Chapter 4 / Community Planning for Climate Resilience

Mass Audubon regularly receives calls from individuals concerned about development in their cities and towns and its impact on wildlife habitat, water resources, and farmland. Following the recommendations of the previous edition of *Losing Ground*, we have developed the *Shaping the Future of Your Community* program to promote sustainable community planning, especially in areas of the state undergoing rapid development.

We recognize that economic development, including residential development, will continue to affect natural land, but not all land is the same, and not all development is the same. The *Shaping* program is working with communities to ask: Where is development most appropriate and how can growth be steered so that ecosystem function is maintained for people and wildlife? The way development is designed also plays an important role. Green, energy-efficient buildings in compact multi-use developments; preservation or planting of trees and native vegetation; and treating rainwater as a resource rather than a waste product all contribute to a more sustainable built environment.

Local land use rules determine the location, intensity, and style of development. The vision for a community and the mechanisms for achieving that vision are expressed and codified in documents such as community Master Plans, Open Space and Recreation Plans, zoning and subdivision regulations, and local wetlands bylaws. While these mechanisms can be arcane, they can be harnessed to protect land and promote sustainable forms of development. The challenge lies in creating a set of land use rules and programs that fit with the unique resources and interests of each community.

Planning for Preservation and Development

Over the past several years, state officials and regional planning agencies have developed new planning approaches and initiatives to guide development in a more sustainable manner while preserving important natural assets. The *Losing Ground* series has influenced that work, and Mass Audubon has been a partner in these efforts. The previous edition of *Losing Ground* identified the Sprawl Frontier, an area of rapid development in and along the I-495 corridor. Following the recommendations of that report, Mass Audubon focused on working with state and regional partners to support community planning in this and other fast-growing parts of the state. Collaborations such as the 495/MetroWest Development Compact Plan (495 Plan)[11] and other regional plans for the South Coast and Central Massachusetts regions designate Priority Development Areas that are most suitable for growth and Priority Preservation Areas that should be targets for protection. Most importantly, these plans include extensive input from each community in the region.

HELPING YOU SHAPE YOUR COMMUNITY

Massachusetts' complex land use laws are administered mainly by volunteer local officials. Mass Audubon established the *Shaping the Future of Your Community* program in 2009 to support adoption of local sustainable development techniques through customized workshops, community-based training, and direct assistance to local officials and residents. The program received an Environmental Merit Award from the New England Regional Office of the Environmental Protection Agency in 2013. For more information on how we can help you, visit www.massaudubon.org/shapingthefuture.

Priority Preservation Areas draw on resources such as *BioMap2* and local Open Space and Recreation Plans to identify high-priority lands for protection. Fortunately, many towns are creating funding mechanisms to actually protect these lands through the state Community Preservation Act (CPA). CPA is a local option that provides a combination of state and local funding for open space and recreation, historic preservation, and affordable housing. Since its passage in 2000, CPA has been adopted by 155 communities in Massachusetts and has provided $1.2 billion for over 6,000 projects including protection of over 19,000 acres of open space.[12]

These regional planning efforts highlighted the need to adopt "smart growth" tools to support innovative development in the Priority Development Areas while protecting the Priority Preservation Areas. Smart growth techniques such as well-sited, compact design, walkable neighborhoods, mixed commercial and residential districts, Low Impact Development, and green buildings can meet economic and housing needs while maintaining ecosystem function within a built landscape.

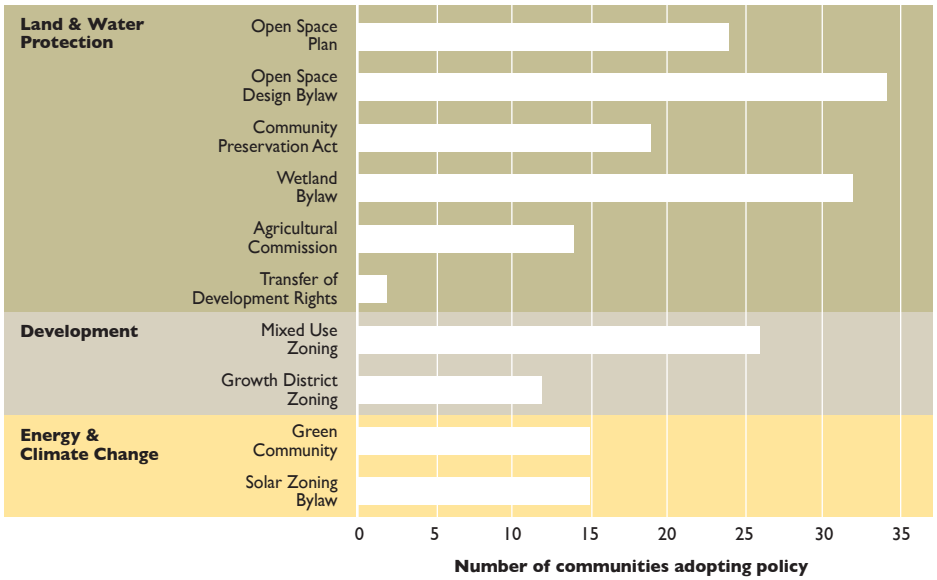
Communities can further direct development to the most appropriate locations through use of incentive-based programs such as transfer of development rights (TDR) and density bonuses. These techniques can be used to redirect growth away from high-value open space areas and toward town centers and/or redevelopment sites where appropriate infrastructure may exist or can be built. As a result, open space can be preserved, and higher density downtown or village center areas can be revitalized while reining in escalating municipal costs associated with sprawling road networks and associated water, wastewater, and stormwater infrastructure. Transforming the typical pattern of development in Massachusetts away from suburban sprawl toward more mixed-use, walkable neighborhoods has many benefits beyond open space protection—including social interaction, recreational opportunities, and healthy lifestyles. The demand for these kinds of living arrangements is growing rapidly.

Smart Growth Tools in the I-495 Region

We analyzed land use regulations in each of the 37 communities in the 495 Plan region, focusing on several smart growth tools that have been widely promoted by the state and regional planning agencies. Smart growth tools were grouped into three categories: Land and Water Protection; Priority Development Techniques, and Energy and Climate Change. Figure 4.1 summarizes the adoption of these tools in the region.

- **Land and Water Protection—**We assessed several tools in this category including whether each community had an Open Space Plan that had been updated and accepted by the state; a Natural Resource Protection Zoning bylaw (or older Open Space Design/ Cluster/Conservation Design Zoning); local passage of the Community Preservation Act (CPA); a municipal wetlands bylaw; a Transfer of Development Rights Zoning Bylaw (TDR); and an Agricultural Commission.

Figure 4.1: Adoption of land use techniques by communities in the 495 Plan region



All but one of the 37 communities have adopted at least one of these measures, but none have adopted all six and only eight have five of the six. The most widely adopted techniques are the local Wetlands Bylaw, Open Space Zoning, and Open Space Plan. Wetlands bylaws generally provide better protection for upland buffers to wetlands and waterways than the minimum state requirements. An updated Open Space Plan is necessary to qualify for state grants for open space and recreation projects. About half of the communities have adopted the CPA, and 14 have established an Agricultural Commission to support local farming. Only two communities use TDR, a tool that is complex to administer, but one that if properly applied can play an important role in supporting smart growth.

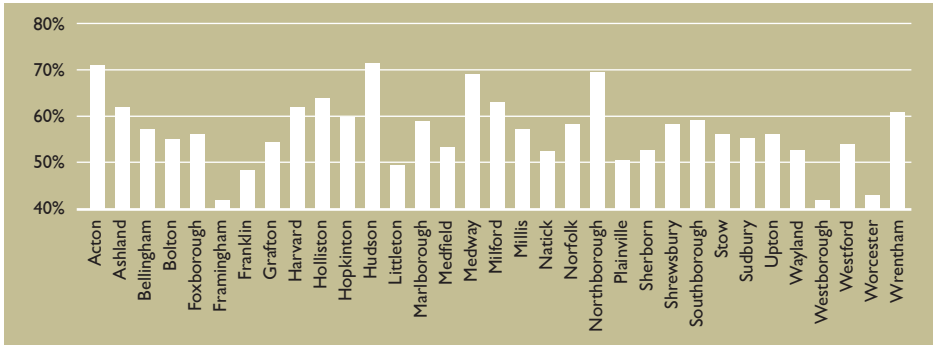
- **Priority Development Techniques—**We examined two techniques that concentrate development in designated locations—Mixed Use Zoning that addresses the increasing popularity and marketability of mixed residential/commercial uses in walkable neighborhoods or to revitalize downtowns; and Growth Districts approved by the state Executive Office of Housing and Economic Development (including 43D and 40R districts). The majority of communities have established one or both of these kinds of districts, with Mixed Use being applicable in at least one location in 26 of the communities.
- **Energy and Climate Change—**We looked at Green Community designation by the state, and adoption of a Solar Zoning bylaw to designate appropriate locations and conditioning of large-scale ground-mounted solar arrays. Solar Zoning bylaws can ensure that forests or areas targeted for future preservation are not vulnerable to solar development. Two-thirds of the communities can count at least one of these measures, although only seven have both. Communities can also promote the integration of renewable energy into buildings and developments, such as roof-mounted solar PV or hot-water and solar parking canopies. Although we did not analyze the extent of municipal regulations that promote such approaches, Green Community designations support appropriately sited renewable energy systems.

Natural Resource Protection Zoning

Not all development projects have the same economic or environmental effects. Traditional subdivisions divide virtually all of the available upland on a site into house lots, resulting in sprawling development. One alternative is Natural Resource Protection Zoning (NRPZ) or Open Space Design (OSD), which provides communities and developers with flexibility in subdivision design, allowing for development that minimizes disturbance to natural features while still providing for new construction. NRPZ offers many benefits to landowners, developers, and municipalities. It enables communities to protect valuable land and water resources without the need to purchase land, it reduces the extent of new infrastructure such as roadways and stormwater systems that a community needs to maintain, and it gives landowners a cost-efficient way to develop their property with an attractive, marketable result. Unfortunately, this innovative approach to site design is not widely used in many communities due to outdated zoning and subdivision rules.

Diving deeper in analyzing land use rules in the 495 Plan region, we took a special interest in the communities that have adopted an NRPZ or similar bylaw. We used criteria adapted from those developed by the Massachusetts Executive Office of Energy & Environmental Affairs, to analyze various elements of each community's bylaw, and ranked each bylaw as Good, Better, or Best in relation to the state's model NRPZ bylaw. This analysis found that all but 3 of the 37 communities have some type of open space or cluster bylaw. However, the majority of these bylaws do not include many of the best practices recommended by the state.

Figure 4.2: Natural Resource Protection Zoning Score for the 495 Plan Communities



We analyzed the bylaws in relation to several provisions (Figure 4.2) including:

- whether Open Space Design is allowed by right or only permitted through special permit
- the minimum amount of open space protection required
- whether it applies to only large developments and a few locations or to large and small projects in many areas of the community
- if the open space is contiguous or not; if important natural resources are conserved
- any relationship to local open space or master plans
- procedural requirements for determining yield and design
- any provisions for monitoring of the protected open space

We assigned points, giving more points to provisions that were better or best practices. The maximum possible point score was 39, and some points were weighted higher because they contribute more directly to resource conservation. Scores were then normalized to produce a percent score. Berlin, Hopedale, and Maynard have not adopted any NRPZ bylaw. Boxborough's open space bylaw only applies to commercial districts and was not comparable for purposes of this analysis.

All but one of the bylaws require a Special Permit for approval of a conservation subdivision design, while allowing traditional cookie-cutter subdivisions "by right." This complicates the process and creates uncertainty for developers. Other issues with older bylaws include inadequate criteria for the selection of the most important areas to conserve from a natural resource perspective, no link between the bylaw and local Open Space Plans, inadequate connectivity among protected open space, and lack of sufficient procedures for securing the permanent protection and proper management of the designated open spaces.

There are good reasons for communities to tailor a bylaw to local needs; however, the bylaw must make it easier for landowners and developers to pursue the community's desired result, rather than being so restrictive or cumbersome that the "easy" path remains conventional, sprawling design. It is also critical that the land protected through NRPZ contributes to the protection of a larger, interconnected network of natural land and trails consistent with the local open space plan. Small pieces of land within or around the border of a development may have local aesthetic value but often do little to support a resilient network of natural areas.

There is great variability from one community to another on use of the land protection and smart growth techniques that state and regional planning agencies have been promoting for several years or even decades. This reflects not only the different interests among communities, but also the local capacity issues associated with updating plans, bylaws, and regulations. Local land use boards are made up of citizen volunteers, and, while some communities have professional planning staff, those staff have many responsibilities. In addition to updating plans, bylaws, and regulations, staff responsibilities also include reviewing and overseeing development projects—which often consumes a great deal of their time. Adopting zoning changes requires a two-thirds majority vote of town meeting or a City Council—which can be difficult to achieve, especially when new and innovative approaches are proposed and people are uncertain of the results. Inevitably, different communities implement adopted tools to varying degrees—for example, some communities create a comprehensive Open Space and Recreation Plan and then immediately start putting it to use, while others may have a good plan but have not been able to follow through with implementation.

Building Community Resilience

Many of the tools initially designed for smart growth or sustainable development will also help communities adapt to the unavoidable impacts of climate change. By minimizing the loss and fragmentation of forests and protecting natural defenses such as vegetated buffers along shorelines, rivers, and wetlands, communities can reduce their vulnerability to impacts of increasingly intense storm events while maintaining the natural capacity of the land to absorb carbon.

On average, an acre of forest in Massachusetts contains about 85 tons of carbon,[13] and with 62 percent of the state covered in forest these lands are capturing about 13 percent of statewide annual emissions.[14] A recent report from Harvard Forest and the Smithsonian Institution, *Changes to the Land*,[15] analyzed several scenarios for future land use in Massachusetts. The "Forests as Infrastructure" scenario focusing on targeted land conservation, smart growth development, and good forest management scored highest on nature-based benefits. By 2060, it results in 25 percent less forest fragmentation, and protects 280,000 more acres of high-priority forest habitat than a continuation of recent trends. It also doubles local production of timber and other forest products while increasing carbon storage by 35 percent over existing levels.

Forests are the best land cover for absorbing and filtering precipitation, slowing runoff, and allowing water to percolate into soils where it recharges groundwater. Climate change is also predicted to increase the frequency of droughts. The capacity of the land to recharge aquifers is vital for water supply, and groundwater is also essential to maintain flow in streams. Many of our rivers and streams already suffer from lack of flow during summer and fall due

WESTFORD CASE STUDY

In 1978, the Town of Westford adopted a Conservation Subdivision bylaw. This bylaw requires submission of two plans for any proposed subdivision—one based on traditional design and another using conservation design. The planning board chooses the plan it prefers, and in most instances that has been the conservation design. Over the past 35 years, this bylaw has been applied to 48 developments, and resulted in the permanent protection of 1,743 acres of land, either through conservation restrictions (CRs), transfer to the town, or application of a special overlay zoning district. The interconnected network of open space created by this bylaw protects extensive wildlife habitat and water resources, and provides approximately 13 miles of hiking trails for public enjoyment.

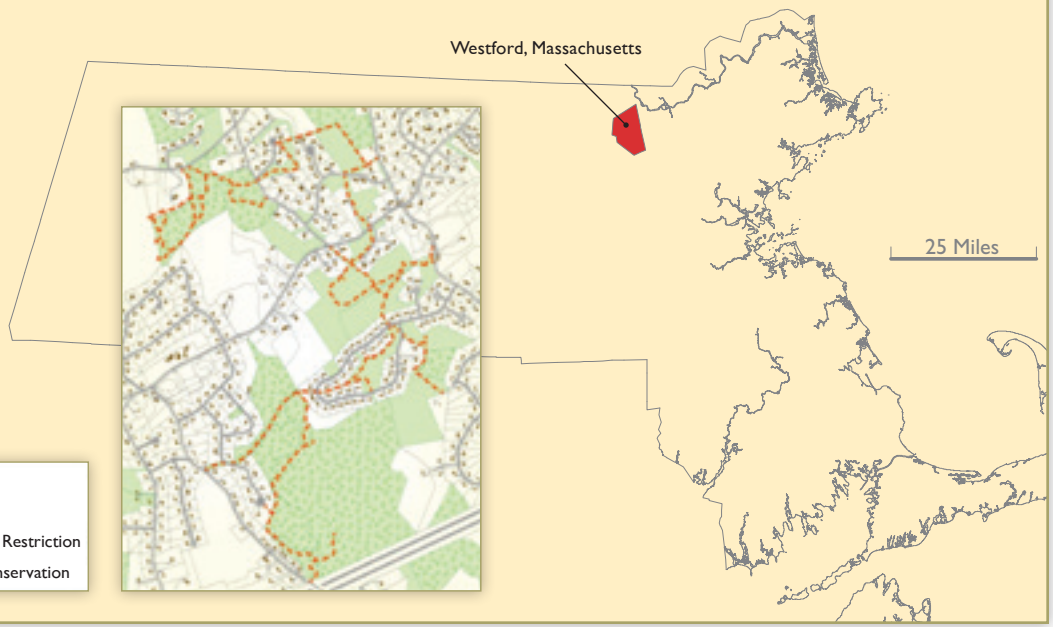


Figure 4.3: An extensive trail system connects two conservation areas and three residential areas in Westford, Massachusetts.

LID CASE STUDY

One example of the successes and challenges in greening development is the Alewife area on the Cambridge/Belmont line. The area suffers from frequent flooding and Combined Sewer Overflows, but also has excellent amenities including a state reservation with unusual urban wildlife habitats, a transit station, and connections to a regional bikeway. Redevelopment of a former manufacturing plant at 165 Cambridgepark Drive in Cambridge will replace a 100 percent impervious surface with a 300-unit Transit-Oriented Development that incorporates a vegetated "green" roof and bioretention systems. These green infrastructure elements will result in a net increase in vegetated area and a net decrease in surface runoff that will aid in reducing flooding in the sensitive Alewife Brook floodplain. Additional green infrastructure improvements have also been undertaken in the Alewife area, including a constructed wetland to collect and treat roadway runoff while enhancing wildlife habitat. Recreational trail improvements and interpretive signage have also been added. However, at the same time a major development is proposed for a nearby property that contains the last remaining tract of forested upland in the vicinity. While green redevelopment can improve existing conditions in some locations, important remaining natural areas must be protected for the ecosystem services they contribute.

Figure 4.4: A green roof and patio, similar to plans for 165 Cambridgepark Drive

Figure 4.5: Constructed wetland complex, Alewife Reservation, Cambridge, Massachusetts

to water withdrawals and impervious surfaces such as pavement and rooftops. The Harvard Forest/Smithsonian report found that protecting our forest infrastructure and growing smarter can keep the increase in runoff from impervious surfaces to below 10 percent in almost all of the watersheds in the Commonwealth. Forest cover around headwater streams is particularly important to protect coldwater fisheries to support trout and other aquatic species that are increasingly stressed by heat waves, reduced stream flows, and hot runoff from roads and rooftops.

But we can do even more than just preserving our natural "green infrastructure." We can use Low Impact Development (LID) techniques including rain gardens, grass swales, and infiltration areas that capture, filter, and infiltrate runoff from roofs, driveways, and roadways. LID can be applied in new developments to maintain existing hydrology, or even to increase the amount of infiltration over existing conditions in an already-stressed watershed. In some cases, LID technologies can also be integrated into existing developments, ameliorating the effects of development on hydrology. Green roofs, well-placed landscaping, and street trees also have energy-efficiency benefits for building heating and cooling. Taken together, these and other green building techniques can make the built environment more attractive and livable, help mitigate climate change by reducing energy demand, and also increase resilience to climate extremes.

Restoration

Even if all new development is built in areas of low environmental sensitivity, using compact, LID design, there are still many features of existing development and infrastructure that make natural and human communities vulnerable to the impacts of climate change. Our rivers and streams are bisected by thousands of dams and culverts that prevent safe passage of fish and other wildlife and present hazards during flood events. Efforts are underway to prioritize removal and retrofitting of these barriers.

Communities are beginning to recognize the value of greening their cities and towns with trees, pocket parks, community gardens, plantings along streambanks, and green roofs. These and other projects can reduce heat island effects, absorb storm runoff, provide locally sourced food, support outdoor exercise and social interaction, and enhance habitat for urban birds and other wildlife. Along the coast, Massachusetts is investing in green infrastructure projects such as beach nourishment, coastal wetland restoration, and even reestablishment of oyster beds. Both coastal and inland restoration and green infrastructure projects provide economic benefits well in excess of the costs. Coastal restoration projects can return as much as $15 in net economic benefit for every taxpayer dollar invested.[16]

Conclusion

Massachusetts has made great progress in recent years toward reducing the rate of sprawl-style development and increasing the pace of well-targeted land conservation and ecological restoration. But there remains a significant risk that these trends may be reversed once again. As updating local land use rules and protecting land can get lost among the many pressing community priorities, the state's continuing commitment to helping communities grow and develop in environmentally sustainable ways is essential. With nimble and responsive zoning and planning tools, local communities are better equipped to achieve a sustainable, vibrant future for the nature and people of Massachusetts.

Chapter 5 / Conclusions and Recommendations

In the period between 2005 and 2013, more than three acres of land were permanently protected in Massachusetts for every acre that was developed. This is an encouraging pace of protection versus development and an increase from the 2:1 ratio cited in the 2009 edition of *Losing Ground* that covered the years from 1999 to 2005. These numbers reflect both the reduced rate of development during our analysis period relative to previous editions of *Losing Ground* and a concerted effort, led by the Commonwealth in partnership with municipalities and private groups, to protect key lands across the state. As encouraging as these figures are, we must recall that the last *Losing Ground* report demonstrated that development has indirect ecological impacts on an area three to four times the size of the built footprint itself.

Building activity was dramatically reduced in the period of our analysis due to the Great Recession (2008-2009) and resulting credit crunch; yet data on new housing indicate that development pressure is returning to levels seen in the years before the economic slowdown. And new construction may increase even more quickly than is indicated in Figure 1.2: the housing start data presented there is based on permitted units; yet the Massachusetts Permit Extension Act[17] means that some of these permitted units haven't yet been built, so the increase in acres developed could take off even faster than new permits.

We must adopt and implement the most innovative approaches to land planning and site design and increase the pace of land protection even further if we are to maintain a Massachusetts with an interconnected mosaic of forests, fields, and wetlands, including the most valuable land for wildlife habitat and climate resilience, while providing for economic growth in an efficient and sustainable manner. The need for these strategies becomes ever more urgent as the climate crisis escalates. In order to achieve these goals, we recommend the following actions.

Funding for Land Protection

- **One percent for nature**—The state administration and legislature should devote at least 1 percent of the annual state operating budget to environmental programs; the current rate is 0.64 percent.
- **Environmental Bond**—The legislature must complete final passage of an Environmental Bond and the administration must commit to spending no less than $50 million per year for land protection in the Commonwealth.
- **Community Preservation Trust Fund**—The legislature and administration must provide continued support for the Community Preservation Trust Fund by funding the state match for locally raised dollars for open space, affordable housing, historic restoration, and recreation projects.
- **Federal Tax Incentives**—The conservation community should advocate for expansion of federal tax incentives to include gifts of outright ownership of land, also known as *fee interest*. Recently enacted federal and state tax incentives for land conservation have resulted in a rapid increase in the pace and overall magnitude of conservation; however, current federal incentives are limited to gifts of less-than-fee interests only—such as conservation restrictions (CRs). While CRs are a critical part of the land protection toolkit, sometimes a gift or bargain sale of the fee interest is the best outcome, for achieving resource protection goals and the donor's goals. Demographic data suggest that many opportunities for fee transfers of important, unprotected properties will occur in the coming decade. Expanded federal tax incentives will provide conservation practitioners with all of the tools they need to address key opportunities in the years immediately ahead.

Increase the Pace of Land Protection in the Era of Climate Change

- **Commitment to Land Protection**—The new gubernatorial administration must continue and build upon the Patrick Administration's commitment to land protection as detailed in the Executive Office of Energy & Environmental Affairs' recently released report *100,000 Acres of New Conservation Land and 150 New Parks: A Legacy for the Next Generation*.
- **Land Protection Strategy**—The land protection community should develop strategies for increasing the pace of land protection. Table 5.1 shows the pace of land protection necessary to achieve various conservation goals in the coming decades.
- **Targeted Land Protection**—State, local, and not-for-profit land protection and stewardship efforts should continue to focus on the areas of opportunity for protection of important habitat and resilient landscapes identified in Chapter 3. Practitioners should become familiar with and utilize the latest conservation planning tools including *BioMap2*, TNC's resilience model, and UMass Amherst's Conservation Assessment and Prioritization System (CAPS).[18] Table 5.2 shows that we can protect a majority of *BioMap2* Core Habitat in the coming decades if we increase our focus on these lands.

Effective and Innovative Planning

- **Zoning Reform**—The Governor should actively and publicly support and the legislature should pass zoning reform legislation (*An Act Promoting the Planning and Development of Sustainable Communities*[19]). This legislation would update Massachusetts'

antiquated planning and zoning laws and encourage strong community planning and natural resource protection while maintaining a vibrant and competitive Commonwealth.

- **Planning in the Sprawl Frontier—**State and regional planning resources should be focused on the Sprawl Frontier, including more assistance and incentives for communities to adopt innovative, sustainable development and green infrastructure techniques.
- **Massachusetts Endangered Species Act—**The conservation community and the legislature should continue to support the Priority Habitat provisions of the Massachusetts Endangered Species Act[20], which were recently upheld by the Massachusetts Supreme Judicial Court.

Climate Change Adaptation

- **Comprehensive Adaptation Management Plan—**The legislature should pass and the governor should sign the Comprehensive Adaptation Management Plan (CAMP) bill.[21] The bill will require the state to develop an adaptation plan that clearly outlines the Commonwealth's goals, priorities, and principles for resilience, preservation, protection, restoration, and enhancement of the Commonwealth's built and natural infrastructure.
- **Funding for Adaptation Planning—**Funds for climate change adaptation planning and project implementation should be provided through multiple sources including the state operating budget, Environmental Bond, Regional Greenhouse Gas Initiative, the Water Infrastructure Finance bill, and federal sources.
- **Green Infrastructure—**Communities should invest in land protection and restoration of inland and coastal wetlands and upland buffers as green infrastructure to enhance the resilience of our natural and built environments.
- **Restoration Funding—**The state should continue to fund restoration efforts through the Division of Ecological Restoration and UMass Amherst's River and Stream Continuity Project,[22] specifically wetland and buffer restoration, dam removals, and replacement of undersized culverts, to enhance resilience of wildlife habitat and the built environment.

Partnerships

- **Conservation Land Stewardship—**The conservation community must continue to work together to actively uphold the conservation values of permanently protected land.
- **Community Preservation Act—**The conservation community should continue to support cities and towns in adopting and implementing the Community Preservation Act.
- **Land Cover Data—**The Executive Office of Energy & Environmental Affairs and the Information Technology Division of the Administration and Finance Secretariat should ensure the availability of up-to-date, statewide aerial photographs and well-constructed, useful, and timely land cover data for use in this type of analysis. Agencies should explore innovative collaborations with universities and the user community.
- **Maintain Open Space Data—**The land protection community should continue to work closely with MassGIS to maintain a comprehensive and up-to-date Open Space datalayer.

Table 5.1: Land protection outcomes for various rates of land protection over time. Percent is based on total land area of state.

		2020		2025		2050	
acres/day	acres/year	total acres	% of state	total acres	% of state	total acres	% of state
40	14,600	1,361,275	27.2%	1,434,275	28.7%	1,799,275	36.0%
50	18,250	1,386,825	27.8%	1,478,075	29.6%	1,934,325	38.7%
60	21,900	1,412,375	28.3%	1,521,875	30.5%	2,069,375	41.4%
70	25,550	1,437,925	28.8%	1,565,675	31.3%	2,204,425	44.1%
80	29,200	1,463,475	29.3%	1,609,475	32.2%	2,339,475	46.8%
90	32,850	1,489,025	29.8%	1,653,275	33.1%	2,474,525	49.5%
100	36,500	1,514,575	30.3%	1,697,075	34.0%	2,609,575	52.2%

As detailed in Chapter 2, as of April 2013, nearly 1.26 million acres (25.2 percent) of the state's land area has been protected. Table 5.1 shows how many acres and what percent of the state's land area would be protected if we conserved land at the rate shown on the left through the date shown at the top. For example, if we can increase the recent 40 acre/day pace of land protection by 50 percent to 60 acres/day and sustain that rate through 2025, we will have protected fully 30 percent of the state.

Table 5.2: *BioMap2* Core Habitat protection outcomes for various rates of protection over time. Percent is based on total *BioMap2* Core Habitat excluding large water bodies.

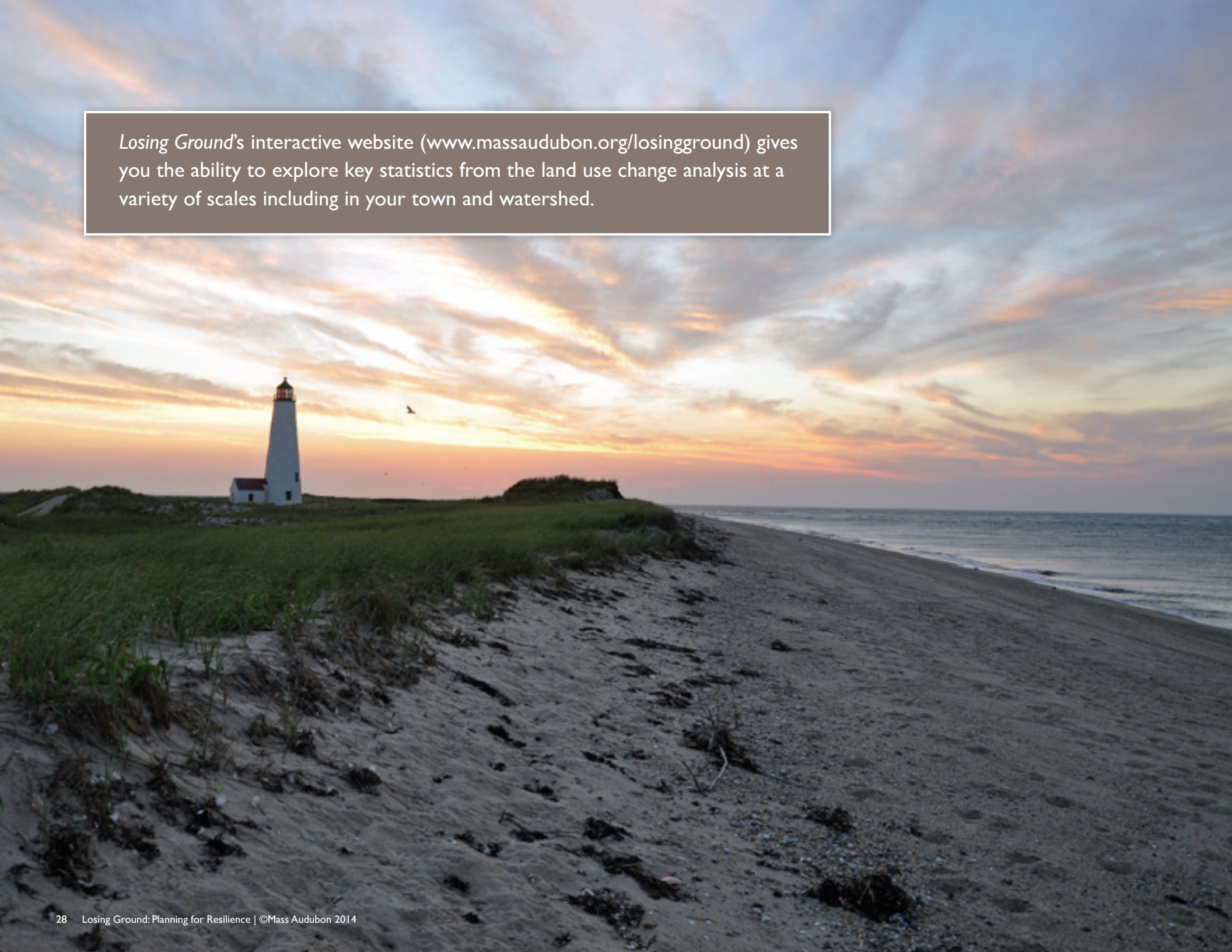
		2020		2025		2050	
acres/day	acres/year	total acres	% of Core Habitat	total acres	% of Core Habitat	total acres	% of Core Habitat
15	5,475	578,667	50.1%	606,042	52.5%	742,917	64.3%
20	7,300	591,442	51.2%	627,942	54.4%	810,442	70.2%
30	10,950	616,992	53.4%	671,742	58.2%	945,492	81.9%
40	14,600	642,542	55.6%	715,542	61.9%	1,080,542	93.5%
50	18,250	668,092	57.8%	759,342	65.7%	1,155,204	100%
60	21,900	693,642	60.0%	803,142	69.5%	1,155204	100%

Table 5.2 shows how much *BioMap2* Core Habitat could be protected at various rates over time. From 2005 to 2013, Core Habitat was protected at a pace of 15 acres/day resulting in over 540,000 acres, or 45 percent of Core Habitat being permanently protected. Roughly one-third of all land protected since 2005 is Core Habitat. If we could further focus land protection efforts and increase the pace of Core Habitat protection to 30 acres/day, we could protect over 58 percent of all terrestrial Core Habitat by 2025.

This report's title, *Losing Ground*, refers to the ongoing conversion of undeveloped land, valued for wildlife habitat, agriculture, forest products, and water quality, among other attributes, to the hard infrastructure of human use. As documented by the *Losing Ground* series, the pace of this conversion has varied over time, and this edition witnesses an ebb associated with the Great Recession. Indications already point to the resumption of higher development rates in 2014 and beyond, but at this point the window of opportunity for progressive and informed land use decisions remains open in many communities. In the lull before boom times return, now is the time to take stock of the forests, wetlands, fields, and rivers that are so important for each community's natural, cultural, and economic health, and chart a deliberate development course that protects these assets over the long term.

The need for such intelligent planning is heightened throughout the Commonwealth by the effects of climate change. As one example, sea-level rise will continue to alter coastal areas and, combined with increased storm intensity, threatens some of the highest valued real estate in the state. Superstorm Sandy and Tropical Storm Irene demonstrated the vulnerability of infrastructure we consider to be permanent, and we would be foolish to ignore their lessons. The value of natural lands—including salt marshes, barrier beaches, and forested floodplains—for mitigating the damaging effects of intense storms is clear, and investments in protecting these natural defenses provide dividends forever. It is a win-win decision when land protection benefits both human and natural communities, yet short-term human interests continue to be powerful considerations.

The recent milestone of protecting fully one-quarter of the land area of the state could not have been accomplished without the dedicated efforts by government, nongovernmental organizations, and private landowners. Yet for the conservation community there is no time to rest on this accomplishment. Action on the recommendations in this report will ensure progress toward a sustainable and vibrant Massachusetts that continues to function for people and nature.



Losing Ground's interactive website (www.massaudubon.org/losingground) gives you the ability to explore key statistics from the land use change analysis at a variety of scales including in your town and watershed.

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