

Maine Coastline

News from the Maine Coastal Program

Winter 2007



Maine Geological Survey conducted research around Drakes Island in Wells to predict the results of a 2-foot rise in sea level; the image at left shows areas inundated at mean high water (MHW), the right at highest annual tide (HAT). Images courtesy of Maine Geological Survey.

Anticipating Rising Seas

In Maine, sea level has risen more than half a foot over the past 90 years, according to data gathered from a tide gauge in Portland. Many scientists now project an increase of 2 to 3 feet by 2100, and researchers at the Maine Geological Survey (MGS) are working to assess the potential consequences of such a rise. Seeing how the contours of the coast will change in coming decades could help communities plan and make needed policy changes.

Two forces are accelerating the rate of sea-level rise, both of them driven by global warming. When ocean temperatures warm, sea-water expands. In addition, melting ice sheets in Greenland and Antarctica are contributing to the rise.

Gordon Hamilton, a research scientist and professor with the University of Maine's Climate Change Institute, has found that

Greenland's massive ice sheet is melting at an unprecedented rate (with one glacier retreating more than 3 miles in a single year). "The three large glaciers that we're tracking represent 20 percent of Greenland's ice sheet (which holds enough fresh water in total to raise sea levels around the globe 21 feet)," Hamilton notes. "If the changes we've observed are occurring elsewhere in Greenland, we could see a meter of sea-level rise by 2100."

Storm surge from more intense weather systems could compound the damaging effects of sea-level rise. "Our primary concern in Maine is from Nor'easters, in which wind direction and currents combine to pile water along the coast," says Stephen Dickson of the MGS. During such storms, water levels might increase an additional 1 to 3 feet. "There's a potential for bigger and stronger storms here as water and air temperatures rise," Dickson predicts.

(continued on page 3)



Director's Column

Human impacts on Maine's coast range in scale from the local (such as roadway runoff) to the global (as our cover story highlights). Clearly we need to get a better handle on how these cumulative impacts are altering natural systems over time. The damage often comes from many small actions taken by individuals—such as landowners applying lawn chemicals or clearing vegetation near water bodies. Educating individuals to make sound choices is critical to reducing our adverse impacts.

Communities also play an important role in reducing cumulative impacts. By developing ordinances that encourage well-planned and carefully sited development, for example, municipalities can help preserve water quality, sustain biodiversity and protect commercially harvested species. One of the best ways to do this is to take a “systems approach” in reviewing potential developments, considering individual projects in the context of the larger ecosystem.

To help address the limitations in the traditional permitting system, Maine's Department of Environmental Protection (DEP) adopted guidelines in 2004 for assessing cumulative impacts when processing permit applications under Maine's Natural Resource Protection Act (NRPA—Title 38 M.R.S.A., Sections 480-A to 480-Z). The guidelines help staff rate how severe the cumulative impacts might be, and help determine the level of mitigation or project changes required. DEP's guidelines can be found at <http://www.maine.gov/dep/blwq/docstand/nrpa/sopcumimpact.pdf>. Elizabeth Hertz at the Coastal Program is working to adapt DEP's guidance for use by municipalities: look for updates on these new tools in future editions of *Maine Coastline*.

The stories in this issue also may help communities and individuals consider ways to address cumulative impacts. Low impact development practices (see page 4), YardScaping techniques (page 5), and best management practices in forestry and agriculture (page 8) can help lessen adverse impacts on coastal resources. This issue also profiles two successful regional watershed projects. Their work assessing resource health and planning habitat restoration provides an encouraging model for how state government and coastal municipalities can work together to sustain coastal ecosystems.

Kathleen Leyden
Director, Maine Coastal Program

Maine Coastline

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Anticipating Rising Seas *(continued from cover)*

Dickson and Peter Slovinsky of the MGS are working to map portions of Maine's coastline where the most damage might occur from a 2-foot rise in sea levels. Much of their research focuses on the coastline in York and Cumberland counties, where the most dense development coincides with the most vulnerable coastal geology (sandy beaches, estuaries, and mud and cobble bluffs). Major economic impacts could occur there, Hamilton notes, with declines in tourism and "loss of taxable revenue with the submerging of expensive waterfront homes."

Grants from the National Oceanic and Atmospheric Administration and from the Maine Coastal Program allowed MGS to gather precise horizontal and elevation data for beaches, dunes, and adjacent salt marshes. Their initial research around Drakes Island in Wells (see graphic on cover) reveals that roads would be threatened by flooding with a 2-foot rise in sea level and the island's causeway could be flooded by a 3-foot rise.

The MGS findings are supported by an independent study completed in 2006 by the Natural Resources Council of Maine. That analysis relied on a less specific data set to map potential inundation levels along the entire Maine coast. Neither the State's research nor the NRCM study account for erosion, fill, shoreline

changes or storm surge flooding so actual water levels could be higher than the maps depict.

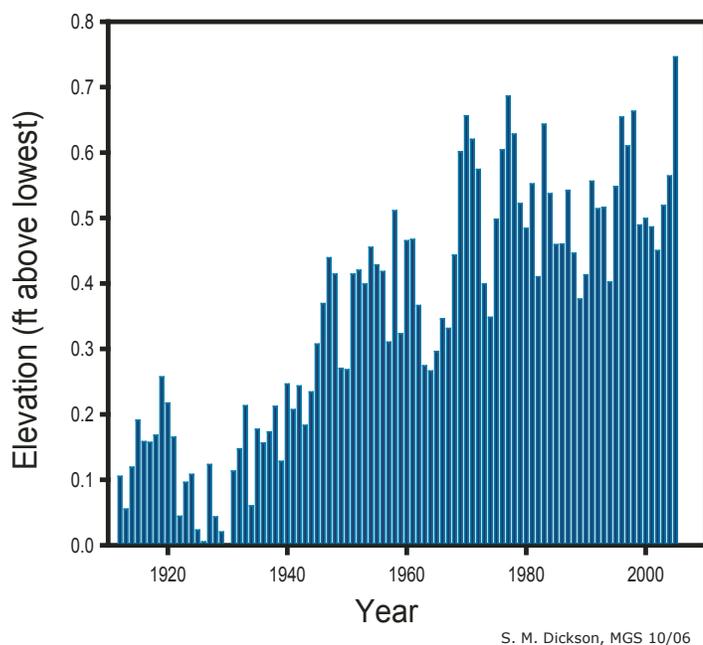
The inundation maps prepared by MGS and NRCM are distinct from the new Flood Insurance Regulatory Maps (FIRMS). Many southern Maine towns are working with the State Planning Office to improve the accuracy of flood maps and to prepare digital maps over the next two years. The inundation maps could help towns adopt hazard mitigation and emergency management plans as well as new regulations. For example, municipalities need to amend their shoreland zoning ordinances within the next two years to conform to changes in the state's model ordinance. In that process, Dickson suggests,

"Communities are going to need to think about how rising waters, higher winds and storm surge will affect their infrastructure including roads, pumps, wastewater treatment plants, buried power lines and utility poles."

Stephen Dickson, PhD
Maine Geological Survey

towns could adopt some new measures that anticipate rising sea levels. Planning boards also should consider revising floodplain ordinances to raise the minimum height for building 3 feet over the existing 1-foot freeboard. "Communities are going to need to think about how rising waters, higher winds and storm surge will affect their infrastructure," Dickson notes, "including roads, pumps, wastewater treatment plants, buried power lines and utility poles." Many towns will also need to consider whether to let salt marshes—the nursery ground for many fish and shellfish species—migrate inland, as current marshes become submerged.

Changes in Sea Level in Portland, Maine



Measurements gathered at a tide gauge in Portland indicate that sea level there has risen by 0.6 inches over the past 90 years.



A homeowner's humorous response to the prospect of sea level rise, above, may provoke a chuckle—but the problem is growing more serious.

Reducing Impacts from Development on Coastal Waters

An inverse relationship exists between land use and water quality: as development increases, water quality tends to decline. This pattern is particularly evident in the more densely developed coastal watersheds where nutrient and bacterial pollution is increasingly common. The recent Pew Oceans Commission report cites conventional development as a major cause in declining coastal water quality. Communities could lose valuable fish and shellfish habitat and experience more beach closings unless they take action to reduce runoff pollution from development.

Development that fragments the landscape tends to reduce natural vegetation cover and make it harder for rain to soak into the ground. More paved surfaces generate more runoff water, which carries contaminants from agriculture, landscaping, industry, vehicles and atmospheric pollution into vulnerable water bodies. To minimize this damaging runoff, towns in coastal Maine should consider two alternatives to conventional land development practices: Low Impact Development and Cluster Development.

Low Impact Development (LID) is an approach to site planning, design and development that attempts to conserve natural areas and minimize stormwater runoff. LID calls for careful site planning to retain existing vegetation and natural drainage patterns, minimize impervious areas, and protect vegetated buffer zones. LID also involves designing and incorporating best management practices (BMPs) that minimize runoff and treat stormwater as close as possible to its source (see LID Techniques). These small-scale controls often replicate natural processes in detaining and filtering stormwater. It's best to employ several different BMPs around a site—treating small amounts of stormwater close to the source and using it in beneficial ways, rather than collecting and discharging it as a waste product offsite.

LID helps maintain water quality and quantity on-site, reducing the risk that nutrients or sediment in runoff water will disrupt sensitive ecosystems. LID is particularly appropriate in areas where increased infiltration is needed to maintain stream flows, recharge aquifers or help mitigate flooding. It also is suitable for use in renovation and expansion projects, and for single-lot development.

Cluster Development is a planning and design technique that applies mainly to residential subdivisions, but also may be used for mixed-use developments. Cluster subdivisions (also known as conservation or open space subdivisions) are designed to concentrate building on the most suitable portions of a site, providing greater protection for natural resources than would be achieved with a conventional grid subdivision. Design standards for lot size, frontage, setbacks and roadways are reduced to allow greater design flexibility. In exchange, a substantial portion of the site must be set aside as protected open space. Cluster subdivisions are also valuable for open space planning and may help connect conservation lands at little or no cost to the public. Developers are discovering the many benefits of this approach, which often lowers the infrastructure costs of each dwelling and can raise property values by offering connections to trails and natural areas.

This piece was drafted by Russell DeConti, an independent planning consultant in Cape Elizabeth, and Ellie (Stewart) Baker from the Horsley Witten Group, Inc. in Newburyport, MA.

LID Techniques

LID Site Planning and Design to create stormwater management systems that work with the site's natural hydrology, minimizing land disturbance, and locating buildings in a sensitive manner (e.g., clustering).

Reducing Use of Impervious Surfaces in roads, parking areas and driveways (e.g., through sharing of parking lots and driveways).

Using Permeable Paving that allows rainwater to percolate into the ground while providing surface stability in parking areas and driveways.

Fostering Bio-retention (also known as "rain gardens")—landscape features that collect and treat rainwater, helping it infiltrate into soil.

Using Vegetated Swales (shallow drainage channels alongside roads, rather than conventional curb and gutter treatments) to convey and filter stormwater.

Installing Grassed Filter Strips (low-angle vegetated slopes, usually situated near large impervious surfaces, that slow and treat stormwater flows).

Creating Green Roofs (vegetated roof systems that capture rainfall and return it to the atmosphere).



Including permeable ground in parking areas not only improves aesthetics but reduces runoff.



East End Community School Green Roof, Portland, Maine.

Free Trainings Available on LID and Coastal Protection

Maine has an active program of Nonpoint Education for Municipal Officials (NEMO), helping planning boards, harbor committees, conservation commissions and other municipal staff and volunteers understand how best to address nonpoint source pollution (runoff from roads, development sites, farm fields and working forests).

The Coastal Program recently helped fund creation of a new NEMO presentation that demonstrates how runoff pollution from development affects coastal habitats, and suggests ways to reduce impacts. This program is useful for towns modifying their comprehensive plan or updating ordinances to improve water quality protection, and for those considering open space protection, a cluster development ordinance, or source water protection.

NEMO also offers trainings on Low Impact Development (LID) techniques (see sidebar). Following a slide presentation, NEMO Coordinator LaMarr Cannon talks about how to keep ordinances flexible enough to allow for LID, and how to integrate LID into existing projects and retrofits. Many communities are seeking this kind of LID guidance following the October 2005 approval of new DEP Chapter 500 stormwater regulations that encourage LID.

For more information or to schedule a NEMO presentation in your community, contact LaMarr Cannon at (207)771-9020 (or lcannon@maine.rr.com).



YardScaping for Healthier Waters

YardScaping seeks to inspire Maine residents to create and sustain healthy landscapes using ecologically based practices not dependent on irrigation, pesticides and fertilizers. The idea for this program first arose in 1997 after the Maine Legislature passed a resolve encouraging the State to minimize reliance on pesticides. In 1999, the Maine Board of Pesticides Control (BPC) and Friends of Casco Bay launched a pilot BayScaping project to reduce yard chemical runoff into Casco Bay.

The success of that initiative and similar programs across Maine prompted the BPC to reach out to homeowners and businesses statewide through its YardScaping Partnership (www.yardscaping.org), which advocates a new approach to lawn care. "Lower the bar on perfection," counsels Gary Fish of the BPC. "Beautiful yards don't have to be completely weed-free and bug-free: your yard can be an ecosystem instead of a monoculture."

To help people appreciate the benefits of ecological landscaping, the program is creating Maine's first public yardscape at a 2.5-acre site along Portland's Back Cove. The yardscape will have 4 demonstration plots with interpretive signage so that interested landowners and landscaping professionals can see how to create beautiful yards without pesticides and fertilizers.

For more information on YardScaping, contact Gary Fish (gary.fish@maine.gov, 287-2731) at the Maine Board of Pesticides Control.

Questions to Ask Lawn Care and Landscaping Services

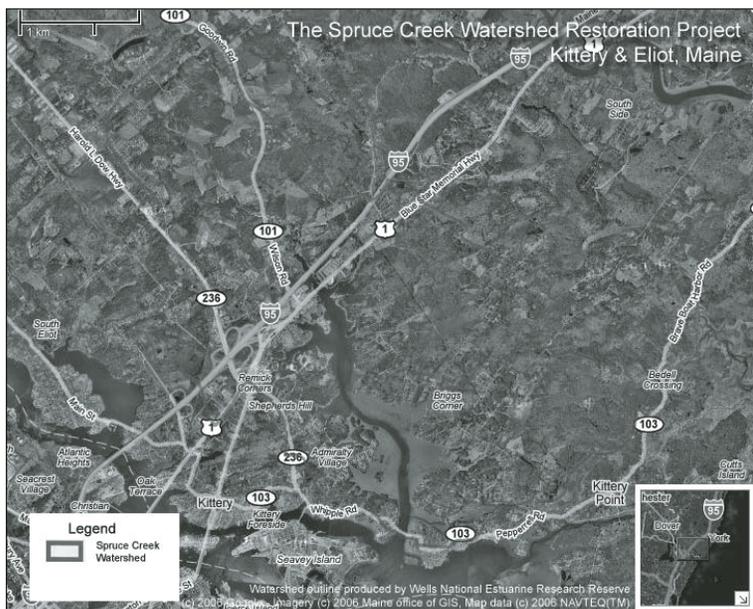
According to the BPC, 2.9 million pounds of yard care pesticides came into Maine in 2004—three times the amount used in 1995. That increase coincides with a tripling of yard care companies during the same period. If you hire out yard care, ask your provider the following questions:

- What is your company's approach to pest control? Do you monitor pests (versus applying insect or weed control on a fixed schedule)? Do you use non-chemical controls when possible, and use spot treatments rather than broadcast applications? Does your company use watering, mowing and aeration methods that reduce pest infestations?
- Do you apply fertilizer without testing to determine the soil's needs? (Find a company that applies fertilizer only when test results show it's needed.)

YardScaping Tips

- Reduce the size of your lawn; replace turf with native vegetation (groundcovers, shrubs, perennial flowers and ferns);
- Convert your high-input lawn to a low-input lawn by over-seeding with tall or fine fescue grass varieties;
- Mow high (2.5–3 inches) and let the clippings lie;
- Monitor precipitation with a rain gauge and water only as needed (lawns and plants typically need an inch a week of water during the growing season); and
- Test your soil before applying any fertilizers and apply a slow-release nitrogen formula only once in the fall (between Columbus Day and Halloween) when no rain is forecast (fall fertilization feeds the grass, not the weeds). Soil test kits are available from your county Cooperative Extension office.

Spruce Creek Association: Protecting a Priority Watershed



Passersby on the Maine Turnpike or busy Route 1 glimpse only a narrow span of water when they cross over Spruce Creek in Kittery. Just below Route 1, though, this tidal estuary opens out and runs for two miles through the center of Kittery before emptying into the Piscataqua River.

More than half the land in Kittery drains into Spruce Creek, including nearly a hundred acres of outlets and parking lots. Runoff from roadways and development has taken its toll on water quality, lowering oxygen levels and introducing bacteria and toxic contaminants. The Maine Department of Environmental Protection (DEP) lists Spruce Creek as one of 17 coastal watersheds named a “Nonpoint Source Priority Watershed” due to documented water-quality problems or threats (e.g., bacterial contamination, low dissolved oxygen levels, or toxic contamination).

The State’s commitment to restore the health of this beleaguered but beautiful creek is more than matched by a corps of dedicated local volunteers at the Spruce Creek Association (SCA, www.sprucecreekassociation.org). The watershed group has worked consistently since 2002 to monitor and improve the creek’s water quality.

With funding from DEP’s Section 319 Grant Program (see sidebar on page 7), the SCA recently completed a watershed survey to locate sources of polluted runoff. “Spruce Creek faces a ‘death by a thousand cuts,’” observes SCA’s Phyllis Ford, “with many small issues that have a huge cumulative effect. We have to work aggressively to fix these problems.”

Maine Coastal Program support helped Kittery undertake a year-long demonstration project, removing a tidal restriction under Route 1 to see if greater tidal flow to the upper creek would improve estuarine habitat and water quality. “The year is up, and those Route 1 flashboards will most likely remain out,” says Jon Kachmar, Habitat Restoration Coordinator at the Coastal

Program. “Our next effort is to properly size two culverts farther upstream (which are being replaced due to their age), making sure they allow for adequate flow.”

Coastal Program funds helped SCA create a searchable database of habitat restoration priorities within the watershed. “This is an incredible tool for us as we move forward,” reflects Ford. “It’s like a cookbook with all the recipes we need to succeed in restoring the creek.”

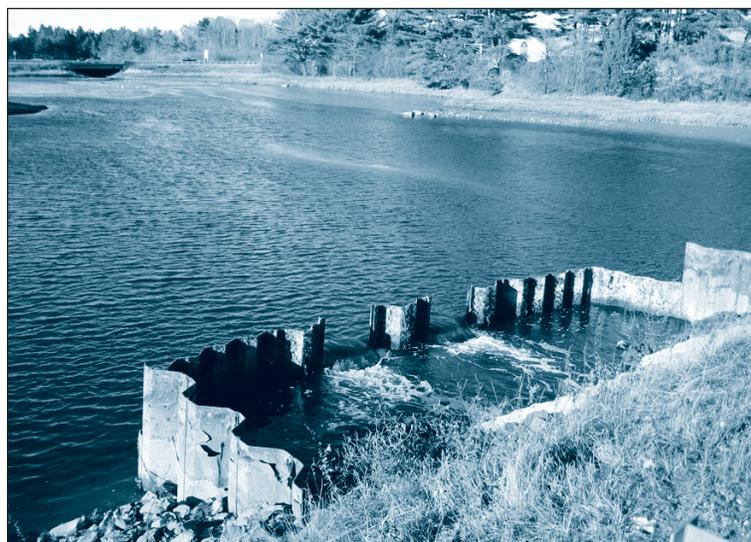
The SCA also collaborated with the Coastal Program to complete a stormwater inventory along Route 1, with help from supportive mall owners. Now SCA is finalizing plans with the Department of Transportation to install a rain garden (stormwater retrofit) that will treat some roadway runoff before it enters the creek.



Community volunteers helped SCA complete a nonpoint source pollution inventory.

Having gained a thorough understanding of what is affecting the creek, SCA is now working with the towns of Kittery and Eliot to apply for a major Environmental Protection Agency grant that would fund three years of actions to improve water quality and aquatic habitat throughout the watershed. The group also is securing many pledges and matching funds from area businesses active in the public-private partnership to restore Spruce Creek.

Don Kale, from the Division of Watershed Management at DEP, sees SCA as a terrific model of how communities can systematically assess pollution problems and then work to restore the health of coastal estuaries. “I can’t say enough good about their efforts,” Kale says. “They’ve gone far beyond anything I might have imagined in what they’ve accomplished.”



Removing these tidal restrictions formerly located by Route One has opened up tidal flow to the upper creek—improving habitat and water quality.

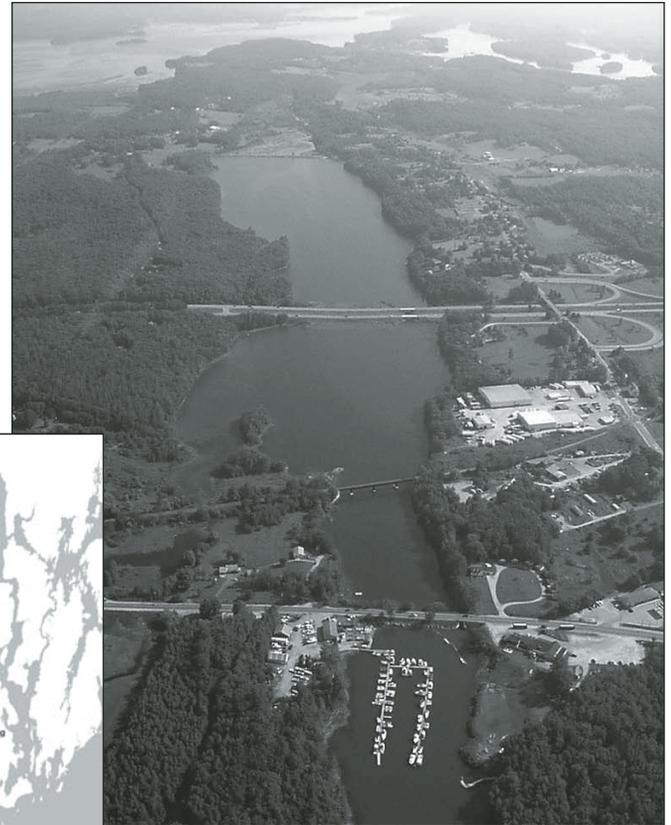
The New Meadows River Watershed Project

In 1999, five communities in the New Meadows River watershed began working together to protect the health of their shared resource. “With a river, people understand intrinsically that there’s a connection between them,” notes Theo Holtwijk, Brunswick’s Director of Planning and Development. Brunswick took the lead in applying for a Section 319 grant (see sidebar) from the Department of Environmental Protection (DEP) to locate and prioritize sources of polluted runoff into the Upper New Meadows River and make suggestions for their abatement. “A grant like that is a marvelous hook to get communities talking to each other about how best to spend the funds,” Holtwijk says. Now four of the towns (Brunswick, West Bath, Harpswell and Phippsburg) meet monthly to address concerns related to the river, and each contributes annually to finance projects not funded by grants.

The New Meadows River Watershed Project (NMRWP) involves more than municipal officials. There are representatives from the federal EPA, New Meadows Lake Association, Casco Bay Estuary Partnership, Friends of Casco Bay, Maine Coastal Program, Department of Marine Resources, DEP and Bowdoin College. Over the years, members of the group have worked steadily to identify sources of pollution, educate landowners about ways to reduce runoff, and train volunteers to monitor water quality and conduct shellfish bed surveys. Students at Bowdoin maintain an informational web site (www.bowdoin.edu/new_meadows/) and have helped out with numerous service-learning projects along the river. Removal of overboard discharge systems in West Bath and Phippsburg led to reopening of 1,500 acres of shellfish flats. Soft-shelled clams harvested from the New Meadows River over the last 5 years accounted for between 5 and 10 percent of Maine’s total harvest, generating well over \$1 million for local communities.

Many of the restoration projects were identified through studies the group completed, including two volunteer watershed surveys, a State of the River Report, and—most recently—a watershed management plan and strategic plan. Primary support for these assessments came through DEP’s Section 319 grants and Coastal Program funds. “Each study and report built on the previous one,” Holtwijk observes, “and led to on-the-ground achievements.” Currently, representatives of the NMRWP are embarking on a more sensitive project examining several possible scenarios for restoring tidal flow to New Meadows “Lakes” (a portion of the river where causeways have kept water levels fairly static). “While most people may not have known about our project before, we’re getting their attention now,” Holtwijk jokes, adding that the proposal has generated valuable discussions about how best to strike a balance when enhancing ecological values could potentially diminish property values (for landowners whose “lakefront” land might become more tidal).

NMRWP’s work has been valuable at many levels, Holtwijk believes. Beyond the practical work of restoration, “it’s given us an opportunity to talk to our neighbors, get to know them, and begin to form relationships.” He hopes that the project will become more involved in educational outreach in the future, and engage school children in service-learning projects throughout the watershed: “It would be nice to use the New Meadows River also as a resource for learning.”



The collective effort of four midcoast towns is helping to improve water quality in the New Meadows River.

Grant Opportunity for Municipal Watershed Work

The Maine Department of Environmental Protection (DEP) administers a federal grant program that could benefit coastal communities undertaking watershed-based projects. DEP awards grants for actions within a watershed that improve or protect a water body; for volunteer watershed surveys that identify sources of nonpoint source pollution and propose prioritized solutions with rough cost estimates; and for creation of locally supported Watershed Management Plans. “The vast majority of the \$600,000 awarded annually goes to inland communities,” says Don Kale of the Watershed Management Division at DEP. “It would be great to see more coastal communities take advantage of these grants to maintain or improve the health of their watersheds through active local or regional management. The Department can provide advice and technical assistance to sponsors to develop strong projects that stand a good chance of approval.”

Grant awards range from \$7,500 up to \$98,000, with a local match required. The RFP is posted each spring in March or April. For more information, view the program description on the DEP website, www.maine.gov/dep/blwq/docgrant/319.htm, or contact Norm Marcotte (207-287-7727, norm.g.marcotte@maine.gov).

Keeping Waters Clean

With funding support from the Maine

Coastal Program and Maine Outdoor Heritage Fund, the **Maine Forest Service** has published a new handbook for foresters, loggers, and woodlot owners entitled *Best Management Practices for Forestry: Protecting Maine's Water Quality*.

The booklet lists relatively simple, practical steps for protecting vegetation and reducing the amount of pollution and sediment entering waters before, during and after logging operations. The manual includes fundamental principles and specific guidance (for particular features such as stream crossings or log landings). It is available online at http://www.state.me.us/doc/mfs/pubs/bmp_manual.htm.



Reseeding along logging roads is one practice described in the MFS manual Best Management Practices for Forestry: Protecting Maine's Water Quality.

The **USDA Forest Service** has released a three-part Urban Watershed Forestry Manual that describes how to use trees to protect and restore urban watersheds. The first part describes methods for increasing forest cover; the second presents specific ways to incorporate trees into development sites; and the third provides detailed guidance on urban tree planting and maintenance. The manual is available online at <http://www.cwp.org/forestry/index.htm>.

The **Maine Department of Agriculture** has just published a new booklet summarizing information from many sources on best management practices in agriculture. It contains a description of the BMP development process, a brief description of each general practice, an index to help find BMPs for particular purposes, and an extensive list of references (with web links where available) to documents that describe the practices, their scientific underpinnings and their applicability. The Maine Coastal Program helped support the preparation of this booklet. For more information, contact Bill Seekins (207-287-7531, Bill.Seekins@maine.gov).



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The Maine Coastal Program represents a partnership of local, regional and state agencies that work collaboratively to enhance management of the state's diverse coastal resources. Housed at the State Planning Office, Coastal Program staff work extensively with governmental agencies and community organizations such as local land trusts and regional economic development groups. Planning and outreach focus on such issues as watershed management, development issues, fisheries management, water quality monitoring, marine education, citizen stewardship, coastal hazards, marine infrastructure and habitat protection.

For more information on the Maine Coastal Program, please visit our website at www.maineoceanprogram.org.



Maine Coastline Online

Past issues of *Maine Coastline* can be found on the Coastal Program's website. For more information on the following topics, please go to <http://www.state.me.us/spo/mcp/news.php#newsletter>:

- [Pew Oceans Commission, Spring 2002](#)
- [Nature-based Tourism, Winter 2003](#)
- [Working Waterfronts, Summer 2003](#)
- [Aquaculture, Winter 2004](#)
- [Managing Growth and Development, Summer 2004](#)
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