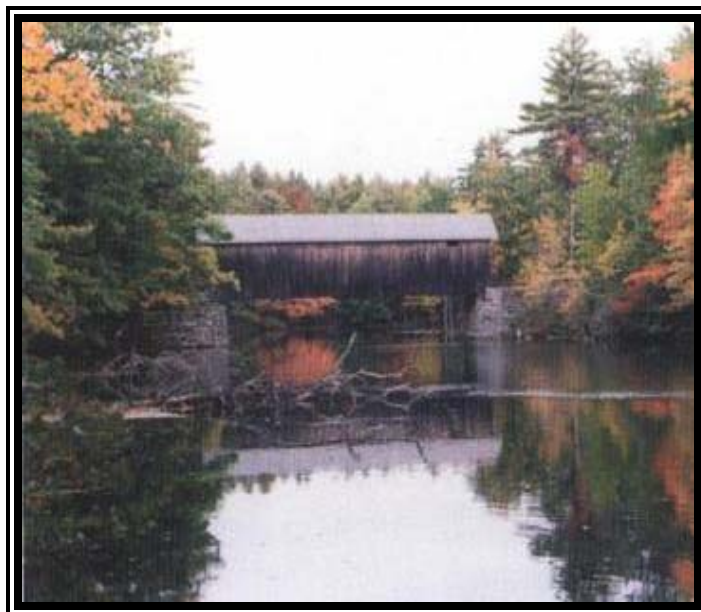


Protecting and Enhancing Open Space Along the Presumpscot River



Prepared by
the Presumpscot River Management Plan Steering Committee

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Introduction

This white paper addresses the value, status and future of open space along the Presumpscot River. It concludes with a set of recommendations for activities aimed at protecting open space along the Presumpscot and capitalizing on the opportunities the river's open space resources provide. This report was developed as part of the effort to develop a broadly supported plan for management of the Presumpscot's many resources. Similar analyses have also been produced on the Presumpscot River's fisheries and cumulative impacts to the resources of the river. This entire effort was directed by the Presumpscot River Management Plan Steering Committee, a diverse group of citizen, local, state and federal representatives committed to the future of the river.

Open space is one of the aspects of the Maine environment which distinguishes it from other states. Where do Maine's citizens choose to walk, canoe, enjoy nature, hunt, fish, hike and renew their spirits? Open space is undeniably important to the Maine way of life. However, Maine's open space lands are being steadily eroded, particularly in Southern Maine. Recent studies have demonstrated the rate at which we are losing open space as a nation and as a state.

“According to a study by Witham and Hunter (1989), Maine and New Hampshire forest area decreased by 7%, agriculture by 9%, and non-forested upland by 12%, while rural residential area increased by 23% and urban/industrial by 4% in a twenty-year period from the mid 1960s to the mid 1980s” (Maine Audubon Society, 2000).

The Presumpscot is in a part of Maine which is losing open space at a rapid rate. In response to this and other related problems, the State Planning Office has championed efforts to control sprawl. Encouraging compact patterns of development in Maine communities has a number of advantages, which include but are not limited to maintaining open space. Compact development is a good idea in its own right. It benefits local taxpayers, contributes to a sense of community, and can even benefit developers by reducing costs (MSPO, 1997). This report, however, is not about preventing sprawl (although that is one tool which can be used to preserve open space); instead, it is about the importance of protecting open space based on its own merits.

Protecting riparian open space (open space along river and stream corridors) is especially critical. Consider its importance to:

- Fish and aquatic life. Riparian open space filters the runoff from the land, protects waters from sedimentation,¹ maintains cool water temperatures, and contributes organic matter to the aquatic food base.
- Wildlife. Riparian open space provides habitat used by 80% of Maine's terrestrial vertebrate species at some time during their lifecycle.

¹ Deposition of mineral or organic matter which results when the ground surface is worn away (by stormwater runoff, for example).

- Water quality. Riparian buffers prevent sedimentation and detoxify runoff before it reaches our water courses.
- Ecological functioning and connectivity. The purity and integrity of aquatic ecosystems is critical to the functioning of the whole biosphere. The proper functioning of these water courses is dependent upon riparian open space to maintain its cleanliness and energy flows. Riparian open space, and the waters they protect, connect all elements of the ecosystem together – the land to the smallest intermittent brooks, the brooks to the streams, the streams to the lakes, the lakes to the rivers, the rivers to the estuaries, and the estuaries to the ocean.
- Recreation. Humans are inexorably drawn to our water courses as a place to recreate. Whether it's for whitewater boating, fishing, observing wildlife, or simply sitting by the shore, water has a magical ability to soothe and stimulate the human soul.

This report catalogues the significance of open space along the Presumpscot River. It identifies the areas which are most vulnerable to the loss of open space, identifies the most valuable open space preservation opportunities (from a habitat perspective), and offers a set of actions to help us move forward on open space protection.

The good news is that as of 2000, a surprising amount of the Presumpscot shoreline (83.9%) remains undeveloped, with development clustered primarily near the historic mill sites in Westbrook, Mallison Falls and Little Falls, and Great Falls (North Gorham) (see Figure 1). Further, there are a wide variety of significant open space values along the Presumpscot, ranging from fish and wildlife habitat, to sites important to our understanding of early indigenous cultures. However, while the pace of development in the recent past has been relatively modest, the pressures for development along the Presumpscot are stronger now than they have been in the recent past, particularly along the lower river. This is in part because of the cleanup of the Presumpscot River itself and improvements in air quality. In addition, while most of the Presumpscot remains undeveloped, little of it is permanently protected. These are the challenges facing the communities along the river today.

In challenge lies opportunity.

Figure 1. Developed and Undeveloped Areas Along the Presumpscot River Corridor

I. The Values of Riverine Open Space Along the Presumpscot River

A. Natural Resource Values

1. Overview

Open space along the Presumpscot River is important for fish and wildlife habitat, provides a unique habitat for many plants not found elsewhere, offers space needed to accommodate and absorb floodwaters, is a buffer that helps maintain the water quality of the river, and provides opportunities for agriculture especially in areas that include “prime” soils for crops. These open space values are described in detail in the sections that follow.

Figure 2 presents a composite of high natural resource values within 500 feet of the Presumpscot River, based on available natural resource data. Shown are: wetlands; areas of at least 5 acres ranked as the highest² value habitat for U.S. Fish and Wildlife primary trust species (see Table 1 for a list of these species); rare animal habitat, deer wintering areas, and prime farmland (existing fields of at least 10 acres in a rural landscape --excludes Westbrook and Portland. This composite map shows a concentration of these natural values in three areas: (1) along the original river section between Sebago Lake basin and the North Gorham impoundment; (2) along undeveloped sections of the river between Little Falls and Saccarappa Dam, and (3) in the Portland/Falmouth section of the river, upriver of I-95.

Notably, each of these areas are segments of the river where the original riparian corridor remains both undeveloped and unaltered by inundation. The Saccarappa, Mallison, and Little Falls Dams do not change the width of the river substantially; whereas the impoundments above Gambo Dam, Dundee Dam and North Gorham Dam created impoundments that flooded a much wider area. Hence one reason for the concentration of high natural resource values in the three areas identified could be that values associated with the original river corridor remain largely intact in undeveloped areas not flooded by dams.

² Based on an analysis by the U.S. Fish and Wildlife of the value of habitat areas for priority trust species (see Table 1); the areas in Figure 2 scored in the top 25% in this analysis, and were identified as the areas most valuable for local land use protection efforts as part of a interagency effort to support habitat protection at the local level, called “Beginning with Habitat”(see Footnote 3 below).

Table 1. Priority Trust Species List for the U.S. Fish & Wildlife Service

BIRDS	Killdeer	Semipalmated sandpiper	Horseshoe crab
American bittern	Least sandpiper	Short-billed dowitcher	Shortnose sturgeon
American black duck	Least tern	Short-eared owl	Winter flounder
American woodcock	Northern flicker	Surf scoter	
Arctic tern	Northern goshawk	Upland sandpiper	PLANTS
Bald eagle	Northern harrier	Veery	Eastern prairie fringed orchid
Bicknell's thrush	Olive-sided flycatcher	Whimbrel	Furbish's lousewort
Black scoter	Osprey	White-winged scoter	Robbins' cinquefoil
Black tern	Peregrine falcon	Wood duck	Small whorled pogonia
Black-bellied plover	Pied-billed grebe	Wood thrush	
Blue-winged warbler	Piping plover		MAMMAL
Canada warbler	Purple sandpiper	FISHERIES	Canada lynx
Chestnut-sided warbler	Red knot	Alewife	
Common loon	Red-shouldered hawk	American eel	REPTILE
Common snipe	Roseate tern	American shad	Plymouth redbelly turtle
Common tern	Saltmarsh sharp-tailed sparrow	Atlantic salmon	
Eastern meadowlark	Sanderling	Atlantic sturgeon	
Field sparrow	Scaup (greater or lesser)	Blueback herring	
Grasshopper sparrow	Sedge wren	Bluefish	

Figure 2: Open Space with High Natural Resource Values

2. Wildlife and Fish Habitat Values

Open space corridors along rivers or streams (riparian lands) have special value as wildlife habitat for several reasons: 1) these lands form the edge between two important habitat types (terrestrial and aquatic); 2) they help maintain the value of the river and estuary as habitat; 3) riparian lands occupy a unique position in the landscape and hence have special values; 4) riparian lands are often the most continuous wildlife travel corridors available within a region; and 5) riparian open space helps prevent the fragmentation of wildlife habitat.

The combination of these values has led a coalition of planning and conservation organizations³ to conclude that protecting riparian habitat should be the “**backbone**” of local and regional planning efforts. In a series of reports and maps (entitled “Beginning with Habitat”) developed by these organizations to assist local natural resource conservation and open space protection efforts, the need to protect riparian habitat is supported by the fact that **80% of Maine’s terrestrial vertebrate wildlife species use riparian areas to meet their habitat needs at some point in their life cycle**. Their report concludes, “Conservation of wetlands and surrounding riparian habitat is essential to ensuring that the full compliment of Maine’s plants and animals persist on the landscape.” Regarding the critical nature of riparian habitats for many species that are threatened in other areas, it is worth noting that, “Over half of all owl, salamander, frog and toad species that breed in Maine are listed as of special concern, threatened or endangered in other northeastern states” (Maine Audubon Society, 2000). Thus, Maine has a chance to protect important riparian habitats for species other areas have already lost.

Value of Riparian Lands as an “Edge” Habitat: Riparian open space lies at the edge between the terrestrial and the aquatic environment. That is, it lies between two very different ecosystems. An ecosystem consists of the living things in an area, the environment that sustains them and their interactions. The edge between two ecosystems (called an ecotone) often has special value as habitat because it has different vegetation and environmental conditions than the interior of either of the two abutting habitats (e.g., more food, more or less light, warmer or cooler temperatures, etc.). Further, the animals that use edge habitats can choose between the abutting habitats and conveniently utilize the resources available in the two different ecosystems, as well as the edge itself.

Habitat Value for Water-Dependent Species: The value of riverine riparian lands as edge habitat is increased because a number of wildlife species require the juxtaposition of aquatic and terrestrial habitats for their success. For example, wood ducks, goldeneyes, and hooded mergansers are all waterfowl species that nest in hollow trees and require the proximity of water for their young. Likewise, a number of amphibians require the juxtaposition of terrestrial habitat and aquatic environments for their different life stages (e.g., amphibians, like the spotted salamander, lay their eggs in water [generally vernal pools which are

³ “Beginning with Habitat” developed as a partnership by Maine Audubon Society, Maine Department of Conservation, Maine Department of Inland Fisheries and Wildlife, Maine State Planning Office, U.S. Fish & Wildlife Service, Wells National Estuarine Research Reserve, Maine Coastal Program, U.S. Geological Survey, Southern Maine Regional Planning Commission, and The Nature Conservancy.

common in riparian areas], but spend most of their life in moist wooded habitats). Blandings and spotted turtles, which need both wetland and upland habitats, offer another example of a species that required the juxtaposition of different habitat types (Beginning with Habitat Coalition, 2002).

Habitat Value for Terrestrial Wildlife Species: Riparian open space also provides access to water for forest-dwelling terrestrial species. While some forest species can meet their requirements for water from their food, others require access to surface water for drinking. Riparian areas along rivers with dependable flow such as the Presumpscot are particularly important for these species during periods of prolonged drought and during the winter.

Riparian habitat is also valuable to deer and other mammals more generally. Telemetry studies in Maine indicate furbearers differentially select riparian habitats over adjacent habitats: 85% of furbearers located by these studies were found within 100 meters (approximately 300 feet) of water. The species studied included coyote, bobcat, red fox, fisher, and marten. These and other species use the riparian zone as a route for traveling within their extensive home ranges. They also feed in riparian habitat, which usually contains higher densities of food items than less diverse adjacent habitats (Jones, et al., 1988).

Habitat Value for Birds: A number of birds of prey utilize the riparian edge to find their food. These birds range in size from kingfishers to eagles and include ospreys as well as a number of the larger hawk species. These birds use perch trees along the water to locate their prey. Wading species like herons and bitterns, while they don't use perch trees, use the riparian edge to hunt for small fish and other aquatic organisms. Riverine areas also have special value for some of these species in the winter when other areas are iced over (e.g., wintering eagles congregate around open water areas on rivers).

Other avian species use riparian habitats for other purposes as well and require riparian strips of varying widths. In southern Maine, song sparrows, common yellowthroats, yellow warblers, and eastern kingbirds were found nesting in riparian buffer strips less than 10 meters (approximately 30 feet) wide, while Cooper's hawks and sharp-shinned hawks also nested in riparian areas but required riparian habitat 100 meters (approximately 300 feet) or more wide. A 200 meter-wide (approximately 600 feet) vegetative strip is apparently able to accommodate breeding territories of most songbirds. In addition to maintaining this riparian habitat, maintaining adjacent undeveloped forests will add significantly to the value of riparian habitat areas for area sensitive forest interior species.

Habitat Values of Riverine Wetlands: The riparian edge can also provide specific habitat types not found elsewhere. Examples include shrub/scrub wetlands which commonly occur along rivers, particularly those with unregulated flows, or flows that fluctuate widely. There are a number of species that favor these shrub/scrub wetlands. Species in southern Maine for whom shrub/scrub riverine wetlands are important include: northern harrier, marsh hawk, merlins, sharp skinned hawks, cooper's hawk, yellow warblers, common yellow throats, wilsons warbler, alder flycatcher, willow flycatcher, blue green gnat catcher, northern water

thrush (Ron Joseph, USFWS, pers. comm.), little brown bat, big brown bat, red bat, black racer snake, certain dragonflies, certain butterflies (Mark McCullough, IF&W, pers. comm.).

Other examples of habitat types peculiar to riverine areas include gravel bars and grassy islands used by a number of birds for nesting, e.g., various ducks and geese, killdeer, nighthawks, and others.

Value of Riparian Land as Buffers from Disturbance for Sensitive Riverine Species:

Undeveloped open space protects the wildlife using riverine and estuarine habitats from disturbance. For example, while no nesting pairs of bald eagles have been recorded along the Presumpscot since 1962 when data collection began (Charlie Todd, Maine IF&W, pers. comm.), this could easily change with the recovery of the eagle population, and the improved water quality of the river. Bald eagles, including adults with young, are already regularly seen along the Presumpscot. They build large stick nests usually in prominent white pines or spruces located within one mile of marine habitats, shallow lakes and ponds, or along larger rivers. They eat primarily bottom-dwelling fish during the summer months, but shift their diet to birds (primarily waterfowl and gulls) and carrion during the winter. Because eagles are very sensitive to disturbance, wildlife biologists recommend that the area within a quarter-mile of an eagle's nest should be limited to low-impact activities. Additionally, the area within 330 feet of an eagle's nest should be maintained as a completely undisturbed nesting sanctuary devoid of development and human disturbance.

The Presumpscot Estuary is an important feeding and resting area for numerous species of shorebirds, including sandpipers, plovers, turnstones, curlews, dowitchers, and phalaropes. A large number of these birds depend on coastal habitats in Maine for feeding and resting during their long migration from the Arctic breeding grounds to southerly wintering areas. Commonly used feeding areas include mudflats, and salt marshes, including those found in the Presumpscot Estuary (Jones, et al., 1988). These birds benefit from the current lack of disturbance present in the estuary. Even though busy highways border parts of the estuary, human activity is largely confined to the roadways which ironically help to isolate the area from human disturbance.

Role of Riparian Lands as Contributors to Aquatic Ecosystem Functions: Riparian open space also maintains the ecological functions of the adjacent waters. For example, stream ecosystems are heavily reliant on detritus from the terrestrial environment as a source of energy to power their ecosystems. In some heavily forested waterways, up to 75% of the aquatic ecosystems organic food base may be supplied by dissolved organic compounds and detritus such as fruit, limbs, leaves, and insects. These materials fall from the forest canopy into the water and become the first link in the food chain. They are consumed by bacteria, fungi, and aquatic insects, which in turn provide food for larger insects and fish. This contrasts with lake ecosystems where most of the plant product occurs within the lake itself (Eady, n.d.).

Further, larger wooded debris contributes to the complexity of aquatic habitats providing hiding places for many fish and other aquatic species. This debris can be critically important to maintaining the populations of various aquatic species. Large branches and tree trunks

that enter the channel provide habitat and cover for fish, and play a major role in the formation of pools and spawning grounds.

In addition, overhanging foliage provides shade which helps to reduce warming from the sun, thus, maintaining lower water temperatures, reducing the evaporation rate of water, and increasing the water's oxygen holding ability. All of these benefits are critical to the survival of cold-water fish species (Montana University System Water Center -- "Riparian Zones").

Role of Riparian Lands in Protecting the Water Quality and Habitat Suitability of Aquatic Ecosystems: Undeveloped riparian areas also protect water quality from sedimentation, toxins and contamination by other man-made materials. Various studies have shown that buffer strips of up to 250 feet in width – depending upon slope, soil type, etc. – are necessary to infiltrate water into the soil and biologically treat contaminants. In addition, the root systems of riverine vegetation anchor the soil and help prevent erosion by holding riverbank materials together. These root systems provide a path for water to flow through the soil, which prevents the soil from becoming saturated. This is important, as saturated soil is very heavy and far more prone to slumping than drier substrates. Plants, as well as undisturbed soils, help in filtering the runoff of nutrients, pesticides, and other contaminants from adjacent land in the watershed. Without adequate riparian buffers, contaminants and unnatural levels of sediment can enter surface waters.

The impact of certain manmade materials (e.g., pesticides, oils, and gas on aquatic ecosystems), is well documented, but even entirely natural soil particles can be a problem. Soil and sediment concentrations in a river can result in abrasion damage to fish gills and at high levels can cause mortality in insects and adult fish. Even low sediment concentrations can cause behavioral changes and disrupt normal reproduction. For example, trout and salmon as well as other species use gravel beds for spawning. They lay their eggs in depressions scooped out of the gravel. Successful spawning requires clean gravel with water flowing through it to keep the eggs alive. Embedded gravel results from sediment filling in the spaces in gravel beds. This limits the flow of well-oxygenated water needed by the fish eggs and the suitability of conditions for spawning ("The Riparian Zone -- Streamside Vegetation for Water Quality," Cumberland County SWCD). In addition, suspended sediments in water interfere with the photosynthesis of submerged plants by blocking sunlight, causing them to die. As a result, dissolved oxygen levels near river bottoms affected by sedimentation can drop abruptly and lead to the degradation of aquatic life (Welsch, 1991).

Summary of Suggested Buffer Widths for Riparian Ecological Functions: A recent study prepared by Kleinschmidt Associates (1999) summarized riparian buffer strip functions and needed widths as follows (Table 2):

Table 2. Suggested Buffer Widths

Function	Suggested Width	Notes
Shade and Temperature Regulation	15-80 feet	<ul style="list-style-type: none"> • Depends on stream size. • Shade is more important for small and medium sized streams, as large streams will be unshaded regardless of buffer width. • Canopy closure must be maintained. • Common recommendation is 1 mature tree height of width.
Water Quality Protection	25-200+ feet	<ul style="list-style-type: none"> • Must be vegetated, but not necessarily forested. • Some sources recommend two zone buffers. • Several recommendations that 90+ feet required for sediment removal. • Some sources suggest adjustments based on slope, soil type, degree of forest canopy closure, and regional differences in vegetation types.
Woody Debris and Organic Inputs	Similar to shade requirements	
Stream Flow Regulation—attenuation of peak flows and maintenance of base	NA	Typically dependent on watershed scale impacts. Riparian management alone will not protect these functions.
Wildlife Habitat	200+ feet	Terrestrial wildlife habitat protection for riparian dependent species typically requires wider buffers than those required for water quality and aquatic habitat protection.

Unique and Special Values of Riparian Lands: Riparian open space also has special values because of its unique position in the landscape. Because materials from the surrounding landscape drain or wash down into them, these low-lying areas often represent the best watered and most fertile soils in the watershed. Thus, some plant species of value to wildlife only grow, or only grow in abundance, in such areas. These highly productive areas are important for a wide variety of wildlife as they provide abundant sources of food for many wildlife species.

In addition, because of its sheltered position in the landscape and the prevalence of dense softwoods in its low lying and sometimes poorly drained soils, some riparian open space has special values for species like white-tailed deer seeking shelter from winter cold and deep snows. The primary behavioral mechanism for deer to conserve energy during winter is to move to traditional “deer yards”, or deer wintering areas (DWA). During winter, deer concentrate into ranges that are only 20-30% the size of their summer range. These DWAs provide deer with shelter from radiant heat loss as well as improved mobility because snow in these stands is generally not as deep as in surrounding areas. In Maine, a survey of 350 deer wintering areas found that 85% of these areas occurred in riparian conifer stands. The dense canopy of softwood cover in a DWA moderates the effects of winter by maintaining warmer than average temperatures and by greatly reducing wind velocity. The dense forest cover also intercepts much of the snowfall and ground accumulations are packed firmly, making traveling much easier, hence decreasing energy demands. In addition, snow on adjacent waterways may be shallow or densely packed offering better travel opportunities than the surrounding uplands.

Along the Presumpscot River, a relatively large deer wintering area exists along the north end of the Presumpscot. This area is considered an important habitat even though the Presumpscot River is in Southern Maine, where DWA's are less critical than are in northern and northwestern Maine.

Value as Wildlife Travel Corridors: Riparian open space also has special values because it maintains travel corridors for wildlife in developed areas. Riparian corridors are often the most continuous travel routes available for species which use forested lands or shrub/scrub lands to conceal their movements. These travel corridors are critical for wildlife's ability to use different parts of their range to meet their requirements at different times of year or for different life stages. For example, white-tailed deer use these travel corridors to travel between feeding and bedding areas and between their winter range and other habitats during the spring, summer and fall.

Value of Riparian Corridors in Providing Connectivity Between Dispersed Upland Habitats: Even when they are not used as routine travel corridors, riparian corridors can link dispersed habitats and provide a way for animals to move from one to another over longer intervals. For example, the young of certain species of reptiles, amphibians and mammals all need the ability to disperse to new habitats to set up territories for successful feeding and breeding. Even though this dispersal may occur sporadically, rather than the more or less continuous use true travel corridors receive, it allows for the continuous exchange of genetic material between different populations within a species, a critical factor in maintaining the species'

resilience to disease and other adverse impacts. It is important, therefore, to maintain undeveloped, naturally vegetated corridors of a sufficient width between habitats to allow for this genetic exchange. Allowing habitats to become isolated "islands" surrounded by development will cause them to lose much of their ecological value even though the habitat itself is not directly impacted (Cohen, 1997).

According to Maine Audubon, "Small isolated habitat patches can be a 'population sink' from a regional landscape perspective. Individuals who can not reproduce successfully in the altered habitat may still use the remaining small patches. The results may be a reduced regional population. A study by Robinson (1989) in central Illinois showed that neo-tropical (long-distance) migrant birds were unsuccessful at breeding in forest tracts because of increased predation in these small habitat patches. A different study by Friesen (1995) in Ontario found fewer neo-tropical migrants in forest tracts adjacent to a high amount of residential housing" (Maine Audubon, 2000). Table 3 (from a Maine Audubon publication) shows the minimum area needed by a variety of Maine species.

Different wildlife species have varying requirements for the minimum size of the habitats they will utilize. According to Maine Audubon, "Blocks between 1 and 19 acres are home to species typical of urban and suburban landscapes (e.g., raccoons, skunks, and squirrels). Blocks of 50 acres of grassland or 250 acres of forest provide habitat for birds that are uncommon in smaller grasslands and forests. These birds may include grassland species such as the upland sandpiper and grasshopper sparrow and forest species such as the veery and scarlet tanager. Moose, bald eagles, goshawks and similar species usually require 500 to 2500 acres, while blocks of greater than 2,500 acres may hold the full complement of species expected to occur in Maine" (Beginning with Habitat Coalition, 2002). Table 3 from the publication cited above lists the minimum habitat area needed by a variety of Maine species.

Table 3. Area Requirements of Selected Maine Wildlife Species

a. Habitat Area Requirements for Area-Sensitive⁺ Forest Birds Found in Maine

Bird Species	May Occur in Blocks <250 Acres	Occur in Blocks 250- 500 Acres	Occur in Blocks 500- 1000 Acres	Occur in Blocks >1000 Acres
Red-shouldered hawk			X	X
Yellow-billed cuckoo**	X	X	X	X
Downy woodpecker**	X	X	X	X
Hairy woodpecker		X	X	X
Pileated woodpecker*			X	X
Least flycatcher		X	X	X
Great crested flycatcher*	X	X	X	X
Common crow	X	X	X	X
Tufted titmouse*	X	X	X	X
White-breasted nuthatch	X	X	X	X
Brown creeper*			X	X
Blue-gray gnatcatcher				X
Veery		X	X	X
Hermit thrush			X	X
Wood thrush			X	X
Gray catbird**	X	X	X	X
Yellow-throated vireo*	X	X	X	X
Red-eyed vireo*	X	X	X	X
Northern parula				X
Chestnut-sided warbler*		X	X	X
Black-throated blue warbler				X
Black-throated green warbler*			X	X
Black-and-white warbler			X	X
American redstart		X	X	X
Ovenbird			X	X
Northern waterthrush			X	X
Louisiana waterthrush			X	X
Mourning warbler			X	X
Canada warbler				X
Scarlet tanager		X	X	X
Rose-breasted grosbeak*	X	X	X	X
Rufous-sided towhee**		X	X	X

(See bibliography for references)

⁺ Bird species that are uncommon in smaller forests.

* Some studies did not classify these species as area-sensitive.

** Some studies classified these species as area-sensitive, but most did not. These are more likely not area-sensitive.

b. Habitat Area Requirements for Area-Sensitive⁺ Grassland Birds found in Maine

Bird Species	Minimum Block Size	Preferred Block Size
Upland Sandpiper	150 acres	500 acres
Bobolink	5 acres	75 acres
Eastern meadowlark	15 acres	20 acres
Grasshopper sparrow	30 acres	250 acres
Vesper sparrow	30 acres	50 acres
Savannah sparrow	20 acres	40 acres
(Jones & Vickery 1997; Vickery et al. 1997)		
⁺ Bird species that are uncommon in smaller grasslands.		

c. Habitat Area Requirements for Large Mammals Found in Southern and Central Maine

Species	Home Range*
Black Bear	19,200 acres
Bobcat	5760 acres
Fisher	4747-9600 acres
Mink	20-50 acres (females), 1280-2010 acres (males)
Moose	1280-12,800 acres
River Otter	15-30 linear miles
(DeGraaf & Rudis 1986)	

d. Habitat Area Requirements for Turtles Found in Maine

Species	Home Range*	Additional Distances Traveled (for nesting, migrating, feeding)
Snapping Turtle	4.50-22 acres	Up to 5 miles
Common Musk Turtle	2.4 (females) acres - 4.4 (males)	Less than 0.5 miles
Spotted Turtle	5-7 acres	Up to 1.25 miles
Wood Turtle	1446 river feet	Up to 6 river miles Up to 0.10 miles over land (500 feet)
Eastern Box Turtle	0.8-3 acres	Up to 0.2 miles
Eastern Painted Turtle	0-2 acres	Up to 1 mile or more
Blanding's Turtle	0-300 acres	Up to 4.20 miles
(DeGraaf & Rudis 1986; Ernst et al. 1994; Hunter, Albright & Arbuckle 1992; McCollough per comm.)		
*Home range is the primary area in which an individual animal lives, and includes areas for resting, sleeping, feeding and breeding.		

3. Plant Habitat Values of Riparian Lands

In addition to providing habitat for animal species, riparian open space areas also have special value for certain plants and plant communities. Certain species require the characteristics of riverine or riparian habitats to be successful, while other species achieve their best development in these areas.

Value of Riparian Lands as Habitat for River-Dependent Wetlands: Wetlands such as certain types of shrub/scrub wetlands are specific to riverine areas. These may occur along the aquatic edge of the riparian zone or on islands within the river. These wetlands include a variety of different plant species, including shrubs such as willows, as well as a variety of grasses and sedges. These areas provide habitat not only for these species of plants, but also provide special values for a variety of wildlife species as well.

Value of Rich Floodplain Soils and Riparian Areas as Habitat Especially Suited to Certain Plant Species, including Certain Rare Plant Species: Community types such as silver maple forest require riparian sites with high water tables and relatively rich soils for successful development. Species such as black willow occur commonly only in riparian locations. Still other common species achieve their best development in riparian areas, although they may not be limited to these habitats. These include certain hardwood species such as black cherry and butternut. It is reported that some of New England's largest white pine originally came from alluvial riparian sites (areas built up from materials carried by and deposited from floodwaters). Some of these trees were reported to achieve diameters of 10 feet (Pike, 1967).

Other lesser plants, many of which are now rare, thrive in the rich alluvial flats in riverine riparian zones. These include species such as ginseng. These species are rare now in part because many of these rich alluvial flats have been converted to agricultural use or developed for other purposes. Other more common species also require rich alluvial settings, e.g., species such as the ostrich fern or fiddleheads are largely limited to alluvial sites.

Two plant species identified by the state as threatened or endangered have been observed on the north end of Dundee Pond: *Isotria medeoloides* (Small Whorled Pogonia) and *Lindera benzoin* (Spicebush). Spicebush is so named because of the spicy aroma it gives off if any part of the plant is broken. This is a large shrub that can reach a height and spread of about 10 feet. Its flowers are pale yellow and hang on leafless branches in early spring. Leaves appear in late spring and feel like velvet. Red berries occur in late summer. In the fall, the leaves turn yellow. The shrub is often found in moist, shady sites along floodplain forests, shady streams, and in small pocket swamps. Spicebush is considered difficult to transplant (Michigan State University Extension Home Horticulture).

The Small Whorled Pogonia is one of the rarest plants in Eastern North America. Only 49 locations with populations are now known to exist. In 1982 it was officially protected under the Federal Endangered Species Act of 1973. A member of the orchid family and a perennial herb, it has been classified as the rarest orchid east of the Mississippi River and north of Florida. The plant usually occurs in small numbers with mostly a few, and rarely more than 30, individuals at a site. The largest populations, some containing over 200 individuals, are found in Maine and New Hampshire where over 80% of the known world population occurs.

The Small Whorled Pogonia grows in relatively open woods typically 50 to 60 years old, free of dense undergrowth of shrubs and other low vegetation, and dominated by hardwoods such as beech, birch, maple, oak and hickory. Less often it grows under softwoods like hemlock. Characteristically, the Small Whorled Pogonia requires a relatively open understory canopy, and proximity to features that create breaks in the forest canopy which persist for long periods of time. It prefers acidic soils with a thick layer of dead leaves, especially on shallow slopes where small streams flow in the spring. The plant may remain dormant underground for years waiting for favorable conditions before emerging through the decaying leaves on the forest floor (Dept. of Botany & Plant Pathology, Univ. of Maine).

It is possible that both the Spicebush and Small Whorled Pogonia lost habitat due to the impoundments on the Presumpscot that may have inundated many suitable habitats (Don Cameron, Maine Natural Areas, pers. comm.). However, no predevelopment data exists to determine what additional habitat areas may have existed before the dams were built.

Studies done for hydropower relicensing on the Androscoggin River identified a number of species that were likely to have occurred on the alluvial flats along that river (see Table 4). These same species may have existed along the Presumpscot as well.

Table 4. Representative or Examples of Rare Plant Species Likely to Have Occurred Along the Androscoggin River Under Natural Conditions

Genus	Species	Common Name
Panax	quinquefolius	American Ginseng
Asarum	canadense	Wild Ginger
Prenanthes	racemosa	Glaucous Rattlesnake-
Carex	media	Intermediate Sedge
Carex	capillaris	Hair-like Sedge
Gentianella	amarella	Northern Gentian
Allium	tricoccum	Wild Leek
Malaxis	brachypoda	White Adder's-Mouth
Cypripedium	reginae	Showy Lady's Slipper
Spiranthes	lucida	Shining Ladies'-Tresses'
Listera	auriculata	Auricled Twayblade
Galearis	spectabilis	Showy Orchids
Triphora	trianthophora	Nodding Pogonia
Bromus	kalmii	Wild Chess
Hvstrix	patula	Bottle-Brush Grass
Podostemum	ceratophyllum	Threadfoot
Hedvotis	longifolia	Long-leaved Bluet
Ulmus	rubra	Slippery Elm
Viola	novae-angliae	New England Violet

Source: Woodlot Alternatives, Inc. 1995.

Role of Riparian Lands in Dispersal and Genetic Exchange Among Plant Species: Finally, as in the case of animals, because of the continuity of habitat provided by riparian open space areas, the dispersal of certain species is facilitated. Adequate dispersal provides increased genetic exchange within regional populations. Dispersal of species whose seeds are readily carried by water occurs more readily in these environments (e.g., butternut are common on rich alluvial flats probably in part due to the richness of the soils and in part because of the dispersal of their nuts by water).

4. Value of Riparian Lands for Flood Protection

Maintaining open space is important for floodwater storage and mitigating flood damage in downstream areas. Open space along rivers provides an area for floodwaters to spread out, lose velocity, and recharge groundwater stores. Having such storage available can reduce downstream flood levels and velocities thereby reducing flood damage.

The Presumpscot River, like all rivers in Maine, has flooded periodically. The most recent flooding event, the flood of October 1996 was an event of record proportions for the river. The rainfall, as much as 15 inches in a 24-hour period, and subsequent flooding was estimated to be a 1 in 250 year event. A review of all known significant historical peak flows on the Presumpscot River reveals that the October 1996 peak flow of 23,300 cubic feet per second was 68% larger than any other flow in the last 102 years (Table 5) (USGS, 1997).

Table 5. Significant Historical Peak Flows

Date	Flow (cubic feet per second)
April 15, 1895	13,000
March 1, 1896	13,800
February 13, 1900	11,300
March 2, 1900	9,720
May 17, 1916	12,400
June 17, 1917	9,710
March 12, 1936	11,200
September 11, 1954	12,400
March 14, 1977	11,200
May 12, 1989	9,200
August 29, 1991	13,900
October 22, 1996	23,300
Source – “Flood of October 1996 in Southern Maine – USGS 1997	

The historical record is somewhat sketchy when it comes to measuring the surface water elevations at specific locations during flood events. For instance, the “Highlights of Westbrook History” does mention a flooding event on the Presumpscot River in 1843, but there are no details giving the height of the water or the extent of damage. A report entitled “Flood of October 1996 in Southern Maine” - USGS 1997, does provide information on peak water-surface elevations for the past 100 years (See Table 6).

Table 6. Historical Peak Water Surface Elevations

Location	Year					
	1896	1916	1954	1977	1991	1996
Upstream of Saccarappa Dam	-	73.8 ft.	75.7 ft.	-	-	76.8 ft.
Upstream of Cumberland Mills Dam	-	46.0 ft.	45.8 ft.	-	-	51.6 ft.
Upstream of S. D. Warren Bridge	-	-	-	-	38.9 ft.	47.4 ft.
Upstream of Route 302 Bridge	36.6 ft.	34.1 ft.	36.5 ft.	-	-	43.8 ft.
Downstream of Route 302 Bridge	-	33.9 ft.	35.5 ft.	-	-	-
Upstream of Blackstrap Rd. Bridge	35.8 ft.	32.0 ft.	33.5 ft.	32.3 ft.	-	41.0 ft.
Upstream of Route 26/100 Bridge	35.1 ft.	31.7 ft.	31.8 ft.	-	-	38.8 ft.
Upstream of Smelt Hill Dam	22.5 ft.	25.2 ft.	23.4 ft.	-	-	26.5 ft.
Source – “Flood of October 1996 in Southern Maine – USGS 1997						

Based on that report, the flood of October 1996 reached an elevation of 43.8 feet above sea level at the Route 302 bridge, which was more than 7 feet higher than the previous record which occurred in the flood of 1896. The 1996 level was reached despite the fact the flow to the river consisted of only one-third of the potential flow. The fact is, the flow to the river from two-thirds of its drainage was held back by the Eel Weir Dam at the outlet to Sebago Lake. Sebago Lake provided storage for the 440 square mile watershed upstream of the outlet dam. The historic level of the 1996 flood was reached with flow input from only 200 square miles of the 640 square mile Presumpscot River watershed.

5. Value of Riparian Lands in Maintaining Water Quality

As population increases in a watershed, and the land becomes more developed, the amount of impervious surface area increases. The result is greater storm water runoff and nonpoint source (NPS) pollution. Fertilizers washed off lawns, oils and greases from cars rinsed off of driveways, and sediment eroded and carried away from compacted foot and vehicle trails are all examples of NPS pollution. Visual signs of NPS pollution include weed growth along shorelines, reduced water clarity, algal blooms, sediment deltas, and altered wildlife habitats

(Hardesty & Kuhns, 1998). When water quality deteriorates, recreation on the waters affected becomes undesirable, fish populations decline, and property values decrease.

As mentioned earlier in the section on the value of riparian buffers in protecting aquatic ecosystems, soil and sediment concentrations in a river can result in abrasion damage to fish gills and in high levels can cause mortality in insects and adult fish. Even low sediment concentrations can cause behavioral changes and disrupt normal reproduction. Imbedded gravel results from sediment filling in the spaces in gravel beds. This limits suitable conditions for spawning since trout and salmon will not use embedded gravel. Also, by covering spawning grounds, sediment reduces oxygen needed by existing incubating eggs (“The Riparian Zone — Streamside Vegetation for Water Quality,” Cumberland County SWCD). Algal blooms and suspended sediments in water also interfere with the photosynthesis of submerged plants by blocking sunlight, causing them to die. As a result, dissolved oxygen levels near the river bottom can drop abruptly and lead to the destruction of aquatic life (“Riparian Forest Buffers—Function and Design for Protection and Enhancement of Water Resources,” USDA).

Vegetated buffers are effective tools which can be used to help mitigate the negative effects on a river’s water quality caused by NPS. A well designed buffer strip helps eliminate or mitigate the effects on water quality of nutrients, sediment, organic matter, pesticides, and other pollutants.

Two of the more well known elements linked to water pollution (nitrogen and phosphorous), are found in fertilizers and animal waste. When these elements are applied to crop and pasture lands, they can flow into water bodies and stimulate excessive aquatic plant growth, adversely affecting water quality. Studies have shown that the amount of nitrogen in runoff and shallow groundwater can be reduced by as much as 80% after passing through a riparian buffer. The buffer also transforms toxic chemicals such as pesticides to non-toxic compounds by microbial decomposition, oxidation, reduction, hydrolysis, solar radiation, and other biodegrading forces at work in the riparian vegetation (“Riparian Forest Buffers—Function and Design for Protection and Enhancement of Water Resources,” USDA).

Vegetated buffers help to:

- Stabilize shorelines and streambanks to prevent erosion;
- Slow runoff, allowing sediment to drop out of the water;
- Take up nutrients and pollutants that would otherwise end up in the water. Plants use these nutrients for growth, storing them in plant tissues;
- Improve wildlife habitat by providing food and shelter;
- Shade waters and help keep water temperatures cool.

Some simple practices that help reduce NPS and improve water quality include:

- Keeping lawn areas to a minimum;
- Taking advantage of natural features by leaving depressions and irregularities in lawns to help slow the movement of water;

- Not mowing to the edge of the water;
- Leaving as much shrub and tree growth as possible, especially on steep slopes;
- Keeping footpaths to the water narrow and winding so they cannot channel water;
- Stabilizing heavy traffic areas by covering with bark mulch, wood chips, gravel, etc. (“Vegetated Buffer Strips”, China Region Lakes Alliance).

Maintaining riparian areas along the Presumpscot River and its tributaries in forest cover is extremely important to maintaining water quality in the tributaries and the main stem of the Presumpscot River. Numerous studies have demonstrated the value of forested riparian buffers in maintaining water quality. These buffers need to be wide enough to infiltrate water flowing from the surface of developed areas, agricultural fields, lawns and roads into the soil. The width of such strips varies depending upon the nature of the soils and the slope of the land.

General guidelines for the width of riparian strips to maintain water quality are as follows:

Average Slope of Land Between Exposed Mineral Soil and Normal High Water Mark (Percent)	Width of Strip Between Exposed Mineral Soil and Normal High Water Mark (Feet Along Surface of the Ground)
0	25
10	45
20	65
30	85
40	105
50	125
60	145
70	165

From the Maine Land Use Regulation Commission, Maine Department of Conservation. *Land Use Districts and Standards For Areas Within the Jurisdiction of the Maine Land Use Regulation Commission, Chapter 10 of the Commission's Rules and Standards*, Initially Adopted January 12, 1977, Latest Revision Effective January 1, 2001.

6. Value of Riparian Lands for Agriculture

Historic and Recent Trends in Agriculture Along the Presumpscot River

Agriculture has been an important contributor to open space along the Presumpscot River since early Colonial times. Samuel Dean, a local Presumpscot farmer and conservationist, developed an important farming text in 1790 which served as the standard for American agriculture for a generation (see Appendix A). The most noticeable change in the agricultural landscape from the eighteenth to the twenty-first century is the significant conversion of cropland and other farm-related open spaces to other uses, including forested land and development. This trend reflects both the decline of agriculture and the spread of suburban development (residential and commercial).

Present day land use along the Presumpscot River was reported in an analysis submitted by S.D. Warren Company as part of its license application for the dams along the river from the Dundee Dam to the Saccarappa Dam in Westbrook. This analysis showed that, from the top of the Dundee impoundment to the Saccarappa Dam, in strip of land extending variously from 250 to 1000 feet in width from the river, forested land accounted for 55% of the area, residential and urban industrial uses accounted for 17%, agriculture or maintained field comprised 9%, shrub or reverting fields accounted for 9%, and wetlands accounted for 9%. As elsewhere in Maine, agriculture has declined in the Presumpscot corridor and hence open space associated with farms has been shrinking.

Several trends in the farming practices in Maine and in the Presumpscot watershed have contributed to this loss of agricultural land base. Socioeconomic pressures on family farms have led to: crop diversification; the growth of a few very large commercial farms; and the subdivision of many family farms into several small operations, producing specialty crops on reduced acreage. Many of these small farmers are now classified as part-time farm producers. In addition, the combination of declining profits from farming and increasingly profitable opportunities to sell land for development has resulted in thousands of acres of traditional productive farmland in the Presumpscot watershed yielding to the final survival crop - new housing subdivisions.

Development continues to threaten the irreversible conversion of farmland to other uses. Recognizing that land use cannot remain static and that the Presumpscot corridor is becoming more suburban, it seems reasonable that protection of agricultural land should be based on the quality of the agricultural soils. Soils can be rated in terms of their ability to grow agricultural crops. Obviously some soils in the river corridor are much more valuable for agriculture than others.

Prime Agricultural Soils in the Presumpscot River Watershed

Prime Farmland (one of several kinds of important farmlands as defined by the U.S. Department of Agriculture) is farmland that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops while using acceptable farming methods. Farming prime farmland produces the highest yields requires minimal amounts of energy and economic resources, and results in the least damage to the environment.

Prime farmland is a limited strategic resource. Maintaining prime farmland as open space is an important pre-requisite to its use as agricultural land. Farmland preservation programs will play an increasingly important role in preserving important open spaces throughout the Presumpscot River Watershed. Farmland and open space preservation may also have long-term future benefits relating to food security and crop production.

Prime farmland is found in various locations along the Presumpscot River. However, many of these locations include isolated small pockets of prime soils and are currently in forested land cover. There are only two prime farmland areas that are both actively used (cleared land

in mowed or cultivated fields), and of a size large enough to support an agricultural operation (10 acres or more). These occur at the confluence of the Presumpscot River and the Little River, and at a large bend in the river about a mile above Saccarappa Dam. These areas have been included in Figure 2, which shows areas of high natural resource values along the Presumpscot River.

B. Cultural Values

1. Value of Riparian Lands for Recreation

Open space along the Presumpscot River is especially important because there are few riverine recreational opportunities present in the Greater Portland area. Open space along the Presumpscot River offers opportunities for the following activities:

- Boating, canoeing, kayaking
- Swimming
- Fishing
- Hunting
- Wildlife observation and birdwatching
- Walking
- Bicycling
- Skiing and snowshoeing
- Historical study
- Educational activities
- Snowmobiling
- Enjoying the peace and quiet
- Communing with nature
- Spiritual renewal

Fishing: River fishing opportunities are particularly noteworthy on the Eel Weir Bypass section of the Presumpscot River, which provides year round opportunities for trout fishing. Flows are maintained in the rocky, moderate gradient bypass from the Eel Weir Dam just upstream, and an adequate fish population is maintained by stocking of trout provided by the Department of Inland Fisheries and Wildlife.

Boating: The Presumpscot River is suited to recreational boating in small skiffs, canoes, and kayaks, but requires caution in some spots. The upper reaches have good water quality and are scenic because the banks are largely undeveloped. In Westbrook the river goes through the heart of the downtown. Below Westbrook, the river is largely undeveloped and the water quality is much better than in the past due to water pollution cleanup efforts and the shutdown of the SAPPI pulp mill. Current challenges to boating are poor access in some areas and difficult portages around some of the dams. Access to the impoundments and portages around the FERC-licensed dams are likely to be addressed, at least in part, by the dam owners if the dams are re-licensed through the FERC process.

Trails: Trails along the river provide a number of benefits including the following: a place for exercise, a community amenity, and visual and physical access to the river and its shoreline. High standard trails (wide and hard-surfaced, like the proposed Mountain Division Rail Line Trail) could also provide a facility for bicycling and access to natural resources for persons with physical disabilities. Trails could also be designed to accommodate winter recreation (e.g., cross-country skiing and snowshoeing). Trails available for these purposes would in addition to the benefits cited above, provide access to the river at a time when it would normally be considered inaccessible.

Educational Opportunities: Boat and land access can both provide educational opportunities for adults and school children. Signs, brochures, and educational programs can reach adult visitors, while river access can enhance school programs. As an undeveloped area near Maine's largest population center, the river offers unique opportunities for natural resource education. Maine Audubon reports that participants in the Christmas bird count along the Presumpscot routinely identify birds along the river corridor that are found nowhere else in Maine at that time of year, thus the river has special values for outdoor education.

2. Value of Riparian Lands Related to Historic and Archeological Sites

Rivers provide food, water and transportation and naturally attract human habitation and development. As a result, river corridors are often enriched with traces of the past. The Presumpscot is no exception. The river corridor is a patchwork of relics from early prehistory to the recent past. Preserving and celebrating historic resources can provide important opportunities for education, add interest to the physical landscape, and help to heighten and define an area's sense of place. In addition, by preserving open space important because of its prehistoric or historic significance, the value of the river as habitat and a source of pleasure will be preserved for future generations.

Indigenous Cultures

Over ninety-five percent of the known prehistoric habitation sites in Maine are found along waters navigable by canoe (Maine Historic Preservation Commission website <http://www.state.me.us/mhpc/archeol.htm>). Evidence from along the Presumpscot indicates continuous human habitation of the river corridor for the past 9,000 years. The landforms that were used by early Native Americans for camping occur at elevations from 1 to 10 meters above seasonal river levels. The sites at lower elevations have been subject to flooding over time, this flooding has either covered the sites with alluvial deposits or damaged them by erosion. Sites on higher riverbank landforms appear to have survived without much erosional damage (Arthur Speiss, Maine Historical Preservation Commission, personal communication).

Due to the existence of FERC-licensed hydropower projects on the river, a search of these sites has been conducted and any sites that were identified as potentially endangered will be protected. If the dams are not re-licensed, the protection of these sites could be dealt with as part of decommissioning or it will fall to the State of Maine Historical Preservation Office to develop some other means to protect them. Detailed site specific information from these

studies is not publicly available due to the risk of site disturbance. However, it is known that Middle and Late Archaic (ca. 3500-6000 BP) archeological sites have been found at Indian Island in Sebago, at Outlet Brook on the east side of the Basin near the narrows from Sebago to the Basin and at White's Bridge, on the eastern shore of the narrows between the Basin and Sebago Lake, and on Basin Island (Yesner et al., 1983, Landlocked Salmon). State Site # 8.10 (located approximately 900 feet upstream from the Smelt Hill Dam on the right bank) and the Walker site (located at the confluence of the Piscataqua and Presumpscot Rivers) are archeological sites that have been eroded by the high waters behind the Smelt Hill Impoundment. (US Army Corps of Engineers, 2000).

Colonial Era

Relics from the colonial era include the graves of the Thomas Wakely family in a cemetery on the eastern bank of the river near Presumpscot Falls in Falmouth. The family was killed by Indians in 1675. A 1976 reconstruction of Babb's Bridge is found on Hurricane Road in Windham. The original bridge, which was the oldest surviving covered bridge in the state, was lost to arson in 1973 (MacDonald et al, 1994).

Industrial Era

Cumberland and Oxford Canal: The Cumberland and Oxford Canal was built along the Presumpscot River in 1830. The twenty-mile canal had twenty-eight locks and ran from Sebago Lake parallel to the Presumpscot south to the Fore River. It provided transportation to the port of Portland for raw materials from as far inland as Harrison, Maine. It also provided a supply route for inland settlers and a safer means of transportation than the roads of the day. The level of Sebago Lake was raised to allow boats to enter the mouth of the Songo River in Naples. A number of Locks were needed to make the journey from sea level to Sebago Lake possible since the Presumpscot drops 267 feet from Sebago to the sea. Rendered obsolete by the railroad, the canal closed in 1872 (Knight, 1976).

Today, many remnants of the canal remain. Below the Head Dam above Eel Weir Canal, the granite structure of the Upper Guard lock (relocated from its original site) is visible, including holes for iron strap hinges identical to those found on 18th and 19th century gates still in use in England. An intact section of the canal a mile long serves as a power canal for the Eel Weir hydropower station. Below Eel Weir Dam, the remains of Middle Jam Lock include a stonework channel located on the western shore of North Gorham pond (MacDonald et al, 1994). At Middle Jam Road, which runs along the river from Route 35 to North Gorham, remnants of posts where log rafts were tied can still be seen in the water (*Portland Press Herald*, Aug. 26, 2001). The remains of Kemp and Warren Locks can be found near Babbs Bridge on the Hurricane Road in Gorham (Knight, 1976). Between Little Falls and Gambo Falls, a stretch of the canal towpath can be found. A submerged section of the towpath can also be seen at Gambo. Additional remains of the canal and/or tow path are visible above Mallison Falls, from Mallison south to near the Little River and south of the Little River to Conant Street, Westbrook (MacDonald et al, 1994).

Oriental Powder Mill: At Gambo, on the Gorham side of the river, the foundation still exists for the grindstone used by the Oriental Powder Mill in the nineteenth century. This mill, which operated from 1824 to 1905, was one of the largest producers of high quality gunpowder during the civil war. The unstable and explosive gunpowder from the mill was transported in relative safety via canal boats on the Cumberland and Oxford Canal to ships in Portland, thus avoiding the bumpy and rutted roads that existed at the time (Knight, 1976).

Riverton Trolley Park: From 1896 until 1929, Riverton Trolley Park served as a recreational mecca for Portland residents, offering a casino, a 2000 seat theater, concerts and picnic grounds [Portland Parks and recreation web page <http://www.ci.portland.me.us/troll.htm>]. Rental boats and steamers provided rides between Cumberland Mills and Presumpscot Falls. By 1994, even the stone gates to the park had been dismantled (Macdonald et al, 1994). Today, Riverton Trolley Park, located along the Presumpscot corridor, is maintained by the City of Portland Parks and Recreation Department. Since 1997, the Friends of Riverton Trolley Park have worked to keep the historical significance of the park alive through guided tours and family events.

Other Industrial Era Sites: Sites in Falmouth include sections of F.O.J. Smith's failed canal between Mile Pond and Martin's Point (the lower half has been filled in). This canal was part of a grandiose scheme to turn the Presumpscot into a major East Coast freshwater seaport in the 1860's. In addition, remains of a nineteenth century combing mill can be found above the Presumpscot Falls fishway (Smelt Hill Dam). Just below the falls, a 120-foot channel and dock carved from solid rock may be the remains of a depot or shipyard. On the western shore of the estuary are foundations and dock pilings and even some slag from the foundry of the Presumpscot Iron Company (Macdonald et al, 1994). These remains are all ghosts of the earlier industrial era on the river.

Protection of Historical Sites on the River

The Maine Historic Preservation Commission (MHPC) provides protection for significant historic and archeological sites in Maine. The recent Draft Environmental Impact Statement issued by the Federal Energy Regulatory Commission (FERC) for the relicensing of Dundee, Gambo, Little Falls, Mallison Falls and Saccarappa Dams recommends that SAPPI work, in consultation with MHPC, to develop a Historic Properties Management Plan. The plan would contain principles and procedures designed to protect all historical sites from impacts resulting from the continued operation of the dams.

Sites near the Presumpscot River on the National Register of Historic Places include:
(Based on a check of the National Park Service's National Register web site and reviewing maps.)

- Cumberland and Oxford Canal, four sections
- Cumberland Mills Historic District
- Great Falls Historic District, North Gorham
- Walker Memorial Library, Westbrook
- Warren Block, Westbrook
- Westbrook High School, Westbrook

II. Open Space and Public Access Along the Presumpscot

A. Status and Trends in Open Space

In the year 2000, only 16 percent of the area immediately along the Presumpscot River (within 250 feet) was developed, and it does not appear that major changes have occurred since that time; hence, most of the river frontage (84%) is undeveloped (see Figure 1 and Table 7). Above Westbrook approximately 14% of the land adjacent to the river is developed, while below Westbrook to the site of the former Smelt Hill Dam, about 21% of the river corridor is developed. Since the mid 1950's, open space along the river (undeveloped land with at least 500 feet of frontage) has been reduced only slightly. Only 6% of the river frontage (or roughly 3 miles) has been developed since the mid-1950's, roughly half of the development that occurred during the period from the mid 1950's to 2000 was located above Westbrook and half below. Prior to 1950 about 10% of the river frontage (or about 4.6 miles) was developed. Most of the development since 1950 occurred in the two decades between the 1950's and the 1970's. Since the 1970's only an additional 1% of the land along the river has been developed (about a half-mile).

The relatively slow pace of development along the river can be linked to the past uses. Industrial development, such as mills, and waste discharges made shoreland areas below these discharges less attractive for residential and recreational development than they would have been if the water were cleaner. Further, in the past, strong airborne odors from the Westbrook Pulp Mill impacted the desirability of downwind property as a place to live. With the elimination of pulp processing at the SAPPI mill, both water and air quality have been dramatically improved. These changes are expected to increase development pressure along the river.

Table 7. Open Space Inventory and Trends for Municipalities along the Presumpscot (1950s-2000)

City/ Town	Total Frontage (miles)	Percent Undeveloped 1950's	Miles Developed up to the 1950's	Percent Undeveloped 1970's	Miles Developed 1950's-1970's	Percent Undeveloped 2000	Miles Developed 1970's-2000
Gorham	14.4	91.8	1.18	89.8	0.29	88.8	0.14
Windham	13.6	93.9	0.83	85.9	1.09	85.2	0.10
Westbrook	9.75	75.0	2.44	65.4	0.94	62.5	0.29
Portland	3.80	100	0	96.5	0.13	96.5	0.00
Falmouth	5.30	97.8	0.12	97.5	<0.01	97.5	0.00
TOTAL	46.85	90.1	4.57	85.0	2.45	83.9	0.53

Recent Open Space Protection and Acquisition Projects in Falmouth and Portland

As evidence of the current desirability of Presumpscot River frontage, in the Fall of 2001, the City of Portland chose to purchase and protect one of the largest tracts of remaining open space along the river in Portland. This decision was reached when a developer proposed building a 67-home, riverfront subdivision in North Deering, the City's fastest growing neighborhood. The portion of the parcel to be developed included 3,000 feet of undeveloped, woodland river frontage and 65 acres of land. Negotiations between the City and the landowner stalled for a period of time due to disagreements over how much the land was worth. While the City valued the land for roughly \$1.2 million, the landowner believed that the land could command a price of \$3 to \$4 million as house lots.

The Portland Landbank Commission, Portland Trails, and the Land for Maine's Future Board worked collaboratively to negotiate a deal to make the purchase of the riverfront land affordable for the City. As a result of these negotiations, the landowner will be able to build 30 homes on 40 acres of the land, none of which is within 500 feet of the river, and the City will own 48 acres of land along the river. Neighbors and city officials envision a network of informal trails and a canoe launch for the site. The final purchase price was \$750,000 for the land, and the City agreed to spend an additional \$415,000 to improve infrastructure and to extend Hope Road to the new houses.

More cause for optimism exists with regard to preservation efforts on this section of the river. Portland Trails has recently entered into an option to buy an additional 9.5 acres of riverfront property on the Presumpscot River in Falmouth, only 1/4 mile away from the purchase discussed above. The property consists of three parcels. Two parcels on the south side of the river include almost 1,200 feet of shoreline. This will provide opportunities to link trail systems along that side of the river. The third parcel encompasses the site of the former Smelt Hill Dam and extends to the Allen Avenue Extension Bridge. It includes close to 2,200 feet of river frontage. Portland Trails will own the 9.5 acres with the Falmouth Conservation Trust holding an easement.

These two purchases together include 57.5 acres of protected land which will provide opportunities for recreation, create a buffer between the riverfront and nearby residential neighborhoods and will protect habitat for wildlife that depend on this important riparian corridor. The acquisition of these properties, now known as the **Presumpscot River Preserve**, combined with the Falmouth Conservation Trust properties as well as those of several private landowners, will place more than 80% of the riverfront between the Maine Turnpike and the Allen Avenue bridge under protection (*Portland Press Herald* article, 11-04-01).

B. Public Recreation Lands Along the Presumpscot River

Inventory of Public Recreation Lands: Lands presently available as public recreation lands along the Presumpscot River are summarized below in Table 8 and shown in Figure 3.

Table 8: Public Recreation Lands Along the Presumpscot River

<u>Town</u>	<u>Name</u>	<u>Ownership</u>	<u>Easement Holder</u>	<u>Acreage</u>
Windham				
	Dundee Park	Town of Windham		25.8
	Great Falls Boat Launch	FPL Energy	Leased by Town	2.6
	Portland Water District	Portland Water District	Leased by Town	21.7
	SD Warren	SD Warren		<u>82.1</u>
Total Acreage				132.1
Gorham				
	C&O Canal Path	Carrigan, Edward	Gorham Land Trust	0.3
	C&O Canal Path	Richardson, Harrison	Gorham Land Trust	6.0
	Gambo Powder Mill	Gorham Land Trust		3.1
	Little River	Gorham Land Trust		2.9
	Mountain Division Trail	State of Maine		6.8
	Hawkes Towpath Preserve	Gorham Land Trust		40.2
	North Gorham Pond	FPL Energy		<u>0.3</u>
Total Acreage				59.6
Westbrook				
	Public Trail & Baseball Field	City of Westbrook		3.3
	Park	City of Westbrook		1.0
	Reserve Street Playground	City of Westbrook		0.9
	Saccarappa Park	City of Westbrook		1.4
	Skating Rink	City of Westbrook		5.3
	Westbrook River Trail	City of Westbrook		57.2
	Westbrook River Walk	City of Westbrook		9.3
	Westbrook Riverbank Park	City of Westbrook		<u>12.2</u>
Total Acreage				90.5
Portland				
	Presumpscot River Preserve	City of Portland	Portland Trails	48.0
	Presumpscot River/Pride's Brid		Portland Trails	2.3
	Riverside Golf Course	City of Portland		263.5
	Riverton Trolley Park	City of Portland		<u>19.8</u>
Total Acreage				333.5
Falmouth				
	Mahoney	Mahoney	Town of Falmouth	15.1
	Pleasant Hill Graves Park	Town of Falmouth		11.1
	Presumpscot Falls Park	Town of Falmouth		5.5
	Presumpscot Falls	Portland Trails		9.5
	Walton Park	Town of Falmouth		<u>4.4</u>
Total Acreage				45.6
Falmouth Estuarine Properties				
	Audubon Society	Gililand Farm Sanctuary 2	Falmouth	6.8
	Mackworth Island	Mackworth Island		<u>8.0</u>
Total Acreage				14.8
TOTAL ALL TOWNS				676.1

Recreation Lands in the River Corridor: As Table 9 reveals, Portland, has almost 70% of the Presumpscot River corridor occurring within the City in public recreation lands. This means Portland has, among the municipalities with Presumpscot River frontage, the largest percentage of municipal river corridor area dedicated to public recreation. Further, although Portland has, in absolute terms, next to the smallest amount of river corridor land and river frontage (120.4 acres, 3.8 miles of frontage), Portland's public recreation lands account for about one-third of the existing public recreation lands within the corridor as a whole (5.2% of the total of 15.5% of corridor lands currently available for public recreation).

Table 9: Public Recreation Lands in the 250-Foot River Corridor

City/Town	River Corridor ¹		Percentage of River Corridor Acres in Recreation Lands	
	acres	miles	within the City/Town	within the whole corridor
Falmouth	231	5.3	9.9	1.4
Portland	120	3.8	69.5	5.2
Westbrook	306	9.8	15.9	3.0
Windham	458	13.6	16.7	4.7
Gorham	445	14.4	4.0	1.1
Standish	54	0.8	0	0
Corridor Total	1615	47.7	NA	15.5

¹ River Corridor means a 250 foot wide strip of land adjacent to the river
Source: Data for acres in the 250-foot river corridor from EPA Region 1 GIS Map analysis for the Casco Bay Estuary Project.

C. Public Water Access Sites Along the Presumpscot River

Public water access points to the Presumpscot are described below and shown in Figure 3. These sites provide access for boaters, anglers and swimmers (most sites provide one or two forms of access, but not all three).

1. Route 35 Bridge over the bypassed riverbed provides access for flyfishing. This section of the bypassed river is guaranteed flow from the Eel Weir Dam at Sebago Lake and is heavily stocked by IF&W with landlocked salmon, brown trout and brook trout.
2. North Gorham Park provides a public swimming area and a carry-in boat launch on North Gorham Road in Gorham. It provides access to North Gorham Pond.
3. Carry-in boat launch on the Windham Center Rd. provides parking and access to the River and Dundee Pond. This area is stocked by IF&W with trout.
4. Dundee Park is owned by the Town of Windham and is open to the public from May until Labor Day. It provides opportunities for swimming, picnicking and carry-in boat launching.
5. The canoe portage at Dundee Dam in Gorham is a trail that connects a take-out at the west end of the dam with a put-in below the tailrace. An access gate on the road to the powerhouse and dam limits access other than for canoe portage.
6. The site of the historic Oriental Powder Mill and the remains of the Cumberland Oxford Canal are owned by Gorham/Sebago Regional Land Trust and have trails as well as an informal canoe take out and launch to portage the dam. Access is currently provided by an abandoned road off Route 237 in Gorham. IF&W also stocks this area with trout.
7. The Hawkes Property in Gorham, with access off Tow Path Road in Little Falls village, is owned by the Gorham/Sebago Regional Land Trust and provides trails and access to the river with a carry-in boat launch.
8. There are two canoe portage trails at Mallison Falls Dam, one on each side of the river. On the west side near the powerhouse, the put-in site includes a small parking lot and is also used for fishing access. This area is stocked with trout by IF&W.
9. A small property located off Route 237 is owned by Gorham/Sebago Regional Land Trust and provides access to the Little River and the Presumpscot near their confluence. It provides trails and a carry-in boat launch.
10. Riverton Trolley Park is owned by the City of Portland and is the former site of an amusement park. Trails run through the park and access to the river is provided by an informal carry-in boat launch.
11. A small piece of public land just upstream of Allen Avenue Extension Bridge in Falmouth provides parking, but the area does not provide easy access to the river due to steep banks.

Additional water-access, not listed above or shown on the attached map, is being developed at the Presumpscot Falls properties recently acquired by Portland Trails and the Town of Falmouth.

D. Trails Along the Presumpscot River

Trails exist along some portions of the Presumpscot. The best known of these include the towpath of the Cumberland and Oxford Canal in Gorham and the urban riverfront walk in Westbrook. Westbrook plans to extend its trail system, and other communities are interested in doing the same. These include Portland and Falmouth with their recent Presumpscot River Preserve purchases (see boxed description of these acquisitions on Page 29 for more information on this topic).

In 1997, the State of Maine purchased a portion of the Mountain Division Rail Line which runs from Route 202 in Windham to the Maine/New Hampshire border in Fryeburg. The Maine Department of Transportation plans to develop this corridor as a “rail-with-trail.” This entails construction of a multi-use recreational trail parallel to the existing rail bed, which will also be improved to permit expansion of freight and passenger rail operations along the line. The State hopes to eventually purchase the remainder of the rail line from South Windham to Portland and create a continuous multi-use path from Portland to the White Mountains. The rail line from Gambo Road to Westbrook runs directly adjacent to the Presumpscot and could provide a significant recreational opportunities.

Figure 3. Public Recreation Lands and Public Access Points Along the Presumpscot River

Methods to Preserve Important Open Space for Municipalities and Landowners

Easements: Natural values can be protected, and public access provided, by legally binding conservation easements which give the easement holder certain legal interests in the property involved. Conservation easements are less expensive than outright purchase, and can accomplish conservation goals. An easement can be held by the state, a town, or an organization such as a land trust, and can limit development, restrict certain land use practices and/or permit public access to the land. Conservation easements should be monitored to ensure that their provisions are implemented. The cost of and the willpower to follow through with a monitoring program are important considerations in evaluating the appropriateness of easements as a mechanism to conserve land.

Acquisition: Direct purchase of land by a government agency or land trust can be an effective way to protect open space values provided adequate resources are available for management. Ownership provides a high level of control over the resource and can be accomplished creatively with local organizations sharing costs and management responsibilities with government agencies. Acquisition can be used to accomplish several aims at once, including preservation of wildlife habitat, protection of water sources, and providing public access.

Funds for acquisition can be raised from a number of different sources. Some towns maintain land acquisition funds with monies appropriated at town meetings. The State of Maine administers funds which can be tapped for land acquisition, among them: The Land and Water Conservation Fund (Maine Department of Conservation); The Maine Outdoor Heritage Fund (administered by a board consisting of private and state conservation interests); and the Land for Maine's Future program (Maine State Planning Office). The State also administers funds which can be used for trail construction through the National Recreation Trails Fund (Department of Conservation) and through Transportation Enhancements (Department of Transportation). In Maine, the state legislature has not allowed municipalities to raise funds by levying a local real estate transfer tax although this mechanism has been used by municipalities in other New England states to buy open space. Funds may also be available from private donors, foundations, and nongovernmental agencies.

Individual Landowner Agreements for Habitat Restoration or Enhancement Programs:

Voluntary programs can also be undertaken by local governments, individuals, and civic groups to improve, create, or restore wildlife habitat. These efforts can include planting shrubs, trees, and other perennials that provide food for wildlife or other efforts to improve the management and productivity of wildlife habitats. In addition, the Department of Inland Fisheries and Wildlife negotiates voluntary agreements with landowners to protect wildlife habitat. Further, habitat restoration and enhancement efforts can be required as a condition of environmental permits issued by local, state and federal agencies.

Methods to Preserve Important Open Space for Municipalities and Landowners (cont.)

Current Use Programs: In Maine, the tree growth and farmland/open space tax law programs are current use taxation programs available to individual landowners. Forest land, open space and farmland all provide habitat and food for various species of wildlife and can provide opportunities for recreation. These current use tax programs can be used as an incentive for landowners to maintain their land as open space.

Under current use taxation, land is taxed on the basis of its current income producing capacity, not on its fair market value. The goal of this type of taxation is to reduce the tax burden for landowners who keep their land in agriculture, open space, or forest uses. These uses both provide public values and require less town services than commercial or residential development. The tax abatements last as long as the low intensity use of the land is maintained. A change to development uses usually results in tax penalties.

The drawback to these programs is the reduction in local tax revenue that results, therefore, many municipal officials discourage enrollment in the tree growth or open space programs. However, studies in Maine show that conservation lands actually boost the value of adjacent property and in the long term, help stabilize the town budgets by reducing the amount of land available for residential development, a use which has been shown to increase costs and taxes.

Regulation & Zoning: Zoning ordinances are tools used to regulate land use. Town-wide zoning, Shoreland Zoning, and Floodplain Management Zoning are the three most prevalent types of zoning in the State. Maine's Mandatory Shoreland Zoning Act requires municipalities to adopt land use regulations for all areas within the shoreland zone defined to include areas within 250 feet of the normal high-water line of great ponds, rivers, and tidal waters; areas within 250 feet of the upland edge of certain non-forested freshwater and coastal wetlands; and areas within 75 feet of certain streams.

Areas within the shoreland zone may be placed in one of several districts. The most protective of these is a Resource Protection District, which essentially prohibits development. Resource Protection Districts are required in floodplains and on steep slopes. Other districts are more permissive, but outside of urban areas shoreline development is generally required to be set back at least 100 feet from the water and screened from the shore by retaining natural vegetation. Municipalities may adopt more stringent standards than the State's guidelines.

Methods to Preserve Important Open Space for Municipalities and Landowners (cont.)

The guidelines for clearing vegetation as contained in Maine’s Mandatory Shoreland Zoning Act require that:

1. No cleared openings in the forest canopy greater than 250 feet are permitted within 100 feet of great ponds (10 acres or larger), or within 75 feet of other water bodies, streams or wetlands, with the exception of a winding pathway no wider than 6 feet to provide shoreline access;
2. Selective cutting of trees and shrubs 4 inches or more in diameter is not allowed to exceed 40 percent in a 10-year period;
3. Tree pruning is limited to the lower third of the tree, to create views, and to the removal of dead branches in order to maintain healthy trees. Shrubs may be pruned to improve the view of the water, and may be thinned if less than 4 inches in diameter, but no new openings may be created; and
4. Natural vegetation and ground cover is required to be maintained within 100 feet of lakes, and cutting is required to retain a well-distributed stand of trees and other vegetation.

The State’s guidelines define a “well-distributed stand of trees and other vegetation” by a point system which requires a certain total point score be maintained in any 25-foot by 25-foot square (625 square feet) area within the buffer strip. The value for any given tree is based on tree diameters as follows:

Diameter of trees at 4 ½ feet	
<u>Above ground level</u>	<u>Points</u>
2-4 inches	1
4-12 inches	2
>12 inches	4

On areas adjacent to great ponds, and rivers and streams flowing to great ponds, a point score of 12 or more must be maintained. Adjacent to other water bodies, a score of 8 or more is the minimum (Maine DEP, n.d.).

III. Existing Open Space Protection

A. Shoreland and Open Space Zoning Along the Presumpscot River

1. Resource Protection Districts

Resource Protection Districts include such areas as floodplains and steep slopes, and, in general, prohibit or severely restrict development. Table 10 and Figure 4 show the extent of Resource Protection zoning along the Presumpscot River. The depth of Resource Protection Districts varies between the towns. In towns where floodplain zones are incorporated into the shoreland Resource Protection District, the depth can exceed the 250-foot standard shoreland zone in some places, and can be less than 100 feet in other areas. Hence even though Table 10 shows extensive areas in the Resource Protection Districts, a number of these areas are 100 feet in width or less, and could be developed beyond the 100-foot Resource Protection zone. A Limited Residential zone has a 100-foot setback for development; hence a 100-foot Resource Protection zone provides little more protection from development than a Limited Residential zone.

For example in the town of Gorham, the Resource Protection District follows the 100-year floodway quite closely. Areas that widen to more than 100 feet include stretches below the Dundee, Gambo, and Mallison Falls Dams; as well as areas near the confluence of tributary rivers and streams. Many other areas in Gorham are covered by narrow Resource Protection Districts with depths of less than 100 feet.

Table 10: Percent of Presumpscot River Frontage in Resource Protection Districts

Municipality	Total Frontage (miles)	River Frontage in RPZ (miles) ¹	Percent of River Frontage in RPZ
Gorham	14.4	8.71	60.5
Windham	13.6	5.49	40.4
Westbrook	9.75	7.01	71.9
Portland	3.80	1.52 ²	40.0
Falmouth	5.30	4.54	85.7

¹ This does not necessarily imply that riverfront parcels may not be developed, as when the Resource Protection zone is 100 feet wide or less, and development is allowed beyond 100 feet, it is the equivalent of a Limited Residential zone.

² Portland has also zoned 1.8 miles of river frontage as Recreational Open Space, which protects lands from use other than open space and recreation; hence Portland has protected 3.3 miles or 87% of its river frontage as open space (see discussion below).

2. Open Space/Recreation Districts

Open space/recreation districts are a tool used by the City of Portland to zone public recreation lands. These districts exclude future development not related to recreation and open space. This district exists along the Presumpscot River from Route 302 (the bridge at Riverton) to the city line at the I-95 bridge, and includes two city-owned parks, the Riverton Trolley Park and the municipal golf course. These two parcels include about 1.8 miles of river frontage that are protected from development unrelated to recreation. When considered in conjunction with the river frontage in Resource Protection Districts, Portland has protected approximately 3.3 miles of its 3.8 miles of river frontage, or 87% of the Presumpscot River frontage within the City.

3. Limited Residential/Recreational Districts

Limited residential/recreation districts provide for moderate density residential development and include areas that are either already developed in this pattern or are judged to be suitable for such use. Limited residential/recreational districts are found along the Presumpscot River at the following locations: Sebago Lake Basin (this is actually the first impoundment on the Presumpscot River); along the Eel Weir Bypass (the original riverbed below Sebago Lake Dam) on the Standish side of the river; all of North Gorham Pond; parts of Dundee Pond; along the Rousseau Road in Windham near the Saccarappa impoundment; and segments of the river in Westbrook above the Saccarappa Dam.

4. General Development Districts

General development districts include areas such as downtowns and allow for denser development. General development districts along the Presumpscot River are found in: South Windham; and Little Falls (Gorham), and Westbrook.

B. Flood Plain Protection

Federal law requires that local governments establish flood plain protection ordinances in order for the residents of those communities to qualify for federal flood insurance. Flood plain protection ordinances provide that first floor elevations must be above the 100-year frequency flood and that flood flows not be restricted by development in what are called velocity zones. The towns of Windham, Gorham, Westbrook, Falmouth, and Portland have all complied with the Federal Emergency Management Agency's (FEMA) requirements for flood plain protection ordinances.

Significant flood damaged occurred along the Presumpscot River from storms on August 19, 1991 (Hurricane Bob), October 22-23, 1996 (the Great Flood of 1996), as well as one spring flood in the late 1980s and another storm event in the 1990s.

Areas hardest hit by floods have included: areas near the Rousseau Road (Windham); areas along Colley Wright Brook at River Road crossing (Windham); areas near Water Street above

Saccarappa Dam (Westbrook); areas near the Route 302 crossing (Portland); the Riverside Golf Course below the Riverton Bridge (Portland); and areas near Cumberland Mills (Westbrook).

The flood of record (250 year frequency) occurred on October 21-22, 1996, when damages amounted to more than \$5 million in damages to public property and more than \$50 million in damages to private property.

Presently, floodplain mapping in Windham, Gorham, and Westbrook is being updated by the U.S. Geological Service to extend the area protected as floodplain due to the severity of the October 1996 event (Louis Sidel, Maine State Planning Office, pers. comm.). This update will extend the protected areas further back from the river.

Figure 4. Resource Protection Zones Along the Presumpscot River

C. Protection of Open Space Through Enrollment in Current Use Tax Programs, Public Ownership, or Easements

A number of areas along the Presumpscot River are protected through public ownership or conservation easements. These include the areas previously listed in Table 8 -- Public Recreation Lands Along the Presumpscot River; and other lands that are in public or quasi-public ownership, but not necessarily dedicated to open space or recreation; and lands dedicated to open space, but not necessarily available for public recreational use.

This report classifies open space lands into three categories of “protection:”

Lands Taxed on the Basis of Current Use: This category includes lands that are enrolled in the Tree Growth or Farmland and Open Space tax reduction programs. As described earlier, these programs provide reduced property taxes as long as the property remains undeveloped and used for tree growth, farm, or open space uses. Development can occur on these lands but payment of a tax penalty is required.

Table 11. Maine Tree Growth & Maine Farmland Open Space Parcels

City/Town	Map/lot#	Acreage	Frontage	Classification
Windham	8-5 C	39	1,700 feet	Maine Open Space
Windham	8-3	44.5	1,200 feet	Maine Tree Growth (38.6 acres)
Windham	5-4	36	1,700 feet	Maine Tree Growth

Because this form of protection can be changed easily, these lands are not included on the maps of protected lands or considered protected in the analysis which follows.

Lands With Limited Protection: These lands include lands in public or quasi-public ownership that do not have easements or deed restrictions that protect the land from development. Lands that are in public ownership are not guaranteed to stay as open space in the future, unless there is a conservation easement protecting the property from development. Even public lands that are currently dedicated to open space or recreation and zoned for open space could be subject to changes in municipal objectives; for example, a golf course could be expanded to include a new riverfront clubhouse, or be converted to an attractive riverside office park or residential development. In some cases this would require changing the zoning (e.g., a nonrecreational use in a recreational open space district), and in other cases it would not (e.g., the new clubhouse on the golf course).

Land With Permanent Protection: Only lands that have legal restrictions for future development through permanent conservation easements, or ownership by a land trust or land conservation organization, are considered to be truly protected open space.

Tables 12 and 13, and Figure 5 show the parcels along the Presumpscot River that are classified as Permanently Protected or Lands With Limited Protection. Table 14 shows the

distribution of protected lands by municipality. The area analyzed is the river corridor within 250 feet of the river.

Table 12: Open Space Lands with Limited Protection

<u>Town</u>	<u>Name</u>	<u>Ownership</u>	<u>Easement Holder</u>	<u>Acreege</u>	
Falmouth	Falmouth Wastewater Facility	Falmouth Wastewater Facility		1.5	
	Martin's Point Park	Martin's Point Park		0.8	
	MDOT	MDOT		2.3	
	Plummer-Motz/Lunt School	Plummer-Motz/Lunt School		2.1	
	Portland Water District	Portland Water District		4.4	
	Reich Property	Reich Howard		11.2	
	State of Maine	State of Maine		15.2	
	Walton Park	Town of Falmouth		4.4	
	Presumpscot Falls Park	Town of Falmouth		5.5	
	Pleasant Hill Graves Park	Town of Falmouth		<u>11.1</u>	
				Total Acreege	58.4
	Gorham	North Gorham Pond	FPL Energy		0.3
Mountain Division Trail		State of Maine		<u>6.8</u>	
				Total Acreege	7.1
Portland	Riverside Golf Course	City of Portland		263.5	
	Riverton Trolley Park	City of Portland		<u>19.8</u>	
				Total Acreege	283.2
Westbrook	Public Trail and Baseball Field	City of Westbrook		3.3	
	None	City of Westbrook		9.6	
	Park	City of Westbrook		1.0	
	Police and Rescue Department	City of Westbrook		1.5	
	Reserve Street Playground	City of Westbrook		0.9	
	Saccarappa Park	City of Westbrook		1.4	
	Skating Rink	City of Westbrook		5.3	
	Westbrook River Trail	City of Westbrook		57.2	
	Westbrook River Walk	City of Westbrook		9.3	
	Westbrook Riverbank Park	City of Westbrook		12.2	
	Westbrook Sewerage District	City of Westbrook		<u>11.8</u>	
			Total Acreege	113.4	
Windham	Great Fall Boat Launch	FPL Energy	Leased by Town	2.6	
	Grace Butham Foundation	Lawrence Ceady		37.6	
	Portland Water District	Portland Water District	Leased by Town	97.5	
	SD Warren	SD Warren		82.1	
	State Maine Correction Prison	State of Maine		127.7	
	Dundee Park	Town of Windham		<u>25.8</u>	
				Total Acreege	373.3
TOTAL LIMITED PROTECTION				835.4	

Table 13: Open Space Lands with Permanent Protection

<u>Town</u>	<u>Name</u>	<u>Ownership</u>	<u>Easement Holder</u>	<u>Acreage</u>
Falmouth	Audubon Society	Gilsland Farm Sanctuary	Falmouth Conservation Trust	6.8
	Presumpscot River Place	Home Owners Association	Falmouth Conservation Trust	9.5
	Mackworth Island	Mackworth Island		8.0
	Mahoney	Mahoney	Falmouth Conservation Trust	<u>15.1</u>
			Total Acreage	39.4
Gorham	C&O Canal Path	Carrignan, Edward	Gorham Land Trust	0.3
	Gambo Powder Mill	Gorham Land Trust		3.1
	Hawkes Towpath Preserve	Gorham Land Trust		40.2
	Little River	Gorham Land Trust		2.9
	C&O Canal Path	Richardson, Harrison	Gorham Land Trust	<u>6.0</u>
			Total Acreage	52.5
Portland	Presumpscot River Preserve	City of Portland	Portland Trails	40.7
	Presumpscot River/Pride's Brid		Portland Trails	<u>2.3</u>
			Total Acreage	43.0
TOTAL PERMANENT PROTECTION				135.0

Table 14: Protected Open Space in the 250-Foot River Corridor

City/Town	River Corridor¹		Percentage of River Corridor Acres			
			Limited Protection		Permanent Protection	
	Acres	Miles	City/Town	Corridor	City/Town	Corridor
Falmouth	231	5.3	16.5	2.4	4.9	0.7
Portland	120	3.8	55.1	4.1	14.4	1.1
Westbrook	306	9.8	18.7	3.5	0.0	0.0
Windham	458	13.6	22.3	6.4	0.0	0.0
Gorham	445	14.4	0.3	<0.1	3.7	1.0
Standish	54	0.8	0.0	0.0	0.0	0.0
Total Corridor	1615	47.7	NA	16.4	NA	2.8

¹ River Corridor means a 250 foot wide strip of land adjacent to the river .

Source: Data for acres in the 250-foot river corridor from EPA Region 1 GIS Map analysis for the Casco Bay Estuary Project.

Figure 5. Open Space Protected by Ownership or Easement

IV. Challenges and Opportunities

A. Description of Challenges

Growing Development Pressures: In the past, development along the Presumpscot River below Westbrook has been discouraged by the negative effects of the SAPPI pulp mill and the availability of more attractive waterfront property elsewhere in the region. Today, the mill's pulp operations have been eliminated, and so has the pulping operation's air and water pollution. These constituted most of the mill's effluent emissions. Partly as a result of this change, and partly due to an increasing scarcity of waterfront property in the area, the potential for development along the Presumpscot has never been higher.

Most Open Space and Recreation Lands are Not Currently Protected: Presently the amount of open space that is protected along the Presumpscot River is quite limited. Table 7 shows that while almost 84% of the river corridor is undeveloped, less than 20% of the river corridor is protected from development (Table 14).

Figure 6 shows areas of unprotected open space along the Presumpscot River that are vulnerable to development. These are: a) areas which lie outside Resource Protection Districts established by shoreland zoning; b) areas not protected by government ownership or by easements; and c) areas relatively suitable for development because they lie within 2,500 feet (roughly a half-mile) of an existing road and greater than 200 feet from a power line or railroad. The figure shows that there are substantial areas along the river, mostly above Westbrook, that are presently undeveloped but which are vulnerable to development. Resource Protection Districts offer some protection, but often the districts do not extend as far as the minimum setback for development; hence these riverfront lots are not really protected from development even by zoning; and of course zoning can be changed even if it is currently protective.

Figure 6. Open Space Vulnerable to Development

B. Description of Opportunities

The Extensive Undeveloped Areas Along the Presumpscot Present a Rare Opportunity: Because most of the shoreline along the Presumpscot River remains in open space, there are extensive opportunities to protect the area's open space values, to improve public access, to provide trails either to or along the river and to provide a variety of other recreation facilities and opportunities. Figure 6, viewed as an opportunity, provides a picture of the lands still available for open space protection. Given the extent of the area; its recreational, natural, and cultural values; and its location close to a major population center, the potential for protecting open space along the Presumpscot truly represents an opportunity of rare proportions.

Defining Priorities for Protection: Deciding which of the many potentially worthy areas should be a priority for protection necessarily depends on the objectives of the protection effort. As this report has discussed, there are many values worthy of considering in open space protection. These include fish and wildlife habitat values; scenic and recreational values; ecological and scientific values, including protection of rare plants and plant communities; prime agricultural soils; and historic or archaeological values.

While a comprehensive analysis covering all these values was beyond the scope of this study, it was possible, with available information, to identify areas that should be considered a priority for protection due to the high value of their natural resources and lack of current protections. Using natural resources information from state and federal resource agencies, and land use protection information gathered as part of this project, a preliminary analysis of this issue was conducted by the U.S. Environmental Protection Agency Region 1, utilizing their Geographical Information System (GIS). This analysis overlaid map coverage of areas along the river with high natural resource values (Figure 2), defined as areas that are prime farmlands or have especially high values as wildlife habitat (including wetlands, deer yards, habitat of rare animal species and high value habitat for the U.S. Fish and Wildlife Priority Trust Species), with the map coverage showing areas that are unprotected and vulnerable to development (Figure 6). The results, which show high value resource areas that have no current protection, are shown in Figure 7.

It is somewhat reassuring to find that, based on this analysis, there are relatively few areas that contain high value natural resources that are without at least some protection. Many of the high value natural resources are presently protected either through zoning in Resource Protection Districts, or through current public or conservation ownership or easements.

It is important to recognize however that this analysis did not include areas which may have high value for recreational activities, as historic or archeological sites, or for aesthetic resources. Therefore, it is not comprehensive. Further, the analysis which was conducted is based on data gathered largely from air photo interpretation (e.g., mapping of wetlands and areas which are high value for U.S. Fish & Wildlife Service Trust Species). It would therefore be desirable to refine even the analysis of existing values based on site specific field information. These ideas are included in the Recommendations which follow in Sections V and VI.

The results of the preliminary analysis reflected herein are nonetheless instructive and provide a useful starting point for open space protection efforts in the short term. Examining the areas

identified as high value and vulnerable in Figure 7, a number of general areas can be identified as having a cluster of priority high value natural resources. These include:

1. The backland behind the Resource Protection District along the shoreline of Dundee Pond on the east (Windham) side, from south of Dundee Park to roughly 500 feet north of Dundee Dam.
2. The Windham side of Dundee Falls below the Dundee Dam (about one half mile stretch of the river with rapids and a series of islands).
3. An area below the Mallison Falls Power Station access point in Gorham, roughly 500 feet in length, extending back beyond the 250-foot corridor area.
4. The area near the confluence of the Little River and Presumpscot River in Gorham.
5. An area in Gorham from just north of the power line near Mosher Brook to the Westbrook town line.
6. An area in Westbrook, from just below the railroad near the Windham/Gorham town lines, to the Golf Course, about three quarters of a mile downriver.

These clusters are more evident when viewed at a larger scale, therefore readers who are interested in this analysis are encouraged to view the maps online at <http://www.cascobay.usm.maine.edu/>.

Table 15 summarizes all parcels identified as including high value natural resources that currently lack protections. It is apparent from Table 15 that many individual, and sometimes small, parcels are involved, and that a minimum size criteria may be needed to focus efforts on the largest, and hence most significant, open space opportunities. Table 15 shows that 70% of the acreage of high value/unprotected natural resources is in 30 parcels that contain over 0.5 acres of high value natural resources. Further analysis of the location of these larger units, , should be undertaken in any effort to narrow down to the highest priority areas for protection actions.

Table 15: Priorities for Protecting High Value Natural Resources

	All Parcels with Priority High Value Natural Resources		Parcels with at least 0.5 acres of Priority High Value Natural Resources	
	# Parcels	Total # Acres	# Parcels	Total # Acres
Gorham	31	19	9	13.7
Windham	37	15.9	8	10.2
Westbrook	33	11.3	6	9.7
Portland	12	3.5	2	1.6
Falmouth	25	4.0	5	2.7
TOTAL	138	53.7	30	37.9

Securing Permanent Protection on Limited Protection Lands: In addition to defining priority natural resource protection areas, this report also shows that there is an opportunity to enhance the level of protection that exists on a number of parcels along the river which already have some degree of protection. Lands shown in Figure 5 and listed in Table 12 as Limited Protection Lands are those held in public ownership but lack deed restrictions to ensure their continued status as open space lands. For a minimal cost, an easement could be donated for these lands to accomplish permanent protection. The same idea could be extended to the lands enrolled in current use tax programs since these landowners have already demonstrated an interest in maintaining open space.

Figure 7. Priorities for Open Space Protection Based on Natural Resource Values

V. Recommendations and Strategies for Protecting and Enhancing Open Space Along the Presumpscot River

The following opportunities for protecting and enhancing open space and recreational activities along the Presumpscot River were identified by the Steering Committee for this planning effort.

- A. Create a Presumpscot River Council;
- B. Develop a water trail the full length of the river;
- C. Develop a land trail the length of the river;
- D. Create new public access points to the river, where they are needed and appropriate;
- E. Conserve open space parcels with a focus on high value areas;
- F. Renovate portions of the Cumberland and Oxford Canal as historic/recreational resources;
- G. Assist with improvements to Riverton Trolley Park; and
- H. Educate landowners and other watershed residents about the benefits of conserving and enhancing riparian lands along the Presumpscot River and its tributaries.
- I. Conduct a field survey of the river and its shoreline to identify areas with high public values
- J. Refine the analysis of areas of high priority for protection by integrating the results of the field survey with the GIS analysis, and identifying large parcels with significant public values.
- K. Encourage permanent open space protection of publicly owned lands through deed restrictions or conservation easements.
- L. Encourage voluntary permanent protection as open space for lands enrolled in current use tax programs.
- M. Encourage current use taxation for open space along the river.
- N. Encourage expansion of local Resource Protection Districts to include the entire floodplain as it is being remapped by the U.S. Geological Survey.
- O. Identify a central repository for GIS Information on the Presumpscot River and its shorelands.

Strategies for implementing these opportunities are presented in the following pages.

A. Create a Presumpscot River Council

NEED: A Presumpscot River Council is needed to facilitate and guide implementation of the Plan developed for the future of the River. The Council would provide the framework and the resources needed for an organized effort to secure funding and to coordinate resources needed to implement the recommendations contained in this white paper, as well as recommendations related to fisheries issues and cumulative impacts. It would also serve to provide an ongoing mechanism and capability for addressing issues arising in the future that may affect the River. Without a Council, the possibilities for the future of the River as envisioned by this Plan will be greatly diminished.

HOW: The Casco Bay Estuary Project should convene a task force, including members of the Presumpscot River Management Plan Steering Committee, to consider options for how the Council might be structured and organized, and to take whatever steps are needed to establish the Council. The Androscoggin Watershed Council provides a successful model for watershed councils in Maine. Council members should include governmental units with responsibilities related to management of the Presumpscot and its shorelands, such as municipal governments, state and federal fisheries management agencies, Maine DEP, and the Portland Water District; as well as a cross-section of interests related to the river, including businesses, property owners, and various non-governmental organizations (NGOs) such as the Friends of the Presumpscot, Presumpscot River Watch, Portland Trails, Maine Audubon Society, various local land trusts, and others.

WHEN: Within 1 year of completion of Plan.

WHO: Presumpscot River Management Plan Steering Committee and CBEP

COST: \$10,000/year to hire a part-time director and purchase supplies

POTENTIAL FUNDING SOURCES:

American Rivers,
River Network,
Davis Foundation.

B. Develop a Water Trail the Full Length of the River

NEED: Portions of the Presumpscot River have been attractive to paddle for some time; however, with improved water quality in the lower river and the removal of the Smelt Hill Dam, there is growing interest in paddling the river, as well as paddling longer sections of the river. There is a growing movement of people creating water trails around the nation, as evidenced by strong attendance at the national conference of North American Water Trails, Inc. in South Portland in September 2001. Creation of a water trail would require that access points be appropriately spaced and carries around dams or rapids be user-friendly. According to guidebooks and those who know the river, many of the current carries are difficult to use and access is difficult for some stretches of the river.

HOW: State agencies, local governments, and non-government organizations should look for opportunities to acquire land for access to the river, as well as carries around dams and rapids where needed. The same groups should seek funding to engineer and build carries that are safe and suitable for boaters including, to the extent possible, those with physical disabilities.

WHO: SAPPI as part of relicensing, local government, land trusts, and trail organizations.

COST: Land acquisition costs could range from very little in the case of a donation to market value, if land must be bought. Trail costs will vary depending on the site involved and the segments of the public to be served.

POTENTIAL FUNDING SOURCES:

Land for Maine's Future Program,
Land and Water Conservation Fund,
Foundations and private individual or business donors,
National Recreation Trail Fund.

C. Develop a Land Trail the Length of the River

NEED: Walking is America's most popular form of outdoor recreation, enjoyed by an estimated 84.3 percent of the population age 16 and older according to the 1999-2000 National Survey on Recreation and the Environment. Trails provide an opportunity for regular, moderate physical activity, recommended by the US Surgeon General to prevent chronic disease related to inactivity. Trails can provide access to pleasant outdoor settings, transportation (depending on location), and access to other forms of recreation along the river including fishing. The Cumberland County Regional Trails Plan, completed in 1997 by the Greater Portland Council of Governments, calls for creation of a trail following the route of the historic Cumberland and Oxford Canal from route 202 in Gorham to Sebago Lake.

HOW: Local governments, trail organizations, and land trusts should work with willing landowners to gain access rights to develop trails. These groups could acquire easements or the fee interest in land through a variety of methods ranging from donation by the landowner to purchase for full market value. Trail segments should be constructed to standards and for uses appropriate to the setting, should be consistent with the wishes of the landowner, and in keeping with the goals of local groups. Parking and rest room facilities should be provided at appropriate intervals. While the goal is to complete a trail the full length of the corridor, this may not be possible, due to landowner's attitudes and development patterns; if so segments of trail along the river may still be worth developing.

WHO: Local government, trail organizations, and land trusts

COST: Cost for acquiring interest in land may vary from very little in the case of donations to full market value. Trail construction costs vary greatly depending on the type of trail being developed and the terrain it is crossing.

POTENTIAL FUNDING SOURCES:

Land for Maine's Future Program,
Land and Water Conservation Fund,
Foundations and private individual or business donors
National Recreation Trails Fund,
TEA-21 Enhancement funds,
Maine Outdoor Heritage Fund.

D. Create New Public Access Points to the River, Where They Are Needed and Appropriate

NEED: As the river has been cleaned up, and with the removal of the Smelt Hill Dam, interest in recreational use of the Presumpscot is growing. According to municipal officials and representatives of nonprofit organizations, there is increased interest in boating, fishing, and walking along the river. While public access generally exists near road and the dams, water access is limited for substantial portions of the rest of the river. In other cases, particularly with dam portages, access is legally available but difficult or unsafe.

HOW: After conducting an analysis of where additional access is needed and appropriate, acquire property or property rights for public access from landowners willing to donate or sell property or an easement. With land available, each community would need to decide how to use the site: What types of trails, how to reach the water, whether to include a boat launch, and where to put parking and other facilities such as picnic tables and outhouses.

WHO: Land trusts, trail groups, local government, fishing groups.

COST: Varies widely depending on the property involved, the property interest needed, and the type of facilities to be created.

POTENTIAL FUNDING SOURCES:

Land For Maine's Future Program,
Land and Water Conservation Fund,
Foundations and private donors
National Recreation Trails Fund,
TEA-21 Enhancement funds,
Maine Outdoor Heritage Fund.

E. Conserve Open Space Parcels With a Focus on High Value Areas.

NEED: Conservation of open space has a variety of important public and ecological benefits. As noted in the text, riverine open space offers important, or in some cases, unique habitat for some animals and plants; maintaining riparian areas along the Presumpscot River and its tributaries in forest cover is extremely important to maintaining water quality in the tributaries and the main stem of the Presumpscot River; and riverine open space is important for a variety of recreational activities. Even without access, conserved land can provide an attractive scenic backdrop for river uses.

HOW: Work with willing landowners to conserve open space through obtaining conservation easements or land in fee, through techniques ranging from donations to purchase at full market value.

WHO: Local municipalities and land trusts.

COST: Varies from very little in the case of donations to full market value for land.

POTENTIAL FUNDING SOURCES:

Land for Maine's Future Program,
Land and Water Conservation Fund,
Foundations and private business or individual donors

F. Renovate Portions of the Cumberland and Oxford Canal as Historic/Recreational Resources

NEED: The C&O Canal represents both a pathway convenient to the Presumpscot River and a historic site commemorating Maine's labor, economic and social history. In many parts of the nation, local, county and state governments have worked with civic groups on canal restoration projects. Redeveloped canals have helped regions cope with the impact of urban sprawl by setting aside wild areas while at the same time reminding present and future generations of the challenges and inventiveness of past eras. Examples include the Chesapeake and Ohio Canal National Park (<http://www.nps.gov/choh/>), the Illinois and Michigan Canal Corridor (<http://www.canalcor.org/>), and the Delaware Canal (<http://www.canals.org/hmpark.htm>). Canal park projects range from simple towpath repair to fully watered and working portions replete with canoe rental and canalboat rides. An array of midrange options is also available.

Like other canals in the Canal Era of the early Industrial Revolution, the C&O Canal was *far more* than “just a ditch”. Clever ingenuity with early technology enabled engineers and craftsmen to run canal boats uphill via locks and a variety of tramways. In some areas, laborers tunneled through mountains and could overcome a river barrier with an aqueduct—an ironic water bridge over a water body. The Cumberland and Oxford Canal employed many of these features. The Canal remains a landmark of national importance for its use of unique drop-keel sailboats instead of the usual tow-only barges, and for the presence of the Oriental Powder Company, which supplied much of the Union Army's gunpowder during the Civil War.

HOW: Interested parties should first identify the most promising canal areas for historical renovation. These could include the Oriental Powder Company area adjacent to the old Gambo Road, the segment north of Towpath Road in Gorham, the Little River Aqueduct abutments, portions of the canal near the covered bridge on Hurricane Road, and as much of the area between Little Falls and the Gambo Road as possible.

The next task would be to determine the desired type of renovation for each portion. Canal renovation involves historical signage and exhibits and generally takes one of the following forms:

- Renovation of towpath as a walking/bicycling trail
- Renovation of canal and towpath to allow a stream to run through the old canalbed, creating a scene reminiscent of canal days
- Renovation of canal and towpath to fully watered state to allow canoeing and fishing
- Full restoration of canal with working locks and canalboat rides

WHO: Regional land trusts, which own or have access to several portions of the canal; local landowners; citizen groups; historical societies; local governments

WHEN: As soon as possible to stabilize the portions of the canal that still exist and prevent further deterioration of physical structures.

COST: Costs vary but can be minimized by volunteer labor, equipment loaned by local businesses, and by the ability to choose the degree of restoration desired. Detailed cost estimates are available in '*C&O Canal Restoration Research Notes and Costs*'. A few general estimates:

- Volunteer labor with some loaned equipment renovated and rewatered several miles of the Illinois and Michigan Canal for about \$2,500 per quarter-mile. (The stream-only—versus fully watered option—would cost even less.)
- Signage ranges from \$750 for a simple marker to \$3,200 for larger Cor-Ten™ steel interpretative signs to \$7,500 for Cor-Ten™ silhouettes of mules and mule drivers. Donated or volunteer-crafted wooden signs can be significantly lower-cost.

POTENTIAL FUNDING SOURCES:

The most important funding source in many canal restoration projects has been volunteer labor and equipment donated or loaned by local firms. TEA-21/TEA3 funding as well as other government and charitable funding can also be of great assistance.

G. Assist with Improvements to Riverton Trolley Park

NEED: The Riverton Trolley Park is a historic site which was once a center for recreation on the Presumpscot in Portland. It continues to provide open space, but is in need of improvements to realize its full value for recreation. Parking is now available off Forest Avenue opposite the entrance to the Park, with access under the Riverton Bridge and through a washed out area. There are currently no permanent markers to educate visitors about the area's history.

HOW: With funding, trails could be improved and some of the historic features of the Park, such as the entrance gate, could be restored. Permanent, high-quality interpretive panels could bring the history of the site alive in an unobtrusive way.

WHO: Friends of Riverton Trolley Park, Portland Trails

COST: Cost figures are unavailable for site improvements. Interpretive panels and mounting, \$20,000.

POTENTIAL FUNDING SOURCES:

National Recreation Trails Fund,
TEA-21 Enhancements,
Private foundations.

H. Educate Landowners and Other Watershed Residents About the Benefits of Conserving and Enhancing Riparian Lands Along the Presumpscot River and its Tributaries

NEED: Riparian lands along the Presumpscot and its tributaries provide a number of important public and ecological benefits. The benefits of riparian lands (sometimes referred to as riparian buffers) can include serving as:

1. A community recreational asset where public access is provided for walking, biking, cross-country skiing, and paddling.
2. A floodwater control mechanism.
3. A source of organic debris which provides food needed for a diverse assemblage of aquatic plants and animals; a canopy which shades and cools surface waters; and a source of large woody debris which increase aquatic habitat diversity by providing cover for fish, creating pools (by deflecting flows), and providing attachment sites for aquatic insects (a source of food for fish).
4. Important, and in some cases unique, wildlife habitats including but not limited to a corridor for the movement of birds, furbearers, and mammals.
5. Important habitats for shoreline and wetland plants and plant communities, some of which are rare or have special habitat value for wildlife.
6. An effective mechanism to minimize nonpoint source pollution by limiting erosion and infiltrating polluted runoff containing such contaminants as oil, fertilizers, and pesticides into the soil and decontaminating them. This not only reduces contamination of the river, but also reduces contamination in the downstream clam flats of the Presumpscot River Estuary.

While municipal shoreland zoning and state timber harvesting regulations do provide some protection of these benefits along much of the Presumpscot River and its tributaries, there still are some important aspects which are not addressed by these regulations. (Note: Streams smaller than second-order do not even receive protection under current state shoreland regulations.) Some of these remaining aspects may be addressed by education of riverfront landowners and other citizens in the watersheds. First of all, an increased public awareness about the important benefits of healthy riparian lands should result in increased public support for protection of these lands. Increased awareness also should encourage improved stewardship of these lands. (People might be less likely to commit acts which degrade riparian land health, landowners might return previously cleared riparian areas to forested conditions, degraded riparian areas might be identified and restored, etc.) Additionally, some landowners might decide to go beyond current shoreland cutting regulations and allow some riparian lands to remain uncut in the future. This practice, which has been recognized as beneficial by scientists and natural resource managers, would benefit aquatic habitats by allowing trees to mature, die, and fall into river and stream

channels, thereby providing more habitat structures for fish and other aquatic life than currently exists.

HOW: Collaborative efforts among governmental agencies and conservation organizations to educate riparian landowners and other watershed citizens about the benefits of proper management of riparian lands and steps that could be taken to preserve those benefits. Efforts might include the distribution of educational materials, Stream Habitat Walks (stream surveys conducted by citizens under the guidance of the Maine Stream Team Program), demonstration projects focusing on riparian zone restoration, and articles in local newspapers and newsletters.

WHO: Maine Stream Team Program (Maine DEP), Presumpscot River Watch, Friends of the Presumpscot River, Cumberland County Soil and Water Conservation District, Natural Resources Conservation Service, local governments, and land trusts.

COST: Costs for such efforts vary depending on the level of effort undertaken, but likely would be in the range of \$1,000-\$10,000 per specific undertaking. Volunteer time would be required for many of the efforts mentioned. Donations (ex. Riparian buffer planting supplies, etc.) would help make efforts even more successful.

POTENTIAL FUNDING RESOURCES:

USEPA 319 Grants (administered through Maine DEP),
Land for Maine's Future Program,
Land and Water Conservation Fund,
Maine Outdoor Heritage Fund,
Maine Stream Team Program Mini-Grants,
Trout Unlimited Embrace-A-Stream,
Donations from local businesses, etc.

I. Conduct a Field Survey of the River and its Shoreline to Identify Areas With High Public Values of All Types

NEED: The analyses included in this report of high value resources and areas with unprotected high value resources were developed based upon existing information, most of which was derived from aerial photography. For example, the National Wetland Inventory maps and maps of high value habitat for U.S. Fish & Wildlife Service trust species were derived largely from interpretation of aerial photos. This approach was necessary for such large scale data collection efforts; however, field survey data would greatly enhance the reliability of this information. Furthermore, the information analyzed to date has been for a select set of natural resource values, rather than the full spectrum of resources with importance to the public. Therefore, a field survey is needed to identify areas of the river and its shorelines with high public values of all types. These include:

- Areas important for rare, threatened or endangered species of both plants and animals;
- Significant wildlife habitats, which include but are not limited to the above;
- Wildlife viewing areas which in many cases overlook, but may not be located in, significant wildlife habitats;
- Significant botanical resources, which include but are not limited to occurrences of rare, threatened or endangered species;
- Scenic areas;
- Recreational resources, including recreational access points, fishing areas, opportunities for trails, and others;
- Cultural resources;
- Educational resources (e.g., areas which allow study of geological features or biological systems); and
- Other areas with high public values.

HOW: Coordinate a field inventory of the resources of the Presumpscot River. To reduce costs, the use of qualified volunteers should be considered.

WHEN: Within three years of the completion of the Plan.

WHO: Presumpscot River Management Plan Steering Committee and the Casco Bay Estuary Project.

COST: Depending upon how much volunteer assistance can be secured, the cost for this effort could range from the vicinity of \$10,000 (strictly planning and coordination of the effort), to as much as \$50,000 (if experts were hired to conduct the work).

POTENTIAL FUNDING SOURCES:

Casco Bay Estuary Project Funding
Foundations

J. Refine the Analysis of Areas of High Priority for Protection

NEED: The current analysis of high value resources that are unprotected is limited to a few select types of natural resources for which information was available. This analysis does not, however, include the full spectrum of areas that have important public values. Further, as pointed out in the previous recommendation for a field study, the information relied upon is based largely on interpretation of aerial photos and does not reflect on-the-ground field surveys. There is therefore a need to expand and refine the existing “Priorities for Protection” analysis.

HOW: Once the information called for in Recommendation I above is collected, the results should be integrated with the GIS analysis. Further, there should be an analysis to identify where additional public access to the river is needed and appropriate in light of other resource values and conditions; and where there are large parcels with high public value resources. The results of these various analyses should then be synthesized to identify areas of high priority for protection or acquisition.

WHEN: Within four years of completion of the Plan.

WHO: This analysis could be conducted by a single entity, such as the Greater Portland Council of Governments, a land trust organization, or the University of Southern Maine as a graduate research project; or the work could be accomplished incrementally, e.g. individual municipalities or local land trusts could undertake this analysis for a portion of the River.

COST: \$5,000.

POTENTIAL FUNDING SOURCES:

Casco Bay Estuary Project Funding
Foundations

K. Encourage Permanent Open Space Protection of Publicly Owned Lands

NEED: A number of areas along the Presumpscot are already publicly owned but nonetheless could still be developed. These areas should be permanently dedicated to open space to ensure their continued value in these regards. This could be accomplished most effectively through the donation of no-development easements to a land trust, or less certainly through designation of these areas by local governments for open space purposes, or other mechanisms.

HOW: Members of the Presumpscot River Management Plan Steering Committee with a strong interest in open space (for example, Portland Trails), or land trusts could approach local governments to dedicate these publicly owned areas to open space in perpetuity.

WHEN: Upon completion of the Plan.

WHO: Presumpscot River Management Plan Steering Committee members with a strong interest in open space.

COST: A few thousand dollars to organize the effort and draft whatever documents prove necessary.

POTENTIAL FUNDING SOURCES:

Funds for these efforts may already be available through local and regional land trusts, it may only require refocusing existing land protection efforts.

L. Encourage Voluntary Permanent Protection as Open Space for Lands Enrolled in Current Use Tax Programs

NEED: A number of areas along the Presumpscot are enrolled in current use tax programs, thus indicating the owner's sensitivity to this issue. However, these lands are not permanently protected, as they may be withdrawn from the current use tax programs and developed in the future.

HOW: The members of the Presumpscot River Management Plan Steering Committee with a strong interest in open space issues, such as Portland Trails, or the local and regional land trusts could approach the owners of these properties to donate or sell conservation easements on them.

WHEN: Commencing upon completion of the Plan and continuing for as long as is needed.

WHO: Presumpscot River Management Plan Steering Committee members with a strong interest in open space issues.

COST: Costs could range from a few thousand dollars to organize these efforts and contact landowners; however, if conservation easements must be bought, costs would increase.

POTENTIAL FUNDING SOURCES:

Funding to organize this effort and approach landowners may already be available through local and regional land trusts, it may only require refocusing existing land protection efforts.

M. Encourage Current Use Taxation for Open Space Along the River

NEED: Open space along the river may in some cases be vulnerable to development because of rising taxes. Getting such lands enrolled in current use tax programs would reduce taxes and hence for some parcels may increase the prospects for them remaining as open space.

HOW: The members of the Presumpscot River Steering Committee with a strong interest in open space, and particularly the local and regional land trusts, could approach landowners with appropriate holdings along the river and encourage them to enroll their land in current tax use programs.

WHEN: Commencing upon completion of the Plan and extending for as long as is necessary.

WHO: Presumpscot River Steering Committee members with a strong interest in open space issues, particularly the local and regional land trusts.

COST: Cost for this effort are likely to be a few thousand dollars to organize the effort and contact landowners.

POTENTIAL FUNDING SOURCES:

Funding for this effort may already be available through local and regional land trusts, it may only require refocusing existing land protection efforts.

N. Encourage Expansion of Local Resource Protection Districts to Include the Entire Floodplain Being Remapped by the U.S. Geological Survey

NEED: As evidenced by the 1996 flood, the floodplains of the Presumpscot extend back beyond where they were previously thought to exist. The USGS is currently re-mapping floodplains along the Presumpscot. These areas are required by State law to be included within Resource Protection Districts under the Shoreland Zoning Act. However, as these districts have already been established based upon the old mapping of the floodplains by the communities involved, they may need to be encourage to revise the boundaries based upon the new information which will become available when USGS completes its mapping.

HOW: The Presumpscot River Steering Committee and the Casco Bay Estuary Project could, when updated information is available, approach the communities to encourage them to update their shoreland zoning.

WHEN: When new floodplain maps have been completed by the USGS.

WHO: Presumpscot River Steering Committee and the Casco Bay Estuary Project.

COST: A few thousand dollars to organize this effort.

POTENTIAL FUNDING SOURCES:

Casco Bay Estuary Project funding and foundations.

O. Identify a Central Repository for GIS Information on the Presumpscot River and its Shorelands

NEED: A considerable amount of effort has gone into creating the Geographic Information System data layers and analyses developed as part of this project; however, it is not clear which institution will serve as the repository for that information and maintain and update it over time so that it will remain useful in planning for the future of the Presumpscot. Potentially the University of Southern Maine, Greater Portland Council of Governments, or the State Office of GIS could assume this responsibility.

HOW: The Casco Bay Estuary Project should identify the appropriate repository for the GIS information developed as part of this project.

WHEN: Immediately.

WHO: Casco Bay Estuary Project.

COST: Unknown -- hopefully an organization with existing GIS capability and for whom this information will be useful will be willing to assume stewardship of it at no cost. As noted earlier, when the information needs to be updated, there will be additional costs; and when information is requested, there will be costs to produce it.

POTENTIAL FUNDING SOURCES:

User fees could be charged to cover costs of producing information from the GIA database.

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APPENDIX A: Early American Soil Conservationists

The following anecdote is an excerpt from McDonald, A. (1941), pp. 7-10.

“EARLY AMERICAN SOIL CONSERVATIONISTS”

Samuel Deane

1733-1814

An Advocate of Experimental Agriculture

After the time of Eliot, more farmers became interested in measures for protecting and enriching the soil. Occasionally someone would write a book or a pamphlet on agriculture, and by 1800 about 20 of these had been published. But agriculture as a whole had been going downhill. As the slopes became poorer, the rich valley land suffered, too, because sand, gravel, and poor subsoil were washed down from the hills. In many places the rich soil had long since been washed off.

While the water was at work carrying away the soil, the wind was at work also. Samuel Deane, who lived a generation later than Eliot, was first to attempt to control wind erosion. The lives of the two men were somewhat similar. Both were ministers, both were farmers, and both accepted little on faith alone. Both were familiar with but questioned the ideas of English agriculturists.

*Deane relied on experiment even more than Eliot did. He became so much interested in his agricultural experiments that when the Revolution broke out, he retired to his farm at Gorham near Portland, Maine², and devoted all of his time to agriculture. About 1787, he began writing his book, which he hoped would improve American agriculture. *The New England Farmer or Geological Dictionary* was published in 1790 and for a generation became the standard text on American agriculture.*

*Like Eliot, Deane recognized the ill effects of erosion by water in New England and developed ways to overcome it. He observed in his book that with heavier rainfall in the hills "more of the fine mould would have been washed down into the hollows; and deeper channels would have been made in the soil by the running of water which are considerable inconveniences" (6,p.232 *The New England Farmer*).*

Plowing to Prevent Erosion

The principles of plowing to prevent erosion, developed by Eliot, were carried forward by Deane. Both recommended deep plowing and Deane suggested that farmers should plow their furrows a little deeper each year.

In addition Deane recommended contour plowing to prevent gullying and sheet washing. In this respect his work paralleled that of Thomas Jefferson³ and Thomas Mann Randolph of Virginia. All agreed that wherever sloping lands were cultivated, contour plowing should be adopted.

Randolph directed his efforts toward developing a hillside plow that would eliminate dead furrows and turn all of the soil in one direction. Deane, however, suggested that a less cumbersome plow was needed in order to reduce friction. To some extent this could be accomplished by plating the wooden moldboard with iron.

Where an entire hill lay within one field, Deane recommended that it should be plowed all the way around the hill on the contour. The hentings, or parting furrows, furnished drains in which the water moved so slowly that none of the soil was washed away. If only one side of a hill were to be plowed, the team should return light each time so that the furrows would all be turned in one direction.

At first Deane suggested throwing up banks of earth⁴ on the contour but dismissed the idea in favor of ribbing, which was merely running parallel contour furrows at intervals on sloping lands to prevent washing. On cultivated land, the furrows were to be made in the fall and spaced 3 or more feet apart, depending on the steepness of the hill. For pastures that showed a tendency to wash, he recommended furrows 8 to 10 feet apart. In this way Deane extended the principles of contour plowing to pasture management.

The principles of terracing and stripcropping, widely used today, were also advocated, in a combined form, by Deane. His "alternate husbandry" consisted of plowing the land in flat ridges about 9 feet wide. The ridges were alternately planted in grain and allowed to lie fallow.

In addition to general farm improvement as a method of preventing soil wastage, Deane recommended several specific techniques. To prevent erosion on ditch banks, Deane recommended that strong-rooted grasses be planted on their margins. To prevent gullying along roads and paths about the farm, he suggested the use of carts with wide wooden wheels. Some of these in use, he said, had wheels a foot wide.

Crop Rotations

Deane was particularly interested in experimenting with various types of crop rotations. He clung, in part, to the old, bare-fallow system, believing that it was often wise to renovate the land in this way. He did favor, however, planting rows of potatoes or carrots at intervals on the fallow land. Although he had read many English treatises, giving various sequences of root, grain, and grass crops, he would not accept them until he had tried them in New England. Long experience was necessary to determine the best rotation, but little experimentation had been done along this line.

Based on experience and observation, Deane made a few tentative suggestions. For light, warm soils, he recommended **corn, peas, or potatoes** for the first year; for the second year, **rye or barley**; the third and fourth years, **clover**; the fifth, **wheat**; and the sixth and seventh, clover. For cold stiff soils, he recommended **oats or potatoes** for the first year; second year, potatoes well dunged; third year, **flax or wheat**; and for several years thereafter, **grass**. One of Deane's principles was that the so-called "**white**" crops⁵ should never be grown for more than 2 years in succession. A "**green**" or **soil-building crop** should be alternated with "white" crops.

He suggested different rotations for different areas. For Bristol County, Maine, he suggested: The first year, Indian corn; the second year, rye, wheat, oats, or barley; and for the third and fourth years, clover. In Cumberland and Lincoln Counties of Maine, it seemed desirable to raise

*field peas, oats, or potatoes during the first year; **Indian corn** with much dung, the second year; barley or rye, the third year; and **herd's-grass** and clover up to the tenth year.*

*Deane was one of the few farmers of the colonial period who relied chiefly on **potatoes**. He was considered the best farmer in the community but even his total production was low, an indication of the small scale of production of the subsistence farmers of New England. In one year, his total crop yields were as follows: **70 bushels of potatoes, 50 of French turnips, 40 of English turnips, 5 of peas, 2 of buckwheat, 70 of carrots, 3 of parsnips, 4 bushels of beets, and 500 cabbages** (35, p. 366).*

It is significant that Deane, on his own farm, had more or less abandoned grain crops because they depleted the soil. Although clover was inserted in most of his rotations, he still remained critical of it, not conceding that it was better than any other "grass." He admitted that it improved the soil near the surface but doubted if it made the soil as a whole any better, though agricultural authorities of his time agreed that a clover "lay" was a good preparation for wheat.

Methods of Enriching the Soil

In regard to green manures, Deane favored Eliot's suggestion that millet would make poor land rich (6, p.116). He also recommended peas and oats, and said that some farmers had used clover and rye grass with success.

*All of Dean's methods of soil renovation were subsidiary to his main idea that there could be no real improvement without dung. Quoting Dryden, he said that farmers should not be ashamed of their occupations, as many of them were, but "**should toss about their dung with an air of majesty**" (6, p.2). **The practice of saving all manures, along with reducing the size of farms, would, he felt, make farming successful in New England.***

*Deane suggested several methods by which the farm manures might be best utilized. He endorsed Eliot's idea of mixing soil and manures, but carried this idea still further by suggesting that the soil and manure be mixed in a declivity so that the wash from the surrounding area might be utilized. In this **compost heap**, he put all the usual farm wastes including leaves, ashes, and trash of various kinds. Also, he believed that the practice of folding, whereby cattle were penned nightly for the purpose of preserving their dung to enrich the soil, was a good one although seldom practiced.*

Deane's ideas on soil texture were similar to those of other writers of the late 18th century, since he thought soil fertility was largely dependent on this characteristic. Like Eliot, he suggested adding sand to clayey soils and clay to sandy soils. In particular, he recommended that marsh mud or any rich intervale soil be transferred to the worn hillsides.

Wind-Erosion Control

Aside from the Cape Cod and Wallingford settlers, Samuel Deane was the only colonial writer who considered wind erosion an important problem for New England farmers. Even then there were numerous, small wind-eroded areas that had to be abandoned and that caused the settlers discomfort in times of high wind. "Some barren sands consist of very fine particles, and have no sward over them. The wind drives them before it, and makes what are called sand-floods, which bury the neighbouring lands and fences" (6, p. 242).

To prevent the blowing and drifting of sand, Deane (6, p.161) recommended hedge fences as well as plantations of locust trees.

*This tree grows best in a sandy soil, and will propagate itself in the most barren places, where the soil is so light as to be blown away by winds. By sheltering such places, and dropping its leaves on them, it causes a sward to grow over them, and grass to grow upon them. *** those who possess hills of barren sand *** should not delay to make forests of these trees on such spots. Like soil conservationists of today he realized that black locust trees not only reduced erosion but also provided valuable weather-resistant material for fence posts.*

*Not all of Deane's ideas regarding the prevention of erosion were original. He acknowledged that many of them had been practiced by other farmers before he tried them. He was the first, however, with the exception of the Cape Cod settlers, to suggest measures for wind-erosion control. His methods of plowing were the forerunners of the hillside ditch. He seems to have put into practice more erosion-control measures than any other American farmer before 1790. His book on agriculture, the *New England Farmer*, probably exerted more influence on New England farming than any other book published in the United States before the Civil War. It ran through several editions, and was revised and "brought up-to-date" by later agricultural leaders. It was the only comprehensive treatise on agriculture published in New England before 1800.*

² *Until 1820 Maine was a part of Massachusetts. To avoid confusion, "Maine" is used in this paper to identify all places included in the present State of Maine.*

³ *For discussion of Randolph's and Jefferson's contributions to erosion control, see Hall (9).*

⁴ *From this time on, some conservationists occasionally suggested a crude form of terrace. Terracing did not become popular until after the Civil War, however, and few of the earlier farmers ever actually carried out the idea.*

⁵ *White or exhausting crops included oats, corn, flax, rye, and barley; green or soil-building crops included legumes, root crops, and grasses.*