

APPENDIX F

NATURAL RESOURCES INVENTORY

INTRODUCTION

Although much of the focus of the Comprehensive Planning effort and much of the focus of the people who live in Bath is on the neighborhoods and the urban portion of the City, there is a significant percentage of Bath that is quite rural. The land area northwest of the Whiskeag Road crossing of Whiskeag Creek (currently zoned as Low-Density Residential) comprises approximately 34 percent of the City's total. (See the Growth and Rural Areas map.) As discussed during the Comprehensive Plan process, the rural portion adds greatly to the reason we enjoy living in Bath.

Natural resources also offer certain natural opportunities for and constraints to development. There are natural areas where development is more costly (e.g., floodplains) and where development should be avoided (e.g., steep slopes). There are natural areas that are important and could be harmed by development (e.g., wetlands).

This appendix inventories the land- and water-based resources of the City of Bath. Much of the information has been mapped to show general locations of these resources with certain characteristics and their relationship to one another. The maps should not be used to make definitive decisions about specific parcels of land. On-site investigations still need to be conducted in most cases. The maps, however, have great value in our City-wide planning efforts. The inventorying and mapping of natural resources provide knowledge to public and private decision makers about which resources could potentially harm development and potentially be harmed by development. This appendix provides an understanding of the natural opportunities and constraints associated with various land uses and development.

THE LAND

Surficial Geology

A study of the surficial geology of an area explains what is covering the land's bedrock, how this material got there, what the soils formed from this material are likely to be, and, more important, what opportunities or constraints the land presents.

The great ice sheets of the last ice age receded from what is now Bath about 10,000 years ago. Although much of the earth's fresh-water supply was in the massive continental ice sheets, the ocean flooded the land as the glaciers receded. This was caused by the weight of the ice, thousands of feet thick, having depressed the land surface.

The materials deposited by the glaciers—either directly on the bedrock or in the ocean waters when the sea flooded the land—are primarily the source materials for soils in Bath. These soils affect activities such as building and road construction, farming, installation of utility lines and septic systems, and utilization of natural resources (e.g., clay-mining).

Most of Bath's land area is overlain by thin unstratified (i.e., unsorted) layers of mixed sands, gravels, silt, clay, and boulders. This mixed glacial debris is referred to as *till*.

The next most common surficial material is *silty clay* deposited over rock or till in what were marine settings. Interspersed throughout the City's land area are pockets of freshwater wetlands and a few saltwater wetlands along the Kennebec River. In North Bath, there are three locations marine near-shore deposits. These are areas of sand, gravel, and mud that were deposited near the shore or in shallow locations when the land was flooded by the ocean.

Soils

Knowledge of the surficial geology enables understanding of the soil. As the 1997 Comprehensive Plan explained, the soils in Bath are dominated by what are called *Hollis* and *Buxton soil series*.

Hollis soils are relatively well-drained shallow soils that formed in glacial till. Severe limitations for most uses (e.g., buildings, septic systems, and

farming) are primarily due to the shallowness to bedrock. Surface runoff is slow to medium, permeability is moderate, and available water capacity varies depending on soil depth. Hollis soils are identified as either medium or low potential for most uses. In low-potential soils, the depth to bedrock is usually the limiting factor. Overall development costs on medium-potential Hollis soils are 70 percent to more than 100 percent higher than development on high-potential soils consisting of fine, sandy loam on a mild slope (i.e., 0 to 8 percent), such as a Charlton soil (Charlton soil is used for comparison).

Buxton soils are deep, moderately well-drained soils. They were formed in marine or lacustrine (i.e., lake) deposits of silt or clay over bedrock, glacial till, or sand and gravel. Severe limitations for most uses mainly result from slow permeability of the subsoil. Surface runoff is medium and available water capacity is high. Buxton soils are susceptible to frost-heaving and have low shear strength (i.e., subject to shearing and sliding on steep slopes). Disturbed and unprotected areas are highly susceptible to erosion. Overall development costs on Buxton soils are estimated to be 34 to 63 percent higher than costs on the comparison soil.

The dominant wet soil in Bath is the *Scantic series*, which consists of deep, poorly drained, level or nearly level (i.e., 0 to 3 percent slope) soils that formed in silt and clay deposited by ponded water. Surface runoff is medium to ponded (i.e., having no runoff), permeability is slow or very slow, and available water capacity is high in the surface layer and moderate below it.

According to the Natural Resource Conservation Service (NRCS), a part of the U.S. Department of Agriculture (USDA), Hollis fine sandy loam with 8 to 15 percent slopes is considered a farmland soil of statewide importance. Bath has large areas of Hollis soils; however, the predominant type is Hollis very rocky, fine sandy loam, which is not considered a farmland soil of statewide importance.

Topography and Elevation

For the purposes of this Comprehensive Plan, the term *topography* is used to mean the relief of the land—the heights, slopes, and flat areas. Awareness of the City's topography helps in knowing where development is suitable or unsuitable and/or very costly. Bath has been described as a series of rolling hills that form "steps" moving from east to west toward West Bath and Brunswick. Steep slopes occur moving westerly, up the steps, away from the Kennebec River. In general, the height of the land increases from Washington Street to Middle Street, from Middle Street to High Street, and from High Street westward. Elevations range from less than 10 feet above sea level along the Kennebec River to more than 260 feet above sea level on the Butler Head property owned by the City. Most of the land in Bath is in the watershed of the Kennebec River (including Merrymeeting Bay), with some land in the northwest portion of the City in the watershed of the New Meadows River.

As stated in the 1997 Comprehensive Plan, the slope of the land influences its use and development potential. Land with slopes between 3 and 8 percent (i.e., a gentle slope) is considered ideal for most types of development. Very flat land can create significant problems for proper drainage on a site. At slopes greater than 8 percent, large-scale commercial and industrial uses become difficult unless extraordinary construction and development techniques are employed. At slopes between 8 and 15 percent (i.e., a moderate slope), residential development is practical. At slopes greater than 15 percent (i.e., a steep slope), development even for moderate-density residential use becomes more difficult and costly. Road construction is expensive if grades are kept suitable for winter maintenance. Extensive areas with slopes exceeding 25 percent are generally unsuitable for conventional development in this climate and should be avoided, if possible, except for very-low-density residential or recreational use. Development activities on steep slopes can result in environmental pollution from runoff and erosion.

The steepest slopes occur on the west side of High Street from about Nichols Street south to about Fairview Lane and on the north side of Thorne Head.

Land in Conservation

For an urban community like Bath, it is important to understand the number and locations of the parcels of land in some form of conservation—that is, where the development potential has been removed. Land in conservation includes lands owned by the state, lands owned by the City, lands owned by the LKRLT, and lands in the State Constitution-allowed Open Space Current-Use Tax Program. These parcels of land in conservation are shown in the following table and on the Lands in Conservation map.

LAND IN CONSERVATION IN BATH 2008

Map-Lot and Location	Acres	Type
6-9, Rocky Reach Road	10.3	Open-space tax
15-18, North Bath Road	6.0	Open-space tax
6-10, Rocky Reach Road	9.5	Open-space tax
10-15 & 12-3, (Thorne Head) High Street	85.2	Land-trust-owned
15-41, 43 & 49, Whiskeag Road & High Street	85.9	
6-15, Lines Island	77.6	State-owned
4-26, (Butler Head) Varney Mill Road	136.0	City-owned
5-1, Varney Mill Road	3.9	City-owned

Source: City of Bath Assessor's Office, 2008

Agricultural and Forest Resources

One of the state's comprehensive-planning goals, which municipalities are required to address, is to safeguard Maine's agricultural and forest resources from development that threatens them. Agriculture and forestry add to the City's economy and help preserve some of the remaining rural quality of place. The major agricultural activities occurring in Bath today are the Hawkes Family greenhouse business in North Bath on Bayshore Road and Walter Taggart's bison and cattle farm on Ridge Road. The Hawkes Family has nine greenhouses and approximately 18 acres of gardens where it grows vegetables, flowers, and landscaping materials. Taggart's farm encompasses 50 acres and has ten head of Angus cattle and forty bison.

Other parcels are included in the Farmland Current-Use Tax Program, a state program that allows farms to be assessed for tax purposes at farmland rather than market values. These parcels are shown in the table and on the Current Use Tax Programs map.

**PARCELS IN BATH IN THE FARMLAND
CURRENT-USE TAX PROGRAM
2008**

Map-Lot and Location	Acres	Produce/ Service	Customer
7-11, Hawkes Lane	20.0	Boarding of horses	General public
15-20, North Bath Road	10.0	Hay	General public
15-21, North Bath Road	6.0		
10-1, North Bath Road	14.5	Hay Woodlot	General public
	31.0		
10-10, North Bath Road	13.5		
7-26, Bayshore Road	10.0	Vegetables, landscaping materials (annuals and perennials)	Wholesale and retail
7-33, Bayshore Road	8.6		
7-39, Varney Mill Road	20.3	Christmas trees Woodlot	General public
	5.0		
6-1, North Bath Road	50.6	Bison, beef, and hay Woodlot	Wholesale
	15.0		

Source: City of Bath Assessor's Office, 2008

Another agricultural resource is the Bath Farmers Market that operates in Downtown Bath on Thursdays and Saturdays from May through October, and at a church on Congress Avenue two Saturdays a month for the rest of the year.

Forest resources, based on parcels in the Tree Growth Current-Use Tax Program (similar to the Farmland Current-Use Tax Program) are shown in the following table and on the Current Use Tax Programs map. Very few parcels have been removed from any of the current-use tax programs in the past five years, and some have been added. The amount of farm and forest land has stayed about the same over the last five years.

**PARCELS IN BATH IN THE TREE GROWTH
CURRENT-USE TAX PROGRAM
2008**

Map-Lot and Location	Breakdown
12-10, Washington Street	6 Softwood 5 Mixed 11 Total
15-22, North Bath Road	7 Softwood 11 Mixed 18 Total
15-41, Whiskeag Road	40 Softwood 7 Hardwood 47 Total
15-15-1, Whiskeag Road	7.5 Softwood 8.0 Mixed 15.5 Total
5-23, Varney Mill Road	16 Softwood 9 Mixed 6 Hardwood 31 Total
15-49, Whiskeag Road	13.63 Softwood 13.63 Total
7-43, Varney Mill Road	17 Softwood 20 Mixed 3 Hardwood 40 Total
18-4, Old Brunswick Road	5 Softwood 7 Mixed 12 Total

Source: City of Bath Assessor's Office, 2008

The Assessor's Office has calculated the "loss" of tax revenue because these parcels are taxed at a current-use rather than fair-market value of approximately \$25,000 annually.

Islands in the Kennebec River

The large islands in the Kennebec River, although not visited by most Bath residents, are viewed by many from several different vantage points and are part of Bath's sense of place. All are privately owned except for Lines Island. They are listed in the following table.

MAJOR ISLANDS IN BATH

Map-Lot	Name of Island	Size
1-14	Little Sturgeon Island	0.38 Acre
1-15	Big Sturgeon Island	0.78 Acre
5-31	Varney Island	3.2 Acres
6-13	Little Ram Island	0.26 Acre
6-14	Ram Island	6.8 Acres
6-15	Lines Island (owned by the State of Maine)	77.2 Acres
10-11	Muskrat Island	0.18 Acre
10-12	Crawford Island	6.8 Acres
10-13	Wood Island	13.8 Acres

Source: City of Bath Assessor's Office, 2007

Other Land Resources

There are no significant sand and/or gravel aquifers in Bath. Homes that are not served by the public water system are on wells, mostly drilled into the bedrock. (The extent of the City served by the BWD is discussed in Appendix H, 4.8.)

Large blocks of undeveloped land are important natural resources. Not only do they provide a sense of the City's enduring rural character, they are also critical to many species of wildlife. According to *Beginning with Habitat: An Approach to Conserving Maine's Natural Landscape for Plants, Animals, and People* "[i]f we want to maintain habitat for animals that have large home ranges, such as bear, bobcat, fisher, and moose, and other animals that are sensitive to human disturbance, such as upland sandpipers and wood thrushes, we need to conserve large blocks of forest or grassland, or wetland habitat." The following table lists the habitat block size needed for various animals.

HABITAT BLOCK SIZE REQUIREMENTS FOR WILDLIFE IN MAINE

<u>Tier 5</u> 1-19 Acres	<u>Tier 4</u> 20-99 Acres	<u>Tier 3</u> 100-499 Acres
Raccoon	Raccoon	Raccoon
Small Rodent	Hare	Hare
Cottontail	Small Rodent	Small Rodent
Squirrel	Porcupine	Porcupine
Muskrat	Cottontail	Cottontail
Red Fox	Beaver	Beaver
Songbirds	Squirrel	Squirrel
Skunk	Weasel	Deer
Most Reptiles	Woodchuck	Muskrat
Most Amphibians	Muskrat	Red Fox
	Red Fox	Songbirds
	Songbirds	Skunk
	Skunk	Most Reptiles
	Most Reptiles	Garter Snake
	Garter Snake	Ring-Neck Snake
	Ring-Neck Snake	Most Amphibians
	Most Amphibians	Sharp-Shinned Hawk
		Cooper's Hawk
		Harrier
		Broad-Winged Hawk
		Kestrel
		Horned Owl
		Barred Owl
		Osprey
		Turkey Vulture
		Turkey
		Wood Frog

Source: "A Response to Sprawl: Designing Communities to Protect Wildlife and Accommodate Development," Maine Environmental Priorities Project, 1997

The large blocks of undeveloped land in Bath identified by the MDIF&W are shown on the Critical Natural Areas map and located as follows:

- in the South End west of High Street; part of a 1,500-acre block, much of which is in West Bath
- between Old Brunswick Road, Ridge Road, Whiskeag Road, and Whiskeag Creek; approximately 360 acres
- between Whiskeag Road, Ridge Road, and North Bath Road; a block of approximately 370 acres

- a block at Butler Head; approximately 360 acres
- a block west of Ridge Road and south of Bayshore Road; part of a 690-acre block, most of which is in Brunswick
- Thorne Head, mapped as a 237-acre block; however, part of it includes the 42-acre Bath Landfill

The land-based resources, including farms, forests, and mineral resources, which are needed to support Bath's rural economy are shown on the Critical Rural Areas map.

THE COMMUNITY FOREST

The community forest consists of the street trees, the trees in the rural and undeveloped parts of Bath, and all the various treed and forested parts of the community. The City-owned community forest consists of approximately 270 acres of forested areas, 9,000+ trees, and 6,000+ street trees. The City-owned and privately owned community forest is enjoyed by residents of and visitors to Bath. It is a large part of what we like about the community.

Based on Geographic Information System technology and aerial photography analyses, the City has a canopy cover of approximately 87 percent. A tree inventory determined that the City has 160 different species growing along the street and in wooded and forested areas. Norway maple (*Acer platanoides*) is the most common species, with approximately 45 percent of the total. This high percentage of tree cover for such an urban community provides a multitude of environmental, social, and economic benefits. The City is also home to nine of the State Champion Trees registered by the State of Maine's Forest Service Project Canopy.

Since its formation in 1992, the Community Forestry Committee has planted more than 900 trees around the City with an eye for "the right tree in the right spot," early pruning and training, watering, and selecting for broadening the diversity of the overall tree population. Since 1992, the two groups—the Forestry Committee and the Forestry Division of the Parks and Recreation Department—have been awarded \$390,000 in grants for the City for tree planting and management since 1992. Bath has been a National Arbor Day Foundation-recognized Tree City USA community for eleven

years and received the Growth Award for five consecutive years. In 2007, the City of Bath received an award for excellence as a community from the State of Maine Forest Service Project Canopy.

WATER RESOURCES

Another of the state's comprehensive-planning goals is to protect the quality and manage the quantity of Maine's water resources, including lakes, aquifers, great ponds, estuaries, rivers, and coastal areas.

In Bath, there are no great ponds (a *great pond* is a naturally occurring body of water 10 acres or more in size) nor significant sand and gravel aquifers (an *aquifer* is an underground layer of water-bearing permeable rock or unconsolidated materials—gravel, sand, silt, or clay—from which groundwater can be usefully extracted). And, there are no known locations grown water supplies have been polluted. The inventory of other water resources is discussed in the following section.

MARINE RESOURCES

Another of the state's comprehensive-planning goals is to protect the state's marine resources industry, ports and harbors from incompatible development and to promote access to the shore for commercial fishermen and the public. Included in this section are discussions of the Kennebec River and Merrymeeting Bay; ports and harbors; and access to the shore for commercial fishermen, marine trades, water-dependent businesses, and the public. The following subsections inventory these resources.

Kennebec River

The Kennebec River, upstream of Merrymeeting Bay, is 230 miles long and drains an area of almost 6,000 square miles. The largest tributary to the Kennebec is the Androscoggin River, which drains an area of almost 3,500 square miles and is more than 160 miles long. The origin of the Kennebec River is Moosehead Lake; the origin of the Androscoggin River is Rangeley Lake. These two rivers come together at Merrymeeting Bay with a combined total water flow of more than 10 billion gallons per day (gpd).

Each river is significantly impacted by the urban areas it flows through, as well as by rural farmlands. The Kennebec River flows through the urban areas of Skowhegan, Waterville, Winslow, Augusta, Hallowell, and Gardiner before reaching Bath. The Androscoggin River flows through Berlin (New Hampshire), Bethel, Rumford, Mexico, Jay, Livermore Falls, Auburn, Lewiston, Brunswick, and Topsham before reaching Merrymeeting Bay. The water quality is significantly impacted by all of these municipalities. The Kennebec River is also impacted by the farmlands and fields along the shores of both it and the Androscoggin as evidenced by the slight brown color of the water of the Kennebec after a heavy rain event.

The Kennebec River is affected by various pollution sources located in the City of Bath, both *point sources* and *nonpoint sources*. Point sources are those that come directly from a pipe, such as a stormwater drain, an "overboard discharge," or a combined sewer overflow (CSO). Nonpoint sources are those that do not flow directly from a pipe, such as runoff from streets, bridges, and parking lots and runoff from agricultural fields, construction operations, and mining.

Even with this urban impact, according to 38 MRSA, Section 465-B, the water quality of the Kennebec River is Class SB, which is the second highest of three levels of classification. According to this Maine State Law, "Class SB waters must be of such quality that they are suitable for the designated uses of recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other estuarine and marine life. The habitat must be characterized as unimpaired." The law further states, "[d]ischarges to Class SB waters must not cause adverse impact to estuarine and marine life in that the receiving waters must be of sufficient quality to support all estuarine and marine species indigenous to the receiving water without detrimental changes in the resident biological community. There may be no new discharge to Class SB waters that would cause closure of open shellfish areas by the Department of Marine Resources."

The Kennebec River is protected by the City's adopted Shoreland Zoning, which has been approved by MaineDEP. The shoreland zoning regulations are contained in the Bath Land Use Code.

In addition to the Androscoggin River, tributaries to the Kennebec River include Whiskeag Creek, Winnegance Creek, and an unnamed brook that enters the West Branch portion of the Kennebec southwest of Lines Island. Winnegance Creek abuts rural and low-density-residential uses. Whiskeag Creek abuts residential development and crosses under Route 1. The unnamed brook abuts rural and agricultural land uses. These tributaries are protected by MaineDEP-approved shoreland zone and with the exception of Winnegance Creek by an overlay zoning district that requires special permitting for development closer to the water than 150 feet.

The MaineDEP licenses overboard discharge systems. These systems are allowed in certain situations for existing homes that have no other alternative for wastewater treatment or collection. In Bath, there are six such discharges to the Kennebec River, two to Merrymeeting Bay, and one each to Whiskeag Creek and Winnegance Creek.

The MaineDEP also licenses CSO locations. CSOs occur when heavy rain or snowmelt causes one or more of the City's combined sewers (i.e., a sewer pipe carrying both sanitary waste and stormwater) to discharge into the Kennebec River because the volume is greater than a pumping station can accommodate. All discharges are documented by frequency and volume and this information is reported monthly to the MaineDEP. The number of CSO locations has decreased from thirty-one in 1971 to eight in the mid-1990s to four today (i.e., 2008). They are located at the Rose Street, Pleasant Street (Castine Avenue), Commercial Street, and Harward Street pumping stations.

Fish species in the Kennebec River in Bath include striped bass, alewife, Atlantic and short-nosed sturgeon, and American eel. The existence of striped bass supports an active fishing-guide business.

Merrymeeting Bay

According to the web site of Friends of Merrymeeting Bay:

The Bay is the 9,000-acre confluence of six rivers, two of which, the Androscoggin and the Kennebec, are two of Maine's largest. Four smaller rivers flow from the towns surrounding the Bay: the Eastern from Dresden and Pittston; the Abagadasset from Bowdoinham and Richmond; the Cathance from Bowdoinham and Bowdoin; and the Muddy River from Topsham. Merrymeeting Bay is a unique

ecosystem; technically, it is an inland delta, not an estuary, as it is cut off from direct access to the ocean; at low tide the waters of the Bay flow out through The Chops, a narrow gap, into the lower Kennebec. Though the Bay is affected by tides, there is very little salt in its waters. Large areas of the Bay consist of freshwater mud flats and sand bars upon which wild rice and pickerel weed flourish, plants that provide food and cover for waterfowl.

Merrymeeting Bay is home to several endangered and protected species of wildlife; short-nosed and Atlantic sturgeon, bald eagles, ospreys; and many species of anadromous fish [anadromous fish are those species that migrate from the sea to freshwater to spawn], such as shad, smelt, striped bass, river herring, and salmon. The Bay and its tributaries are favored breeding grounds for Canada geese, herons, and other wading birds, and for many species of ducks.

Merrymeeting Bay, by virtue of its unique characteristics and large size, is an ecological gem in our midst. Unfortunately, many factors, particularly water pollution and pressures from development, have reduced much of the once-abundant resources of the Bay to remnant levels.

The Kennebec Estuary Focus Area

According to Beginning with Habitat:

The Kennebec Estuary Focus Area contains more than 20 percent of Maine's tidal marshes, a significant percentage of Maine's sandy beach and associated dune habitats, and globally rare pitch pine woodland communities. More than two dozen rare plant species inhabit the area's diverse natural communities. Eight imperiled species of animals have been documented in the Focus Area, and it contains some of the state's best habitat for bald eagles.

The Focus Area extends southward from Gardiner and Pittston at its upstream end to Phippsburg and Georgetown at the coast. Along with the mainstem of the Kennebec River, it encompasses numerous inlets and tributaries with hundreds of miles of tidal waterfront.

Conservation priorities in the Kennebec Estuary include habitat for migratory fish, undeveloped shoreline for bald eagle nesting and roosting, intact beaches and dunes, freshwater and saltwater tidal marshes, and the upland forests that buffer these shoreline ecosystems and provide habitat for songbirds and mammals. Publicly owned conservation lands in the Focus Area help to protect clam flats, drinking water, and community-based agriculture, and they provide recreational opportunities, such as fishing, hunting, and hiking.

At the heart of the Kennebec Estuary is Merrymeeting Bay, one of the most important waterfowl areas in New England. Six rivers, draining one-third of the state of Maine, converge in Merrymeeting Bay to form an inland, freshwater, tidal

delta. Extensive beds of emergent and submerged aquatic vegetation support thousands of ducks, geese, rails, wading birds, and other water-dependent species during spring and fall migrations. Wild rice is common throughout the bay, providing an important food source for migratory waterfowl and other birds such as bobolinks. The intertidal mudflats are also important feeding areas for migrating shorebirds. Floodplain forests and shrub swamps serve as key migratory stopover sites for neotropical passerines. Over 50 species of freshwater fish and ten species of anadromous fish use Merrymeeting Bay, including the rare Atlantic salmon (*Salmo salar*), shortnosed sturgeon (*Acipenser brevirostrum*), and Atlantic sturgeon (*Acipenser oxyrinchus*). At least one rare mussel species, the tidewater mucket (*Leptodea ochracea*), inhabits the bay. One of the small tributaries flowing into Merrymeeting Bay is Maine's only known location for the redbfin pickerel (*Esox americanus*). American eels, currently believed to be declining in much of their geographic range, are abundant in parts of the bay. Merrymeeting Bay has some of the northeast's best habitat for rare plants associated with tidal freshwater marshes. Several sites around the bay are particularly significant, such as the Cathance River, Chops Creek, Eastern River, Lines Island, Abagadasset Point, and Swan Island.

Because Merrymeeting Bay drains nearly one third of Maine, the potential for water-quality degradation is high. Both the Androscoggin and Kennebec Rivers have major industries upriver. Although these industries are much cleaner than in years past, contamination remains in the bay's fine-grained sediments. Eagle eggs from Merrymeeting Bay have been found to contain some of the highest levels of PCBs ever recorded. Mitigating past and future contamination of the watershed will be a continuing challenge.

Beginning with Habitat goes on to discuss Lines Island, about half of which is in Bath, also in the Kennebec Estuary Focus Area:

Along the southeast side of Lines Island is a 20-acre freshwater tidal marsh with some of the bay's largest populations of rare plants. Dominated by wild rice, this marsh contains softer mud that supports hundreds of spongy arrowhead along with scattered populations of Parker's pipewort and estuary burmarigold. Water pimpernel occurs sporadically where the base of the rocky upland meets the mud flats. In part because of its importance for bald eagles, Lines Island has been protected as a wildlife refuge by the Maine Department of Inland Fisheries and Wildlife.

The portion of the Kennebec Estuary Focus Area in Bath is shown on the Critical Natural Areas Map.

The New Meadows River

According to the New Meadow River Watershed Project's website:

The New Meadows River is located in the northeastern corner of Casco Bay in southwestern Maine. ... Its watershed, estimated at approximately 23 square miles, falls within two counties, the western shore being in Cumberland County, the eastern shore in Sagadahoc County. The watershed covers areas in five municipalities, the City of Bath to the north, Brunswick and Harpswell to the west, and West Bath and Phippsburg to the east. All but the City of Bath have shoreline on the River proper.

Although named a "River," technically it is not, since no river actually flows into or down the New Meadows. In fact, since there is no river flow, the New Meadows does not even meet the definition of an estuary, for there is normally only a relatively small drop in salinity between the mouth at Bear Island and the Lakes at the north. ... The New Meadows River, therefore, is simply an embayment, but a very interesting one. The New Meadows River encompasses a wide range of habitats and ecological niches within its 23 square mile watershed in the Sagadahoc and Cumberland counties of Midcoast Maine. Originating from volcanic activity, the river benefits from glacial deposits of varied sediment types that help contribute to its high productivity and diversity. Interestingly, because little fresh water flows into the system, the New Meadows is not technically a river but an embayment, fact that only underscores the need to preserve this unique watershed.

The "headwaters" (if it can be called that) of the New Meadows are along the boundary of Brunswick and Bath; Bath's northwestern boundary, north of the Old Brunswick Road. The New Meadow's watershed management plan points out that only one percent of its watershed lies in Bath. This plan does cite three potential non-point pollution locations in Bath: one is a residential land use, and two are roads. There may be some water flow from the Bath Country Club (golf course) property along Whiskeag Road under Ridge Road to a wetlands at the head of the New Meadows, however, it is not certain if this is the case. More study and monitoring should be done determine this and to determine appropriate non-point pollution mitigation strategies.

The Port of Bath and the Working Waterfront

Chapter 3 relates that in Bath's heyday, the waterfront was lined with boatbuilding and shipbuilding facilities, docks, piers, and warehouses. The Kennebec River was full of river traffic and ships at anchor.

Today, what might still be called the Port of Bath is used for recreation and as a working waterfront. Along the Kennebec River are two working waterfront locations that continue the marine-dependent qualities of Bath's industrial sector, which has made Bath the "City of Ships" for well over 150

years. These working waterfront locations are BIW's shipbuilding, repairing, and launching facility (perhaps the most intensive working waterfront in the state) and the site (including the pier with deep-water access) of the recently closed Stinson sardine cannery—previously the shipbuilding site of the Texas Steamship Company.

The recreational part of the Port of Bath includes the City's North End and South End Boat Launches; the marina at the Kennebec Tavern; the City's pier, float facility, and moorings at Waterfront Park; BFC Marine, and pier facilities at Maine Maritime Museum.

The North End and South End Boat Launches were built by the City with financial assistance from the Maine Department of Conservation. The North End Boat Launch, built in 1976, is located off Bowery Street and has about forty parking spaces for vehicles with trailers and ten more for vehicles without trailers. It is open from sunrise to sunset and there is no fee charged for launching or retrieving boats.

The South End Boat Launch, built in 1998, is on Washington Street in the South End and has thirty-seven parking spaces for vehicles with trailers. Associated with the South End Boat Launch are a parking area for about fourteen vehicles without trailers and an open-space area used by the neighborhood as a small park. The South End Boat Launch is open from sunrise to sunset and there is no fee charged for launching or retrieving boats. The South End Boat Launch also has a restroom facility that must be pumped out as needed.

The marina at the Kennebec Tavern is a privately owned facility consisting of 80 to 100 slips (depending on boat size) located in front of the restaurant and the property downstream known as Bath Port. Gasoline, shore power, and fresh water are available.

The City's pier, float, and mooring facilities are located in the downtown at Waterfront Park. New floats were installed in 2004 and can accommodate more than 200 feet of watercraft. Fresh water, electricity, and a holding-tank pumpout facility are available but no fuel. Waterfront Park has a public restroom. There is 2-hour parking at Waterfront Park for thirty vehicles and about fifteen spaces within 600 feet where 4-hour parking is allowed.

Waterfront Park is located across Commercial Street from a large grocery store, and it is within an easy walk to several restaurants, numerous shops, and a proposed 94-room hotel. A walkway has been proposed between Waterfront Park and the Bath Railroad Station, which is located less than a quarter-mile to the south.

Until 2006, BFC Marine, Inc., operated a marina directly downriver from Waterfront Park, servicing boats and outboard motors and supplying gasoline. There also was a small chandlery. At the time of writing this Comprehensive Plan, the BFC property is for sale and BFC Marine is closed. Whether a new buyer will operate it as a marine business in the future is not known.

Approximately 1 mile downstream from Downtown Bath is Maine Maritime Museum. The museum offers ten guest moorings and a "visiting yachtsmen's building" with two heads (i.e. restrooms), showers, and a washer and dryer. At the downstream end of the museum property is Deering Pier, which can accommodate vessels up to 200 feet long with a draft of 17 feet. The Deering Pier has electricity and fresh water.

The maximum "air draft" or height of a vessel that can come into Downtown Bath, upstream of the Sagadahoc Bridge, is 73 feet. Vessels that cannot get upstream of the Sagadahoc Bridge often tie up at Deering Pier. The City operates a fixed-route bus system and a seasonal trolley service that can bring visitors from the Maine Maritime Museum into the downtown.

The site of the former Stinson sardine cannery is a 5.6-acre parcel with about 820 feet of river frontage. The existing pier can accommodate vessels up to 350 feet long and has deep water. The pier has not been maintained well and is in need of repairs. The site is zoned Marine Business, which allows manufacturing and many water-related and water-dependent uses. The site is currently vacant (i.e., 2008). The cannery closed in 2005 and a fire destroyed all of the buildings on the site in 2006. Before the site was used as a sardine cannery, it was a shipbuilding facility of the Texas Steamship Company.

The BIW facility, adjacent to Bath's downtown, is a 75-acre site with about 4,000 feet of deep-water frontage on the Kennebec River. (Although there

is deep water along its piers, BIW periodically dredges the floating dry dock's "settling basin" and the river channel so the ships can transit safely to and from the Atlantic Ocean.) BIW builds ships almost exclusively for the U.S. Navy. The BIW facilities include a 750-foot floating dry dock, three shipways, three wharves, an outfitting pier, five cranes, and indoor facilities for pre-outfit and assembly. Also located within the facilities are engineering, design, ship-support, and administrative offices.

The BIW property (zoned Industrial) and the former Stinson sardine cannery property, the Maine Maritime Museum, and the two City-owned boat launches (zoned Marine Business) are the only sites on the river where water-dependent manufacturing uses are allowed. Other than the loss of the sardine cannery (the site is still available for water-dependent uses) and the closing of the BFC Marine marina, there have been no conversions in the last ten years from water-dependent to nonwater-dependent uses.

The Kennebec River is also home to about fifteen full-time fishing guides; another eleven part-time guides assist fishermen on weekends and/or when they use vacation time from their full-time job. Four of the guides keep their boats berthed at Bath marinas; the other guides have their clients meet them at the two boat launches. The fishing-guide "industry" brings fishermen to Bath from all over the United States as well as other countries, mostly for striped bass.

The day-to-day management of the "Port" is the responsibility of the City's Harbor Master, who is a full-time Bath Police Officer. He administers and enforces the City's harbor ordinances.

The waterfront areas that include functionally water-dependent uses and waterfront areas that deserve maximum protection from incompatible development are shown on the Critical Waterfront Areas map.

CRITICAL NATURAL RESOURCES

According to SPO, Critical Natural Resources or Areas in Bath include:

- the shoreland zone;
- large habitat blocks;
- multifunction wetlands;

- essential wildlife habitats and threatened, endangered, and special-concern species occurrences as depicted on maps prepared by the MDIF&W;
- significant wildlife habitat as defined by Maine State Law;
- significant freshwater fisheries habitat;
- rare and exemplary natural communities and rare-plant occurrences as determined by the MNAP database;
- Beginning with Habitat Focus Areas of Ecological Significance identified by the Beginning with Habitat Program of the MDIF&W;
- floodplains as depicted on Federal Emergency Management Agency (FEMA) flood-hazard identification maps.

Knowledge of these features and areas is an essential part of planning for any town or city, and protecting them is an important responsibility. In fact, one of the state's comprehensive-planning goals, which all communities need to address, is to protect the State's other critical natural resources, including without limitation, wetlands, wildlife and fisheries habitat, sand dunes, shorelands, scenic vistas and unique natural areas.

The City's Land-Use Code presently protects some of these features but not all of them. The Shoreland Zone is protected as required by the MaineDEP. The City's Floodplain Management Ordinance was approved by the SPO in 2000. The City participates in the Sagadahoc Region Rural Resources initiative, which has been working since 2002 to protect natural resources in Eastern Cumberland County and Central Sagadahoc County. Whereas some of the critical natural resources are less well protected than others, the threat has been relatively low because Bath is experiencing only limited growth in the rural areas.

Wetlands

Wetlands are land areas in which water has become the dominant factor in determining the type of plant and animal life and the nature of the soil development. Wetlands are transitional areas between dry land and open water, with low topography, poor drainage, and standing water subject to variation with season and climate. The actual delineation of wetlands is complex and boundary identification requires extensive fieldwork.

According to Maine State Law, freshwater wetlands are "freshwater swamps, marshes, bogs and similar areas that are inundated or saturated by surface or groundwater at a frequency and for a duration sufficient to support, and which under normal circumstances do support, a prevalence of wetland vegetation typically adapted for life in saturated soils; and, not considered part of a great pond, coastal wetland, river stream or brook" (38 MRSA 480-B(4)). Coastal wetlands are "all tidal and subtidal lands, including all areas below any identifiable debris line left by tidal action; all areas with vegetation present that is tolerant of salt water and occurs primarily in a salt water or estuarine habitat; and any swamp, marsh, bog, beach, flat or other contiguous lowland which is subject to tidal action during the maximum spring tide level as identified in tide tables published by the National Ocean Service. Coastal wetlands may include portions of coastal sand dunes" (38 MRSA 480-B(2)).

Many years ago, wetlands were often considered useless land needing to be drained or filled for agricultural purposes or to create land for development. More recently, however, it has been shown that wetlands have many important environmental and cultural functions. In the 1970s, scientists, ecologists, and conservationists began to articulate the value of wetlands. We now know that wetlands act as groundwater-recharge areas; mitigate floodwater damage; and act as storage basins during wet periods and as water retainers during dry periods, stabilizing water flow and supply.

Wetlands are important wildlife habitats. Like tropical rain forests and coral reefs, wetlands contain a tremendous variety of wildlife species; they are teeming with life. Wetlands are home to numerous fish, wildlife, and plant species that rely on this type of habitat to survive. Many other species rely on the wetlands species as food.

Wetlands are also important water-cleansing mechanisms. Aquatic plants commonly found in wetlands change inorganic nutrients into organic materials, trapping phosphorus and suspended solids. Water flow is slowed, allowing silt to settle out. Studies of wetlands functions have shown that 77 percent of total phosphorus and 94 percent of suspended solids entering wetlands are retained. Wetlands, therefore, protect downstream water resources from siltation and pollution.

In addition, wetlands provide important visual and open-space value. According to the U.S. Environmental Protection Agency (USEPA) web site, "wetlands have recreational, historical, scientific, and cultural values. More than half of all U.S. adults (98 million) hunt, fish, birdwatch or photograph wildlife. They spend a total of \$59.5 billion annually. Painters and writers continue to capture the beauty of wetlands on canvas and paper, or through cameras, and video and sound recorders. Others appreciate these wonderlands through hiking, boating, and other recreational activities. Almost everyone likes being on or near the water; part of the enjoyment is the varied, fascinating life forms." The wetlands in Bath, both freshwater and coastal, add greatly to the visual quality of life that we enjoy.

The discharge of dredged or fill material into wetlands is regulated nationwide by the Clean Water Act under the supervision of the Army Corps of Engineers. Maine State Law (i.e., the Natural Resource Protection Act [NRPA], 38 MRSA 480) regulates the dredging, filling, draining, and construction in, over, or adjacent to wetlands and activities that could impact wetlands. This Maine State Law is enforced by the MaineDEP. Also, the Maine subdivision law requires that all wetlands be shown on any subdivision plan.

The wetlands depicted on various Critical Natural Areas map in this Comprehensive Plan have been identified from aerial photography. The maps are important from a broad-view, community-wide planning perspective. However, the maps are not suitable or intended for site-specific planning, which should only be done after on-site wetlands delineation has occurred.

These wetlands (from Maine Department of Conservation date) were characterized based on six wetlands functions using a process developed by the SPO. The six functions are cultural or educational, freshwater fish habitat, flood-flow control, wildlife habitat, marine habitat, and sediment retention. The wetlands shown on the map have also been ranked according to this evaluation procedure. This ranking provides an understanding of the values of particular wetlands. However, as the *Beginning with Habitat* publication states, some wetlands functions are essential to the specific environment even without a high score or ranking.

The MaineDEP also evaluates wetlands and recognizes "wetlands of special significance." These wetlands are any coastal wetlands; any wetlands within 250 feet of coastal wetlands; any wetlands within 250 feet of a great pond; any wetlands with at least 20,000 square feet of aquatic or marsh vegetation or open water; any wetlands located within a 100-year flood zone; any wetlands that contains significant wildlife habitat as defined by the MDIF&W; any wetlands that is part of peat lands not previously mined; and any wetlands within 25 feet of a river, brook, or stream.

In our City-wide planning process, we should be aware of threats to the wetlands in Bath. According to the MaineDEP's web site:

Wetlands are threatened by many human activities. Since colonial times, over half of the wetlands in the lower 48 states have been lost due to development, agriculture, and silviculture, including 20% of Maine's wetlands. Although modern legislation has greatly slowed wetlands loss, the U.S. continues to lose almost 60,000 acres per year. Moreover, the ecological health of our remaining wetlands may be in danger from habitat fragmentation, polluted runoff, water-level changes and invasive species, especially in rapidly urbanizing areas.

"Human activities threaten wetlands in several different ways. Stressors to wetlands can be chemical (e.g., toxic chemicals), physical (e.g., sedimentation), or biological (e.g., non-native species).

- Hydrologic alterations can significantly alter the soil chemistry and plant and animal communities. These alterations can be the results of deposition of fill material, draining, dredging and channelization, diking and damming, diversion of flow, and addition of impervious surfaces in the watershed, which increases water and pollutant runoff into wetlands.
- The input of pollutants, such as sediment, fertilizer, human sewage, animal waste, road salts, pesticides, and heavy metals, can exceed the wetlands natural ability to absorb such pollutants and cause degradation. Pollutants can come from urban, agricultural, silvicultural and mining runoff, air pollution, leakage from landfills and dumps, and boats stirring up pollutants around marinas.
- In addition to being impacted by hydrologic alterations and pollutants, wetlands vegetation can be damaged by domestic animals grazing on them, non-native species that compete with natives, and the removal of natural vegetation."

Vernal Pools

Vernal pools are a type of wetlands. According to the MaineDEP web site:

Vernal pools, or "spring pools," are shallow depressions that usually contain water for only part of the year. In the Northeast, vernal pools may fill during the fall and winter as the water table rises. Rain and melting snow also contribute water during

the spring. Vernal pools typically dry out by mid to late summer. Although vernal pools may only contain water for a relatively short period of time, they serve as essential breeding habitat for certain species of wildlife, including salamanders and frogs. Since vernal pools dry out on a regular basis, they cannot support permanent populations of fish. The absence of fish provides an important ecological advantage for species that have adapted to vernal pools, because their eggs and young are safe from predation.

The Board of Environmental Protections Rules, adopted to implement the NRPA, protect significant vernal pools by regulating activities in, on, over, or adjacent to them. The Rules went into effect on September 1, 2007. Also, significant vernal pools are considered a significant wildlife habitat. Significant wildlife habitats are shown on the Critical Natural Areas map.

Significant Plant, Wildlife, and Fisheries Habitat

In 1974, the Maine Legislature established the Maine Critical Areas Program in an effort to conserve the best examples of Maine's natural diversity. (In 1993, the Critical Areas Program and the Natural Heritage Program merged to become the MNAP.) The legislation charged the SPO with conducting statewide surveys to identify significant botanical, geological, zoological, and scenic areas worthy of preservation. The program has three basic functions: (1) identify and document significant natural areas, (2) register them as Critical Areas, and (3) promote their voluntary conservation through cooperation with landowners. The MNAP is now a part of the Maine Department of Conservation.

There are four Critical Areas in Bath: Butler Cove and Headland, West Branch Cove, Whiskeag Creek outlet, and Winnegance Creek outlet. In a previous program, the state also designated two Natural Areas in Bath: Bath Cliffs and Thorne Head.

The Natural Heritage Program coordinated inventories of sensitive natural features and provided data and technical assistance for conservation planning and permit review. It compiled data from field surveys, museum and live collections, publications, and consultations with experts throughout the Northeast. The Natural Heritage Program conducted field surveys to verify specific locations of high-priority features and to collect accurate information on the condition and quality of rare features. The program identified five sites in Bath containing eleven rare and/or endangered plant

species. Two species—Long's bittercress (*Cardamine longii*) and *Lilaeopsis* (*Lilaeopsis chinensis*)—are threatened species, which means only two to four occurrences have been documented recently in all of Maine. Historical records identify six additional species that have not been identified or located since 1916.

The MDIF&W designated portions of Bath as Essential Habitat, which means they contain features vital to the recovery of an endangered or threatened species in Maine. Essential Habitats for bald eagles are located on Lines Island, on a small unnamed island in Merrymeeting Bay, on the east shore of the Kennebec River south of Day's Ferry in Woolwich, and in the Winnegance section of Phippsburg. The "Essential Habitat" designation restricts development and construction activities, without a permit, within a quarter-mile radius of the active nests. The quarter-mile-radius circles of protection of these areas include some portions of Bath; the areas are shown on the Critical Natural Areas map. Because eagles are known to rotate established nesting sites, areas around inactive nests also are protected against localized development for five years from the last known occupation.

Here in Bath, Significant Wildlife Habitats include Tidal Waterfowl and Wading Bird Habitat, Inland Waterfowl and Wading Bird Habitat, and Significant Vernal Pools. Vernal pools were discussed earlier in this appendix. According to a "DEP Fact Sheet":

Tidal waterfowl and wading bird habitat: The DIF&W [MIF&W] has identified and rated certain intertidal areas along the coast as high or moderate value to waterfowl and wading birds. This high to moderate value tidal habitat is limited to the identified tidal habitat area and is located within the coastal wetland, which is already regulated as a protected natural resource pursuant to the NRPA [Natural Resource Protection Act].

Inland waterfowl and wading bird habitat: [MIF&W] has identified significant inland habitats for ducks, geese, herons, and similar species of waterfowl and wading birds throughout the state, rating them as having "high to moderate value." A high to moderate value inland bird habitat is a complex of freshwater wetland and open water areas plus a 250-foot wide area surrounding the complex itself where inland species of waterfowl and wading birds nest.

Certain activities in or near a Significant Wildlife Habitat are regulated by the State. Activities that require a permit are:

- The dredging, bulldozing, removing, or displacing of soil, sand, vegetation or other materials;
- Draining or otherwise dewatering the habitat;
- Filling; or
- The construction, repair, or alteration of any permanent structure.

Critical waterfowl habitats are associated with the Bath shore of Merrymeeting Bay, the mouth of Whiskeag Creek where it enters the Kennebec River, the shore of so-called Log Pond at King's Landing (near the intersection of Harward and Washington Streets), Trufant Marsh south of BIW, the marsh between Maine Maritime Museum and Bath's South End Boat Launch, and the marsh at Winnegance. The large freshwater wetlands associated with the upper reaches of Whiskeag Creek (on the Bath-West Bath town line) is also considered a significant waterfowl habitat by the MDIF&W.

In December 2006, the MaineDEP adopted new rules to protect shorebird, tidal, and waterfowl habitat. According to the MaineDEP's web site:

As Maine marks the edge of the range for many wading bird species, their populations are small and consequently vulnerable to habitat loss and alteration. For example, Great and Snowy Egrets, Glossy Ibis, and Least Bittern reach the northern extent of their range in Maine, where they nest in just a few locations.

In contrast, Great Blue Herons are among the more abundant and widely distributed of the wading birds. However, they often nest in the tops of dead trees where they build large stick nests. These colonies of 2 to 200 nesting pairs are frequently, but not always, located in places with limited human disturbance. Road construction, logging, and human presence within or near established colonies can result in loss of many young herons in a single nesting season and abandonment of the colony in future years.

The diet of many wading birds includes fish, amphibians, and large insects, placing them near the top of the food chain. Top predators, especially in aquatic ecosystems, such as herons and egrets, are vulnerable to accumulation of environmental contaminants. Increased toxins can negatively affect feeding and breeding behaviors and result in a shortened life span and reduced productivity.

There are habitats for these waterfowl species along the Kennebec River south of BIW, in the Winnegance area, along Whiskeag Creek and where it meets the Kennebec River, along the shore of Merrymeeting Bay, and the

upper reaches of the New Meadows River. These are shown on the Critical Natural Areas map.

Another significant habitat is the location in North Bath of the redfin pickerel. This rare-animal location and habitat are also shown on the Critical Natural Areas map.

Mapped rare-plant communities are located along the southeast shore of Merrymeeting Bay in Bath, near Butler Cove, and along the west shore of the Kennebec River west of Lines Island and Ram Island. The brackish tidal marsh where Whiskeag Creek enters the Kennebec River is also considered an important natural-community location.

Important Views

It is a truism that important views provide our sense of place: from the built-up portions of Bath on the Kennebec River and its eastern shore, the City from the river, the river and its islands from rural parts of Bath, the rural areas of Bath, and the built-up portions of Bath from various vantage points. Quality views add greatly to our quality of life and also have been proven to attract visitors, new residents, and even new businesses.

A report written in 1988 for the Bath Waterfront Resources Committee, entitled "Between the River and the Bay," identifies many important views, as follows:

- view of the Arrowsic shore and the Kennebec River from the South End Boat Launch
- view across the river to Day's Ferry from upper Washington Street
- view from Thorne Head of Woods Island, Crawford Island, Ram Island, Thorne Island, Lines Island, Burnt Jacket Channel, and the West Branch of the Kennebec River
- view of these islands from the Rod and Gun Club and surrounding properties east of North Bath Road
- view of the West Branch of the Kennebec River from the fields east of Varney Mill Road

Other important views include the following:

- the Kennebec River and the Woolwich and Arrowsic shore from the Winnegance area and from the route along Washington Street, Front Street, Kings Landing, and upper Washington Street, and from Thorne Head (homeowners in this area are fortunate to have these views but they are also available to those who drive and walk this route)
- Fiddlers Reach, Winnegance, and up the Kennebec River from Hospital Point at the Plant Memorial Home on lower Washington Street
- up and down the Kennebec River from the South End Boat Launch
- Maine Maritime Museum's marsh south of Deering Pier, seen from Washington Street
- the Kennebec River and Woolwich shore from Waterfront Park
- up and down the Kennebec River and across to the Woolwich shore from the Coal Pocket
- spectacular views of the Kennebec River and islands in the river and even mountains from Thorne Head Cliffs
- the field next to the Stone House Farm on Whiskeag Road, where several horses usually can be seen grazing
- open fields in Whiskeag Creek area on the east and west of Lower Mill Pond; pleasant woodland vistas from the road to either side of the Lower Pond dam and bridge
- dramatic views out over the Whiskeag Creek estuary from the Lower Pond dam
- wonderful views from several points (walking or driving) on North Bath Road by the large inlet out to Lines Island
- beautiful views of the Kennebec River and Merrymeeting Bay from West Chops Point; other than from Thorne Head, this is one of few places where the Bay can be seen
- the Bay from the Butler Cove area
- Lines, Crawford, Woods, and Ram Islands in the Kennebec River seen from Whiskeag, North Bath, and Varney Mill Roads and from Thorne Head
- City and its skyline, and up and down the river, from the Kennebec River and the Sagadahoc Bridge
- the downtown from the Court House
- the cranes at BIW from Route 1

Locations of these important views are indicated on the Important Views map.

NATURAL HAZARDS AREAS

Natural hazards include floods, hurricanes and other coastal storms, windstorms, coastal erosion and landslides, forest fires, and winter snow and ice storms. The state goal is to discourage development in areas affected by these natural hazards.

For residents of Bath, probably the most significant hazard is flooding. The flood-hazard areas in Bath are shown on the Critical Natural Areas map. The City participates in the National Flood Insurance Program, and the City's Floodplain Management Ordinance, adopted in 2000, has been approved by the SPO. As shown, much of Bath's riverfront from and including BIW to the North End Boat Launch is in a 100-year flood-hazard area, which means that there is a 1 percent chance the area will flood in any given year. In the future, this area may or may not be larger if the sea level rises, as some experts forecast that it will.

The other significant natural hazard affecting Bath and its residents is winter ice storms. The ice storms of 1998 and 2008 caused electrical power outages in large areas of the City of Bath, in both rural and urban areas.

CONSTRAINTS TO DEVELOPMENT

As stated in the introduction to this appendix, natural resources provide both opportunities and constraints. On the constraint side, there are natural areas where development is more costly or where the natural features could harm development and natural areas where the important natural features could be harmed by development.

The Constraints to Development map shows natural areas that should be avoided because of slope, drainage, prime farmland soils, flood-hazard areas, proximity to a water body, proximity to rare or endangered species, or a combination of these. The following matrix ranks the criteria and provides a score, which has been mapped.

The natural areas with severe constraints are generally located along the West Bath town line in the southwest portion of Bath, along the Kennebec River south of BIW, along Whiskeag Creek east of Ridge Road, Butler Cove, along the New Meadows River west of Ridge Road, along the shore of Merrymeeting Bay, east of Varney Mill Road, and the large wetlands east of Windjammer Way and Bernard Street.

BATH CONSTRAINTS MAP MATRIX

Item	Variable	Severe	Significant	Moderate	Slight	None	Score
Slope	>25%	x					4
	15% - 25%		x				3
	8% - 15%			x			2
	1% - 8%					x	0
	<1%		x				3
Drainage	Excessively drained	x					4
Soils	Moderately well drained				x		1
	Well drained					x	0
	Poorly drained		x				3
	Somewhat excessively drained		x				3
	Very poorly drained	x					4
Prime Farmland	All Prime Farmland	x					4
	Farmland of Statewide Importance			x			2
	No					x	0
Flood	100-Year	x					4
	500-Year			x			2
	Out					x	0
Wetlands	In	x					4
	Out					x	0
Water Bodies	Shoreland Zone, RP, NRPO	x					4
	Out					x	0
Habitat	Rare/Endangered Species	x					4
	Wading Bird, Shorebird, Coastal Birds, other habitat		x				3
	Undeveloped Blocks >250 acres		x				3
	Undeveloped Blocks <250 acres			x			2
	Large Undeveloped Forest		x				3
	No Specific Habitat					x	0

Constraint Category	Point Range	Square Feet	Acres	Percentage
Low	0-5	91,607,333	2,103	35%
Low-Moderate	6-10	120,826,906	2,774	46%
Moderate	11-15	30,656,334	704	12%
Moderate-Severe	16-20	13,258,298	304	5%
Severe	21-25	6,274,656	<u>144</u>	<u>2%</u>
			6,029	100%
No areas had a score greater than 25.				

PLANNING IMPLICATIONS OF THE NATURAL RESOURCES INVENTORY

1. The surficial geology and resulting soils of Bath have not been kind to agriculture. The limited agriculture and forest practices do, however, add to the lasting rural scenic quality of North Bath.
2. There are steep slopes along the west side of High Street from about Nichols Street south to about Fairview Lane. The steepness of these slopes makes development of the area difficult if not impractical.
3. The City has approximately 414 acres of land either permanently removed from development potential or set aside in the state's Open Space Tax Program. All of the protected parcels are in North Bath.
4. There are almost 205 acres of land in Bath classified in the Farmland Current-Use Tax Program. Land in this classification is valued for tax purposes as farmland, not at market value. The farmlands are used to grow hay, board horses, grow vegetables and flowers, cultivate Christmas trees, and raise bison. Although the farms do not comprise a significant portion of the City, they contribute to the economy of Bath and the rural character of North Bath.
5. The Tree Growth Tax Program includes more than 376 acres of forestland.
6. The land in conservation plus the land in one of the state's current-use tax programs total approximately 995 acres. This is about 1.5 square miles, or about 15 percent, of the area of Bath.
7. The nine large islands in the Kennebec River are part of the City of Bath. They add greatly to the Kennebec River views we enjoy.
8. Large blocks of undeveloped land contribute to the rural quality of Bath and also provide habitat for many birds and mammals. If these blocks are broken up—even if development is minimal—the value of the habitat to many animal species is greatly diminished.

9. The Kennebec River carries a huge volume of water and has a high water quality. It is a visual, recreational, and economic resource, and it adds to our sense of place, recreational enjoyment, and economic livelihood.
10. As stated by Friends of Merrymeeting Bay, "the [Merrymeeting] Bay, by virtue of its unique characteristics and large size, is an ecological gem in our midst. Unfortunately, many factors, particularly water pollution and pressures from development, have reduced much of the once-abundant resources of the Bay to remnant levels."
11. Beginning with Habitat's Kennebec Estuary Focus Area includes the Merrymeeting Bay, Lines Island, and other portions of Bath. This focus area is depicted on the Critical Natural Areas map. Working with landowners, the Kennebec Estuary Land Trust, and developing and implementing appropriate development regulations will help to protect this area of statewide ecological significance.
12. The facilities, land, and businesses that comprise what can be referred to as the Port of Bath make the City of Bath somewhat unique. It gives the City a competitive advantage that has been capitalized on for decades. Its loss would make Bath much less economically competitive.
13. As stated in the "Gulf of Maine Council on the Marine Environment Action Plan 2007-2017": "Working waterfronts are essential to marine-dependent industries and often define the character of coastal communities." What is left of Bath's industrial working waterfront includes a vacant parcel once used as a shipbuilding site and sardine cannery, and the BIW facility.
14. Wetlands are not just "swamps that need to be filled to accommodate development." They provide important water-cleansing and flood-control functions; are breeding grounds for many large and small animals; and they add to the beauty of Bath.
15. As pointed out by the MNAP, knowledge of the significant plant and animal habitat—including rare species and natural communities—helps

avoid development conflicts and assists landowners in making informed decisions about development or conservation of their land. This is true whether or not the plant and animal habitat is catalogued in the MNAP.

16. Views form our sense of place and are important to our enjoyment of living in and visiting Bath. These views include the river, the islands in the Kennebec River, the east shore of the river, and the open fields that contrast with Bath's urban qualities. The important views also include vistas of the City from the river and from the Sagadahoc Bridge.
17. Much of the downtown is in a 100-year flood-hazard area. At times of astronomical high tides, some street-flooding occurs on Commercial and Washington Streets. If a sea-level rise occurs in the future, additional flooding is likely.
18. Natural resources and natural areas provide both opportunities for and constraints to development. The natural areas with severe constraints are generally located along the West Bath town line in the southwest portion of Bath, along the Kennebec River south of BIW, along Whiskeag Creek east of Ridge Road, Butler Cove, along the New Meadows River west of Ridge Road, along the shore of Merrymeeting Bay, east of Varney Mill Road, and the large wetlands east of Windjammer Way and Bernard Street.