



Coastlines

Spring 2006



Commonwealth of Massachusetts

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Dear *Coastlines* Reader,

Welcome to *Coastlines*, the annual magazine of the Massachusetts Office of Coastal Zone Management (CZM). This edition focuses on "Smart Growth," a concept that has gained much state and national attention over the last few years. What, exactly, is Smart Growth? Smart Growth includes many elements with the overall goal of promoting better development and land use practices that make sense from an environmental, cultural, and economic perspective. Sprawling subdivisions and roadways lined with strip malls eat up extensive tracks of land, spread people out, add to commuting times, and erode our sense of community. Throughout eastern Massachusetts these growth patterns have irrevocably changed cities, towns, and landscapes. The good news is that many people, using common-sense approaches, have found alternatives that are good for communities and the environment.

You may still be wondering, what does Smart Growth have to do with coastal zone management? Well, the number one coastal pollution problem comes from the land. It's called nonpoint source pollution—the accumulated contaminants collected when rain and snowmelt run over lawns, roadways, farm fields, and other developed surfaces, picking up soil sediments, nutrients from fertilizers and sewage, and chemicals from pesticide use and other sources. This contaminated runoff ultimately flows to the sea or another water body. Smart Growth offers tremendous tools to combat this problem, leaving forest land and fields to slow and filter the runoff, while using practical techniques to minimize contaminants introduced to the environment.

The emerging and proven solutions presented in this edition of *Coastlines* are truly exciting, as is CZM's opportunity to work with so many inspired individuals and organizations to meet the Commonwealth's continually growing needs for housing, infrastructure, and economic opportunity, while maintaining a sense of culture and community, a healthy environment, and clean coastal waters.

For more on Coastal Smart Growth and other CZM initiatives, see www.mass.gov/czm, or sign up for CZM's monthly electronic newsletter, CZ-Mail, at www.mass.gov/czm/czmail/currentczmail.htm [to request printed copies, call the CZM Information Line at (617) 626-1212]. And, as always, please feel free to contact us with suggestions so we can better provide you with information in the future.

Sincerely,

Susan Snow-Cotter

Susan Snow-Cotter

Director, Massachusetts Office of Coastal Zone Management



“Smart Conservation”—Good for the Environment, Good for the Economy

By Stephen R. Pritchard, Secretary of Environmental Affairs

As SECRETARY OF THE EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS (EOEA), one of my major initiatives is called “Smart Conservation.” This strategy brings the conservation of air, land, oceans, and water resources together in a comprehensive approach that looks at traditional environmental protection and restoration issues in an innovative way. This progressive stewardship model integrates management systems, expands partnerships and leverage opportunities, and supports communities in adopting effective land use planning and development designs that creatively use incentives and conservation restrictions.

The results—balanced land use management decisions—make a big difference for the environment. Wildlife habitat remains intact, protecting biodiversity; natural landscapes are preserved, allowing for natural stormwater filtering and recharge that reduces pollution and protects drinking water; and homes are located closer to jobs and services, reducing car trips and improving air quality.

Balanced land use management decisions are not just good for the environment—they are good for the economy. Sprawling development is expensive, requiring extensive infrastructure such as roads, sewers, and water service (and their continual maintenance). Building homes far from economic centers increases commuting time and costs, and with high gas prices, this can have a big impact on family budgets. And of course, environmental impacts have an economic price tag as forests and fields make way for subdivisions and strip malls, removing nature’s water filtration system, which must then be replaced by costly drinking water, stormwater, and sewage treatment options. Finally, alternative approaches to sprawling development are good for developers (concentrated development and redevelopment that leaves open space intact has lower infrastructure costs), realtors (the value of the houses in these developments is higher), and entrepreneurs who are helping to build the way to a balanced and sustainable future.

The Coastal Smart Growth Program, which is featured in this edition of *Coastlines*, was built as part of my "Smart Conservation" initiative . The Smart Growth Program focuses on promoting Open Space Residential Design (OSRD), Low Impact Development (LID), and other techniques that you will read about in the pages that follow. These techniques use planning, design, and natural landscapes to protect the environment, while lowering development costs. This EOEA/CZM partnership has been extremely successful. Highlights include:

- ♦ The release of the Massachusetts Smart Growth Toolkit, which provides local officials and the business community with new methods to guide and promote sustainable and environmentally sound development and growth. (See <http://www.mass.gov/envir/sgtk.htm>)
- ♦ The LID Working Group, a statewide public-private partnership of local, state, and federal agencies; environmental organizations; regional planning agencies; and representatives from planning, engineering, law, and development firms. The group is pooling financial and technical resources to develop technical manuals and fact sheets, regulatory models, and associated outreach materials that promote LID.
- ♦ The adoption of dozens of local bylaws that promote OSRD, LID, and similar "smart growth" techniques in communities across the Commonwealth.

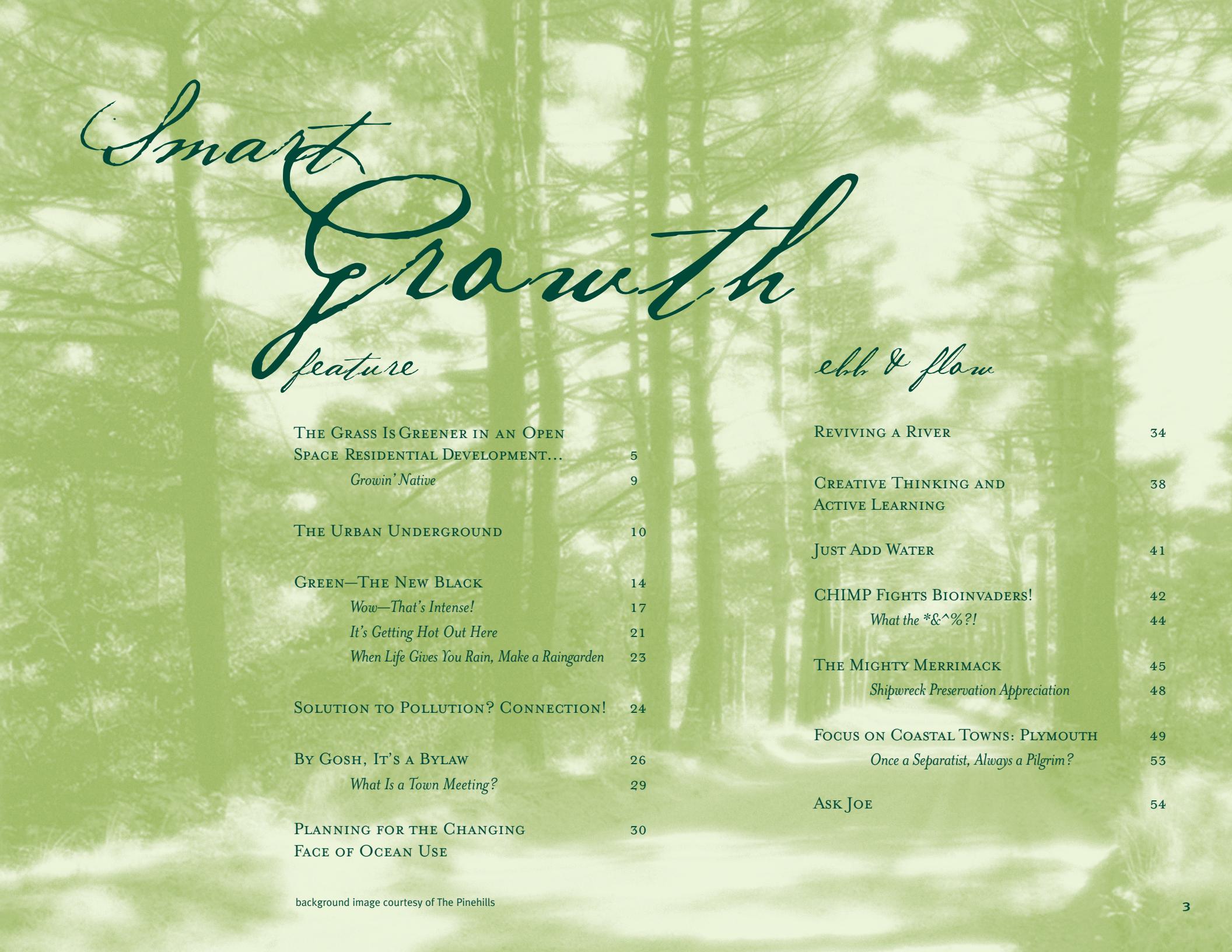
Through these efforts, "Smart Conservation" is a real win-win—benefiting the environment and the economy and improving the quality of life in Massachusetts, today and in the future. I hope you will find these tools and articles useful.

Sincerely,

A handwritten signature in blue ink that reads "Stephen R. Pritchard". The signature is fluid and cursive, with "Stephen R." stacked above "Pritchard".

Stephen R. Pritchard
Secretary, Executive Office of Environmental Affairs





Smart Growth

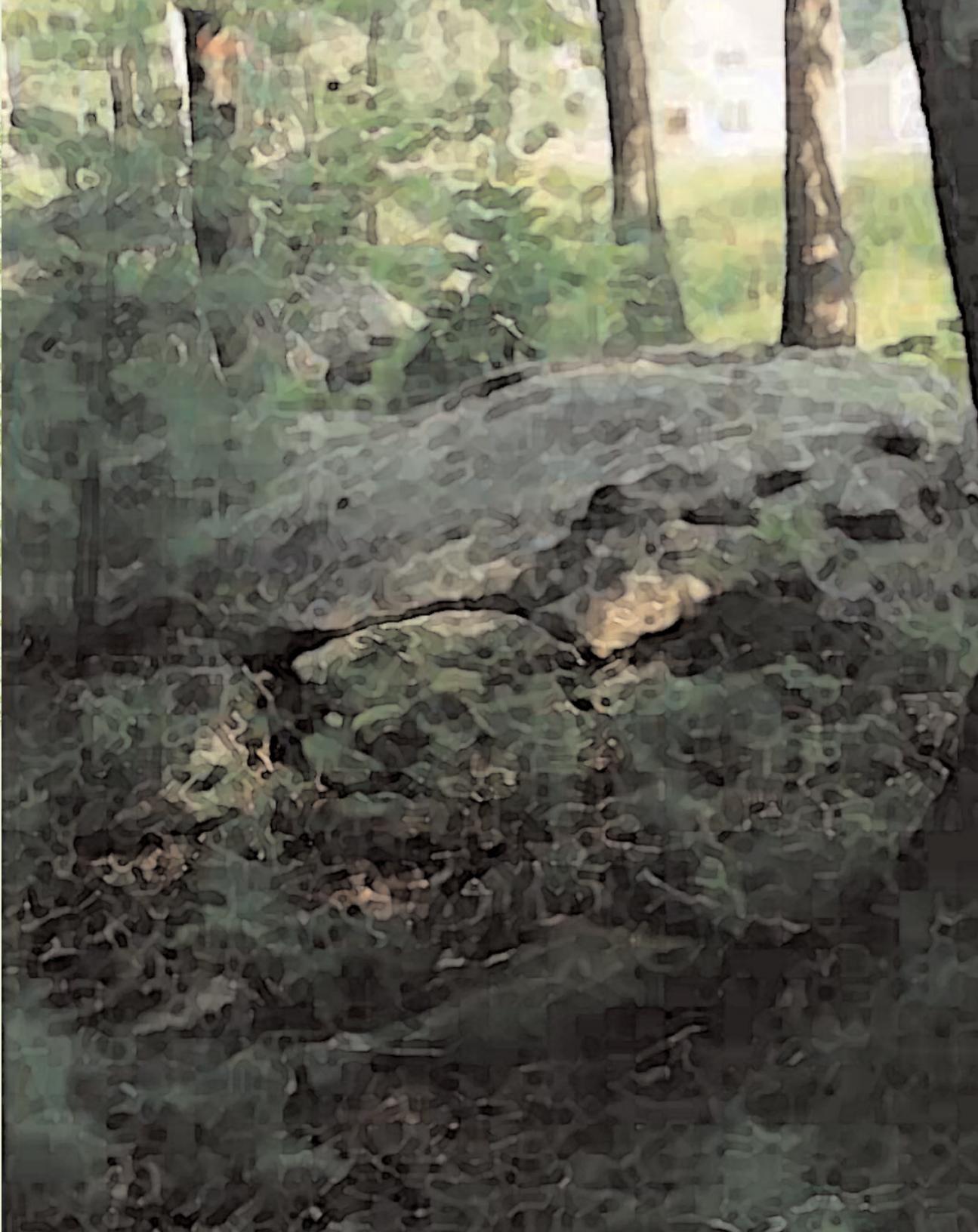
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ebb & flow

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*Seeing the forest,
the house, and the
trees—in Newburyport's
Colby Village, a typical
Open Space Residential
Development, forest
land is preserved
for all to enjoy.*





The Grass Is Greener in an Open Space Residential Development...

By Arden Miller, CZM

DURING THE 1970S AND 1980s, land development within Massachusetts increased by a whopping 45 percent, a stark contrast to the modest 15 percent growth in total population. Previously undeveloped areas that were home to birds and animals quickly became home to subdivisions and their accompanying houses, roads, septic systems, schools, municipal buildings, and businesses. As these developments grew across the state, environmentalists and residents who enjoyed open space became increasingly concerned.

Bigger Is Better?

In the Massachusetts towns north of Boston—an area including large stretches of wetlands, wildlife habitats, estuaries, and open spaces with unspoiled views of nature—things were no different. During this time, and into the 1990s, local regulations required new homes to be built on lots measuring one acre or more, the intention being to discourage dense development. Ironically, these requirements

actually exacerbated development pressures as houses, and the roadways leading to them, were developed on tracts of land that were often larger than they needed to be. What had once been contiguous open space, home to native flora and fauna, became fragmented parcels where little of the original plant and animal life, and even less of the original character, remained. With these developments came associated municipal costs—more roads to maintain, and more

Take a walk on the preserved side... Siting 66 units of housing on 125 acres, Caldwell Farm housing development (right, and below) in Newbury preserved 100 acres of open space containing fields, forest, and wetlands.



Trends suggest that by 2020, the population in Massachusetts will increase by 8%. By developing land in adherence with Smart Growth principles, the sprawl often associated with increases in population can be minimized.

stormwater runoff from the roads, which created more pollution and more water quality issues. On top of this, there was increasing concern over the loss of open space and the loss of wildlife and bird habitats. With their natural habitats disrupted, species such as wild turkeys and coyotes were suddenly making regular appearances on suburban lawns and town centers. What, if anything, could stop sprawl and preserve habitats?

To determine if Arendt's Conservation Subdivision Design might be used in place of conventional subdivision design on the North Shore, Cooper and Leahy set up a workshop where Randall Arendt addressed local realtors, land developers, builders, representatives from environmental groups, and members of planning councils and conservation commissions. After this initial workshop, attendees, along with others in the community, were invited to discuss what was and wasn't working within the current subdivision design model with the ultimate goal of coming up with something that would work better.

The first meeting, chaired by Cooper and Leahy, was attended by close to 20 people, all with strong feelings about land use and development. "Those first meetings were difficult, to say the least," Cooper recalls. "The developers didn't want the 'tree huggers' to tell them how to plan a subdivision and the environmentalists didn't want any more development on the North Shore." But despite the disparate, and often polarized views, everyone kept coming back to the scheduled monthly meetings. It took a year of hashing things out for the group to finally agree on something, and that something was that no one was happy with the existing regulatory system. "This first agreement was really the turning point," Cooper states. "After that, we were all determined to work together to find something that would work."

The group, representing 18 different public and private organizations, officially named themselves the Green Neighborhoods Alliance. Between 1996 and 1997, there were many lengthy discussions, but the polarization that marked earlier meetings was no longer there. "People saw that they would have to give in on something they wanted in order to get something else that they wanted more," Cooper recalls. What came out of this year of

compromises was a fully drafted regulatory model, based on Arendt's development designs, that focused on these four steps:

- 1) Identify areas for open space preservation based on environmental and social priorities;
- 2) Site the houses to maximize the number of lots with great views of the protected open space;
- 3) Design roads to minimize their length, width, and cost; and
- 4) Draw the lot lines where they logically fall once the best locations for open space, houses, and roads are all identified.

Realizing the Values

The Alliance took these core concepts of Arendt's, adding more flexibility and incentives for builders and developers, and christened their bylaw model Open Space Residential Design (OSRD). Of course Rome, and OSRD subdivisions, were not built in a day. After continued discussions and community meetings, the OSRD model was adopted as a regulatory tool by Newbury in 1999. Unlike a traditional subdivision where each individual house has as much land surrounding it as the owner can afford, in an OSRD development, houses are set closer together in what's known as a "cluster development." The land that would ordinarily be surrounding houses is zoned in one continuous expanse that everyone in the community has access to and views of. Ideally, the land with the most historic value, or the land that is home to species that rely on it for sustenance, is preserved. This way, natural scenery is saved and views of historic structures, such as stone walls, cow paths, rural roads, native forests, and, in some cases, even farmland with fruit trees, can be enjoyed by all. The set up is similar to living in a golf course community where, interestingly enough, up to 80

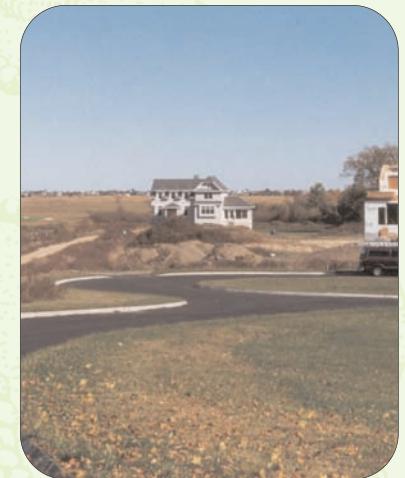
percent of the residents don't golf, but rather choose to live there for the views.

Style and Substance

In addition to the aesthetic desirability, there are many other benefits. First off, roads can be smaller, and fewer are required. Generally, the access to these houses is along one road, and often that road is a dead end, eliminating excessive through traffic and reducing stormwater runoff from paved surfaces. As for developers, this method streamlines review, both a time and money saver. And site development—aka landscaping and infrastructure—costs are minimized, as most of the terrain is left *au natural*. For realtors and those who are buying into an OSRD, it's been shown that homes in these subdivisions appreciate more than 12 percent faster than their counterparts in conventional subdivisions.

Al Symes, of Symes Associates, Inc.—a real estate development and property management company—is one of the original Alliance members. "At the time we began discussing open space design, we were one of the first groups in Massachusetts to consider this as a development tool. I'm happy to see that these concepts have spread to a national level since then. Having good planning tools from the start makes everything better in the long run." Symes isn't the only one impressed with the model; in 2004, the Green Neighborhoods Alliance was one of 15 groups state-wide to receive the U. S. Environmental Protection Agency's Environmental Merit Award in recognition of the work they've done to "reshape suburban development to reduce sprawl and minimize environmental impacts."

By 2001, seven communities had passed OSRD bylaws and the seeds of reshaping conventional subdivision design were spreading. And, to this day, the reshaping continues;



Shared driveways and smaller roads in subdivisions like Colby Village mean less road run off and pollution.

as of early 2006, a total of 24 towns have passed bylaws that require developers to use the OSRD model in new developments, and another 12 have added OSRD components to their bylaws. Such developments include Caldwell Farm in Newbury, Old North Mill in Hopkinton, Assabet Estates in Westborough, Canterbury Farms in Amherst, and Bellows Farm in Acton. Each development had unique features and

the flexibility of the model allowed for varying lot sizes and creative design, sometimes leading to significant savings. For example, the Old North Mill development in Hopkinton donated 20.24 acres of land to a local land trust, which resulted in tax benefits for the residents, while Assabet Estates in Westborough reduced overall roadway from the conventional 2,453 feet to 1,679 feet, minimizing road maintenance and stormwater runoff treatment costs, all while preserving natural vegetation.

The viability and profitability, not to mention the environmental sustainability, continue to make this adaptable model appeal to developers, environmentalists, and residents. But, for some, that was just the beginning. Having spread the OSRD model, Cooper now convenes a monthly meeting to promote the virtues of Low Impact Development (LID), another tool for keeping Massachusetts cleaner and greener. With LID, the focus is on maintaining natural terrain and nature's water cycle. To give an example, by planting trees, shrubs, and grasses that are native to Massachusetts, individuals and businesses can realize significant savings because these plants are hardy and require no fertilization and little or no watering to survive. In addition, by reducing road width and planting natural grasses on site, less pollution runs into streams and wetlands and groundwater is able to recharge, helping to preserve drinking water supplies. Cooper's monthly LID Working Group is open to representatives from state, federal, non-profit, and private businesses and agencies—basically, any person or group that wants to explore ways to lessen the effects of pollution and development on the environment. "We've laid the groundwork through OSRD. People are more open to creative ways to save the environment and their money," Cooper states. "I think most people are willing to do things differently, but if they don't know there's a problem, they're not going to change things. We just need to keep spreading the word."

Got cows? In the Old North Mill development in Hopkinton, cow paths were preserved.



photos by Heather Clish

Growin' Native

By Arden Miller, CZM

When landscaping in Massachusetts, using indigenous plants and grasses benefits the environment in a number of ways. Thinking locally and growing natively, the Parker River National Wildlife Refuge Visitor Center has created a site that demonstrates some of the aesthetic and environmental advantages of using local plants. The Center was awarded grant money from Massachusetts Environmental Trust (MET) by Massachusetts Office of Coastal Zone Management (CZM) as part of both agency's efforts to promote Low Impact Development (LID). The LID philosophy is to reduce the need for water and fertilizer, hence conserving water and decreasing pollutants through eco-friendly landscaping. (For more on LID principles and practices, see *The Solution to Pollution? Connection! The Story of the LID Working Group* on page 24.)

The Visitor Center, with its entrance in Newburyport, is located off of the road to Plum Island, next to the Parker River National Wildlife Refuge. (The Refuge occupies three quarters of a mile of the eight mile barrier beach, which is an important stop over for migratory birds.) The one-acre parking lot at the Center was landscaped in June of 2004 with close to 700 natives, including bayberry, pitch pines, high- and low-bush blueberry, and Virginia roses (and, yes Virginia, while this variety of rose may not sound native, rest assured, it is!). This less-than-natural setting

of a parking lot mimics what you'd find on a beach: extreme temperature changes, high winds, sand, and salt. Due to the plants' local origin, they are already adapted to these conditions, and adept at helping to anchor the soil, while also acting as a natural filtration system for stormwater. (This last piece is crucial as stormwater runoff can contain all sorts of nitrates and pollutants that, left unfiltered, can end up in local rivers, tributaries, and the ocean.)

As more people become aware of the benefits of LID and Massachusetts towns adopt ordinances and policies to reduce the use of chemical fertilizers, such pilot plantings offer a real-life demonstration of how native plants can do good while looking good. Another consideration that is gaining increased attention, both nationally and locally, is water conservation. While the Bay State is in no way arid, there have been a number of summers when water conservation is not just encouraged, but required. Unlike their non-native counterparts, native grasses and plants can survive during times of feast or famine, making them desirable ecologically, economically, and aesthetically.

The Center's parking lot brings these principles to life, literally, and educates visitors through signage, pamphlets, and their website, www.fws.gov/northeast/parkerriver/nativeplant1.html.



Nearly 700 native plants went into the Parker River National Wildlife Refuge Visitor Center's demonstration site.



As natives of Massachusetts, sweet fern (left) and virginia roses (above), are able to withstand New England temperature extremes.

Kathryn Glenn, regional coordinator of CZM's North Shore office worked with the Center on the project. "By using only plants that are native to Plum Island, this project illustrates the way native plants adapt to, and thrive in, their natural habitat," Glenn explains. "The Center's lot successfully demonstrates that landscaping can be in harmony with nature."

THE URBAN UNDERGROUND

Fields, Forests, Brooks, and Blacktop - Can't We All Just Get Along?

By Ethan Nedea

I WAS WALKING IN DOWNTOWN AMHERST one lazy morning when I passed the sign for Tan Brook; on it was the silhouette of a wood duck. But there was no bridge or culvert, no sound of rushing water, and certainly no wood ducks. There was only a print shop, Italian restaurant, parking lot, and busy road. Curious and with time to kill, I wandered across the parking lot, between some buildings, and came to another road with the same sign—but still no wood ducks. Finally I knelt down and peered through stout iron grates at the corner of a parking lot and saw inky water several feet below. **Tan Brook.**

*Drain, drain, go away...
OK, we need our drains.
But some of the stuff that
ends up inside them and,
ultimately in our lakes,
rivers, and oceans...
not so much!*

I spent the afternoon cutting through neighborhoods, hopping fences, and peering down storm drains to trace Tan Brook from its headwaters (a small pond near a cemetery) to its confluence with the Mill River (near a sports arena). From what I could see, about 80 percent of Tan

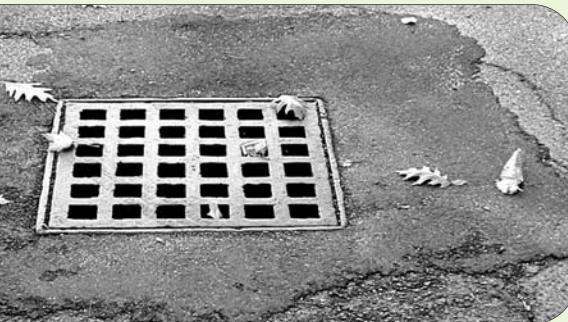
fields. Its waters were seasoned with a concoction of road salt, oil, grease, pizza crusts, dog poop, lawn chemicals, and other urban ingredients. I felt deceived. Living in a progressive and environmentally friendly community, I assumed our natural resources were revered. The Department of Public Works was kind enough to give the drainage system a name (albeit not the most flattering one) and a wood duck silhouette on the sign (a cruel sense of irony). Yet it was unfortunate that a stream that once drained a rich deciduous hillside and supported a diverse community of aquatic insects was now relegated to an underground drainage network, removed from sight and disconnected from our lives.

DISMANTLING ECOSYSTEMS

One of the greatest threats to natural

ecosystems is mankind's tendency to wipe the natural slate clean when colonizing an area. In the United States, for example, we have cleared land, leveled hills and valleys, filled wetlands, channeled water into engineered conduits, and paved broad areas. This ensures that our structures have solid foundations that vehicles can travel smoothly and at a high speed, and that water and waste are quickly directed toward a convenient depository.

This high-intensity land use has steadily engulfed vast amounts of land throughout the United States. From 1982 to 1997, urbanized land increased by 25 million acres in the contiguous United States (NRI 2001), and the rate of development has continued to accelerate in the last decade. Experts predict that by 2025 there will be 68 million more developed



photos by Ethan Nedea

Brook flowed through underground pipes that drained nearly 60 percent of the downtown area and nearby college campus. The brook flowed underneath vast parking lots, roadways, buildings, and athletic

(roughly the size of Wyoming) and that 25 percent of coastal areas will be developed (up from 14 percent in 1997) (Beach 2002, EPA 2001). Coastal watersheds are already greatly threatened, as coastal counties comprise only 17 percent of the land area of the contiguous United States but contain more than half of the human population (NOAA 1998, Beach 2002). Impervious surfaces—such as roadways, parking lots, and rooftops—now cover more surface area in the United States (nearly 45,000 square miles) than do all remaining herbaceous wetlands. An additional 1 million single-family homes, 10,000 miles of roadways, and countless other buildings and parking lots will likely be built annually in the coming decade (Elvidge et al. 2004).

In natural landscapes, the air, land, water, and living organisms comprise a dynamic ecosystem driven primarily by the hydrologic cycle. Impervious surfaces break the connectivity between the above-ground and below-ground portions of a watershed. This connectivity is of utmost importance to element and nutrient cycling and to virtually all ecosystem processes, including maintenance of biological diversity. It even affects climate. Therefore, it should not be surprising that impervious surfaces and engineered landscapes that intercept and direct water off the landscape cause myriad environmental problems.

Impaired water quality, loss and degradation of terrestrial and wetland ecosystems, coastal pollution, water shortages, damaging floods, and harm to fish and wildlife populations can be partly or wholly attributed to impervious surfaces and poor water conservation.

Studies have demonstrated that when impervious surfaces cover greater than 10 percent of a watershed, freshwater and coastal ecosystems begin to suffer sharp and sometimes irreversible declines in health (Schueler and Holland 2000). Some Massachusetts watersheds have more than 50 percent of the land areas as impervious surfaces, especially in the Boston metropolitan area. Each day, millions of gallons of reusable freshwater are expeditiously removed from local hydrologic cycles rather than being recycled on the landscape. Rainwater and snowmelt are wasted because they run off rooftops, cannot infiltrate pavement, and flow quickly across monocultures of manicured grass. A one-acre parking lot produces 16 times more runoff than a one-acre meadow (Schueler and Holland 2000).

Worse, this wasted runoff leads to concentrated pollutants in water bodies. Surface water is directed toward gutters, which lead to storm drains, which empty into streams, rivers, or the ocean. Urban runoff is responsible for 55 percent of

environmentally impaired ocean shorelines, 46 percent of impaired estuary miles, and 21 percent of impaired lake-miles in the United States (EPA 1998).

Soils that were once alive with roots, microbes, invertebrates, and burrowing vertebrates remain comparatively dormant beneath pavement and buildings in urban areas. Some creatures still lurk below the asphalt or live in storm drains, clinging to the sad remnants of once productive habitats. Ants spill out of fissures in the pavement to drag pizza crusts and scones into their underground labyrinths. Worms are displaced by street flooding and writhe on wet pavement until the clouds break and the sun turns the plump pink bodies into flat scorched ribbons. Larval sewer flies and rat-tailed maggots live in the anoxic urban stormwater soup and siphon oxygen from the atmosphere until they finally metamorphose into aerial adults and fly skyward through manhole covers. This is life in the urban underground: cosmopolitan creatures that can withstand almost every threat that humans throw at them.



*Tan Brook: Neither tan, nor a brook. And not a wood duck in site.
Discuss...*

STARTING OVER

Every so often, I find myself daydreaming about how my life could be different if I could start again, armed with a lifetime's



DUMP NO WASTE



DRAINS TO RIVER

Unfortunately, this message often goes unheard and unseen.

ways that we develop and use natural resources evolve tremendously as we learn from centuries of experience. There is a growing awareness of the consequences of land use, urban design, and consumption on our lives and the environment. Urban design and planning is a rapidly evolving field of engineering and applied science, but putting theory into practice is challenging because cities are already built—existing infrastructure and design constrains new creativity. How can we start over?

One major challenge will be to reduce the effects of impervious surfaces and find ways to deal with urban runoff and non-point source pollution. Although the concept of reducing impervious surfaces is alluring to environmentally conscientious people who like to feel grass below their feet and relish the rich smell of earth, there are many practical limitations. Basketballs do not bounce on

worth of insight and clarity. I do not begrudge the learning process, but it is sad to think that I may get to apply lessons learned along the way only late in life. We build our communities just so—the

wood chips. Roller blades come to a rapid halt when people veer into the grass. And most people would not think of taking their sport utility vehicles off road. So how can we increase the porosity of the landscape to retain water and maintain existing infrastructure and preserve our quality of life?

Creative minds continue to explore ways to conserve water and restore ecosystems in an asphalt world, but the complexity can be overwhelming. Ideas range from rooftop gardens and cisterns that trap rainwater, parking lot designs, to regional planning and zoning (including bylaws and ordinances). At a regional scale, planning and zoning dictate where development will occur. At a neighborhood scale, planners focus on the arrangement of different land uses, street layouts, and optimum population densities. At a site scale, the focus is on construction practices, stormwater designs, buffer widths, and landscaping. It may be impractical to redesign cities altogether—Boston's Big Dig is a testament to the costs involved with urban reconstruction (as of November 2005, nearly \$15 billion had been spent on this effort). But as human populations soar in Massachusetts municipalities and urban sprawl engulfs rural areas, there is ample opportunity to

design efficient environmentally friendly communities that conserve water.

New philosophies named "Smart Growth," "Smart Conservation," and "New Urbanism" guide development in some areas of the country. Smart Growth promotes compact development, reduced impervious surfaces and improved water retention, protection of environmentally sensitive areas, mixing of land uses (e.g., residential, office, and retail), public transportation, support for pedestrians and bicyclists, and other urban design features such as greenways. [Massachusetts Executive Office of Environmental Affairs has produced the Smart Growth Toolkit, a great resource for integrating these principles into local and regional planning; see www.mass.gov/envir/smart_growth_toolkit/index.html.]

Thinking of all the ways to reduce impervious surfaces and conserve water is like standing in a penny candy store with a nickel in your pocket—mouth watering, wistful, and wide-eyed—considering all of the glorious possibilities. If you are like my wife around candy, then you understand that the sadness of not having everything is often stronger than the happiness of having a nickel's worth. The decision is invariably slow and reluctant. But the

need for water conservation is immediate; many of our streams and coastal waters are approaching an environmental tipping point beyond which they will be as woeful as Tan Brook.

Reviving the urban underground will require water: water to soak thirsty soils, water to recharge critical aquifers, and water to sustain streams and wetlands. This calls for a broad, long-term effort by all levels of government, land developers, building material suppliers, private businesses, and not-for-profit environmental groups. Finally, these efforts must be buttressed by a culture of conservation among citizens.

If you do not have the time or wherewithal to join local government or planning boards to effect change at a broad scale, just look around your home and yard for places to begin. I built a small pond in my backyard this summer, intercepting surface runoff before it got to the stormwater drain of the housing development next door. A green frog moved in within days—I have no idea where it came from but my satisfaction was immense. I am digging out the old cement walkways leading to my doorways in favor of wood chips, adding more gardens, and directing rooftop runoff into rain barrels. That

is my contribution for now—rainwater will not reach Tan Brook and be whisked away to Long Island Sound. It will remain close to where it landed and support all the frogs, birds, and thirsty roots on my humble parcel of land.



Ethan is a science communicator, environmental consultant, and graphic artist. He lives amongst pervious and impervious surfaces in Amherst, Massachusetts. Ethan can be contacted through his web site, www.biodrawversity.com.

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DANGER: All Roads Lead to Someone's Watershed! Pollutants and other unsavory things go down the drain, and into our waters.

photo by Dave Merrill



Green— The New Black

Out of the Dark and into the Green, Everything's Coming Up Sedums

By Arden Miller, CZM

What do New York City's Rockefeller Center, the Ford Motor Plant in Dearborn, Michigan, and Boston's Four Season's Hotel have in common? While all well-known institutions, their *raisons d'être* vary greatly. In Boston, the elegant five-star Four Seasons Hotel is renown for their elaborate high tea service and the rumored celebrity sightings (Mick Jagger! Meryl Streep!), while in the Midwest, the Ford Motor Company's 1,200 acre plant is one of the largest car, truck, and sports utility vehicle manufacturers in the world. And Rockefeller Center is synonymous with New York City's annual internationally broadcast tree lighting ceremony. But despite these vastly different associations, these landmark institutions share one surface area that is the same: green roofs.



photo courtesy of Mathew Carr, Hydrotech

Just Add Plants

What are these green roofs, and where did the idea of planting things atop a building spring from? Simply put, a green roof is created when a traditional rooftop is sealed with a protective waterproof membrane, and then a drainage layer, a minimum of two inches of soil, and plants are added, resulting in a rooftop that is covered in—among other things—green. (For specific details, and types of green roofs, see “*WOW—That’s Intense!*” on page 17.) As for the second part of the question, according to legend, their roots, pardon the pun, go as far back as 600 B.C. with the fabled hanging gardens of Babylon.

Considered to be one of the Seven Wonders of the World, the rooftop trees and hanging vines that allegedly graced the famed Mesopotamian palace were created by King Nebuchadrezzar to cheer up his foreign-born wife, Amyitis, who missed the greenery of her homeland. These precursors to today’s green roofs were made by filling the hollowed out areas on top of terraces with soil and planting trees and vines. Fast forward to more than 2,000 years later and 4,000 miles away where resourceful Icelanders started

using sod as insulation for both their roofs and walls in the mid-1800s. To this day, a number of these sod-covered buildings live on (and you thought vinyl siding was long lasting!). Some, such as the still functioning “sod church” in Vidimyri, Iceland, have even become popular tourist attractions.

From Beer Gardens to Roof Gardens

Green roofs have been dotting the European landscape since the late 1960s. But nowhere have green roofs caught on faster—or become more common place—than in Germany. Once upon a time, few vacations to Germany were complete without a trip to one of their world renown beer gardens. But today, roof gardens are a far more common site. In the 10 years between 1989 and 1999, German roofing companies installed nearly 350 million square feet of green roofs. And today, it’s estimated that Germans have somewhere between 800 million and one billion square feet of green roofs!—to put it in a New England perspective, that’s the equivalent of 3,300-4,250 Fenway Parks (including the stands!).

Growing greener: The rooftop of Manulife Financial in Boston has a variety of native grasses and plants that provide a nice view and help to insulate the building from extreme temperatures.

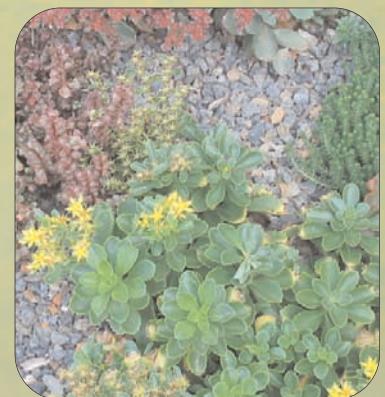


photo courtesy of Boston City Hall

Close up of sedums on Boston City Hall’s roof top. Due to their hardiness and resistance to drought, sedums are often used in the construction of green roof tops.

In Deutschland, they feel so strongly about the benefits of dachbegrünungs—that's green roofs to us—that in some cities, such as Hamburg, more than 90 percent of all commercial and residential rooftops are green, and in other cities, such as Stuttgart, all new buildings are required to use green roof technology. A driving force behind these requirements is the demonstrated ability of green roofs to retain stormwater after a rainfall; rather than having countless gallons of water flooding the sewage system, or picking up toxins that get washed into rivers and streams (and, when the geography dictates, can ultimately end up in the ocean), the rain is absorbed on rooftops where, even after an intense storm, only a small portion of it ends up as runoff. To defray the costs of treating water that is not collected by a green roof, and to encourage businesses and individuals to replace traditional black asphalt rooftops with green ones, some German cities levy a "rain tax" on non-greened tops.

Black v. Green

Meanwhile, on this side of the Atlantic, there has been no talk of a rain tax, but green roofs are appealing to more and more people for a variety of reasons. Rick Mattila of Genzyme in Cambridge, Massachusetts, explains their decision to have an extensive green roof installed: "We can see the Charles River right from our

building, and we know that 75 percent of the pollution in the Charles comes from stormwater runoff. This is something we can do to help the environment we live in." Mike Maloney of Maloney Morris Associates has been installing green roofs around New England since 1998. "Every year since I've been in the business, more people have become interested—the word is definitely spreading. From an ecological standpoint, they reduce stormwater runoff and also help with the urban heat island effect," Maloney explains. (For an explanation of the urban heat island affect, please see, "*It's Getting Hot Out Here!*" page 21.)

For others, going green is an aesthetic or business decision. Matt Carr is a member of the American Society of Landscape Architects, and has worked for Hydrotech, a leading green roof installer in the United States for 15 years and, during that time, has been involved in the scoping of more than 250 green roof projects. "A lot of people are interested in having a green roof because it's a fifth architectural dimension and can give buildings a unique look; it's something special and different. Others just want to know 'When will I see the return on my investment?'" To answer that last question, a series of things need to be taken into account—building size, average outside temperature, type of heating and cooling systems, and

*City 'Scapes: Chicago
City Hall's award-winning
rooftop was planted with 400
kinds of plants and flowers,
all native to Illinois.*



photo courtesy of Roofscapes, Inc.

Wow—That's Intense!

By Arden Miller, CZM

When it comes to rooftops made with veggie toppings, there are two basic kinds: extensive and intensive. Both start with a waterproof membrane to seal the rooftop so that water cannot penetrate, and both include an irrigation layer and growth medium—also known as an overburden—made up of nutrients and soil. Where the rooftops differ is in the amount of growth medium, the filter and irrigation systems, and what's on top.

Basically, anything from three to six inches of growth medium supports what's known as an extensive green roof. These are the rooftops that are not made to be publicly used spaces, but rather to insulate the building from cold and heat, catch stormwater runoff, and help reduce the urban heat island effect. (Other benefits to the extensive roof system can include creating a wildlife habitat area for the birds and the bees, providing insulation from overhead noise, and providing an aesthetically pleasing view.) Extensive green roofs usually weigh between 15 and 50 pounds per square foot and cost between \$10 - 15.00 per square foot to install. It is generally recommended that the plants receive fertilizer and water regularly until they have grown in (usually, this happens within six months of planting them). Once established, unless there is a severe drought and they require

watering, they are basically self maintaining. In some cases, professional installers will recommend that the rooftop system include a drip tube so that, in times of excess rain, the roots don't drown.

When a roof has anywhere from six inches to three feet of overburden, it's called an intensive green roof. These weigh in up to 150 pounds for each square foot and can cost up to \$75 per square foot to install. The intensive green roof has all the benefits of the extensive top, plus the ability to hold larger amounts of stormwater runoff, and it can support shrubs and trees in addition to ferns, flowers, and sedums. To ensure that the trees and plants have adequate room for roots, and ample drainage and water opportunities, intensive roofs have more construction layers. Depending on the types of plants selected, and the desired look, an intensive rooftop, like one's backyard or a public park, generally requires grooming, weeding, and fertilizing. These are solid roofs that can support human activity, and they are often designed to be used as outdoor park-like space.

Most installation companies guarantee the integrity of the green roof's membrane, and will replace it if there are any leaks. An annual



photo by Brad Rowe, Michigan State University



*Top: An intensive rooftop greets diners at this Lansing, Michigan restaurant.
Left: Tulips and grass brighten the views of the Callahoun School's rooftop in New York City.*

inspection, for drainage and leaks, is advisable. Be they intensive or extensive, or a combination of the two, with more than 400 types of drought-resistant plants and flowers available, landscaping possibilities are as vast one's imagination.

N.B.: All growth systems vary, depending on the installation company, and these facts and figures are not meant as guidelines for installing your own green roofs, tempting as that may be. For information on professional roof contractors, see www.greenroofs.com/directory.php.

Old Green: A sod church in Iceland (top) still standing after nearly 400 years. New Green: A restaurant in Wisconsin has a grass roof that is regularly shorn by sure-footed goats!



internal settings commonly used—and there is no precise answer. (It is estimated that a green roof can cut cooling costs by 20 to 30 percent.) But one thing is clear: having a green roof reduces costs on both the heating and cooling fronts. When it heats up outside, your traditional blacktop roof absorbs the heat, making air conditioner units put in for overtime when temperatures soar. Conversely, having the extra insulation on the outside—not unlike the sod-covered buildings the Icelanders created 200 years ago—helps keep heat in when temperatures dip. "Most buildings will realize a 33 percent savings in heating and cooling costs after a green roof is installed. In energy cost savings alone, they should pay for themselves in six or seven years. If that isn't enough reason to want one, consider this: the average black asphalt roof requires replacing every 10 to 15 years," Carr adds. While green roof technology is still a relatively new concept, the

Rockefeller Center's intensive green roof—in place since the mid-1930s—is still holding up, and the German rooftops that have been in place since the 1970s have never needed replacing.

But What About the Cost?

And Do We Have to Hire a Gardner?

Initial expenditures—on average, a green roof will cost anywhere from \$10–75 dollars/square foot to install, which is about twice the cost of a traditional blacktop roof—are a prohibitive consideration for some. And then there's the question of maintenance. Who wants to weed and prune the rooftop? It is possible, even preferable from an environmental perspective, to have a rooftop installed that requires very little to no maintenance. The plants most commonly used are sedums, which are in the cactus family and naturally require very little by way of water and nutrients to survive, and can withstand high winds, drought, storms, and intense sun. "Most rooftops require some initial attention; during the first year, as they are growing in, you'll want to make sure that the plants are taking and sprouting where you want them to. And, if there is a drought, of course you have to give them some water," Carr explains. An exciting development in the world of native plantings and green roofs for the East Coast area is the work currently being done by Jeff Liecht. A botanist and former professor at Tufts University, Liecht is cultivating a variety of ferns and



photo by Sara Windjue



photo courtesy of Mathew Carr, Hydrotech

“A lot of people are interested in having a green roof because it’s a **fifth architectural dimension** and can give buildings a unique look; it’s something special and different.”

-Matt Carr, Hydrotech

Green and Blue: Looking out of the window at Boston’s Manulife Financial, you can see the green roof in the foreground, and Boston Harbor beyond.



photo courtesy of Boston City Hall

Boston City Hall's terrace (top) has been brightened by rooftop plantings that were selected for color and durability.
In Cambridge, Genzyme Corporation had a green roof installed to lessen stormwater runoff to the Charles River.

other native New England plants that will offer the potential to go both green and native. (For more on native plants and their benefits, see "Growing Native" on page 9.)

Still not convinced? There are a number of reasons to embrace the green side. Besides energy cost savings, stormwater runoff reduction, rooftop longevity, and aesthetics, some other reasons to consider the vegetative topping include:

- Heat island reduction (see article "It's Getting Hot Out Here!," right).
- Habitat for wildlife (plant it, and they will come).
- Noise reduction (the denser, softer surfaces absorb sound).
- Better air quality (plants absorb carbon dioxide, a main ingredient in greenhouse gasses, and release oxygen).

A Growing Trend

Regardless of motivation, businesses, individuals, and municipalities all over the United States are installing green roofs. City Halls in Atlanta, Chicago, Portland, and Seattle all have green rooftops. (Interesting side note: the rooftop of Chicago's City Hall is planted with 400 different species of plants and flowers, all native to Illinois, and the project won the 2002 American Society of Landscape Architects Professional Merit Award.) Boston's City Hall has undergone a greening too; their 8th and 9th floor terraces are part of a green roof demonstration garden, inspired by the May 2005 Green Roof Conference held in Boston. Across the United States, university campuses—including Harvard, Carnegie-Melon, Massachusetts Institute of Technology, University of Georgia, North Carolina-Chapel Hill, Pennsylvania State, and Michigan State—all have green rooftops on at least one of their buildings. (On some campuses, such as Michigan State and Carnegie Melon, researchers are carefully monitoring plant life and water



It's Getting Hot Out Here

By Arden Miller, CZM

If you were to overhear someone talking about “urban heat island,” you might assume they were discussing a t.v. show. Unfortunately, they’re not. While the phrase is evocative of a “Survivor” type reality show, urban heat island refers to the unique phenomenon whereby many cities, lacking in greenery and covered in concrete, are 2 to 10 degrees hotter than surrounding lesser developed areas.

Cause and Effect

When you have an area where there is a large collection of tall, dark buildings and parking lots made of asphalt, two things happen: first, the black asphalt rooftops and parking lots absorb the heat (much like a person who is wearing black on a hot summer day); second, the tall buildings trap heat. Adding to the sticky, icky heat felt when temperatures reach high levels are the additional air pollutants—pollutants form faster in hotter weather, and vehicle emissions in urban areas create extra ozone that, without adequate amounts of greenery to give off energizing oxygen, stick in the air and can make it difficult to breath. Combined, this effect is known as urban heat island.

Hotlanta: A Case Study

Atlanta is often referred to as “Hotlanta” for good reason. Between 1970 and 1980, the

population grew by 27 percent—it was a “hot” place to move to. By 1990, the population increased by an additional 33 percent. Suburbs doubled in size, nearly 350,000 acres of forest were cleared to make way for housing and roads, and dark roofs and pavement took over. And then things got really hot. Meteorologists regularly noted that temperatures inside the city were 10 degrees higher than in the outlying areas.¹ Ten degrees is a lot, especially in a southern city. And, while difficult to prove the exact numbers of oxygen-giving greenery that would need to be planted to completely ameliorate this situation, the more vegetation on the ‘island,’ the better. When it comes to putting their money where their heat island is, Atlanta’s City Hall is leading by example: they’ve had a 3,000 square foot green roof since 2003. With this roof’s high visibility (it’s open to the public during business hours and visitors and employees can eat in a cafeteria that overlooks the roof garden), the message that green roofs are functional and beautiful is spreading.

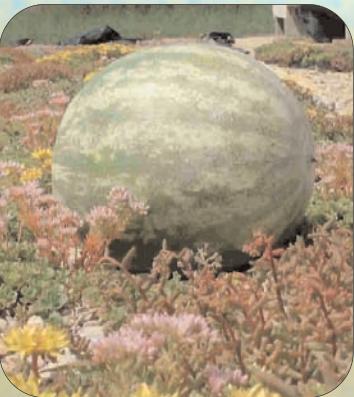
Hotter than Hell’s Kitchen

But it’s not just the south that has a heat problem: in New York City, more than Hell’s Kitchen can get very, very warm in the summer. And, like Atlanta, the higher city temperatures are

attributed to urban sprawl. To address their island’s heat island effect, Manhattan’s Greening Gotham Organization has formed an alliance with the national environmental organization, Earth Pledge, and together they have created the Green Roof Initiative. One offshoot of this collaboration (which includes city, state, and private citizens) is the green roof demonstration project at Pace University. The U.S. Environmental Protection Agency and Pace University will monitor the effects that the 30,000 square foot green roof—one of the largest in the city—will have on the climate. On a smaller scale, Greening Gotham encourages private citizens to add green to their rooftops by offering the consulting services of experienced pro-green roof professional engineers and architects, often for free. And such grass roots initiatives and collaborations are forming in other cities.

As of early 2006, Boston, Chicago, New York, Portland, Seattle, Washington, D.C., and Toronto are watching more and more green spring up. Someday, with proper planning and planting, “urban heat island” will be nothing more than a reality show and we can choose to watch it, or to change the channel.

¹ Dr. Keith Heidorn, The Weather Doctor, July 1, 2002



Green roofs: Not just for eco-freaks! Dogs and watermelon lovers can appreciate them too, as these two examples from the Michigan State Green Roof Project show.

retention to add to the growing body of research on the topic, and at the University of Pennsylvania, Professor David Beattie, a long-time advocate of green roofs, teaches a course on the topic and has an outdoor area devoted to their study that is affectionately called "Beattieville.") A number of commercial buildings have gone green, too. In Connecticut, Foxwoods Casino—the largest resort casino in the world—has an extensive intensive green roof, while on the West Coast, headquarters for The GAP outside of San Francisco have been teaming with green since 2001. Lincoln Center in New York City, the largest performing arts center in the world, is pushing the green envelope artistically with their plans for a sloping green roof that will be open to the public as part of a multi-million dollar "Avenue of the Arts" renovation project. In Pittsburgh, Pennsylvania, the Heinz 57 Center (yes, the ketchup people!) provide employees with 12,000 square feet of roof meadow and flowering perennials to ponder while thinking up their next condiment campaign. And, closer to home, IKEA, (the Swedish furniture and home accessory giant best known by some as Jerry's furniture store

of choice on Seinfeld), supports 37,000 square feet of green atop its environmentally friendly Stoughton store.

LEED By Example

The Deerfield Academy, a college preparatory school in Deerfield, Massachusetts, plans to make the most of their

green roof. The project is expected to be complete in spring of 2006, at which time the students will begin monitoring the types of sedum used for school credit. And, while the students are getting credit for their research, the school will be getting credit for having the roof installed. For developers and builders, using energy-saving techniques such as green roofs can qualify them for Leadership in Energy and Environmental Design (LEED) certification, which leads directly to financial savings through tax credits, and has the added cache of being lauded as an environmentally friendly entity.

Everything's Coming Up Roses...

If rooftops imitate life, they'll never be a bed of roses. But beds of colorful sedums, ferns, native plants, and trees are in our foreseeable future. "More and more people are interested in marrying the ecological and technological benefits with the pretty designs," observes Matt Carr. "As we look to ways to conserve our resources and take care of what we have, green roofs are going to become even more popular. And if you don't care about that stuff, well, they just look good." As the seeds spread, be on the lookout for green. It's the new black.

Sources

¹ Is That a Garden On Your Roof?, *Newsweek*, August 5, 2005

More Information

<http://www.greenroofs.com/> <http://www.greenroofs.org/>

<http://hortweb.cas.psu.edu/research/greenroofcenter/>

http://www.lid-stormwater.net/greenroofs/greenroofs_home.htm

<http://www.earthpledge.org/GreenRoof.html>

<http://www.hrt.msu.edu/greenroof/>

When Life Gives You Rain, Make a Raingarden

By Betsy Rickards, CZM

Raingardens—known in some circles as bioretention cells—appear on the surface to be a shallow depression containing plants, grasses, and flowers. What distinguishes them from other gardens is their ability to retain water, specifically rainwater, that would otherwise flow over asphalt, pick up pollutants, and ultimately end up in rivers, streams, and the ocean.

And not only do these pretty little retention cells lessen contamination in our waterways; rain gardens also recharge the groundwater supply, which ultimately benefits drinking water supplies. How do they do this?

Well, compared to a traditional lawn, rain gardens soak as much as 30 percent more rain. And by holding the water in their tight little grip, the plants and soils capture the water and sediments and absorb nutrients and pollutants from sources such as fertilizers, pet wastes, and oils. Subsequently, the water that makes its way to local water bodies is significantly cleaner. As an added bonus, this extra retention helps to moderate flooding, which reduces erosion of the banks and shoreline.

Rain gardens can work virtually everywhere. If you have some outdoor space, you can help by

planting one to collect runoff from your roof or, if circumstances allow, to capture water that drains from your driveway or lawn. Rain gardens are very easy to establish on new residential construction. On existing lots, the most difficult work might be in removing the existing grass and plants. Most gardens are created by digging a shallow area in the lawn. (If rain doesn't soak readily into the ground, layering a combination of sand, gravel, soil, and mulch into the garden plot will quickly solve the problem). Next, select hardy native plants (for more on native plants, see “Growing Native” on page 9) with deep root systems and place them in the garden. For an additional benefit, you may choose plants that are attractive to birds, bees, and butterflies. The end result is a beautiful, low maintenance garden that is beneficial to you, the environment, and your community. Give it a try! For a user friendly guide on designing and building a rain garden on a residential site, visit: <http://clean-water.uwex.edu/pubs/raingarden/rgmanual.pdf>.

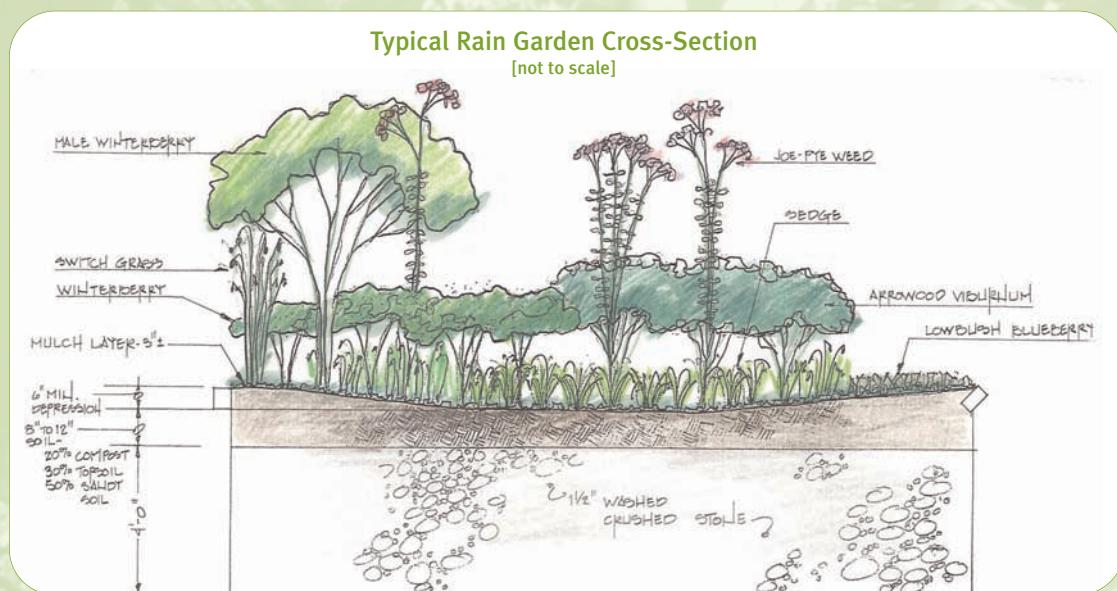


Illustration courtesy of Comprehensive Environmental Inc.

I beg your pardon, what is a rain garden? These shallow depressions filled with plants benefit the environment in many ways. Left: The anatomy of a rain garden. Right: Rain garden in action.



Solution to Pollution? Connection!

The Story of the LID Working Group

By Anne Donovan, CZM

Many in Massachusetts have become involved in using and promoting Low Impact Development (LID) principles to help lessen the negative effects of environmental pollutants.

It all started with a conversation between colleagues. In 2003, Andrea Cooper (then the North Shore Regional Coordinator for the Massachusetts Office of Coastal Zone Management [CZM]) and Vicky Gartland (then a Hydrologist with the Massachusetts Department of Conservation and Recreation [DCR]) were musing about what, if anything, they could do to stem the Bay State's sprawling development patterns by promoting this new-to-Massachusetts idea—Low Impact Development (LID). Being practical (and connected), they decided the first step was to gather a group together that could promote LID concepts. The goal was to evaluate what scientific, technical, and outreach resources were needed to promote LID in Massachusetts; identify what already existed; and determine what gaps remained.

Cooper took over as coordinator of this ad hoc conglomeration of about 25 interested and active participants. Originally, those with a technical focus and those with an outreach focus met separately, talking among themselves about the resources that were available and the resources that were needed. Once the outreach group identified that one of the biggest gaps was technical assistance materials, however, the group decided to become one—the LID Working Group—to overcome the obstacles involved in effectively implementing LID at the local level together.

The enthusiasm was infectious as collaborators constructively shared information. In one of its first tasks, the group developed a spreadsheet that served as an LID wish list, complete with what was already being done to fill the needs. The simple effort had big dividends. Within months, LID Working

Group members were applying for (and receiving) grants to complete projects to fill in the spreadsheet holes. Specifically:

- DCR received a \$1 million Targeted Watershed grant from the U.S. Environmental Protection Agency (EPA) for pilot projects to demonstrate the feasibility of LID and water conservation techniques in the Ipswich River Watershed.
- The North and South Rivers Watershed Association received a Section 319 Grant from the Massachusetts Department of Environmental Protection (which administers these EPA funds) to produce a Massachusetts edition of the national LID video called Reining in the Storm.
- The Boston Metropolitan Area Planning Council, in coordination with the I-495 MetroWest Corridor Partnership, received EPA funds to develop fact sheets, model bylaws, and other materials for an LID Toolkit, which is available online at <http://www.mapc.org/LID.html>.

For the first six months or so, the LID Working Group focused on updating each other on the flurry of LID activity happening in the state. Over time, however, this information exchange began to take place through group emails, while the meetings began to focus on educating members on different aspects of LID. The goal was to identify issues and obstacles from the diverse perspectives of the different members to resolve problems before the LID techniques were promoted outside the group. Topics covered have included: examining design criteria, methodology, and assessment data regarding the effectiveness of LID methods; green roofs; permeable pavers; bioretention; and vegetated filter strips.

The collaboration and communication have lead to resounding success. LID Working Group members are:

- Actively promoting model LID bylaws—five communities have bylaws in place while another 18 are preparing to adopt bylaws as of May, 2006.
- Spreading the word about effective LID models in Massachusetts, including an ambitious project in Cohasset to retrofit 52 catch basins with bioretention cells, complete with a community demonstration in the town center that shows how the cells look from the beginning of the installation to full grow out.
- Assisting the Massachusetts Environmental Policy Act Unit in ensuring that LID practices are considered for use in major development projects, such as the IKEA furniture store in Stoughton.
- Reaching local officials in LID workshops and seminars (500 so far and still counting).

The LID Working Group now has more than 100 members, including representatives from: local, state, and federal agencies; conservation organizations and watershed associations; private law, planning, and engineering firms; developers and landscape architects; regional planning agencies; the University of Massachusetts; the University of New Hampshire; and the National Association of Home Builders. This true public-private partnership has resulted in a real pooling of resources, connecting those with funding and expertise with those with implementation strategies.

And it all started with a conversation.

For details on the LID Working Group, contact CZM's Coastal Smart Growth Coordinator, Andrea Cooper, at andrea.cooper@state.ma.us or (617) 626-1222.

More than 100 and *Still Counting*

On July 19, 2005, the membership of the LID Working Group officially reached 100, and membership continues to grow! As of press time, here is the complete list of member organizations: 495/MetroWest Corridor Partnership; A.D. Makepeace Company; Agresource; Allsopp Design; Ambient Engineering; American Hydrotech, Inc.; Anderson & Kreiger LLP; Boston Society of Architects; Buzzards Bay Project; Charles River Watershed Association; Cities of: Newburyport and Salem; Comprehensive Environmental Inc.; Conservation Law Foundation; Eight Towns and the Bay; Environmental Business Council of New England, Inc.; Essex County Community Foundation; GeoSyntec Consultants; Great Meadows LLC; greenGoat; Groundwork Lawrence; Horsley Witten Group; Lawrence Community Works; Low Impact Development Center; Massachusetts: Department of Conservation and Recreation, Department of Environmental Protection's Bureau of Resource Protection (Stormwater, Wastewater Management, and Wetlands Sections), Department of Fish and Game, Department of Housing and Community Development, Environmental Policy Act Unit, Executive Office of Environmental Affairs, Office of Coastal Zone Management, Office of Community Development, Riverways Program, STrategic Envirotechnology Partnership, and Water Resources Commission; Massachusetts Audubon Society; Massachusetts Association of Conservation Commissions; Massachusetts Bays Program; Massachusetts Watershed Coalition; Merrimack Valley Planning Commission; Metropolitan Area Planning Council; MetroWest Growth Management Committee; Miller Microcomputer Services; Nashua River Watershed Association; New England Civil Engineering Corp.; Norfolk Ram Group, LLC; North and South Rivers Watershed Association; North Shore Regional Conservation Commission Network; Patriot Resource and Conservation Area; Rainwater Recovery Inc.; Rubin and Rudman LLP; Salem Sound Coastwatch; Spear and Associates; Symes Associates, Inc.; The Green Round Table; The Neve-Morin Group, Inc.; Towns of: Andover, Cohasset, Duxbury, Framingham, Franklin, Gardner, Groton, Ipswich, Kingston, Littleton, Marshfield, Norwell, Plymouth, Southborough, and Topsfield; U.S. Department of Agriculture and its Natural Resources Conservation Service; U.S. Environmental Protection Agency's Region 1: National Pollutant Discharge Elimination System Storm Water Permit Program, Office of Wastewater Management, Office of Communities and Smart Growth, and Office of Wetlands, Oceans & Watersheds; U.S. Senator John F. Kerry's Office; University of Massachusetts; University of Massachusetts Extension; University of New Hampshire Stormwater Center; Wachusetts Working Landscape Partnership; Waquoit Bay National Estuarine Research Reserve; Weston & Sampson Engineers, Inc.; and Woodard & Curran.

By Gosh, It's a Bylaw - Changing the Way Towns Are Developed through Town Meeting

By Andrea Cooper, CZM

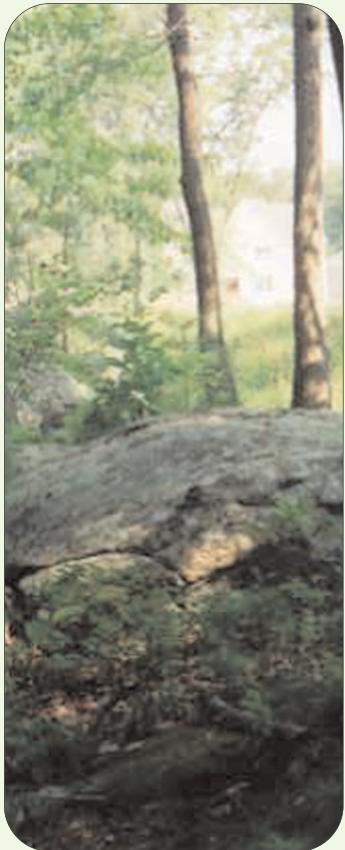


photo by Andrea Cooper

Bylaws protect open space and preserve views like this one in Colby Village.

Open Space Residential Design (OSRD) is an important component of "Smart Growth" that, when incorporated into a local bylaw, paves the way for developers to design and build new residential subdivisions that reduce the impacts of stormwater runoff, preserve open space, and protect unique habitat.

As one can imagine, introducing a concept that changes the way subdivisions are built and land is used—not to mention getting towns and cities to buy into it—takes a lot of time and planning. Between 2000 and 2005, the "Green Neighborhoods Alliance" championed the OSRD model to 19 towns and two cities in Massachusetts and all adopted bylaws (or, in the case of cities, ordinances). This statistic on its own is impressive enough for people to ask us, "How did you do that???"

To answer that question, we need to begin where it ends: the Town Meeting. Rarely found outside of New England, these are meetings where residents decide upon issues that will impact their lives. (For a comprehensive explanation of Town Meetings, see *What Is a Town Meeting?* page 29.) If you are a registered voter within a Town Meeting town, you can think and act locally by just following established practices for placing an article on the ballot. (And you can have a say in the ballot's outcome.) As the history of Town Meetings in Massachusetts demonstrates, however, there is rarely such a thing as "just," at least not when it comes to implementing real change or passing bylaws that will affect how people can develop and use their property.

So where to begin? If you're committed to seeing your article become a bylaw, you carefully lay the groundwork for at least a year prior to even bringing it up for vote in Town Meeting. As CZM's North Shore Regional Coordinator, and founding member of the Green Neighborhoods Alliance, I learned, thanks to shared wisdom of many others, how to get bylaws passed that, quite literally, have changed the face of several North Shore communities. When attempting to get a bylaw passed, the most important thing is to develop an outreach strategy prior to the Town Meeting. You don't want to be on the defensive. By the time your bylaw is brought up as an article for voting, you want to be sure it's going to pass.

To do this, you need to find out who the towns' movers and shakers are. If they have issues with your article, invite them to attend a public forum where the issues will all be addressed. When they understand your article, ask them to vocalize their support to neighbors and friends. Do be careful of the people who come "out of the woodwork" to support you. Remember: just because someone is eager does not guarantee they'll be an asset to your cause. Once the prospective bylaw has been brought into public consciousness, hold public forums (any resident can do this in a library or other public building and it allows people to express concerns and ask questions).

It's really important to listen carefully to people's concerns; you want to find out what your obstacles are and who needs to have their obstacles addressed. It's also important

know which community institutions need to be on board—the Historical Society, the Neighborhood Association, Mother’s Against Drunk Driving, the Coffee Klatsch at the local diner—in order for something to pass. You can’t just generically address different factions, you have to figure out each group’s specific concerns and allay their fears by explaining how your proposal will help rather than harm their life and the community.

When it comes to outreach, it’s crucial to have a strategy to reach as many people as possible. Use the press—*Letters to the Editor* in the local newspaper is a great forum, people actually read those, especially in small towns. You need to

“ It’s important to know which community institutions need to be on board... You can’t just generically address different factions; you have to figure out each group’s specific concerns and allay their fears by explaining how your proposal will help... ”

get the word out and explain the positive benefits of your bylaw to people. If they don’t know how it’s going to help them, they aren’t going to care if your article gets passed or not. You need to make them aware, make them care. If a developer thinks a part of your proposed bylaw is going to make things more difficult, you need to research that and outline the positive benefits they’ll experience.

Along with Kathy Leahy of MassAudubon, North Shore developers, planners, and the Metropolitan Area Planning Council, we developed and distributed OSRD brochures and made presentations to everyone from neighborhood associations to the local chamber of commerce. You don’t

need a fancy brochure—just one that clearly explains the benefits. Anyone can hand out flyers at the town’s busiest spots, like in front of the post office and the town recycling center—and don’t forget those school events!

In several towns where we worked to pass articles, the recruitment of those who would be directly affected by OSRD bylaws was critical. After key developers came to understand that this new kind of zoning would give them design flexibility, they became advocates of the plan and brought its message to others in their field. They helped immensely by being able to answer their peer’s questions from a business and development perspective. I cannot emphasize enough how important it is to have those directly

involved promoting the message. It’s one thing for environmentalists to say, “We need to preserve the nice land for the birds!,” but when you can get someone who’s not a bird lover to explain the benefits of having preserved land in a community in terms of increased property values, adding buffers to existing neighborhoods, and shorter roadways for the town to maintain, those who might not care about the birds will listen.

Before Town Meeting, it’s a good idea to hold a second public meeting just to make sure that all issues and potential issues have been addressed. Open with a statement explaining how this particular bylaw resolves formerly identified issues.



*The Long and Historic Road:
In Pinehills subdivision
in Plymouth, this historic
road was preserved.*

Have a cheat sheet and don't be afraid to refer to it. You don't want to forget to address any of the concerns that have been brought up previously or you'll lose your case before you even begin. In the case of OSRD, we integrated our environmental message with public health (preserving drinking water supplies), economics (cost-effective for the developer and taxpayers), and social (providing the community with walking trails and

photo courtesy of The Pinehills

open space to meet and socialize in)—in other words, we had something for everyone so the message connected.

After you've done all this, and feel confident that your article has enough support to pass, it's Town Meetin' time! Be sure to hand out fact sheets at the start of Town Meeting (they'll help refresh people's memory and give them something to do while waiting). When it's time to bring the article up for a vote, recapitulate your message (don't forget the cheat sheet!) and allay concerns. If at any time you sense a negative vote, it's time to exit gracefully. Remember: it will be easier to say, "I've heard your concerns and I move to postpone the vote..." than to reverse a negative vote.

Town Meetings are a great place to affect change. The average person can make a profound difference in their community. All you need is a plan, a quorum, and an issue you feel passionate about.



Andrea Cooper is the Smart Growth Coordinator for the Executive Office of Environmental Affairs and Massachusetts Office of Coastal Zone Management. She continues to champion OSRD and other principles that protect the environment, preserve open space, and reduce pollution in Massachusetts.

What Is a Town Meeting? *By Arden Miller, CZM*

Like pahking the cah in Havahd Yahd, Big Dig ice cream, and the Evacuation Day holiday (aka Saint Patrick's Day in Baaahston), Town Meetings as a form of local government are rarely found outside of New England. For communities that consider themselves to be towns—a definition based not on size, by the way, but on the municipality's charter—the Town Meeting form of government is mandatory. (In Massachusetts, a city form of government can only be adopted by a community with a population of 12,000 or more, but an area with more than 12,000 residents can still call itself a town and practice the Town Meeting form of government if it so desires. Confused? Yeah, well welcome to Massachusetts!

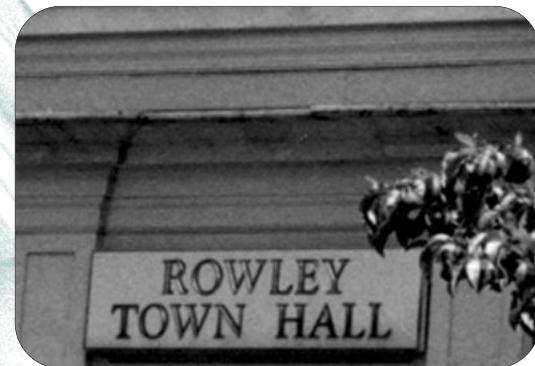
Open v. Representative

There are two distinct types of Town Meetings: Open Town Meeting and Representative Town Meeting. The Open Meeting is for towns with 6,000 or fewer residents. In this forum, the Board of Selectmen (the group of officials elected to administer the public business of a New England town) will call the meeting by issuing a warrant (i.e., a list of items known as articles, to be voted on). Articles are to Town Meeting what Bills are to the State Legislature and, if they pass, they become a locally enforceable

bylaw. All of the town's registered voters are welcome to attend and vote on all articles. For the towns with 6,000 or more residents, the Representative Town Meeting is the norm (any town can elect to have the Open Meeting, but few in the larger-than-6,000-residents category do). In the Representative Meeting, votes are cast by those elected by the townspeople to be Town Meeting Members. (Not unlike how a U.S. Representative would vote on behalf of their constituents in Congress.) A town could have as few as 45 Town Meeting Members, or, as is the case with Framingham (the state's largest town), as many as 216 Town Meeting Members.

Special or Annual?

All towns and city's that have the Town Meeting form of government have an Annual Town Meeting (in many towns, this is more commonly known as the Annual Budget Meeting), held sometime between February 1 and June 30. Since towns' fiscal years begin on July 1, this meeting is where the town resolves any leftover financial issues and then approves the next year's budget. The meeting may also include non-budgetary items, such as articles on the town's zoning bylaws. An article can get brought up for voting through a variety of channels,



Town Hall—the hottest spot to motion, second, and vote in town.

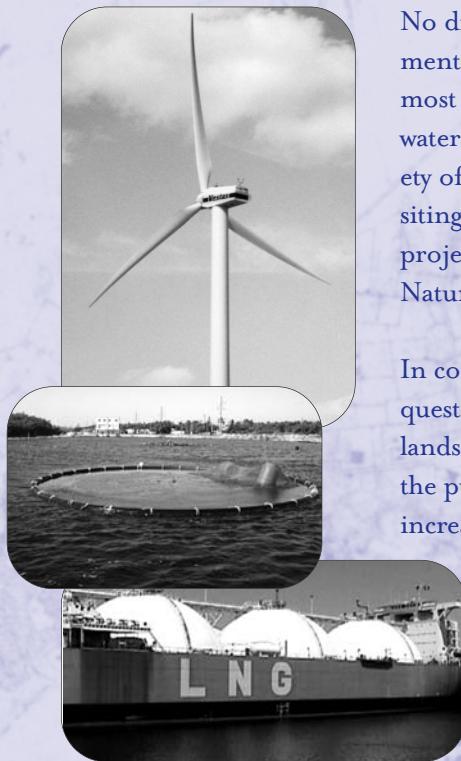
including the request of a specific town department (e.g., the water and sewer commission), or through a petition signed by 10 or more of the town's registered voters.

The second type of meeting is the Special Town Meeting. These are held whenever necessary to deal with issues that can't wait until the Annual Meeting. For an article to be considered for a Special Town Meeting, a petition needs to be signed by either 20 percent of the town's population, or 200 people, whichever is the lower number. When voters call for a meeting through a petition, the Selectmen have 45 days to hold a Special Town Meeting.

Annual, Special, Open, or Representative: Town Meetings are an effective way for citizens in New England to affect change.

Planning for the Changing Face of Ocean Use

By Kate Killenlair Morrison, CZM



From wind turbines to aquaculture to Liquefied Natural Gas (LNG) vessels, many wish to use the ocean's valuable real estate.

No discussion of "smart growth" would be complete without mention of the growing development pressures to one of the most important and sensitive places in the Bay State: our ocean waters. Advances in construction technology together with a variety of impediments to land-based locations have made offshore siting an increasingly attractive and viable option for a number of projects, particularly energy-related facilities, such as Liquified Natural Gas (LNG) terminals and pipelines and wind turbines.

In contrast with land-based projects, the offshore "real estate" in question consists of tidal flats, navigable waters, and submerged lands where ownership is vested in the state and held in trust for the public. As the demand for the use of public trust resources increases, balancing between competing public interests becomes more difficult. The recent proposals and accompanied debate over the LNG terminals in Massachusetts Bay, and the Cape Wind proposal in Nantucket Sound, exemplify this challenge. Here, the desire to expand renewable energy resources, and to site those facilities offshore, compete with a desire to preserve access to prime fishing grounds, protect unobstructed views, and preserve recreational interests. How do we balance competing public values offshore?

The Status of the Status Quo

Despite the abundance of strong environmental statutes and regulations in Massachusetts, limitations exist in the current ocean management approach. Governance structures for ocean resources have historically been focused on individual resources or activities, such as the maintenance of navigation channels, management of commercial fishing, regulation of ocean disposal, and protection of whale migration areas. Jurisdictional boundaries, such as the dividing line between state and federal waters (which is typically three miles offshore), complicate the situation further. Comprehensive approaches to ocean management have been difficult to develop, due to the complexity of resources

involved, their often migratory and multi-dimensional characteristics, and the tensions created by the competing economic and social interests.

As a consequence, regulatory review of development proposals in the offshore is reactive. Opportunities for a planning process that would allow for early identification of measures for better siting, performance standards, and mitigation are limited. Given that the demand for ocean resources is likely to increase, it is imperative that managers be able to take a proactive and more comprehensive approach.

Massachusetts Takes Initiative

Current debates about offshore proposals point out the necessity of ensuring that offshore development can be guided to meet commercial, recreational, aesthetic, and ecological needs. In the past two decades, several states, including Oregon, Florida, and California, have completed various levels of ocean management planning and have passed laws regulating activities in the nearshore and coastal areas, such as those that ban bottom trawling and prohibit the discharge of waste from cruise ships. But, until March of 2005, when Governor Mitt Romney and Senator Robert O'Leary introduced legislation that authorizes the Secretary of Environmental Affairs to prepare and implement an Ocean Plan, no state had attempted to manage large-scale offshore stationary uses of ocean resources.

Prior to introducing this innovative legislation, Governor Mitt Romney initiated the Massachusetts Ocean Management Initiative in 2003, spearheaded by the Massachusetts Ocean Management Task Force (Task Force). After an intensive planning process, the Task Force, made up of 22 members from the public and private sector, published Waves of Change: The Massachusetts Ocean Management Task Force Report and Recommendations. The Task Force's overarching recommendation called for a statutory

framework for comprehensive ocean management, which lead to the introduction of the Massachusetts Oceans Bill legislation. As of this writing, the legislation has been favorably reported out of the Joint Committee on Environment, Natural Resources and Agriculture and is undergoing review by Ways and Means. While changes to the legislation may result from the ongoing legislative deliberations, key elements include:

- *The Ocean Plan shall apply to all state waters, as well as areas in federal waters "that are functionally connected to state waters," and shall guide development into areas that are most appropriate based on existing uses, natural resource values, and development trends.*
- *Public participation shall be on-going and begin early in the scoping process, and shall include regional meetings and comment periods, as well as the opportunity to appeal an adopted Ocean Plan.*
- *A strong baseline assessment of natural, social, cultural, historic, and economic information shall be developed to inform planning efforts.*
- *The Ocean Plan shall articulate management measures, including performance standards, mitigation requirements, and use limitations, as may be applicable to specific geographic areas, to balance resource protection and economic development.*
- *Certain offshore uses, like the discharge/disposal of waste, certain types of sand mining, and commercial advertising, shall generally be prohibited, with additional restrictions applying (e.g., no offshore electric generating facilities) to the five Ocean Sanctuaries in Massachusetts.*
- *Other offshore uses, such as sand and gravel mining for beach nourishment, pipelines and cables, aquaculture, and the construction of docks and piers, shall be allowed, subject to the provisions of the Ocean Plan.*
- *Ocean Plans shall be reviewed every five years to ensure that the best available information is incorporated to accommodate new development issues and to reflect changing human needs.*
- *While fisheries resources will continue to be managed through the Division of Marine Fisheries (DMF), the Ocean Plan shall be integrated into the existing management framework.*

Building on momentum generated by the Ocean Management Initiative, the Massachusetts Office of Coastal Zone Management (CZM), DMF, and the Department of Environmental Protection (DEP) have been working together to explore and collect information that will help provide a baseline for more effective ocean planning. Projects that are currently underway to expand the information base include seafloor mapping and delineation of habitat types; data collection on historic, current, and emerging human use patterns offshore; and an assessment of the Massachusetts ocean and coastal economy. This group will also be developing a planning framework to be used by both project applicants and project review agencies to provide a more consistent and efficient review of proposals.

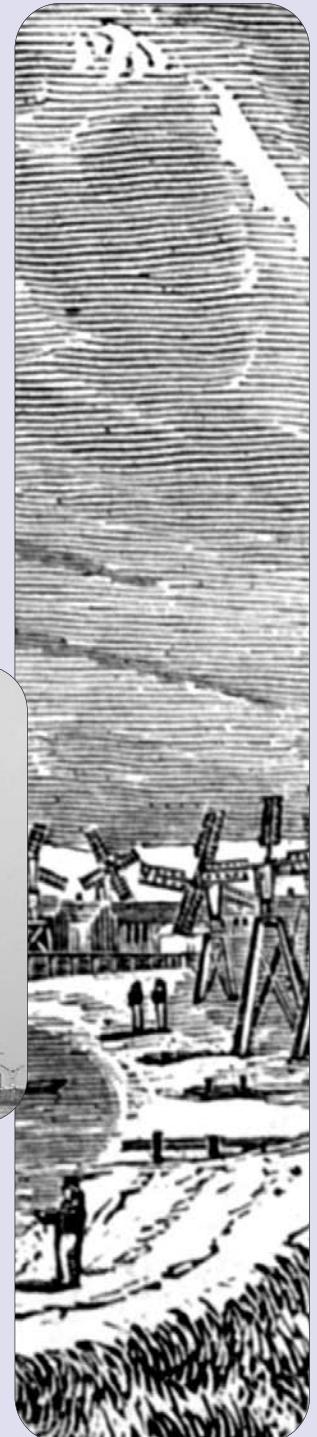
As many of the "smart growth" concepts discussed in this edition of *Coastlines* illustrate, managing development appropriately allows for both the use and protection of public resources in a way that benefits both the economy and the environment. Through the efforts of the Massachusetts Ocean Management Initiative, the Bay State has taken the first steps toward embodying "smart growth" within the ocean governance structure to protect the vital public trust resources that are so important to the common heritage, livelihood, enjoyment, and long-term prosperity of Massachusetts.

For more information on the Massachusetts Ocean Management Initiative, please visit: <http://www.mass.gov/czm/oceanmanagement/index.htm>.



photo by Tom Skinner

Wind energy yesterday and today: In the 1800s, windmills were used to collect salt in Provincetown, Massachusetts (illustration). These days, they're more commonly used to generate wind energy.





A black and white photograph of a coastal landscape. In the foreground, there are dark, jagged rocks. Behind them is a sandy beach. The background features a bright, overexposed sky and some dark, silhouetted shapes that could be distant land or clouds.

ella &
flau

Revising a River

By Bruce Carlisle and Tim Smith, CZM Wetlands Restoration Program

FOR THOUSANDS OF YEARS, the Herring River in Wellfleet, Massachusetts, was a highly productive estuary. In its unaltered state, the river offered vast feeding and nursery habitat for many commercially important fish and shellfish, cycled nutrients and sediment to provide



clear water, produced salt hay for animal fodder, and buffered storm surges. The river was so productive, in fact, that in the 1890s, the catch of alewives and blue back herring averaged more than \$640 per year (or about \$13,000 in today's dollars), enough to pay all of the Town's elected officials, according to yearly town reports.

Since that time, however, human activities have had far-reaching effects on the river's natural function and social value. Throughout the 1800s and early 1900s, as

the Cape became more developed, road and railroad dikes were built across the river's floodplain, bisecting the salt marshes and dramatically altering natural tidal patterns. Additionally, to create drier areas for agriculture and building, natural river and creek channels were straightened, ditches were dug, and dredged spoils were used to fill wetlands and floodplain areas.

The effects of this human disturbance were both dramatic and subtle. With the creation of the Chequesset Neck dike in 1908 (see photo left), species such as alewives, eels, striped bass, and silversides could no longer enter into the Herring River system, and the valuable herring run was severely impaired. By 1919, the value of the herring fishery was reduced to a mere \$86 per year (or about \$1,700 in today's dollar value). Over time, the thousands of acres of highly productive salt marsh gradually degraded and, by the middle of the 20th Century, the once thriving system had turned into brackish, freshwater, or upland vegetation, much of it dominated by the invasive common reed, *Phragmites australis*. The peat, which forms the foundation of a healthy salt marsh, is slowly decaying and so far has subsided nearly three feet lower than its historic elevation. Draining of the salt marsh peat has led to serious water quality problems. Lacking seawater and exposed to oxygen, naturally occurring sulfur in the peat is converted to sulfuric acid, at times causing the water in the Herring River to be as acidic as lemon juice, a condition that has led to many fish kills over the past several years. In addition, the acid causes toxic metals, primarily aluminum, to mobilize from the soil to the water column—a state that is serious enough to warrant

the Herring River's placement on Massachusetts's List of Impaired Waters not meeting surface water quality standards.

In a coordinated effort to turn the tide for this estuary, the Massachusetts Office of Coastal Zone Management's (CZM) Wetlands Restoration Program (WRP) is working with the National Park Service (NPS) and the town of Wellfleet to restore tides to the Herring River system. As agreed to in a Memorandum of Understanding (MOU) between the town and NPS, CZM is a participant in a technical working group formed to advise Wellfleet on the merits of restoring tidal flow to the river and identifying the preferred means for doing so. The MOU also prescribed the creation of a committee to ensure that concerns of local landowners, fishermen, aquaculturists, and others are taken into consideration. Pending approval of the committee's recommendations by the Board of Selectmen, the technical committee will develop a comprehensive restoration plan for the river. Encompassing more than 1,000 acres of inter- and sub-tidal estuarine habitat, the project—if undertaken by Wellfleet—will be the largest and most ambitious wetland restoration project attempted in Massachusetts, if not the entire Northeast.

WHAT IT COULD BE

The Herring River originates as a small stream at Herring Pond in north Wellfleet. As it flows southwestward, it gathers volume from groundwater. Where the river meets Wellfleet Harbor at Chequesset Neck, it is nearly 500 feet wide—one of the largest river mouths on Cape Cod. About 80 percent of the Herring River's floodplain is located within the Cape Cod National Seashore. Since the 1970s, NPS scientists and others have been studying the tide-restricted estuary to understand its current condition and the effects of restoring the tidal connection to Wellfleet Harbor. Research and modeling conducted or

commissioned by the NPS show that a wider opening of the Chequesset dike would reintroduce enough seawater to re-saturate the peat, reduce production of sulfuric acid,



A portion of the Chequesset Yacht and Country Club golf course lies within the historic floodplain of the Herring River.

and improve water quality. Restoring tidal influence to the Herring River would deliver marine sediments and the marsh surface will gradually rebound to self-sustaining elevations. Clams and oysters would return as salinity rises, and alewives and blue-back herring would once again migrate freely from Herring Pond to Cape Cod Bay.

In the 1960s, before anyone contemplated deliberately restoring tidal flow to the river, the one-way flapper valves in the Chequesset dike rusted and became stuck in a partly

open position. For several years a limited amount of seawater returned to the diked system. The response was immediate and encouraging. With more saltwater, soft-shell clams and oysters eventually returned to the inter-tidal flats, some non-native *Phragmites* died off, and native salt marsh grasses came back. Though modest in scale and restricted to the area just above the dike, these incidental improvements were not unnoticed and soon salt marsh ecologists, local advocates, and NPS managers were advocating for additional tidal flow and a more cohesive and coordinated approach to restore the river.

GOLF BALLS AND MUMMICHOGS

As with any project of local and regional significance, returning tidal flow to the Herring River is not without its complexities. One of the largest challenges is the fate of several golf fairways belonging to Chequesset Yacht and Country Club (CYCC). Constructed in 1934 when the

dike had significantly reduced the river's former tidal footprint, portions of five holes within the nine-hole course were built on what used to be salt marshes. Gradual subsidence of these areas has resulted in serious drainage problems, enough so that after heavy rains or with springtime high water tables,

prolonged flooding makes it impossible to play golf. Returning the river's tidal flow would similarly inundate these low-lying areas during high tides.

*The Chequesset Neck
dike prevents freshwater from
flowing into Wellfleet Harbor.*



photo by Tim Smith

The WRP played an important role in addressing this challenge. Numerous federal, state, and private sector partners were brought together with the CYCC to discuss potential solutions. One of the early proposals to address the course flooding was to build a new, smaller dike at Mill Creek to protect the golf course. This concept was less than ideal, though, as impounded waters would have to be pumped over the dike, flooding would still occur after very heavy rains, costs would be high, and the dike would be detrimental to wetlands further up along Mill Creek.

After more meetings and discussions among the project partners, ideas for relocating part of the CYCC course began to take shape. The show of technical and financial support from the project partners was a critical factor in CYCC's decision to consider making drastic changes to their lands and golf course operations. With support from CZM, the Conservation Law Foundation, National Oceanographic and Atmospheric Administration (NOAA), the Gillette Company, and Massachusetts Corporate Wetlands Restoration Partnership, the CYCC is working with environmental and golf course design consultants to develop plans to reconfigure the golf course adjacent to undeveloped upland they own.

Through the partnership, a funding strategy was developed—CYCC will sell off about 25 acres of its low-lying lands to the town of Wellfleet. The money will go towards the construction and related costs of the course reconfiguration. As for the land, Wellfleet will create a publicly accessible conservation area. After restoration of tidal hydrology to the Herring River system, the abandoned fairways and greens will eventually return to salt marsh, providing critical habitat for mummichogs and alewives, soft-shell clams and fiddler crabs, and Snowy Egrets and Willets.



Open Space funds for a portion of this acquisition have already been approved at Wellfleet's Town Meeting. Additional matching funds are being sought from several other state and federal land acquisition programs. Through the tireless lobbying efforts of the Nature Conservancy, on November 10, 2005, Congressman William Delahunt (D-Massachusetts, 10th), along with Senators John Kerry (D-Massachusetts) and Edward Kennedy (D-Massachusetts) announced a \$500,000 federal appropriation for the project through the Coastal and Estuarine Land Conservation Program. In his press release, Congressmen Delahunt said, "This is a political victory with potentially spectacular natural consequences. So often these days, we're forced to defend against assaults on the environment. It is gratifying to bring home some affirmatively good news about joint stewardship of public lands."

WORK IN PROGRESS

Despite the clear ecological benefits of restoring tides to the Herring River, a range of public concerns still exist. These include the potential for sediments and bacteria to migrate to oyster growing areas and shellfish habitat in Wellfleet Harbor, possible erosion of the "Gut" (right), saltwater intrusion of private water supply, flood impacts to several private residences within the Cape Cod National Seashore, and effects of saltwater on freshwater wetland and upland vegetation. The NPS and CZM have conducted numerous studies to address these issues in recent years, which are currently under review by the technical and public committees formed through the MOU and will form the basis for Wellfleet's decision to move ahead with the restoration.

While the vision of a healthy, free-flowing Herring River is coming into clearer focus, a great deal of work remains. Before the vision becomes reality, Wellfleet's Board of Selectmen must support the plan, a clear path to restoring tides must be developed, and substantial funds need to be raised. If the momentum, energy, and early successes of the restoration partnership can truly persevere, in a matter of several years, the Herring River will be on its way to its former glory and the people of Wellfleet, the Cape, the Commonwealth, and the Northeast will have reclaimed a true national treasure.



pictometry image courtesy of MassGIS

The Herring River floodplain is now dominated by Phragmites, black cherry, and other plants not typically found in salt marsh environments.



Studies sponsored by the Cape Cod National Seashore have demonstrated that the Gut will not be threatened by restoring tidal flow to the Herring River.

Daylight shining through the left bay shows the limited opening of one Chequesset dike tidegate.

Creative Thinking and Active Learning: The Buzzards Bay Stormwater Mapping Collaborative

By Dr. Joe Costa, Buzzards Bay NEP

In 2003, the Buzzards Bay National Estuary Program (NEP) published the report, *Atlas of Stormwater Discharges in the Buzzards Bay Watershed*. Several years in the making, the 100 plus-page report includes maps of more than 2,600 stormwater

discharges and more than 12,000 catch basins along the shores of most of Buzzards Bay. The Atlas also includes a preliminary priority ranking of potential remediation projects based on numerous factors, including the number of known catch basins connected to the discharges, the presence of shellfish beds near the discharge, and if the shellfish beds had been closed due to pollution.

To produce the Atlas, the Buzzards Bay NEP first mapped dis-

charges within a half-mile of shore using grant funding to complete the project. Municipal officials receiving the reports and poster-size maps of their town appreciated the Atlas, but wanted more maps of their entire town. Fire chiefs wanted the maps to help respond to toxic spills on roadways, boards of health were trying to

identify inland sources of pollution, and public works departments needed this information for their new "Phase II" stormwater management permits, now required by the U.S. Environmental Protection Agency (EPA). Inland towns wanted their communities mapped for the same reasons. Unfortunately, the Buzzards Bay NEP did not have the personnel or resources to meet these needs, and hiring private contractors to do the work was too expensive for most towns.

Len Gonsalves, Executive Director of the Buzzards Bay Action Committee (BBAC), proposed a solution. Recognizing that the Buzzards Bay NEP had successfully used student interns to do routine mapping of stormwater drainage networks in the field, he believed that the BBAC could fund students as part of a vocational high school work-study program to do the time consuming, and typically most expensive part, of any field mapping program. Len knew some teachers at Greater New Bedford Regional Vocational Technical High School (GNB Voc-Tech), and knew Voc-Tech wanted to expand its environmental education program, and thought a partnership with BBAC could benefit both organizations.

So, in 2003, the Buzzards Bay NEP began a partnership with the BBAC and GNB Voc-Tech to set up a pilot program to map stormwater networks in Buzzards Bay municipalities. The Buzzards Bay NEP provided technical support and training to guide the effort, and to evaluate the Geographic Information System (GIS) data. The BBAC bought GIS software for the school and paid the students' work-study salaries. The students mapped inland portions of



Using hand held Global Positioning System (GPS) devices, students were able to map stormwater discharge areas within Buzzards Bay.

photos by Joe Costa

Dartmouth, Westport, and Fairhaven—all areas that had not previously been mapped by the Buzzards Bay NEP.

In 2004, the BBAC expanded the stormwater mapping partnership further and hired a consultant, Maurice "Moe" Leger, to work with the students. Moe had been working as an assistant harbormaster in Dartmouth and had just finished mapping moorings in that community. After working with students, Moe developed a clever innovation for the stormwater mapping.

In previous years, students had brought out very detailed aerial photographs where features such as driveways, houses, and even cars could be discerned. Student marked up the photos with locations of catch basins and discharges. Later these maps were brought back to the classroom, and using the GIS software and a "heads up" mapping approach, computer map data files were created. This mapping technique had the accuracy needed for stormwater planning maps, and proved faster than using a Global Positioning System (GPS) in the field and processing the data later. However, Moe saw the benefits of having a GPS out in the field if he could eliminate some intermediate steps of converting the data.

Moe's innovation was to combine in the field heads-up GIS software digitizing with real-time GPS data point collection, using teams of two students driving through neighborhoods. The students had their GPS units linked to their laptops (through wireless or cables), and edited their stormwater GIS database in real time, simply by following their positions on detailed aerial photographs. This strategy proved to be the fastest and most reliable data collection technique for the students, enabled them to correct any inaccurate GPS positioning, and allowed them to enter information as they drove from site to site. The students could also map "on-the-fly" other features that the towns wanted, such as fire hydrants.

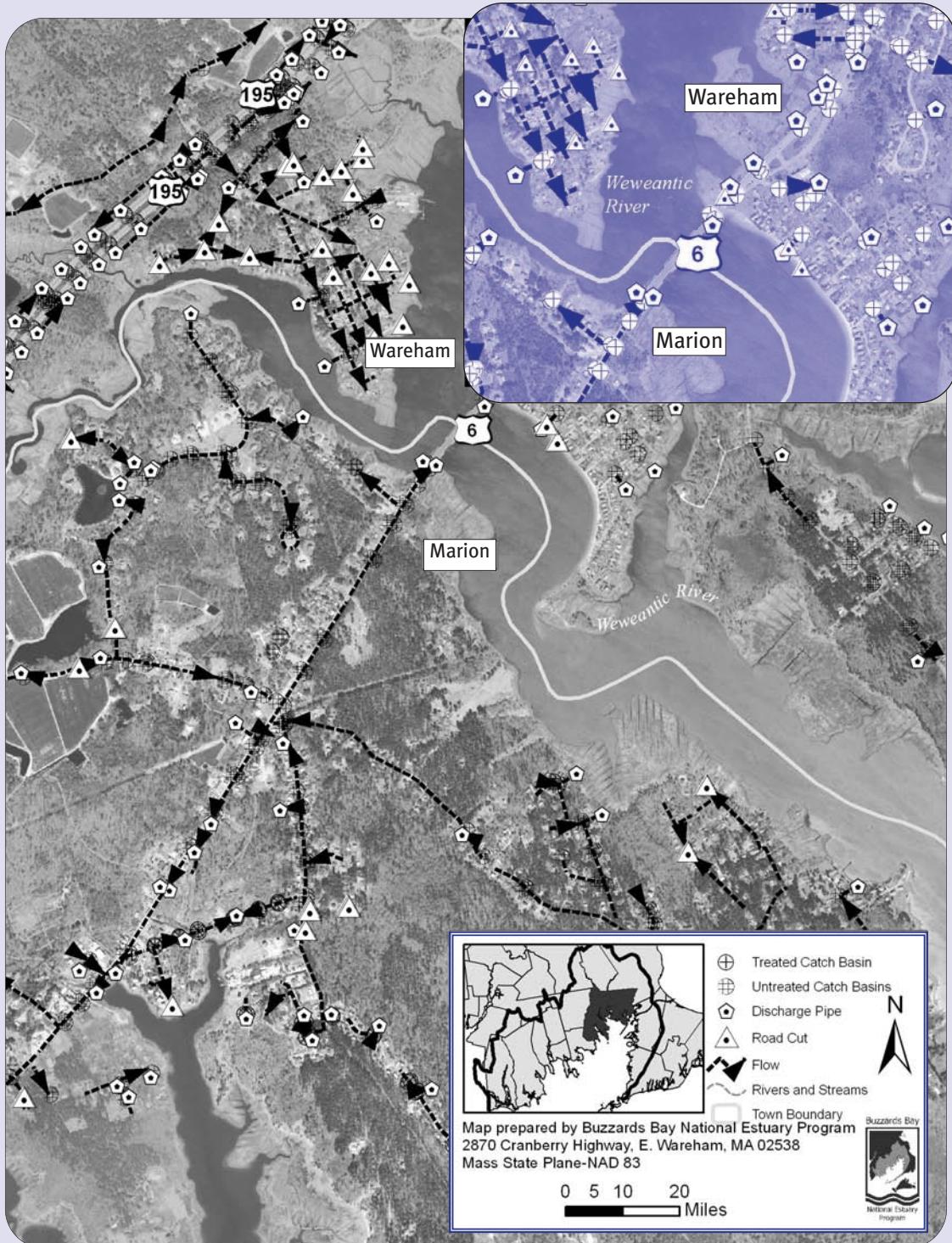
[Handheld combined GPS-GIS units with these capabilities had just come to market, but they were not yet affordable for this program.]

By the end of 2004, the BBAC had spent more than \$12,000 of their funds and were running out of money. The BBAC wanted to continue the effort and map all inland areas of the Buzzards Bay watershed, but could not afford to do it alone. To meet this need, the Buzzards Bay NEP partnered with the BBAC and GNB Voc-Tech to develop a grant application to fund the remaining work. In March of 2005, Massachusetts Office of Coastal Zone Management (CZM) awarded nearly \$19,000 to fund the remaining work, with an additional \$16,000 match of cash and in-kind contributions from the BBAC and Voc-Tech.

Through 2005 this study mapped thousands more stormwater discharges, road cuts, and catch basins in seven Buzzards Bay municipalities. Continuing through the end of 2005, the program partners, including newly hired NEP Natural Resource Planner, Sarah Raposa, worked with municipal public works departments to make final revisions to the maps and data. In November, the NEP provided \$15,000 for municipalities to purchase laptop tablets and GPS units so that they could use and update the stormwater drainage system database, and participate in the collaborative. For his Senior Project, Voc-Tech student Nathan Aruda prepared a manual and made presentations to municipal public works staff on how to use and manage the database



Sarah Raposa from the Buzzards Bay Program and Nathan Aruda, a student at Greater New Bedford Regional Vocational Technical High School, combine GPS and Geographic Information System (GIS) technology to accurately plot points for the Buzzards Bay Atlas.



on these systems. Most importantly, through this partnership, the Buzzards Bay NEP and BBAC helped GNB Voc-Tech create a successful and self-sustaining environmental education program that not only serves the needs of nearby municipalities, but also provides the students with invaluable skills.

This stormwater mapping collaborative has had other benefits to Voc-Tech and their students. In 2004, GNB Voc-Tech, using their pilot work with the Buzzards Bay NEP and the BBAC, was able to obtain a \$45,000 grant from the Massachusetts Department of Education to assist in establishing the school's new Geodesy/Environmental Engineering program. The new Geodesy/Environmental Engineering teacher oversaw students in the stormwater program during 2005, as well as students working on other GIS projects. Students who have participated in the collaborative have benefited as well. One of the first students to participate in the program was hired before going to college, as a contractor by the City of New Bedford to help revise and update the City's stormwater maps. Two more Voc-Tech students were hired by New Bedford to do follow-up GIS work the following winter. According to Steven A. Walker, an administrator at GNB Voc-Tech who helped establish the program, "We are preparing students for higher education in the field of environmental engineering so that they can obtain high-end jobs in that field. We see a strong demand for expertise in this field, and the students are excited by this new environmental program."

For more information about this stormwater mapping collaborative, visit www.buzzardsbay.org/stormatlas-collaborative.htm.

Where it all goes: The information collected is used to map out catch basins, streams, drainage pipes and the like, such as on this map of the Wareham/Marion area.

Just Add Water!

By Arden Miller, CZM

Captain Jacques Cousteau, the famed French “musketeer of the sea” and co-inventor of the self-contained underwater breathing apparatus (scuba), once said, “The oceans are superior to land as an environment for life support. They provide directly the water fundamental to all forms of growth, laden with vital salts, dissolved gases, and minerals...” Whether or not you believe this to be true, it is undeniable that the oceans—all four of them (you know,

compilation of ocean-related activities—from the fun “Mr. and Mrs. Fish Marine Education Program” for elementary schools to the more serious “Cape Cod Bay Marine Life Cruise” to the roll-your-sleeves-up and go “Site Seining in Wellfleet”—there is something for all ages and levels of curiosity. The education guide’s overview of linked sites can help you determine what places and activities you would like to learn more about. All relevant

“The oceans are superior to land as an environment for life support.”

- Jacques Cousteau

the Atlantic, Pacific, Antarctic, and Indian)—cover 71 percent of the Earth’s surface, support an estimated 275,000 plant and animal species, and constitute 97 percent of all the water in the world. Add to that the fact that more than half the world’s population—that’s close to 3 billion people—live within 60 miles of the coastline, and the entire population combined consumes around 29 million tons of fish annually,¹ and there’s no denying it: from Bali, Indonesia to Boston, Massachusetts, the oceans affect us all in some way or other.

And, while all that is a lot to visualize—does anyone know what 29 tons of fish looks like?!—there is an easy way to get to know our neighboring Atlantic Ocean up close and personal. The Massachusetts Office of Coastal Zone Management (CZM) has created an Ocean Management Education Guide website—www.mass.gov/czm/oceanmanagement/education/index.htm—for this purpose. The site contains a

details, including hours and season(s) of operation, volunteer opportunities, contact information, and location(s) are listed as well.

So go ahead: beat the heat on an educational summer boat cruise, solve an underwater mystery with Mr. & Mrs. Fish, learn about making a life at sea from a commercial fisherman, experience first hand what life forms inhabit local estuaries, find out if dolphins sleep, or why some lobsters are blue! Educators, parents, and kids are all encouraged to dive in and explore the site for activity ideas. And, if you are involved in ocean education, or know of local ocean-related activities that you would like included on the regularly updated site, please email: czm@state.ma.us. So, take the plunge—from 20 miles from the shoreline to twenty thousand leagues under the sea, there are more than 60 links to help you chart your next course!

¹www.ocean98.org



photo by Todd Huspeni, University of California, Santa Barbara

*Don't hate me because I'm ugly—hate me because I will destroy marine life as you know it. Yep. I'm the *Carcinus maenas*—aka green crab—and I've been invading waters all over the Atlantic!*

CHIMP FIGHTS BIOINVADERS!

By Peter Hanlon, Massachusetts Bays Program

When you were a kid, you were the one who liked to turn over rocks in the back yard just to see what lurked underneath. While other kids recoiled at the site of an odd insect or wiggling worm, you said, "Oh yeah, my mission is to identify that." Now imagine these many years later that your curiosity in all things hidden is about to lead you on an honest-to-goodness search for critters called "bioinvaders."

Can your day get any better?

First, don't be distracted by the primate acronym – CHIMP stands for the Coastal Habitat Invasive Monitoring Program, a program developed in 2003 by Salem Sound Coastwatch, a nonprofit organization dedicated to protecting the environment of the Salem Sound watershed. These "coastal habitat invaders" are considered one of the leading environmental and economic threats to Salem Sound. Invasive species, or "bioinvaders," often have a profound, adverse effect on marine ecosystems. Non-native species that are introduced to coastal waters, such as the European green crab (*Carcinus maenas*) and Asian shore crab (*Hemigrapsus sanguineus*) can prey on commercially valuable shellfish, while other invaders get their kicks chewing up piers and pilings, clogging pipes, damaging fisheries, and causing public health problems.



Along the coast of Massachusetts, scientists have witnessed these invasions and their effects. A 2003 assessment of marine invasive species along the Northeast U.S. coastline that included a site visit in Salem Harbor confirmed that invasives are invading our waterways (see “*There Goes the Neighborhood*,” *Coastlines*, Winter 2004–2005 for more information). But as valuable as it is to have professional scientists searching for the presence of marine invasive species, a small number of experts could never keep an eye on the entire coastline on a consistent basis.

That’s where the CHIMP steps in. Scientists from Salem Sound Coastwatch and its partner organizations and agencies provide an ongoing training program providing CHIMP volunteers with both classroom and field training. These trainings teach volunteers about the different ways that marine invasive species are introduced into local waters,

and how to identify those species. Once armed with this information, volunteers take their knowledge into the field, making periodic visits to rocky shorelines, salt marsh creeks, tidepools, docks, or pilings to observe and record any sightings of marine invaders. To help volunteers identify invasive species while out in the field, Salem Sound Coastwatch and the Massachusetts Office of Coastal Zone Management (CZM) have developed a set of identification cards with photos, detailed line drawings, background information, written descriptions, and clues to identification for each species (see sidebar *What The *&^%?!*).

CHIMP volunteers look for new invasive species, and also help track the spread of known invaders throughout the region. The program is one of a small number of organized marine invasive species monitoring efforts along the coast of Massachusetts, and the information it collects is entered into an online marine invasive species database (www.marineID.org). Both the database and the CHIMP are part of a marine invasive species monitoring network being created by CZM and its partners, including Salem Sound Coastwatch and the Massachusetts Bays Program. The baseline information collected through this expanding network is essential for coastal resource experts to develop policies and plans to deal with the spread of known marine invasive species, as well as the introduction of potentially harmful new species.

So for those of you who are excited by getting up close and personal with tide pools, salt marshes, or even the underside of the dock at your local marina, all in the name of helping to protect our coastal waters, Salem Sound Coastwatch has a job for you. Get in touch with them at (978) 741-7900, or learn more at www.salemsound.org.

Eeeew - that's naaaasty!
Didymosphenia is a type of
algae, an invasive type in
some regions of North
America. It attaches to rocks
in streambeds and may impact
freshwater fish, aquatic plants,
and important aquatic insects.

Codium fragile by any other
name is Dead Man's Fingers.
This dark green finger-like
alga takes over intertidal zone.
Not good.



What The *^%&?!

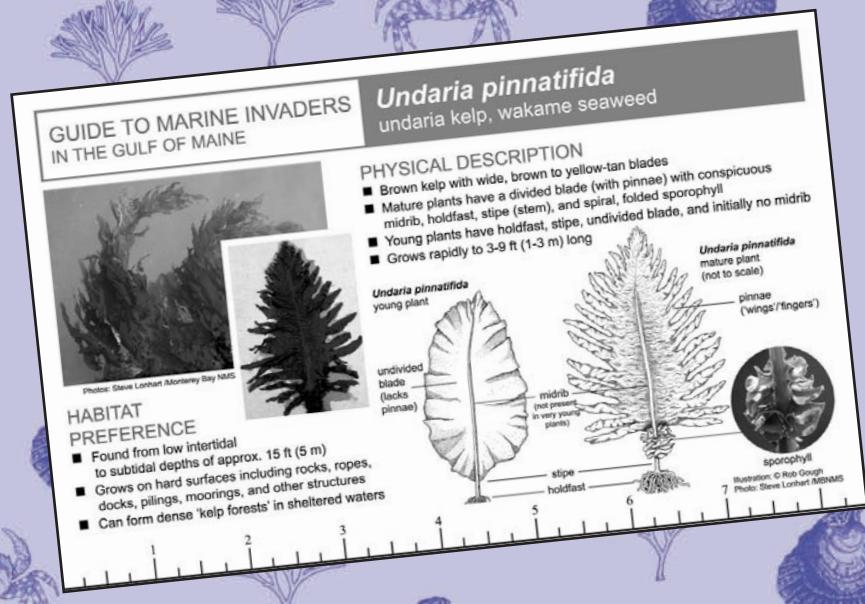
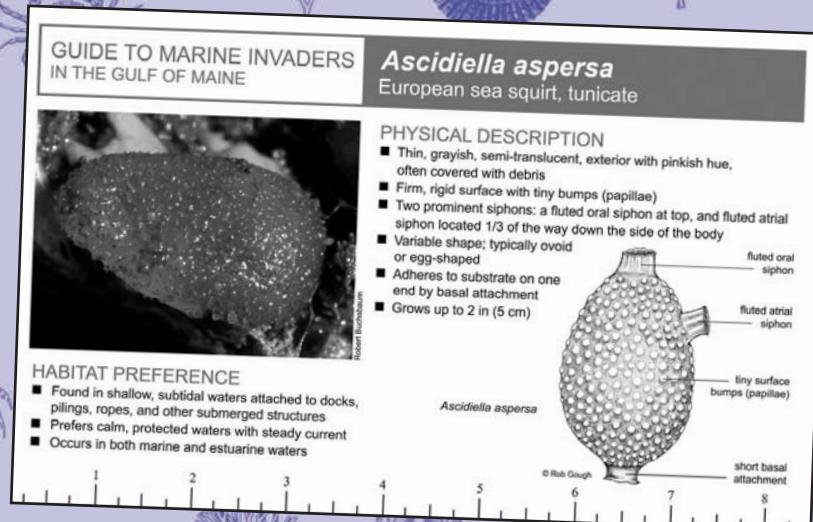
By Peter Hanlon, Massachusetts Bays Program

Identifying marine life in the wild can be tricky business, especially if you're just learning how. To help volunteers participating in the CHIMP, Salem Sound Coastwatch and the Massachusetts Office of Coastal Zone Management have developed a set of identification cards that make it easier to correctly identify marine invasive species. The 5.5" x 8.5" cards are full color, weather resistant, and easy to read. Each card contains:

- ◆ Images and/or line art of the species.
- ◆ Textual description and clues to identification.
- ◆ Image and/or line art of similar species.
- ◆ Invasion status (introduced, or cryptogenic-i.e., of unknown origin).
- ◆ Preferred habitat.
- ◆ Native range.
- ◆ Current range.

Identification cards for twenty different species are complete and available in PDF form at: <http://www.salemsound.org/mis/misid.htm>. Or, you can purchase laminated versions of the cards for \$20.00 from Salem Sound Coastwatch by contacting info@salemsound.org, or calling (978) 741-7900. All money collected funds the reprinting of the cards and supports monitoring of coastal habitat marine invaders.

Card samples (left) help volunteer monitors identify species that don't belong in the Gulf of Maine. Please note: cards shown here are not shown to scale; actual cards are full-color and show the size of these invasive creatures, along with a measurement guide for easy identification.



The Mighty Merrimack

Newburyport's Maritime History

By David Trubey, CZM

If you have ever sailed through the mouth of the Merrimack River in Newburyport, Massachusetts during an outgoing tide and an easterly wind, it will come as no surprise that this is one of the most dangerous river mouths in the country. On an average day, the sheer volume of water rushing through the narrow opening between Plum Island and Salisbury is enough to make even the most seasoned mariner sweat.

The 24-gun frigate, Boston, (background), is representative of the Neptune. Both were built in Newburyport in the late 1700s, and used by fortune-seeking privateers.

Newburyport-built 24-gun frigate *Boston* painting by Rod Cladius; image courtesy of Naval Historical Center

In a northeast gale, standing waves at the river's mouth make landlubbers on the adjacent jetty check the rocks under their feet to make sure that they are firmly in place. According to files kept by the Massachusetts Board of Underwater Archaeological Resources (MBUAR), at least 70 vessels have come to an early demise in and around this area over the past two and a half centuries. Compared to a significant amount of other Massachusetts river mouths, the Merrimack has more than three times the number of reported wrecks.

While many of these shipwrecks have long since vanished, the details of wreck history are alive and well at the Newburyport Maritime Society (NMS). Since 1970, the NMS has worked "to protect, preserve and interpret the maritime history of the lower Merrimack Valley." This mission is currently accomplished through a variety of educational programs and exhibits at its Custom House Maritime Museum in Newburyport and Lowell's Boat Shop in Amesbury (www.themaritimessociety.org).

Legalized Piracy on the High Seas

Spirited involvement in maritime affairs is nothing new to the Newburyport community. During the early years of the Revolutionary War, the Merrimack River towns of Newburyport and Newbury were largely occupied in the construction and outfitting of privateers. Privateers were

privately owned, armed vessels that targeted enemy trade during times of war. In his historical sketch, *Ship Building on the Merrimac River*, John Currier contends "...the first privateer fitted out within the limits of the original thirteen colonies sailed from Newburyport in August, 1775 . . . ". Privateers, or Letters of Marque as they are sometimes referred to after their official government commission, played a significant role in the period leading up to and during the Revolutionary War when more than 600 hundred Letters of Marque were issued by the Continental Congress (federal legislative body of the 13 American colonies). These letters were, in effect, a license for a private vessel to take reprisal against the merchant vessels of an enemy nation during times of conflict or war. The system, which historian Samuel Eliot Morison describes as "legalized piracy," was extremely beneficial to the fledgling American Navy. American privateers were very successful "...in preying on the enemy's commerce, intercepting his communications with America, carrying terror and destruction into the very chops of the Channel, and supplying the patriot army with munitions, stores and clothing at Johnny Bull's expense."^{*} As noted by Samuel Eliot Morison in *The Maritime History of Massachusetts: 1783 - 1860*: "Her [privateering] success . . . was probably the greatest contribution of seaboard Massachusetts to the common cause." In addition to the military benefits of privateering, the system

Compared to...other Massachusetts river mouths, the Merrimack has more than three times the number of reported wrecks.

* In literature and political cartoons during this period, the term "John Bull" was commonly used to personify England and English manner.

also contributed socially to Massachusetts's coastal communities by employing fishermen and other maritime related tradesmen such as shipbuilders and sailors.

Privateering on the Merrimack: Neptune's First and Final Voyage

While privateering brought wealth to some citizens of the newly founded community, the loss of life in Newburyport was substantial relative to its population. According to Currier, 22 vessels with crews totaling more than 1,000 sailors were lost from that port. One such vessel was the privateer, Neptune, constructed at the Cross Yard in Newburyport and commanded by Captain William Friend. Neptune appears to have been a relatively small vessel of 16 or 20 guns. While heading to sea, she was lost shortly after exiting the mouth of the Merrimack River. *The Independent Chronicle* and *The Universal Advertiser* of August 29, 1777, reports that "Thursday last a 20 gun ship, coming out from Newbury-Port, instantaneously overset, and in a little time after went down head fore mast in 14 fathom water; providentially a sloop and boat being near, took off all the hands but one just as she went down. The whole crew consisted of about 70." While the exact location of this wrecking incident is not known, one historical source states that Neptune was "...about a league [3.18 nautical miles] from the bar."

In the coming months, the MBUAR, with the assistance of the NMS, will be delving into the mysterious disappearance of Neptune. It is hoped that historical research combined with marine remote sensing of the Merrimack River coastal area might shed some light on the vessel and its significance to the maritime heritage of Newburyport and the Commonwealth.

¹ MORISON, SAMUEL ELIOT, 1961 *The Maritime History of Massachusetts: 1783-1860*. Northeastern University Press, Boston.

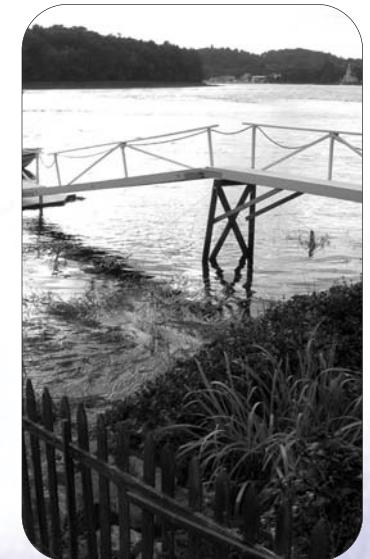
Additional References:

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BAYLEY, WILLIAM AND OLIVER O. JONES. *History of the Marine Society of Newburyport, Massachusetts*. Daily News Press, Newburyport, Massachusetts. (1906).

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WEARE, NANCY V. *Plum Island: The Way It Was*. Newburyport Press, Newburyport, Massachusetts. (1996.)



Not all of the Merrimack River is as placid as this. Parts of it can get crazy rough.

Shipwreck Preservation Appreciation

By David Trubey, CZM

In 2003, as part of an ongoing effort to work with local communities, the Massachusetts Board of Underwater Archaeological Resources (MBUAR) teamed up with the Newburyport Maritime Society (NMS) to create programs that would foster an awareness of and appreciation for the area's shipwrecks. In 2003-2005, in recognition of Massachusetts Archaeology Month, an annual program promoting archaeological research across the state, the MBUAR, NMS, and Public Archaeology Laboratory, Inc. of Pawtucket, Rhode Island, sponsored events highlighting the role of technology in the detection and exploration of shipwrecks and other submerged archaeological sites. These events featured guest speakers, equipment, exhibits and images of local shipwrecks, and—perhaps even more importantly—helped generate excitement about historic shipwreck preservation.

In October 2005, the MBUAR and NMS unveiled a new program dedicated to the reporting and documenting of shipwrecks along the banks of the Merrimack River, the beaches of Plum Island, and the Salisbury shoreline. Known as the Shoreline Heritage Identification Partnerships (SHIPS), this program trains volunteers to recognize the structural elements of shipwrecks, which often make but a brief appearance before disappearing in the shifting sands. Additionally, volunteers are trained to accurately record locations, take basic site measurements, and notify archaeologists at the MBUAR when wrecks are

spotted. The SHIPS program is expected to play a significant role in the research and protection of local shipwrecks and in fostering local stewardship of our maritime heritage. If you are interested in getting involved, please call (617) 626-1032.

Children explore a simulated wreck at the Custom House Maritime Museum during Massachusetts Archaeology Month. Nearly 1,500 pounds of sand were brought in to make the activity realistic.



FOCUS ON COASTAL TOWNS



WHEN IT COMES TO HISTORY CURRICULUM IN THE UNITED STATES, there are several “lessons” few children leave behind. Up there with “In fourteen hundred and ninety-two, Columbus sailed the ocean blue,” the story of the Boston Tea Party, and Paul Revere’s midnight ride, is the story of the Pilgrims. From sea to shining sea, unless you’ve been living under a rock, chances are you’ve heard of the Pilgrim’s sailing across the Atlantic on the *Mayflower* and landing on Plymouth Rock. (Whether or not they *literally* landed on the rock is a subject of some debate, but more on that later.)

Between a Rock and a Harsh Place

So, to begin at the very beginning, the group that has come to be known as “the Pilgrims” were originally residents of England. (See sidebar “Once a Separatist Always a Pilgrim?” for details on their departure.) There were 101 passengers, plus crew, when the *Mayflower*—a cargo vessel allegedly used to transport wine from France to England—set sail (a baby boy, aptly named Oceanus, was born *en route*, bringing the passenger total up to 102 by landing time). Seas were rough and daily meals consisted of dried fish, salted meat, and “oatmeyle.” On November 21, 1620 by modern-day calendar calculations, after 66 days at sea, the *Mayflower* landed in what is now Provincetown, Massachusetts. After a few exploratory trips around the peninsula, they decided there was too much sand, not enough fertile soil, and that they could probably do better. A smaller expedition led by the famed Miles Standish (the only man on the *Mayflower* not named William, Jonathan, Peter, Edward, or Isaac, incidentally), journeyed farther out and found the area we know

today as Plymouth. Fellow passenger, group historian, and future Massachusetts Governor William Bradford, described the area "fitt for situation" with "...diverse cornfields and little running brooks..."

As for its "fitt-ness," those who lost loved ones during the first harsh winter (more than half of the original passengers perished) may have wished that they'd continued on to Virginia, but none of their diaries have been unearthed. We could speculate that those who survived were, indeed, the

difficult; dwellings were simple structures made of wood with the aforementioned paper-and-linseed oil windows and food had to be hunted, harvested, or bartered for. (In the early days, those who farmed the land were called "Planters" while those who ventured out of the colony to make a living trading goods overseas were known as "Adventurers.")

Subsequent settlers' survival rates were higher than the *Mayflower* passengers'. The town, which was called New Plimouth until the 1700s when it became Plymouth, was



photo by Don Teague

Bogged Down: Plymouth has cranberry bogs galore. Tours of Ocean Spray's Cranberry World explain their various uses. And, speaking of uses, the Plymouth Bay Winery even has cranberry wine—free for the tasting during a tour of their winery.

forefather's of grit and hardiness that is associated with the "Yankee spirit." Undeterred by reports of this first unfortunate winter, three ships full of their fellow Separatists from Leiden, Holland followed; the Fortune landed in 1621, and the Anne and Little James both arrived in 1623. In a letter from *Mayflower* passenger Edward Winslow to his fellow Separatists, he recommended that they bring the following to their home-to-be: "Be careful to have a very good bread-room to put your biscuits in. Let your cask for beer and water be iron-bound...bring good store of clothes and bedding with you. Bring every man a musket or fowling piece...paper and linseed oil for you windows, with cotton yarn for your lamps." By all accounts, early life was often

built around the First Parish Church (which still stands today at 19 Town Square). As with much of New England, trade routes and the promise of a more prosperous life led more people to the area. Many immigrants from Portugal, Italy, Germany, and other parts of Europe made Plymouth their home. From 1825 to 1969, the Cordage Rope Company employed much of the town. (Cordage was a major manufacturer of rope during this time; today the original factory has been reconverted to house shops and restaurants). Being in an area with forests, ponds, streams, and the Atlantic, hunting and fishing opportunities were plentiful and sustained many (to this day, there is an official hunting season in Plymouth's Miles Standish State Park.)

Through hard work and the luck of geography, many "Adventurers" made their fortunes at sea and a number of houses that reflect these fortunes can be seen on Sandwich, Water, Court, and Leyden Streets.

Rock Solid History

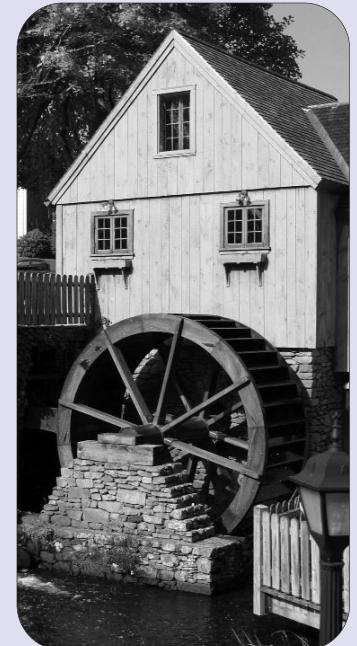
And the rock? Well, according to Bill Bryson, author of the New York Times Best Seller *A Short History of Nearly Everything*, "The one thing the Pilgrims certainly didn't do was step ashore on Plymouth Rock. Quite apart from the consideration that it may have stood well above the high-water mark in 1620, no prudent mariner would try to bring a ship alongside a boulder..." But other sources say otherwise. The Elder Faunce (alleged to be 95 years of age in 1741) claimed that his father, a passenger on the *Mayflower*, showed him this site as a boy and told him that was where they landed. This unassuming (it's only three feet across), yet larger-than-life rock has had a number of well-documented adventures over the years. In 1774, the townspeople attempted to move it and, in the process, split it into two separate halves! They left the bottom portion at the wharf and carried the top half to the town's meeting-house. From there, it took a trip to Pilgrim Hall in 1834. When the Pilgrim Society completed a Victorian canopy over the lower portion of the rock in 1867, the top was reunited with the bottom and "1620" was carved into the rock, setting the now-famous date in stone. Then, 300 years after the Pilgrims set their sites, and possibly their feet, on this granite ballast, the Plymouth waterfront was rebuilt with a promenade structured so that the rock appears at water level.

In spite of—or, more likely because of—its past, the rock lives on, inspiring many a tourist to make a pilgrimage to Plymouth. And after checking out the famed rock, there are a number of other things to do. While at the waterfront, visitors can explore a replica of the original *Mayflower* called, succinctly, *Mayflower II*. (The original *Mayflower* returned to its



trade routes post-Plymouth, until it was declared "in ruinis" and sold for scrap in 1624.) Those thirsting for cranberry wine, or just curious about how fruit wines are made, can enjoy free tastes and tours at the Plymouth Bay Winery. And, speaking of cranberries, Ocean Spray's "Cranberry World," also in Plymouth, gives free tours. Going back further in time, the original Grist Mill that provided flour to the Pilgrims and their descendants is also open for tours. And, if you're into history, you can check out the site of the Pilgrims' first meeting house and fort at Burial Hill (right next to the First Parish Church) and the Wax Museum with wax replicas of historical figures. And, of course, there's the Plimouth Plantation, one

On Cranberry Road you can bike, hike, swim, and camp at Miles Standish State Forest.



photos by Don Teague

In the Days of Yore, the Grist Mill was a vital part of the community, for man cannot live on oatmeale alone.

of the country's oldest "living history" museums where the staff dress, talk, and interact in keeping with the researched inhabitants of Plymouth in 1627. (Don't get confused if you're there on a Sunday and they tell you it's Monday; in 1627s, Sunday was a day for worship and reflection, a



Top: Mrs. Patience Watson and many of New England's earliest settlers rest in Plymouth.

The Plymouth Plantation (right) is a place to experience how life was lived when Plymouth was spelled Plimouth.



literal day of rest, and no Pilgrim worth their fowling piece would even consider working.) And there's the state park named after the original adventurer, Miles Standish, which is open to the public

year round. Plymouth Town Manager Mark Sylvia explains what he thinks makes Plymouth special: "We're enormously rich with resources—historic, natural, economic, and community-wise. Plymouth has beaches, numerous inland

photos by Don Teague

water resources, naturally occurring Pine Hills, and we're also home to a lot of species, including the endangered Plymouth Redbelly Turtle [*Pseudemys rubriventris bangsi*]. And because so many generations have remained here, a sense of history is passed down and imbued in the town. You can feel it when you walk around."

Measuring in at 104 square miles, Plymouth has the largest land area of any town in the Commonwealth. Being 37 miles from Boston, and 5 miles from the Cape Cod Canal, and having the Atlantic Ocean as its eastern border, it's a desirable location for many. In 1970, the population was just over 18,500—by 1990 that figure increased to more than 45,000 people. In 2005, the Plymouth Police Department estimated the town contained 54,000. Despite considerable population growth, the New Plimouth of yore is still very much present today. Leyden Street, which runs the course of the downtown and is named after—you guessed it—the Pilgrim's previous home in the Netherlands, is a permanent reminder of the town's roots. "Just to imagine this is where the Pilgrim's village actually was is pretty amazing," says Don Teague, Membership Director of Destination Plymouth. And, as a destination, Plymouth has the distinction as being known as "America's Hometown." "We weren't the first town in America—that distinction, sigh, goes to Jamestown, Virginia—but we were the first town designed around living as a community rather than as a place to profit from," Teague says. "It's a place unlike any other - well worth the trip, and much easier to get to than it was in 1620!"

For things to do in Plymouth, check out:
www.mass.gov/dcr/parks/southeast/mssf.htm
www.visit-plymouth.com
www.plimoth.org

Once a Separatist, Always a Pilgrim?

By Arden Miller, CZM

Only in the United States is the word Pilgrim spelled with a capital ‘p’ to refer to the group of men and women who landed on the shores of Massachusetts in November of 1620. Traditionally, the word “pilgrim” is used in the lower case to refer to one who is going on a religious quest, usually when a trek of some distance is involved, to a place of established religious significance (e.g., Muslims visiting Mecca, Christians and Jews visiting Jerusalem). That this group of early settlers was, in fact, on a religious quest—or, rather, on a quest for religious freedom—possibly explains the association. For many years, centuries even, the passengers of the first four ships to settle in Massachusetts were referred to as the “First Comers” or “Forefathers.” It wasn’t until the 1800s when the journals of Mayflower passenger and Governor of Plimouth William Bradford’s journals were returned from England to Massachusetts and his quote. “So they left the good and pleasant city, which had been their resting place near 12 years. But they knew they were pilgrims and looked not much on those things, but lifted up their eyes to the Heavens, their dearest country, and quieted their spirits” became widely known that the moniker stuck.

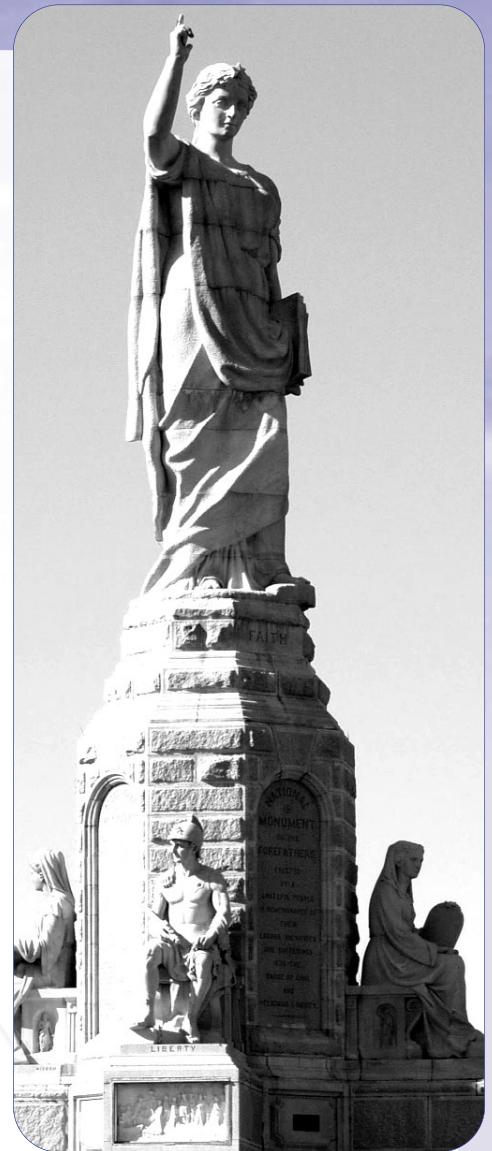
Separate and Not-so-Equal

But, before they were Pilgrims, and before they left England for New England, they were known as Separatists. What was a Separatist, you wonder? Well, in the days of mutton chops and moats, Henry the VIII was the King of England. England, like much of the world in the early 1500s, was under the rule of the Pope and the Catholic Church in Rome, and church and state were one and the same. When Henry the VIII wished to divorce his wife—strictly forbidden in the Catholic church—he decided to start his own church. Between bouts of gout and beheadings, Henry severed all ties with Rome and, in 1537, the Church of England was born. Not everyone was on board though. And a small, but active and organized contingency in the Midlands area of Scrooby, Nottinghamshire were determined to have their own separate congregation. People who subscribed to this separate church

became known as Separatists, the persecuted of their day. And where does anyone who wishes to escape persecution and to worship in their own way go? Amsterdam!

Scrooby Dooby Who??

The Scrooby Separatists, many of whom were imprisoned under Queen Mary’s regime, feared for their futures and a group of approximately 30 people left England (in secret, natch) in 1608 to live and let live in the land of tolerance. After a mere year in Amsterdam, they headed to the university town of Lyden in the Netherlands where they spent more than a decade, many making their living working in textile mills and the university. Rumbles of war between Spain and the Netherlands, plus a fear that their children were losing their English identity, led the group to seek their fates in the unchartered territories of New England. The group had permission to settle in the northern part of Virginia, but the Mayflower charted another course and the Separatists became Massachusetts’ First Comers on November 11 (by the Roman calendar which, unlike their religion, was still widely recognized), 1620. And the rest, as they say, is history.



Gotta have faith! Faith stands on top of Plymouth's National Monument of the Forefathers.

Ask Joe

By Arden Miller, CZM

Joe, a Massachusetts resident since 1974, began working at the Massachusetts Office of Coastal Zone Management (CZM) in 1980. He has represented CZM on numerous committees involved with coastal and marine issues.

What types of coastal issues are distinct by region and which kinds affect all of the regions? All regions are affected to some extent by stormwater run-off, public access issues, and development pressure. They just vary in intensity and details. The area north of Cape Cod is part of the Gulf of Maine and, geographically, typically has a rocky coast, whereas the area south of Boston is known for its sandy beaches and dunes. So beach erosion is an issue specific to the sandy areas. In terms of coastal development, the area from Boston Harbor north tends to have more people and more industrial uses (including the working ports of Salem and Gloucester). Both areas have a limited amount of coastal space, and a lot of people want access to it. And since the coast is finite and everyone and their brother wants a view of it, there is always pressure to build in the few undeveloped areas.

During the time you've been a part of the Massachusetts Emergency Management Team, what coastal area disasters generated the most media attention? Between August, 1991, and November, 1992, we had three presidential declarations of disaster. In August, it was Hurricane Bob. In October, Bob was followed by the "No Name Storm" or "Halloween N'oreaster" as it was referred to. (Since then, with the publication of Sebastian Junger's book *The Perfect Storm*, this storm has come to be known by the book's title.) And then, between December of '92 and March of '93, there were two intense winter blizzards that were bad enough to warrant a declaration. These were very busy times for Massachusetts and hazards. As part of the disaster team, I was on camera so much, the Assistant Director joked that CZM should sell ad space on my jacket sleeves!

During the past 30 years, which coastal region have you seen the most changes in when it comes to physical and economic development? Definitely Martha's Vineyard and Nantucket have changed the most significantly when it comes to physical development. Just in terms of sheer numbers of people and all the amenities that go with them—more buildings, more stores, and more parking lots equal more issues when it comes to water quality, parking, traffic, and beach access. As for economics, the fishing industry has changed dramatically. Going back 30 years,

Massachusetts was in the top 10 in terms of value and volume and Gloucester, New Bedford, Boston, and Chatham were all within the top 25 ports in the nation. Now, due to overfishing, regulations, and environmental conditions, that's all dropped significantly, though, I must say, the fish tastes just as good! And, while the average fish catch has fallen, the cost of living in Massachusetts has risen. For a fisherman, just catching the amount of fish to earn a salary you can live on is a very difficult proposition these days.

In your opinion, which coastal town in Massachusetts most embodies the qualities associated with New England? Boston and Salem represent what I think of as quintessential New England. Both have the rich maritime history coupled with the feeling of small towns. Even Boston, with nearly 600,000 residents, has a small town atmosphere. I see the same people on the train every day. And, in the summer, you can smell the coastal air in Boston. And just look at the State House—there's a life-sized sacred cod plaque hanging in the Chamber of the House of Representatives! In Salem, if you take a walk down Federal Street, you'll see all the brick facade Federalist houses that were built during the heyday of the clipper ships when captains made their fortunes at sea.

What local-level issue has caused the most impassioned reactions from people? The development and implementation of the Massachusetts Water Resource Authority's underground tunnel and accompanying sewage treatment plan. In 1983, when this plan was unveiled, Boston Harbor was filthy. Fish kills were reported on a daily basis. The sewage was only treated in a primary way—which is to say that large items were screened out, and the rest was dumped directly into the Harbor. The new proposal was for sewage to receive secondary treatment, meaning that after the primary treatment, sewage is further filtered to remove all sludge. The effluent would then travel through a deep rock tunnel extending under Massachusetts Bay to about nine miles east of Deer Island. No one was sure if this would change things; people wondered if it was going to be like playing three card monte—changing the location and varying the treatment, but without any real difference. And beyond all the wondering was the outrage over the expense. The proposed tunnel was the first of its kind and people doubted it could be pulled off. We're still paying for it in that our water bill used to be, like, nothing, and now, well... But the gamble did pay off: the Harbor is a lot cleaner and I can't remember the last time a fish kill was reported.

What coastal town has the best fried clams? Oooh—that's a tie. Clam Box in Ipswich or Essex Sea Food in Essex, on Cape Ann. Different batters, but both are delicious!



*Quintessential New
England coastal view:
sunset over Ipswich Bay.*

photo by Patricia M. Pelczarski