

# SECTION FIVE



# Habitats



Peter Taylor/Waterview Consulting

## Introduction

The quality and quantity of habitat available for fish, birds, mammals and other organisms provides one of the most direct measures available of the cumulative impact of development on environmental quality. Yet high-quality habitat can also be tricky to track, since what is good habitat for one species is not necessarily good for others. It is easy to see how development on coastal islands could harm populations of eiders and gulls that nest there. It may be less obvious why the conversion of forest to a suburban landscape in the (still largely forested) Casco Bay watershed would harm wildlife.

Maine has been a largely forested state with abundant rivers, lakes and wetlands for over 10,000 years. Many of Maine's native fish and wildlife, from fisher to moose, migratory birds to brook trout, are dependent on forest, or a mosaic of forest and aquatic habitats, to survive. Moose are denizens of forest, lake and wetland; beaver of forest and river; Atlantic salmon of forested streams and ocean waters.

Loss of wetlands, destruction of forests and damage to riparian areas produce direct effects on populations of birds, mammals, amphibians, fish, and invertebrates that depend on such areas for all or part of their lifecycle. But

urban and suburban development not only reduces the amount of habitat available for Maine's forest species, it also alters how habitats are connected to one another. Roads, lawns and shopping malls slice intact forests into small, often isolated patches. While a road or lawn may not be much of a barrier to a deer, it can be an uncrossable chasm for species from warblers to ground beetles that prefer the shelter of trees. Where roads cross streams, culverts can create barriers to movement of aquatic organisms, preventing fish from reaching spawning areas, or denying them shelter in smaller streams from spring floods or hot summer afternoons. Such habitat fragmentation can lead to declines in wildlife populations and local loss of species. Fragmented habitats are also thought to be less resilient to environmental change.

Tracking changes in habitat quality and quantity provides direct information to guide land use policy and to suggest priorities for land conservation. It also helps identify local and regional drivers for changes in abundance of species of concern. A look at habitat change shows the extent of landscape alteration and helps to make clear the types of landscapes that public policies, market forces, and individual choices are building.

## How are urbanization and development affecting the availability of habitats for fish, wildlife and birds that depend on interior forest areas?

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

### Status

Forests provide essential habitat to many of Maine’s native birds, fish, and mammals. Certain species, including large herbivores and predators such as fishers, hawks and owls, roam over large areas of forest and thus cannot survive in the small forests found in suburban areas. Many species of migrant songbirds, including many warblers, are forest specialists, nesting successfully only in large blocks of forest. While the Casco Bay watershed is still largely forested, forest interior habitat may be in short supply.

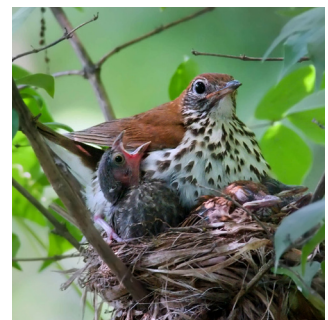
While to most humans there may appear to be little difference between the edge and the interior of a forest, there can be profound differences from the perspective of the animals and plants that live there. The edges of forests have a different microclimate from the interior. They often are sunnier, windier, and drier than the depths of the woods. Proximity to other habitats, such as lawns or agricultural fields, brings its own challenges. For example, invasive species like Eurasian bitterweet and house sparrows are far more abundant. Many predators, from raccoons to house cats, are less common in deep woods than near open habitats. The brown-headed cowbird, which lays its eggs in the nests of other birds, favors open habitats as well. Certain wildlife species are sensitive to human disturbance, and thus are most common in the deep woods where people are less active.

Forest interior wildlife includes songbirds such as the wood thrush, scarlet tanager, and many warblers; larger birds, including woodpeckers, hawks, and owls; and forest interior mammals such as fisher, lynx, and bear. Even some small rodents and insects have been shown to be much more abundant in interior forest.

Maine’s Beginning with Habitat Program recently analyzed land cover data derived from satellite imagery from 1999-2001 to shed light on the availability of deep forest habitats throughout Maine (Beginning With Habitat 2010). The resulting geographic dataset represents large – more than 500 acre – contiguous areas of forest that are at least 300 feet away from other habitats. Such areas are most likely to provide significant interior forest habitat.



Jerry Oldenettel



Kelly Colganazar



Eric Bégin



USFWS

Clockwise from top left: Scarlet tanager, wood thrush (with young cowbird, a nest parasite), brook trout, and lynx are among the species in Maine that need interior forest habitat.

Even in a largely forested watershed such as Casco Bay, suitable habitat for forest specialists may be uncommon. Their ideal habitat occurs only in large areas of forest that are compact in shape and are located far from most human activity. Almost 69 percent (676.0 square miles) of the 986 square mile Casco Bay watershed is forested (Maine Office of GIS 2004). In contrast, only 172.6 square miles (17.5 percent) of the watershed consists of interior forest habitat, the majority of which is located in the upper portions of the watershed. Interior forest is far less abundant in the more highly developed coastal communities, where suburban lands, abundant roads, powerlines, and other linear infrastructure cut the forest into smaller areas that provide little true interior forest habitat.

## Trends

Most of New England, including Maine, has been gaining forest area for much of the last 150 years. That long-term trend reflects shifts in the rural economy: the agricultural production that fed eastern cities first moved to the Midwest and then overseas. Today, abandoned agricultural lands are a major component of the landscape of the Casco Bay watershed. Their presence is revealed by the presence of stone walls, old apple trees, and other, more subtle evidence of past agriculture in the midst of large areas of forest.

Only in recent decades, as development patterns have converted more and more forest to suburb (The Brookings Institution 2006), has that long-term trend been reversed. Where characteristic exurban development patterns are most intense – along the route 95 and 295 corridors and near Portland, Brunswick, and the other regional service center communities – interior forest habitat has undoubtedly declined in recent decades. The extent and speed of those declines, however, is poorly known.

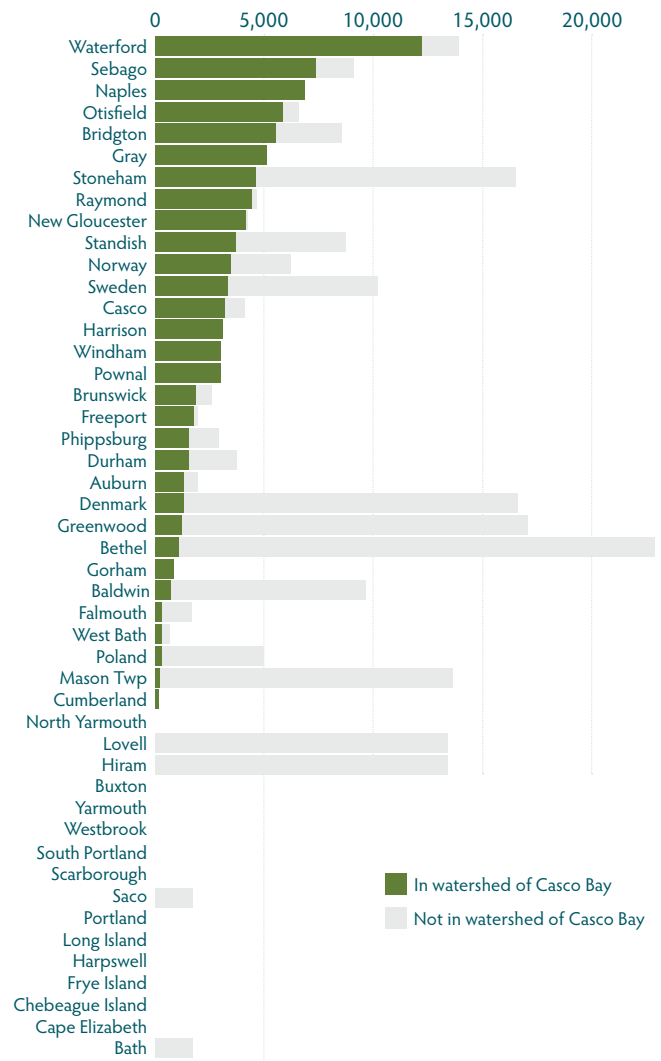
The Beginning with Habitat program has only recently begun explicitly mapping interior forest habitat. Its analysis was first made available in 2009, but the underlying satellite data on which it is based dates back a decade. Rigorous, geographically defined trend analysis will require generation of new geographic data from historic sources and acquisition of new imagery. (Note: In the 2005 *State of the Bay* report, CBEP reported on “Undeveloped Blocks of Land,” a related metric that sheds light on similar issues. That metric was based on the same land use data, harking back to the same satellite imagery as the interior forest metric.)

## Actions/Solutions

The Beginning with Habitat program was founded to help educate towns about the value of protecting wildlife habitat. Its habitat maps, land use analysis, and related products together provide a important planning toolkit to help local communities achieve this goal.

Other approaches may prove important for the long-term protection of interior forest habitat. Land trusts, towns, and state agencies are finding creative ways to support conservation of forest area for a host of reasons. Protection of forests not only provides habitat for forest interior wildlife, but can also support forest-dependent jobs, and protects the character of our communities. The forests of the Casco Bay watershed also provide important ecosystem services of direct benefit to our society, such as carbon sequestration and provision of clean water. Acquisition of land or conservation easements provides direct habitat conservation (see Indicator 13), and support the economic viability of forest-dependent land uses, from traditional forestry, to carbon sequestration markets and markets for ecosystem services.

Interior Forest Habitat in Casco Bay Townships



The majority of the interior forest habitat in the Casco Bay watershed lies within the northern and western towns at the headwaters of the Sebago Lake / Presumpscot River watershed. The more developed coastal communities contain little or no interior forest habitat.

## References

Beginning with Habitat 2010. Beginning with Habitat: Primary Map 3. Undeveloped Habitat Blocks. [http://www.beginningwithhabitat.org/the\\_maps/map3-undev\\_habitat.html](http://www.beginningwithhabitat.org/the_maps/map3-undev_habitat.html)

The Brookings Institution. 2006. *Charting Maine's Future: An Action Plan for Promoting Sustainable Prosperity and Quality Places*. Brookings Institution Metropolitan Policy Program.

Casco Bay Estuary Partnership. 2005. *State of the Bay*. <http://www.cascobay.usm.maine.edu/sotb05.html>

Maine Office of GIS. 2006. MECLD dataset. Maine Office of Geographic Information Systems. <http://megis.maine.gov/catalog>



**Forest Habitat**

- Interior forest block
- Other forested area

## Interior Forest Habitat

While forest land is still abundant in the Casco Bay watershed, much of it offers little suitable habitat to wildlife that depends on deep forest habitat. While forests are widespread except in the heart of the Portland metropolitan area, interior forest habitat is much more concentrated away from the coast. Roads and developed lands near the coast divide forest into patches too small to provide secure habitat for forest interior specialists. Data: Beginning with Habitat and Maine Office of GIS

## RIPARIAN BUFFERS IN THE CASCO BAY WATERSHED

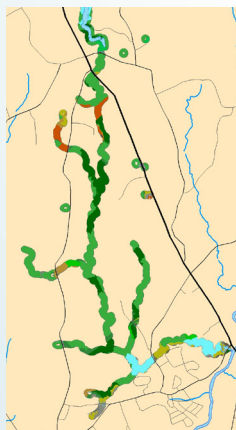
### Introduction

Riparian buffers are the narrow strips of land adjacent to streams, rivers, lakes and the coast. Well-vegetated buffers, especially forested and wetland buffers, are important to supporting good water quality, and to improving fish and wildlife populations.

Vegetated buffers slow water, help shorelines resist erosion, and filter runoff, which limits the delivery of sediment and associated pollutants to streams. Buffers, especially wetland buffers, are also excellent at absorbing macronutrients like nitrogen and phosphorus, further protecting water quality.

Forested buffers shade the water, reducing temperatures and increasing dissolved oxygen levels. They also provide dead leaves, which, by providing food directly or indirectly to aquatic organisms, are a major energy source for stream ecosystems. Logs and woody debris derived from riparian trees provide shelter for aquatic organisms along the shore. Woody debris influences stream channel development, and contributes to development of pools, backwaters and other stream features that make for good fish habitat. In some of the watershed's sandy or clay-lined coastal streams, rocks are rare, making woody debris one of the few places where aquatic insects can attach to hard surfaces, and avoid being washed downstream.

Riparian forests also provide important sheltered corridors for wildlife reluctant to cross open land. In agricultural and suburban landscapes, the long, sinuous strips of forest remnants that often lie along streams can link together patches of forest that would otherwise be isolated, supporting robust populations of woodland wildlife, and facilitating annual migration of forest birds and animals (see Indicator 12).



Land use in the 50-meter riparian zone of Mill Brook.

### Status

GIS technology can be used to combine information on land cover (Maine Office of GIS 2006) with data on the locations of aquatic areas like streams, lakes, and the ocean (Maine Office of GIS 2004). The result characterizes land use in areas close to aquatic habitats, as shown in the example above.

The majority of the Casco Bay watershed and a majority of the riparian areas within it remain forested. 70.7 percent of the watershed is forest or wetland. The

50-meter riparian buffer zone adjacent to Casco Bay itself (65.9 percent) is slightly less forested than the landscape as a whole, presumably because people like to live and work along the shore. The buffer areas along the watershed's lakes and ponds (75.3 percent) and especially along streams and rivers (83.1 percent), in contrast, are more likely to be forested than is typical for the watershed as whole.

The proportion of buffers within each subwatershed – the HUC 12 subwatersheds – of the Casco Bay watershed that remains in forest or wetland varies from a low of 27 percent in the highly urbanized Fore River subwatershed to 98 percent along the Northwest River. The percentage of riparian buffers that remains in forest and wetland is correlated with the proportion of each subwatershed that is either forest or wetland. Thus the abundance of riparian forest and wetland is lowest near the coast, and greatest in the largely forested upper watershed.

### Trends

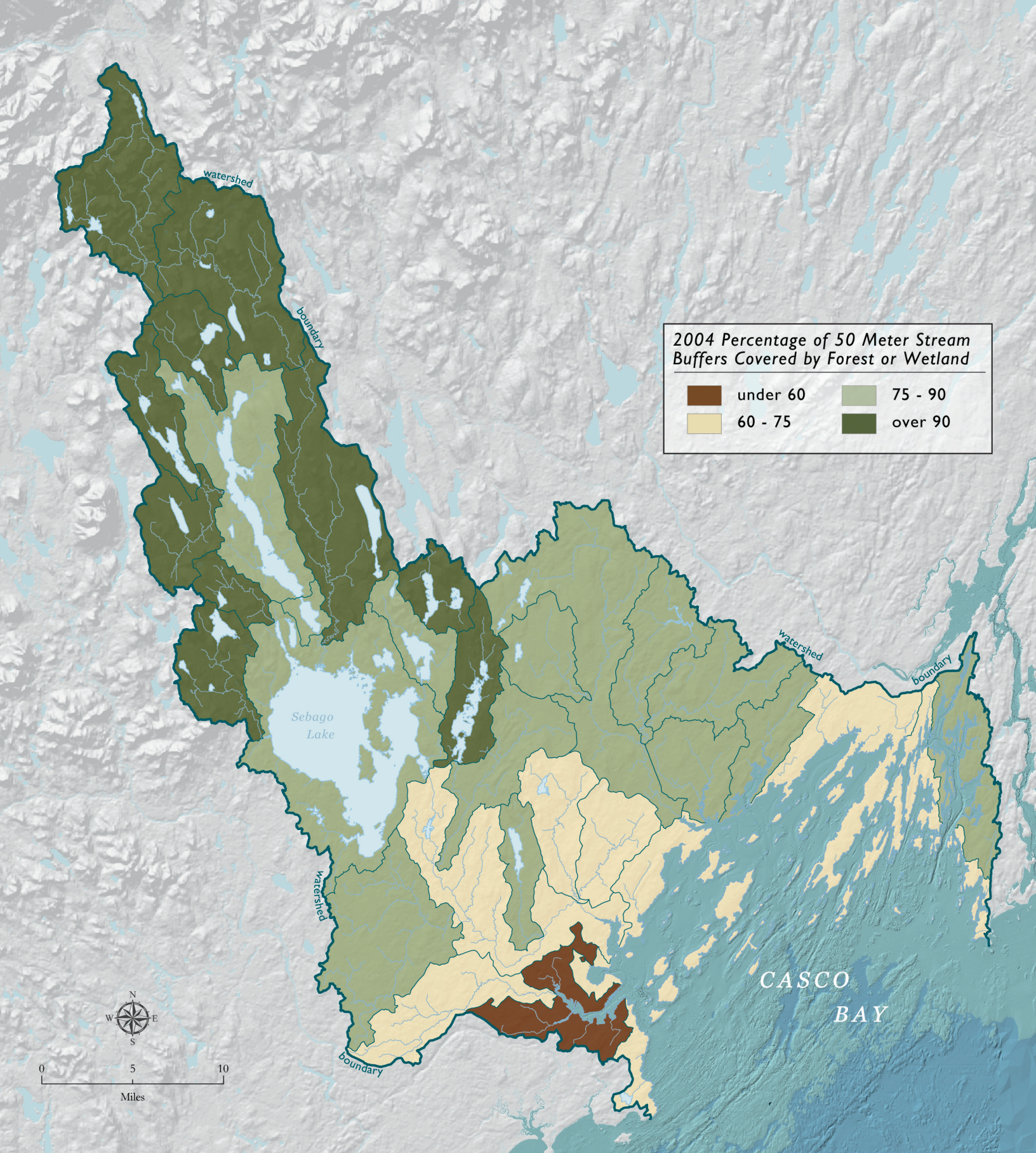
Riparian buffer analysis has not previously been carried out throughout the watershed, and available historic land cover data used slightly different methods for determining what constituted forest or wetland. Accordingly, we do not have rigorous information on trends in riparian buffer condition.

As with the other Casco Bay watershed habitat indicators, however, the driving force behind long-term trends in the condition of riparian vegetation is land use change, along with the economic choices, policy decisions, and social forces that shape land use decisions.

Maine has several laws that protect shorelines and riparian areas. Its Shoreland Zoning Act, for example, requires towns to adopt land use regulations that apply within the "shoreland zone" – areas within 250 feet of pond and lakes, rivers, tidal waters and wetland, as well as those within 75 feet of streams. Rules generally include restrictions on construction and clearing of vegetation. The Natural Resources Protection Act offers additional protection for lands adjacent to coastal wetlands, some freshwater wetlands, great ponds, rivers and streams.

### References

- Maine Office of GIS. 2006. MECLD dataset. Maine Office of Geographic Information Systems. <http://megis.maine.gov/catalog/>
- Maine Office of GIS. 2004. WQPONDS, WQSTREAMS, WQRIVERS, and WQCOAST datasets. Geographic data available through Maine Office of Geographic Information Systems. <http://megis.maine.gov/catalog/>



**Condition of Riparian Buffers by Subwatershed**

## FISH PASSAGE SURVEY

While habitat fragmentation has been studied extensively in upland forests, it is also a significant problem in rivers and streams. Flowing waters are often crossed by many roads and are blocked by large and small dams. Without proper design, construction, and maintenance, dams and culverts can block the movement of fishes and other aquatic organisms. The effects of such fish passage barriers on long distance migratory fish species like Atlantic salmon and alewives are significant. The effects on resident species are less well understood.

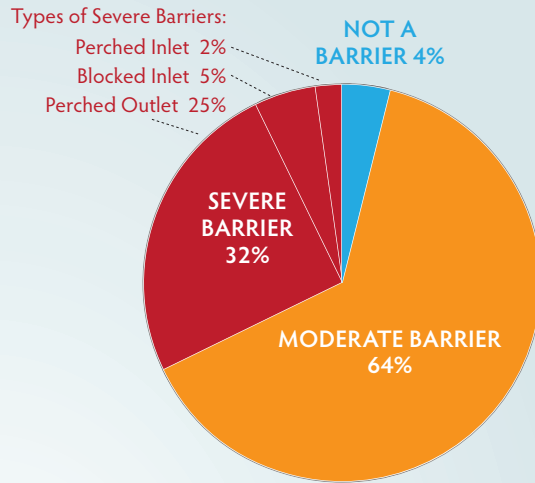
In 2009, CBEP seasonal staff, working with volunteers from Trout Unlimited and personnel from the U.S. Fish and Wildlife Service Gulf of Maine Coastal Program Office, visited over 700 potential fish passage barriers in the Royal River and lower Presumpscot River watersheds. They collected detailed data from over 480 culverts and approximately 30 dams. The survey was the first in the state to be carried out in a region that is largely urban and suburban; previous Maine surveys were focused on more rural landscapes, especially forested watersheds.

About one-third of culverts in the region never permit fish to pass. The majority of culverts are partial barriers to fish movement – blocking access some of the time, or to certain species of fish. Only a handful of crossings never restrict movement of fishes.

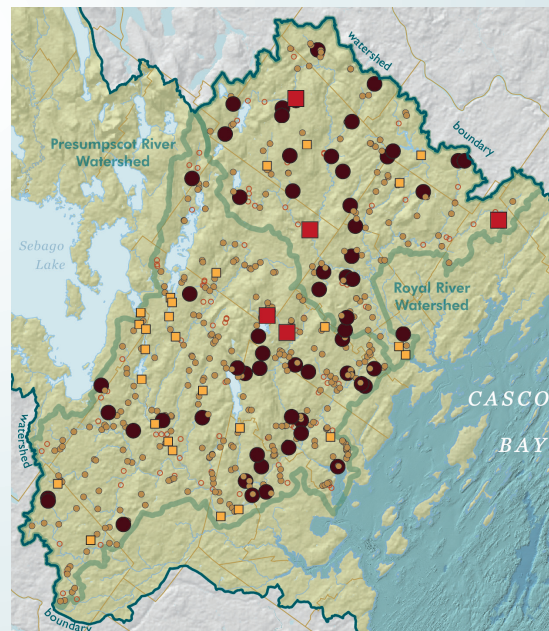
U.S. Fish and Wildlife staff analyzed the data to identify priority restoration opportunities in the study area, both for restoring access of anadromous fishes to stream habitat and for restoring access to lake habitat – which is particularly important to alewives, one of the most abundant anadromous species in the region. The results of those analyses provide CBEP and its partners with a “to do” list for fish passage restoration.

CBEP staff have also developed a tool – based in part on methods pioneered by the Piscataqua Region Estuaries Partnership under their Climate Ready Estuaries project – that provides a rough estimate of the relative flood risk at each culvert. Using the geometric data about each culvert collected during the field survey, along with the geographic information derived from GIS analysis, CBEP compared culvert flow capacity with expected storm flows.

Analysis of the results showed significant overlap between culverts that block fish migration and culverts that may pose higher than average flood risk. That insight has led to conversations with local communities, the Maine Department of Transportation, and the Cumberland County Emergency Management Agency to identify sites where culvert replacement would simultaneously serve environmental, infrastructure and public safety goals.



**Results of 2009 field survey.** Most culverts are fish passage barriers. A quarter of all culverts are impassable to fish because their outlet is perched significantly above the elevation of the stream. Since most of Maine’s anadromous fishes don’t jump, these culverts effectively block upstream movement of many anadromous fishes.



### Priority Fish Passage Restoration Areas

Dams		Culverts	
<span style="color: red;">■</span>	Priority	<span style="color: black;">●</span>	Priority
<span style="color: orange;">■</span>	Other	<span style="color: brown;">●</span>	Other
<span style="color: white;">○</span>	Unsurveyed crossing (2009)		

## Is the area of protected habitat increasing in the Casco Bay watershed?

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

### Status

The Casco Bay watershed continues to provide valuable habitat for a range of fish and wildlife species. Available habitat, however, can be lost or degraded by human activity, especially urban and suburban development. Constructing homes or shopping malls converts field and forest wildlife habitats to lawns, roads, and remnant forest plots that support a less abundant and less diverse animal community.

While land conversion in the Casco Bay watershed may have slowed slightly due to the recent economic downturn, the population of the Greater Portland area is growing, and the use of land for homes and businesses has been growing still more rapidly. Development today consumes more land per person than it did a generation ago, and much more than it did in the mid-twentieth century. Much of the regions' recent growth has been centered not in existing urban areas, but in peripheral communities that, until recently, were largely rural.

Such land use trends reduce both habitat quantity and quality; pose challenges for industries based on natural resources; and block access to wild lands for traditional pursuits like hunting and hiking. Land conservation efforts play an essential role in ameliorating such unintended consequences of land use choices.

Maine has a vibrant tradition of locally led conservation. As of June 2010, the Maine Land Trust Network listed 100 land trusts and other organizations dedicated to conserving land around the state (MLTN 2010). Those groups are involved not only with protecting habitat, but also with preserving farmland, protecting working forests, and



**Conserved lands in the lower 16 municipalities around Casco Bay.** Many conserved lands remain in private ownership, and do not allow public access. Always check with the landowner before visiting any protected area.

developing recreational trails. Several times, Maine's voters have supported bonds to fund land protection through the Land for Maine's Future Fund, which has protected nearly half a million acres in Maine since its inception (Maine State Planning Office 2010). State and federal agencies also undertake conservation initiatives, and facilitate local efforts by providing technical assistance, leadership, funds, and other support.

The Casco Bay watershed itself is home to at least 25 nonprofit organizations directly involved in land conservation. About half the towns in the watershed have





Examples of properties protected with support from the CBEP Habitat Protection Fund in Scarborough, Bridgton, and Pettingill Island (clockwise from top left).

## CASCO BAY HABITAT PROTECTION FUND

CBEP's Habitat Protection Fund supports local conservation by providing seed funding in support of habitat protection efforts by land trusts, towns and state agencies. Between 2006 and 2010, CBEP invested more than \$250,000 through the fund to support a dozen conservation projects. While not all projects are complete – and thus permanent protection is not yet assured – the projects involve over 4,500 acres of land. They have resulted in protection of a Casco Bay island and purchase of land for a park in Bridgton, Maine, and they include several projects to protect wetlands, mudflats, riparian areas, and forests. The projects

provide significant opportunities for recreation, while two included efforts to support local agriculture.

CBEP funding typically represents only a small fraction of a project's total cost: sponsors must raise the bulk of necessary monies from other sources. But CBEP funding is often available early in project development, and can be used to support the cost of surveys or appraisals, without which project negotiations often cannot begin. And by clearly demonstrating local support, CBEP funds can also boost the chances of receiving funding from state, regional, or national sources.



conservation commissions, which are generally volunteer-based municipal commissions that work to improve management of open space in our communities. Local organizations garner support for conservation efforts from a variety of sources, including private donors, foundations, local community members, municipal budgets, the Land for Maine's Future program, and federal grants, as well as from CBEP's own Habitat Protection Fund.

### Counting Protected Lands

Land protection takes many forms, and some areas that local residents think of as "protected" may in fact be more vulnerable than is generally known. Town forests, for example, are often considered permanently protected. Yet most are community assets that could be tapped at any time to address community needs. In the absence of other restrictions, town forests could become the location of a new school or town building, or even be sold to raise revenue for cash-strapped municipalities.

Conservation easements are an important tool for land conservation. Under an easement, certain rights associated with land ownership – the right to subdivide the property, construct a house, or log an area of forest, for example – are donated or sold by the land owner to a conservation organization. Such restrictions are binding not only on the current land owner, but on future owners as well. Easements thus provide a legal mechanism for permanent protection.

Conservation easements, however, are drafted on a case by case basis. Each one reflects the particular landowner's wishes, the conservation goals being addressed, and legal and practical constraints. Some easements allow agriculture, logging, or even limited residential or commercial development. It is thus sometimes difficult to decide exactly what constitutes "protected lands."

### Acres and Parcels

Since 1997, The Gulf of Maine Coastal Program Office of the U.S. Fish and Wildlife Service, with significant funding from CBEP, has maintained a geographic database of conserved and open space lands in the lower 16 municipalities<sup>1</sup> of the Casco Bay watershed. Several different levels of protection are tracked: (1) conserved lands that are permanently protected; (2) open space lands that lack permanent protection, including unofficial conservation lands; and (3) recreational lands, which include areas that are used primarily for recreation, but may provide some conservation or habitat benefits. Open space lands that are not permanently protected comprise a variety of lands: areas in agricultural or tree growth programs; those owned in common by homeowners associations; areas conserved

<sup>1</sup> The 16 municipalities are Cape Elizabeth, South Portland, Portland, Westbrook, Long Island, Chebeague Island, Falmouth, Cumberland, Yarmouth, North Yarmouth, Pownal, Freeport, Brunswick, Harpswell, West Bath, and Phippsburg.

### Protected Lands in Lower 16 Casco Bay Watershed Towns, 2010.

Level of Protection	Number of Parcels	Total Acres Protected	Percent of Casco Bay Watershed
Conservation Land	438	15,694	7.5%
Open Space (no protection)	306	7,494	3.6%
Recreational Land	110	1,917	0.9%
<b>TOTAL</b>	<b>854</b>	<b>25,105</b>	<b>12.0%</b>

to protect drinking water; town forests for which there exists no legal barrier (such as a conservation easement) to block conversion to another use; and similar areas.

As of 2010, 854 parcels in the lower 16 municipalities of the Casco Bay watershed, amounting to more than 25,000 acres and 12 percent of the area of the watershed, are being tracked in the database. A majority of those lands, some 15,694 acres – about 7.5 percent of the area of the towns examined – is considered permanently protected.

### Trends and Conclusions

The amount of permanently protected land in the lower 16 municipalities of the Casco Bay watershed has more than doubled since 1997. That truly remarkable achievement reflects the diligence and hard work of many individuals and organizations throughout the region.

Year	Number of Sites	Area Permanently Protected (acres)	Percent of Study Area
1997	246	7,300	3.5%
2005	341	10,900	5.2%
2010	438	15,694	7.5%

Collectively, those efforts are of great significance to local communities. No location in any of these 16 towns is more than three miles from permanently protected conservation lands: the typical distance is less than two-thirds of a mile. There is little doubt that conservation efforts are playing an important role in protecting the character of the landscape in the watershed.

### References

- Maine Land Trust Network. 2010. MLTN: Alphabetical List of Land Trusts. [http://www.mltn.org/view\\_trusts-alphabetical.php](http://www.mltn.org/view_trusts-alphabetical.php)
- Maine State Planning Office. 2009. *Land for Maine's Future Program: Protecting Maine's natural heritage and future economic health. The 2009 Biennial Report to the Joint Standing Committee on Agriculture, Conservation & Forestry.* Augusta. February 2009. <http://www.maine.gov/spo/lmf/docs/ACF%20Biennial%20Report%202-09%20WEB.pdf>