternative to an OBD is a recirculating biological filtration system.

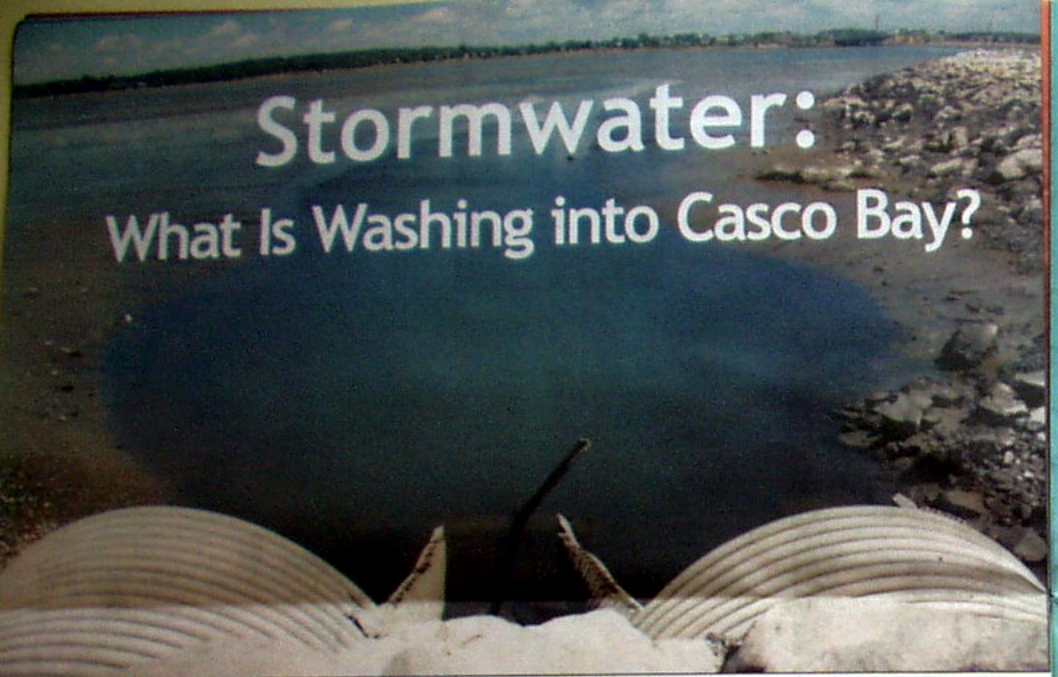
Faces of the Bay

"Through the work of the Casco Bay Estuary Project and their consultants, we've been able to open additional clam flats around Casco Bay. These flats will prove to be increasingly productive in years to come."

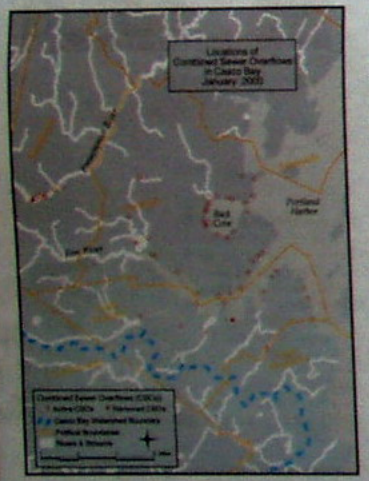
Dana Wallace, of Brunswick, has worked on clam flat issues in Maine for decades.

Stormwater:

What Is Washing into Casco Bay?



During heavy rains, untreated municipal wastewater can flow directly into Casco Bay through outlets like these combined sewer overflow pipes along Portland's Back Cove.



MOST OF THE POLLUTION that enters Casco Bay comes from countless small sources throughout the watershed. Exhaust particles or oil from your car, for example, might land on a road far inland. When rain falls, pollutants wash into a brook and are carried downstream to a river. By the time they reach Casco Bay, they've mixed with other contaminants picked up along the way—animal wastes, fertilizers and pesticides from homes and agricultural operations, and soil from construction sites. Polluted stormwater creates a host of problems downstream.

Why Is Stormwater a Concern?

- It causes soil erosion which degrades water quality. Silt carried into streams and rivers can cover the breeding ground of fish and the habitat of aquatic insects. Soil deposition in the Bay creates the need for periodic dredging–an expensive process that disrupts bottom habitats.
- Nutrients carried by stormwater runoff can over-fertilize lakes, streams and coastal waters, causing undesirable algal blooms which deplete the oxygen needed by fish.
- In some urban areas, stormwater can overload municipal sewage systems so that sewage is released directly into the Bay. Elevated levels of bacteria in area waters pose a public health risk, requiring swimming bans and shellfish bed closures that put clammers out of work.
- Runoff washes toxic oil and metal contaminants from roads and parking lots into streams, sewers and—ultimately—the Bay.

Ways to Reduce Stormwater Runoff

Best Management Practices

BMPs, AS THEY'RE KNOWN, are methods of design and construction that can reduce water pollution such as planting vegetative buffers along waterways and creating ponds to temporarily hold stormwater (which helps settle out pollution). The Maine Department of Environmental Protection publishes BMP guidelines for managing stormwater and controlling pollution: call 287-3901 to order.

Volunteers plant a vegetative buffer strip

Demonstration Projects

COMMUNITIES IN THE CASCO BAY WATERSHED are devising creative solutions to address the expensive and difficult problems associated with stormwater pollution. The Town of Freeport, for example, has begun to retrofit stormwater management structures to control pollutants such as bacteria, particulates and nutrients. Using BMPs and technical assistance from the Cumberland County Soil and Water Conservation District, the Town devised ways to make sediments and pollutants settle out in detention basins instead of in the Bay. The techniques involved:

- raising emergency spillways and the pond outlet to detain water longer;
- installing filter berms to slow water flow entering the basin; and
- reducing the outlet pipe diameter, slowing water flow from the basin.

For more information on these and other methods, contact the Cumberland County Soil and Water Conservation District at 839-7839.

Combined Sewer Overflows

MANY OLDER SEWER SYSTEMS were designed so that when heavy rains overload the treatment plant, the system releases untreated sewage and stormwater directly into rivers and bays through Combined Sewer Overflows (CSOs). Fortunately, these antiquated systems are being replaced with systems that separate sewage and stormwater. The next step in reducing pollution involves treating the stormwater that has been separated, a major challenge for communities. The Casco Bay Estuary Project is working with Friends of Casco Bay, Maine Department of Environmental Protection and municipalities to maintain progress eliminating CSOs.

Faces of the Bay

"Freeport has reopened almost all of our previously closed clamflats. The stormwater management we have undertaken will protect those flats for future generations."

Jacki Cohen
Freeport Town Planner

What You Can Do

√ Reduce or eliminate use of lawn chemicals and fertilizers since rainwater washes these into the Bay. Reduce your lawn area and leave clippings on your lawn to enrich the soil. For further information on reducing pesticide use, contact Friends of Casco Bay at 799-8574.

√ On your land, minimize the amount of area covered with impervious surfaces. Use gravel and stone dust in place of concrete or asphalt.

√ On sloped lands, maintain a ground cover of tall grasses or shrubs since these plants help filter pollutants from runoff. During construction projects, minimize the amount of ground that is disturbed and replant and mulch promptly to prevent eroded soil from washing into waterways.

√ To learn about best management practices for homeowners and municipal officials, call the Cumberland County Soil & Water Conservation District, 839-7839 or the Maine Department of Environmental Protection, 287-3901 (http://janus.state.me.us/dep/baep).

Activities for Small Fry

Word Search

Find the following words in the fish:

Casco	Watershed	Habitat
River	Stream	Estuary
Clam	Mussel	Lobster
Seal	Gull	Island
Bay	Swim	Sail
Fish	Beach	Mudflat
Rock	Sand	

M A E R T S
T A L F D U M B C
L D E H S R E T A W G
R H C A E B M G I Y L A E S R
V O E B M Y R A U T S E M D H E
A C C T G U L L D N A S B N D V
H K F L S H O C S A C S U I S I
T A T I B A H W Y R U T W G R
E D R A O E V A W M I S
W I S L A N D M
L H S I F

Casco Bay: Whose Job?

Casco Bay, blue and serene,
it's not that dirty but it's not pristine.
Whose job is it to see that it's clean?

There are inland people and folks on the shore.
They are the closest: the bay's at their door.
But inland towns are growing more and more.

From ponds, lakes and streams every day,
The water flows down—it's nature's way.
Carrying pollution into the Bay.

From parking lots, driveways and fertilized lawns,
Rooftops and cars–the pollution moves on,
Bit adds to bit until clean water's gone!

But if every day, everyone, everywhere
Will think before doing, take every care
We can get and keep clean the water we share.

Casco Bay, blue and serene,
It's not that dirty but it's not pristine.
It's everyone's job to see that it's clean!
It will take us all–of that there's no doubt!
Working together is what it's about!

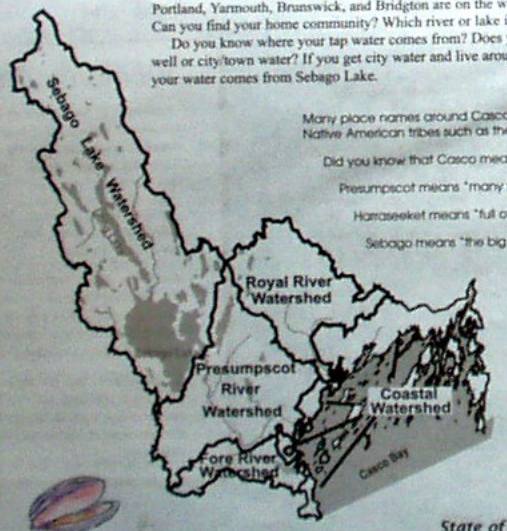
by Jean Dyer, Chebeague Island

Color in the Watershed Map

This map shows the Casco Bay watershed. Water in this area flows into Casco Bay eventually. There are five smaller watersheds within the Casco Bay watershed.

Color each of the smaller watersheds a different color. Identify which watershed you live in. Looking at another map for comparison, mark where Portland, Yarmouth, Brunswick, and Bridgton are on the watershed map. Can you find your home community? Which river or lake is nearest to you?

Do you know where your tap water comes from? Does your home use a well or city/town water? If you get city water and live around Portland, your water comes from Sebago Lake.



Many place names around Casco Bay come from Native American tribes such as the Abenaki.

Did you know that Casco means "muddy"?

Presumpscot means "many falls river."

Harraseeket means "full of obstacles."

Sebago means "the big stretch of water."

Casco Bay Estuary Project Staff

Beverly Bayley-Smith, Assistant to the Director, Casco Bay Estuary Project & Maine Law Institute
Katherine Groves, Director, Casco Bay Estuary Project

Honorary Staff

(who work tirelessly in their own agencies to advance CBEP goals)

Lee Doggett, Maine Department of Environmental Protection
Diane Gould, U.S. Environmental Protection Agency New England

Casco Bay Estuary Project Partners

Governmental Agencies

U.S. Environmental Protection Agency New England
U.S. Fish & Wildlife Service, Gulf of Maine Project
Maine Department of Environmental Protection
Maine Department of Marine Resources
Maine Department of Transportation
Cumberland County Soil & Water Conservation District
Army Corps of Engineers
Town Officials, Shellfish Commissions & Harbor Commissions in declared communities

Regional and Local Groups

Friends of Casco Bay
Presumpscot River Watch
Friends of the Royal River
Friends of the Presumpscot River
Lakes Environmental Association
Portland Water District
Maine Coast Heritage Trust

Area Businesses

Albert Frick Associates
Normandeau Associates
MER Assessment Corporation
Portland Trap Company
New Meadows Lobster
A. L. Griffin, Inc.
The Bait Lady
Resource Trading Company
Mackworth Environmental
Portland Pipeline Corporation
Merrill Industries Incorporated
Cargill Incorporated
Sprague Energy
Koch Materials Company
Mobil Oil Corporation
Gulf Oil Limited Partnership
Land and Water Associates

Countless Citizens and Landowners

Casco Bay Estuary Project

The Casco Bay Estuary Project coordinates many partnerships within the watershed, involving the organizations and individuals listed here. By helping to reinforce connections among existing groups, the Project enhances the capacities of all those working to protect the Bay.

Support for the Casco Bay Estuary Project is provided by the U.S. Environmental Protection Agency (under Section 320 of the Clean Water Act) and the Maine Department of Environmental Protection. Additional funds are provided through grants and contributions. The Project is administered by the Edmund S. Muskie School of Public Service at the University of Southern Maine in Portland and the Maine Law Institute at the University of Maine School of Law.

Surfing Casco Bay: Web Site Links

Casco Bay Estuary Project
www.cascobay.usm.maine.edu

Casco Bay Online
www.cascobay.com

Gulf of Maine Aquarium
www.gma.org

Maine Audubon Society
www.maineaudubon.org

Maine Coastal Program
janus.state.me.us/spo/mcp/mcp.htm

Maine Department of Environmental Protection
janus.state.me.us/dep

Maine Department of Marine Resources
janus.state.me.us/dmr

Portland Water District
www.pwd.org

USDA Natural Resource Conservation Service
www.ne.nrcs.usda.gov

US Environmental Protection Agency New England
www.epa.gov/region1

US Fish and Wildlife Service Gulf of Maine Project
gulfofmaine.fws.gov

Board of Directors

Jacki Cohen, Town of Freeport
Jean Dyer, Casco Bay Island Development Association
Ken Elowe, Department of Inland Fisheries & Wildlife
Dusti Faucher, Friends of the Presumpscot River
Stewart Feher, U.S. Fish & Wildlife Service Gulf of Maine Project
George Flaherty, Cumberland County Emergency Management Agency
Alan Houston, Town of Brunswick
Dan Jellis, Citizen Representative
Jeffrey Jordan, City of South Portland
Jack Kartez, Edmund S. Muskie School of Public Service

CBEP staff and board members with EPA New England Regional Administrator Mindy Lubber (front right)

Kathleen Leyden, Maine Coastal Program
Betty McInnes, Cumberland County Soil & Water Conservation District
John MacKinnon, Friends of the Royal River
Paul D. Merrill, Merrill Industries
Amy Naylor-Hobbs, Citizen Representative
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Alison Reeser, Maine Law Institute, University of Maine School of Law
Rick Seeley, Greater Portland Council of Governments
Steve Silva, U.S. Environmental Protection Agency New England, Maine State Unit
Laura Taylor, Maine Department of Marine Resources
John Wathen, Maine Department of Environmental Protection
Jamie Willey, Portland Water District

State of the Bay 2000

Cover photo: Bill Silkes, Jr. www.casinohunter.com
Text: F. Marino Schaeffer
Illustrations: Robin Swennes
Layout: Ed Gee Handcrafted Writing and Design www.hwdesign.com

Get to Know Your Bay!

Field Trips Around Casco Bay

The following sites will introduce you not just to the shores of the Bay but to the main rivers that flow into it: the Stroudwater, Fore, Presumpscot, Royal and Harraseeket. For a free map that shows places to explore around Casco Bay and for a schedule of upcoming trail events, contact Portland Trails (775-2411).

Eastern Promenade Trail, Portland: Enjoy expansive views of Casco Bay from this 2-mile trail along the Portland peninsula's eastern edge. You can start at the India Street end of Commercial Street or at the Eastern Prom boat launch.

Stroudwater Trail, Portland: A natural oasis in an unlikely setting, this 1.25-mile trail follows the Stroudwater River out toward Westbrook. Parking is off Outer Congress Street 0.1 mile beyond Westbrook Street (look for a steep gravel driveway on the right).

Fore River Sanctuary, Portland: This 85-acre property has a 3.5-mile network of trails winding through woods and marsh lands at the head of the Fore River. There's even a 25-foot waterfall! Park off Rowe Avenue (north end) or off Frost Street in the Maine Orthopedics lot (south end).

Pettengill Farm, Freeport: First settled in the late 18th century, this 140-acre saltwater farm has a trail system through woods and meadows along the Harraseeket River. The saltbox house, built around 1800, is listed on the National Register of Historic Places. Special tours and programs are offered regularly (865-3170) or you can explore on your own. Take Bow Street across from L.L. Bean and go 1.5 miles, turning right on Pettengill Road. Park at the gate and walk one-half mile on the dirt road.

Freeport Historical Society

Royal River Park, Yarmouth: This mile-long walkway through the heart of Yarmouth follows the lower Royal River, just up from the river's last active mill. You can park across from the Water District on East Elm Street and walk downstream or launch a canoe and paddle upstream.

Giant Stairs, Bailey Island: Harpswell Heritage Trust's Macintosh Trail along the bold eastern shore of Bailey Island provides panoramic views by a fascinating rock formation known as the Giant Stairs. An easy half-mile loop trail leads along ledges above the shore. Take Route 24 to Bailey Island and turn left on Washington Avenue 1.7 miles beyond the cribstone bridge. Proceed 1/4 mile and park across from the church.

Friends of Riverton Trolley Park (postcard image circa 1900)

Riverton Trolley Park, Portland: City residents once took streetcars from downtown to visit this park's casino, band stand and trout pond. While the structures are gone, the park continues to provide a serene setting along the Presumpscot River. Friends of Riverton Trolley Park offers regular walking tours every other Saturday morning (766-2970), or you can explore on your own. Located at Outer Forest Avenue and Riverside Street, with parking at the Riverside Street ball field.

Draft Minutes
Casco Bay Ad Hoc Indicators Committee
March 5, 2004

In attendance: Karen Young, Jack Kartez, Michelle Dionne, Mike Doan, Joe Payne, Diane Gould, Phineas Sprague, Phil Boissoneault, Lee Doggett (by phone)

Draft Meeting Minutes

1. Introduction: Why are we revisiting our Monitoring Plan/Refining our Indicators?

Diane noted that EPA Headquarters is requiring CBEP to have environmental indicators in place by the beginning of FY 2005. It is also timely to review the indicators CBEP defined in the 1996 Monitoring Plan to 1) evaluate their success as indicators over the last 8 years; 2) evaluate the need for additional or different indicators; 3) provide a foundation for the next "State of the Bay" report; and 4) ensure that CBEP's indicators fit with the framework of other regional indicators being developed, in particular the efforts of the regional coastal indicator group that met in New Hampshire January 6-8.

2. Definition: What is an indicator?

   Straw definition: Environmental indicators are measures of environmental quality that are used to assess the status and trends of environmental conditions. Their purpose is to show how well a system is working. If there is a problem, an indicator can determine what direction to take to address the issue. To be effective, an indicator must be:

   - Relevant, able to show you something about the system that you need to know.
   - Easy to understand, even by people who aren't experts.
   - Reliable, so the information the indicators provide is trustworthy.
   - Timely, so the information is available while there is still time to act.
   - In addition, a good environmental indicator will simplify large amounts of complex information into a concise, easily understood format.

The group agreed to use the straw definition, noting the importance of verifying the usefulness of any proposed indicator as a true indicator of the status and trends of environmental conditions. It was also noted that some indicators appeal more to a) scientists, b) managers, or c) the public and having a mix of these types of indicators is good.

3. What are we currently using as indicators? Review our monitoring plan and discuss additional activities/programs that are providing indicator data (e.g., air deposition monitoring, National Coastal Assessment).

   Hard copies of the Casco Bay Monitoring Plan were distributed. The group discussed the status of each of the indicators described in the plan.

#1 (Track CSO Abatement) - Lee noted that in all of Maine, CSO discharge volume has been reduced from 2.8 billion gallons/yr to 1.7 billion gallons/year in the period 1999-2003. Lee will provide figures for the Casco Bay watershed. John True compiles this information for DEP.

#2 (Assess stormwater loading of pathogens, toxics, nutrients and sediments) CBEP did not implement this element of the plan due to the costs involved. EPA's lab did fund collection of stormwater samples for PAH analysis in Long Creek.

#3 (Changes in status of shellfishing areas) - CBEP has been tracking shellfish area closures using data provided by DMR. Lee noted that information will be included in the 305b report due April 1.

#4 (Changes in public health status of swimming beaches) - Lee noted that East End (since 1989) and Willard (since 1997) beaches are monitored (required as part of the CSO program) and there were no closures in 2003. DEP has also conducted one-time monitoring at other Casco Bay beaches (e.g. Thomas Point, Long Island). There should be positive trends due to CSO improvement (sewage treatment plant on Peaks Island and Quebec St. project at East End beach). Maine beach monitoring data and closures are available online at www.maine healthybeaches.org.

#5 (Track regulated activities) - DEP (Portland office) has been working on this activity (e.g., NRPA wetlands activities, docks and piers, shoreline disturbance). Liz Hertz and Judy Gates were suggested as contacts on this. Group agreed it makes sense to coordinate with Liz Hertz regarding the state's requirement to develop indicators of the success of the CZM plan.

#6 (Assess changes in land use/habitat loss) - Remote sensing data was used by NOAA C-Cap to track changes in development in the lower Casco Bay watershed three years ago. This was a broad-brush approach. The group agreed Stewart Fefer and Jeff Dennis should be approached for further information on land use changes. Michelle D. pointed out that many changes in the shoreland zone are so small but cumulative that they won't show up at the landscape scale. Lee D. can get high resolution images.

#7 (Track wetland losses) - Maine SPO developed a wetland characterization pilot project. We need to talk further to Liz Hertz (also, Stewart Fefer) about tracing wetland loss. The scale of earlier efforts makes them less useful. Perhaps use a case study (Peaks I. or Westbrook 2 foot contours) for State of Bay report. Mike Mullen has information on cumulative wetland loss; also, Jean DeFranco is compiling information for freshwater for the 305(b) report.

#8 (Changes in eelgrass) - Seth Barker at DMR collecting this data. We should get an update from him on the status of this effort. [Update: A draft report on trends in Casco Bay is under review].

#9 (Waterbird survey) - The waterbird survey was recently completed by IF and W. The survey is repeated on a 5 year basis. Stewart Fefer should be able to provide the status of this.

#10 (Track low DO events) - FOCB collects DO data as part of its citizen monitoring program. In addition, CBEP funds FOCB to collect more intensive DO studies in

selected areas of the bay where low DOs have been recorded. FOCB analyzed 1993 – 1998 monitoring data and is planning analyze the 1999 –2003 data.

#11 (Track physical water quality parameters) - FOCB has 11 years of data on T, pH, salinity and DO in Casco Bay. A six year water quality data analysis was conducted on the 1993-1998 data but FOCB would like to analyze all the data collected to date.

#12 (Miles of rivers, streams, coastal water meeting water quality classification – 305b report) Trends could be determined by comparing past biennial 305b reports.

#13 (Protected habitat) – CBEP is working with U.S. Fish and Wildlife Service Gulf of Maine Program office to update maps of protected lands this summer. It should be possible to do a change analysis over time. The data on properties which are not open for access are not public; suggestion that data layers for properties should be distinguished by type of protection (e.g. easement vs. fee acquisition)

#14 (Changes in sediment toxics) – CBEP collected sediment toxics data in 1991 and 1994. The study was repeated in coordination with the National Coastal Assessment in 2000 and 2001. A trend analysis will be completed in 2004. It was pointed out that the change analysis may not reflect mitigation of pollution – only reflects potential risk in biologically active layer at the time of sampling.

#15 (Mussel tissue toxics) – CBEP funded collection and analysis of mussel tissue toxics at selected sites in the bay in years 1, 3, 5 and 7. A trend analysis will be conducted as part of the Toxics Report this year. In addition, Lee D. did an analysis of DEP's data for the 305(b) report.

#16 (Lobster tissue toxics) – CBEP funded collection and analysis of lobster tissue toxics (meat and tomalley) at selected sites in the bay in years 2 and 4 of implementation. A trend analysis will be conducted as part of the Toxics Report this year. The National Coastal Assessment (NCA) collects samples for whole body toxics. CBEP is not currently collecting additional lobster samples. Should we be looking at mercury in fish?

#17 (Cormorant tissue toxics) –Study was discontinued; data was not helpful as an indicator. This was originally selected as an indicator because the chicks that were sampled would reflect a local source of pollution. Should we be looking at seals? Ask about the MERI database.

#18 (Sediment toxicity bioassay) – The NCA conducted sediment toxicity bioassay on samples collected in Casco Bay in 2000 and 2001.

#19 (Benthic community analysis) – The NCA conducted benthic community analysis on samples taken in Casco bay in 2000 and 2001. CBEP did not collect these data because the cost was too high. Using these data and the data from #18 and #14, a sediment quality triad could be done.

Other data collected by the CBEP or its partners which may be useful in indicator development include atmospheric deposition of contaminant loads (nitrogen, metals), acreage of valuable habitat protected and restored, invasive species data (2003 rapid assessment), Beginning with Habitat data, impervious surface data (DEP), Turning

the Tides tidal restriction data, NCA water column nutrient data, FOCB nutrient and chlorophyll a data.

4. Compare our current indicators with the regional indicators developed at the January 6-8 New Hampshire workshop. A chart was used to compare the indicators in the CBEP Monitoring Plan and others used by CBEP and partners with the recommended suite of regional indicators. The conclusion was that CBEP is on track with indicators that parallel the majority of the recommended regional indicators. See the chart. Arrows note parallel/related activities.

5. Is the NHEP (New Hampshire Estuary Project) using any additional indicators we feel we should consider?
   At the moment, the group did not recommend any additional indicators based on the NHEP indicator set.

6. What additions/deletions do we want to make to the indicators in our monitoring plan? The group noted several linkages that have been added to the copy of the chart included with these minutes. In addition, the group noted that Casco Bay has a number of unique habitats (e.g., Maquoit, New Meadows) which we may want to consider in indicator development. The group also noted the importance of economic and, possibly, recreational indicators (e.g. clam harvest). Michelle D. suggested that an important change to consider tracking is buffer impacts (ie. Conversion of natural vegetation to lawn). Also suggested - impervious surface, OBD removals, NPDES permits and volume, health index for water quality, chlorophyl a, and phragmites.

7. Next steps – How do we proceed?

   We agreed that we may want to break into smaller groups formed around the following three areas:

   Developing Economic indicators

   Ideas:

   Correlate property value with water quality (Dr. Boyle with UMO)
   Collect recreational fishery data (Bruce Jewel of DMR creel survey)
   Update the economic analysis done by Charlie Colgan

   Revising our current Monitoring Plan

   Hold follow-up discussions with SPO, DEP and others identified above in the minutes

   Update and expand the plan to include the activities underlined in the Chart

   Developing indicators for the State of the Bay report

   Ideas:

   Determine how to involve the lay populace (e.g., "Sneaker index"/ "Jane's toes")

Address quality of life issues and what changes it will take to reach goals (e.g. "pain index – pain we have to accept to reach our vision")

Frame vision and goals for the future – e.g " Estuary of the Future" – paint a vision of where want to go

Figure out how to engage public with a good story (e.g. salmon back in the Presumpscot, "eco-history of the shad")

Include a case study (e.g. Casco Bay clean marina)

The larger group agreed to meet again on **April 29th from 10 – 12** [Room 522A]. Hopefully we can all meet together, then spend the latter part of the meeting in smaller groups.

Attachment 4

COLD CLIMATE STORMWATER

Stormwater Management in Cold Climates: Planning, Design, and Implementation

November 3-5, 2003,
Portland, Maine, USA
www.cascobay.usm.maine.edu/coldsw.html

Dear Conference Participant,

On behalf of the conference steering committee, sponsors, and partners, welcome to Portland, Maine!

"Stormwater Management in Cold Climates: Planning, Design, and Implementation" is the first international North American conference dedicated specifically to addressing the challenges of urban stormwater management in cold climates.

Our vision is to provide a forum for dialogue, information exchange and problem-solving across multiple disciplines and cold climate regions. Two days of outstanding sessions will feature forward-thinking experts addressing a broad range of important stormwater topics. We are excited to welcome 55 presenters and 375 participants from Norway, Sweden, Canada, and twenty-two U.S. states. Representatives include engineers, scientists, U.S. state and federal government employees, municipal staff, developers, designers, contractors, students, and others. The Casco Bay Exhibit Hall also features 22 different stormwater product manufacturers, service providers, and organizations.

As a participant in this conference, whether an attendee, speaker or exhibitor, you are demonstrating the leadership that will be needed to accomplish the task of managing stormwater in the 21st century. In this era of rapid urban development, competition for government dollars, and increased awareness of the ties between environmental and social issues, protecting our water resources is becoming an increasingly complex challenge. Through your efforts, both here and back in your communities, that challenge can be met.

This conference is an excellent opportunity to meet and learn from others through both formal and informal exchange. In order to foster networking and conversation, we have scheduled extended lunch times and breaks. In addition, please join us and fellow conference participants for a reception from 5:00 to 8:00 p.m. on Tuesday, November 4 in the Casco Bay Exhibit Hall. We look forward to meeting you!

We sincerely hope that you enjoy the conference and your stay in the Portland area.

Best regards,

Karen Young, Conference Co-chair
Director, Casco Bay Estuary Project

Todd Janeski, Conference Co-chair
Coastal Non-point Source Program Manager
Maine Coastal Program/State Planning Office

		Stormwater Management in Cold Climates Conference: November 3-5, 2003 Holiday Inn by the Bay, Portland, Maine USA		
Monday 11/3/2003	**7:30 - 5:00**	**Registration in lobby.**		
		8:00am - 4:00pm Certified Professional in Stormwater Primer New Hampshire Room	9:00am - 12 noon 1:00 - 4:00pm ASIST Computer Training Sessions Rhode Island Room	12 noon - 5:00pm Cold Climate Manual Work Group Massachusetts Room
	5:00 - 7:00	**Site visit to HYDRO International**		
Tuesday 11/4/2003	**7:30 - 8:30**	**Registration in lobby. Continental breakfast in Casco Bay Exhibit Hall.**		
	8:30 - 8:45	**Welcome**		
	8:45 - 9:45	**Keynote Speaker: Gary Oberts, "Snowmelt Research and Management: Ready for the Next Big Step"**		
	9:45 - 10:15	**Break in Casco Bay Exhibit Hall**		
		NEW HAMPSHIRE ROOM	**RHODE ISLAND ROOM**	**VERMONT ROOM**
	10:20 - 12:15	**Urban Snow Management**	**Stormwater Impacts & Treatment**	**Planning & Design for Stormwater Management**
	10:20 - 11:00	Annette Semadeni-Davies, "Observation and Modelling of Urban Snow"	Tim Van Seters, "Performance Assessment of Various Stormwater Treatment Facilities--Toronto, Canada"	Reid R. Coffman, "Green Roofs and Urban Stormwater Management: An Industry Review for Cold Weather Climates"
	11:00 - 11:40	Gary Oberts, "Meltwater Treatment Practices: The Basics"	Robert Roseen, "Seasonal Effects on Stormwater Microbiology and Effects of Standard Treatment Methods"	Katrin Scholz-Barth, "Green Roofs: Feasibility and Practicality for Stormwater Management in Cold Climates"
	11:40 - 12:15	Steven F. Daly, "Improving the Corps of Engineers Snowmelt Modeling Capabilities"	Terri-Ann P. Hahn, "A String of Pearls: Using BMPs in Sequence to Enhance Nutrient Removals"	Amy Prouty Gill, Alan G. LeBlanc and John Z. Olcott, Jr. "Stormwater Basins and Aesthetics: Not a Contradiction"
	12:15 - 1:30	**Lunch in Casco Bay Exhibit Hall**		
	1:30 - 3:30	**Stormwater Design for Roads and Highways**	**Stormwater Impacts & Treatment (continued)**	**Stormwater Management & Maintenance**
	1:30 - 2:10	Richard A. Claytor, Jr., "Retrofitting a Public Works Highway Yard with Stormwater Treatment Practices: A Cold Climate Stormwater Management Implementation Project in the City of Attleboro, Massachusetts"	Eric W. Strecker and Marcus Quigley, "Assessment of Cold Weather Highway Runoff Water Quality and BMP Performance"	John J. LaGorga, "Reducing Nutrient Runoff from Agricultural and Urban Sites in Syracuse, NY"
	2:10 - 2:50	Michael G. Darga, "Miller Road: A Case Study in Urban Road Stormwater Treatment"	Scott Nolan and Natalie Landry, "Stormwater Treatment Evaluation Project in Seabrook, New Hampshire"	Andrea Donlon and Rebekah Lacey, "Illicit Discharge Detection and Elimination: State/Local Partnerships"
	2:50 - 3:30	Carina Färm, "Monitoring, Operation, and Maintenance of Detention Ponds for Road Runoff"	Vaikko Allen, "Performance of a Vortechs System During Cold Weather Precipitation and Snow Melt Events"	David H. Fluharty, "Improved Maintenance: Drainage Management System"
	3:30 - 3:45	**Break in Casco Bay Exhibit Hall**		
	3:45 - 5:00	**Urban Snow Management Studies**	**Planning for Stormwater through Low Impact Development**	**Stormwater Treatment Practice (STP) Performance**
	3:45 - 4:25	David Mongeau and Pamela J. Deahl, "Treatment of Stormwater Runoff from Snow Melt at the Portland, Maine Snow Dump"	Evan Richert, "Unintended Consequences"	Chris Spelic, "Performance of Porous Pavement in Cold Climates"
	4:25 - 5:00	Douglas L. Heath, "Road Salt Impacts to Lakes and Streams from Interstate 93 and Adjacent Roads in Southern New Hampshire"	Wendi Goldsmith, "Stormwater Management and Low Impact Development for Cold Climates"	Eric W. Strecker, "Factoring the Performance of BMPs into the Development of Total Maximum Daily Loads (TMDLs) for Lake Tahoe"
	5:15 - 8:00	**Evening Reception in the Casco Bay Room, Holiday Inn**		

Community Strategies to Improve the Bay

Steps that can be taken locally to improve and protect Casco Bay

The Friends of Casco Bay
BAYKEEPER

April 2002

Casco Bay Estuary Project

Community Strategies to Improve the Bay was
prepared for the Friends of Casco Bay by:

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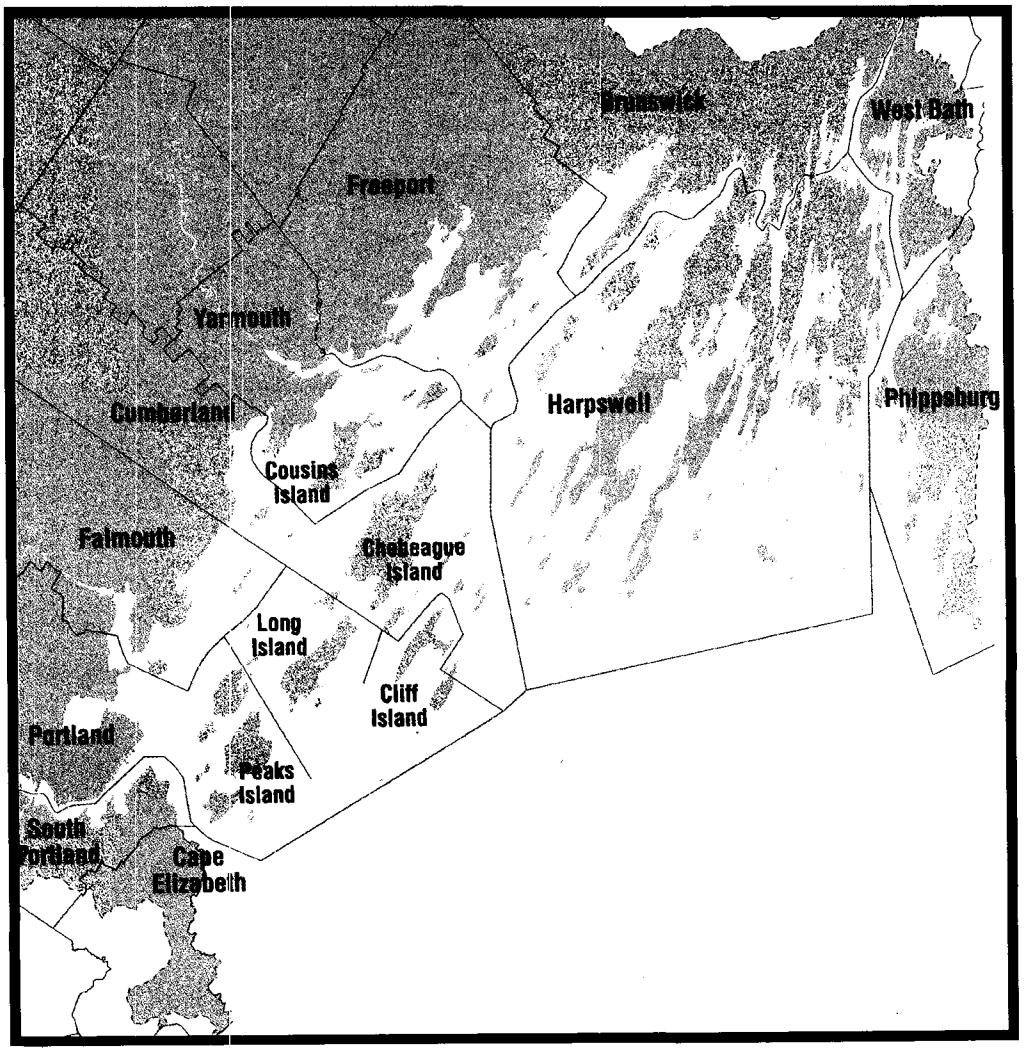
A project affiliated with the
Edmund S. Muskie School of Public Service
and the Marine Law Institute.

Community Strategies to Improve the Bay

Steps that can be taken locally to improve and protect Casco Bay



Shaded area = Lower Casco Bay Watershed

Threats to the Bay:

Nutrient loading

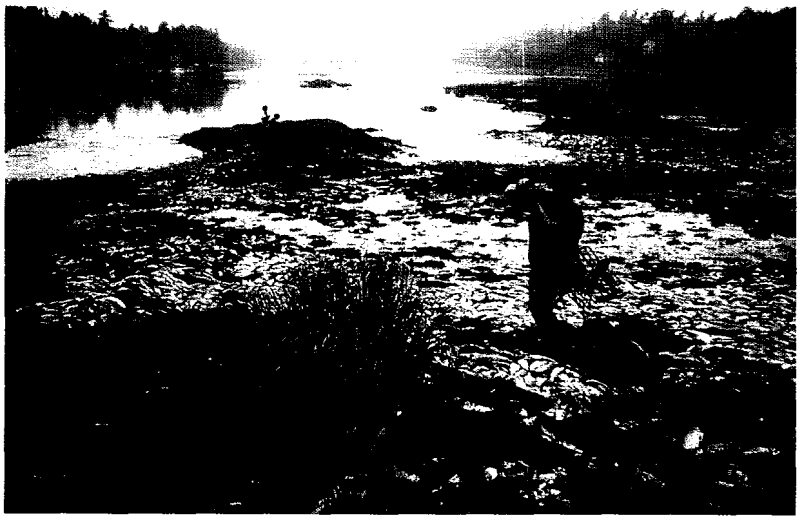
Excessive organic matter and nutrients enter the bay in runoff and can support an explosion of oxygen demanding bacteria. Resulting declines in dissolved oxygen can be lethal to marine life. Dissolved oxygen levels are therefore an important indicator of ecosystem health.

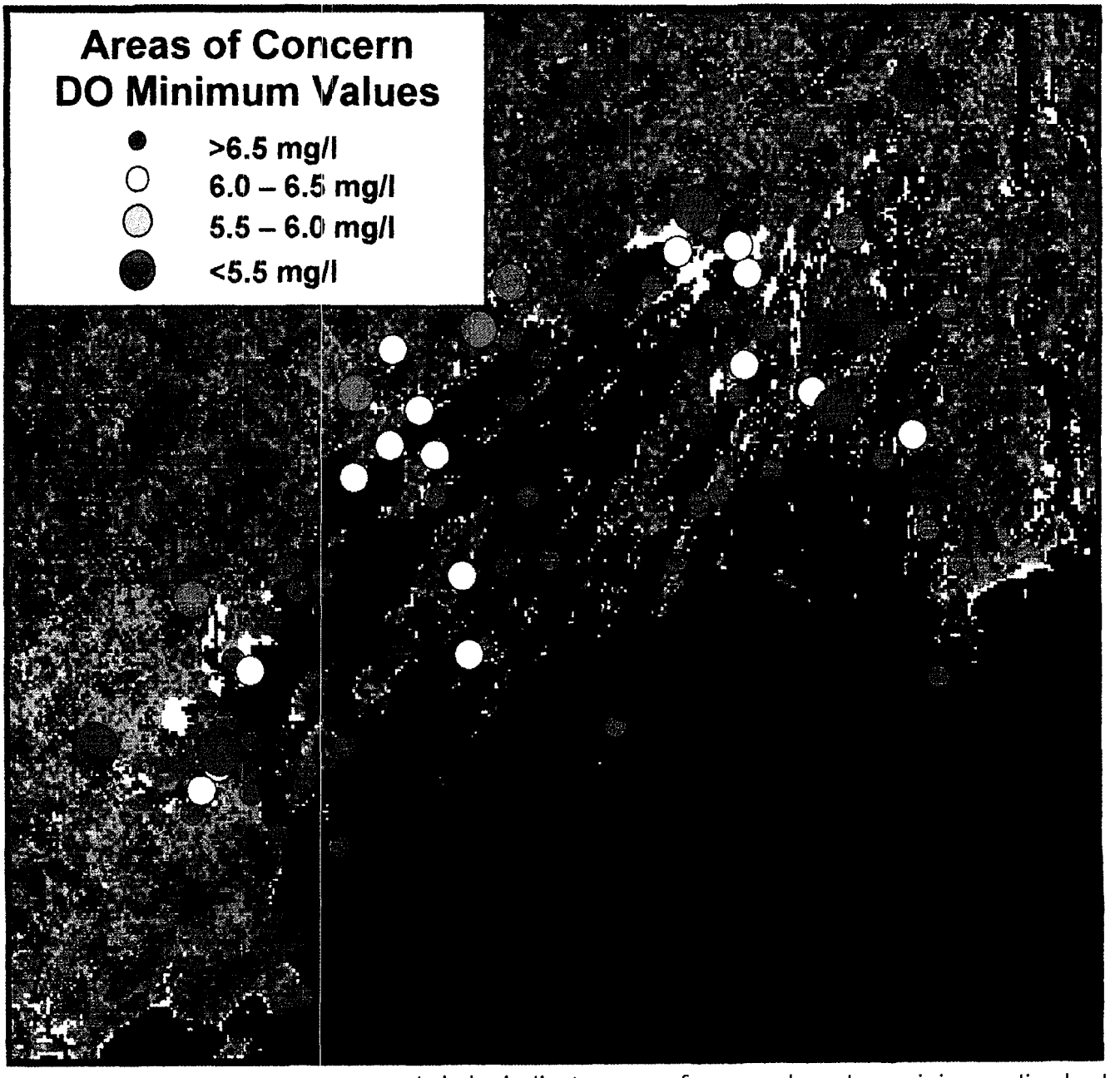
Casco Bay is generally in good health with regard to dissolved oxygen but there are areas of concern

The Friends of Casco Bay have conducted water quality monitoring in the bay since 1993. Eighty stations are sampled from April to October from shore; an additional ten stations are sampled by boat year round. Dissolved oxygen is measured along with several other oceanographic parameters. Data from the first six years of the monitoring program have recently been analyzed. The results indicate that while Casco Bay is generally in good shape with regard to dissolved oxygen, there are areas of concern (see map on facing page). Portland Harbor, the Presumpscot River, Royal River, Cousins River, Maquoit Bay, Quahog Bay and New Meadows River all exhibited relatively low levels of dissolved oxygen. In Portland Harbor, with seven sites sampled, low levels were primarily associated with Custom House Wharf and the Stroudwater Bridge sampling sites. By contrast, Quahog Bay, with five sites sampled, exhibited more uniformly depressed levels of dissolved oxygen. Point source discharges may be the cause of lower dissolved oxygen at Customs House Wharf, while nutrient-laden stormwater may be the source of the problem at the Stroudwater Bridge. The most recent dissolved oxygen data from the Presumpscot showed improved dissolved oxygen, indicating that elimination of the Sappi pulping operation upstream at Westbrook may have reduced levels of oxygen-demanding bacteria at the mouth of the river.

Sources of nutrients include septic systems, wastewater treatment plants, agricultural land and lawns. Conversion of meadows and woodlands into lots with buildings and pavement, and the loss of wetlands, increase the flow of nutrients into Casco Bay. That is because soils filter stormwater and plants absorb nutrients, while impervious surfaces increase runoff. Naturally occurring sources of organic matter can also cause problems: the Friends of Casco Bay monitoring program determined that the natural accumulation of seaweed in Peabbles Cove in Cape Elizabeth is the cause of low dissolved oxygen in that area.

Massive 1979 fish kill in the New Meadows River of menhaden (pogies) deprived of an adequate supply of oxygen





Large red circles indicate areas of concern based on minimum dissolved oxygen concentrations observed between 1993-1998.

A naturally occurring bloom of toxic algae may have contributed to the lethal decline in dissolved oxygen that resulted in a massive shellfish die-off in Maquoit Bay in 1988. The geography of the bay's inlets must be taken into account in evaluating the threat of nutrient loading. Maquoit Bay is relatively poorly flushed; nutrients are more likely to cause a problem in Maquoit Bay than in other areas of the bay more closely connected to the currents of the Gulf of Maine. The 1988 shellfish kill in Maquoit Bay demonstrates the risk from nutrient loading, whatever its source: thirteen years later Maquoit Bay has not regained its former status as one of the most productive shellfish harvesting areas in the state.

Pathogens

Pathogens, bacteria and viruses that affect human health, are a pervasive problem in Casco Bay. Although not by themselves a threat to the environment, they are a public health risk and result in the closure of shellfish harvesting areas. One source of pathogens introduced to Casco Bay are the waste water treatment plants in Freeport, Yarmouth, Falmouth, Westbrook, Portland, South Portland and Cape Elizabeth. There is little that can be done at this time to reduce or eliminate resulting shellfish closures. As population in the region grows, the volume discharged from waste water treatment plants will increase, and areas closed to shellfishing near the outfalls may be expanded, especially for those plants, such as in Falmouth and Freeport, which discharge to enclosed areas.

Population growth will increase the discharge of waste water to Casco Bay

Some towns in Casco Bay have been very aggressive in locating and removing sources of bacterial contamination including boat discharges, failing septic systems, overboard discharges, waste water treatment plant overflows, manure storage, and pet wastes. For example, Freeport has successfully removed all but one of its overboard discharges, encouraged an upstream farm to use best management practices for manure storage, and has initiated a pet waste cleanup program at Winslow Park.

Historically, many Casco Bay shorefront home and business owners found it easier to discharge their domestic waste into the bay via overboard discharges than to build in-ground septic systems on a rocky shore. Overboard discharge systems, which partially treat wastewater, represent one source of bacterial contamination that keeps approximately 25% of Maine's mussel and softshell clam flats closed to harvest (due to the risk of system malfunction). Installation of these systems has been prohibited in Maine since 1987. When it enacted the ban, the Legislature also created a program to help pay for replacement of existing overboard discharges with in-ground systems, where possible. Many communities in Casco Bay have taken advantage of this program to remove overboard discharges within their borders.

Pathogens result in the closure of shellfish beds

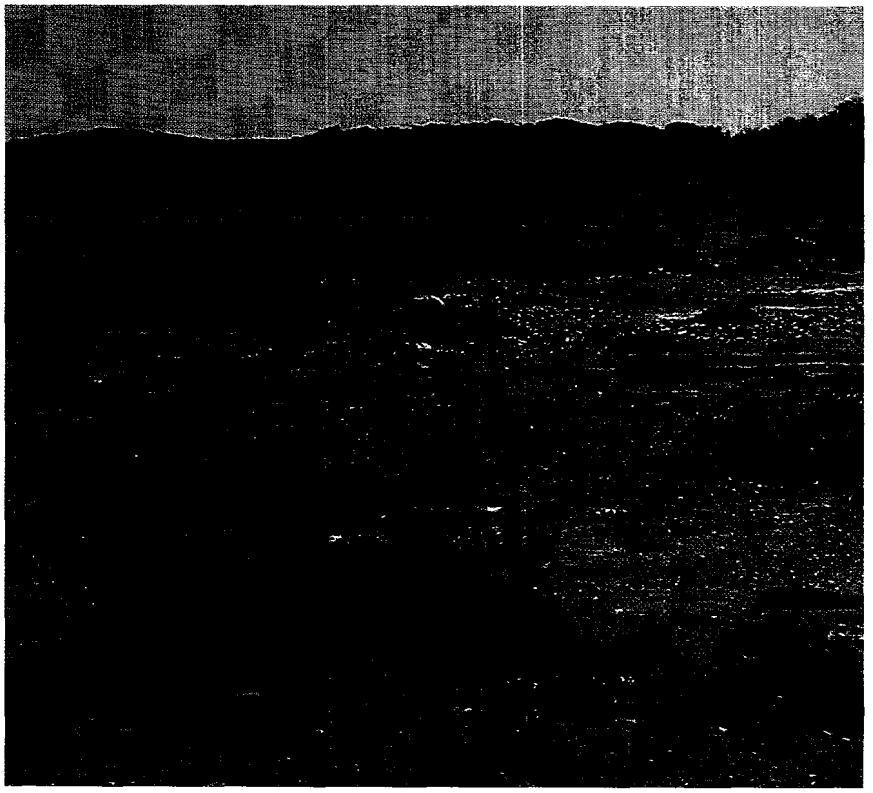


Table 2. Number of licensed overboard discharges (OBD) as of 2001.

Municipality	OBDs	OBDs in Casco Bay Estuary Project removal program
Cape Elizabeth	5	
South Portland	1	
Portland*	60	
Falmouth	2	
Cumberland	1	
Yarmouth	14	
Freeport	1	
Harpswell	116	10
Brunswick	5	3
West Bath	19	8
Phippsburg	11	1
Long Island	4	
Total	**239**	

* All are located on Portland's Islands

In recent years hundreds of acres of Casco Bay clam flats have been re-opened to harvesting after pollution sources were cleaned up

In 1999, the Casco Bay Estuary Project, in collaboration with local stakeholders, assessed closed shellfish areas within the bay in order to help municipalities restore their shellfish growing areas. Intertidal areas were ranked according to their shellfish productivity, sources of pollution and degree of difficulty of remediation. Clam flats in Brunswick, West Bath, Harpswell, and Phippsburg were targeted for remediation. By the end of 2001, 35 overboard discharges will have been removed and 300 acres of shellfish habitat opened to harvest in the four towns.

Bacterial contamination from homes often goes undetected or ignored. Local code enforcement officers focus on licensing new systems rather than remediating inadequate existing systems. However, grant programs and low interest loans can facilitate water quality improvement by funding replacement of untreated discharges, malfunctioning septic systems, and installation of community-based disposal systems.

Combined sewer overflows (CSOs) occur when major rainstorms cause waste water conveyance pipes and treatment plants to become overloaded, resulting in direct discharge of untreated wastewater to Casco Bay. Portland and South Portland have programs in place to separate stormwater from the waste stream in order to reduce pathogen contamination. The next challenge is to reduce the volume of stormwater altogether and to ensure

that all stormwater is properly treated, removing contaminants as well as suspended solids and pathogens, before being discharged into the bay.

Discharge of human waste from boats is another source of pathogens in Casco Bay. Some marinas in the bay operate facilities for pumping out wastewater holding tanks. In addition, the Friends of Casco Bay operate a pumpout boat. Although discharge of sewage from boats is prohibited within state waters, enforcement is nonexistent and the practice is common.

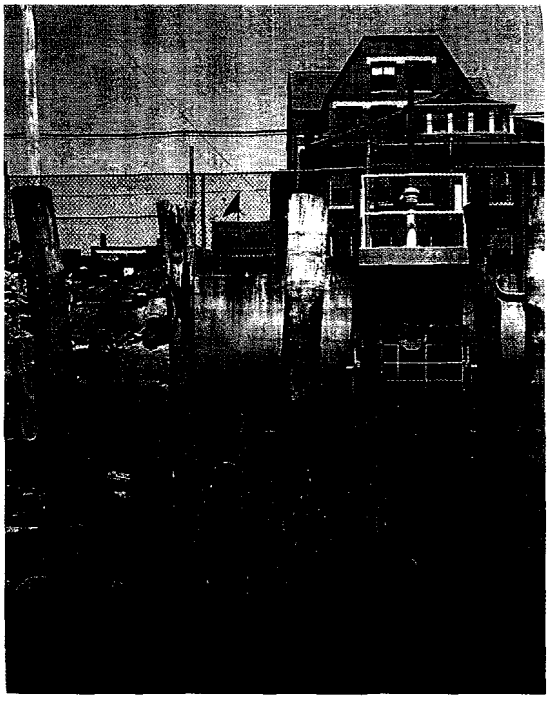
Although sewage discharge from boats is prohibited within state waters enforcement is nonexistent and the practice is common

Shellfish harvesting areas in the vicinity of anchorages are subject to closure if fecal coliform levels are high, or the threat is high, based on the number and type of boats, particularly live-aboard boats, moored in the area. Pathogens may represent a threat to swimmers at popular anchorages such as the Goslings and Cocktail Cove as well as along the shore of the mainland. To help maintain shellfishing within the Harraseeket, Freeport has relocated moorings and is educating boaters regarding discharge laws and the availability of pumpout facilities.

Toxic Contaminants

The bay has likely been a sink for toxic contamination since the dawn of the industrial revolution. Toxics enter the bay today from industrial discharges and wastewater treatment plants, atmospheric deposition, stormwater, boatyards and marinas. Toxic chemicals have the potential to harm living organisms. The degree of toxicity depends on the chemical, its concentration, and the affected organism. Types of toxic contaminants include metals, organic compounds, and chlorine.

Combined sewer overflow (CSO) that discharges into Portland Harbor



Sediment analysis conducted by the Casco Bay Estuary Project indicates that toxic materials have accumulated in several areas of the bay, particularly in more heavily populated areas. Inner bay and shallow water sites near the City of Portland have elevated levels of weathered petroleum, probably resulting from chronic inputs from runoff and point sources. Nearby sites in the west bay showed a relative enrichment from an unweathered petroleum product suggesting a localized source of contamination, perhaps fresh diesel fuel. The contaminant composition of sediments from Cape Small, far from urbanized sources, was similar to that of the inner bay; perhaps these contaminants come from the Kennebec River.

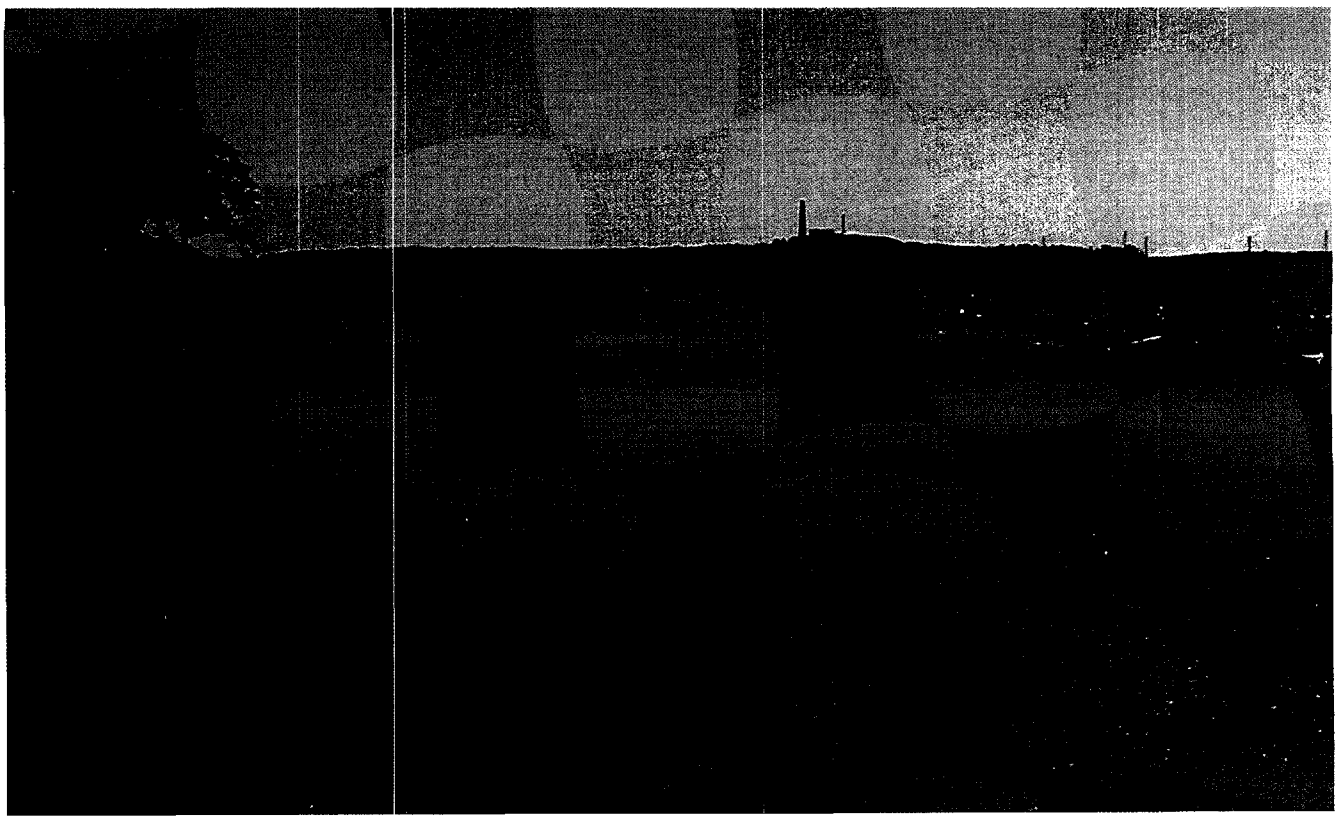
Some results of sample analysis were considered high by national standards. The widespread distribution of contaminants at elevated concentrations in the bay, including in areas that are not located near any historical sources, known discharges, or intense urban development, suggests that atmospheric deposition of combustion-related contaminants may play a significant role in the accumulation

of such contaminants in the sediments. The Casco Bay Estuary Project will repeat sediment analysis in late 2001 to assess trends in toxic contamination over time.

Stormwater runoff carries pesticides and herbicides applied to agricultural fields, recreational areas, and homeowners' yards into the bay. Homeowners are the largest group of pesticide users and yet they are the least regulated. The amount of pesticides sold for home use by Maine residents has doubled in the past five years to 1,600,000 lbs; many are common weed killers, weed and feed products, and insect and rodent controls that are all readily available at hardware and garden supply stores. State law requires that anyone who applies pesticides in a public place, such as schools, municipal grounds, golf courses and parks, be licensed by the Maine Board of Pesticide Control. Enforcement is poor, however; for example, many schools use unlicensed staff to apply pesticides.

Homeowners are the largest group of pesticide users and yet they are the least regulated

The Friends of Casco Bay are currently sampling stormwater runoff for the presence of three herbicides and two insecticides (all common components of weed and feed products), as well as nutrients (nitrogen and phosphorus), to test the widely held theory that such chemicals are washing into the bay.



Toxic contaminants at elevated levels are widely distributed in the bay's sediments, suggesting that one source is the atmosphere. Vehicle exhaust and smoke stacks are sources of contaminants.

What can be done to protect water quality?

Stormwater Management

Since 1990, stormwater runoff has been regulated by the federal government in municipalities with populations greater than 100,000 and construction sites larger than five acres through a permitting process that pertains mostly to new construction. More recent regulations (EPA's "Phase II" regulations) enlarge the sphere of oversight to urbanized areas larger than 50,000 people and construction sites between one and five acres. These rules are principally applicable to the Casco Bay municipalities of Cape Elizabeth, Falmouth, Portland, and South Portland. Each municipality is obligated to improve water quality and reduce pollutant discharge to the "maximum extent practical" and to report results using measurable goals. Activities designed to comply with Phase II regulations will complement existing efforts to limit CSOs.

Runoff from the parking lot at the YMCA in Freeport is collected in a detention pond to reduce pollutant discharge into the bay

Stormwater can also be addressed by smaller and more rural communities. Runoff to coastal and upstream waters can be reduced by buffers required by state-mandated shoreland zoning regulations. Nutrient loading and sedimentation are minimized by vegetation, which slows runoff and absorbs nutrients. Towns, with support from the Maine Department of Environmental Protection, should resist granting variances that compromise the effectiveness of setbacks.

Stormwater is most likely the single largest source of pollution to the bay

Nonpoint Education for Municipal Officials (known as NEMO) is an education program housed at the Southern Maine Technical College. It is an excellent means of informing municipal staff and volunteers regarding prevention of nonpoint sources of pollution; Freeport has already benefited from participation in NEMO. The program will soon offer training so that representatives from local communities can conduct their own educational sessions.

Build-out analyses of residential areas, conducted to plan for development within a town, can also be used to assess nutrient loading on a watershed basis. By calculating the number of homes in a subwatershed and applying average rates of nutrient runoff from septic systems and impervious surfaces,

estimated total nutrient loading can be compared to that which the receiving water can absorb without suffering degradation (which is related to size, flushing and other parameters). A build-out analysis for Casco Bay's coastal towns performed by the Casco Bay Estuary Project is a useful starting place for such an exercise.

Best management practices recreate as much as 50% of the filtering capacity of natural features disrupted by development

In order to protect Middle and Maquoit Bays, the Town of Brunswick has established a coastal protection zone in part of the area draining to the bays (a pending proposal would extend the zone to nearly the full extent of their watersheds). Housing density and impervious surface are regulated to reduce nutrient loading to the bay from septic systems and stormwater.

For more developed areas, the amount of impervious surface becomes the limiting factor in maintaining water quality; it is estimated that impervious surface of as little as 10% will result in degradation of surface waters within a watershed. As an example, Concord Brook watershed which drains about half of downtown Freeport, is calculated to have 14-20% impervious surface already.

Municipalities can require that best management practices (BMPs), described by the Maine Department of Environmental Protection, be applied to development and other land use activities within their borders. BMPs can recreate as much as 50% of the filtering capacity of natural features disrupted by development through creation of vegetated buffer strips and swales, ditch stabilization, and stormwater detention ponds. These features help to reduce erosion and improve water quality by allowing infiltration of stormwater.

Installation of such features is not the end of the story. They must be maintained on an ongoing basis to ensure that they continue to function properly. A recent analysis of stormwater features in Scarborough indicated that many were not achieving the level of treatment for which they had been designed. In another example, Freeport undertook a major retrofit of stormwater structures in Concord Brook to improve their capacity to capture and treat stormwater. Towns should work with the Maine Department of Environmental Protection to ensure that design, installation and maintenance of BMPs are sufficient to ensure effective treatment of stormwater.

The pond next to Cole-Haan headquarters in Yarmouth features innovative stormwater management, collecting rainwater off buildings for use in irrigation

Working together, municipalities, government agencies, non-governmental organizations and

stakeholders can create watershed management plans to comprehensively address water quality issues. Currently, such groups are at work on the Presumpscot, New Meadows and Royal Rivers.

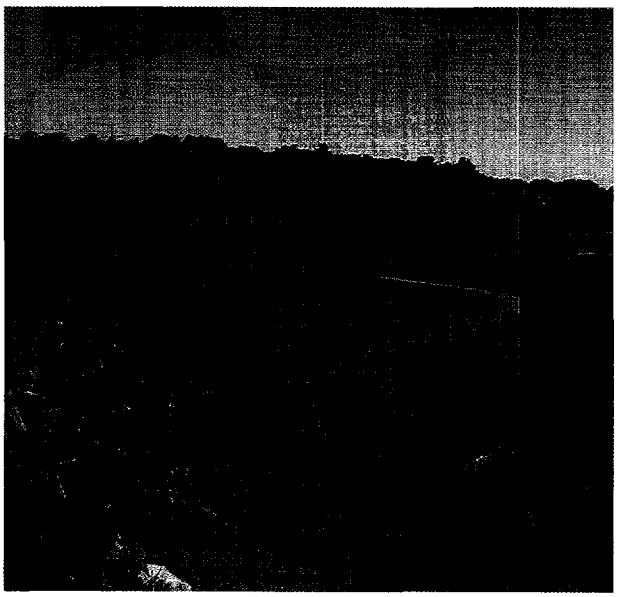
Individual homeowners, and other land owners, can do their part for the bay by participating in the BayScaper program, an effort of the Friends of Casco Bay in partnership with the Maine Board of Pesticides Control, to promote environmentally sound landscaping practices. Participants receive guidance on how they can limit the flow of nutrients and pesticides from their lands and ultimately into Casco Bay.

Habitat Protection

Preservation and restoration of wetlands and other natural habitats is another way to maintain and improve water quality. Grants are available from the National Oceanic and Atmospheric Administration's Community-based Restoration Program, the U.S. Army Corps of Engineers' Coastal America Program, the Maine Outdoor Heritage Fund, the Casco Bay Estuary Project, the Gulf of Maine Council on the Marine Environment, the US Fish and Wildlife Service (related to the North American Waterfowl Management Plan and National Coastal Wetlands Conservation Program), and the National Fish and Wildlife Foundation to help protect and restore habitat. Preservation of riparian and coastal habitats ensures that these areas continue to be pollution filters, not pollution sources.

Also important are efforts to restore coastal habitat, such as the Conservation Law Foundation's "Return the Tides" program, which trains volunteers to identify opportunities to restore salt water flow where it is constrained by roads, bridges, and other structures. Naturally functioning salt marshes and intertidal flats are important to maintaining Casco Bay's nutrient cycle.

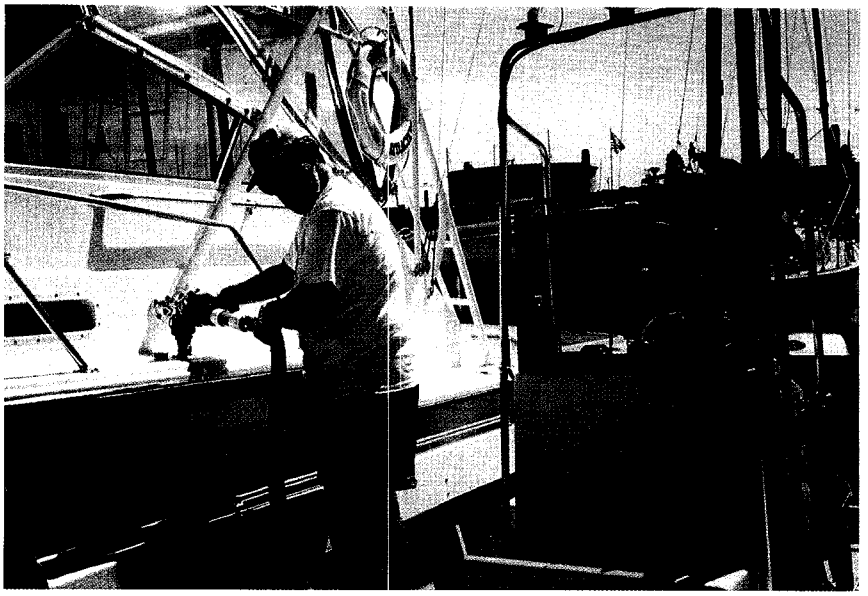
Salt marsh preservation assures protection of valuable habitat and filtering functions



Protection of open space in many cases preserves natural vegetation that filters water eventually draining to the bay. Similarly, many of the techniques designed to limit sprawl, such as steering growth toward areas that are sewered (assuming that the wastewater treatment is effective) and limiting the expansion of roads, will also help to protect water quality in Casco Bay.

Pollution Prevention

Pollution prevention activities are also important. Industrial pretreatment programs can reduce the amount of toxic contaminants introduced into the municipal waste stream. Integrated pest management and BayScaping are ecologically sound alternatives to many current pesticide practices and can reduce the pesticide load in stormwater.



The Friends of Casco Bay's pumpout boat will meet boaters on the bay, making it convenient to empty a boat's holding tank

South Portland is a model for managing municipal lands to limit water quality impacts: integrated pest management is used to reduce chemical use. Soil testing, selection of hardy vegetation and calculation of lightest possible applications limits need for use of fertilizers and pesticides.

In-ground septic systems generate nutrients, even when properly functioning. When malfunctioning they are a source of pathogens as well. Limiting housing density in unsewered areas, ensuring the proper functioning of septic systems, and maintaining vegetated setbacks from water courses are important to protecting water quality. The Town of Yarmouth allocates tax revenue to pump septic systems in the town every three years at no extra charge to the homeowner. This proactive approach will prevent the failure of many septic systems, and reduce the need for costly replacement systems.

Availability of functioning pumpout facilities is important for limiting discharge of sewage from boats. Towns working together with the Maine Department of Environmental Protection can ensure that marinas provide and maintain pumpout services. In addition, boaters need to be educated regarding the location of pumpout facilities and the importance of not discharging directly to Casco Bay.

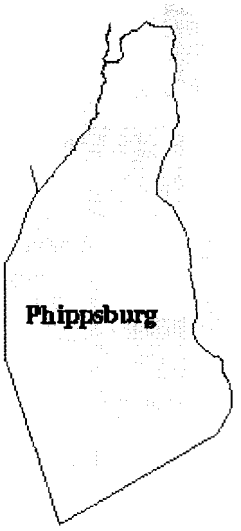
Education

Availability of functioning pumpout facilities is important for limiting discharge of sewage from boats

Education is a crucial tool in achieving compliance with water quality regulations, recommendations, goals and policies. Mailings to home owners, information in boat registrations, town web sites, local access television programming, and school programs are among the many opportunities for increasing awareness in our communities of the need for effective stewardship of the bay – by individuals, businesses, nonprofits, schools and others. Organizations like the "Stream Teams", coordinated by Maine Department of Environmental Protection, create an avenue for citizens to collaborate on protecting streams that are important to their community and provide a clearinghouse for information on water quality protection.

The following section of the report details specific recommendations which each of the municipalities bordering the bay can implement to protect and improve water quality in Casco Bay.

Phippsburg



Setting

- Rural setting on coastal peninsula adjacent to the Kennebec River, Casco Bay, and the New Meadows River
- Population has increased by 16% since 1990
- Historical and current industries include fishing, boat building, lumber mills, shellfish harvesting, and tourism
- Primarily residential community
- Over 12 miles of coastline bordering Casco Bay and 28 square miles of land area

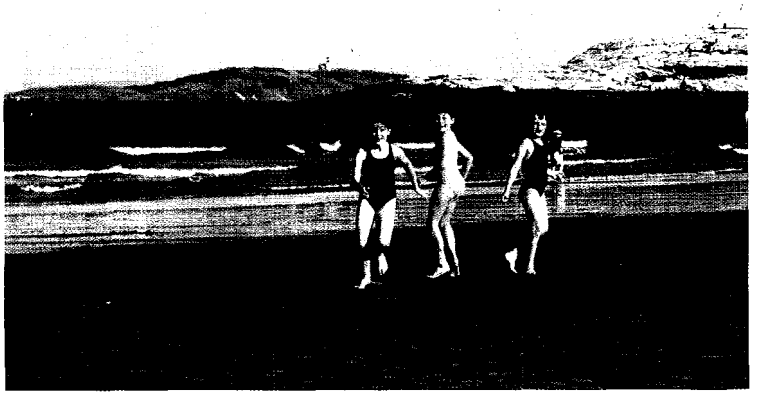
Water quality issues

- Wastes from boats in the Basin during the summer months
- Overboard discharges at Sebasco, West Point and Carrying Place
- Non-point source pollution in Round Cove
- Dissolved oxygen levels in the upper New Meadows River among lowest in Casco Bay

Model activities

- Active shellfish committee collects water samples to assure that clam flats are "Open to Harvest"
- Participation in multi-town effort to protect water quality in the New Meadows River
- Land trust has purchased over 700 acres for conservation in past 15 years

Popham Beach State Park is the most visited open space in Phippsburg. The local land trust has been protecting hundreds of additional acres in recent years.



Opportunities

Restore and protect shellfish growing areas

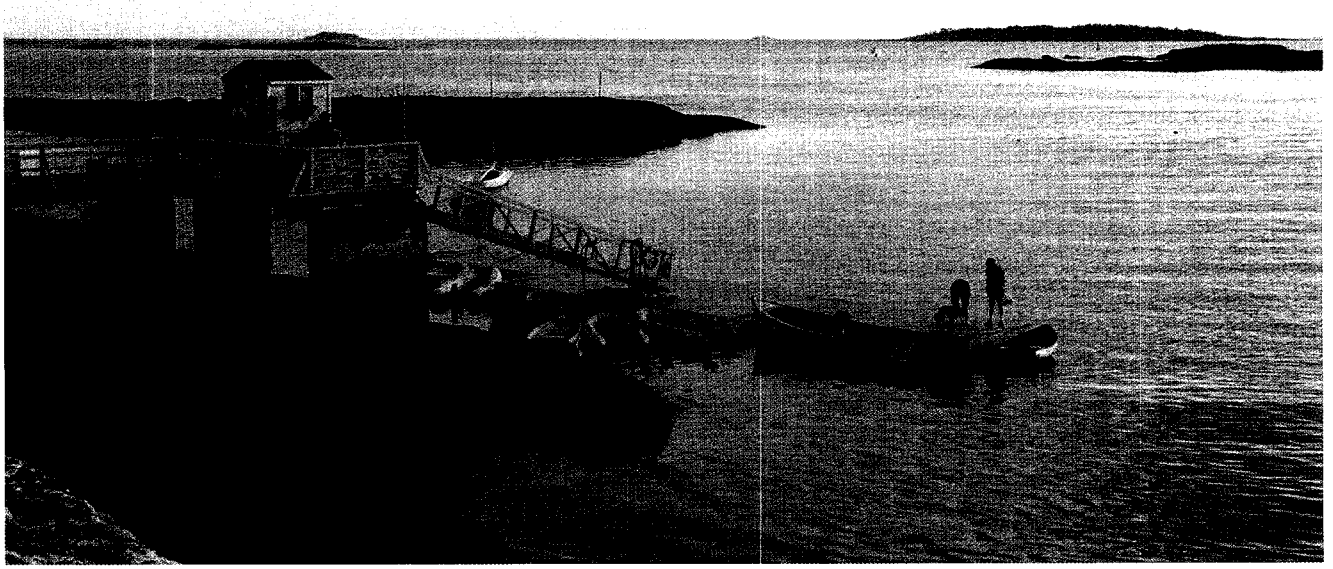
- Continue water quality monitoring and efforts to remove overboard discharges
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility

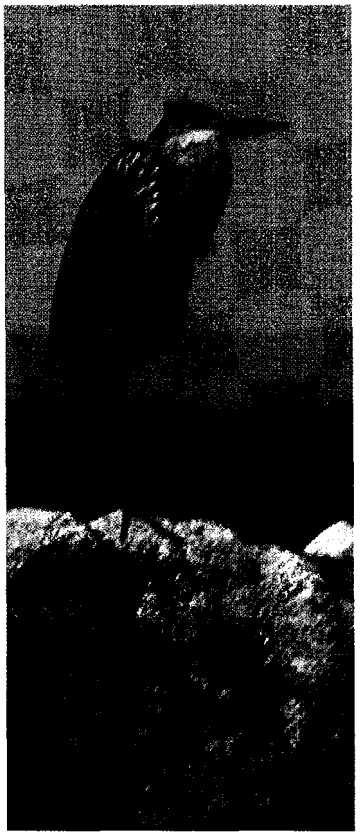
- Require timely pumping of septic systems
- Inspect septic systems upon sale or transfer of property and require replacement of overboard discharges where appropriate
- Install sign at entrance to the Basin regarding ban on discharges and availability of pumpout facilities
- Develop harbor management ordinance to limit moorings in the vicinity of shellfish growing areas
- Work with West Bath, Harpswell and Brunswick to provide additional pumpout facilities, including for deep draft, recreational vessels
- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection
- Encourage compliance with state law requiring installation and maintenance of pumpout facility at Sebasco

Reduce impacts of pesticides and other toxics

- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Require use by the town and private landowners of best management practices for road/stream crossings, available from the Maine Department of Environmental Protection
- Develop regulations, best management practices and/or integrated pest

Sebasco Estates





management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect

- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Amend the shoreland zone to require 250 foot setback from streams, wetlands and other riparian areas
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Participate fully in development of a watershed management plan for the New Meadows River
- Support public and private efforts to protect open space through acquisition and easements
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College

Raise public awareness of water quality issues in Casco Bay

- Develop K-6 curriculum materials, and service learning opportunities related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners. The goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Provide information about discharge laws and availability of pumpouts to residents registering boats

West Bath

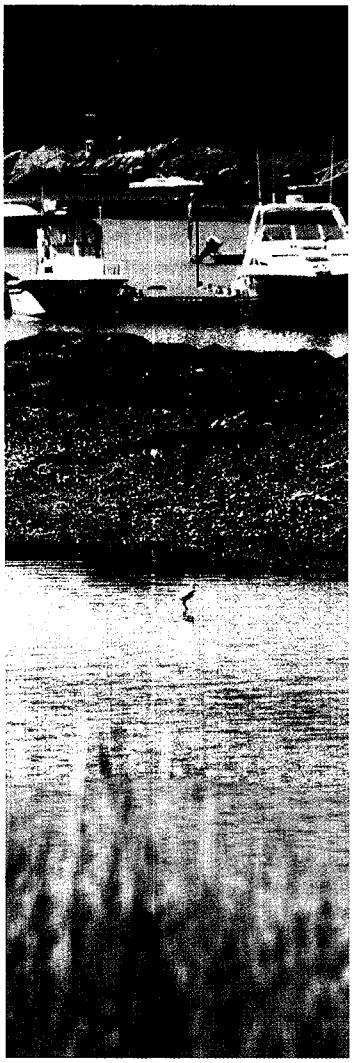
Setting

- Rural community on the New Meadows River
- Mostly residential, with commercial development along Bath Road
- Population rose from 1,716 to 1,798 between 1990 and 2000, an increase of 4.8 %
- Over 8 miles of shoreline on Casco Bay with almost 12 square miles of land area
- Coastline contains valuable soft-shell clam harvest areas

Water quality issues

- Overboard discharges are keeping over 65 acres of clam flats closed to harvesting
- Stormwater is not addressed
- Dissolved oxygen levels in the upper New Meadows River and New Meadows Lake among lowest in Casco Bay

New Meadows River



Model activities

- Participation in multi-town effort to protect water quality in the New Meadows River
- Banned new overboard discharges in 1987 - first community to do so
- Collaborating with Casco Bay Estuary Project to remove overboard discharges in important soft-shell clam habitats

Opportunities

Restore and protect shellfish growing areas

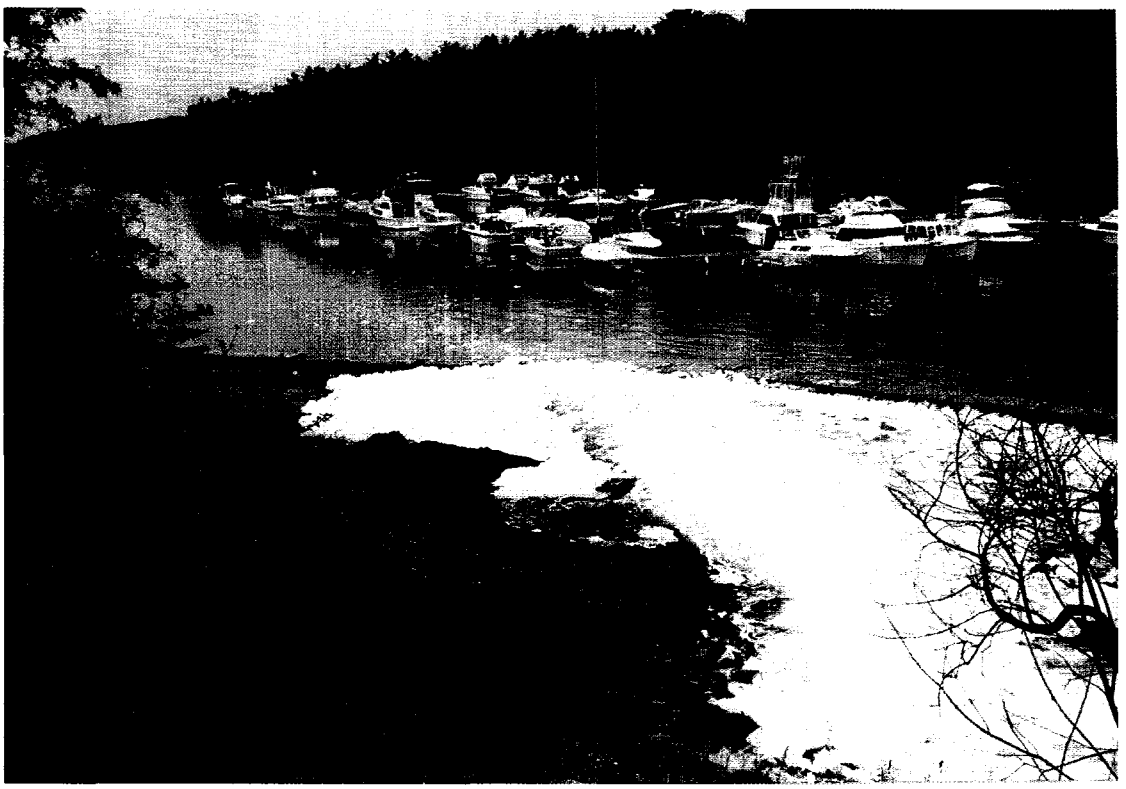
- Continue water quality monitoring and efforts to remove overboard discharges
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Work with Phippsburg, Harpswell and Brunswick to provide additional pumpout facilities, including for deep draft, recreational vessels
- Develop harbor management ordinance to limit moorings in the vicinity of shellfish growing areas

- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection

Reduce impacts of pesticides and other toxics

- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Develop stormwater management plan especially in developed area along Bath Road
- Require use of best management practices for road/stream crossings, available from the Maine Department of Environmental Protection, by the town and private landowners
- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas

West Bath is part of a multi-town effort to protect water quality in the New Meadows River



Removal of OBDs has opened acres of shellfish harvesting area in the New Meadows River

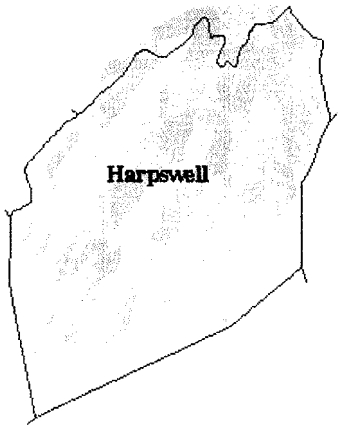
Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Work with Brunswick to remove barrier at mouth of New Meadows Lake to increase tidal action and flows in the lake and thereby reduce risk of low dissolved oxygen
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Participate fully in development of a watershed management plan for the New Meadows River
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Form conservation commission and/or land trust to work towards land acquisition and resource conservation, and to monitor enforcement of environmental regulations

Raise public awareness of water quality issues in Casco Bay

- Develop K-6 curriculum materials and service learning opportunities related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Harpswell



Setting

- Three peninsulas give town longest shoreline in Casco Bay (230 miles); land area equals 24 square miles
- Largely rural community of 5,239; population up 5% since 1990
- Economy dependent on fisheries, summer cottages, and commuters
- Coastline contains valuable soft-shell clam harvest areas
- Many islands provide wildlife habitat and recreational opportunities

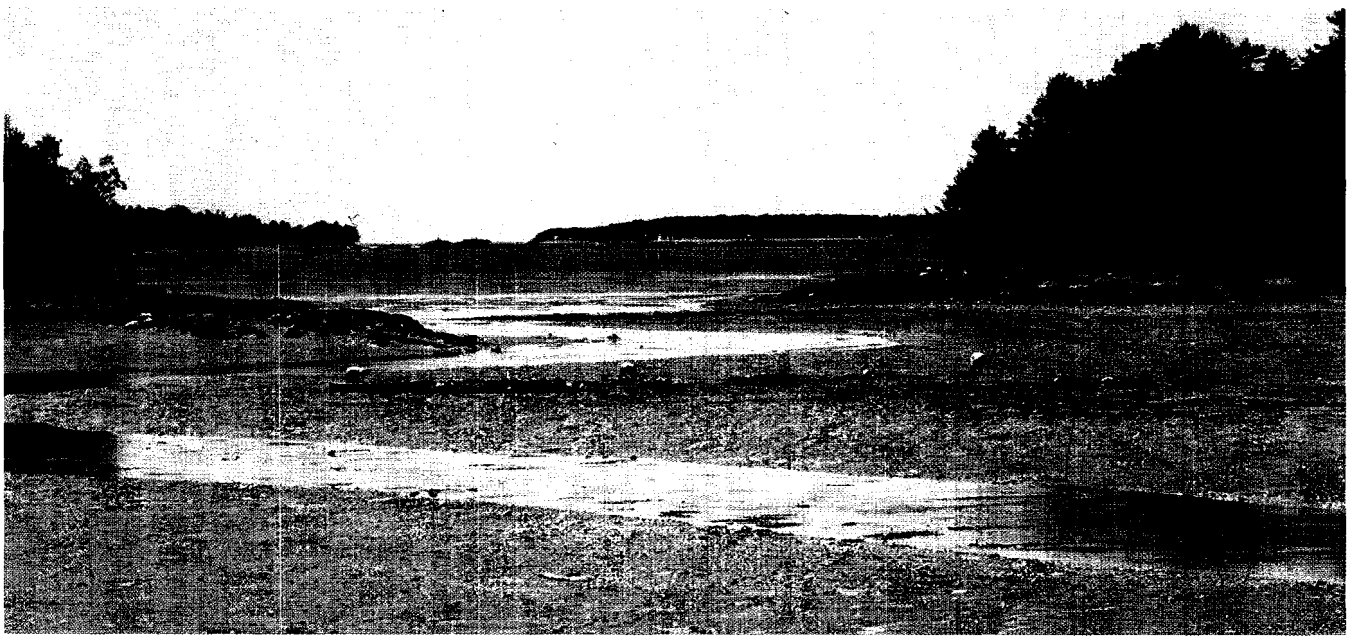
Water quality issues

- Many overboard discharges remain
- Dissolved oxygen levels in the upper New Meadows River and Quahog Bay among lowest in Casco Bay
- Discharges from boats may contribute to shellfish closures
- Continued development a likely source of pathogens and nutrients
- Harpswell Cove and Middle Bay must be managed jointly with Brunswick

Model activities

- Volunteer monitoring of shellfish flats
- Overboard discharge removal program in important shellfish harvest areas

Harpswell is actively protecting shellfish harvesting areas from pollution



- Participation in multi-town effort to protect water quality in the New Meadows River

Opportunities

Restore and protect shellfish growing areas

- Investigate joint management with Brunswick of pollution threats in the watersheds of Harpswell Cove and Middle Bay
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Continue to remove overboard discharges
- Assign municipal staff to sample collection
- Work with West Bath, Phippsburg and Brunswick to provide additional pumpout facilities, including for deep draft, recreational vessels
- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection
- Develop harbor management ordinance to limit moorings in the vicinity of shellfish growing areas

Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Monitor Brunswick Naval Air Station for activities that may threaten water quality

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality

- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Support efforts of the Land Use Committee to implement a resource protection ordinance
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Eliminate exemption for agriculture within the shoreland zone
- Participate fully in development of a watershed management plan for the New Meadows River
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Study circulation of Quahog Bay to determine flushing rates
- Support public and private efforts to protect open space through acquisition and easements

Raise public awareness of water quality issues in Casco Bay

- Develop K-6 curriculum materials, service learning opportunities and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com and other internet-based educational material, etc.)

- Provide information about discharge laws and availability of pumpouts to residents registering boats

Brunswick

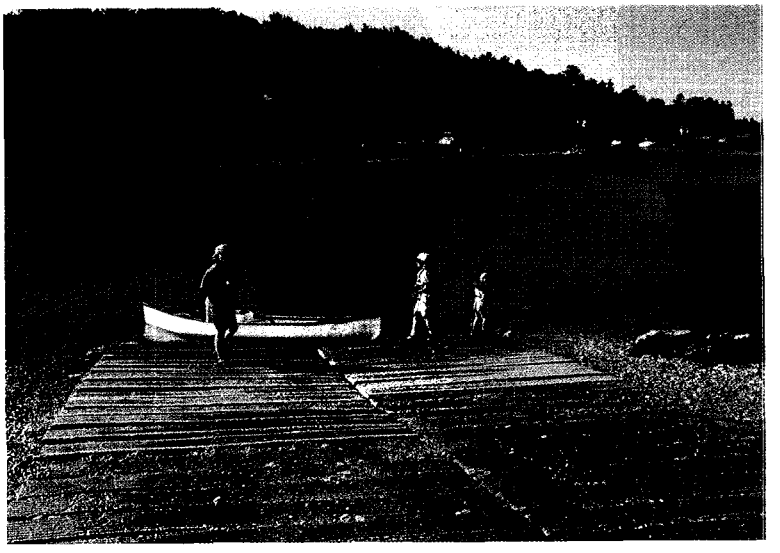
Setting

- Community of over 20,000; situated between the Androscoggin River and the head of Casco Bay
- Population growth of 1.3% over last decade but 2.6 houses built for each new resident
- Forty-nine miles of coastline and 47 square miles of land area
- Growth focussed on town center and surrounding neighborhoods
- Rural part of town includes farmland, wooded areas, and other large undeveloped parcels
- Economy dominated by Brunswick Naval Air Station, light manufacturing, service industries and Bowdoin College
- Coastline contains valuable soft-shell clam harvest areas

Water Quality Issues

- Threats to status of shellfish harvesting areas
- Dissolved oxygen levels in Maquoit Bay, New Meadows Lake and the New Meadows River among lowest in Casco Bay
- Illegal boat discharge
- Toxic contamination from marinas and boatyards
- Harpswell Cove and Middle Bay must be managed jointly with Harpswell

Boat ramp at Sawyer Park on the New Meadows River in Brunswick



Model activities

- Coastal Protection Zone limits nutrient run off
- Leader in multi-town effort to protect water quality in the New Meadows River
- Collaborating with Casco Bay Estuary Project to remove overboard discharges in important soft-shell clam habitats
- Active land trust has preserved several large tracts of land
- Open space plan being developed that includes outreach to neighboring towns

Opportunities

Restore and protect shellfish growing areas

- Investigate joint management with Harpswell of pollution threats in the watersheds of Harpswell Cove and Middle Bay
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Amend ordinance regulating marine activities, structures, and ways to limit moorings in the vicinity of shellfish growing areas
- Exert leadership within the Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection
- Work with West Bath, Phippsburg and Harpswell to provide additional pumpout facilities, including for deep draft recreational vessels

Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Monitor Brunswick Naval Air Station for activities that may threaten water quality

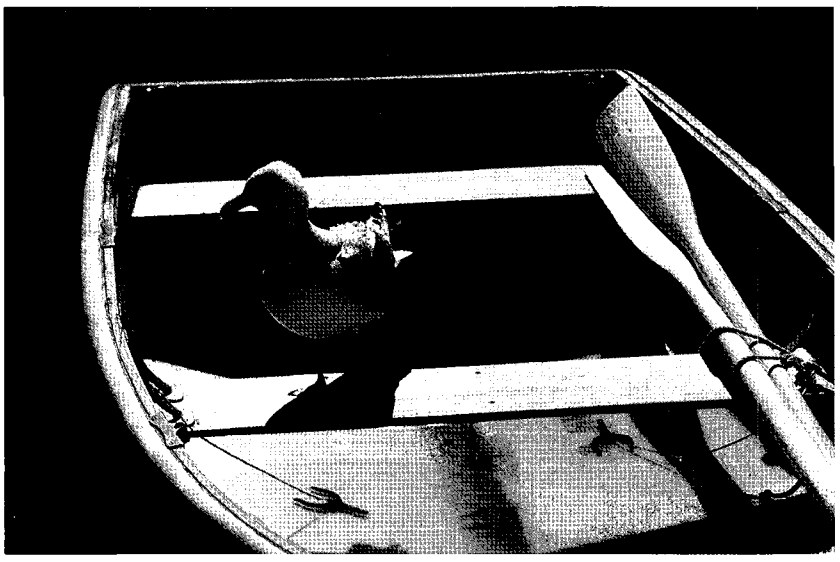
Brunswick's coastal protection zone regulates housing density and impervious surface to reduce nutrients flowing into Maquoit and Middle Bays

Manage land use to minimize pollution impacts

- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Work with West Bath to remove barrier at mouth of New Meadows Lake to increase tidal action and flows in the lake and thereby reduce risk of low dissolved oxygen
- Continue to participate fully in development of a watershed management plan for the New Meadows River
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Support public and private efforts to protect open space through acquisition and easements
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College

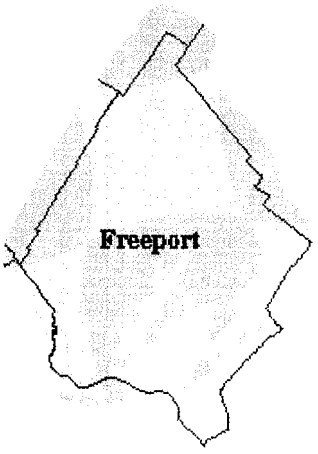
Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"



- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Freeport



Setting

- Population has grown 13% in ten years; now at 7,800
- 27 miles of coastline and 35 square miles of land area
- 18 islands, including Bustins, which has 111 seasonal homes
- Harraseeket is a large semi-enclosed harbor with over 350 moorings and 211 slips
- Coastline contains valuable soft-shell clam harvest areas: "Harraseeket is one of the most important softshell clam producing areas in Casco Bay – if not the entire state" (DMR Sanitary Survey, 1995)
- 800 acres of inter-tidal habitat:
  70% closed in 1993
  90% open in 1995
- Varied development of immediate shoreline
- Wastewater treatment plant discharges into Harraseeket

Water quality issues

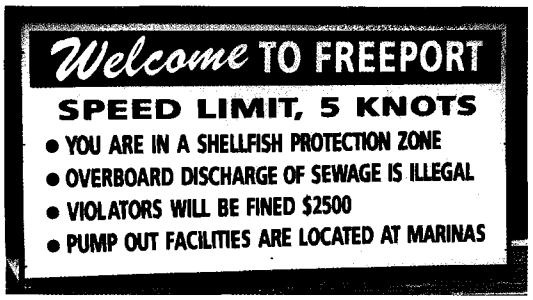
- Threat of bacterial contamination of shellfish harvesting areas from illegal boat discharge and sewage treatment outfall
- Dissolved oxygen levels in the Cousins River among lowest in Casco Bay
- Increased impervious surface in Concord Brook (which is estimated to be 14-20% impervious) and Frost Gully Brook watersheds threatens stream water quality
- Pressure on stream corridors and wetlands from development
- Presence of dioxin in Cousins River

Harraseeket River

Model activities

- Efforts to manage stormwater through development review, retrofits, municipal facilities, and participation in NEMO and Stream Teams

- Deliberate effort to cleanup pollution sources causing shellfish closures including removal of all but one overboard discharge and application of best management practices for manure storage at an upstream farm
- Reorganization of harbor to accommodate both moorings for boats with heads and shellfishing, and an education campaign including sign at harbor entrance



- Pet waste bags available at Winslow Park
- Adoption of open space plan
- Annual street sweeping and catch basin cleaning
- Bond issue passed by voters to provide funds for acquiring open space
- Local government addressing residential growth issues

Opportunities

Restore and protect shellfish growing areas and swimming areas

- Continue to educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Assure waste water treatment plant functions optimally
- Implement pet waste education campaign for downtown, especially parking lots
- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection
- Monitor water quality at swimming areas using Enterococcus method and develop rapid response protocol to initiate closures, if necessary, in a timely fashion (following US EPA BEACH protocol)

Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Maintain prohibition on pesticide use in Resource Protection District
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

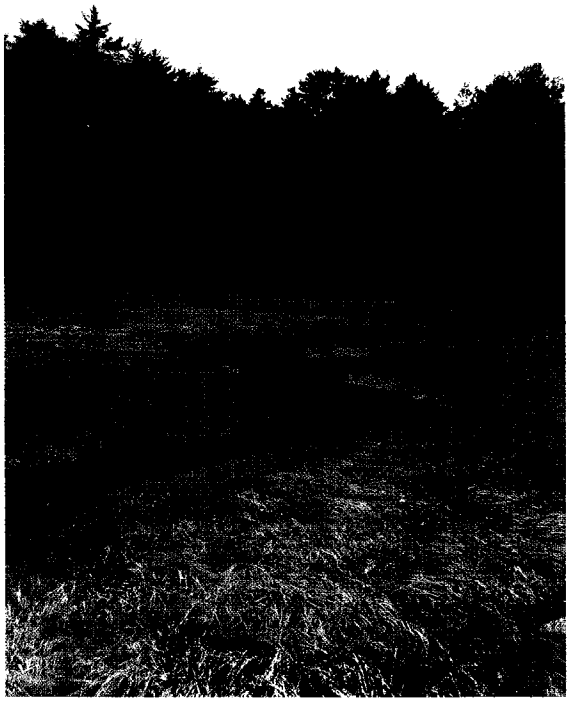
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Support public and private efforts to protect open space through acquisition and easements
- Support recommendations of the Freeport Residential Growth Committee
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Use natural landscape to treat municipal stormwater and provide complementary uses such as recreation and open space
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan

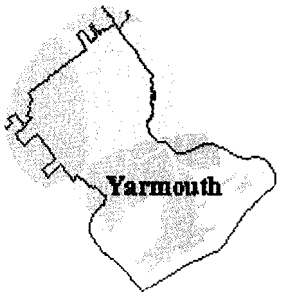
Raise public awareness of water quality issues in Casco Bay

Upper reaches of the Harraseeket River



- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Yarmouth



Setting

- Popluation is just over 8,300, an increase of 6.3% since 1990
- Mostly residential, with a service industry-based economy
- Over 7 miles of shoreline, with two islands connected to the mainland and inhabited year-round, and several other islands; 13 square miles of land area
- Coastline contains valuable soft-shell clam harvesting areas
- Comprises significant portion of Royal River watershed
- Shares Broad Cove with Cumberland, and the Cousins River with Freeport

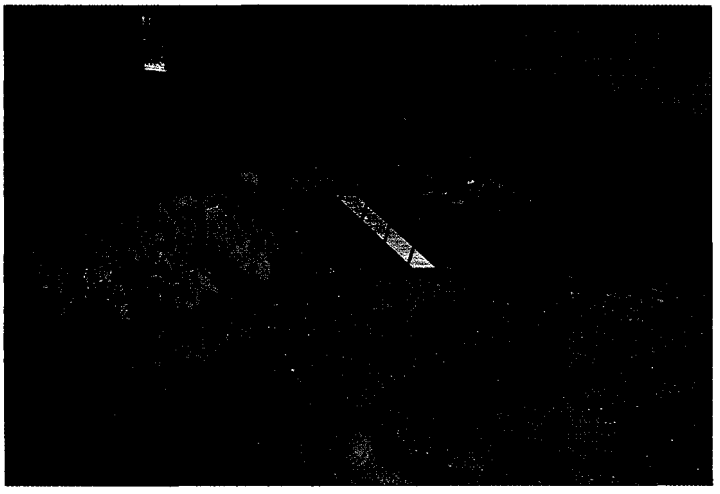
Water quality issues

- Community-based treatment plant on Cousins Island
- Remaining overboard discharges on Littlejohn Island, sanitary survey required
- Three marinas, only one has pumpout facilities
- Dissolved oxygen levels in the Cousins and Royal Rivers among lowest in Casco Bay
- Stormwater runoff from I-95 and US Route 1 adjacent to Royal River
- Presence of dioxin in Cousins and Royal Rivers

Model activities

- Septic systems regulated by plumbing inspector and codes enforcement officer, cost of tri-annual pumpouts is covered by the Town as a municipal service to home owner (visit must be scheduled by the homeowner)
- Wastewater treatment plant upgraded eight years ago, has capacity to hold excess (up to 1 million gallons) storm water until the plant can properly treat it
- Street sweeping done with water to reduce dust and material is hauled to demolition landfill and re-used if possible
- Has toxics reduction program to reduce the amount of metals and other contaminants entering the waste water stream

Cousins Island in Yarmouth where several OBDs were replaced with a community septic system



- Friends of the Royal River active in monitoring and promoting conservation of the river and its watershed

Opportunities

Restore and protect shellfish growing areas

- Remove remaining overboard discharges, and remove or upgrade the community-based system on Cousins Island
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Develop harbor management ordinance to limit moorings in the vicinity of shellfish growing areas
- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection

Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property – ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- With other communities in the Royal River watershed, develop specific recommendations for implementation of the *Royal River Watershed: A Water Quality Management Plan* and investigate opportunity to develop a regional management authority for the river

Royal River marinas

- Develop a stormwater management plan for the downtown area and Route 1 corridor that includes complementary uses such as recreation and open space
- Work with Falmouth and Cumberland to develop a watershed management plan for the East and West Branches of the Piscataqua River to address nonpoint source pollution and stormwater loading
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Investigate role of sediment oxygen demand in depletion of dissolved oxygen in Royal River
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Support Friends of the Royal River and other volunteer efforts to improve the health of the Royal River
- Support public and private efforts to protect open space through acquisition and easements
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College

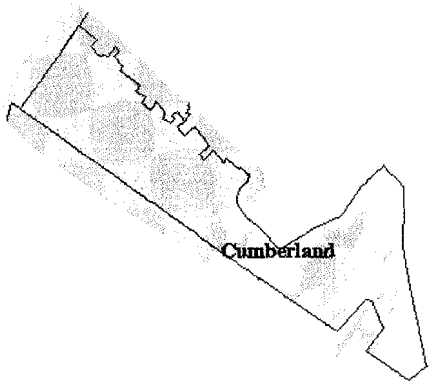
Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"

Sandy Point Beach on Cousins Island

- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Cumberland



Setting

- Rural town becoming suburban, several working farms remain
- Mainland shorefront built up with residential development
- Population grew 23% in last 10 years to just over 7,000
- Home construction has outpaced population growth: a decrease in household size (from 3.44 to 2.89) between 1970 and 1990 accounts for an additional 325 houses
- 2.5 miles of mainland frontage on Casco Bay with no deep water access; 26 square miles of land area
- Town encompasses several islands including 1600 acre Great Chebeague Island, with a year-round population of 330, swelling to 1800 in the summer
- All of mainland intertidal area open to recreational shellfishing only; most of Chebeague open to shellfishing; ten commercial licenses issued for digging on the islands
- Sewage system owned/managed by Portland Water District, effluent piped to Falmouth Sewage Treatment Plant

Water Quality Issues

- Runoff of both nutrients and pesticides from ever-increasing residential development threatens the quality of wetlands and streams
- Three areas on Chebeague closed to shellfishing due to two overboard discharges and an area that fails water quality tests

Chandler Cove ferry dock at Chebeague Island

Model activities

- Effort to minimize sprawl through land use ordinance, especially with clustering
- Work to help farms survive and assure they use best management practices
- Town owned Val Halla golf course uses "green" turf maintenance practices such as organic fertilizer and pesticide application only when needed to solve discrete problems

- Monitoring and sanitary surveys conducted to keep shellfish harvesting areas open

Opportunities

Restore and protect shellfish growing areas

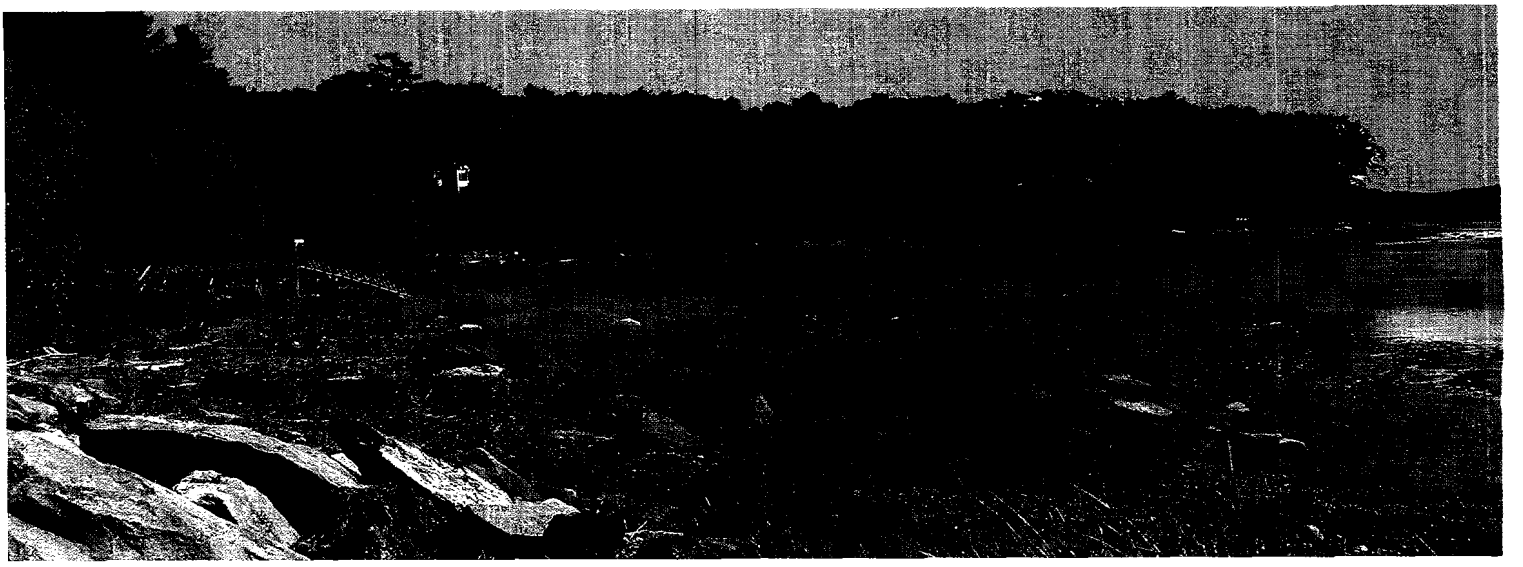
- Open closed areas on Chebeague by completing shoreline survey of eastern shore and facilitate removal of overboard discharge on Chandler Cove
- Educate boaters to hold their sewage and have it pumped out at a disposal facility

Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Work with Yarmouth and Falmouth to develop a watershed management plan for the East and West Branches of the Piscataqua River to address nonpoint source pollution and stormwater loading
- Use natural landscape to treat municipal stormwater and provide complementary uses such as recreation and open space.
- Support public and private efforts to protect open space through acquisition and easements



Broad Cove in Cumberland

- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

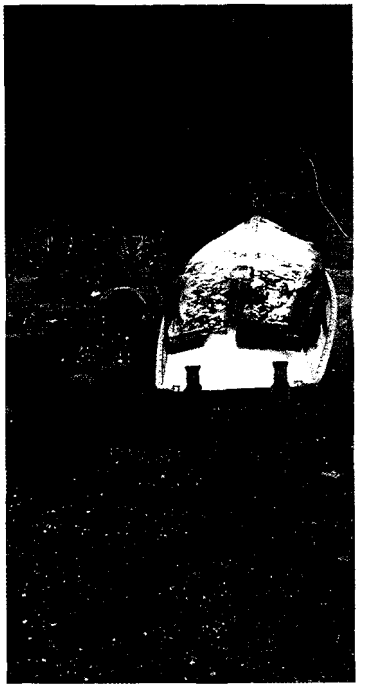
Falmouth

Setting

- One of the fastest growing towns on Casco Bay
- Population increased from 7,610 in 1990 to 10,310 in 2000, an increase of over 35%
- Mostly residential, with a service industry-based economy
- Over 6 miles of shoreline and 30 square miles of land area
- Three contiguous anchorages with a total of 1,000 moorings
- Town issues 73 recreational shellfish licenses, no commercial licenses

Water quality issues

- Storm water runoff, especially from concentrated high pavement areas on Route 1
- Dissolved oxygen levels in the Presumpscot River among lowest in Casco Bay
- Waste water treatment plant scheduled for upgrade in 2002-2003
- Limited areas open to clam harvesting due to anchorage, waste water treatment plant, and nonpoint source pollution
- Extensive anchorages, limited pumpout facilities, and lack of enforcement of "No Discharge" zone
- High phosphorus levels in Highland Lake (drains to the Presumpscot)



Model activities

- Town adopted a Highland Lake Watershed Management Plan to reduce phosphorus loading
- Conservation Committee and other groups working to acquire lands for preservation
- Fiber matting used to stabilize soil after ditch "clean-out"
- Street sweepings are tested and re-used, if appropriate, for fill, construction or for sanding
- Friends of the Presumpscot River and Presumpscot Riverwatch active in monitoring and promoting conservation of the river and its watershed through participation in a Stream Team and other activities
- Smelt Hill Dam removal will improve water quality in the Presumpscot River by restoring natural flows

- Golf course at Portland Country Club, located in Falmouth, is the only golf course in Maine certified by Audubon International, which requires steps to be taken to protect and create wildlife habitat, conserve water and protect water quality, and reduce chemical use

Opportunities

Restore and protect shellfish growing areas

- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility

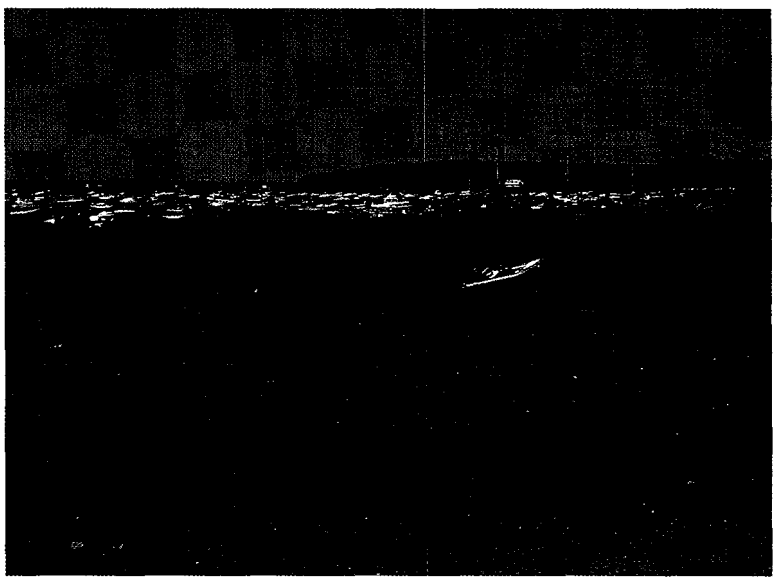
Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

Manage land use to minimize pollution impacts

- Enforce wetland protection setbacks and buffer requirements; consider stronger wetlands protection plan
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas

Falmouth anchorage



- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Develop a stormwater management plan for the Route 1 commercial district that includes complementary uses such as recreation and open space

- Work with Yarmouth and Cumberland to develop a watershed management plan for the East and West Branches of the Piscataqua River to address nonpoint source pollution and stormwater loading
- Support public and private efforts to protect open space through acquisition and easements
- Support the efforts of Presumpscot RiverWatch and Friends of the Presumpscot River to improve the health of the Presumpscot River

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners–the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
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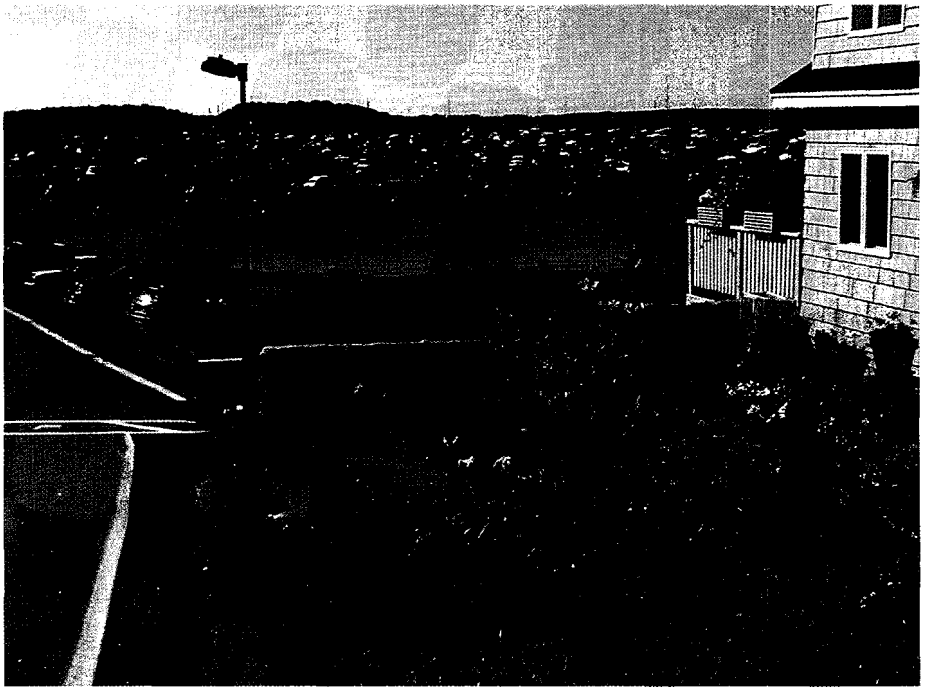
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Falmouth Town Landing



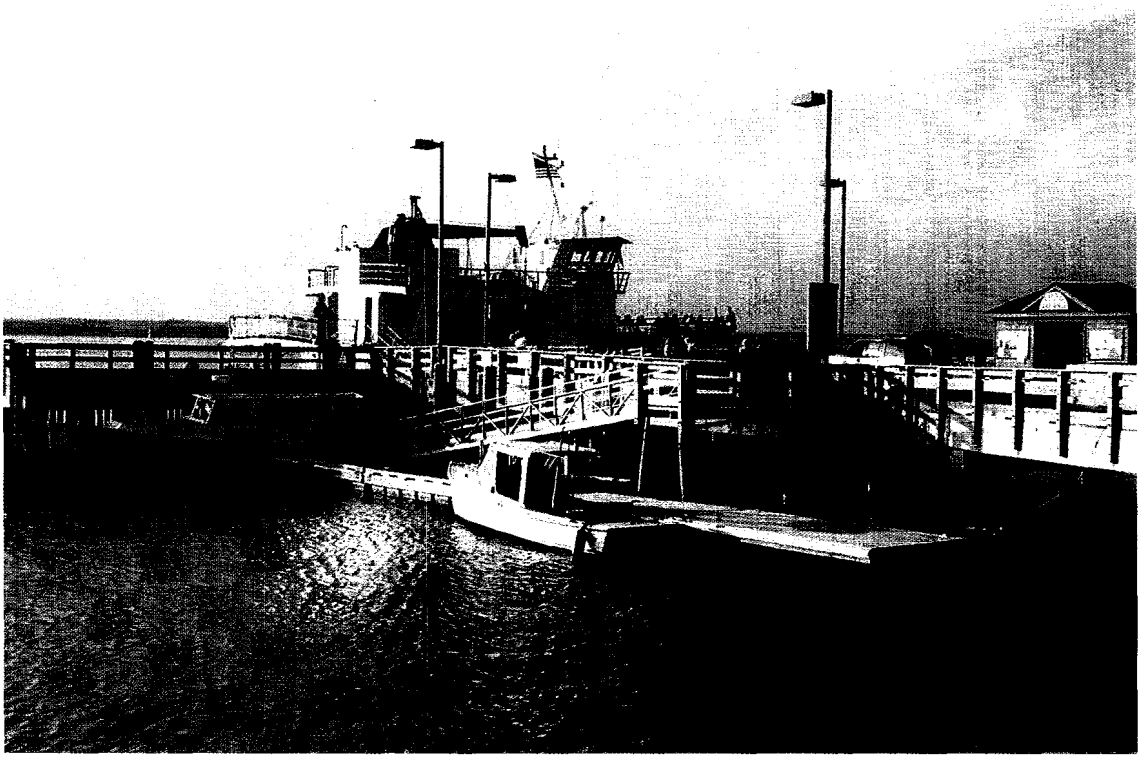
- Support the Presumpscot River Watershed Plan produced by the Casco Bay Estuary Project sponsored Presumpscot River Team.

Long Island

Setting

- 900 acre Long Island plus six offshore islands; 3.2 square miles of land area in all
- Ten miles of coastline
- Separated from Portland in 1993 and incorporated as Town of Long Island
- Population currently steady at about 200; 146 lived on Long Island in 1830 and 252 in 1880
- Population grows to 900 in summer
- In 1995, 26% of adults were fishermen
- At the beginning of the 20th century Long Island was a booming tourist destination
- Subdivision of land at that time created many small lots, all non-conforming by present standards, and an exacerbating factor in today's ground and coastal water quality problems
- One third of island taken for Navy Refueling Depot in 1940's; remediation of the Navy facilities completed in the 1990's
- About 150 moorings, but few boats with heads

Ferry, fire boat and lobster boat at Mariner's Wharf on Long Island



Water quality issues

- Water quality testing shows elevated bacteria levels - an uncommon occurrence away from the mainland - most areas closed to shellfishing
- Coastal and ground water quality problems due to inadequate sewage treatment, especially in areas where houses are clustered together on small lots

Model activities

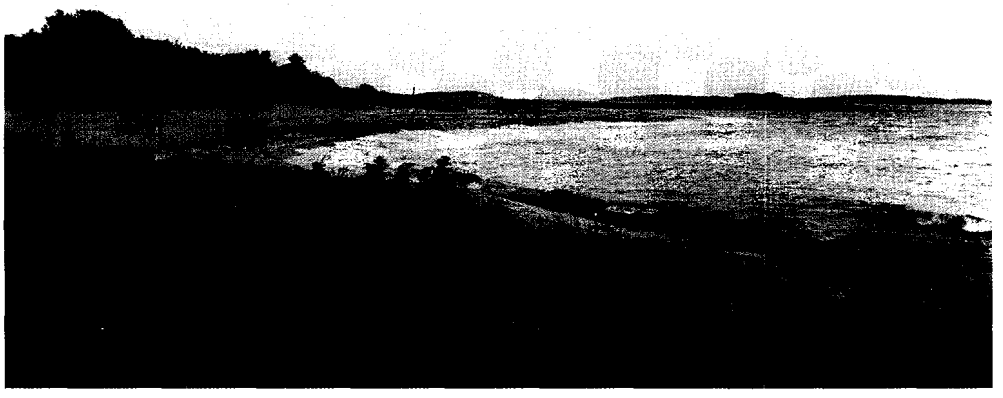
- Self determination: a model for what a community can do to control its own destiny
- Fuel depot remediation successfully completed
- Recently adopted a shellfish ordinance and appointed and trained a shellfish warden
- Ordinance language requires sewage system inspection upon transfer of title
- Dissemination of water quality and shellfish information in island newsletter

Opportunities

Restore and protect shellfish growing areas

- Identify and upgrade malfuntioning and inadequate wastewater disposal systems; further tighten regulation
- Educate boaters to hold their sewage and have it pumped out at a disposal facility
- Facilitate removal of overboard discharges in Wreck Cove and Harbor Grace

South Beach



- Investigate and eliminate gray water discharges on the northern end of the island
- Conduct shoreline surveys and continue water quality monitoring
- Consider seeding prospective clamflats

Reduce impacts of pesticides and other toxics

- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

Manage land use to limit pollution impacts

- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Support public and private efforts to protect open space through acquisition and easements
- Conduct build out analysis to assess potential impact of inground septic systems and impervious surface on water quality

Raise public awareness of water quality issues in Casco Bay

- Develop K-5 curriculum materials related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Continue newsletter articles and other methods of educating residents regarding water quality

- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
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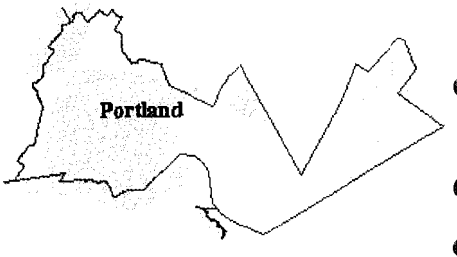
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Portland

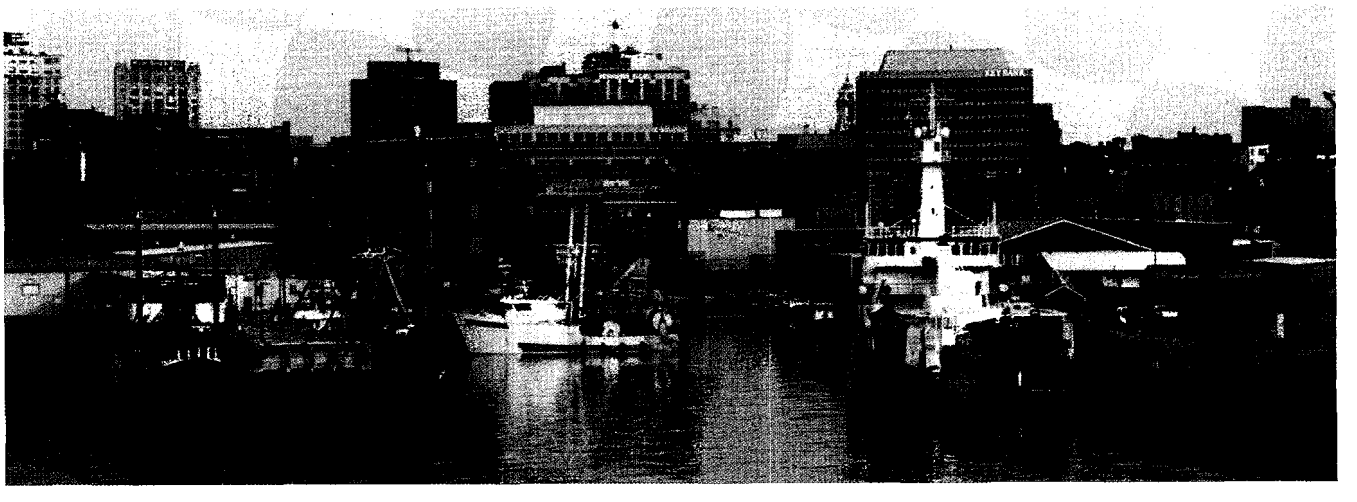


Setting

- Urban setting, the largest city in the state (64,249); densely populated except for island communities
- City comprises 19 square miles of land area; coastline is 16 miles for mainland and 21 miles for islands
- Population relatively constant over the past 10 years
- Industries include food processing, light manufacturing, metal works
- Port of Portland (including South Portland) is largest oil terminal port on East Coast
- East End Beach provides recreational opportunities, boat launch and moorings

Water quality issues

- Toxics from combined sewer overflows include those from industrial sources
- Dissolved oxygen levels at Custom House Wharf, Stroudwater Bridge and in the Presumpscot River among lowest in Casco Bay
- In Year 4 of a 15-year combined sewer overflow improvement program, but waterfront combined sewer overflows are generally not included
- Private maintenance dredging cost prohibitive because of contaminants in sediments
- Possible presence of illegal pipes/drains along the waterfront
- Historic industrial use, such as the old Portland Gas Works, contributes to contaminant load



- Poorly functioning septic systems and overboard discharges on islands, discharges from boats and cruise ships, lack of pumpout facilities

Model activities

- Street sweeping and cleaning of the City's 5,000 catch basins occurs annually. Pilot project underway using a Vactor truck to remove polycyclic aromatic hydrocarbons (toxic compounds found in exhaust and other combustion products) in catch basin sediments.
- Greenway Master Plan calls for use of natural features and created wetlands to filter stormwater in the Capisic Brook and Fall Brook areas while providing public recreational areas
- Hall Stream Team, including Capisic Brook, is part of Maine Department of Environmental Protection's Stream Team program
- The City and Portland Water District helped residents eliminate mercury in the waste stream with a residential mercury collection day
- An industrial pretreatment program reduces toxic input to the waste water treatment plant
- Creation of a TIF (Tax Increment Financing) district and other measures to provide low interest loans for dredging and dredge spoil disposal
- Expansion of Peaks Island waste water treatment plant, with additional sewer connections
- Use of the preferred Enterococcus method for monitoring water quality at East End Beach, along with rapid response protocol to initiate closures in a timely fashion
- Effort to control pet waste on the Eastern Promenade walkway: increased awareness through signage, increased enforcement by rangers, and availability of bags for cleanup
- Smelt Hill Dam removal will improve water quality in the Presumpscot River by restoring natural flows

Entrance to Back Cove, B&M plant to the north, Portland Water District's East End Wastewater Treatment Facility to the south

Opportunities

Restore and protect shellfish growing areas

- Facilitate removal of island overboard discharges and replacement of malfunctioning septic systems
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Develop waste disposal protocol for cruise ships to avoid discharges, including gray water
- Investigate waterfront discharges, identify and resolve disposal issues related to tenant turnover
- Prioritize combined sewer overflow program to address Casco Bay water quality
- Expand pet waste program to other areas draining to the bay

Reduce threat from toxic contaminants and nutrient loading

- Require remediation of sediments contaminated with polycyclic aromatic hydrocarbons (PAHs) at Gas Works/Northern Utilities and polychlorinated biphenols (PCBs) at Portland Water District
- Comply with Phase II stormwater regulations
- Develop upland disposal option to facilitate disposal of contaminated dredge spoils
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect

- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas

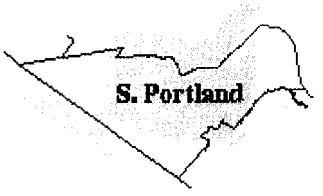
Manage land use to minimize pollution impacts

- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Support public and private efforts to protect open space through acquisition and easements
- Implement Greenway Master Plan for Capisic Brook and Fall Brook, and extend to other watersheds use of the natural landscape to treat stormwater while providing for recreation and open space
- Conduct buildout analysis for islands to assess potential impact of septic systems and impervious surface on water quality
- Support the efforts of Presumpscot RiverWatch to improve the health of the Presumpscot River

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use city web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

South Portland



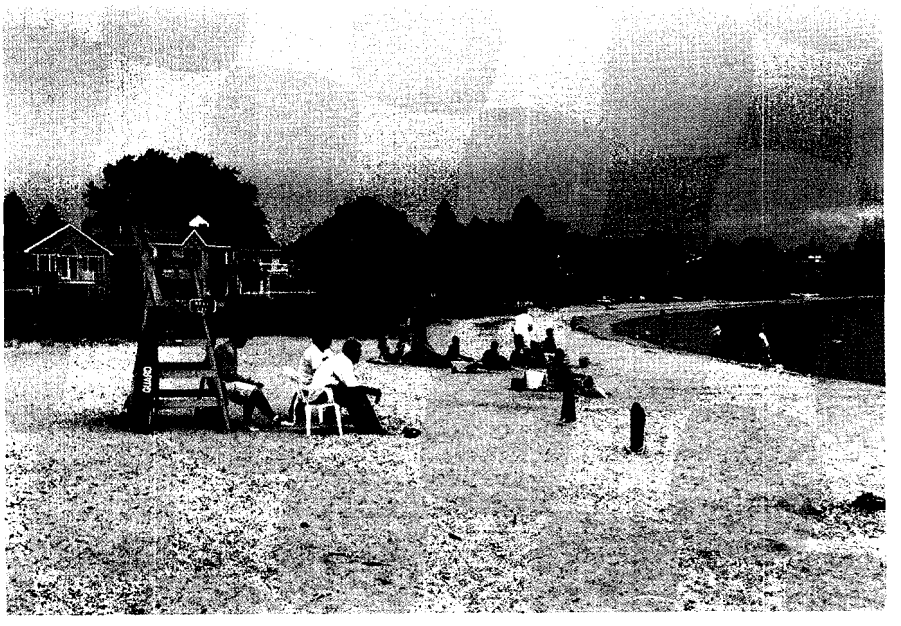
Setting

- Densely populated, population stable over past 10 years (23,324)
- Bounded on two sides by water, Fore River and Casco Bay
- Land area is 12 square miles; coastline is ten miles
- Industry, Portland International Jetport, a series of shopping malls, portions of the Maine Turnpike and Route 295 contribute to large amount of impervious surface
- Oil transport dominates commercial activity in the harbor: tankers offload oil which is stored in large tanks adjacent to the Fore River
- Marinas provide water access and recreational opportunities
- Draft shellfish ordinance is first step towards shellfish harvest, beginning with possible depuration digging

Water quality issues

- Toxics from combined sewer overflows include those from industrial sources
- Dissolved oxygen levels in the Stroudwater River among lowest in Casco Bay
- Historical activity at the South Portland shipyard contributed contaminants to Casco Bay

City staff regularly test water quality at Willard Beach in South Portland



- Contaminants in sediments complicate maintenance dredging due to difficulty of dredge spoil disposal

Model activities

- Integrated pest management applied to municipal facilities: minimized use of fertilizers/ pesticides through soil testing, species selection, and limited application of chemicals as last resort

- Stormwater addressed by annual street sweeping and catch basin cleaning; drains stenciled with "Don't dump: Drains to Casco Bay"; prepared to comply with Phase II stormwater regulations
- Aggressive program underway to remove combined sewer overflows
- Maine Department of Environmental Protection study underway in Long Creek to assess the effects of airport runoff on water quality in Long Creek
- An industrial pretreatment program reduces toxic input to the waste water treatment plant
- Use of the preferred Entercoccus method for monitoring water quality at Willard Beach
- Pet waste bags available at Bug Light Park and Willard Beach
- Infiltration strip to catch stormwater at Bug Light Park parking lot

Opportunities

Restore and protect shellfish growing and swimming areas

- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Expand pet waste policy, especially in areas that drain to the bay
- Develop rapid response protocol to implement beach closure

Reduce impacts of pesticides and other toxics

- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Participate in negotiation of consent decree between Maine Department of Environmental Protection and South Portland Shipyard regarding remediation of contaminated sediments
- Develop upland disposal option to facilitate disposal of contaminated dredge spoils
- Review reports on tank farm oil/water separators

Manage land use to minimize pollution impacts

- Support public and private efforts to protect open space through acquisition and easements

- Use natural landscape to treat municipal stormwater and provide complementary uses such as recreation and open space
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use city web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

South Portland provides bags as incentives for dog owners to clean up after their pets at Willard Beach

Cape Elizabeth

Setting

- Suburban setting with two state parks along the coast and Fort Williams municipal park
- Town comprises 15 square miles of land area; coastline in Casco Bay is 5.1 miles
- Population grew by 2.42% during last 10 years (now 9,086)
- Casco Bay provides recreational opportunities and scenic vistas

Water Quality Issues

- Few water quality issues due to municipal sewer system and lack of industry
- Accumulation of seaweed in Peabbles Cove is the source of low dissolved oxygen in that area
- Potential for elevated heavy metals, sediments, phosphorus, and bacteria from stormwater runoff as described in the Town Center Stormwater Management Plan
- Stormwater affects Trout Brook

Model activities

- Developed a stormwater management plan; implemented half of recommended infrastructure improvements.

Fort Williams Park and Portland Head Light receive 1/2 million visitors a year, who come to enjoy fine views of Casco Bay

- Good street sweeping practices
- Careful use of fertilizers/pesticides, use restricted to athletic fields
- Effective carry in, carry out trash policy at Fort Williams
- Active land trust makes Cape Elizabeth a leader in permanently dedicated open space
- Effective wetland protection

Opportunities

An active land trust makes Cape Elizabeth a leader in permanently dedicated open space

Reduce impacts of pesticides and other toxics

- Develop written protocol for integrated pest management program
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Limit stormwater flow contributing to South Portland CSO

Manage land use to minimize pollution impacts

- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Support public and private efforts to protect open space through acquisition and easements

Pond Cove in Cape Elizabeth

- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Complete infrastructure improvements listed in Town Center Stormwater Management Plan
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Ship Cove at Fort Williams Park

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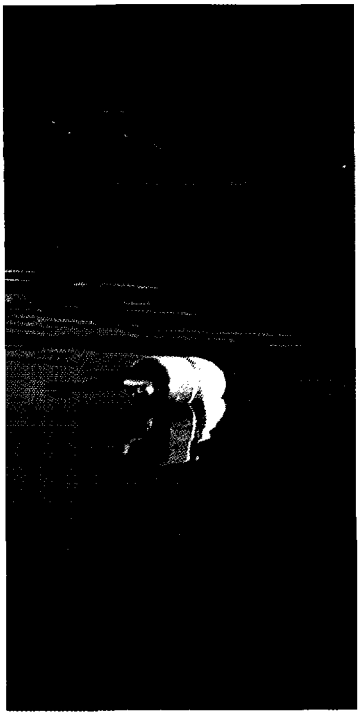

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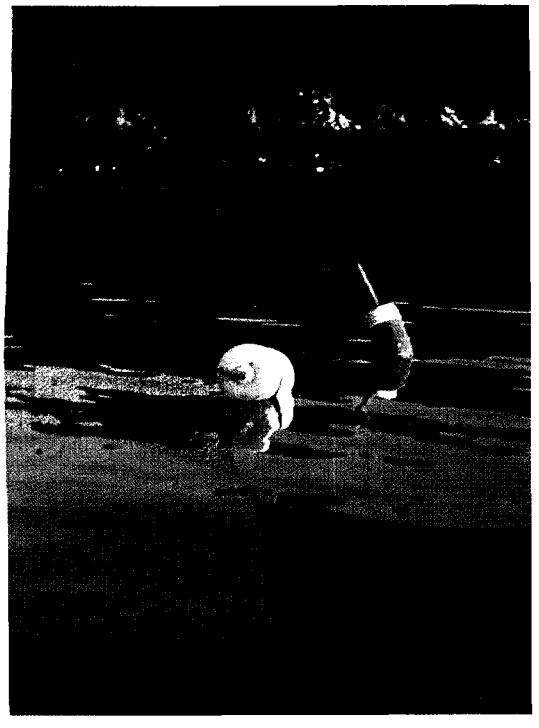

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www.thinkfirstspraylast.org

Notes

Notes

CASCO BAY ESTUARY PROJECT

Expanding and Sustaining the Shellfisheries of Casco Bay

Maine's natural resources have always been important to its people. Timber, tourism, agriculture and fisheries are hallmarks of the state's economy. Industries that rely on natural resources must utilize them in a sustainable fashion to maintain our quality of life.

Clamming represents an important tradition as well as a livelihood for residents of the Casco Bay region. Water contamination has limited the economic value of this resource in recent years. Malfunctioning septic systems, overboard discharge systems, boat discharges and non-point sources of pollution have caused closure of many shellfish flats to harvesting. Due to the threat or existence of bacterial pollution, 37 percent of the clam flats in Casco Bay were closed to shellfish harvesting in May 1995. Water contamination from sewage also causes closures of swimming areas in Portland and Peaks Island.

The Casco Bay Estuary Project (CBEP) is one of 28 estuary projects administered nationwide by the U.S. Environmental Protection Agency to develop practical and innovative ways to revitalize and protect estuary ecosystems. The CBEP, hosted by the University of Southern Maine's Muskie School and Marine Law Institute, focuses on five priority areas: clam flat protection; toxics removal and long-term monitoring; habitat protection; combined sewer overflows and storm-water reduction; and stewardship promotion in the watershed.

The Casco Bay Estuary Project Established the following goal and objectives in order to protect and restore clam flats in Casco Bay.

Goal:

- ***Open clam flats and protect shellfish impacted by water quality.***

Objectives:

- ***Reduce bacterial contamination in Casco Bay;***
- ***Increase open shellfish acreage currently impacted by poor water quality;***
- ***To promote sustainable management of shellfish resources thereby clearly establishing the link between environmental quality, economic vitality, and community well being.***

In 1999 the CBEP received a grant from the U.S. Environmental Protection Agency under their Sustainable Development Challenge grant program to expand and sustain the shellfish resources of Casco Bay. This program integrates environmental protection, economic prosperity and community well-being by optimizing the utilization of shellfish resources in Casco Bay. Less obvious, but just as important, is the informal use of the status of shellfish flats as an indicator of environmental quality.

The Casco Bay Estuary Project worked extensively with Normandeau Associates, Albert Frick Associates, and MER Assessment Corp. throughout this project. These organizations provided the on-the-ground effective management and action needed for positive progress and creative thinking.

The Casco Bay Estuary Project has already made successful efforts through this program. Overboard Discharge Systems that impact clam flats are gradually being replaced. In the past year, 20 shellfish areas have been reopened in Cumberland, Yarmouth, Freeport, Harpswell, and Brunswick.

Project Tasks

Phase I: During this phase a Project Team was convened, made up of shellfish harvesters and managers, concerned citizens, potentially affected homeowners and businesses, municipal and regional planning staff, and state regulatory staff. Accurate resource maps, areas classified by the Maine Department of Marine Resources as "Closed to Shellfish Harvesting," were reviewed and associated sources of pollution were identified. Shellfish inventories were used to rank flats according to their potential for remediation. Steps necessary to achieve sustainable harvest were described.

Phase II: The objectives in this phase include working with property owners, communities, and the Maine Department of Environmental Protection to eliminate sources of pollution and to provide technical and financial assistance to municipalities electing to protect flats. Mechanisms for eliminating existing or preventing new sources of bacterial contamination were implemented (e.g., removal of overboard discharges (OBDs), replacement of faulty septic systems).

Phase III: This phase involves integrating shellfish management into a comprehensive shellfish management plan for Casco Bay. Regional sustainable shellfish harvest management must consider requirements for inventory and landings data, likely annual red tide closures, limitations on winter digging in some areas, sources of seed clams, and effects of predation. Sustainability includes educational outreach programs to publicize the economic and community benefits of protecting Casco Bay harvesting and a plan for the coordinated and regional management of soft-shell clams in Casco Bay. In this phase we will explore the feasibility of new management tools, such as coordinated shellfish management.

Phase I: Define Priorities for Pollution Abatement

In Phase I we investigated and prioritized shellfish harvesting areas. Shellfish inventories, surveys of shoreline pollution sources, existing data on water quality, and local knowledge were used to rate closed or threatened shellfish growing areas according to their potential for successful pollution abatement. Several factors were important in the evaluation and remediation of shellfish harvesting areas including the density of clams and likelihood of remediation of pollutant sources causing the closure. CBEP established a committee of stakeholders concerned about environmental quality as it pertains to shellfish harvesting. Committee members met at the beginning of the project to set the course for the project and then several times to review information and determine the next steps for the project. Shellfish resource maps with shellfish harvest areas were sent to coastal towns for review and update.

Task 1: Information compilation

The project focused on clam habitat in areas where shellfish harvesting is prohibited in the Towns of Falmouth, Cumberland, Long Island, Yarmouth, Freeport, Brunswick, Harpswell, West Bath, and the west side of Phippsburg (Figure 1). As a first step, we identified potential soft-shell clam harvest areas that were within areas prohibited for harvest along with priorities for remediation. These areas were named and assigned a station number and an estimated acreage. Maine Department of Marine Resources shared information on shellfish resources, likely causes of closure, and water quality monitoring results. Maine Department of Environmental Protection provided information on the location and license number of overboard discharges (OBDs). Friends of Casco Bay provided additional water quality data. The closure surrounding each flat was listed, where available, as well as the reasons for closure and the number of OBD's.

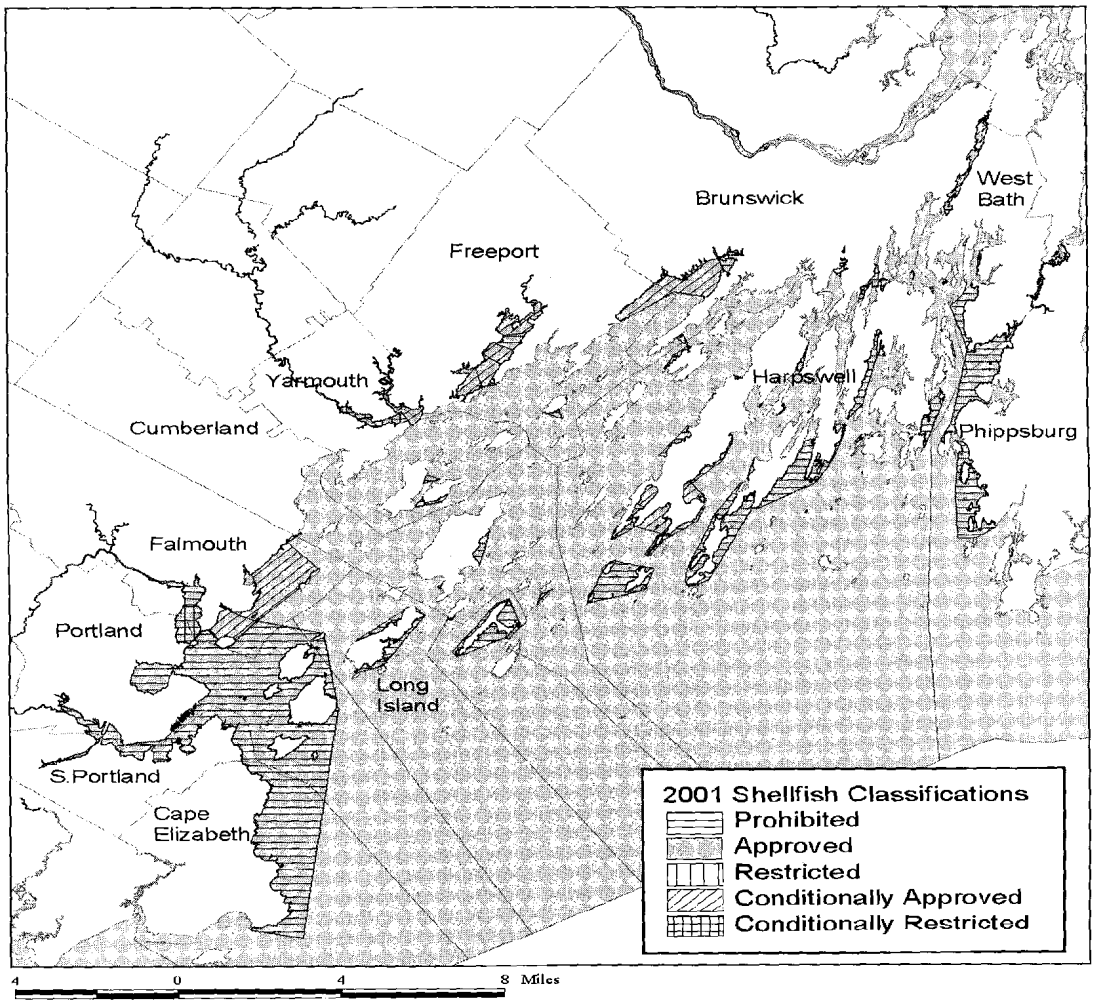
Task 2: Habitat screening

The compilation process identified 57 potential soft-shell clam habitats in areas defined as prohibited. The Town of Brunswick generously provided its airboat and operator for much of the screening process. Additional site visits were made to flats in Yarmouth, Freeport, Harpswell, and Brunswick. Each site was evaluated in terms of its potential to provide harvestable levels of soft-shell clams. Each flat was assigned a rank (low, moderate or high) for its harvestable soft-shell clam resources based on estimated density and breadth of size-classes, using best professional judgment. GPS coordinates were collected in order to define the limit of soft-shell clam habitat, to be included in future GIS maps.

Task 3: Ranking process

The resulting information was reviewed and a preliminary rank was assigned to each flat. The rank was based on the estimated size of the flats, the value of the resource, and reasons for closure. All areas with resources rated as low were assigned a preliminary rank of "low". All areas with resources categorized as high or moderate-high that were at least 2.5 acres in size were ranked as high. All areas rated as having low- moderate resources were ranked as moderate. Any areas larger than 2.5 acres that were not visited were assigned a rank of moderate in order to keep them in the ranking process. The Committee decided to focus on areas ranked high and moderate in terms of clam resources, which comprised approximately one third of the total number.

FIGURE 1. Casco Bay Closed Clam Flats



Sources: Maine Department of Marine Resources and the Casco Bay Estuary Project, 2001

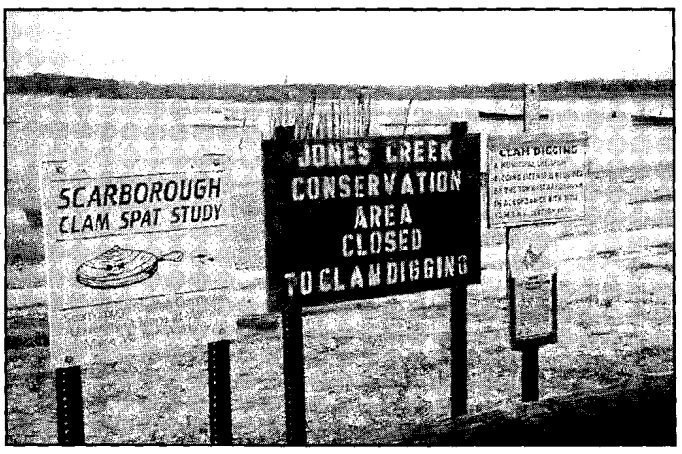
TABLE 1.
High priority flats, acreage, and sources of contamination

Town	#	Acreage	OBD's	Other Sources
W. Bath	8	97	22	Septic
Phippsburg	1	8	0	Septic, NPS
Harpswell	8	84	11	Marina, septic, NPS
Harpswell & Brunswick	1	20	0	Houseboat
Brunswick	2	163	5	NPS
Freeport	1	2	0	NPS

Sources: Casco Bay Estuary Project, 2000

Additional information about water quality, shoreline survey, and sources of bacterial contamination was gathered for all flats ranked high or moderate in terms of the feasibility of remediation. In some cases, fecal coliform levels were low enough to consider opening the flat and only a shoreline survey or removal of a nearby OBD was needed.

Approximately 57 clam flats in Casco Bay (800 acres of soft-shell clam habitat) are closed to harvesting due to actual or potential contamination, based on analysis by the Casco Bay Estuary Project and Maine Department of Marine Resources. The reasons for closure, which were based on poor water quality, included OBDs, poorly functioning septic systems, marinas, a houseboat, and non-point sources (NPS) — runoff from agricultural sources and upstream wildlife. Of these, three



(Merritt Island in West Bath, Stover Cove and Bethel Point in Harpswell) were opened to harvest during our assessment. A list of the highest value clam flats with best remediation potential was reviewed with the municipal shellfish committees, who further refined the list (Table 1). Water quality improvements for these high priority flats became the focus of Phase II.

Phase II: Water Quality Problems

The water quality of Casco Bay has improved over the last several years with construction and improvement of municipal sewage treatment plants and industrial treatment. But there is still a significant pollutant load reaching Casco Bay due to storm-water runoff, which captures pollutants from vehicles and development, and from septic systems in the area.

In the larger communities around the Bay, sewage is now collected and treated. Where homeowners are responsible for the treatment of their wastewater, inground septic systems have replaced straight pipes and cesspools. Therefore, this phase of the Casco Bay Estuary Project targets two remaining sources of bacterial contamination: overboard discharges and non-point source pollution. The project provides technical support in obtaining state pollution abatement funds, implementing pollution abatement projects, and identifying opportunities for preventing new sources of contamination.

Storm-Water Runoff

During the natural hydrological cycle, storm-water runs along the ground after a rainfall or during snowmelt and picks up a variety of pollutants from lawns, roofs, driveways, parking lots, and residential, commercial, and industrial sites. Loaded with sediments, bacteria, nutrients, chemicals, and debris, storm-water then flows into water bodies and storm sewers that drain into Casco Bay. Storm-water runoff causes periodic closures of productive shellfish flats and swimming beaches.

Septic Systems

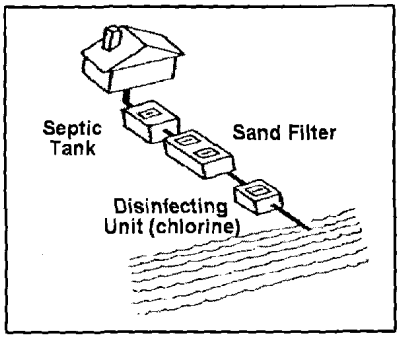
Despite construction of new municipal sewage treatment plants over the last 20 years, septic systems still constitute the principal form of residential wastewater treatment. A septic system acts as an individual sewage treatment and disposal system buried in the ground. Typically, "gray" waste from kitchen sinks, washing machines, baths and showers, along with "black" water (human waste), is piped to a septic treatment tank where the solids settle out and decompose by bacterial action. The partially treated wastewater in the tank (effluent) - which is high in nitrogen and bacteria - flows into the disposal area (leach field), usually through a distribution box and a series of underground pipes. The soil in the disposal area serves to filter, clean and absorb the wastewater before it infiltrates into the groundwater. Typically, the septic tank provides primary treatment, while the disposal area provides secondary treatment.

When a septic system fails due to inadequate maintenance, overloading, or poor design and construction, untreated nitrogen and bacteria may flow directly into groundwater or coastal waters and cause closure of clam flats and swimming areas. Therefore, septic systems require routine inspections and pumping out the sludge at the bottom of septic tanks once every two to five years to make sure the system is operating properly.

Overboard Discharge Systems

Between 1974 and 1987, Maine Department of Environmental Protection regulations allowed treated, chlorinated overboard discharge systems (Fig. 2) to be built as a replacement for straight pipes or as an

Figure 2. Overboard Discharge System



Sources: Maine Department of Environmental Protection and Maine Department of Community and Economic Development, 1993

Pollution Sources

Point-Source Pollution

Point sources convey polluted water into rivers and the bay through direct conveyances such as pipes and storm drains. During heavy rains, a portion of the combined sewage (sewage from home and businesses and storm-water) must be diverted without treatment through relief points known as combined sewer overflows. Combined sewer overflows are a major problem in the Portland area, with 59 points that discharge into Casco Bay during storms.

Point sources of bacterial contamination that cause clam flat closures:

- Wastewater treatment plants
- Residential septic systems
- Combined sewer overflows
- Overboard discharge (OBD)
- Straight pipes
- Marine toilet discharge

Non-point Source Pollution

Non-point source pollution includes runoff that enters rivers and the bay from diffuse locations. According to national studies, non-point sources of pollution now contribute up to 60 percent of the pollutant load.

Common non-point sources of bacterial contamination in the Casco Bay watershed include:

- Wildlife, Waterfowl
- Pet, livestock waste
- Agricultural runoff
- Storm-water runoff from construction sites, urbanized areas, and highways
- Runoff from impervious surfaces

The Overboard Discharge Grant Program

If you are considering replacing your system with one of the alternative systems in compliance with the Maine Subsurface Wastewater Program, contact your town office and the Department of Environmental Protection to obtain more information about the funding programs and your eligibility for assistance.

The Maine Department of Marine Resources works with towns and the Maine Department of Environmental Protection to identify closed shellfish flats that are priority areas and targets OBDs in those areas to be eligible for grants.

alternative to conventional inground septic systems. By 1987, nearly 400 overboard discharge units had been installed in the towns surrounding Casco Bay. An overboard discharge system is similar to a septic system except that the leach field is replaced by a combination of a sand filter or mechanical aerobic tank and a chlorination unit to disinfect the effluent before it is discharged into a water body. Overboard discharges require more maintenance than conventional septic systems.

Malfunctioning subsurface disposal systems, direct outfall pipes, and overboard discharges together with agricultural runoff and overflows from sewage treatment plants devalue property, close clam flats, and put public health at risk on Maine's coast. In fact:

- ***There are over 2,500 licensed overboard discharge systems along Maine's coast;***
- ***Contamination from licensed overboard discharges, failing subsurface disposal systems and straight pipes are responsible for the closing of 25% of Maine's productive clam flats that compose 9,000 acres;***
- ***Contamination from failing subsurface disposal systems on Maine lakes contributes to rising phosphorus levels, falling oxygen levels and a build-up of green algae.***

In addition to having the septic tank pumped, homeowners must ensure that the sand filter or mechanical aerator is working properly, and that chlorine tablets are in place in the disinfection unit. Because the required maintenance cannot be ensured, overboard discharge systems are considered a potential source of bacterial and chlorine contamination. The Maine Department of Environmental Protection licenses and periodically inspects existing overboard discharge units to make sure that they are not discharging unacceptable levels of bacteria. Overboard Discharge Law in 1987 prohibited all new non-municipal overboard discharges and established a procedure for replacing existing overboard discharge units with alternative treatment. If your house or business has an overboard discharge system or malfunctioning subsurface disposal system, or if your wastewater system was installed prior to July 1974, you may be part of the water quality problem in some Maine towns. Likewise, if you suspect that there are problem systems or discharges in your town, you can help lead a community effort to clean up the river, lake or ocean near you.

Creative Alternatives for Wastewater Disposal

There are many alternatives to overboard discharge and other failing or outdated wastewater systems (Table 2). Not only are there different subsurface disposal options available to serve one

TABLE 2. Alternative Wastewater Systems

Option	Comments
Individual Replacement Subsurface Disposal System (with one or two septic tanks and one of various types of effluent disposal beds)	*These are standard systems that work well provided adequate soils for subsurface disposal are available or can be trucked to the site.*
An Individual Holding Tank	*A holding tank should be considered as a last resort; they have to be pumped out frequently at considerable cost.*
Group (or Cluster) Subsurface Disposal System with one or more septic tanks and disposal beds or one or more holding tanks, serving a number of homes	*A group system is often the answer when a number of homes, close to one another, lack suitable soil for individual systems. A group system requires cooperation and a long-term commitment to maintenance.*

Sources: Maine Department of Environmental Protection and Maine Department of Community and Economic Development, 1993

TABLE 3. Progress to date

Town	Systems Started in Program	Systems Completed	Out-to-bid	Construction Pending	In Process	On Hold
Brunswick	10	6	3			
Harpswell	2	1			1	
West Bath	21	16		1	3	1

Sources: Casco Bay Estuary Project, 2001

home or a group of homes, but there are also experimental systems, municipal sewage districts, and holding tank systems. Depending on the site size, there are different recommendations on the system types that would be appropriate. In this program, small lot size prevented the use of conventional septic tank systems; most had to use a space-saving leach field system.

Removal of overboard discharge systems becomes more complicated on waterfront lots where soil is inadequate or where lots are too small for an inground septic system. The Town of Brunswick devised a creative solution for 53 homes and cottages on Mere Point that had overboard discharges or substandard systems. With help from the U.S. Environmental Protection Agency, the Maine Department of Environmental Protection, the Maine Department of Economic and Community Development, and the Casco Bay Estuary Project, the town replaced the existing systems with subsurface "cluster" wastewater disposal systems and individual septic systems. Septi-tech™, a pretreatment system which allows for a reduction in the size of a leach field, was used in conjunction with Elgin-In-Drain™ leach field systems. The project demonstrates solutions for areas with limited soil capacity and small lots.

Illegal Boat Sewage Discharges

Casco Bay has approximately 1,900 boat slips at 19 privately owned marinas and 3,400 moorings controlled by towns. Illegal discharge of sewage from boats presents a public health problem for both swimmers and shellfish consumers. Although sewage pumpout is only permitted in waters three miles out from the coastline (i.e., outside the bay) it is suspected that many boats discharge into bay waters. A mobile pumpout boat operated by the regional nonprofit group, Friends of Casco Bay (FOCB), helps tremendously with reducing boat discharges. For information on the FOCB pumpout boat call (207)-799-8574.

Licensed Wastewater Discharges

Among the potential sources of nutrients, municipal wastewater discharges contribute the most nitrogen to Casco Bay's ecosystem. Flats near combined sewer overflows, municipal sewage treatment plants, and other licensed discharges are permanently closed to shellfish harvesting. Many of these discharge sites in Casco Bay are in the Fore River, Back Cove, and Presumpscot River, where other contributing factors (e.g., bacteria-laden storm-water runoff from a densely populated area) could precipitate closure. Permanent closures are also in place around municipal sewage treatment plant discharges in Freeport and Yarmouth.

Phase III: Sustainable Harvest

Shellfish harvesting provides an ideal opportunity to demonstrate the integration of environmental protection, economic development and community well-being. All of the municipalities on the rim of Casco Bay with the exception of Cape Elizabeth, South Portland, Portland and Long Island have clam management programs. The programs vary greatly in scope and license allocation. Current management practices are based upon the clam flat survey. The survey provides information including: the location of clam producing areas, clam size distribution, the presence or absence of clam spat, the average clam density and estimated standing crop. State regulations require municipalities with clam management programs to survey their clam

flats at least once every three years. Survey data are also used for determining the appropriate status for conservation areas (open or closed) and in reseeding decisions.

Although clam management has been practiced in Casco Bay for decades and the most active municipalities have set the standard for the rest of the state, there are many weaknesses in the current management practices. The project will lay the groundwork for future conservation efforts by creating a collaborative network among the Bay's coastal communities. This network will provide a forum for the development of new approaches to shellfish management and environmental protection.

Shellfish resource management falls essentially into two categories: 1) fishing effort or pressure control and 2) resource protection and enhancement.

Fishing effort control

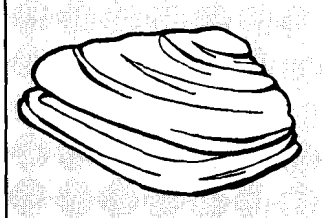
Shellfish resources, particularly intertidal resources, are, by their nature, susceptible to overexploitation. Fishing effort control has a number of techniques to maintain sustainable harvest. Perhaps the most important tool in fishing effort control is the imposition of limits on the number of licenses that are issued granting individual rights to harvest shellfish. Towns operating under approved shellfish ordinances are granted the right to limit the number of licenses issued within the municipality, although certain restrictions apply.

In addition to limited entry, harvesting can be controlled by the imposition of restrictions on the number of days and/or times during which harvesting can take place or on the amount taken during any specific period of time. For example, several communities have limited harvesting to daylight hours only while others have prohibited harvesting on Sundays.

Resource protection and enhancement

The best-known and most extensively used resource protection measure is *size limitation*. Size restrictions are commonly used in fisheries management and are currently being applied to numerous species. *Conservation closures* are routinely imposed on flats where clam density is low due to over-harvesting, lack of recruitment, or a combination of the two. Such closures have proven successful in improving productivity, particularly when combined with resource enhancement measures. Another is to alternately close and open several flats simultaneously, thus spreading the digging effort, a technique referred to as *flat rotation*. While this latter approach may appear to be sensible in theory, the fact that clams grow at different rates

It Is Interesting to Know



The first reference to size limitation as applied to soft-shell clams (Mya arenaria) in Maine came in 1917 when laws regarding "reservations", essentially private leases, restricted the harvesting of clams to 2 ½ inches or greater. In 1935, a law was passed which, for the first time, set a statewide minimum size of 2 inches and allowed a 15% tolerance level, the level being reduced to 10% in 1943. The statewide "2-inch clam law" was repealed in 1963 to increase resource availability due to the devastating effects of green crab, Carcinus maenas, predation during the 1950's and early 1960's. Also, in 1963, the Private and Special laws were repealed and the Legislature authorized the establishment of Municipal Shellfish Conservation Programs which, upon State approval of a Shellfish Ordinance, allowed individual towns to set size limits, among other things. However, the statewide "2-inch clam law," with a 10% tolerance, was reenacted in 1984.

Interestingly, support for reinstatement of the 2-inch size limit came from industry, not so much as a conservation measure, but as a result of economic concerns that small clams were considered lower in quality and thus depressed market price, both in and out of state. Indeed, following re-enactment of the 2-inch law, prices rose and Maine regained its reputation for a premium product.

on different flats makes coordination difficult. As a consequence, many towns feel it is better to simply leave all areas open at all times, thus ensuring a more even distribution of the harvesting pressure.

The resource enhancement measure most widely used today to increase production is the seeding of flats. Two techniques currently receiving considerable attention in Maine are the *transplanting of naturally-occurring seed* from high-density areas to low-density areas and the *planting of hatchery-raised seed.* The transplantation of naturally-occurring seed has the advantage of requiring little monetary outlay, but is very labor-intensive. Planting is usually accomplished by broadcasting harvested seed directly over the target area during high water, preferably in the late afternoon, thus ensuring that the next low water will occur during darkness to reduce avian predation. Hatchery production of soft-shell clam seed offers great promise, particularly for private-sector aquaculture, but the current production capacity in Maine falls far short of the needs. Furthermore, once spread, hatchery-produced seed is subject to the same risks of predation as naturally-produced seed. In view of the substantial cost of the seed, these risks are often considered undesirable. Many communities have begun programs to revitalize the industry by seeding flats with both wild and hatchery-grown seed (from the Beals Island Regional Shellfish Hatchery and Spinney Creek Shellfish Hatchery) and are also conducting recruitment, growth and survivability studies.

Heavy clam sets appear to occur adjacent to structures protruding from the sediment surface, i.e. stones, branches, tires, etc. Based on these observations, it seems reasonable to assume that structures intentionally placed as vertical projections from the sediment surface also act to encourage settlement in the surrounding area. Use of recruitment *enhancement structures* may serve as an attractive alternative to both transplanting naturally occurring seed and the planting of hatchery-produced seed since their use is much less labor-intensive than the former and less costly than the latter.

All of these resource enhancement measures are very labor-intensive and are consequently nearly always done as a volunteer effort. In order to ensure that sufficient labor is available to carry out their

History of Shellfish Management

Shellfish have played an important role in Casco Bay throughout Maine's history as evidenced by the shell mounds around the shoreline and on the many islands of the Bay left by the native people hundreds of years ago. Active management of this resource is first documented in 1821, the year of the then newly-formed State of Maine, when laws were established to protect the rights of citizens to the taking of clams. Delegation of authority to individual towns for management of the resource began in 1895 when the Towns of North Yarmouth, Yarmouth, and Cumberland began managing their shellfish resources under the Private and Special Laws.

These laws were amended and expanded until no less than 68 laws applied to shellfish management. By 1957 these laws had become sufficiently complicated and burdensome that a special Research Study Committee created by the Legislature recommended that the State, through the then Department of Sea and Shore Fisheries, assume cooperative management responsibility for shellfish resources. In practicality, however, control remained with the towns. In 1959, responsibility for enforcement of town boundaries by the State was withdrawn, leaving the towns to rely entirely on themselves. This situation soon became unsustainable and in 1963 the legislature enacted enabling legislation that laid the groundwork for the management system that exists today.

Today, towns across Maine manage the intertidal shellfish resources within their municipal boundaries through authority conferred by their respective Town Shellfish ordinances. These ordinances must be approved by the Maine Department of Marine Resources before enactment and are administered through local shellfish committees or commissions. Individual town ordinances are developed based on a Model Ordinance developed by the Maine Department of Marine Resources and specifically describe how management will be carried out in the town.

respective shellfish conservation programs, several municipalities now require commercial harvesters to perform a certain number of *"conservation hours"* in order to assure re-issuance of their harvesting licenses.

Predator control

Clam predators are many and varied and include the green crab, *Carcinus maenas*, the moon snails, *Euspira heros* and *E. triseriata*, sand worms, *Nereis virens*, mud shrimp, *Crangon septemspinosa*, and the milky ribbon worm, *Cerebratulus lacteus*, to name but a few. The green crab is by far, aside from humans, the clam's most significant predator. The most dramatic example of the effects of green crab predation was the impact of the crab population explosion that occurred in the 1950's, contributing to the precipitous decline of the clam resource. The mild winter temperatures during the 1950's allowed the green crab to survive in unprecedented numbers. The green crabs devour small clams shortly after settlement as well as larger juveniles and are such effective predators that by the late 50's and early 60's, the soft-shell clam resource throughout Maine had been reduced to historically low levels.

The Department of Sea and Shore Fisheries responded to the green crab emergency by implementing a predator exclusion program, more commonly referred to as the "crab fencing" program. Crab fences were erected along the mouths of selected coves known for their productivity to prevent green crabs from moving up the flats on the incoming tide. Crab traps were set and fished inside of the fenced-in area to remove existing crabs. These measures were very labor-intensive, but proved effective in protecting at least a small portion of the clam population. However, green crabs do exist in sufficiently large numbers in certain areas posing a risk to seeding efforts. Consequently, in certain areas where seed is applied to the flats, the seeded area is covered with plastic mesh to exclude crabs.

Soft-shell clam enhancement techniques

As overexploitation of marine resources and high predation has contributed to the clam population decline, new techniques must be employed to

Author of this fact sheet, Natalia Kassatova, helping to establish the boundary of a test site.

control, protect, and enhance the resource. Soft-shell clam enhancement represents an important link between easing fishing pressure on this resource, allowing clammers to continue this Maine tradition and life style. Most soft-shell clam farming techniques require extensive labor and capital investment; therefore, the need for developing low-cost and low maintenance methods is significant.

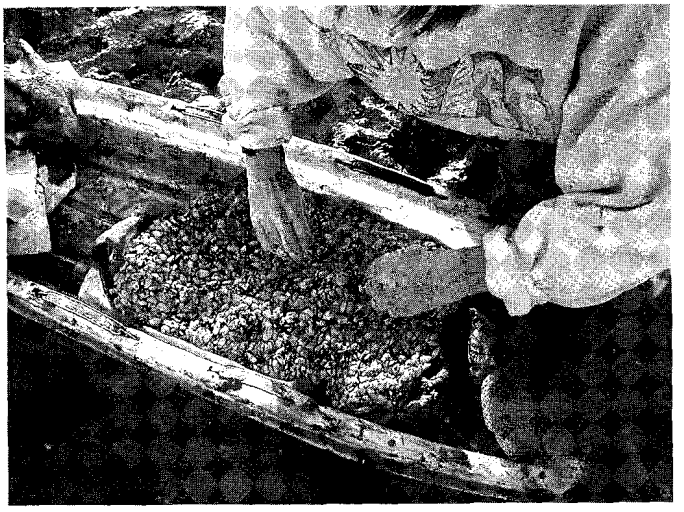
In order to test the value of soft-shell farming options, in October of 2001 the CBEP, together with Normandeau Associates and MER, along with local clammers and interns from USM, conducted experimental clam seeding in saltwater "farms" in three different locations: Yarmouth (between Cousins and Little John Island), Freeport (north of Indian Island off Flying Point Neck), and

Guy Watson of the Yarmouth Shellfish Committee helping Normandeau Associates staff, Marcia Bowen, furrow one of the test plots with clam forks. Furrowing is a technique used to create a roughened surface on which seed clams are broadcast. This technique may allow the clams to burrow into the sediment more quickly than on unfurrowed substrate.

Clammers covering half of the plots with netting. The net protects small juveniles from predators such as green crabs.

Phippsburg (off Small Point Harbor). The goal of the seeding experiment was to determine the most effective planting method in terms of season (fall and spring), size of seed (small - up to 10 mm and large - 18-20 mm), and flat substrate treatment (furrowing the substrate prior to broadcasting juveniles). A secondary goal was to evaluate the effectiveness of predator netting.

Three plots measuring 28 X 25 feet were established in each town. One was for small clam seeding, one was for larger clams, and one was with no seeding at all. Half of each plot was covered with predator netting and the other half was left uncovered. Half of the plot was furrowed with a clam rake, with furrowing done perpendicular to the net, so that half of the netted area and half of the uncovered area were furrowed. Results will be based on the control plots with no seeding and natural conditions. A second seeding will be done in spring 2002. Survival will be assessed in late summer 2002.



The size of the seeding clams ranges from small (8-10 mm) to large (18-20 mm). In the spring and fall of 2002 the surviving clams will be counted and measured to determine the success.

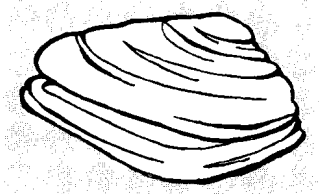
Implementation of the Management Techniques

Management techniques vary significantly between municipalities within Casco Bay and between regions within the state. Most communities with shellfish resources to protect do have ordinances that define the responsibilities and goals of the shellfish committee, requirements of license holders, license fees and applicable state regulations. Most towns within Casco Bay do not restrict the amounts of clams that can be harvested per tide by commercial license holders; all towns do have limits on recreational diggers. Few municipalities allow nighttime digging, as this is especially difficult to enforce. Conservation time, required of most harvesters to obtain a town license, may involve assisting with resource surveys, re-seeding events, collecting water samples or other tasks deemed necessary by the shellfish committee. Provisions are set forth in all ordinances to allow for the revocation of licenses for any violation of that ordinance. Shellfish management plans rely upon resource surveys, which vary in extent and complexity depending on budgetary and volunteer resources.

Regional Shellfish Management

The concept of a regional shellfish management program is not new in Casco Bay. From the 1940s through the 1950s, a Casco Bay regional shellfish management council was established to coordinate efforts to enhance and manage the clams and fishery. Among other accomplishments, the council was instrumental in coordinating the transplanting of 38,000 bushels of small juvenile hard clams from heavily concentrated areas to less densely populated areas around the Bay over a period of several years. A more recent attempt at regional management which began in 1978, specifically the Brunswick—Harpswell—West Bath Region Council, was not as successful. Today, there is a Casco Bay Regional Clam Council that meets once a month.

What You Can Do



The next time you wash dishes, take a shower, do the laundry or flush the toilet, consider this: the average family contaminates from 120 to over 500 gallons of water per day. This water contains: fecal matter, fat and grease, nitrates, phosphorus, pathogenic bacteria, infections viruses, toxic chemicals, and organic compounds. Needless to say, if you are concerned about keeping the water clean, it is in your interest to limit your use of household chemicals, detergents and cleansers. By conserving water, you can cut down on the amount of waste water you discharge.

The success of any future attempt at regional management will rest on the acceptance of and respect for the sense of ownership. Accordingly, the focus of a regional council should be on issues of broader rather than specific concern. These issues include resource assessment, research and development of new management techniques, including transplanting and assessment techniques, compliance with water quality monitoring requirements, and law enforcement. And finally, to ensure participation by all interested parties, the Council should seek representation from all aspects of the shellfish industry, including harvesters, dealers, processors, and shippers; resource managers; the marine scientific community; all municipalities bordering on Casco Bay; and State and local law enforcement personnel.

Copies of the reports, Expanding and Sustaining the Shellfisheries of Casco Bay: Phase 1, Normandeau Associates and MER Assessment Corporation; Portland Area Wastewater Treatment Impact, Jody Hibbard; Casco Bay Plan; Casco Bay Estuary Project; and Treat It Right: Alternative Wastewater Systems That Protect Water Quality, Maine Department of Environmental Protection and Maine Department of Community and Economic Development, are available from the Casco Bay Estuary Project.

Comprehensive Shellfish Management Plan for Casco Bay

If a comprehensive plan were to be developed, these are some possible components of the plan:

- Develop an educational outreach program to publicize the economic and community benefits of protecting Casco Bay. Provide periodic updates on the efforts of communities to protect their shellfish resources.
- Develop a plan for the coordinated and regional management of soft-shell clams in Casco Bay.
- Explore the feasibility of new management tools.

Want to know more?

The mission of the Casco Bay Estuary Project is to preserve the ecological integrity of Casco Bay and ensure the compatible human uses of the bay's resources through public stewardship and effective management. For more information, call or write:

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		Stormwater Management in Cold Climates Conference, November 3-5, 2003 Holiday Inn by the Bay, Portland, Maine, USA		
Wednesday 11/5/2003	8:00 - 8:30	**Registration in lobby. Continental breakfast in Casco Bay Exhibit Hall.**		
	8:30 - 9:30	**Morning Plenary Speaker: Sveinn T. Thorolfsson, "Problems in Urban Drainage in Cold Climates: Experience in the North European Atlantic Region"**		
	9:30 - 10:00	**Break in Casco Bay Exhibit Hall**		
		NEW HAMPSHIRE ROOM	**RHODE ISLAND ROOM**	**VERMONT ROOM**
	10:00 - 12:00	**Stormwater Treatment Practice - Design, Construction & Maintenance**	**Ecological Impacts and Impervious Surface Area**	**Stormwater Financing**
	10:00 - 10:40	Clinton Pinks, "Design and Construction of Stormwater Management Projects in Alaska"	Jeffrey Varricchione and Susanne Meidel, "Summary of the Impacts of Urbanization on Selected Maine Streams Detected by the Maine Department of Environmental Protection"	PRESENTATIONS & PANEL DISCUSSION Paul Tischler, "Comparing Stormwater Utilities to Impact Fees" Phillip Davenport, "The Virginia Beach, Virginia Stormwater Utility: A Case Study of the First Ten Years" D. Scott Johnstone, "Financing Stormwater Planning, Infrastructure and Maintenance: Filling the Tool Box with Choices and Selecting the Correct Tools for Each Situation" Todd Janeski, "Maine Model Stormwater Management Utility"
	10:40 - 11:20	Eileen Pannetier, "Designed to Fail: Why Most Commonly Used Designs Will Fail and How to Fix Them"	Deborah Caraco, "New Research on Impervious Cover"	
	11:20 - 12:00	Gregory R. Baryluk and Gregg Novick, "Stormwater Quality and Quantity Management via Underground Systems"	Jack Kartez, "Visualizing Watershed Health: Access to Current Tools"	
	12:00 - 1:30	**Lunch in Casco Bay Exhibit Hall**		
	1:30 - 3:30	**Groundwater Infiltration as a Stormwater Management Tool**	**Watershed Assessment & Restoration**	**Stormwater Financing and Local Management**
	1:30 - 2:10	Andrew Potts, "Adapting Porous Pavement and Other Infiltration BMPs to a Cold Climate"	John Field, "Using Fluvial Geomorphology to Assess and Restore Streams Impacted by Urbanization"	William J. Johnston, "Functional Distribution of the Virginia Beach Stormwater Management Utility"
	2:10 - 2:50	Daniel Holzman, "Design of Stormwater Infiltration Systems for Cold Climates: A Case Study"	Kathleen D. White, "Cold Climate Considerations in Stream Restoration"	Kristie Rabasca and Robert Patten, "Stormwater Phase II Implementation Costs and Funding Availability"
	2:50 - 3:30	John Hopek, "Stormwater Infiltration Impacts on Groundwater Quality at Industrial and Commercial Sites in Southern Maine: Results of Long-Term Compliance Monitoring"	Lori Barg and Bob Kort, "The Most Bang for the Buck: Developing a Watershed Restoration Plan for a Rapidly Urbanizing Vermont, USA Watershed"	Jeff Edelstein, Kathi Earley and Brenda Zollitsch, "The Casco Bay Interlocal Stormwater Working Group: A Case Study in Regionalism"
	3:30 - 3:45	**Break in Casco Bay Exhibit Hall**		
	3:45 - 4:30	**Closing Forum: Moderated Discussion on Current Stormwater Topics**		
	5:00 - 7:00	**Field trip to Vortechnics**		

Stormwater Management in Cold Climates Conference November 4 and 5, 2003

Presentation Summaries

(In alphabetical order by title)

Title: **Adapting Porous Pavement and Other Infiltration BMPs to a Cold Climate**

Presenter: *Andrew Potts, Cahill Associates, Pennsylvania*

Presentation Description: Infiltration BMPs provide some of the best techniques for managing stormwater volume and quality, as well as for mitigating peak discharge rates. Porous pavement is a proven technology with more than a twenty-year performance record, and numerous applications of porous pavement in colder climates will be presented. But more recent applications of Infiltration BMPs will also be presented and discussed, such as infiltration beds under playfields and meadows, porous concrete sidewalks, rain gardens, woodland infiltration trenches, water quality swales, infiltration basins and other techniques. Design considerations, such as soils testing, construction, winter and normal maintenance will be addressed. Guidelines on porous asphalt and concrete mixes, the underlying stone infiltration beds, and subgrade preparation (uncompacted soil) will be offered. This presentation will also discuss the process of developing a truly "sustainable" site, beginning with consideration of the landscape, topography, hydrology, and "low impact" strategies.

Title: **Assessment of Cold Weather Highway Runoff Water Quality and BMP Performance**

Presenters: *Eric Strecker, Marcus Quigley, GeoSyntec, Oregon and Massachusetts*

Presentation Description: This is a presentation and discussion of the differences between water quality during snowmelt or rain on snow runoff as measured from highways and then the performance of BMPs during cold conditions. The FHWA's Pollutant Loadings and Impacts from Highway Stormwater Runoff project developed a database on highway runoff water quality from 16 sites in 6 states that included snow washoff/melt events. A characterization of the the snow melt data will be compared to the overall characterisitics of highway runoff. The National BMP Database (www.bmpdatabase.com) contains studies on BMPs that include snowmelt runoff. For those BMPs with snowmelt data that can be identified (usually via chloride levels and the dates of the events) an assessmet of the peformance of BMPs under cold weather conditions will be presented.

Title: **A String of Pearls: Using BMPs in Sequence to Enhance Nutrient Removals**

Presenter: *Terri-Ann P. Hahn, Landscape Architectural Design Associates, Connecticut*

Presentation Description: On a recently completed project in Brewster, NY (on the cusp between Zones 5 & 6) stormwater design specifically targeted removal of phosphorus from stormwater runoff from a new shopping center. The shopping center was a big box retail project with large parking lots, which will generate significant runoff all year long. The project is located within the NYC Watershed and required the specific and measurable removal of phosphorus. The project was expected to generate phosphorus due to stormwater runoff and the discharge from a wastewater treatment plant. The use of stormwater BMP's in series, although assumed to work, had never really been confirmed. At the Highlands, the design in based on two principals. First, that by reducing flow rate and increasing storage time, we would substantially improve water quality; and second, the use of different kinds of BMP's would help to offset the weaknesses of each individual BMP. Therefore, we assembled a "string of pearls" to offset the nutrient loads generated by the project. This presentation is a case study of how the use of these BMP's in series successfully removed phosphorus from the stormwater runoff.

Title: **The Casco Bay Interlocal Stormwater Working Group: A Case Study of Regionalism**

Presenters: *Jeff Edelstein, Edelstein Associates/Cumberland County Soil & Water Conservation District, Maine; Katherine Earley, City of Portland, Maine; Brenda Zollitsch, Casco Bay Estuary Project*

Presentation Description: How can regionally-based collaborative efforts be supported? What factors lead to their success or failure? Eleven municipalities in the Casco Bay Watershed have been working collaboratively on the Stormwater Phase II Program. This presentation describes: 1) the history of the group and the factors that led to its creation and growth; 2) the group's approach to implementing Phase II; and 3) the challenges ahead. The presentation focuses on lessons learned from this effort and how those lessons can help guide other regional efforts towards success.

Title: **Cold Climate Considerations in Stream Restoration**

Presenters: *Kathleen D. White, Corps of Engineers, New Hampshire*

Presentation Description: Stream restoration projects in cold climates may not operate as designed because the effect of climate on stream restoration design has not been adequately addressed. This presentation will discuss planning and design considerations for stream restoration in cold climates.

Title: **Comparing Stormwater Utilities to Impact Fees**

Presenter: *Paul Tischler, Tischler & Associates, Inc., Maryland*

Presentation Description: Recovering stormwater capital costs through a stormwater utility or impact fees has different advantages and disadvantages. In this session Paul Tischler will summarize these trade-offs. He will also present an overview of a stormwater impact fee methodology using a case study.

Title: **Design and Construction of Stormwater Management Projects in Alaska**

Presenter: *Clinton Pinks, CBLC Limited Consulting Engineers, Canada*

Presentation Description: The Alaska Projects presentation is a chronology of stormwater management projects constructed between 1996 and 2001 from a landscape architectural perspective. The presentation uses before and after construction imagery to illustrate some of the more challenging design issues and solutions that each project presented. The projects include a series of small sedimentation basins, the daylighting of an anadromous stream, the construction of the South Anchorage Snow Disposal Site, and the realignment of a creek through wetlands. The presentation illustrates a variety of revegetation techniques and will be of interest to those practicing in the areas of water quality improvement, native revegetation techniques, and wetlands restoration.

Title: **Designed to Fail: Why Most Commonly Used Designs Will Fail and How to Fix Them**

Presenter: *Eileen Pannetier, Comprehensive Environmental Inc., New Hampshire*

Presentation Description: This presentation focuses on how BMPs fail and how they could be designed better to reduce the maintenance load. Although everyone is concerned about maintenance, few designs really minimize it or even consider ease of maintenance or low maintenance. Unfortunately, most engineering design reviews are not catching these problems because the science is so new. CEI's maintenance criteria, along with methods to get them implemented at the local level, will be described in this presentation.

Title: **Design of Stormwater Infiltration Systems for Cold Climates: A Case Study**

Presenter: *Daniel Holzman, Jaworski Geotech, Inc., New Hampshire*

Presentation Description: Stormwater management regulations are increasingly strict and complex. On-site stormwater infiltration is a common requirement, raising serious regulatory issues

given the fragmented and often conflicting assignments of local authorities, many of whom are not familiar with groundwater modeling and analysis. For the practicing engineer, design of even a simple subdivision may involve juggling the conflicting demands of the Planning Board, Board of Health, Conservation Commission, and Zoning Board of Appeals, occasionally with state or federal involvement. This presentation discusses one project in Wakefield, MA, and offers suggestions on presentation of stormwater and groundwater information to various regulatory bodies.

Title: **Factoring the Performance of Best Management Practices into the Development of Total Maximum Daily Loads (TMDLs) for Lake Tahoe**

Presenter: *Eric W. Strecker, GeoSyntec, Oregon*

Presentation Description: GeoSyntec is assisting the UC Davis in performing BMP assessments and evaluations to support the Lahontan Regional Water Quality Board in the development of TMDLs for Lake Tahoe. This work includes a review of the available urban runoff and BMP performance data and it's value in assessing BMP performance, conducting an analysis of BMP performance via the use of long-term simulations to assess current BMP implementation levels vs. potential future additional BMPs or changes to sizing requirements, evaluation of the use of potential enhanced BMPs (such as chemical addition), an assessment of basin wide implementation, and potential costs for such implementation. The work will be conducted over a 3-year period. This paper will discuss the overall approach and then report on the first two elements of the assessment of available data and the initial assessment of potential BMP performance via the use of long-term simulation models. The presentation discusses some of the cold weather challenges.

Title: **Financing Stormwater Planning, Infrastructure and Maintenance: Filling the Tool Box with Choices and Selecting the Correct Tools for Each Situation**

Presenter: *D. Scott Johnstone, Stone Environmental, Inc., Vermont*

Presentation Description: Financing a storm water project, from planning through construction, requires different approaches for each community and within each state – approaches that fit with the expectations and accepted norms of the community. Understanding the available funding choices, including the strings that come with each, that may fill your toolbox is critical. Key lessons that this presentation will focus on are knowing how and when each tool may be applicable.

Title: **Functional Distribution of the Virginia Beach Stormwater Management Utility**

Presenter: *William J. Johnston, City of Virginia Beach, Virginia*

Presentation Description: The Stormwater Utility generates over $11 million per year for the maintenance and operation of the City's stormwater system. These funds are distributed into operating, maintenance and capital budgets to support a progressive program. This presentation details the types of projects and distribution of fields which have proven effective and efficient in meeting both the short term and long term needs for the City of Virginia Beach.

Title: **Green Roofs and Urban Stormwater Management: An Industry Review for Cold Weather Climates**

Presenter: *Reid R. Coffman, The Ohio State University, Ohio*

Presentation Description: This presentation will introduce the concept of green roofs and describe the state of green roof technology with regard to stormwater management in cold climates. European and North American research will be used to describe the effectiveness of green roofs as a stormwater management tool, while demonstrating the concerns with the technology. The overall development trends in industry and research will be given. Recent cold climate projects will provide insight regarding the current level of knowledge.

Title: **Green Roofs: Feasibility and Practicality for Stormwater Management in Cold Climates**

Presenter: *Katrin Scholz-Barth, Scholz-Barth Consulting, Washington, DC*

Presentation Description: Green Roof technology is only slowly emerging in the United States. Historically, traditional sod roofs were effectively used to protect building inhabitants from extreme climate fluctuations mostly in northern regions, such as Scandinavia, Greenland, and Alaska. This presentation will address and compare the contemporary use of green roofs in Europe and the US. It will point out, by providing some detail about design and construction, how green roofs can be used to maximize energy efficiency and stormwater control. The presentation will also discuss how varying design parameter influence the practicality of green roof technology particularly in Cold Climates.

Title: **Illicit Discharge Detection and Elimination: State/Local Partnerships**

Presenters: *Andrea Donlon, New Hampshire Department of Environmental Service; Rebekah Lacey, New England Interstate Water Pollution Control Commission*

Presentation Description: This presentation will focus on state/local partnerships addressing the illicit discharge detection and elimination (IDDE) minimum control measure of the federal Stormwater Phase II Final Rule. Rebekah Lacey of the New England Interstate Water Pollution Control Commission (NEIWPCC) will discuss NEIWPCC's Phase II Stormwater Workgroup and *Illicit Discharge Detection and Elimination Manual*. Andrea Donlon of the New Hampshire Department of Environmental Services (NHDES), who collaborated with Rebekah in preparing the IDDE manual, will then discuss NHDES's IDDE efforts, including technical and financial assistance to municipalities, outreach, and case studies.

Title: **Improving the Corps of Engineers Snowmelt Modeling Capabilities**

Presenter: *Steven F. Daly, Corps of Engineers, New Hampshire*

Presentation Description: This presentation describes recent improvements to the Corps of Engineers snowmelt-modeling capabilities in managing the Nation's water resources. The Distributed Snow Process Model will be included in the next release of the Hydrologic Engineering Center's Hydrologic Modeling System. In addition the snow process objects developed for HEC- HMS will form the foundation of the Snow Process Modeling in the Corps Water Management System (CWMS).

Title: **Improved Maintenance: Drainage Management System**

Presenter: *David H. Fluharty, University of New Hampshire Technology Transfer Center*

Presentation Description: Stormwater produces surface and underground water. Highway drainage systems carry surface water on, beside, beneath, or away from the traveled way, or intercept and divert underground water. These systems are essential to protect the investment in highways. To maintain drainage systems effectively, highway agencies should have a multiyear maintenance plan, and budgets adequate to achieve them. Enabling highway managers to prepare effective plans and budgets are the primary purposes of DrainMS.

Title: **Meltwater Treatment Practices: The Basics**

Presenter: *Gary Oberts, Emmons & Olivier Resources, Minnesota*

Presentation Description: Tremendous strides have been made in the understanding and management of snowmelt. The advent of sophisticated computers and software, the chemical data to finally know what that snowpack will yield to a receiving water, and the behavior of that water as a slug of heavily polluted meltwater enters are all recent advances in the science. Observations will be made on what we have learned and how it applies to everyday practical application in cold climate regions. Accompanying this will be the identification on the many information needs that still exist for both theoretical

and practical aspects. This keynote address will set the stage for the conference, which focuses on lessons learned and practical applications for the future.

Title: **Maine Model Stormwater Management Utility**
Presenter: *Todd Janeski, Maine Coastal Program, State Planning Office, Maine*
Presentation Description: Stormwater utilities are an increasingly popular means of managing stormwater runoff at the local level. As both rural and urban development pressures put increasing demands on the resources in Maine, local municipalities are faced with mitigating the impacts associated with growth. The Maine Coastal Program/State Planning Office has developed a model stormwater utility to be used as the catalyst for discussions on utilities in Maine. This model outlines managerial entities ranging from local municipalities to existing districts to quasi-municipal organizations and provides suggestions on the fee structure.

Title: **Miller Road: A Case Study in Urban Road Stormwater Treatment**
Presenter: *Michael G. Darga, Wayne County Department of Public Services, Michigan*
Presentation Description: Miller Road, located in one of the most industrial areas in the country, is being transformed through a cooperative partnership from a barren roadway into a boulevard greenway with groundcovers, vegetated swales and mechanical methods filtering the pavement runoff prior to discharge.

Title: **Monitoring, Operation and Maintenance of Detention Ponds for Road Runoff**
Presenter: *Carina Färm, Department of Public Technology, Mälardalen University, Sweden*
Presentation Description: In the region Mälardalen in Sweden 34 detention ponds for road runoff has been invented regarding aspects of maintenance and operation of the ponds. Four of these detention ponds were also investigated regarding the quality and quantity of accumulated sediment in the bottom of the ponds to be able to estimate the removal efficiency in the ponds.

Title: **New Research on Impervious Cover**
Presenter: *Deborah Caraco, Center for Watershed Protection, Maryland*
Presentation Description: This presentation will summarize recent research on the impacts of urbanization and impervious cover to stream systems. Drawing on available research from around the country, it will discuss hydrologic, water quality, geomorphologic, and biological impacts of urbanization. A primary focus of the presentation will be the "impervious cover model" and the thresholds at which stream degradation begins.

Title: **Observation and Modelling of Urban Snow**
Presenter: *Annette Semadeni-Davies, Lund University, Sweden*
Presentation Description: Despite the dominance of snowmelt in cold regions, urban drainage systems continue to be designed according to standards developed for short, high intensity rain storms. During the 1980s and early 1990s, work in Scandinavia and Canada identified fundamental differences between rural and urban snowmelt processes. They found that snow properties varied both between town and country and within the town depending on land-use. Moreover, the energy balance is heavily modified by buildings. Thus melt and runoff generation occurs at different times and rates. Town centres can have melt rates almost double that of residential areas. These revelations will come as no surprise to practitioners working in cold regions, however, there is a lack of published material in general literature. This presentation is both a summary and continuation of the state-of-the-art review found in a UNESCO special report on urban drainage in cold regions. Topics discussed include snow distribution, snow energy balance, frozen soil and runoff generation and modelling approaches.

Title: **Performance Assessment of Various Stormwater Treatment Facilities: Toronto, Canada**

Presenter: *Tim Van Seters, Stormwater Assessment Monitoring and Performance Program, Canada*

Presentation Description: Since 1995, a number of different stormwater management technologies in the Toronto area have been monitored and evaluated through the Stormwater Assessment Monitoring and Performance (SWAMP) Program, a cooperative initiative of federal, provincial and municipal agencies. Technologies monitored include wet ponds, constructed wetlands, conveyance exfiltration systems, oil grit separators, underground storage tanks and a flow balancing system. This presentation discusses the design and effectiveness of these technologies, with a particular focus on facility performance and function during cold weather conditions.

Title: **Performance of a Vortechs System during Cold Weather Precipitation and Snow Melt Events**

Presenter: *Vaikko Allen, Vortechnics, Inc., Maine*

Presentation Description: Cold weather runoff events present unique flow and pollutant characteristics associated with winter sanding, freezing of impervious areas, and snowmelt. Factors such as increased conductivity, viscosity and average particle size will be discussed with a focus on their impacts on TSS removal efficiency. Removal efficiencies achieved by the Vortechs System during two field tests will be investigated as compared to removals during warm weather events.

Title: **Performance of Porous Pavement in Cold Climates**

Presenter: *Chris Spelic, Invisible Structures, Colorado*

Presentation Description: The interest and the use of porous paving have witnessed tremendous growth over the last 20 years. We will look at some of the benefits of using these systems in cold climates and how they compare to impervious covers. Some of the topics to be covered: porous paving as a BMP for cold climates; misconceptions about porous paving; lower maintenance verses imperious paving; porous paving and freezing; plowing and de-icing of these systems, and; current projects and examples. Porous paving could be the answer for many future projects with designers, architects, engineers and governments looking for alternatives to current problems.

Title: **Problems in Urban Drainage in Cold Climate: Experience in the North European Atlantic Region**

Presenter: *Sveinn Thorolfsson, Norwegian University of Science & Technology, Norway*

Presentation Description: This presentation deals with problems in urban drainage in the North European Atlantic region, where low temperatures and the snow cause problems due to: 1) frozen ground; 2) snow cover; 3) rain-on-snow; and 4) snow redistribution. Problems are also due to frost heave and freezing in pipes, ice on ground surfaces clogging, gutters and inlets, icing in manholes and storm sewers, and ice in watercourses. Freezing and melting leads to frequent runoff problems. The urban drainage systems must be able to handle these conditions. The temperature of mixed wastewater and stormwater conveyed to wastewater treatment plants may be low, less than +5 C^{o} causing operational problems. Too much stormwater conveyed to overflows and wastewater treatment plants is causing pollution discharges into local recipients. Urban drainage systems must be protected against freezing, but at a high cost of construction and operation. Alternative methods for locating water and sewer pipelines in the ground are presented, including the so-called "Shallow trenches" with insulated sewers. There is a need for development of an urban runoff model to handle these situations.

Title: **Reducing Nutrient Runoff from Agricultural and Urban Sites in Syracuse, NY**

Presenter: *John J. LaGorga, Moff & Assoc. Consulting Engineers, New York*

Presentation Description: In January 1989, Onondaga County executed an Amended Consent Judgment (ACJ) in settlement of litigation initiated in connection with alleged violations of state and federal water pollution control requirements. The ACJ obligated Onondaga County to develop a comprehensive watershed model and perform non-point source (NPS) environmental-benefit projects (EPB) in the Onondaga Lake watershed. The EBP obligations were met through a demonstration project where best management practices (BMPs) were implemented on three farms and at two urban sites in the Onondaga Lake watershed (Syracuse NY, a cold weather climate). The major objective of the demonstration project was to document water quality before and after BMP implementations. The effectiveness evaluation served to demonstrate the measurable water quality benefits of the BMPs. Water quality data suggests that significant water quality improvements can be achieved by implementing agricultural BMPs.

Title: **Retrofitting a Public Works Highway Yard with Stormwater Treatment Practices: A Cold Climate Stormwater Management Implementation Project in the City of Attleboro, Massachusetts**

Presenter: *Richard A. Claytor, Jr., Horsley & Witten, Inc., Massachusetts*

Presentation Description: The City of Attleboro Highway Maintenance Yard is an older public works facility located on six and a half acres immediately adjacent to, and within the floodplain of the Ten Mile River. Stormwater runoff is a major concern at the site due to the quantity and type of pollutants present on-site, the site's proximity to the river, and because there is currently no treatment or barrier between the site and river. The consulting firm of Horsley & Witten completed a Stormwater Management Master Plan and construction drawings for the implementation of a suite of stormwater management measures to address pollutant export to the Ten Mile River. These included both structural and non-structural measures such as bioretention facilities, swales, a sand filter, and two proprietary stormwater management treatment practices. Non-structural measures included recommendations for covering salt mixing and storage areas, more frequent street sweeping, spill containment and clean up procedures, and implementation of a vehicle fleet washing facility. Several cold climate considerations as well as specific physical constraints governed the selection and design of many of the structural management measures.

Title: **Road Salt Impacts to Lakes and Streams from Interstate 93 and Adjacent Roads in Southern New Hampshire**

Presenter: *Douglas L. Heath, U.S. Environmental Protection Agency, New England*

Presentation Description: Deicing chemicals such as sodium chloride have been applied to Interstate 93 and associated roads in southern New Hampshire since the 1960s. From December 2002 to May 2003, EPA New England, the New Hampshire Department of Transportation (NHDOT) and the New Hampshire Department of Environmental Services collected 412 water samples from 17 streams, two lakes, and seven public water supplies along the 20-mile stretch of the highway and exit ramps. During that winter season, NHDOT applied approximately 28.2 tons of salt per lane mile along the 20 miles from the state line north to Exit 6 in Manchester, NH. Chloride concentrations in water samples and a high correlation between chloride and specific conductance measured in the field at 15-minute intervals by data-logging devices support the finding that chronic chloride toxicity for macroinvertebrates and fish (230 mg/l) was exceeded in six streams draining the I-93 area.

Title: **Seasonal Effects on Stormwater Microbiology and Effects of Standard Treatment Methods**

Presenter: *Robert Roseen, University of New Hampshire*

Presentation Description: Nine stormwater control systems in NH, constructed in general accordance with local town planning guidelines, were selected for the study of stormwater treatment effectiveness. The selected sites included: retention (wet) ponds, detention (dry) ponds, wet swales, and dry vegetated swales. Water sampling occurred during the first one-half inch of precipitation. The overall project objective was to determine whether or not there is a significant difference in water quality treatment effectiveness for microbial pathogens between stormwater control systems that include resident water during dry weather and those that do not.

Title: **Snowmelt Research and Management: Ready for the Next Big Step**

Presenter: *Gary Oberts, Emmons & Olivier Resources, Minnesota*

Presentation Description: Tremendous strides have been made in the understanding and management of snowmelt. The advent of sophisticated computers and software, the chemical data to finally know what that snowpack will yield to a receiving water, and the behavior of that water as a slug of heavily polluted meltwater enters are all recent advances in the science. Observations will be made on what we have learned and how it applies to everyday practical application in cold climate regions. Accompanying this will be the identification of the many information needs that still exist for both theoretical and practical aspects. This keynote address will set the stage for the conference, which focuses on lessons learned and practical applications for the future.

Title: **Stormwater Basins and Aesthetics: Not a Contradiction**

Presenters: *Alan G. LeBlanc, John Z. Olcott,Jr., Camp Dresser & McKee, Inc., New Hampshire; Amy Prouty Gill, City of Nashua, New Hampshire*

Presentation Description: Regulatory and legal requirements of how wastewater and stormwater is handled will have a profound impact on how land is developed in the future. The City of Nashua, New Hampshire, recently took a proactive step with the design and construction of a 2½-acre stormwater basin, benefiting the general public, local residents, and overall ecology of the area. The presentation details the approach by the city and engineering consultant Camp Dresser & McKee Inc. (CDM) in resolving a major flooding problem and creating a new recreational asset in a dense residential neighborhood.

Title: **Stormwater Infiltration Impacts on Groundwater Quality at Industrial and Commercial Sites in Southern Maine: Results of Long-Term Compliance Monitoring**

Presenter: *John Hopek, Maine Department of Environmental Protection*

Presentation Description: Monitoring of indicator parameters (specific conductance, chloride, and pH) from infiltration sites shows adverse impact on downgradient groundwater, even from largely undeveloped sites. There is seldom an instantaneous response to infiltration, but rather a long period over which declining water quality is established. This apparently reflects not only the rate of plume migration, but also contaminant mobility within the infiltration system and aquifer, which should be expected to vary as these evolve over time. Nested-well data show that localized intense recharge drives infiltrated water through a significant thickness of the aquifer. Short-term monitoring is not adequate to assess these impacts on groundwater quality.

Title: **Stormwater Management and Low Impact Development for Cold Climates**

Presenter: *Wendi Goldsmith, The Bioengineering Group, Inc. Massachusetts*

Presentation Description: Watershed protection has become an increasingly important priority for land use planners nationwide. State, regional, and municipal planning bodies and regulatory

authorities are placing increased emphasis on reducing land use impacts by recognizing the need for sustainable site hydrology and implementing onsite stormwater management. "Green" principles and Low Impact Development (LID) designs are being used to provide site development solutions for stormwater management that are cost effective, compliant with applicable regulations, and that protect and enhance the environment. To this end, state-of-the-art solutions like green roofs, stormwater treatment wetlands, and various Best Management Practices (BMPs) are being used to manage stormwater runoff in a variety of climate conditions to protect and enhance remaining watershed resources. By exploring actual case studies from stormwater management designs that were developed for sites in New England and elsewhere, the presentation will address the setting of design goals, identification of suitable measures, and development of design and maintenance plans

Title: **Stormwater Phase II Implementation Costs and Funding Availability**

Presenters: *Kristie Rabasca, Robert Patten, Environmental Engineering and Remediation, Inc., Maine*

Presentation Description: The MS_4 component of the Storm Water Phase II Program is generally (though not technically) considered an unfunded mandate. The focus of this presentation is to provide an overview of estimated costs for implementation of Storm Water Management Plans, present ways some MS_4 communities are reducing costs associated with the implementation of their five-year Plans, and to highlight existing funding sources that are available within New England to help ease the financial burden associated with regulatory compliance.

Title: **Stormwater Quality and Quantity Management via Underground Systems**

Presenters: *Gregory R. Baryluk, Advanced Drainage Systems, Inc., Massachusetts; Gregg Novick, StormTech, Maine*

Presentation Description: Stormwater quality and quantity management has typically been addressed with aboveground systems, such as ponds. Recently, there has been a shift towards managing stormwater with underground systems. Stormwater quality is addressed with the use of large diameter (48"–60") corrugated high-density polyethylene (HDPE) pipe fabricated with interior weir plates and/or polypropylene open bottom chambers wrapped in a geotextile fabric to treat suspended solids and oil and grease. To address stormwater quantity, a system of pipe laterals and/or polypropylene open bottom chambers connected by manifolds is used. The use of pre-fabricated cleanouts/risers can provide the access necessary for long-term operation.

Title: **Stormwater Treatment Evaluation Project in Seabrook, New Hampshire**

Presenters: *Scott Nolan, University of New Hampshire; Natalie Landry, New Hampshire Department of Environmental Services*

Presentation Description: This Project will test the ability of the AbTech SmartSponge media to reduce bacterial contamination into Hampton/Seabrook Harbor from a storm drainage system in Seabrook, New Hampshire. The AbTech system has been placed in a water quality inlet and the removal efficiencies are currently being evaluated using the Environmental Technology Verification protocols.

Title: **Summary of the Impacts of Urbanization on Selected Maine Streams Detected by the Maine DEP**

Presenters: *Jeffrey Varricchione, Maine Department of Environmental Protection; Susanne Meidel, Partnership for Environmental Technology Education, Maine*

Presentation Description: Over the years, the Maine Department of Environmental Protection has investigated the degradation of the biological, physical, and chemical integrity of numerous stream systems located in urbanizing watersheds around Maine. This presentation focuses on the key findings of completed and current studies of six streams in the

greater Portland and Bangor areas. Although variability was present, the impacts of urbanization to the streams generally were similar in nature, and included degradation of biological communities, increases in pollutants, alteration of water temperature regimes, degradation of riparian conditions, and loss of in-stream habitat quality and diversity. Comparative data on these parameters from streams in both urban and non-urban watersheds will be presented.

Title: **The Most Bang for the Buck: Developing a Watershed Restoration Plan for a Rapidly Urbanizing Vermont Watershed**

Presenters: *Lori Barg, Step by Step; Bob Kort, USDA Natural Resources Conservation Service, Vermont*

Presentation Description: The rapidly urbanizing Allen Brook watershed in northwestern Vermont fails to meet state water quality standards. A comprehensive watershed-based approach was taken to present "every tool in the tool box". The plan was developed with the goal of providing a cost-effective means of restoring waters impaired by nonpoint sources. The approach ranged from public outreach and education to specific changes in zoning, planning and public works documents to detailed scientific investigation and recommendations for retrofitting over 100 stormwater facilities. Town officials, developers, homeowners associations, and others were involved throughout the process.

Title: **The Virginia Beach Stormwater Utility: A Case Study of the First Ten Years**

Presenter: *Phillip Davenport, City of Virginia Beach, Virginia*

Presentation Description: The Virginia Beach Storm Water Utility was implemented in July 1993 and now has ten years of history. The utility has been identified by many as a model for storm water utilities on the east coast. This presentation will discuss the financial aspects of the utility including how the utility was established, the basis for charging fees, the actual fees collected and how they are used, and lessons learned.

Title: **Treatment of Stormwater Runoff from Snow Melt at the Portland Snow Dump**

Presenters: *David Mongeau, Pamela J. Deahl, Hydro International, Maine*

Presentation Description: With significant annual snowfall, and over 340 miles of city streets, the City of Portland, ME, must routinely remove snow from downtown streets in order to keep roads passable in winter. Historically, much of this snow was dumped in a saltwater basin known as Back Bay. In the fall of 2000, the City changed this practice and established an inland location at a municipal Public Works facility for placement of snow. Typically, a detention/retention facility would be used to regulate stormwater flows and control stormwater quality. However, the Portland International Jetport is located approximately 4000 feet from the snow dump location, and a detention pond would be located directly under the approach to the runway. This location would be in conflict with the FAA policy regarding the potential to attract wildlife near an airport. Ultimately, the City chose to install two structural stormwater treatment systems. Manufactured primarily of precast concrete, the treatment systems are installed below grade, thereby avoiding the creation of a wildlife attractant. This presentation will look at the application of structural stormwater treatment systems for the site in question, and discuss the experiences associated with their use.

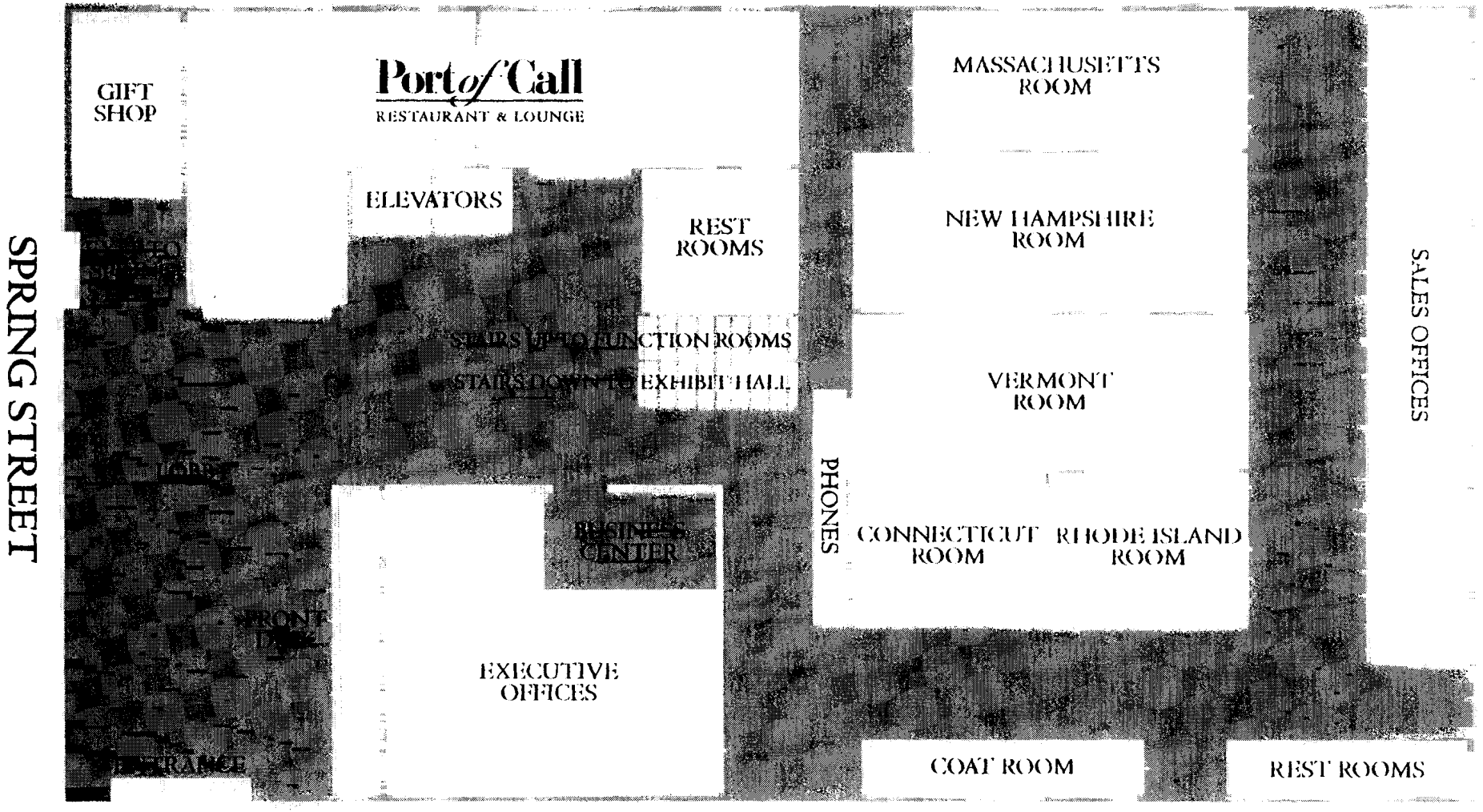
Title: **Unintended Consequences**

Presenter: *Evan Richert, University of Southern Maine, Muskie School of Public Service, Maine*

Presentation Description: The move, which is necessary, to aggressively contain stormwater runoff may carry with it unintended consequences if not carried out carefully. In the worst case scenario, the regulation of runoff in urban areas may become a strong incentive to push sprawl farther out from farm and city centers – with the overall affect of exacerbating the very problem intended to be solved.

Title:	**Using Fluvial Geomorphology to Assess and Restore Streams Impacted by Urbanization**
Presenter:	*John Field, Field Geology Services, Maine*
Presentation Description:	Increased runoff and higher peak discharges resulting from urbanization lead to permanent changes in the physical morphology of stream systems. Fluvial geomorphology provides useful techniques for assessing the impact of urbanization on streams. Comparisons of impacted sites with natural and altered reference conditions permit a determination of how the impacted site is adjusting to urbanization and how close the stream is to attaining a new equilibrium with the urbanized setting. An understanding of past conditions and future states in a stream's morphological evolution will provide guidance on how best to enhance natural stream function in permanently altered watersheds.
Title:	**Visualizing Watershed Health: Access to Current Tools**
Presenter:	*Jack Kartez, University of Southern Maine, Edmund S. Muskie School of Public Service, Maine*
Presentation Description:	Visualization of watershed impacts of impervious surface changes due to growth, using GIS-based models, is now an integral part of nonpoint pollution control planning, management, and (especially) public education outreach. This demonstration and workshop session will review and display the recently developed, public-domain NOAA-CSC Impervious Surface Analysis Tool (ISAT) from NOAA's Coastal Services Center, which requires calibrated impervious surface coefficients for remote-sensing land cover data. How to apply ISAT for zoning-based watershed-buildout analysis will be illustrated, audience experience with tools elicited, and alternate types of approaches such as using parcel-based analysis of impervious surfaces, discussed.

LOBBY & CONVENTION HALL LEVEL



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STORMWATER MANAGEMENT IN COLD CLIMATES
NOVEMBER 3 - 5, 2003
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STORMWATER MANAGEMENT IN COLD CLIMATES
NOVEMBER 3 - 5, 2003
PORTLAND, MAINE
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STORMWATER MANAGEMENT IN COLD CLIMATES
NOVEMBER 3 - 5, 2003
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STORMWATER MANAGEMENT IN COLD CLIMATES
NOVEMBER 3 - 5, 2003
PORTLAND, MAINE
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STORMWATER MANAGEMENT IN COLD CLIMATES
NOVEMBER 3 - 5, 2003
PORTLAND, MAINE

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ATTENTION
"STORMWATER MANAGEMENT IN COLD CLIMATES" CONFERENCE PARTICIPANTS

FORM AND INSTRUCTIONS FOR OBTAINING TRAINING CREDITS

Technical sessions conducted at the 2003 "Stormwater Management in Cold Climates" Conference may be eligible for continuing education credit in your profession.

Due to the diversity of professional affiliations and geographic regions represented at this conference we were unable to obtain pre-approval from all potential regulatory agencies. However, **we are providing you with the attached session log to document your participation, and to submit to your regulatory agency or certifying party.**

Upon departure from each session you attend please have the Session Monitor stamp the appropriate box on the Ivory colored Session Log. **Session Monitors will stamp your log only upon your departure.** If you attend all three presentations in a session block make sure the Monitor stamps all three blocks when you depart from the room.

If you wish to receive a certificate of participation, it is your responsibility to return a written request with a copy of your Session Log to JETCC **prior to Friday, December 5, 2003**. You should also keep a copy of this document for your own records. After receiving your request we will mail you a certificate indicating the appropriate Training Contact Hours. It is your responsibility to forward this information to your regulatory agency or certifying party.

CONDITIONS FOR OBTAINING TRAINING CONTACT HOURS

A total of 6.0 Training Contact Hours (TCHs) will be awarded for November 4th and a total of 5.0 Training Contact Hours (TCHs) will be awarded for November 5th with the following conditions:

- You must be registered for the day of the conference.
- You must attend the equivalent of 2 complete technical session blocks per day.

  Note: If you attend two presentations at one session and attend a presentation at another session, you must have your Session Log stamped by both Session Monitors.

- You must verify your attendance at the technical sessions using the approved ivory colored form **(attached)**.

Joint Environmental Training Coordinating Committee (JETCC)
PO Box 487
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Phone 207/253-8020 Fax 207/771-9028

November 3rd Session Log

Monday 11/3/2003	Stormwater Management in Cold Climates Conference November 3-5, 2003 Holiday Inn by the Bay, Portland, Maine USA		
Time	Activity		
7:30 - 5:00	Registration in lobby.		
	8:00am - 4:00pm Certified Professional in Stormwater Primer (morning 8 - noon = 4hrs)	9:00am - 12 noon ASIST Computer Training Session #1 (3hrs)	
12:00 - 1:00	Lunch	Break	Workgroup Lunch
	8:00am - 4:00pm Certified Professional in Stormwater Primer (Afternoon 1 - 4:00pm = 3hrs)	1:00 - 4:00 pm ASIST Computer Training Session #2 (3hrs)	12 noon - 5:00pm Cold Climate Manual Work Group
5:00 - 7:00	Site visit to HYDRO International		

Name_____ **Phone #**_____

Company_____ **Fax#**_____

Address:_____ **Email**_____

City:_____ **State:**_____ **ZipCode:**_____

November 4th Morning Session Log

Tuesday 11/4/03	Stormwater Management in Cold Climates Conference November 3-5, 2003 Holiday Inn by the Bay, Portland, Maine USA		
Time	Activity		
7:30 - 8:30	Registration in lobby. Continental breakfast in Casco Bay Exhibit Hall.		
8:30-8:45	Welcome		
8:45 - 9:45	Keynote Speaker: Gary Oberts, "Snowmelt Research and Management--Ready for the Next Big Step"		
9:45 - 10:15	Break in Casco Bay Exhibit Hall		
10:20 - 12:15	Urban Snow Management	Stormwater Impacts & Treatment	Planning & Design for Stormwater Management
10:20 - 11:00	Annette Semandeni-Davies, "Observation and Modelling of Urban Snow"	Tim Van Seters "Performance Assessment of Various Stormwater Treatment Facilities--Toronto, Canada"	Reid Coffman "Green Roofs and Urban Stormwater Management: An Industry Review for Cold Weather Climates"
11:00 - 11:40	Gary Oberts, "Meltwater Treatment Practices"	Robert Roseen, "Seasonal Effects on Stormwater Microbiology and Effects of Standard Treatment Methods"	Katrin Scholz-Barth "Green Roofs — Feasibility and Practicality for Stormwater Management in Cold Climates"
11:40 - 12:15	Steven F. Daly, "Improving the Corps of Engineers Snowmelt Modeling Capabilities"	Terri-Ann Hahn "A String of Pearls - Using BMPs in Sequence to Enhance Nutrient Removals"	Amy Prouty Gill, Alan LeBlanc and John Olcott, "Stormwater Basins and Aesthetics - Not a Contradiction"
12:15 - 1:30	Lunch in Casco Bay Exhibit Hall		
1:30 - 3:30	Stormwater Design for Roads and Highways	Stormwater Impacts & Treatment (continued)	Stormwater Management & Maintenance
1:30 - 2:10	Richard Claytor, "Retrofitting a Public Works Highway Yard with Stormwater Treatment Practices: A Cold Climate Stormwater Management Implementation Project in Attleboro, Massachusetts, USA"	Eric Strecker and Marcus Quigley, "Assessment of Cold Weather Highway Runoff Water Quality and BMP Performance"	John LaGorga "Reducing Nutrient Runoff from Agricultural [and Urban Sites] in Syracuse, NY, USA"
2:10 - 2:50	Michael Darga, "Miller Road: A Case Study in Urban Road Stormwater Treatment"	Scott Nolan and Natalie Landry "Stormwater Treatment Evaluation Project in Seabrook, New Hampshire, USA"	Andrea Donlon and Rebekah Lacey, "Illicit Discharge Detection and Elimination:State/Local Partnerships"
2:50 - 3:30	Carina Färm, "Monitoring, Operation, and Maintenance of Detention Ponds for Road Runoff"	Vaikko Allen "Performance of a Vortechs System During Cold Weather Precipitation and Snow Melt Events"	David Fluharty, "Improved Maintenance: Drainage Management System"
3:30 - 3:45	Break in Casco Bay Exhibit Hall		

Name_____ **Phone #**_____

Company_____ **Fax#**_____

Address:_____ **Email**_____

City:_____ **State:**_____ **ZipCode:**_____

November 4th Afternoon Session Log

Tuesday 11/4/03	Stormwater Management in Cold Climates Conference November 3-5, 2003 Holiday Inn by the Bay, Portland, Maine USA		
Time	Activity		
3:30 - 3:45	Break in Casco Bay Exhibit Hall		
3:45 - 5:00	Urban Snow Management Studies	Planning for Stormwater through Low Impact Development	Stormwater Treatment Practice (STP) Performance
3:45 - 4:25	Dave Mongeau and Pam Deahl "Treatment of Stormwater Runoff from Snow Melt at the Portland, Maine, USA Snow Dump"	Evan Richert "Unintended Consequences"	Chris Spelic, "Performance of Porous Pavement in Cold Climates"
4:25 - 5:00	Doug Heath, "Road Salt Impacts to Lakes and Streams from Interstate 93 and Adjacent Roads in Southern New Hampshire"	Wendi Goldsmith, "Stormwater Management and Low Impact Development for Cold Climates"	Eric Strecker "Factoring the Performance of BMPs into the Development of Total Maximum Daily Loads (TMDLs) for Lake Tahoe"
5:15 - 8:00	Evening Reception in the Casco Bay Room, Holiday Inn		

Name_____ **Phone #**_____

Company_____ **Fax#**_____

Address:_____ **Email**_____

City:_____ **State:**_____ **ZipCode:**_____

November 5th Morning Session Log

Wednesday 11/5/2003	Stormwater Management in Cold Climates Conference November 3-5, 2003 Holiday Inn by the Bay, Portland, Maine USA		
Time	Activity		
8:00 - 8:30	Registration in lobby. Continental breakfast in Casco Bay Exhibit Hall.		
8:30 - 9:30	Morning Plenary Speaker: Sveinn Thorolfsson, "Problems in Urban Drainage in Cold Climates-Experience in the North European Atlantic Region"		
9:30 - 10:00	Break in Casco Bay Exhibit Hall		
10:00 - 12:00	Stormwater Treatment Practice - Design, Construction & Maintenance	Ecological Impacts and Impervious Surface Area	Stormwater Financing
10:00 - 10:40	Clinton Pinks "Design and Construction of Stormwater Management Projects in Alaska, USA"	Jeff Varrichione and Susanne Meidel, "Summary of the Impacts of Urbanization on Selected Maine, USA Streams"	PRESENTATIONS & PANEL DISCUSSION Paul Tischler "Comparing Stormwater Utilities to Impact Fees" Phil Davenport "The Virginia Beach, Virginia (USA) Stormwater Utility: A Case Study of the First Ten Years" Scott Johnstone "Financing Stormwater Planning, Infrastructure and Maintenance - Filling the Tool Box with Choices and Selecting the Correct Tools for Each Situation" Todd Janeski "Maine Model Stormwatern Management Utility"
10:40 - 11:20	Eileen Pannetier, "Designed to Fail: Why Most Commonly Used Designs Will Fail and How to Fix Them"	Deborah Caraco "New Research on Impervious Cover"	
11:20 - 12:00	Greg Baryluk and Gregg Novick, "Stormwater Quality and Quantity Management via Underground Systems"	Jack Kartez "Visualizing Watershed Health: Access to Current Tools"	
12:00 - 1:30	Lunch in Casco Bay Exhibit Hall		

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Address:_____ **Email**_____

City:_____ **State:**_____ **ZipCode:**_____

November 5th Afternoon Session Log

Wednesday 11/5/2003	Stormwater Management in Cold Climates Conference November 3-5, 2003 Holiday Inn by the Bay, Portland, Maine USA		
Time	Activity		
12:00 - 1:30	Lunch in Casco Bay Exhibit Hall		
1:30 - 3:30	Groundwater Infiltration as a Stormwater Management Tool	Watershed Assessment & Restoration	Stormwater Financing and Local Management
1:30 - 2:10	Andrew Potts "Adapting Porous Pavement and Other Infiltration BMPs to a Cold Climate"	John Field, "Using Fluvial Geomorphology to Assess and Restore Streams Impacted by Urbanization"	Bill Johnston "Functional Distribution of the Virginia Beach Stormwater Management Utility"
2:10 - 2:50	Daniel Holzman "Design of Stormwater Infiltration Systems for Cold Climates"	Kate White, "Cold Climate Considerations in Stream Restoration"	Kristie Rabasca and Robert Patten "Stormwater Phase II Implementation Costs and Funding Availability"
2:50 - 3:30	John Hopek "Stormwater Infiltration Impacts on Groundwater Quality at Industrial and Commercial Sites in Southern Maine: Results of Long-Term Compliance Monitoring"	Lori Barg and Bob Kort "The Most Bang for the Buck: Developing a Watershed Restoration Plan for a Rapidly Urbanizing Vermont, USA Watershed"	Jeff Edelstein and Kathi Earley "The Casco Bay Interlocal Stormwater Working Group: A Case Study in Regionalism"
3:30 - 3:45	Break in Casco Bay Exhibit Hall		
3:45 - 4:30	Closing Forum: Moderated Discussion on Current Stormwater Topics		
5:00 - 7:00	Field trip to Vortechnics		

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Stormwater Management in Cold Climates

Planning, Design & Implementation

November 3-5, 2003 ~ Portland, ME USA

CONFERENCE EVALUATION FORM

We appreciate your opinions and advice! Please take a few moments to complete BOTH SIDES of this evaluation. WRITTEN COMMENTS ARE VERY HELPFUL! Thank you!

CONFERENCE RATINGS

Please rate the following aspects of the conference on a scale of 1 to 5, with 5 being excellent.

	Excellent.....				.....Needs Improvement
ON-SITE CONFERENCE ADMINISTRATION	5	4	3	2	1
LOCATION – CITY	5	4	3	2	1
LOCATION – HOTEL	5	4	3	2	1
MEETING ROOM SET-UP	5	4	3	2	1
FOOD	5	4	3	2	1
SLEEPING ROOM ACCOMMODATIONS	5	4	3	2	1
AUDIO-VISUALS	5	4	3	2	1
WEBSITE	5	4	3	2	1
REGISTRATION PROCESS	5	4	3	2	1
PRINTED CONFERENCE PROGRAM	5	4	3	2	1
PRIMER	5	4	3	2	1
FIELD TRIPS	5	4	3	2	1
EVENING RECEPTION	5	4	3	2	1
CLOSING FORUM	5	4	3	2	1
EXHIBITORS	5	4	3	2	1

OVERALL CONCLUSION:

Given the objectives of this event, what is your overall rating?

EXCELLENT **VERY GOOD** **GOOD** **FAIR** **POOR**

WRITTEN COMMENTS

⇒Who were the 3 speakers you were most interested in coming to hear?

1.)_____ 2.)_____ 3.)_____

⇒What 3 topics/issues were you most interested in coming to hear?

1.)_____ 2.)_____ 3.)_____

⇒Which presentations stand out in your mind and why?

⇒How could we have improved the content of the conference?

⇒What other topics would you like to see covered at future conferences?

⇒Please recommend individuals or organizations that should be included in future conferences:

⇒Other Comments:

****

If you are unable to return this evaluation form at the conference, please return by mail or fax to:

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Casco Bay Estuary Project

Maine Coast Heritage Trust

Casco Bay Estuary Project Habitat Protection Fund

June 2003

AVAILABLE FUNDING:
Beginning in October, 2003, the Casco Bay Estuary Project (CBEP), will distribute up to $100,000 this year to support the protection of high value habitat in the Casco Bay watershed through its *Casco Bay Estuary Project Habitat Protection Fund.* The fund will be administered through a partnership with the U.S. Fish and Wildlife Service Gulf of Maine Program and Maine Coast Heritage Trust as described below. Funding levels for individual projects will vary from a few hundred dollars for fees associated with acquisition to funding ranging from $5,000 - $30,000 for land acquisition. Typically, funds for acquisition range from $5,000 - $20,000, but larger amounts will be considered for exceptionally large or significant projects.

USES OF THE FUND:
The Casco Bay Estuary Project Habitat Protection Fund may be used to:

- Pay costs associated with acquisition of high value habitat (e.g. miscellaneous fees, surveys, appraisals)*;
- Purchase an easement on or acquire fee title of high value habitat (described below); or
- Purchase an option on lands with high value habitat.

**Costs associated with acquisition will be considered for funding if it is demonstrated that, without assistance, the project is not likely to proceed.*

GEOGRAPHIC REGION OF INTEREST: Casco Bay watershed; See the Casco Bay Estuary Project website, www.cascobay.usm.maine.edu for a map of the applicable watershed area. The focus of this fund is on lands that are integral to aquatic ecosystems (e.g. coastal, riverine, and freshwater wetland systems). A majority of the funds will be directed to projects in the coastal subwatersheds of the larger Casco Bay watershed.

WHO CAN APPLY:
Non-profit conservation groups (land trusts, watershed groups), towns, state and federal conservation agencies are all eligible to apply, as long as they demonstrate their commitment and capability to protect and manage land acquired in perpetuity for its natural resource values.

CBEP HABITAT PROTECTION SUBCOMMITTEE:
The Casco Bay Estuary Project Habitat Protection Fund will be administered by a subcommittee consisting of the following members. Applicants may contact any one of these individuals to inquire about the fund or initiate the application process.

Karen Young
Casco Bay Estuary Project
University of Southern Maine
49 Exeter Street
Portland, ME 04104-9300
780-4820
kyoung@usm.maine.edu

Lois Winter
U.S. Fish & Wildlife Service
Gulf of Maine Program
4R Fundy Rd.
Falmouth, ME 04105
781-8364
lois_winter@fws.gov

Chris Fichtel
Maine Coast Heritage Trust
One Main Street
Suite 201
Topsham, ME 04086
729-7366
cfichtel@mcht.org

REQUIREMENTS FOR ALL PROPERTIES PROTECTED:
All requirements for the Casco Bay Estuary Project Habitat Protection Fund must be met in order to be eligible for funding.

1. All lands protected through easement or acquisition must be protected and managed for habitat conservation in perpetuity. Applicant must sign a statement provided by the Casco Bay Estuary Project ensuring permanent protection/management of the property for its natural resource values in perpetuity.

2. Public access, permitted in a manner sensitive to the habitat values of the property, must be assured in perpetuity (due to the use of federal funds from EPA for this program). Applicant must sign a statement provided by the Casco Bay Estuary Project ensuring permanent appropriate public access to the property for its natural resource values in perpetuity. If a compelling case for why public access will not be allowed on the protected property (such as protection of sensitive wildlife habitats), the application will be considered.
3. If land management activities (i.e. forestry, haying) are envisioned on the property, those activities must be carried out in an environmentally sensitive and sustainable manner, consistent with the overarching purpose of protecting high value habitat for fish, wildlife and plant communities in perpetuity. Applicants anticipating land management activities must discuss proposed activities with the Habitat Subcommittee.

4. In outreach efforts associated with land acquisition (i.e. written materials, public ceremonies, discussions with key partners, etc.), the Casco Bay Estuary Project Habitat Protection Fund requests appropriate recognition as a partner involved in supporting the land protection initiative. We will supply partners with the Casco Bay Estuary Project logo for visual presentation purposes. In written materials, we request that the Casco Bay Estuary Project Habitat Protection Fund be credited as co-administered in partnership with the U.S. Fish and Wildlife Service Gulf of Maine Program and Maine Coast Heritage Trust.

APPLICATION PROCESS:
In an effort to be responsive to applicants and to maintain flexibility, the application process will be relatively simple and informal. There will be no application deadline; instead, applications will be processed as they are received. The process for applying for funding through the Casco Bay Estuary Project Habitat Protection Fund is as follows:

1. Interested applicants should call one of the three members of the CBEP Habitat Protection Subcommittee listed above to explain the project to insure that it falls within fund requirements and criteria and that funds are still available.

2. The applicant should then submit three copies of the following information to the Habitat Protection Subcommittee member with whom they've been in contact:

a) Cover letter briefly describing project and requesting funds;
b) Casco Bay Estuary Project Habitat Protection Fund application or a pre-existing grant application that addresses the selection criteria and requirements;
c) Map that clearly identifies the boundaries of land and parcels proposed for protection;
d) Appraisal summary sheet or opinion of value, if appropriate;
e) Budget outlining the total project costs, committed funds, and potential funding sources -- both for the project and for any planned stewardship/management; and
f) Letters of support or other supporting materials (optional).

Following a review of the application materials, the selection committee may request additional information or may contact the applicant to arrange a site visit. The Subcommittee aims to finalize funding decisions on an application within 4-8 weeks of receipt of the application.

SELECTION CRITERIA:

The following criteria will be used by the CBEP Habitat Protection Subcommittee to select projects for funding. Please address all applicable criteria in your application materials.

- Protection of land that is integral to an aquatic ecosystem (i.e. coastal, riverine, and freshwater wetland habitats);
- High habitat value(s) for fish, wildlife and/or plant communities*
- Permanent protection of the property
- Public access
- Part of a larger conservation vision
- Contiguous with other protected lands
- Level of threat from development
- Size of the project (larger is generally better)
- Cost-effectiveness of proposal
- Condition of surrounding land
- Likelihood of successful implementation (including acquisition and long-term stewardship)
- Matching funds
- Community support
- Outreach potential

* *Note: Habitat values will be analyzed and prioritized, using multiple tools that may include but are not limited to the following:*
    - *USFWS Gulf of Maine Program's GIS analysis for the Gulf of Maine watershed*
    - *USFWS Gulf of Maine Coastal Program/Casco Bay Estuary Project GIS analysis for the 15 towns surrounding Casco Bay*
    - *USFWS Gulf of Maine Program's database identifying high value nesting islands*
    - *"Beginning with Habitat" initiative, incorporating habitat data from U.S. Fish and Wildlife Service, Maine Dept. of Inland Fisheries and Wildlife and Maine Natural Areas Program*
    - *Land cover maps and aerial photographs*
    - *Local knowledge*
    - *Site visit observations*

Casco Bay Estuary Project

HABITAT RESTORATION PROGRAM:

Partnerships to Revitalize Damaged Habitats

Habitats are places where plants and animals live, feed, find shelter, and reproduce. For humans sharing natural habitats, the knowledge of interdependence carries with it a responsibility. Human activity can threaten and degrade habitat in numerous ways, through direct loss, fragmentation, encroachment, disturbance, diminished water quality, altered drainage patterns, and barriers.

The Casco Bay Estuary Project (CBEP) is working with citizens, local organizations, and agency partners to restore habitat in Casco Bay and its watershed, benefiting our own species in addition to all the "neighboring" plants and animals that share our watershed ecosystems.

What is habitat restoration?

Habitat (or, ecological) restoration is essentially restoration of an ecosystem, which consists of *the biota (plants, animals, and microorganisms) within a given area, the environment that sustains it, and their interactions. Ecological restoration is* ***the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed*** (The Society for Ecological Restoration, "Primer on Ecological Restoration," 2002).

What types of habitat does CBEP want to restore?

Priority habitats identified in the *Casco Bay Plan* (1996) include both the waters and islands of the Bay, and the rivers, streams, and freshwater wetlands of the watershed. Shoreline, saltmarsh, and riparian habitats are part of the aquatic ecosystem and are also priority habitats for the Casco Bay Estuary Project. (For more information on the habitats in the Casco Bay watershed, see the ***Important Habitats*** *table* in this fact sheet, back page.)

What types of assistance can CBEP offer to local Habitat Restoration projects?

- Guidance in developing community support for projects, including facilitation, as resources permit;
- Assistance with project development and planning;
- Technical assistance with implementation strategies and design; and
- Project funding (modest seed funding from Casco Bay Estuary Project and/or assistance with obtaining funding from other sources).

What habitat restoration activities will CBEP support?

The CBEP Habitat Restoration resources and funds can assist in supporting the full spectrum of activities necessary to restore valuable habitat. Because restoration represents a long-term commitment of land and resources, all involved stakeholders should participate in the decision to undertake a restoration project. A project plan should be developed and follow-up monitoring designed. *(See sidebar on next page for more detail.)*

What are the important aquatic habitats of Casco Bay and its watershed? How are human activities impacting them?

Habitat Type	Example Species	Example Human Impacts
Marine and estuarine waters Marine habitats of Casco Bay cover 229 square miles (over 146,000 acres).	• Terns, eider ducks • Pollock, sculpin, winter flounder, skate • whales, dolphins, porpoises	• Oil spills • Marine debris and entanglement in fishing gear
Intertidal and subtidal mud flats Mud flats are the most characteristic intertidal habitat in Casco Bay covering 11,582 acres	• Soft-shell clams and worms • Piping plovers, great blue herons	• Creation of barriers (e.g. causeways) to tidal circulation • Toxic pollution in both sediments and water
Eelgrass beds (and other submerged aquatic vegetation) Eelgrass, which covers 5% or 7,000 acres of Casco Bay, is an important indicator of ecosystem health.	• Flounder, striped bass, eels • Lobster, crabs, scallops	• Nutrient loading and increased turbidity of water • Physical disturbance from boat propellers and anchors
Rocky intertidal habitat Casco Bay boasts 500 acres of rocky shoreline habitat.	• Periwinkles, mussels, barnacles • Crabs, starfish, sea urchins • Seaweeds	• Loss of habitat due to docks and piers • Introduction of invasive species (e.g. Asian shore crab)
Salt Marshes Critical functions of saltmarshes include providing nursery habitat for marine species; mitigation of flooding and storm surge; and filtration of water pollutants.	• Mummichogs • Snowy egret, herons	• Restriction of tidal flow due to roads and bridges • Filling, ditching, and draining of saltmarshes
Islands Casco Bay contains 758 islands, islets, and exposed ledges at mean high tide.	• Seals • Terns and plovers • Osprey	• Elimination of waterbird nesting habitat due to development • Disturbance by humans and introduced predators
Rivers and Streams There are more than 1,356 miles of rivers and streams in the Casco Bay watershed.	• Muskrat, beaver, river otter • Atlantic salmon, alewife, river herring, shad, smelt	• Obstruction of flow due to dams, roads, etc. • Soil disturbance and increased flooding cause erosion of shoreline buffers
Freshwater wetlands Freshwater wetlands in the Casco Bay watershed include bogs, wooded swamps, and vernal pools.	• Herons, bitterns, ducks • Frogs, salamanders, turtles • Moose, deer, raccoons	• Introduction of invasive species (e.g. purple loosestrife) • Filling and draining of wetland habitats

Casco Bay Estuary Project

THE CASCO BAY PLAN, 1996

HABITAT GOAL: ***Minimize adverse environmental impacts to ecological communities from the use and development of land and marine resources.***

HABITAT OBJECTIVES:

- No net loss of aquatic and island habitats.
- Habitats in Casco Bay should be of a quality that does not have an adverse effect on the structure and function of the biological community.
- The miles of rivers, streams, and coastal waters meeting water quality standards shall increase annually

A few of our Habitat Restoration Partners:

Maine Coastal Program/Maine State Planning Office, Maine Department of Environmental Protection, National Oceanographic and Atmospheric Administration (NOAA), Natural Resource Conservation Service, U.S. Fish and Wildlife Service Gulf of Maine Coastal Program, U.S. Environmental Protection Agency, Friends of Casco Bay

Funding for the Casco Bay Estuary Project is provided by the U.S. Environmental Protection Agency under Section 320 of the Clean Water Act, the University of Southern Maine, Maine Department of Environmental Protection, and through grants and contributions.

Casco Bay Watershed and subwatersheds — Home to the work of the Casco Bay Estuary Project

To learn more about the Casco Bay Estuary Project Habitat Restoration Program and to explore partnership opportunities, contact: Casco Bay Estuary Project • 207/780-4820
E-mail : cbep@usm.maine.edu • www.cascobay.usm.maine.edu

Credits: Diane Gould, copy; Julie Motherwell, design; Karen Young and Lakes Environmental Association, photography.

CBEP may be able to provide assistance with the following activities:

- Habitat assessment;
- Consensus-building and convening stakeholders;
- Development of a project implementation plan;
- Design of engineering solutions;
- Implementation including construction;
- Monitoring; and
- Management.

Examples of implementation activities within the CBEP definition of habitat restoration include:

- Restoration of saltmarsh hydrology;
- Eelgrass planting;
- Control of invasive species;
- Installation of fish ladders and fishways;
- Water quality improvement to enhance aquatic habitat
- Planting riparian and shoreline buffers;
- Nesting island restoration;
- Native species planting and reintroduction; and
- Creation of shoreland buffers.

(See Case Studies insert for examples of local Habitat Restoration implementation projects.)

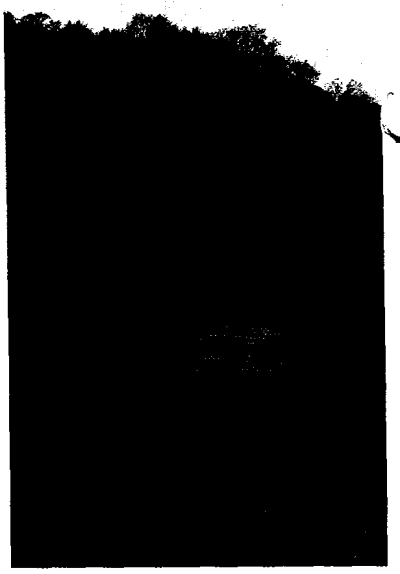
What can habitat restoration accomplish? How?

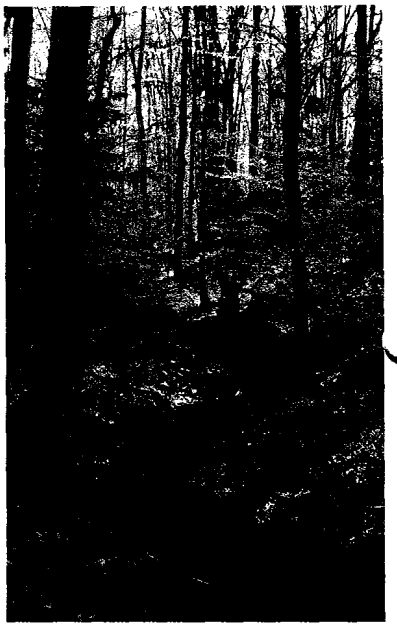
Ideally, restoration attempts to return a damaged or degraded ecosystem to its historic or undegraded condition. This can be established through a combination of historical knowledge of the ecosystem's pre-existing state, studies on comparable intact ecosystems, and analysis of other ecological, cultural, and historical reference information.

In many cases, return to the undegraded condition may not be possible due to permanent alterations resulting from human activity. For example, while improving water quality may enhance fish habitat in a river or stream, long-term changes in water temperature due to runoff from increased impervious surface and loss of sheltering trees may change the species of fish that can be supported. Understanding what the ecosystem was like before it became degraded can, however, help inform the direction of a restoration effort.

Successful ecosystem restoration takes advantage of the ability of the ecosystem to restore itself to the fullest extent possible. In the simplest circumstances, removing or modifying specific disturbances will allow a system to recover on its own (SER, 2002). For example, removing a man-made tidal restriction will allow species of saltmarsh grasses, present historically, to outcompete newcomer freshwater species like *Phragmites*.

Where native species have been lost completely, it may be necessary to reintroduce native plants and animals and control exotic invasive organisms. In some cases, an ecosystem may require ongoing management to sustain its recovery.





What indicates a successful ecosystem restoration project?

An ecosystem has recovered when it can sustain itself structurally and functionally. The Society for Ecological Restoration ***Primer on Ecological Restoration*** (2002) outlines the key characteristics of a restored ecosystem, paraphrased and summarized below. Even when not fully realized, these characteristics can serve as benchmark goals towards which a recovering ecosystem should be moving.

- The plant and animal communities include the species that were present historically and include **native species** to the fullest extent possible.
- The plants and animals needed to develop and maintain a **functioning ecosystem** are present (for example, there is an adequate supply of food for restored native species).
- The physical environment can sustain **reproducing populations** of the key species necessary for continued ecosystem stability or development through time.
- The ecosystem is functioning normally and is resilient enough to **endure normal periodic stress** (for example, fluctuations in weather).
- The ecosystem is **interacting successfully with the larger landscape** which surrounds it, and threats from the surrounding landscape have been reduced as much as possible.
- The restored ecosystem is as **self-sustaining** as a similar undisturbed ecosystem. Note that a normal ecosystem may change over time as part of normal ecosystem development and may fluctuate in response to stress and disturbance.

References: *Casco Bay Plan*, 1996. Casco Bay Estuary Project (http://www.cascobaywatch.maine.edu)

HABITAT RESTORATION
Case Studies in Casco Bay

Outer Green Island: A Tern Habitat Restoration Partnership

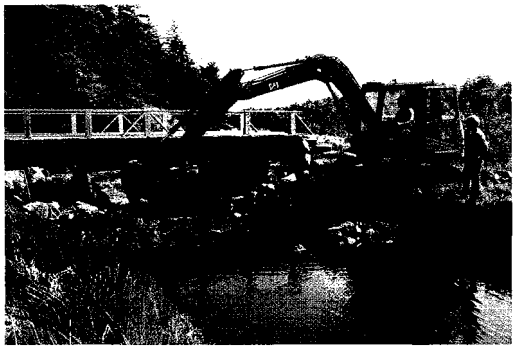
Outer Green Island is a 5.45 acre island in Casco Bay, owned and managed by Maine Department of Inland Fisheries and Wildlife. The island provided nesting habitat for terns in the early 1900s, but unnaturally high populations of aggressive gulls pushed the terns out.

Seabird biologists from Maine Department of Inland Fisheries and Wildlife, Maine Coast Heritage Trust, National Audubon Society, and U.S. Fish and Wildlife Service (Gulf of Maine Program) recognized that the island, located far from the mainland and far from land-based predators (mink, raccoons and owls) had great potential for restoring native terns. The Gulf of Maine Seabird Working Group, an international coalition working to protect and restore seabirds to historic nesting sites, approved the plan in August 2001.

Partners worked together to fund the project, hire an on-site steward for the nesting season and provide supplies to support the field camp. In late April 2002, before migratory terns arrived, biologists set off loud "firework" noises on the island to discourage black-backed gull and herring gull nesting. Lured by recorded tern calls and 100 life-size decoys, the first terns were spotted on Outer Green Island in early May. By June, nine nesting pairs of common terns had settled on the island.

On July 5, 2002, for the first time in 88 years, a common tern chick hatched on Outer Green Island. Biologists are hopeful that, in future years, the endangered roseate tern may also begin nesting on Outer Green Island.

Sprague River Marsh: A Wetland Restoration Partnership



In the upper section of the Sprague River Marsh in Phippsburg, Maine, a tidal constriction, man-made ditches, and cattails (indicative of freshwater runoff) have aggressively invaded a large stand of *Scirpus* (a rare native saltmarsh plant), threatening the salt ecosystem. The Nature Conservancy (Maine Chapter), Bates College, and the Small Point Association are the primary landowners.

Partners from Natural Resources Conservation Service, U.S. Fish and Wildlife Service (Gulf of Maine Program and Partners for Fish and Wildlife Program), the Nature Conservancy (Maine Chapter), and Bates College have collaborated to develop and fund restoration and follow-up monitoring. Preliminary engineering work confirmed the need to remove 100 cubic yards of rock from under a bridge to eliminate the tidal constriction and the need to prevent excessive drainage.

The partners coordinated with the Small Point Association to explain the purpose of the project to landowners. Also, educational programs conducted on the marsh explained the restoration work to local school children. In June 2001, the rocks were removed and the three ditches plugged, permitting more salt water to flow into the upper marsh.

Ditch plugging is a relatively new saltmarsh restoration technique with promise for creating permanent high water habitat on marshes, but for which longer-term ecological results are still pending. Restoration biologists expect that over time, the higher salinities will cause the cattails to die back, permitting the rare, native *Scirpus* to thrive. In addition, pool habitat has been created on the marsh surface in order to attract a suite of native species of aquatic plants, invertebrates, fish, shorebirds, wading birds, and waterfowl that depend on permanent water on the high marsh.

Casco Bay Estuary Project

These are a few of the projects implemented by some of the partners of the Casco Bay Estuary Project.
To learn more about the Casco Bay Estuary Project Habitat Restoration Program and to explore partnership opportunities, contact: Casco Bay Estuary Project • 207/780-4820 • E-mail : cbep@usm.maine.edu • www.cascobay.usm.maine.edu

Representatives of the following organizations participated substantially as members of the Steering Committee in the development of the background information and/or the development of this Plan. Their participation does not necessarily imply endorsement of the Plan. Please see discussion on page 1.

Coastal Conservation Association

Friends of the Presumpscot River

Greater Portland Council of Governments

Hannaford Brothers

Maine Atlantic Salmon Commission

Maine Dept. of Environmental Protection

Maine Dept. of Inland Fisheries & Wildlife

Maine Dept. of Marine Resources

USDA, Natural Resources Conservation Service

Portland Trails

Portland Water District

Presumpscot River Watch

U.S. Environmental Protection Agency

U.S. Fish & Wildlife Service

A Plan for the Future of the Presumpscot River

Reflecting the Views of

the Presumpscot River Management Plan Steering Committee

With Funding and Assistance Provided by

Casco Bay Estuary Project

And

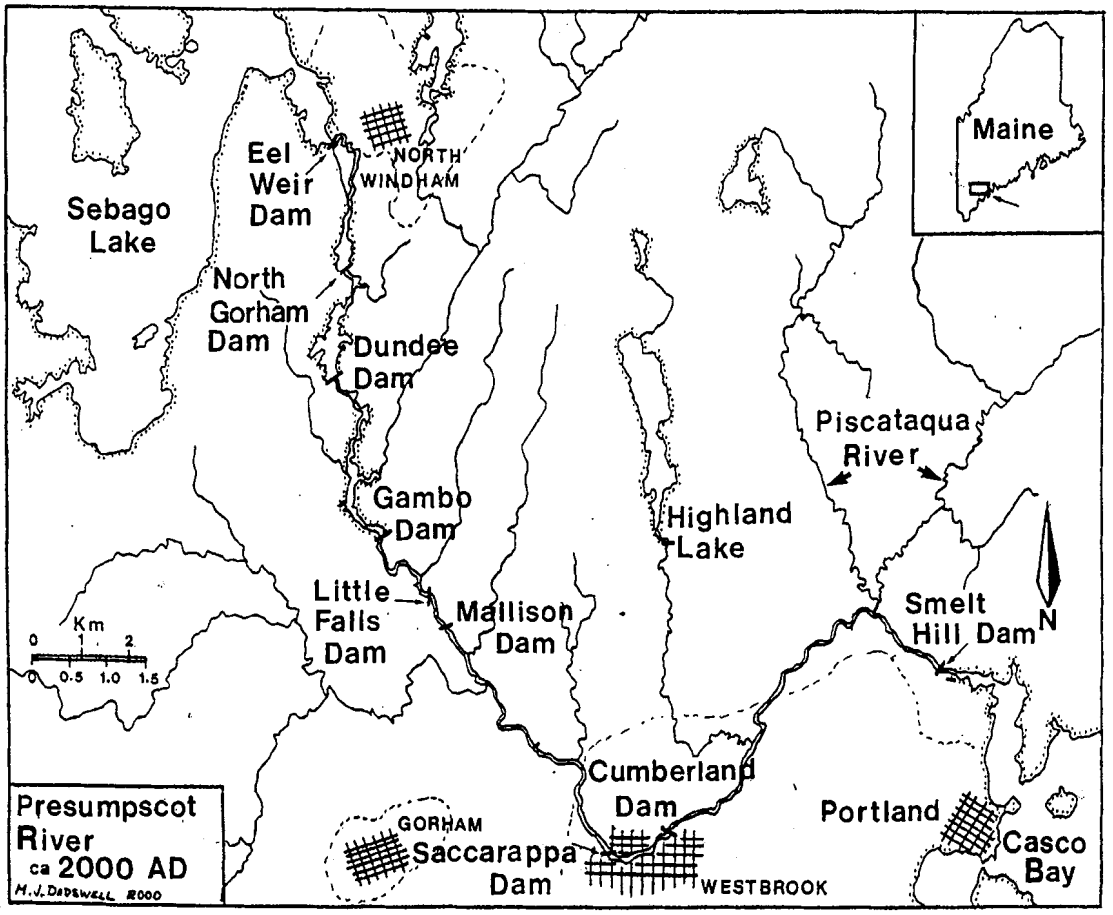
U.S. Environmental Protection Agency, Region 1

Facilitation, Analysis and Technical Assistance Provided by

Land and Water Associates, Hallowell, Maine

August 18, 2003

Presumpscot River *A Plan for the Future*



CASE STUDIES CONTINUED

Long Creek and Red Brook: A Watershed Assessment

Long Creek and Red Brook are two low-gradient, sand-silt bottomed, freshwater streams that flow through South Portland, Scarborough, Westbrook, and a small portion of Portland into Clark's Pond, the Fore River, and eventually Casco Bay. The watersheds contain a variety of land uses, including retail and other commercial development, a golf course, industrial facilities, a landfill, residential areas, and forested and wetland areas. Under a grant from the U.S. Environmental Protection Agency, the Maine Department of Environmental Protection designed and conducted a study to assess the impact of urban development on the biological, chemical, and physical integrity of these two streams.

Assessments included:

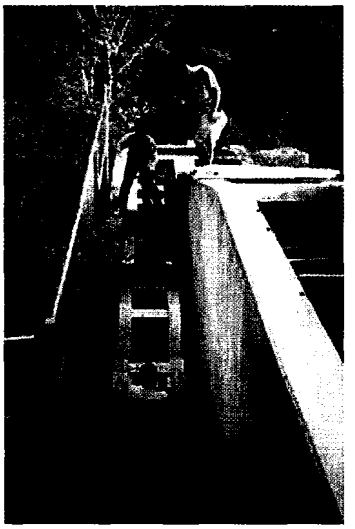
- land-use analyses;
- biological community (algae, macroinvertebrates, fish) sampling;
- baseflow and stormflow water chemistry, temperature, and hydrology monitoring;
- in-stream and riparian habitat characterization; and
- fluvial geomorphology analyses (e.g., channel stability rating, channel shape).

The study found that downstream of intense urban development, stream habitat and biological communities were degraded. The study also detected substantial alterations in the hydrology, channel stability, and pollutant loads of these streams. This degradation was attributed to the transformation of forested wetlands to land uses with a high percentage of impervious surface such as parking lots, roads, rooftops, and driveways.

Other landscape alterations found to impact these streams included degradation of riparian forests and stream channelization which resulted in the loss of shading (i.e., increased thermal loads) and inputs of organic matter (e.g., large woody debris), and habitat simplification.

The results of this study will be used to educate community residents and decision-makers about the impact of human activities on Maine streams, and will also support watershed restoration planning and implementation.

Royal River: Andadromous Fish Stream Restoration



The Royal River is a quiet meandering river about 40 miles long. It rises out of Sabbath Day Lake in New Gloucester, Maine, winds its way through rural wooded areas and fertile farmlands, and eventually empties into the tidal waters of Casco Bay in Yarmouth, Maine.

The Friends of the Royal River, in partnership with the U.S. Fish and Wildlife Service (USFWS) and the Maine Department of Marine Resources (DMR), adopted two fish ladders on the Royal River in Yarmouth in 1996. These fish ladders are critical to the upstream and downstream passage of anadromous fish such as alewives, shad, smelt, blueback herring, sea-run brown trout, and possibly Atlantic salmon. Annually, these fish migrate up the river from the ocean to spawn and in following years migrate down to the bay and ocean to develop into adults.

Installed in the mid to late 1970s by DMR, these ladders fell into a state of disrepair by the early 1990s. In 1996, the Friends started maintaining these ladders by replacing broken baffles, removing debris, and closing and opening the gates on an annual basis. Some material has been supplied by Hancock Lumber, Yarmouth, Maine, and some through a grant from USFWS. Baffles are constructed by both volunteers and DMR staff.

Through these efforts, it is hoped that these fish ladders remain as effective as possible to allow fish passage up and down the river.

Introduction and Overview

The Presumpscot River Management Plan Steering Committee is pleased to present this draft management plan for the Presumpscot River. It reflects three years of background research on major issues of concern, development and review of options for addressing these concerns, and lastly, after input from several public meetings and a written public comment period, development of the Final Plan recommendations.

Background

In the Spring of 2000, the Casco Bay Estuary Project (CBEP) initiated a planning effort for the Presumpscot River involving a diverse group of stakeholders. The CBEP has an interest in the river since it is the largest freshwater source to Casco Bay. Interest in the river had grown in response to plans for the removal of the head-of-tide dam (Smelt Hill Dam, later removed in the Fall of 2002), and dramatic improvements in water quality resulting from the cessation of SAPPI Fine Paper's pulp mill operations in Westbrook. These two events opened new possibilities for the future of the river.

The Presumpscot River originates at Sebago Lake, Maine's second largest lake, which serves as the water supply for Greater Portland. The river, from the Eel Weir Dam at the outlet of Sebago Lake to the head-of-tide, is 27 miles long. It presently has eight dams that block the passage of migratory sea-run fish and impound most of its length from the Cumberland Mills Dam in Westbrook to the Eel Weir Dam at Sebago Lake.

The focus of the planning effort is the Presumpscot River, the adjacent river corridor lands, and to some extent its tributaries, from Eel Weir Dam to Casco Bay. The Plan does not include or address issues related to Sebago Lake levels.

Steering Committee

To develop a plan for the future of the Presumpscot River, the CBEP solicited interest in developing such a plan from a broad group of stakeholders including all five municipalities that border the river. Interested parties were then convened as a steering committee to guide the development of the plan. The Presumpscot River Management Plan Steering Committee is composed of representatives of federal, state and local government agencies, businesses, and conservation organizations and interests. In addition, one municipality actively followed the plan development process.

The goal of the Steering Committee has been to work cooperatively to develop a plan for the future of the river, and to develop recommendations that work for all interests.

SAPPI Fine Paper (formerly S. D. Warren Company), owner of seven of the dams on the river, participated on the Steering Committee for the first two years of the process; including the development of final white papers on Fisheries (May 29, 2002), Cumulative Impacts (June 11, 2002), and a draft Open Space White Paper (June 11, 2002). In addition, SAPPI participated in the public information sessions during June 2002. In November 2002, SAPPI withdrew from the planning process and was not involved in developing the draft or final Management Plan, or the final Open Space White Paper.

Purposes

The purposes of the planning effort were twofold:

1. to develop a comprehensive and unified plan with management objectives to

guide future actions and decisions that impact the river; and

2. to identify opportunities (recommended actions) for supporting continued improvements to the health of the river and its tributaries, and for capitalizing on the potential of a healthy river ecosystem for providing a diversity of public benefits, including recreational, educational and economic benefits; in balance with the benefits of renewable hydropower energy.

Focus Areas

The Steering Committee identified three issues around which to develop its vision and plan for the future of the Presumpscot River:

- Cumulative Impacts to the River
- Fisheries Conditions and Opportunities
- Open Space Conditions and Opportunities

The Steering Committee worked over a period of two years to develop an information base and proposed management objectives for each of these focus areas. White papers were drafted detailing what is known about the issues, and identifying options for addressing related problems or opportunities. These white papers are posted on the Casco Bay Estuary Project web site: www.cascobay.usm.maine.edu, or may be obtained by contacting the Casco Bay Estuary Project at 207-780-4306. They are included as Appendices to this Plan.

Developing the Final Plan

The Committee's work, including a summary of the white papers, was presented at a series of public informational meetings held in June of 2002.

Following the public information meetings, the Steering Committee worked to develop a draft Plan, including a vision for the future management of the river, its shoreland corridor, and to some extent its tributaries, with recommendations for actions that will support the achievement of that vision. This Final Plan was developed after a public hearing (May 7, 2003) and comment period.

It is hoped that this Plan will be used to guide future actions and activities affecting the river, and that it will promote stewardship and partnerships between individuals, community groups, interest groups, and all levels of governments, working together towards a vibrant future for the Presumpscot River.

The Plan includes the highlights of each of the white papers, and concludes with a Vision Statement, Recommended Management Objectives, and a Summary of Recommended Actions. Appendix A includes a more detailed presentation of the Plan Recommendations. Appendix B is a record of public comments received on the Draft Plan, with the Steering Committee's responses to those comments. Appendices C, D, and E are the three white papers providing a detailed treatment of the issues addressed by this Plan.

Contents of the Plan:

Cumulative Impacts to Environmental Conditions on the River and its Shorelands

How Has Use of the River, and Concern About Impacts to the River, Changed Over Time?

Original accounts and archaeological findings on the Presumpscot report it to have been a rushing river with many falls and rapids; abundant fish life, including sea-run species such as Atlantic salmon; and a Native American population (the Rockomeecook tribe of the Abenakis) living largely off the river's bounty, supplemented by corn fertilized with fish caught at the river's falls.

The Presumpscot has a rich history. The river was settled early in Maine's history (the first dam was constructed at Smelt Hill in the early 1730's). The power and water supplied by the Presumpscot were fundamentally important to the early development of the area. Without the river there would have been no mills and little development in the area. The Presumpscot was the site of Maine's first pulp mill, first hydroelectric project, only significant canal, and largest gunpowder mill.

The impact of this development on the river has been significant. No other river in Maine has virtually all its hydraulic head captured behind dams.

While use of the river for power and waste disposal were viewed as a normal part of economic development at the time, the impacts of the dams to the river's fisheries have been a concern since the 1700's. It was the site of one of the first serious disputes over water rights in Maine (fish versus dams). Orders from the Massachusetts Legislature in 1735 and 1741 required that any dams constructed on the river provide passage for fish. In the 1840's concerns were raised over pollution of the river with bark and sawdust; in the 1850's the paper industry was established on the river, and a number of other industries including woolen and textile mills, iron works, and a gunpowder mill added to the pollutant loading of the river. For the next 100 years, industrial uses of the river were pre-eminent over other uses.

By the 1950's the condition of the lower river was similar to most rivers in the developed northeast -- it was heavily polluted and its primary value was as a conduit for waste. The culture of environmental consciousness that grew in the 1960's, led to passage of the Clean Water Act and marked reductions in water pollutant discharges by the 1970's. While industrial and municipal treatment plant discharges to the river have been dramatically reduced since the 1960's, nonpoint sources of contamination from development and other land uses in the watershed have increased.

Interest in reclaiming the river was given a boost in 1992 when the Maine Department of Inland Fisheries & Wildlife undertook one of its most successful efforts to reestablish a trout and salmon fishery in the upper reach of the river, below Sebago Lake. More recently, the removal of the Smelt Hill Dam at head-of-tide, and cessation of the Westbrook Mill's pulp operation have combined to improve the condition of the lower river and air quality in the area. As in the past, this has given rise to a new set of competing interests, which are being addressed by this planning effort.

How Have Water Resources Been Impacted Over Time?

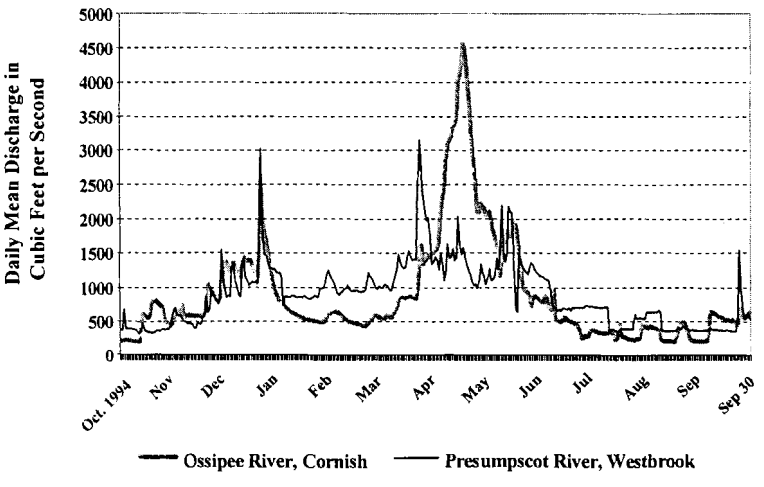
Altered Flow Regimes

One of the most significant changes to the natural river, dramatically altered hydrology, resulted from controlling flows from Sebago Lake, and the development of dams and impoundments on the river. This changed both the flows and character of the river, and altered water levels on Sebago Lake. This analysis addresses cumulative impacts to the river, but does not address changes to Sebago Lake.

Naturally occurring flows were undoubtedly more variable than flows that have occurred with regulation by the dam at Sebago. The figure above compares a typical hydrograph of flows in the Presumpscot River at Westbrook with a hydrograph for the Ossipee River, a comparably sized river with significant headwater lakes. This comparison indicates that the principal effect of the flow regulation at Sebago Lake has been to augment low flow periods. In addition, the hydrographs suggest that flow regulation also moderates high spring flows, and tempers the effects of summer storms (the Presumpscot River is less flashy in the summer).

In addition, current velocities have been decreased by the dams in places along the river; these dams have largely converted the river from free-flowing to a series of impoundments.

A Comparison of Existing Flows on the Presumpscot River with the Ossipee River, an Uncontrolled River in the Adjacent Saco River Drainage



USGS Data, 1994

Changes in Water Quality

Because the basin was originally almost entirely forested, the original water quality naturally occurring in the Presumpscot River was in all likelihood very similar to that in Sebago Lake, its source.

The cumulative impacts of waste discharges, watershed development, and damming of the river are quantifiable. Changes in water quality include:

- Increased Total Suspended Solids
- Increased Dissolved Solids
- Lowered Dissolved Oxygen
- Increased Bacterial Levels
- Shift to Pollution-Tolerant Aquatic Organisms
- Elevated Temperature

Changes in Aquatic Habitat

In the Presumpscot, the community of aquatic life has been adversely affected by cumulative impacts in the river: sedimentation, warming, and creating impoundments. After the historic removal of the Smelt Hill Dam, over half of the river remains impounded.

How Have Estuarine Resources Been Impacted?

Salinity

It is unclear what estuarine species are benefited or disadvantaged by the existence of more stable fresh water flows to Presumpscot estuary, but it is clear that the system is different (more stable, less dynamic) than it would be under natural conditions.

Chemistry of Estuarine Sediments

The Presumpscot River estuary is a large depositional area where fine-grained sediments carried downstream by the river are accumulating. The fine-grained sediments of the river's estuary have moderately elevated levels of metals and high levels of PAHs (polycyclic aromatic hydrocarbons). Also the estuary has the highest levels of dioxins and furans found in Casco Bay.

Volume of Sediments

The volume of coarse sediments reaching the estuary has been reduced by dams, while the volume of fine sediments has been increased by discharges and erosion in the watershed.

Estuarine Water Quality

The extent of eelgrass beds is often used as a positive indicator of estuarine water quality. A 1993-1995 eelgrass mapping project undertaken by the Maine Department of Marine Resources (MDMR) did not detect the presence of eelgrass in the estuary of the Presumpscot, a sign of a degraded condition.

Estuarine Animals

Pollution traveling downstream with the river has impacted estuarine organisms. In 1991, the Maine Department of Environmental Protection data indicated that dioxin, a carcinogen, was present in soft-shelled clams in the estuary in significant amounts, presenting a cancer risk of one in one million.

Eliminating the runs of sea-run fish and reducing the runs of American eels (a species that lives in fresh water and spawns in the ocean) has impacted the estuary as well as the river. Runs of approximately 34,500 to 136,000 adult American shad and 150,000 to 200,000 adult alewives, and 450,000 blueback river herring potentially could be restored to the river. If these potential runs develop, hundreds of millions of juvenile shad, alewives and bluebacks would be hatched in the river each year and tens of millions would migrate out of the river each year. The yearly migrations of these adult and juvenile fish would make the Presumpscot River estuary and Casco Bay more attractive for a wide variety of predators including, but not limited to, kingfishers, great blue herons, osprey, bald eagles, striped bass, and seals. Researchers on Delaware Bay concluded that restoring alewives and river herring to an area that is only half the habitat potentially available on the Presumpscot would produce between 539 pounds and 73,696 pounds of striped bass and weakfish in the Delaware Estuary.

How Have River Fisheries and Aquatic Life Been Impacted?

Historical documentation of the fishery noted that *"The Presumpscot is a ... rapid river ... frequented by salmon, shad and alewives, but seems to have been best adapted to salmon"* and that salmon ascended the river to Sebago Lake and beyond (United States Commission of Fish and Fisheries, 1887).

Major changes to the fish resources of the basin include:

- blocking (by dams) of fish passage for anadromous (salmon, shad, alewives, etc.) and catadromous (eels) species; DMR has estimated that if access were restored for 3 species (shad, alewives and blueback herring) that fish runs totaling approximately 634,000 to 786,000 fish could be supported by the river;
- fragmentation of habitats as a result of dams on the river;
- a shift from fast moving coldwater riverine habitats to a series of slower moving impounded areas (15 of 17.5 miles of the original river above the Cumberland Mills Dam remains impounded). This change favors fish species such as bass and panfish at the expense of native salmonids; and
- deterioration of water quality (including depressed dissolved oxygen conditions) resulting from industrial and municipal discharges.

How Have Threatened and Endangered Species Been Impacted?

Impacts to threatened and endangered plant species inhabiting the Presumpscot River corridor include loss of habitats, particularly floodplain forests as well as reduction in the productivity of these areas. Two plant species identified by the State as threatened or species of concern have been observed and two others reported historically. One of these species (small whorled pogonia) is extremely rare nationally. Agriculture, timber harvesting, inundation by impoundments, loss of anadromous fish, development and pesticide use have all contributed to cumulative impacts on certain threatened and endangered animal species (*e.g.*, bald eagles).

How Have Recreational Resources Been Impacted?

Dams on Presumpscot have changed the character of the river from a fast moving river falling 267 feet over more than a dozen falls and rapids, to largely a series of impoundments. Until the recent removal of the Smelt Hill Dam, which restored 7 miles to riverine conditions, the Presumpscot had only 5 miles out of 27 that were not impounded, and approximately half of this was the tidal section of the river below the Smelt Hill Dam. Above Cumberland Mills Dam, only 2.5 miles of the river is free-flowing, and unimpounded sections are generally small segments, except for the Eel Weir Bypass Reach, which is 6,700 feet long (this section receives only a minor portion of the total outflow from Sebago Lake, most of which goes through a power canal). As a result, impacts to recreational resources include loss of opportunities for whitewater boating and extended river canoe trips as well as loss of coldwater fishing opportunities on the mainstem of the Presumpscot River. At the same time the dams have stabilized flows and created impoundments and opportunities for flat water recreation.

How Have the Local and Regional Economy Been Impacted?

The subsistence economy of the Native Americans who first inhabited the Presumpscot River area was based largely on the food resources provided by the river. This economy was in place for thousands of years before Europeans settled the area. In the 1700's, the European colonial economy was based on a mixture of agriculture and related industrial development.

It would be difficult to overstate the importance of the river to the region's early industrial economy. The power and water provided by the Presumpscot River, particularly the reliable flows which resulted from damming and managing the water level on Sebago Lake, were the reasons for the growth of industry and population centers on its banks.

The river and its management continue to impact the region's prosperity. Today, dams on the river produce low-cost electricity for the SAPPI mill in Westbrook, which provides jobs for over 500 people (energy savings are estimated at approximately $2 million per year), and contributes approximately $85 million per year to the local economy. However, the future of the SAPPI Westbrook mill depends on many factors beyond the energy production at these dams.

In addition, regulation of river flows through controls at Eel Weir Dam at the outlet of Sebago Lake (not proposed for removal by any option under consideration) has provided higher more constant summer flows, reducing wastewater treatment costs for downstream municipal and industrial dischargers.

The waterpower of the river has fueled the area's industrial economy, but there has also been an economic price to pay. This includes the external costs of industrial development borne by the public -- the cost of government programs to reduce pollution, public health costs, etc. – resulting from industrial discharges. Another cost is reduced water quality, with reduced opportunities for trout and salmon fishing, loss of recreation opportunities, and aesthetic impacts. These costs are somewhat offset by enhanced opportunities for flat water recreation and bass fishing.

All of these costs have economic impacts, as well as impacts on the quality of life enjoyed by residents and visitors. For example, a statewide study found that inland fishing supports over 5,000 jobs and has a total economic output of $292 million. Of course, only a small portion of this total results from fishing on the Presumpscot; however, it is likely that the loss of trout and salmon populations has resulted in a loss to the regional economy.

In comparison, in the year 2001 the pulp and paper industry employed 13,200 people in Maine and comprised about 4.5% ($1.45 billion) of Maine's Gross State Product (information from the Maine Pulp and Paper Association), of which only a small portion is attributable to the economy of the Presumpscot Basin.

Thus, the development of the Presumpscot River and its corridor has resulted in important benefits as well as losses to the local and regional economy and environment. While society has benefited from the use of its waters for industry, for power, and for the dilution of wastes, the cumulative impacts of human use have eliminated most of the natural values of the *"river of many rough places."* The challenge faced by this planning effort is to find solutions to problems which reduce cumulative impacts, improve the quality of life for residents and visitors, increase economic activity based on improvements in environmental quality, and support both new and traditional industries.

Fisheries Conditions, Issues and Opportunities

Why are Fisheries a Concern for the Presumpscot River?

Fisheries management is one of the central issues in planning for the Presumpscot River. For the first time in over a century, the future of the Presumpscot River includes new possibilities for fish restoration. Water pollution on the river has been greatly abated with the development of water treatment facilities and SAPPI's elimination of its pulp mill. Further, with the removal of the head-of-tide dam at Presumpscot Falls (the Smelt Hill Dam) in the Fall of 2002, 7 miles of the lower Presumpscot River has been restored to its original free-flowing condition. State and federal resource agencies, and river constituencies now see new potential for both existing resident and potential migratory fishes of the Presumpscot River.

What Fisheries Currently Exist in the Presumpscot River?

The existing fishery of the Presumpscot River includes:

1) An intensively managed stocked trout and salmon fishery located primarily in the Eel Weir Bypass, and secondarily in several other tailraces below the downstream dams and selected tributaries. The Eel Weir bypass (approximately 1.25 miles in length), the original river channel located immediately below Sebago Lake, is stocked annually by the Maine Department of Inland Fisheries and Wildlife with up to 2,500 brook trout.

2) Resident species, primarily bass, perch, and bullhead, found in the series of impoundments that characterize nearly 15 miles of the river below the Eel Weir Bypass (from the upper end of the North Gorham impoundment to the Cumberland Mills Dam); and

3) Migratory species, principally eels, found in all the impoundments, and alewives, found seasonally in the river below the Cumberland Mills Dam.

What Affects Fisheries Habitat in the River?

Development with Dams

Much of the river is impounded by low head dams. Presently, there are eight dams on the river, from its source at Sebago Lake to its outlet at Casco Bay. These include: Eel Weir Dam at the outlet of Sebago Lake, North Gorham Dam, Dundee Dam, Gambo Dam, Little Falls Dam, Mallison Falls Dam, Saccarappa Dam, and Cumberland Mills Dam. The dams have created a series of impoundments that have replaced the natural pools, riffles, runs, and falls originally present in the river. Until the removal of the Smelt Hill Dam in 2002, impoundments occupied approximately 22 of the 27 miles from head-of-tide to the present day outlet of Sebago Lake. Today, 15 of 27 miles remains impounded.

Ecology of an Impounded River

Dams have altered the ecology of the river. Narrow riverine impoundments are too slow moving to function like a natural river, and too fast moving to function as a lake or pond. As a result, planktonic communities, which are the typical food base of lakes, are unable

to develop, and the abundance and diversity of the benthic (bottom dwelling) organisms are diminished compared to a river, lake or pond. Hence, the river is not well suited either to riverine fishes (those that prefer cold, fast-flowing well oxygenated shallow waters, including trout and salmon), or lake dwelling fish (including bass, perch, pickerel, and bullheads). A 1997 baseline fisheries study concluded the bass and panfish habitat was marginal in the five impoundments studied: Dundee Dam, Gambo Dam, Little Falls Dam, Mallison Falls Dam, Saccarappa Dam.

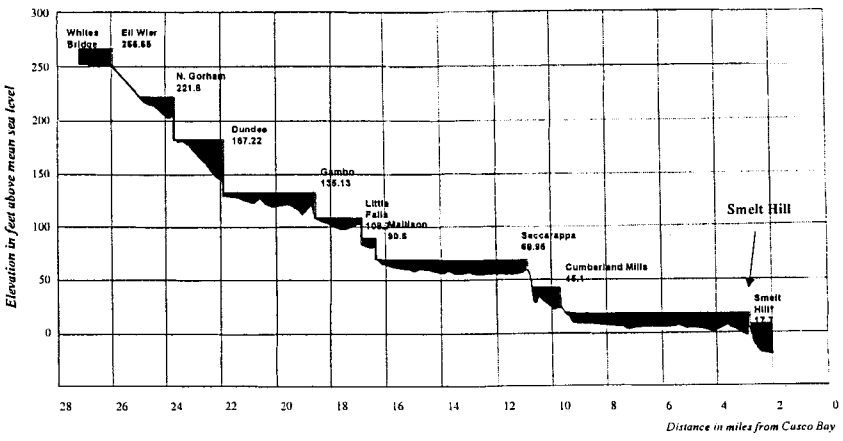
The result is relatively low numbers of fish in the river, composed primarily of species adapted to the impounded environments, i.e., smallmouth bass, pumpkinseed, and yellow perch; and a small seasonal population of stocked brook trout, landlocked salmon, and brown trout principally in the tailrace areas below the dams where conditions are more riverine.

Impediments to Fish Migrations

Dams on the Presumpscot River impede the movement of both resident and sea-run fishes.

- Dams block or impede sea-run fish from returning to fresh water (alewives, shad and salmon return to spawn, while immature eels migrate to fresh water to mature).
- Dams have isolated sections of the river, reducing the ability of resident and migratory fishes to locate spawning areas in the river and its tributaries, and coldwater refuges during hot weather.

PROFILE OF PRESUMPSCOT RIVER*



* Before removal of Smelt Hill

Sources: Federal Emergency Management Agency: Flood Insurance Study. Portland (1998), Falmouth (1984) Westbrook (1980), Gorham (1981), Windham (1981); and Portland Water District (survey of riverbed elevation at White's Bridge).

Prepared by: Natalia Kassatova, Graduate Intern, Casco Bay Estuary Project

Water Temperatures

Like many other small coastal rivers in southern Maine, during the summer the Presumpscot River water temperatures are limiting for native trout and salmon species outside of any coldwater refuges that may exist near springs. This is true of both the impounded and unimpounded reaches, including the Eel Weir Bypass. In the summer, native brook trout move to colder water near springs or in the tributaries where waters are naturally cooler due to shade and a higher groundwater component to the flows (base flows).

For this reason, restoring trout and salmon to the Presumpscot River may also require efforts to enhance tributary habitats through re-establishment of wooded riparian buffers and reduction of sedimentation and pollution discharges. Other species that can tolerate the higher summer temperatures in the river include the introduced brown trout, sunfish, bullheads, and bass.

What Do Historical Accounts Tell Us About the Past Fisheries on the Presumpscot River?

Early historical accounts attest to the abundance and importance of fisheries in the Presumpscot River. They also document a long history of controversies related to blockage of fish migration by dams on the river. The first dam was constructed at the head-of-tide Presumpscot Falls, in the 1730's. Others soon followed. The dams caused public protests and prompted Chief Polin of the Rockomeecook Tribe to walk to Boston to confer with Governor Shirley about restoring fish to the river. Failing to gain an adequate response, Chief Polin made a second trip to Boston and threatened to force the settlers out if the fish were not returned to the river. The first armed conflict between the Indians and the settlers along the Presumpscot River ensued, which was ended when Chief Polin was killed by the settlers in 1756.

On October 30, 1781 the selectmen of the towns of Gorham, and agents from the towns of Windham, Standish and Bridgton (which includes the Crooked River flowing into Sebago Lake), petitioned the Governor and

Legislature of the Commonwealth of Massachusetts to "*appoint a Committee that shall cause good and sufficient fish courses to be made through the several dams on the river*" to restore the fisheries to the river. They stated that the Presumpscot River "*in times past has been remarkable for being frequented by Shad, Bass, (and) Salmon. . .*" They argued that restoring these fish runs was necessary to support the early settlers of the Plantations adjoining the stream and would also benefit cod fishermen, "*For it is well known that the small fish running in shore for fresh water streams draw the Cod after them.*" This petition cites repeated previous petitions on this continuing problem (records of the Maine State Archives).

Charles Atkins, in his report "The River Fisheries of Maine" included in a report from the U.S. Commission of Fish and Fisheries to the 47th Congress in 1887, says of the Presumpscot River, "*It was frequented by salmon, shad, and alewives, but seems to have been best adapted to salmon. All fisheries were practically extinguished early in the present century (the 19th century) by a dam at the head of the tide.*"

"...in times past has been remarkable for being frequented by Shad, Bass, (and) Salmon..."

What Are the State Fisheries Agencies' Goals and Objectives for the Presumpscot River?

In a jointly written Draft Fishery Management Plan for the Presumpscot River Drainage (December 2001), the Maine Department of Marine Resources, Maine Department of Inland Fisheries & Wildlife, and the Maine Atlantic Salmon Commission, call for restoring sea-run fish to the river, including alewife, blueback herring, American shad, striped bass, Atlantic salmon, and possibly Atlantic sturgeon, rainbow smelt, sea-run brook, brown trout, and tomcod. The Plan also states objectives to improve the runs of American eels; stock trout to provide angling opportunities in areas which provide suitable habitat; and provide angling opportunities for other resident sportfish, including smallmouth bass, largemouth bass, chain pickerel, yellow perch, white perch, brown bullheads and black crappie.

What Can be Done to Improve Fisheries in the Presumpscot River?

With the recent removal of the Smelt Hill Dam, migratory fish have unimpeded access to the lower 7 miles of the Presumpscot River and its tributaries for the first time in over a century. However, migratory fish are still blocked from upriver spawning and nursery habitat (as far as the dam at Sebago Lake) by seven dams.

The goal of the Steering Committee preparing the Plan for the Presumpscot River has been to develop recommendations that work for all interests. The problem, and at the same time the opportunity, is finding a solution that allows the restoration of migratory fish to the river, while minimizing adverse effects to the SAPPI mill. Fish passage is costly (capital costs of several millions of dollars per dam), and removal of the dams, while generally less costly (on the order of one million dollars per dam), will reduce SAPPI's electrical generation capabilities. According to SAPPI, hydropower is the Westbrook Mill's lowest cost power source.

Review of Options

There are several possible courses of action to enhance or restore fish resources in the Presumpscot River. Options considered in developing this Plan ranged from simply enhancing the resident (bass and trout) fisheries; to restoring migratory fish runs as far as the dam at Sebago Lake through fish passage facilities and dam removals.

Option 1: Enhance the Resident Fish

Measures can be taken to enhance the numbers of or habitat for resident fish. Species of interest for fisheries enhancement include primarily trout, and bass and other pan fishes. Trout can be increased to support additional fishing through increased stocking in suitable areas, including the tailrace areas below Dundee Dam, Gambo Dam and Mallison Falls Dam. However, the degree of enhancement possible through stocking is limited by the small amount of habitat presently suitable for trout due to the changes in the river caused by dams.

Activities to enhance the bass and pan fisheries, on the other hand, are limited to enhancing the habitat, as in Maine there is no program to enhance bass fisheries by put and take stocking – and hatchery-raised fish are not even available in Maine. Habitat enhancement activities appropriate for the Presumpscot could include enhancing the cover provided for these species in impoundments by creating artificial reefs, and adding submerged woody debris or large rocky rubble to littoral areas on river bottom areas.

Option 2: Restore Migratory Fish Runs

One option initially considered for restoring migratory fish to the river, was the removal of the Smelt Hill Dam at the head-of-tide. This option became moot when the dam was removed in September 2002. The removal of the Smelt Hill Dam is expected to result in restored migratory fish runs in the lower river, as far as the Cumberland Mills Dam, and will allow alewives to migrate up the river and Mill Brook to Highland Lake, a historical spawning habitat for these fish. A small run to this spawning habitat has been maintained over the years through a variety of measures, including trap and truck operations.

Estimated Runs of Migratory Fish in the Lower River Following Removal of the Smelt Hill Dam[1]	
American shad	6,000 – 24,000
River herring	78,000
Alewives	150,000 – 200,000
Atlantic salmon	25 - 100

[1]Other migratory fish that are expected to utilize the river include American eels, striped bass, and possibly sea-run brook and brown trout, Atlantic sturgeon, rainbow smelt, and tomcod.

The challenge and opportunity remaining is restoring the Presumpscot River to its full potential for resident and migrating (sea-run) fisheries. The key issue for migratory fish runs is how the obstructions to passage at the remaining dams on the river, including the Cumberland Mills Dam, are to be overcome. The Cumberland Mills Dam is not covered by the Federal Power Act, and hence fish passage cannot be federally mandated at this dam as it can be for the other dams on the river. The Cumberland Mills Dam is, however, covered by a State Statute (12 MRSA§ 7701-A) that authorizes the Commissioner of the Maine Department of Inland Fisheries and Wildlife to require fishways to be erected by the owners of any dam within inland waters to restore anadromous (sea-run) fish resources.

Opportunities for further restoration of sea-run fish therefore hinge on the future of the Cumberland Mills Dam. The issue of fish passage at Cumberland Mills Dam could be resolved, through State action, or a cooperative agreement involving SAPPI and the various interests that desire the restoration of migratory fish runs above Cumberland Mills Dam.

Alternatives for Further Restoration

There are two basic methods for providing access to the upper reaches of the river: fish passage facilities; or dam removal. Because of the inefficiencies and avoidable mortality of some fish with fish passage facilities, the maximum number of fish passages that will achieve sustainable runs of fish is generally considered to be no more than three. Alternatives considered for this Plan, and the resulting estimated fish runs restored and effects to resident fish are described in the table below and the following text.

Estimated Runs of Migratory Fish[1]	**Option 2A. Fish passage at one to three dams (Cumberland, Saccarappa and Mallison Falls)**	**Option 2B. Removing 3 dams, up and downstream, fish passage at 1-3 others, downstream passage at N. Gorham**
American shad	7,000 – 56,000	16,000 – 136,000
River herring	97,000 – 187,000	206,000 – 450,000
Alewives	150,000 – 200,000	150,000 – 200,000
Atlantic salmon	25 - 450	100 – 1,000
Resident Fish		
Trout/salmon	No change	More habitat
Bass/panfish	No change	Less habitat
Capital Costs	+$1 – 8 million	+ $4 – 13 million

[1]Other migratory fish that are expected to utilize the river after the Smelt Hill Dam is removed include American eels, striped bass, and possibly sea-run brook and brown trout, Atlantic sturgeon, rainbow smelt, and tomcod.

Option 2A. Fish passage at one to three dams (Cumberland, Saccarappa and Mallison Falls). Passage at Cumberland Mills would open one mile of river to sea-run fish; passage at three dams would open an additional seven miles and would provide access to the Little River. Eel passage would also be provided at all dams up to and including Dundee Dam.

Option 2B. Removing three dams, providing up and down stream fish passage at one to three others, and providing downstream fish passage at North Gorham. Saccarappa, Mallison and Little Falls Dams would be removed, and passage would be provided at Cumberland Mills, and possibly Gambo, and Dundee Dams. Under this option, sea-run fish would gain access to 9 to 14 miles more of the Presumpscot River and the Little River and Pleasant River. Nearly eight miles of free flowing river would be restored, enhancing habitat for native trout and salmon. **This option was selected by the Steering Committee as the Preferred Option.**

Passage, not removal, is proposed for the Cumberland Mills Dam in this option for two reasons: (1) this dam is subject only to the authority of the Maine Department of Inland Fisheries and Wildlife to order fish passage facilities; options for a regulatory solution are thus limited to provision of passage, not removal, at this dam; and (2) dam removal would require agreement by SAPPI; however, the Cumberland Mills pond is used by SAPPI for process water and fire control; this Plan did not include a detailed study of how this could be accomplished together with a full or partial dam removal, as SAPPI expressed no interest in such a solution.

A concern raised about this option was how dam removal would affect the flood storage capacity of the river, and the extent of areas in the river floodplain. Currently, the US Geological Survey is redefining the flood hazard areas for the Federal Emergency Management Agency for the Saccarappa impoundment and downstream communities. However, based on a study conducted for the Federal Energy Regulatory Commission on the effects of removal of the Little Falls, Mallison Falls, and Saccarappa dams (conducted in 2001 using existing flood maps), there appears to be a benefit from the removal of the dams, as the river elevation would drop, as would the flood elevations. The Saccarappa impoundment and the elevation of the 100-year flood are both projected to drop by 10 feet. According to the report, removal of the dams "would allow the river to generally stay within the channel under the 100-year flooding scenario, resulting in a decrease in floodway width in the lower Saccarappa reach by 500 feet on the eastern shore and 100 feet on the western shore."

Benefits of Option 2B include:

- Restores eight miles of natural riverine habitat including falls, rapids, riffles, pools, cobble bottom, and the sights, sounds and smells of a flowing river.
- Allows passage for 100% of migratory fish compared to smaller percentages enabled by fish passage devices whose results vary by species and type of device.
- Ends the continuous, unnatural erosion of property along impoundments, which is caused by the flooding of land by the dams.
- Restores previous flooded property to property owners and town tax rolls.
- Eliminates sedimentation caused by the dams and reduces creation of additional suspended particulates brought into the river by ongoing erosion caused by high water behind dams.
- Improves dissolved oxygen levels in the three formerly impounded reaches (these three impoundments are currently "non-attainment" areas – areas not meeting water quality standards due to depressed oxygen levels.
- Reduces the impact of flood events and reduces the size of flood zones above existing dams which are removed, resulting in less property damage and lower insurance rates for property owners. Restores natural bed load movement.

Challenges for Option 2B:

- Cumberland Mills Dam, with fish passage, serves as a limiting factor for allowing sea-run fish access to the free-flowing reach. (Perhaps the answer here is to invest in the best fish passage devices to deliver the most to waters above, including investigation of alteration to the dam to allow a "natural" passage – that is, an altered river bed as opposed to a fish lift or fish ladder.)

How this option will be implemented is harder to envision than why it should be done.

Protecting and Enhancing Open Space Along the Presumpscot River

Why is There Concern for Protecting Open Space Along the Presumpscot River?

The Presumpscot River is located only minutes from Maine's largest urban area, Portland, and is undergoing significant changes that augur well for recovery from what was once a highly polluted river nearly unsuitable for fish, to a river with restored water quality and fisheries. The cleanup of the river and removal of the dam at the head-of-tide have started the process of ecological recovery, and communities along the river are now seeing new potential in the river.

The good news is that a surprising amount of the Presumpscot shoreline (83.9%) remains undeveloped. However, while the pace of development since the 1950's has been very modest, the pressures for development along the Presumpscot are stronger now than they have been in the past as a result of new interest in the river, and the lack of permanent protections for open space along the river. Having an undeveloped river corridor along a river that offers significant public benefits and amenities, located so close to Portland, is an opportunity that should be seized before it is too late.

What Are the Public Values of Open Space Along the Presumpscot River?

Open space along the Presumpscot River:

- is important for fish and wildlife habitat;
- provides a unique habitat for many plants not found elsewhere;
- offers space needed to accommodate and absorb floodwaters;
- is a buffer that helps maintain the water quality of the river;
- provides viable opportunities for agriculture in the areas that are "prime" soils for crops; and
- provides opportunities for outdoor recreation, and appreciation of our history.

Wildlife and Fish Habitat Values

Well-vegetated open space corridors along river or streams (riparian lands) have special value as wildlife habitat for several reasons:

A unique edge habitat: These lands form the edge between two important habitat types (terrestrial and aquatic) which are used by animals that depend on both habitats for food, shelter, or reproduction.

Importance to aquatic habitats: These riparian lands help maintain the habitat values of the river and estuary through filtration of pollutants and sediment in runoff; transport nutrients and other materials needed to sustain aquatic life; provide shade which controls fluctuations in temperatures in the river; and stabilize streambanks against the erosive force of high flows.

Importance to birds: Riparian lands are home to unique riverine shrub-scrub wetlands, which are an important habitat for many bird species and other animals.

Deer yards: Low-lying riparian lands are often the most fertile and well-watered lands in landscape, and support important habitats such as deer yards.

Wildlife travel corridors: Riparian lands are often the most continuous wildlife travel corridors available within a region, linking otherwise disjunct upland habitats and compensating, to some degree, for the loss of large continuous habitat blocks in a developing landscape.

Overall importance to wildlife and plants: ***80% of Maine's terrestrial vertebrate wildlife species use riparian areas to meet their habitat needs at some point in their life cycle.*** Further, a Maine Audubon report states that "Over half of all owl, salamander, frog and toad species that breed in Maine are listed as of special concern, threatened or endangered in other northeastern states" (species that depend heavily on riparian areas). Thus, Maine has a chance to protect important habitat types other areas have already lost.

The combination of these values has led a coalition of planning and conservation organizations to conclude that protecting riparian habitat should be the "*backbone*" of local and regional planning efforts, as "conservation of wetlands and surrounding riparian habitat is essential to ensuring that the full compliment of Maine's plants and animals persist on the landscape" (Maine Audubon Society, Maine Department of Conservation, Maine Department of Inland Fisheries and Wildlife, Maine State Planning Office, U.S. Fish & Wildlife Service, Wells National Estuarine Research Reserve, Maine Coastal Program, U.S. Geological Survey, Southern Maine Regional Planning Commission, and The Nature Conservancy).

Plant Habitat Values

Riparian open space areas have special values for plants and plant communities.

Rich alluvial/ floodplain soil habitats: Community types such as silver maple forest require riparian sites with high water tables and relatively rich soils for successful development. Species such as black willow occur commonly only in riparian locations. Other common plant species that require rich alluvial (floodplain) settings, *e.g.*, species such as the ostrich fern or fiddleheads, are largely limited to floodplain sites.

Importance to Rare Plant Species: Many plants that thrive in the rich alluvial flats in riverine riparian zones are rare now, in part because many of these areas nationwide have been converted to agricultural use or developed for other purposes. Two plant species identified by the State as threatened or endangered have been observed in areas along the Presumpscot above Dundee Dam: Isotria medeoloides (small whorled pogonia) and Lindera benzoin (spicebush). Spicebush, so named because of the spicy aroma it gives off, is often found in moist, shady sites along floodplain forests. The small whorled pogonia has been labeled the rarest orchid east of the Mississippi River and north of Florida.

Riverine Wetland Habitats: Certain types of shrub-scrub wetlands are specific to riverine areas, and occur along the aquatic edge of the riparian zone or on islands within the river. They include a variety of plant species, including shrubs such as willows, as well as grasses and sedges, and provide special values for a variety of wildlife species.

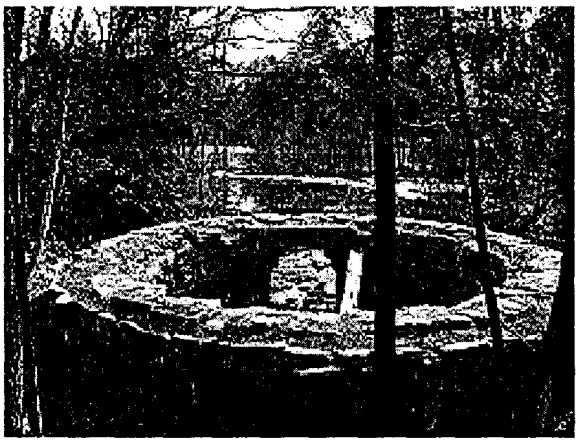
Flood Protection

Maintaining open space is important for floodwater storage and mitigating flood damage in downstream areas. Open space along rivers provides an area for floodwaters to spread out, reduce their velocity, and recharge groundwater stores. Having such storage available can reduce downstream flood flows and velocities thereby preventing increased flood damage downstream.

Historical and Archaeological Resources

Rivers provide food, water, transportation, and power, and naturally attract human habitation and development. As a result, river corridors are often enriched with traces of the past, and the Presumpscot is no exception. Along the river corridor, there is a patchwork of relics from early prehistory to the recent past. Preserving and celebrating historic resources can provide important opportunities for education, add interest to the physical landscape, and help to define an area's sense of place.

The Presumpscot has a particularly rich prehistory and history as it was used heavily by Native Americans, developed as a water transportation corridor with creation of the Cumberland and Oxford Canal, and was the site of many early industrial countries, *e.g.*, the Oriental Powder Mill which supplied much of the gunpowder for the Union Army during the Civil War.



Farming and Open Space

Agriculture has been an important contributor to open space along the Presumpscot River. Native Americans were reported to grow corn in the area around Saccarappa Falls where they could "fish" the corn (using fish as fertilizer). The rich alluvial soils that support a diverse plant community are also prime farmland soils. Once the dominant use of the landscape starting in Colonial times, agriculture or maintained fields now comprise less than 10% of the lands in the Presumpscot River corridor. The Presumpscot was an important area for agricultural experimentation and the development of modern agriculture methods during the Colonial and Early American period.

Recreation

Open space along the Presumpscot River is important for the following activities:

- Boating, canoeing
- Swimming
- Fishing and hunting
- Snowshoeing
- Wildlife observation
- Cross-Country Skiing
- Historical study
- Education
- Snowmobiling
- Bicycling
- Walking
- Kayaking

The open space recreation activities afforded by the Presumpscot River are important because of the undeveloped nature of the river corridor, the diversity of opportunities available, and its proximity to Portland. The river fishing opportunities on the Eel Weir Bypass section of the Presumpscot River, which provides year-round opportunities for trout fishing, are particularly noteworthy.

What is the Current Status of Open Space Along the Presumpscot River?

An Undeveloped Corridor

Today, 84% of the area immediately along the Presumpscot River (within 250 feet) is undeveloped; only 16% is developed. Above Westbrook, about 14% of the land adjacent to the river is developed, and below Westbrook to the site of the former Smelt Hill Dam, about 21% of the river corridor is developed. The table below shows the percentage of river frontage that was undeveloped in the 1950's and 1970's, by town.

City/ Town	Total Frontage (miles)	Percent Undeveloped 1950's	Percent Undeveloped 2000
Gorham	14.4	**91.8**	**88.8**
Windham	13.6	**93.9**	**85.2**
Westbrook	9.75	**75.0**	**62.5**
Portland	3.80	**100**	**96.5**
Falmouth	5.30	**97.8**	**97.5**
TOTAL	46.85	**90.1**	**83.9**

How Does Current Development Pressure Compare to Past Pressures?

Past Trends in Development Along the River

The pace of development since 1950 has been modest. Prior to 1950 about 4.6 miles of the river frontage was developed. Since the mid 1950's, another roughly 3 miles has been developed, with half of that development above Westbrook and half below. Only about a half-mile of this 3 miles of development occurred after the mid 1970's.

This relatively slow development pace along the river can be linked largely to the past uses of the river. Industrial development made many areas immediately adjacent to the river less attractive for residential and recreational development than they would have been if the water were cleaner. In addition, in the past, strong odors from the Westbrook pulp plant impacted the desirability of shoreland property as a place to live. With the elimination of the pulping process at the SAPPI mill, both water and air quality have been improved. These changes are expected to increase development pressure along the river.

New Development Pressure Prompts a Major Protection Effort in Portland

As evidence of the current desirability of Presumpscot River frontage, in the Fall of 2001, the City of Portland narrowly prevented development of one of Portland's largest tracts of remaining open space along the river. A developer proposed building a 67-home, riverfront subdivision in North Deering, the City's fastest growing neighborhood. The Portland Landbank Commission, Portland Trails, and the Land for Maine's Future Program worked collaboratively to negotiate a deal to make the purchase of the riverfront affordable for the City. As a result of the agreement, the City now owns 48 acres of land along the river's edge to a depth of 500 feet and the developer was able to construct 30 new homes.

The acquisition of these properties, known as the **Presumpscot River Preserve**, combined with the property of the Falmouth Conservation Trust and the acquisition of several other private parcels by Portland Trails, has since resulted in the protection of more than 80% of the riverfront between the Maine Turnpike and the Allen Avenue Bridge.

What Public Recreation Lands and Access Areas Exist Along the Presumpscot River?

Public Recreation Lands

The table below shows current public recreation lands and water access points along the Presumpscot River.

City/ Town	# Water Access Sites	Public Recreation Lands Acres/Sites	% of Acres in 250-ft Corridor in Public Recreation Lands
Gorham	6	60/ 6	1.1%
Windham	3	132/ 4	4.7%
Westbrook	0	90/ 8	3.0%
Portland	1	333/ 4	5.2%
Falmouth	1	60/ 7	1.4%
TOTAL	11	675/ 29	15.5%

Public Water Access Points

Access for carry-in boat access, swimming or fishing include:

1. Route 35 Bridge in Windham over the old river bed - access for fly fishing.
2. North Gorham Park in Gorham - a public swimming and carry-in boat launch on North Gorham Road for access to North Gorham Pond.
3. Windham Center Road carry-in boat launch - access to the river and Dundee Pond.
4. Dundee Park in Windham on Dundee pond - swimming, picnicking and carry-in launching.
5. Dundee Dam canoe portage in Gorham - an access gate on the road to the powerhouse and dam, limits use of this access other than for canoe portage.
6. Oriental Powder Mill/Cumberland Oxford Canal historic sites in Gorham - trails and informal canoe portage around Gambo Dam. Access via an abandoned road off Route 237.

7. Hawkes/Tow Path Property in Gorham - access off Tow Path Road in Little Falls village. Access to the river with carry-in boat launching and trails.
8. Mallison Falls canoe portage and fishing access site in Gorham and Windham - two canoe portage trails at Mallison Falls Dam, one on each side of the river. On the west side near the powerhouse, the put-in site is also used for fishing access.
9. Little River Carry-in Boat Access in Gorham - located off Rt. 237; provides access to the Little River and the Presumpscot near their confluence. Trails and a carry-in boat launch.
10. Riverton Trolley Park - owned by the City of Portland. Trails and access to the river through an informal carry-in boat launch.
11. Town of Falmouth - there is a small park after the Allen Avenue Extension Bridge across the river in Falmouth. Parking is available, but no easy access to the river due to steep banks.

Additional water access, not listed above, is being developed at the Presumpscot Falls properties recently acquired by Portland Trails and the Town of Falmouth.

Trails Along the Presumpscot River

Trails presently include the towpath of the Cumberland and Oxford Canal in Gorham, and the urban riverfront walk in Westbrook. Westbrook plans to extend its trail system, and Portland and Falmouth are developing a trail system with their recent acquisitions along the Presumpscot River.

The State of Maine owns a portion of the 50-mile Mountain Division Rail Line from Route 202 in Windham to the Maine/New Hampshire border in Fryeburg and has plans to convert this corridor into a "rail-with-trail" project. The State eventually hopes to purchase the remainder of the rail line from South Windham to Portland to create a continuous multi-use path from Portland to the White Mountains. The entire length of the rail line from Gambo Road to Westbrook runs directly adjacent to Presumpscot River (on the east side) and would provide a great recreational opportunity along the river.

What Protections Exist for Open Space Along the Presumpscot River?

Regulation and Zoning

Zoning ordinances are tools used to regulate both land use as well as the characteristics of the permitted uses. Town-wide zoning, Shoreland Zoning, and Floodplain Management Zoning are the three most prevalent types of zoning in the State.

Shoreland Zoning: The shoreland zone along the Presumpscot River consists of areas within 250 feet of the normal high-water line of the river. Development is prohibited in areas zoned as resource protection districts; however, these districts often include less than 100 feet of the 250-foot shoreland zone, and development can occur beyond the 100 feet.

Open space/recreation districts: The City of Portland zones public recreation lands to exclude future development not related to recreation and open space. This district is established along the Presumpscot River from Route 302 (the bridge at Riverton) to the city line at the I-95 bridge, and includes two city-owned parks, the Riverton Trolley Park and the municipal golf course. These two parcels include about 1.8 miles of river frontage.

Floodplain Zoning: Federal law requires that local governments establish flood plain protection ordinances in order for the residents of those communities to qualify for federal flood insurance. Flood plain protection ordinances provide that first floor elevations must be above the 100-year frequency flood and that flood flows not be restricted by development in velocity areas. This affords some protection, but development is only prohibited in the "velocity" zone.

Protection by Ownership or Easements

A number of areas along the Presumpscot River are protected to some degree as open space through public ownership or conservation easements. The degree of protection varies, depending on the nature of the ownership and presence of any legal restrictions.

Limited Protection Lands: These lands include areas in public or quasi-public ownership that do not have easements or deed restrictions that protect the land from future development. Lands that are in public ownership may or may not stay as open space in the future, unless there is a conservation easement protecting the property from future development. Even public lands that are currently dedicated to open space or recreation and zoned for open space are vulnerable to future changes in municipal objectives; for example, a golf course could be converted, in the future, to a riverside office park or residential development to meet municipal economic development objectives if the political and economic conditions support such a change.

Permanent Protection Lands: Only lands that have legal restrictions for future development applied through permanent conservation easements, or ownership by a land trust or land conservation organization, are considered to be truly protected open space, shown as Permanent Protection in the table below.

City/Town	% of Acres in 250-ft Corridor in	
	Permanent Protection	Limited Protection
Falmouth	0.7	2.4
Portland	1.1	4.1
Westbrook	0.0	3.5
Windham	0.0	6.4
Gorham	1.0	<0.1
Standish	0.0	0.0
Total Corridor	2.8	16.4

What Lands Should Be Protected as Open Space Along the Presumpscot?

Defining Priorities for Protection

Deciding which of the many potential areas that are in need of protection should be a priority for protection necessarily depends on the objectives of the protection effort. There are many values worthy of consideration in open space protection, including fish and wildlife values, scenic and recreational values, ecological and scientific values including protection of rare plants and plant communities, the value of prime agricultural soils, and historic or archaeological values. ***This Plan identified priority areas for open space protection based on high value natural resources*** using available natural resources information. Because of the limitations of the available information (much compiled from air photos, not fieldwork), a more detailed analysis and systematic ranking of each of these and other values based on additional surveys and field data would be useful to sharpen the focus and to identify priorities for protection of high value natural resources.

This Plan does not address priorities for acquisition or management of public lands for recreation. The Steering Committee chose not to address recreation priorities in part because the FERC licensing of the SAPPI hydropower projects would include requirements for public recreation at the projects; and because the scope of effort needed to assess recreation facility needs and resource suitability for recreational use was beyond the resources available for this Plan.

Any future acquisitions of lands along the Presumpscot River should integrate the results of this high value natural resources analysis, and any further refinement thereto, with an analysis of recreational needs and opportunities, and areas suitable for recreational use. The Steering Committee received a number of comments expressing concern that recreational use of protected lands and the river be kept in balance with, and not damage, its outstanding natural resource values. This Plan should be viewed as a starting point towards that goal.

Priorities for Protecting High Value Natural Resources

While a comprehensive and detailed analysis was beyond the scope of this study, it was possible to identify, with available information, areas that should be considered a priority for protection due to high value natural resources and lack of current protections. Using natural resources information from state and federal resource agencies, and land use protection information gathered as part of this project, a preliminary analysis was conducted by the U.S. Environmental Protection Agency, Region 1, utilizing their Geographical Information System (GIS) capabilities. The results, which show high value resource areas that have no current protection, are shown on the attached map (Map 7 from the Open Space White Paper).

Examining the areas identified through this analysis, a number of general areas can be identified as having a cluster of priority high value natural resources. These include:

1. The backland behind the Resource Protection District along the shoreline of Dundee Pond on the east (Windham) side, from south of Dundee Park to roughly 500 feet north of Dundee Dam.
2. The Windham side of Dundee Falls below the Dundee Dam (about a one-half mile stretch of the river with rapids and a series of islands).
3. An area below the Mallison Falls Power Station access point in Gorham, roughly 500 feet in length, extending back beyond the 250-foot corridor area.
4. The area at the confluence of the Little River and Presumpscot River in Gorham.
5. The area in Gorham from just north of the power line near Mosher Brook to the Westbrook town line.
6. In Westbrook, from just below the railroad near the Windham/Gorham town lines, to the Golf Course, about three quarters of a mile downriver.

Securing Permanent Protection on Limited Protection Lands

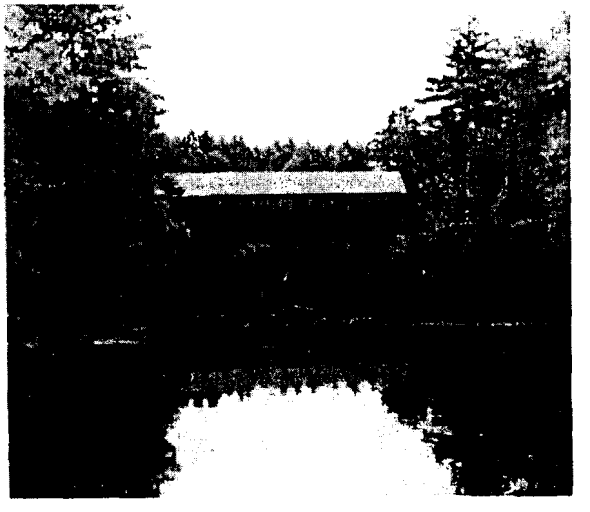
In addition to defining priority high value natural resource protection areas, there is an opportunity to enhance the level of protection that exists on a number of parcels along the river held in public ownership but lacking any deed restrictions to ensure their status as open space lands in perpetuity. For a minimal cost, a restriction could be placed on the deeds for these lands to accomplish permanent protection.

For further information, see the white paper "Protecting and Enhancing Open Space Along the Presumpscot River" and accompanying maps listed below, which are posted on the Casco Bay Estuary website: http://www.cascobay.usm.maine.edu.

Open Space Maps

(available at the above website)

Map 1:	Developed and Undeveloped Areas Along the Presumpscot River Corridor
Map 2:	Open Space with High Natural Resource Values
Map 3:	Public Recreation Lands and Public Access Points Along the Presumpscot River Corridor
Map 4:	Resource Protection Zones Along the Presumpscot River
Map 5:	Open Space Protected by Ownership or Easement
Map 6:	Open Space Vulnerable to Development
Map 7:	Priorities for Open Space Protection Based on Natural Resource Values



A Vision for the Future: Findings and Recommendations

Findings

The future of the Presumpscot River is full of possibility:

Fisheries: Events of the recent past position the river for an unprecedented recovery. Water pollution on the river has been greatly abated with the development of water treatment facilities and SAPPI's elimination of its pulp mill. The removal of the Smelt Hill Dam, at head-of-tide has provided migratory fish species unimpeded access to the lower seven miles of Presumpscot River for the first time in over a century. Migratory fish, either remnant populations from the Presumpscot or strays from other river systems, can now recolonize the lower river. With full recolonization, the river as far as Cumberland Mills Dam in Westbrook (including access to habitat in the Piscataqua River and Mill Brook) could support runs of approximately 13,000 shad, 78,000 blueback herring, 20 to 100 Atlantic salmon, and 150,000 to 200,000 alewives. State and federal agencies have changed how they view the future of the river, and are now calling for restoration of migratory fishes to more of the river, above the Cumberland Mills Dam in Westbrook.

Open Space: Because most of the area along the Presumpscot River remains undeveloped, there are extensive opportunities to protect the area's open space values, to improve public access, to provide trails either to or along the river and to provide a variety of other recreation facilities and opportunities. The time to seize this opportunity may be limited, however, as development pressures are increasing. In the past, development along the river below Westbrook has been slowed by the negative environmental side effects of the pulp mill in Westbrook and the availability of more attractive waterfront property in the region. Today, the mill's pulp operations have been eliminated, and so too have its attendant by-products of water pollution, and offensive downwind odors. Partly as a result of this change, the potential for development along the Presumpscot River has never been higher.

Cumulative Impacts: The Presumpscot has a rich history. The power and water supply provided by the Presumpscot were fundamentally important to the early development of the area, and the rise of an industrial economy along the river. The Presumpscot River was the site of Maine's first pulp mill, first hydroelectric project, only significant canal, and largest gunpowder mill. The river and its management continue to impact the region's economy; dams on the river are still a low cost producer of electricity and contribute economically to the SAPPI paper mill in Westbrook, which uses the power. Development of dams on the river had its costs however. A case in point is that migratory fishes were eliminated from the river – the Presumpscot was the site of one of the first serious disputes over water rights in Maine (fish versus dams). The dams also eliminated trout and salmon habitat and opportunities to fish for these species. Later, industrialization of the river reduced water quality and degraded the aesthetics of the river, reducing its attractiveness for boating, swimming, and other forms of recreation. All of these impacts have had economic impacts, as well as impacts on the quality of life enjoyed by residents and visitors.

The challenge, and at the same time the opportunity before the Steering Committee, is to find solutions to problems which reduce cumulative impacts, improve the quality of life for residents and visitors, and contribute to a vibrant local economy that supports new and traditional industries.

A Vision for the Presumpscot River

The Presumpscot River, including its tributaries and shorelands, is managed to realize the greatest good for all its communities, both human and ecological, through a careful balancing of all potential uses. The river supports the production of renewable energy, and the full range of natural and economic benefits and uses that are dependent upon a restored and ecologically healthy river, including the benefits to resident and migratory fish and wildlife, and the use and enjoyment of the river for open space and recreation.

In pursuing this vision, the participants in this planning effort recognize two important and inescapable conclusions:

1) balancing and optimizing among potentially competing uses, values and interests is complex and requires considered judgments on how to integrate uses to achieve the greatest overall benefits;
2) the optimum mix of uses and management of the river will change over time as our knowledge and society's needs change.

Thus, the planning effort should not be viewed as "finished" at any point in time. Rather, to be effective, it will require a periodic reexamination of the issues involved in management of the river. In fact, this shift in our understanding of appropriate management, and the changing needs of our society over the last two centuries is what has prompted renewed interest in the Presumpscot, and a reexamination of its management.

Recommended Management Objectives

- Restoring, preserving, or enhancing riverine (free-flowing) habitat from Gambo Dam to Casco Bay.
- Restoring self-sustaining populations of native resident fish, and sea-run fisheries.
- Providing access to the entire river (as far as the dam at Sebago lake) for sea-run migratory fish, consistent with the management recommendations stated in the Draft "Fishery Management Plan for the Presumpscot River" prepared by the Maine Department of Marine Resources, Maine Inland Fisheries and Wildlife Department, and Maine Atlantic Salmon Commission (December 2001).
- Encourage operation of hydroelectric projects at Gambo, Dundee, Great Falls, and Eel Weir for maximum production of electricity and minimum impact on local ecosystems.
- Assuring the Presumpscot's waters are clean and are ranked at their highest practicable classification and are attaining these standards.
- Striving to reduce or eliminate existing point-source and nonpoint source discharges into the Presumpscot River and its tributaries.
- Minimizing the impact of nonpoint source pollution on the river.
- Protecting meaningful areas of open space along the Presumpscot River and its tributaries to preserve or improve wildlife habitat and provide healthy riparian buffers.
- Providing for additional public access and low-impact recreation along the river and its tributaries while preserving some lands for wildlife only.
- Promoting the economic, community and ecological benefits of a healthy river system.

Recommended Actions

The following is a summary of recommended actions developed by the Steering Committee with input received at public meetings. Appendix A includes a more complete listing and detailed treatment of the Plan's Recommendations, describing the need, cost, and implementation strategy for each recommendation. Appendix B is a record of comments received on the Draft Plan, and the Steering Committee's response to those comments.

These recommended actions are ranked in relative importance (High, Moderate, Low), reflecting the priorities of the Steering Committee, informed by rankings by participants at the May 7, 2003 public meeting. Attendees registered their priorities on a master list of recommended actions. The Steering Committee found that the participants in this exercise substantially confirmed their own sense of priorities. The results are presented below.

Establish a Presumpscot River Council

Establish a Presumpscot River Council to provide the framework and the resources needed to effectively implement the plan. The Council would provide an organized effort to secure funding and to coordinate resources needed to carry out the recommendations in this Plan. It would also serve to provide an ongoing mechanism and capability for addressing issues arising in the future that may affect the River. The Casco Bay Estuary Project should convene a task force, including members of the Presumpscot River Management Plan Steering Committee, to consider options for how the Council might be structured and organized, and to take whatever steps are needed to establish the Council.

(Top Priority – High Importance)

Restore Fisheries

Support efforts to achieve restoration of fish passage to the river above Cumberland Mills Dam. The preferred option is through removal of three small dams below Gambo Dam, and installation of up to three fish passage facilities as needed to accomplish full access when sea-run fish migrations reach population levels determined to warrant additional passage ***(High*** -- supported by 91% of the participants at the May 2003 public meeting).

Protect Open Space

- Conserve open space parcels with a focus on high value areas ***(High).***
- Educate landowners and other watershed residents about the benefits of conserving and enhancing riparian lands along the Presumpscot River and its tributaries ***(High)***.
- Encourage permanent dedication to open space for areas which are already publicly owned but not so dedicated ***(Moderate).***
- Encourage expansion of local Resource Protection Districts to include the entire floodplain as it is being remapped by the U.S. Geological Survey ***(Moderate)***.

Enhance Recreation

- Develop a water trail the length of the river ***(High)***.
- Create new access points to the river where needed and appropriate ***(High)***.
- Develop a land trail along the river as feasible ***(Moderate)***.
- Renovate portions of the Cumberland and Oxford Canal as historic/ recreational resources ***(Low)***.
- Assist with improvements to Riverton Trolley Park ***(Low)***.

Protect and Improve Water Quality

- Support comprehensive stormwater management efforts ***(High)***.
- Reclassify the river to Class B from Saccarappa Falls to tidewater ***(Moderate/High)***.
- Extend Casco Bay Estuary Project's Toxic Monitoring Program to include more sites at the mouth of the Presumpscot River ***(Moderate)***.
- Identify potential inadequate treatment of point sources of pollution where they exist ***(Moderate)***.

Casco Bay Estuary Project

Reflecting the Views of

Presumpscot River Management Plan Steering Committee

With Funding and Assistance Provided by

Casco Bay Estuary Project

And

U.S. Environmental Protection Agency, Region 1

Facilitation, Analysis and Technical Assistance Provided by

Land & Water Associates Hallowell, Maine

EPA New England

Control Nonpoint Source Pollution

- Support the CCSWCD's Erosion Control Training for Communities *(High)*.
- Implement nonpoint education for municipal officials ***(High)***.
- Identify and remediate nonpoint sources of pollution ***(Moderate/High)***.
- Support erosion control technical assistance for landowners ***(Moderate)***.

Improve River Corridor Habitat Improvement

- Protect and enhance the riparian corridor by re-establishing forested buffers and siting development appropriately ***(High)***.
- Protect significant wetlands through purchasing, restoration efforts, and protective buffer projects ***(Moderate)***.
- Continue efforts of the U.S. Fish and Wildlife Service's Gulf of Maine Program and the State of Maine to provide information to communities in the Presumpscot River Watershed and work with the communities and land trusts to develop protected wildlife corridors ***(Moderate)***.
- Encourage local citizens to perform stream habitat walks within the tributaries of the Presumpscot River ***(Moderate)***.

Support Stewardship/Public Education

- Support natural resources education for schools ***(High)***.
- Educate property owners of negative effects of pesticides ***(High)***.
- Inform public of Fish Advisories ***(Moderate)***.

Ensure Adequate Flood Protection

- Develop a flood mitigation program for the Presumpscot River Watershed ***(Low/Moderate)***.

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DEPOSITION OF AIR POLLUTANTS TO CASCO BAY

FINAL REPORT
STI-902150-2209-FR2

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July 3, 2003

EXECUTIVE SUMMARY

ES-1. INTRODUCTION

In 1990, Casco Bay was designated an "estuary of national significance" and included in the U.S. Environmental Protection Agency's (EPA) National Estuary Program. In response to this designation, the Casco Bay Estuary Project was formed to develop a plan for managing the Casco Bay watershed. Atmospheric deposition is a natural process by which pollutants are transferred from air to soil, surface water, sediment, and groundwater and potentially to living organisms. Wet and dry deposition processes (e.g., rain out, wash out, impaction, adsorption, and absorption) remove particulate and gaseous pollutants from the atmosphere and deposit them on the surface of water bodies, vegetation, buildings and structures, and soil. Transfer of these pollutants from water bodies to sediment occurs through adsorption and sedimentation. Polluted water and sediment lead to undesirable health and environmental impacts, such as mercury-contaminated fish, harmful algal blooms, beach closures, etc.

The current role of atmospheric deposition, as it relates to nitrogen, mercury, and fine particulate matter ($PM_{2.5}$) pollution in Casco Bay, needed to be better understood and quantified. In response to this need, four types of instruments were deployed at the Casco Bay (Freeport) site to collect samples to investigate the concentrations and deposition of these pollutants: (1) Mercury Deposition Network (MDN) and (2) National Trends Network (NTN) samplers collected weekly samples of wet deposition (total precipitation and pollutant concentrations in the precipitation) of mercury and of inorganic nitrogen from nitrate and ammonium, respectively. Three other sites in Maine also collected mercury and inorganic nitrogen wet deposition data, including the Bridgton site which is located in the Casco Bay headwaters. (3) $PM_{2.5}$ IMPROVE-protocol samplers collected data useful in assessing pollutant sources. These data were compared to those collected at the Acadia IMPROVE site. (4) A prototype sampler also collected polycyclic aromatic hydrocarbons (PAHs); results from these measurements are summarized by Golomb et al. (2001).

Sonoma Technology, Inc. (STI) was contracted by the University of Southern Maine to validate and analyze the data collected at the Casco Bay monitoring site from 1998 through 2001. Analyses included comparing the data from this special study monitoring site to data collected from the National Atmospheric Deposition Program (NADP) samplers at other locations in Maine. The data analysis objectives for this project were to determine

- if atmospheric deposition (both wet and dry) provides significant sources of nitrogen and mercury pollution in Casco Bay;
- how coastal Maine fits into the larger regional pattern of atmospheric deposition; and
- the relative potential contribution of atmospheric deposition to the total pollution measured in the sediments.

The data analyses were also used to determine

- the need to continue measurements of inorganic nitrogen, mercury, and $PM_{2.5}$ data collection at Casco Bay; and

- the significance of short-term (1998-2000) seasonal and annual wet deposition patterns in inorganic nitrogen and mercury within Maine.

In this study, wet deposition is determined by multiplying the weekly amount of precipitation collected at a site by the corresponding weekly average wet concentrations of specific pollutants: ammonium, nitrate, and mercury. Annual deposition was calculated by summing the calculated weekly wet deposition amounts for that year. Dry deposition is not measured in the NADP. Dry deposition is inferred from pollutant concentrations in the ambient air or a ratio of dry deposition to wet deposition is assumed. For this report, 229 square miles was used for the surface area of Casco Bay and 985 square miles for the entire watershed surface area.

Estimating wet and dry deposition to the Casco Bay watershed, based on the measurements available, can be highly uncertain. Contributing to the uncertainty in wet and dry deposition estimates are a number of issues, including the following:

- The loss of volatile species from various sampling media during and after sampling, but before laboratory analysis.
- Uncertainty in the estimate of the surface area of the Casco Bay watershed.
- Uncertainty in the fraction of the material deposited in the Casco Bay watershed that reaches the Bay.
- Variations in the type of precipitation that produces deposition, and thus in the amount of material deposited at the surface.
- Year-to-year meteorological variability, which contributes to variability in annual deposition.

ES-2. KEY FINDINGS

- Atmospheric deposition (estimated dry and wet deposition) of inorganic nitrogen is a significant source of pollution to Casco Bay (see **Figure ES-1**).
  - Wet deposition to the Bay[1] surface area accounts for 200 to 246 tonnes/yr. Dry deposition is estimated to be 146 to 182 tonnes/yr. Total (dry + wet) deposition is 30 to 40% of overall total annual inorganic nitrogen loading to the Bay.
  - If all (wet + dry) deposition to the Casco Bay watershed reached the Bay, then inorganic nitrogen deposition totals roughly 70% of overall loading to the Bay.
- Atmospheric deposition of mercury is the dominant source of mercury to the Casco Bay (see **Figure ES-2**).
  - Wet deposition of Mercury to the Bay surface area accounts for 10 to 16 lbs/yr. Estimates of dry deposition of mercury totaled 4 to 16 lbs/yr. Total deposition may be 84 to 92% of overall mercury loading to the Bay.

[1] Ignoring 2001 data which were anomalously low (less than half the precipitation of the previous three years).

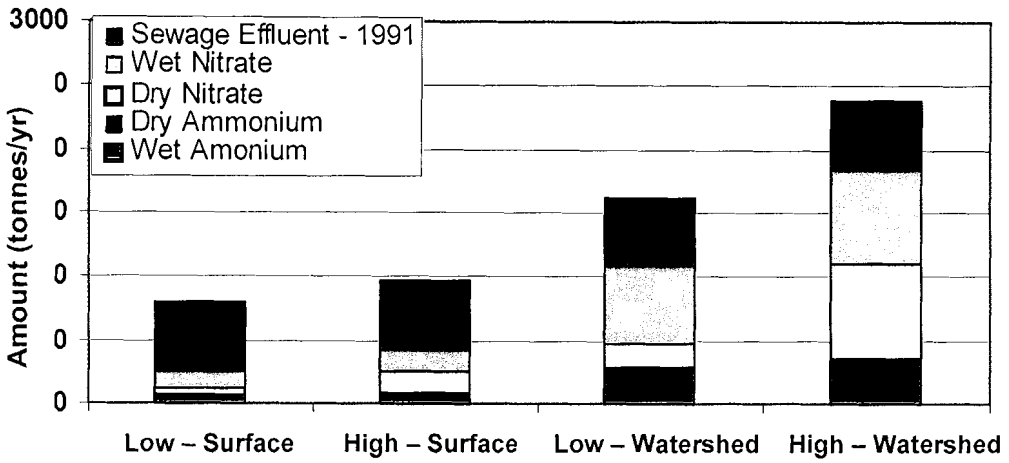


Figure ES-1. Summary of sewage effluent discharges, estimates of dry deposition, and wet deposition of inorganic nitrogen to Casco Bay from 1998 to 2000. "Low" and "high" signify deposition estimate ranges. "Surface" refers to the surface of Casco Bay while "watershed" refers to the entire watershed surface area.

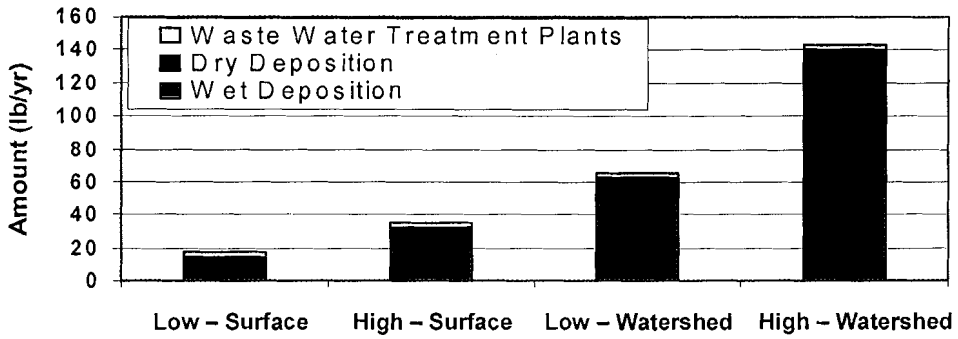


Figure ES-2. Summary of waste water treatment plant direct mercury discharges and dry (estimated) and wet deposition of mercury to Casco Bay. "Low" and "high" signify ranges in dry deposition estimates. "Surface" refers to the surface of Casco Bay and "watershed" refers to the entire watershed surface area.

- Total deposition of Mercury into Casco Bay equals 65 to 143 lbs/yr if all deposition to the Casco Bay watershed reaches the Bay.

- From 1998 to 2001, there was a trend of declining annual mercury, ammonia, and nitrate wet deposition totals at Casco Bay (see **Figures ES-3, ES-4, and ES-5**). This trend was entirely (mercury) or predominantly (ammonia) the result of a corresponding decline in annual precipitation from 1998 to 2001. For nitrate, our analysis suggests that 20% of the decline in deposition over this time period is from a potential corresponding decline in precursor emissions.

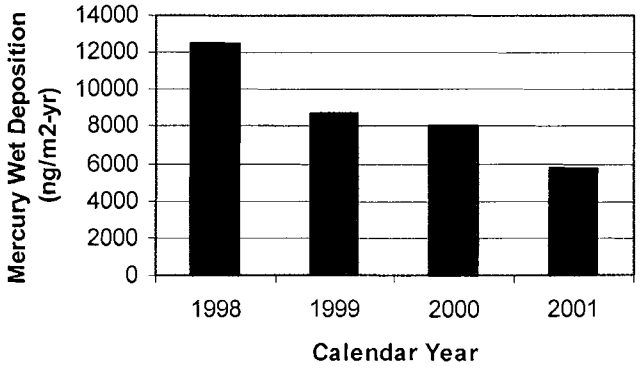


Figure ES-3. Annual wet deposition amounts for mercury from 1998 to 2001 at Casco Bay, which take into account annual changes in precipitation.

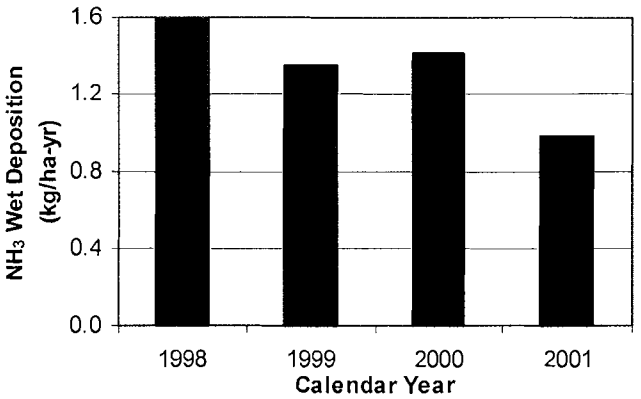


Figure ES-4. Annual wet deposition amounts for ammonia from 1998 to 2001 at Casco Bay, which take into account annual changes in precipitation.

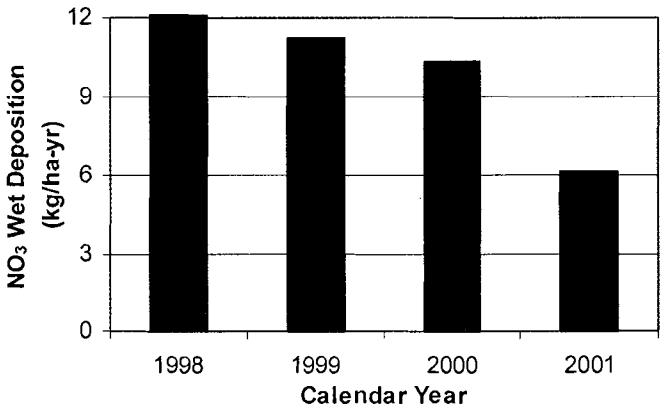


Figure ES-5. Annual wet deposition amounts for nitrate from 1998 to 2001 for Casco Bay, which take into account annual changes in precipitation.

- Understanding regional patterns of air pollution is important for Casco Bay.
  - Long-range transport of pollution in the Bay appears to be important. Trajectory analyses and source apportionment indicate polluted air masses influence the air quality of the Casco Bay area. (Note that local sources also likely contribute to pollution loading in the Bay.)
  - Data from Casco Bay monitors differ from data collected at other Maine monitoring sites, including the headwaters site of Bridgton.

- The seasonal dependence of precipitation (e.g., rain, snow) differed among the sites. Precipitation type is important because snow and rain remove different fractions of air pollutants from the atmosphere. These differences contributed to differences in wet deposition of inorganic nitrogen and mercury among the sites in Maine. For example, more of the precipitation was in the form of rain at Casco Bay than at the other Maine monitoring sites.
- Annual wet deposition rates of inorganic nitrogen are lower in Maine relative to nearby states. Since lower amounts of wet deposition indicate lower levels of air concentrations (or less precipitation) and, thus, emissions, Maine acts as a sink in terms of absorbing inorganic nitrogen emissions from other states. This is consistent with the crude mass balance analysis finding that ammonium and nitrate atmospheric deposition totals are, respectively, one-and-a-half and two to three times greater than the Maine air emission inventory for ammonium and oxides of nitrogen.
- Within Maine, annual wet deposition rates of mercury were similar to or slightly higher than those reported in nearby states. If precipitation is uniform, then similar levels of wet deposition indicate similar levels of air emissions (lb/acre) in each state, implying that Maine is neither a source nor a sink. On the other hand, the crude mass balance approach shows that atmospheric deposition to Maine is about twice the current mercury air emission inventory for Maine. Thus, the crude mass balance approach indicates that Maine is a sink. The wet deposition approach which identifies Maine as neither a source nor a sink is more likely to be correct. The data indicate a low-biased mercury inventory for Maine and/or a high-biased dry deposition rate for mercury.

ES-3. RECOMMENDATIONS

We recommend the consideration of the following studies and analyses to improve the future understanding of the role of nitrogen, mercury, and particles in the air to pollution in Casco Bay. These recommendations involve additional monitoring studies, emission inventory studies, data analyses, and modeling studies. Note that some of these recommendations could be performed using existing data, other recommendations need new resources for new measurements, while other recommendations will not occur for several years after more data is collected and/or new model components are developed.

Monitoring

- Retain speciated PM, wet deposition of nitrogen species, and wet deposition of mercury measurements at the Casco Bay monitoring site near Freeport. Differences between data collected at this site and data collected at other sites in the state are significant.
- Add a CASTNet-type monitoring site at Casco Bay to measure inorganic nitrogen (ammonium, nitrate, and nitric acid) concentrations in the ambient air. These data can be used to better estimate dry deposition rates. In addition, the weekly ambient air data typically provided by a CASTNet monitor can be combined with back trajectory analyses to identify the origin of air parcels with high and low concentrations of ammonium and oxides of nitrogen; these analyses would also help to determine the cause of higher inorganic nitrogen wet deposition concentrations in the summer.
- Assuming that ground-level mercury has some role in mercury wet deposition, monitor ambient air measurements of mercury at Casco Bay to help identify the cause of higher mercury concentrations in precipitation in summer, moderate levels in spring and fall, and lower levels in winter. If these measurements are made on a 24-hr or less sampling frequency, the data could be combined with trajectory analyses to help identify the origin of air parcels with high and low mercury concentrations.
- Consider event sampling of precipitation instead of weekly sampling. One of the observations derived from this study is that a single weekly sample could account for more than 20% of the annual mercury deposition at Casco Bay. During such a week, several storms could arrive at the site from different directions and/or sources, making an assessment of the origin of the mercury extremely difficult, if not impossible.
- Encourage the addition of comparable mercury monitoring sites in nearby states (i.e., Massachusetts, New Hampshire, and Vermont) that currently do not have mercury monitoring. Such information can improve the general understanding of mercury in Maine by classifying other states as sources and sinks. This will also allow a determination of which states are likely over- or understating mercury emissions in the region.

Emission Inventory Analyses and Development

- Update the inventory of direct inorganic nitrogen loading into rivers that empty into Casco Bay. In addition, estimate nitrogen and mercury sources that directly discharge into Casco Bay.
- Update and assess the uncertainty in the mercury air emission inventory for Maine.
- Perform mass balance analyses on data from other states and Canadian provinces. Comparison of air inventories to the corresponding atmospheric deposition rates in those states/provinces will help improve the understanding of sources and sinks of mercury in the Northeast. It will also help identify whether the regional emission inventory for mercury is complete and makes sense when compared to ambient data.
- Identify organic nitrogen air and water emission sources and emission rates (to the extent organic nitrogen is also contributing significantly to water quality issues affected by inorganic nitrogen). Measurements are needed of organic nitrogen atmospheric

deposition; and the "toxicity" of organic nitrogen relative to inorganic nitrogen needs to be established (e.g., what is the relative impact of organic nitrogen relative to inorganic nitrogen on algal blooms?).

Data Analyses

- Perform additional emissions trends analyses for other sites in Maine involving the normalization of wet deposition data by year to reflect longer-term averages.
- Conduct an analysis of seasonal source fingerprints of particles using at least another year or two of IMPROVE protocol data at Casco Bay to provide sufficient samples.
- Perform more comprehensive scatter plot, ratio, factor, and trajectory analyses (using additional years of collected data) in a manner similar to the analysis reported by Polissar et al. (2001) for Underhill, Vermont. This comprehensive analysis could identify source types that impact Casco Bay more precisely.
- Support further research on the causes of seasonal variations in inorganic nitrogen and mercury concentrations in precipitation and the potential differences in the forms of precipitation (e.g., rain versus snow) impacting atmospheric removal rates of nitrogen and mercury. For example, the variation in inorganic nitrogen and mercury concentrations in rain by season may be the result of coincidental changes in ambient temperature.
- Support further research to determine whether a substantial increase in ammonium wet deposition seen in spring, relative to winter, affects plant and marine life in Casco Bay.

Modeling

- Run the Community Multiscale Air Quality modeling system (CMAQ) to determine the contribution of local and out-of-state mercury sources on wet deposition at Casco Bay. As part of this modeling study, update the mercury inventory and dry deposition and/or wet deposition (rain vs. snow) modules. Recent study results by Dvonch et al. (1999) and others should be used to improve the CMAQ chemistry and deposition modules. Consider analysis of CMAQ predictions of wet deposition concentrations (snow vs. rain) in Maine; an EPA report (U.S. Environmental Protection Agency, 1997b) indicates the predecessor model[2] was calibrated to produce a factor of 2 lower wet concentration in Maine than is being measured at Casco Bay (and Acadia).
- Re-run or analyze the existing output of the EPA acid rain model to determine whether the model is correctly predicting the strong temporal correlation found between wet ammonium and wet nitrate ($r^2 = 0.69$) and between ammonium and nitric acid air concentrations ($r^2 = 0.71$) in coastal Maine and the poorer correlations found in nearby states. This is critical to our understanding and comprehension of the reliability of the chemistry module in the EPA acid rain model. This information would be helpful to further our comprehension of the reliability of the EPA acid rain model for making near- and far-field source contribution estimates within Maine.

[2] Regional Lagrangian Model of Air Pollution - RELMAP

- Perform a modeling analysis that estimates the range and likely percentage of mercury and inorganic nitrogen (ammonium, oxides of nitrogen) atmospheric deposition to the watershed that reaches Casco Bay. This will enable better estimations of the amount of wet deposition to the watershed that reaches Casco Bay. Timing as to when atmospheric deposition to the watershed reaches Casco Bay is also important because even though some wet deposition as snow occurs inland in the winter, it is important to understand whether most of this deposition reaches the Bay in another season (e.g., spring) after snowmelt has begun and/or has been completed. A sudden input of a large quantity of nitrogen into the Bay can result in poor water conditions.
- Perform a multimedia Casco Bay surface water and sediment modeling analysis that incorporates the findings of the watershed modeling, dry and wet deposition data, and an updated inventory of surface water sources. Such a study could be used to assess the ability to predict current levels of pollution in Casco Bay. Results could also be used to determine how future changes in air emissions would likely relate to pollution levels within the Bay.

Casco Bay Estuary Project
OUTREACH COMMITTEE
DRAFT OUTREACH STRATEGIC PLAN (REVISED)
February 26, 2004

INTRODUCTION The Casco Bay Estuary Project (CBEP) Outreach Committee has developed a strategy to guide its work. It has determined that the outreach effort will be most effective in meeting our stated goal if it targets decision makers in the watershed rather than the general public. This approach also acknowledges and complements the numerous education and outreach activities that CBEP and our partners are already undertaking.

GOAL

To increase the visibility of the Casco Bay Estuary Project partnership and its accomplishments toward implementing the Casco Bay Plan. The purpose is to increase support from decision makers for our present and future activities. The target audiences for this outreach plan are:

1. The media;
2. Local, state, and federal officials and legislators; and
3. Business and community leaders.

OBJECTIVES

1. **Develop and maintain relationships with media reporters and editors (newspapers, TV, radio, etc)**
2. **Maintain a quality web site**
3. **Develop and maintain relationships with municipal and state officials and legislators and our Congressional delegation.**
4. **Educate business and community leaders about ways to further the mission of the Plan and how that will benefit them.**
5. **Increase awareness of the Project by having a consistent and recognizable face, message, logo, etc.**
6. **Create, disseminate and update complementary outreach materials to target audiences as necessary.**
7. **Incorporate, as appropriate, an outreach component in each funded project.**
8. **Encourage more active participation by Board members in CBEP and in outreach activities.**
9. **Obtain resources to accomplish these outreach strategies.**
10. **Evaluate Outreach Strategy**

STRATEGIES TO BE ACCOMPLISHED UNDER EACH NUMBERED OBJECTIVE

1. Media:

a. Develop a relationship with environmental reporters and editors.
   - Invite to Board meeting
   - Meet with reporters
   - Send them information and meet with them as follow-up.

b. Pitch stories to weeklies

c. Get to know assignment desk person

d. Develop and maintain a database of media contacts based on media outlets of interest to target audiences.

e. Board members and/or staff write Op/Ed piece(s) (e.g. for Maine Voices)

f. Disseminate press/media releases on upcoming events and timely projects.

2. Web Site:

Review, evaluate and update, if needed, website layout, including links, and information to meet objectives of this plan (e.g. update "look" to be consistent with new brochure, highlight current projects).

3. Relationships with municipal, state and Congressional officials.

a. Meet with Congressional delegation in D.C.

b. Meet with the staff of the local Congressional offices.

c. Generate press release(s) about our Congressional funding and other support.

d. Do an educational presentation to State legislative committees (Natural Resources, Appropriations, Education) and/or participate in the 'Day for the Environment' at the State House in the Hall of Flags.

e. Co-sponsor an issues forum for legislators.

f. Organize a reception for EPA reviewers, other partners not on Board, legislators, local officials, DEP officials, etc. after June 2004 Board Meeting.

g. Continue to develop and strengthen municipal relationships through projects (e.g. Casco Bay Interlocal Stormwater Working Group, New Meadows Watershed Committee)

h. Invite state legislators to Board meetings and events; update them at least once each year on CBEP activities.

4. Educate business and community leaders.

a. Work with businesses to emphasize the positive connection between economic development and an improved environment.

b. Officially "recognize" the positive environmental impact of a member(s) of this group on the Bay (e.g. Casco Bay Clean Marinas).

c. Attend community events.

d. Strengthen ties within the USM community.

e. Develop materials highlighting local business anecdotes/testimonials about how a healthy environment is good for business

5. **Consistent and recognizable "face".**
   a. Create improved, consistent written and other materials for distribution (e.g., logo, color, font, design, "branding").
   b. Update our display unit to reflect our new look (see new brochure).
   c. Connect, wherever possible, with the national campaign, "What's an Estuary".
   d. Board members and Staff attend specific meetings and events where decision makers are present. Create a list of important events and find someone to represent CBEP at each. Examples might be: Environmental and non-profit organizations meetings and events, Chamber of Commerce (Eggs and Issues), Legislative events, League of Conservation Voters, some trade shows, Maine Water Conference (George Mitchell), Rotary, etc.
   e. Install Watershed signs (e.g. "You are now entering the Casco Bay watershed") with the CBEP logo.

6. **Complementary Outreach materials.**
   a. Create a power point presentation on the CBEP for Board members to show to organizations.
   b. Create and distribute a State of the Bay report
   c. Update informational handouts , as needed, using material in the State of the Bay report and/or other project or organizational information.

7. **Outreach Component in funded projects.**
   Include an outreach component consistent with the goal and objectives described above in each project. These should emphasize CBEP as a *partner.*

8. **More active Board participation.**
   a. Develop an orientation program for new Board members
   b. Create a list of Board member opportunities and responsibilities to distribute and include in a new Board member packet.
   c. Encourage Board members to represent and talk about CBEP at other meetings in addition to their primary affiliate/organization and emphasize joint projects.
   d. Involve all Board members in at least one project and/or committee.
   e. Solicit Board members from target audience.

9. **Obtain Resources for Outreach Activities.**
   a. Review staffing needs to implement outreach strategy and options for meeting these needs (e.g., reorganizing existing staff responsibilities, fund an Outreach staff person, hire a contractor on a project(s) basis, etc.)

b. Provide small grants for Outreach and education projects to partners (e.g. to promote National Estuaries Day or other events).
c. Add a Board member who is expert on public relations and media.
d. Seek funding and in-kind donations to support projects.

10. Evaluate Outreach Program

a. Assess program progress annually
b. Evaluate the success of the program over a longer term

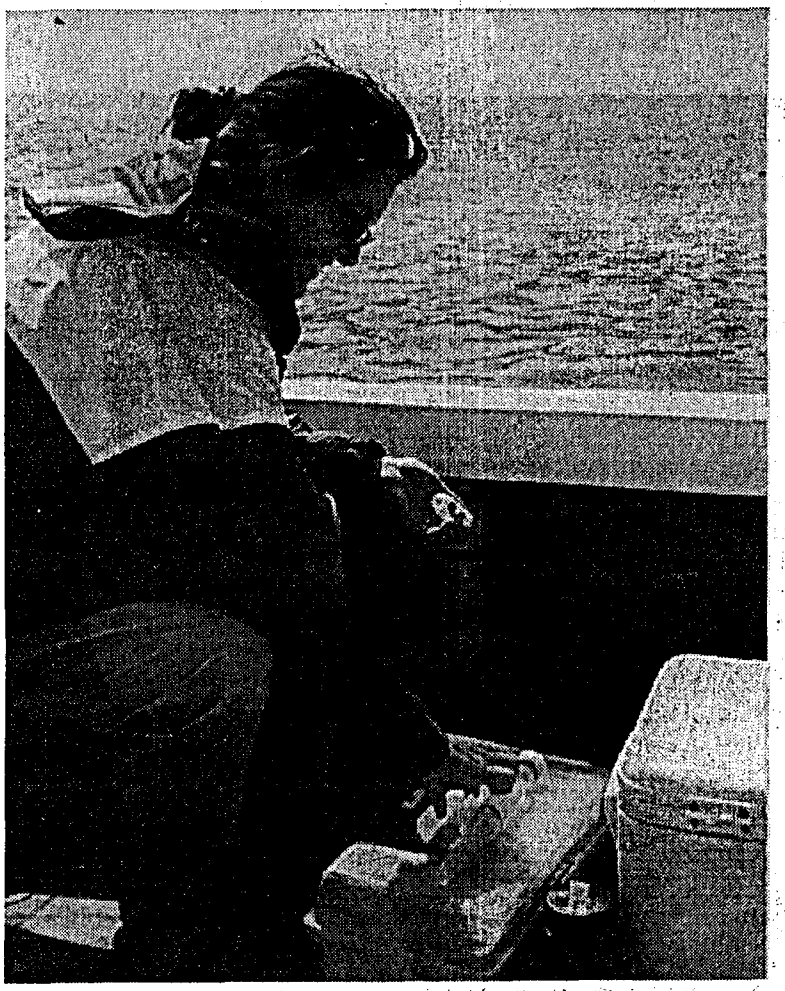
A line of protection where the river meets the sea

On the Waterfront
by Joe Appel

The Casco Bay estuary encompasses an area where the Presumpscot, Fore, Royal and Stroudwater rivers, as well as several other freshwater systems, meet the salt water of Casco Bay. Like other estuaries, it is an especially dynamic environment for plant and animal life, serving as breeding ground, nursery and home for myriad fish and birds.

The area that surrounds the estuary, however, is the most densely human-populated in Maine, which brings numerous threats to its health. In 1990, The U.S. Environmental Protection Agency named Casco Bay's estuary one of "national significance," and it was out of that designation that The Casco Bay Estuary Project emerged.

One of 28 programs nationwide dedicated to protecting estuaries and administered by the EPA, the nonprofit Casco Bay Estuary Project is hosted by the University of Maine School of Law and the Muskie School of Public Service at the University of Southern Maine. The program's director, Karen Young, spoke with The Forecaster recently about the organization's past, present and future.



Karen Young sampling water for a Friends of Casco Bay project that the Casco Bay Estuary Project helped fund as a partner.

Photo courtesy of Karen Young

"In the late 1980s there was a lawsuit against Portland and South Portland concerning wastewater and combined sewer overflows (outlets that deposit excess stormwater and sewage into open water in order to prevent sewers from backing up into structures and streets when it rains). That, along with a report put out by the Conservation Law Foundation entitled 'Troubled Waters,' focused attention on pollution and other problems with Casco Bay. Most people had assumed it was pristine, or close to pristine, but it wasn't.

"When the EPA designated Casco Bay

cies, nonprofits, individuals, businesses. The Friends of Casco Bay nonprofit (we're often confused with them) formed during the same period.

"After five years, in 1995, these meetings produced the Casco Bay Plan. It fo-

conversation. We operate in this unique way where we're federally funded in part but very locally based.

"The local angle on the clam flats was interesting. We were looking to develop a list of general tools for sustainable clam

the Estuary Project began. That same year a whole host of groups started getting together to try to protect the bay. There were federal agency representatives, state agen-

flats and swimming areas, toxics, stewardship, and stormwater and combined sewer overflows (CSOs). At CBEP, we've done many projects in all those areas, but we recently decided to focus on habitat and stormwater/CSOs.

"Before we go into more detail on what we've done, there are some pretty stunning statistics to get out there. The Casco Bay watershed (which extends from Cape Elizabeth to Phippsburg, and northwest to Bethel) is home to 25 percent of Maine's population. That's 3 percent of the state's land, with one-quarter of its people. So all sorts of pressures come to bear: damming, development, industrialization, motor traffic. And economically, so much rides on this area: tourism, agriculture, fishing.

"Another amazing thing to remember is that in 1995, 37 percent of the bay's clam flats were closed by the Department of Marine Resources. Some are still closed because of water pollution, but most have been re-opened. We've done a lot of work on this. Last year alone, 20 shellfish areas were re-opened. It's exciting because it's a combination of looking at environmental protection and economic prosperity together.

"The whole thing is complicated by the fact that management of clam flats is very local. In some cases that makes sense, but we try to look at it more on a regional level. So we have a 'clam team' made up of harvesters, members of local shellfish commissions, the Department of Marine Resources, the EPA, the Maine DEP, scientists and others. This way, you don't have to guess what all those parties want done.

"This is what the CBEP is really about, beyond the specific goals we're trying to accomplish. It's not just our staff, but a partnership of all sorts of people and groups: research, regulatory, workers, politicians, etc.

"So we have a large board with representatives from all the groups. It slows down the decision-making process, but there's no way we'd be as successful in the long run if we didn't have so many people in the almost every town seeds flats in its own way. We experimented with different methods to try to find the best one, but it turned out that a lot of it is very site-specific. So in that case streamlining made less sense. But it will work in areas like using less time-consuming methods to assess particular flats before issuing clam permits.

"The list of all our current projects is long, but it's worth mentioning a few. We're pulling together stakeholders along the Presumpscot River, to develop a management plan there. There are so many big changes there, with Sappi not pulping anymore and then the Smelt Hill Dam coming out. That's all good news, but there's a greater danger now from development, since all the clean-up has made the area a more desirable place to live. That group is going to draft a management plan that will go out for public comment in May.

"In the fall, we'll be co-hosting a conference looking at stormwater management in cold climates. Lots of successful stormwater management stories come out of places like Florida and Maryland, and that's not always applicable here. We're also doing ongoing programs on habitat, in both restoration and land acquisition, and working for conservation easements.

"Right now is definitely a tough time to be doing this, since the state budget is in such a tough place. Our funds have been reduced, but we're grateful that the state has been able to continue funding us. The Maine delegation is very supportive. Even Mike Michaud, who represents the second congressional district, has pledged to support us. He recognizes that his constituents may be far from Casco Bay, but the health of this area is crucial to the health of the whole state."

On the Waterfront runs bi-weekly. Each article focuses on a person, group, issue or feature of the area's waterfront. Readers with a story that might be of interest for the column can e-mail Joe Appel at appel100@earthlink.net.

BLETHEN MAINE NEWSPAPERS

FRANK A. BLETHEN
CHAIRMAN OF THE BOARD

CHARLES C. COCHRANE
PUBLISHER AND
CHIEF EXECUTIVE OFFICER

RIVER REPAIR

Future plan for Pres

● Serious discussion about dam removal should be accompanied by an analysis of costs and benefits.

Debate over the best way to use the Presumpscot River isn't anything new.

In fact, the first armed conflict between the Indians and settlers in Maine happened in 1756 over dams that were blocking fish on the river.

Eight dams remain, and the Presumpscot River Management Plan Steering Committee has recommended removal of three of them – the Little Falls, Mallison Falls and Saccarappa dams – in its proposed plan for the river's future. All three are owned by Sappi Fine Paper North America, which participated with the committee until last fall.

The committee, comprised of more than a dozen organizations and agencies, worked for three years on a comprehensive plan to improve the health of the Presumpscot River and minimize the negative impacts to it.

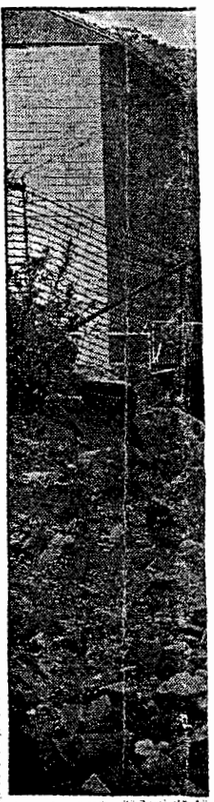
It's a well-researched initiative that deserves a close look by the State Planning Office, which will receive a copy of the group's final recommendations later this month. The difficult issue of dam removal, however, must proceed with a thorough cost-benefit analysis, and that should be the next step in the process.

THE STEERING COMMITTEE hoped to develop a plan that would benefit everyone who has an interest in the river, ultimately improving its recreational, educational and economic benefits.

It tackled three main areas: fisheries, in which the group examined ways to improve migratory fish populations; open space, in which it looked at public access, trails and development impacts; and cumulative impacts, in which it researched how industrialization of the river had affected the ecosystem.

Some recommendations include protection and conservation of land along the river, landowner education, development of water and land trails along the length of the river, nonpoint and point source pollution control, habitat improvement and flood protection.

This isn't something



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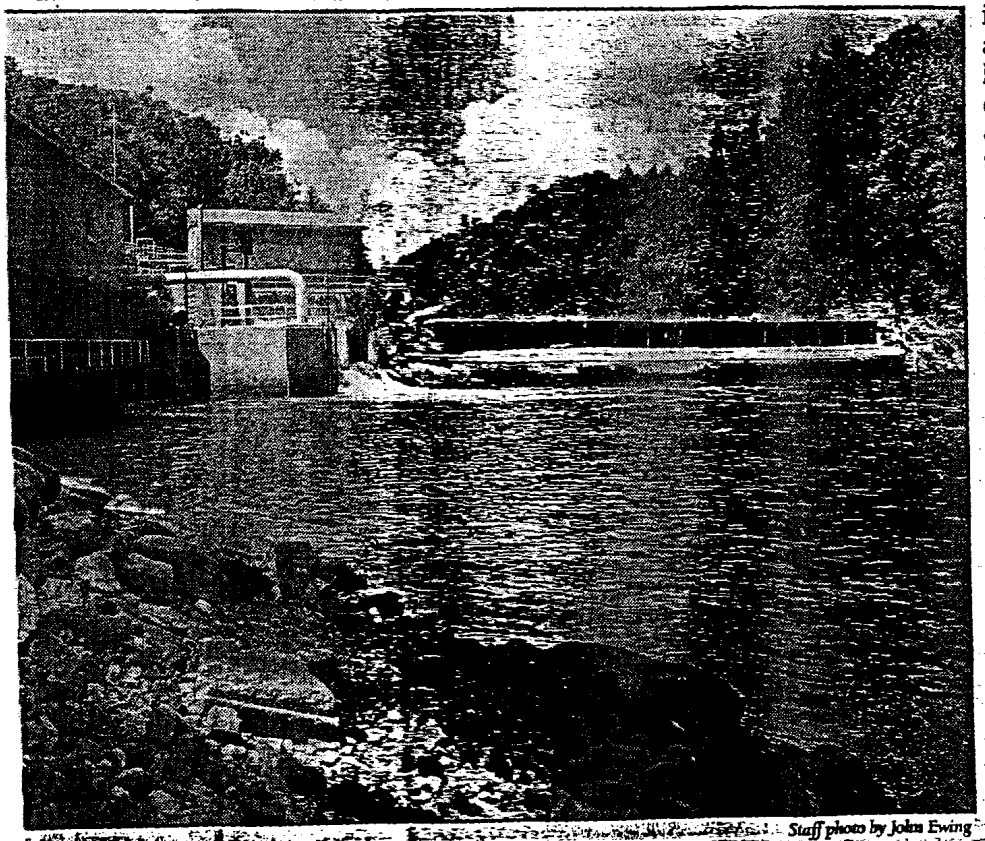
Portland Press Herald

A BLETHEN MAINE NEWSPAPER

A MEMBER OF THE SEATTLE TIMES FAMILY OF NEWSPAPERS The Seattle Times

sumpscot River could make it a jewel



Staff photo by John Ewing

nelt Hill Dam on the Presumpscot in 2002 might be just the first.

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aren Young, director of the
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ladders could simply be providing fish with a way to get someplace they no longer wish to go.

Removal of the three dams between the Cumberland Mills Dam in Westbrook and the Gambo Dam in Gorham could help restore runs of shad, blueback herring, Atlantic salmon and alewives to the river. The migrations of such fish would attract predators to the Presumpscot River estuary and Casco Bay such as osprey, herons, bald eagles, striped bass and even seals.

THE SMELT HILL DAM, the one closest to Casco Bay, was removed in the fall of 2002. Since then, Presumpscot Falls has returned and parcels of the waterfront property have been preserved.

impoundments object to dam removal, and there are concerns about increased flooding. Some argue, however, that flooding is more possible when the dam is present. It's not something that's been thoroughly studied. It should be when the implementation phase begins.

It's unclear why Sappi pulled out of the committee, though the dams the committee has flagged for possible removal are owned by the company and provide the company with a low-cost source of power. A spokesperson for Sappi couldn't immediately be reached.

Truly, the economic impact of removal must be reviewed thoroughly. That's not something the committee has a solid handle on right now, and it's difficult to have one at this point in the long-term, conceptual plan.

It can and should, as it moves to implement components of its plan, conduct a more thorough fiscal analysis.

ONE OF THE KEY recommendations by the group is the formation of a Presumpscot River Council, which would develop the specific parameters and find the resources to make the plan reality.

Funding for projects likely would come from variety of sources, including state, federal and loc governments as well as nonprofit organizations.

The state should give serious consideration to t committee's recommendations, which could bene the state both ecologically and economically years to come.

It's not too late for the public to see a copy of summary or make comments. The information available online at www.cascobay.usm.maine. Comment by mail can be sent to Casco Bay Est Project, 49 Exeter St., P.O. Box 9300, Portland, 04104.

The committee will review the comments, duce a final draft of its plan and send it to the Planning Office.

Whether or not the state decides to adop plan, the committee plans to proceed, Young s

If the benefits of the changes envisioned out the costs – and a thorough analysis should i

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Marine life gone bad: Scientists inventory invaders

By MEREDITH GOAD
Staff Writer

A group of scientists in rain gear huddled over a floating dock that had been pulled from the water at Portland Yacht Services on Monday morning.

Undisturbed by the showers that swept ver the waterfront, they scraped off curtains f kelp, sucked up water samples with yedroppers, and pored over the colorful reatures with unusual shapes that still clung to the dock.

The team of 25 scientists is conducting a week-long survey of floating docks and piers to find out how many exotic marine species have invaded the coastal waters from Maine's Casco Bay to New York Harbor. The group includes about a dozen taxonomic experts with different specialties, from tiny crustaceans to colorful sea squirts. They hail from places as varied as Rhode Island, England, New Hampshire, Seattle and the Carolinas.

European green crabs, Asian shore crabs, periwinkles and other non-native species can enter a coastal area naturally or spread from port to port through a ship's ballast water. While some species are benign, others can spread rapidly and cause widespread economic and ecological harm.

The green crab, for example, preys on commercially valuable shellfish. Other species chew up piers and pilings, damage fisheries or cause public health problems.

A similar survey conducted three years ago in Massachusetts found that 10 percent of the species identified were not native to the state, including two species that had never been seen before on the East Coast. This year's expanded survey will give scientists a broader look at which exotic species are here and how far they've spread.

"One reason that we've chosen Portland is because, with all the ship traffic coming in and out of here, there's a good chance that some of them may have come in on some of the ships," said Jan Smith, director of the Massachusetts Bays National Estuary

Please see **SPECIES**
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SPECIES

Continued from Page 1A

Program.

The survey began Monday with a visit to Port Harbor Marine in South Portland, then moved to Portland Yacht Services on Fore Street. The group spent the afternoon at Brewers South Freeport Marine.

At Portland Yacht Services, Niels Hobbs of the University of Rhode Island used a strainer and an eye dropper to capture tiny animals called arthropods and isopods, which are closely related to crabs and shrimp. He pointed to a small, dark shape scurrying through the water in a plastic container.

"They look a lot like little shrimp," he said, "and there are a number of

that are non-native, that we've found in the past. They're little fast swimmers that you can see in the corner there. Some of them are a little too fast for the eyedropper."

Hobbs said he is collecting as many species as he can, trying to develop a baseline of what's in the water. Scientists don't know yet whether the animals cause any damage, he said.

"As little as we know about what ones are here," he said, "we know even less, really, about what impact they actually have."

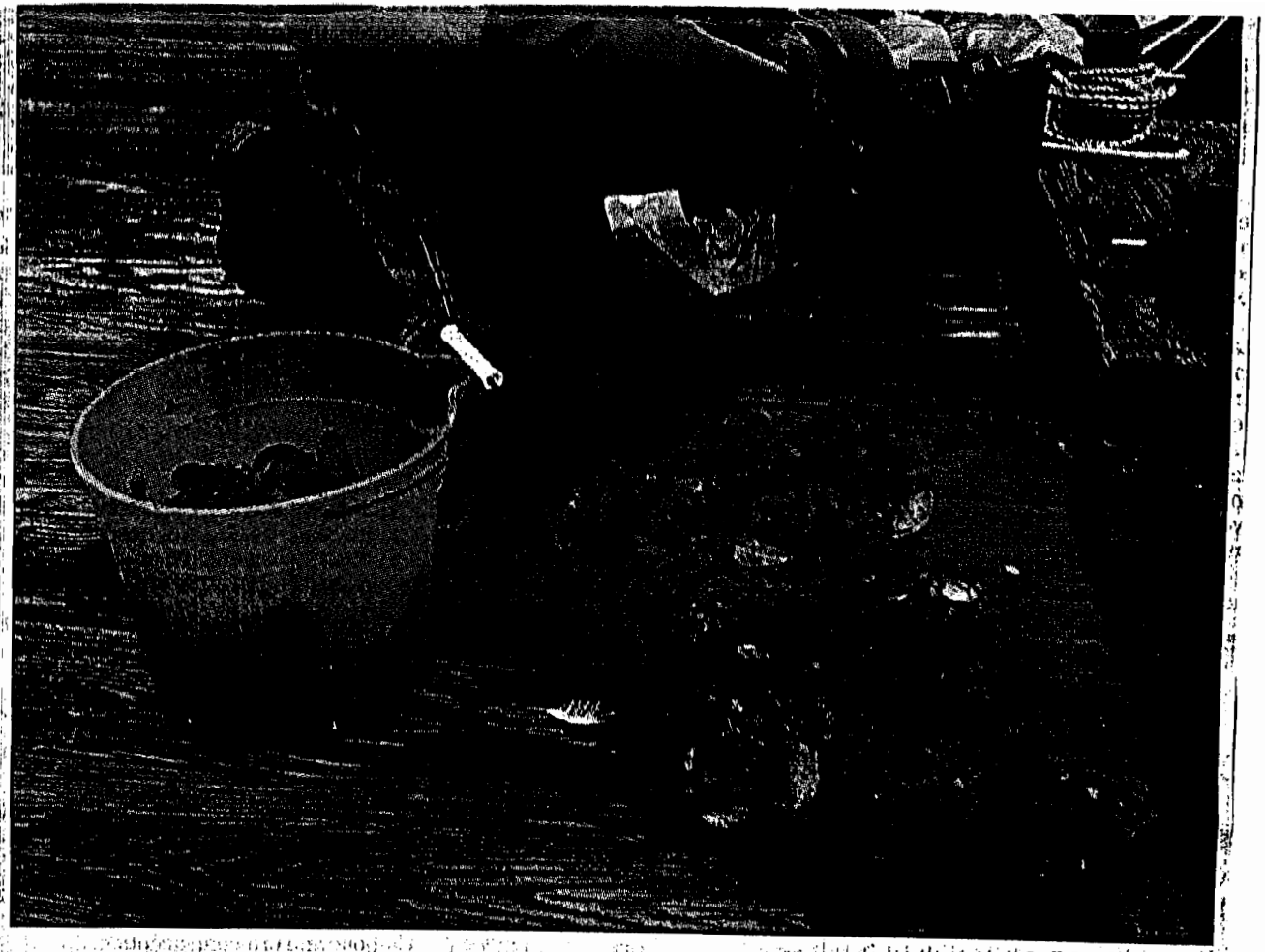
It's a different story for the sea squirts, or tunicates, which were being examined Monday by Gretchen and Charles Lambert of the University of Washington in Seattle. Gretchen Lambert is a taxonomist who, among other things, identifies sea squirts for the Smithsonian. Her husband Charles is a physiologist who also works on the animals, but on this trip is performing a variety of tasks, from sorting critters to making sure that microscopes are working.

"Of the many invasive animals, the most abundant one in this harbor is a sea squirt from Japan," Charles Lambert said, pointing to an orange colony of squishy sea squirts on the dock.

Gretchen Lambert pointed to another one nearby, a brown, knobby creature known as a club tunicate. As tunicate colonies grow, she explained, they smother shellfish fisheries.

"They are causing millions of dollars worth of damage to mussel and oyster growers on Prince Edward Island," she said. "We were there at the end of March to talk to about 100 aquaculturists about how to get rid of them, actually, which is very difficult once they've come into an area. So one thing we hope to accomplish with surveys of this type is to enact more stringent rules on processing the ballast water and profiling suspect vessels."

In March, U.S. Sen. Susan Collins, R-Maine, and other lawmakers introduced a broad invasive-species bill that would set more aggressive rules for the shipping industry and how it handles ballast water. The Environment and Public Works Committee held hearings on the bill last month, but it has not yet been sent to the full Senate.



Staff photo by Jack Milton

Dr. James Carlton, director of the Williams-Mystic Program, collects marine life from a dock at Brewers South Freeport Marine on Monday. He is part of a group of scientists searching docks and piers for signs of exotic marine species in coastal waters from Maine's Casco Bay to New York Harbor.

Lambert said she is also keeping an eye out for a tunicate called Didemnum, a relatively new invader that simultaneously appeared in New England, California, western France and Brittany, New Zealand, most likely carried in ballast water.

"Unlike some introduced species, which so far have mainly been found on what we call artificial surfaces, Didemnum has the ability, we've found, to easily colonize natural rock surfaces," Lambert said. "So it is now subtidal all along New England and parts of northern California, where it is growing in subtidal rock walls, smothering native species and very drastically changing the marine ecology of these areas."

Jan Smith said the scientists will also be watching for "a nasty whelk" from Korea that was introduced into the Virginia Beach area, probably by a Navy ship.

"It's very predatory on shellfish," he said. "We're nervous about it getting up here, so we're kind of keeping an eye out."

The scientists were brought to Maine by the Northeast National Estuary Program Partners, the Casco Bay Estuary Program and MIT Sea Grant, with the help of a $60,000 grant from the U.S. Environmental Protection Agency. Their expenses are being paid, but otherwise the scientists are doing the work for free, Smith said.

The National Geographic Society is filming the group for two days for an upcoming segment on its "Explorer" television program.

Staff Writer Meredith Goad can be contacted at 791-6332 or at:
mgoad@pressherald.com

organizations, and area citizens," according to the information on its web site (academic,bowdoin.edu/new_meadows/). Its stated mission is "to protect, improve and maintain the vitality of the ecological and economic

charge from the bottom.

On a lovely Saturday, the Ruth took several members of the watershed communities on board at Sawyer Park, a public boat launch on the New Meadows in

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ROBERT ANDERSON PHOTO

Cundy's Harbor at the mouth of the New Meadows Watershed

this could have an effect on algae blooms in the lakes and on the susceptibility of the upper New Meadows to fish kills "and other low oxygen events."

Heading south along the river, the shore is lined with what were once summer cottages. Many are now being winterized and used year-round. This is worrisome to those who study the watershed, because of the pressures it puts on the resource. The importance of the resource became apparent as the Ruth chugged out into the waters off Thomas Point Beach.

Brunswick Marine Resources Committee members were on hand to talk about the New Meadows as shellfish resource. Dana Wallace explained that the flats in this area are some of

Troublesome in some locations, including along the Harpswell shore, are continued overboard discharge sites (OBDs). Removal of OBDs is one of the priorities of the NMRWP, which has acted as a facilitator in efforts driven in large part by the Casco Bay Estuary Project, another of the NMRWP organizational members. The Casco Bay Estuary Project, says Heinig, "has been working for years [on OBD elimination] and has put a lot of

reported that a grant proposal has been submitted for further remediation on the New Meadows largely focused on productive clam flats.

Closer to home, the Dingley Island project should be familiar to most in Harpswell. Elsa Martz spurred on a volunteer effort that took advantage of the "Coastal America Project," and partnered with the Navy Seabees to remove a causeway that obstructed water flow around Dingley

sland. "Once it's open, we ope that seals and striped ass will come through," lsa explained, as well as ssuring the estimated 255,000 per year value of he flats.

Another effort that the MRWP has championed is vailability of more pump uts for pleasure boat waste. ebasco Estates has put one , which should alleviate ressure from the heavy oat traffic that comes up he New Meadows into such avens as the Basin in hippsburg.

Looking at the water-esistant map of the New leadows Watershed, a red tain denoting closed flats lots the Cundy's Harbor nd Gurnet areas; purple iangles symbolizing over-oard discharges cluster round the lurid color-coding. Set beside the tables hat show the potential revnue from shellfish harests, that membership fee r Harpswell's participation the NMRWP dwindles to ext to nothing. Not because thousand bucks isn't a fair hunk of change, but ecause the return on the nvestment can be so enorous.

"One of the benefits of being a part of this effort," says Town Planner Noel Musson, "is that we can look at impacts on a region-wide effort and pool collective talent to try to solve a problem." He provides an example of a run-off survey organized by NMRWP that offered training by MDMR to citizen volunteers on "how to identify signs of runoff and erosion." Harpswell's volunteers collected their information and generated a report that showed several areas where "non-point source pollution" from roads was impacting the New Meadows. "This information can and will be used in Harpswell to prioritize road clean-up (sand/salt removal) and general maintenance," Noel says.

This is clearly a case of money well spent.

For further information, or to participate in the New Meadows River Watershed Project, contact Noel Musson (nmusson@town.harpswell.me.us) or Jim Knight, the selectmen's representative to the NMRWP (jknight@town.harpswell.me.us) at the Harpswell Town Office.

Harpswell, ME
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HARPSWELL ANCHOR™

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Watershed projects

New Meadows gets a vitality boost

By S. V. Lowery

Tucked away in a corner of the 2003 Harpswell town budget is $1,000 for "New Meadows River Watershed Project."

Town Planner Noel Musson says that this $1000 is "a membership fee we pay to help support the project." At first glance, this might look hefty for a membership fee, but the project represents present and future returns for the town which are beyond price, as was made evident from on board the Sebasco Estates tour vessel, the Ruth, last May 31.

The New Meadows River Watershed Project (NMRWP) was incorporated in 1999 as a committee of "municipal, state and federal officials, representatives from non-governmental resources of the New Meadows River."

Harpswell is one of the five political subdivisions in the New Meadows Watershed; the others are the towns of Brunswick, West Bath and Phippsburg, and the city of Bath, although Bath lacks New Meadows shoreline.

The New Meadows River isn't actually a river; it is an "embayment," originating from volcanic activity and later enriched by glaciation. Unlike a true estuary, there is no substantial surface freshwater input, and so little mixing of fresh and salt water. However, studies are revealing the possibility that Kennebec River flow from the south, around Small Point, could have real impact on the New Meadows, along with subsurface groundwater dis-

Water

from page 1

Brunswick. We cast off to the outraged scolding of an osprey nesting near the wharf for a voyage of discovery of our own back yards.

The New Meadows offers a diverse range of ecology and habitats. The voyage began below what are called the New Meadows "lakes," which are, according to Chris Heinig of MER Assessment Corporation, usually at full salinity. The so-called lakes are not lakes at all; they're just water from the sea impounded by road construction done over the years. Consequently, the entire New Meadows, says Chris, is "an oceanic environment with active fisheries."

One of the lakes has a deep hole, which may act as an internal source of nitrogen from the data obtained in preliminary studies. If it is a significant source of nutrients for the upper river

may be the most productive, in the State of Maine. This area is a source of seed clams for the entire area, he said. Jack Lemont, who clams in Brunswick, noted that razor clams and European oysters are found in the area as well as little neck and soft shell clams. The reason may be the sandy bottom, but regardless of the why, the economic benefits are clear. According to Wallace, 7-8% of Maine clams come out of the New Meadows River. The estimated economic impact of production for 2003 is $2.2 million.

Jim Hennessy, an oyster grower on the New Meadows from a family that goes back further than anyone can remember in West Bath, has 13 acres in Mill Cove in production. He says working on the water gives him an "incredible sense of freedom," and he values a resource-based job that is non-polluting and involves a

Support was drawn from the Maine Department of Marine Resources (MDMR) and other groups for replacing OBDs with in-ground septic systems. As of the end of 2001, the NMRWP could report that 23 OBDs had been removed in the watershed, ending all OBDs in Brunswick and allowing Harpswell to open several harvesting areas at least conditionally. In West Bath and Phippsburg, "over 1500 acres of shellfish flats in Brigham's Cove and Round Cove were opened to clamming for the first time since the 1970's," in spring 2003, according to the NMRWP web site, thanks to intensive cooperative efforts by the localities, property owners and volunteers, MDMR and the Casco Bay Estuary Project.

Steve Walker, Brunswick's Natural Resources Planner, explained the water quality survey functions that the NMRWP undertakes, and

Land Trust completes Robinson Woods purchase

When the Cape Elizabeth Land Trust signed an agreement with John Robinson in December 2000 to purchase 80 acres of forest along Shore Road, we knew instinctively that there would be great community support for this project.

With an appraised value in excess of $1.6 million, we were very fortunate to be offered the property for the price of $750,000, and now three years later, we are pleased to report that we have succeeded in raising the full amount of funds pledged.

We would especially like to thank the town of Cape Elizabeth and all the residents who have helped to ensure that Robinson Woods will forever remain in its natural undeveloped state.

Support for this acquisition came equally from the Land for Maine's Future program, the town of Cape Elizabeth, and hundreds of donors. A recent $20,000 grant from the Casco Bay Estuary Project Habitat Protection Fund (co-administered by the Maine Coast Heritage Trust and the U.S. Fish & Wildlife Service) put us over the top.

For those of you who have not been in Robinson Woods yet, we hope you will make an effort to walk in amongst the many spectacular trees—some over 300 years old—scattered throughout the property.

For generations this parcel has remained undeveloped with the exception of our 2.5-plus miles of trails for walking and cross-country skiing. Now that the Cape Land Trust is responsible for the permanent protection of Robinson Woods, we are planning some improvements to the property.

In late November, the Land Trust secured an additional grant from the Land for Maine's Future program to build several bridges, an information kiosk and a new map of the habitat and trails within Robinson Woods. The kiosk also will provide copies of the map and a guide to a new interpretive trail to help visitors identify tree species, wildflowers, and wildlife habitat.

Soon after we began to raise the funds to purchase Robinson Woods, the campaign quickly evolved into what is now our *Campaign for the Cape* capital campaign. In addition to raising funds for Robinson Woods, we are raising one million dollars to support future land acquisitions such as our Jordan Farm project. We are also raising funds to endow our stewardship and education programs so we can care for the land and offer greater learning experiences.

All Cape residents will be receiving a brochure in the mail explaining how to donate to the *Campaign for the Cape*. CELT volunteers will be making follow-up calls to make sure you received a brochure and to answer any questions. We look forward to talking with you soon; our friends, our members and neighbors.

You can contact the Cape Elizabeth Land Trust at 767-6054 or e-mail, celt@gwi.net, or P.O. Box 265, Cape Cottage Branch.

Chris Franklin
Executive Director
Cape Elizabeth Land Trust

Cape Courier
Dec. 13, 2003

Portland Press Herald
January, 2004

CAPE ELIZABETH

Land trust hits $800,000 goal to preserve woods and shoreland

The Cape Elizabeth Land Trust has completed its three-year campaign to raise $800,000 to buy 82 acres of forest and shorefront.

The land, which is known as Robinson Woods, will be preserved and used for recreation, including hiking and bird watching. The Land For Maine's Future, town of Cape Elizabeth and Casco Bay Estuary Project Habitat Protection Fund contributed to the purchase.

Residents of Cape Elizabeth donated more than $150,000. And the property's owner sold the land at a fraction of its value.

"Preserving this parcel has been our main objective over the past three years and we are happy and proud to be able to enable visitors and residents to enjoy this area in perpetuity," Trust Executive Director Christopher Franklin said.

– From staff and news services

Are you interested in learning more about plants and animals invading Maine's coastal waters?

- Do you wonder how organisms like the Asian shore crab or non-native sea squirts get here and why they are a problem?
- Do you want to know whether we can prevent others from coming and what can be done about those already here?

Asian shore crab

Come find out which bio-invaders are wreaking havoc on our ocean life and on marine activities such as fishing and shipping!

Attachment 14

England; information about specific bio-invaders; potential pathways for their introduction; and a case study from Massachusetts on how to manage what's here and keep potential new invasions out.

Wednesday, May 5, 2004
8:30 a.m. to 12:15 p.m. (Registration: 8:00 - 8:30 a.m.)
Glickman Library, 7th floor, The University of Southern Maine, Portland

Free and open to the public.

(Pre-registration required. To register, please contact Deb Arbique at the Casco Bay Estuary Project at darbique@usm.maine.edu or 207-228-8593 by April 21.)

Sponsors:

Casco Bay Estuary Project

Sea Grant Maine

THE UNIVERSITY OF MAINE

USM University of Southern Maine
Gloria S. Duclos Convocation on Environmental Sustainability

Partners:
Gulf of Maine Research Institute
Maine Coastal Program/Maine State Planning Office
Maine Department of Environmental Protection
Maine Department of Marine Resources
MIT Sea Grant
The Ocean Conservancy
U.S. Environmental Protection Agency
Wells National Estuarine Research Reserve

Directions to the USM Portland Campus:

From Interstate 295, take exit 6B (Forest Avenue North) onto Forest Avenue and get into the left lane. At the first light, take a left onto Bedford Street. Turn left onto Surrenden Street and left into the new USM parking garage. To walk to the library, go back down Bedford Street and take a right onto Forest Avenue. The Glickman Library is the seven-story building located at 314 Forest Avenue.

From the Maine Turnpike, take Exit 8. Turn left at the traffic light onto Riverside Street and follow the road up the hill. Turn left at the first light onto Route 25 East (Brighton Avenue) and proceed for about two miles. Go straight through the light at the 6-way intersection with Falmouth Street staying on Brighton Ave (not Route 25). The road will curve to the left, turning into Bedford Street. Take a right onto Surrenden Street and a left into the new USM parking garage. To walk to the library, continue down Bedford Street and take a right onto Forest Avenue. The Glickman Library is the seven-story building located at 314 Forest Avenue.

Parking: Public parking is available for $1.00/hour in the new USM parking garage (see Directions). The garage is open from 7:00 a.m. to 11:00 p.m. Please carry ticket with you and pay for parking at the garage office prior to returning to your vehicle to exit.

Please indicate if you need special services, assistance or accommodations to fully participate in this program by contacting Deborah Arbique at (207) 228-8593 or TTY (207) 780-5646 no later than April 21, 2004.

Casco Bay Estuary Project

Partnerships in Action

The strength of the Casco Bay Estuary Project is in its collaborative nature.
Some of our many partners include:

Federal and State Government Agencies & Programs

Gulf of Maine Council on the Marine Environment
Maine Coastal Program/Maine State Planning Office
Maine Department of Environmental Protection
Maine Department of Inland Fisheries & Wildlife
Maine Department of Marine Resources
Maine SeaGrant
NOAA Fisheries
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service – Gulf of Maine Program
Wells National Estuarine Research Reserve

Non-governmental Environmental Organizations

Casco Bay Island Development Association
Friends of Casco Bay
Friends of the Presumpscot River
Lakes Environmental Association
New Meadows River Watershed Committee
Presumpscot River Watch
Maine Coast Heritage Trust and numerous Casco Bay area local land trusts!

Municipalities

City of Portland
City of South Portland
City of Westbrook
Town of Brunswick and many other municipalities!

Businesses and Regional Public Sector

Cumberland County Soil &Water Conservation District
Greater Portland Council of Governments
Hannaford Brothers, Vortechnics, and many other businesses!
Maine Marine Trade Association
Portland Water District
Portland Yacht Services and numerous other "Casco Bay Clean Boatyards and Marinas"!

Educational Institutions

Bowdoin College
Casco Bay-area K-12 schools
University of Southern Maine
University of Maine School of Law – Marine Law Institute

And Countless Citizens!