

5.0

NATURAL

RESOURCES

INTRODUCTION

Natural resource management is critical to the protection, restoration, and promotion of scenic landscapes and wildlife. Holden takes pride in its natural resources, which supply clean drinking water to residents, allow passive and active outdoor recreation opportunities, provide scenic views, enrich working farms, and gives Holden its unique character. Holden is characterized by extensive woodlands, a network of streams and wetlands, and many natural resources. Holden residents value these natural resources and place a high priority on maintaining them for the use of future generations.

Through a robust community engagement process, residents shared their vision for Holden in the coming decades. Recurring themes identified through this process include preservation of existing natural resource areas, utilizing natural resources for recreational purposes, and pursuing creative funding opportunities and preservation programs. The following chapter will provide an overview of existing conditions related to natural resources, issues and opportunities, and strategies for action around three primary goals:

- Protect natural resource areas from environmental degradation, disturbances, and development.
- Expand appropriate public access to the Town's natural resources.
- Improve public awareness of Holden's natural resources.

PRIOR PLANNING AND ENGAGEMENT EFFORTS

Holden residents have been actively working to conserve and preserve essential land and water resources. Prior planning efforts around natural resources include the following:

Master Plan (2008)

The Town of Holden Master Plan (2008) outlines existing conditions, issues, and recommendations



Running Brook (CMRPC, 2019)

across a variety of topics. The recommendations identified in the Master Plan (2008) were divided into first, second, and third-level priorities. The following goals from the Master Plan (2008) pertain to natural resources. The completion status of the recommendations and action items from the Master Plan (2008) can be found in the Benchmark Review in Appendix E.

First Priority Goals:

- Protect natural resource areas from environmental degradation.
- Identify and permanently protect important, unprotected natural resource areas, including wildlife corridors.
- Protect important and scenic vistas and agricultural resources.

Second Priority Goals:

- Increase appropriate public access to watershed protection areas.
- Increase public access to ponds and streams for recreational uses.

Third Priority Goals:

- Provide special protections for slopes to preserve views and to reduce erosion and stormwater runoff.

The Open Space and Recreation Plan (OSRP)

The Town of Holden Open Space and Recreation Plan (OSRP) (2012) provides an overview and analysis of the Town's significant natural and scenic resources, an inventory of conservation and recreation lands, and tangible steps to improve open space and recreation opportunities in Holden. The OSRP (2012) was reviewed and accepted in draft form by the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA). The Town intends to update the plan in 2019 in order to maintain eligibility for grant programs administered by the Massachusetts Division of Conservation Services (DCS).¹

The Five-Year Action Program included in OSRP (2012) identified four goals for the protection and promotion of open space and recreational resources:

1. Preserving aesthetic and natural resources in Holden, including wildlife, wetlands, scenic vistas, unique natural areas, and historical resources.
2. Providing active recreation resources and facilities in Holden.
3. Promoting passive recreation and open space resources.
4. Developing and implementing funding sources.

The Central Thirteen Prioritization Plan

The Central Thirteen Prioritization Plan (Central Thirteen) was completed by CMRPC in 2012. Central Thirteen was a collaborative effort to classify local priorities for development and preservation in 13 communities in central Worcester County, including Holden. Priority Preservation Areas (PPAs), Priority Development Areas (PDAs), and Priority Transportation Improvements (PTIs) were identified in each Town and mapped accordingly, in a manner consistent with existing policies, master plans and guidelines, and the State's Sustainable Development Principles.² In Holden, 13 areas

¹ To remain eligible for DCS grant funding, Massachusetts municipalities must update their OSRP every seven years.

² The Commonwealth's Sustainable Development Principles consist of 10 strategies that promote sustainable development through integrated energy and environment, housing and economic development, transportation and other policies, programs, investments, and regulations.

were identified as local priorities for preservation, including:

- Reservoir Street
- Holden Reservoir
- Fisher Road
- Bullard Street
- Harris Street
- Quinapoxet River/River Street
- Muschopague Road
- Cheney Graham Farm
- Hubbard Farm
- Muschopague Road Farm – JD Enterprises
- NHESP Estimated Habitats of Rare Wildlife
- Mass Central Rail Trail

Municipal Vulnerability Preparedness (2018)

In 2017, the Town of Holden was awarded a Municipal Vulnerability Preparedness (MPV) grant to undertake planning activities related to resiliency and climate change. Fuss & O'Neill assisted the Town with community resilience building workshops and prepared a baseline climate change and natural hazard vulnerability assessment for the Town. As presented in the Town of Holden Community Resilience Building Workshop: Summary of Findings (Fuss & O'Neill, 2018), the top priorities for improving Holden's resilience to climate change are as follows:

- Conduct a study to investigate opportunities to provide green emergency power backup.
- Develop public education and outreach on appropriate operation and maintenance of stormwater best management practices on private properties.

Central Rail Trail (CMRPC 2019)



- Assess green infrastructure opportunities for stormwater management to develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects.
- Determine status of forest management planning, particularly on lands owned by the Town and Commonwealth, in order to reduce wildfire threats and encourage management of invasive species.
- Assess mosquito, tick, and other pest control options; provide public education and outreach about associated risks.
- Work with FEMA to correct flood maps at Industrial Park to reflect accurate, current flood risks.
- Develop comprehensive invasive species management from inventory stage through management planning and implementation.
- Provide education and outreach on fertilizer impacts, via the Agricultural Commission, to inform landowners about the negative water quality impacts of nutrient pollution.
- Coordinate with Town departments to incorporate green infrastructure into planned road improvements.

EXISTING CONDITIONS

Holden is characterized by its abundant natural resources, which include wildlife habitats, large forest areas, agricultural areas, and watersheds. The Town's scenic landscapes consist of farmland and water resources that reflect the community's history as an agrarian Town. It is a Town priority to protect these valuable natural assets. Future development must be guided in a way that preserves not only protected natural areas, but also the connections between such areas.

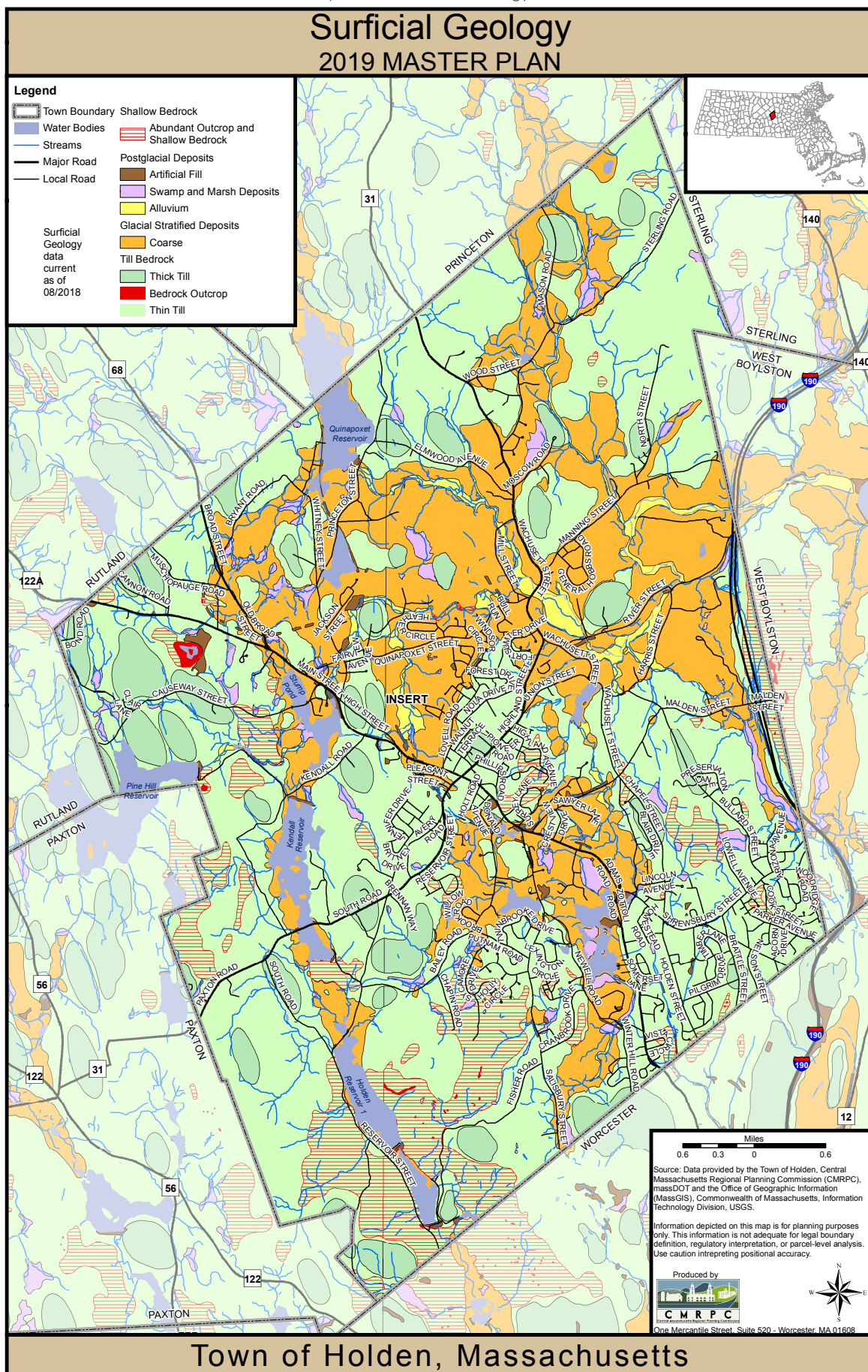
Holden utilizes a variety of bylaws and regulations to protect the Town's natural resources. These include an Aquifer Protection District, regulations governing the public use of the waters of Eagle Lake, Water Use Restriction Bylaw, Stormwater Management and Erosion Control Bylaw, Illicit Discharge Control Bylaw, Wetland Bylaw, Water Protection Bylaw, and Right to Farm Bylaw. The Right to Farm Bylaw promotes the pursuit of agriculture and agriculture-based economic opportunities, and protects farmlands throughout the community. Bylaws such as Water Use Restriction and Stormwater Management are intended to preserve the quantity and quality of the Town's water resources. These bylaws and regulations play an important role in preserving Holden's natural resources and maintaining the Town's rural character.

Geology, Topography, and Soils

Surficial geology is a significant consideration in development and preservation alike. Like much of New England, Holden was once covered by mile-thick glaciers. The advance of the glaciers scraped some hills down to bedrock and their retreat left deposits of till, a mixture of stones, sand, silt, clay, and other materials. These materials tend to have moderately or poorly drained soils and many stones and rocks. Additionally, after the glaciers retreated, floodplain alluvium deposits settled out onto flat areas and wetlands, such as areas along the Quinapoxet River. Generally, areas with such low-lying, water-borne deposits are not suitable for development. Holden's glacial history rendered much of the Town's soil as poorly drained or rocky, rendering development a challenge in many areas. The surficial geology of Holden is shown on Map 5-1.

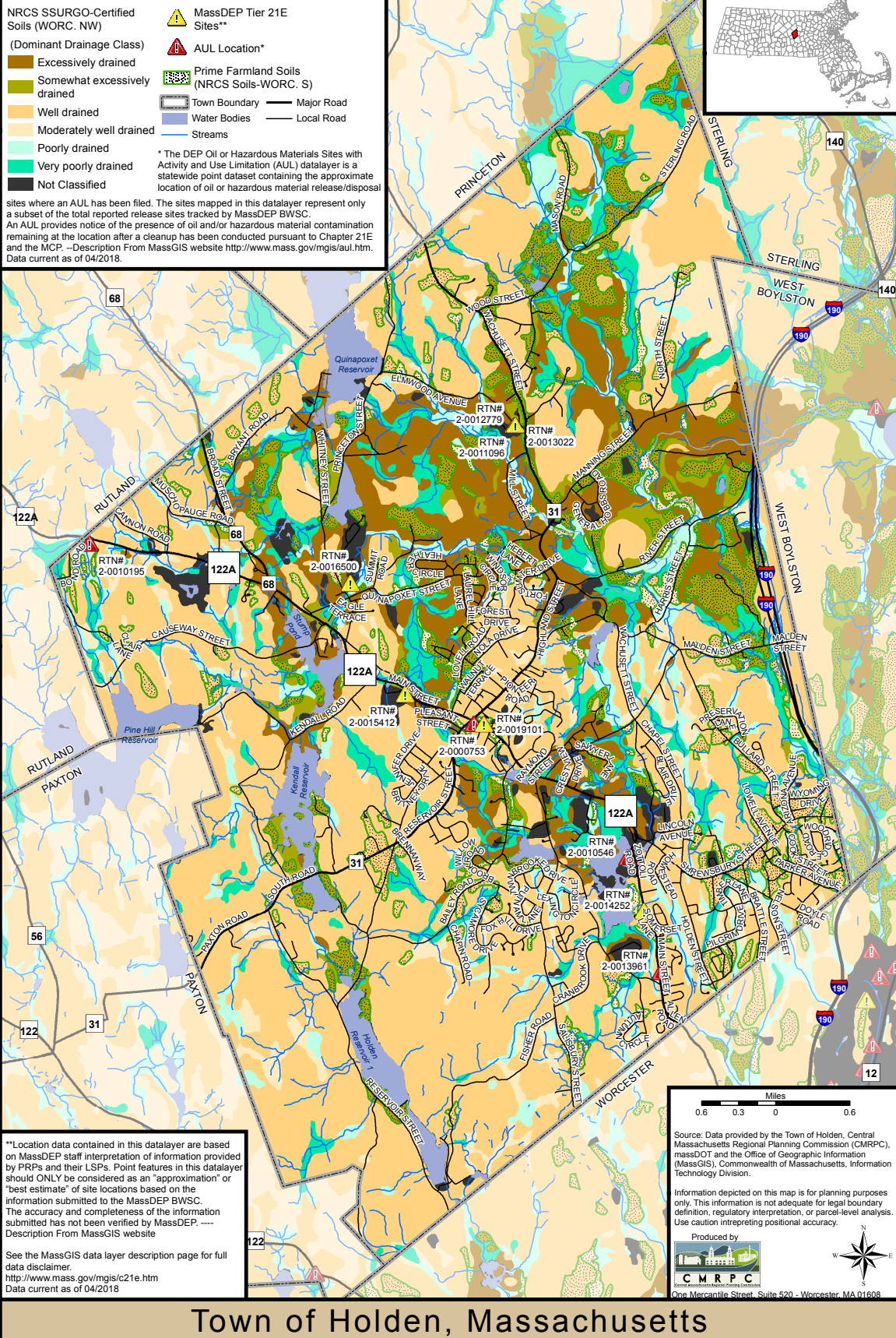
The soils and limitations map (Map 5 - 2) shows most of Holden's soils fall into the Paxton-Woodbridge-Canton and Hinckley-Merrimac-Windsor soil classes. The development limitations of the dominant soil classes are listed. These limitations are from the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) descriptions of each soil class. Development limitations described by NRCS are frequently associated with the ability to utilize

Map 5 - 1: Surficial Geology



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Soils and Limitations Map 2019 MASTER PLAN



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such soils for on-site septic systems. Dominant soil classes in Holden are as follows:

Chatfield-Hollis Rock Outcrop complex: These soils have up to 90% rock outcrops and are generally unsuitable for septic systems or most types of construction.

Hinckley sandy loam: These soils have few limitations for development other than slope.

Deerfield sandy loam: These soils have moderate to severe limitations for development because of high water table.

Merrimac fine sandy loam: These soils have severe limitations for septic systems because of poor filtration due to high permeability. They present slight limitations for roads and residential or commercial development except in areas with slopes greater than 8%, which present an increasingly degree of development challenges.

Windsor loamy fine sand: These soils have severe limitations for septic systems because of poor filtration and slight limitations for roads, residential or commercial development. Areas with slopes greater than 8% have more limitations for development.

Agawam fine sandy loam: These soils have severe limitations for septic systems because of poor filtration and slight limitations for roads, residential or commercial development. Areas with slopes greater than 8% have more limitations for development.

Canton fine sandy loam: These soils have severe limitations for septic systems because of poor filtration and slight limitations for roads, residential or commercial development. Areas with slopes greater than 8% have more limitations for development.

Swansea and Freetown mucks: These soils have severe limitations for all types of development because of wetness. Development on such soils is generally prohibited by wetland regulations.

Severe to Moderate Limitations: These soils include Sudbury, Paxton, Walpole, and Woodbridge soil types and have severe to moderate limitations for development because of wetness and slopes.

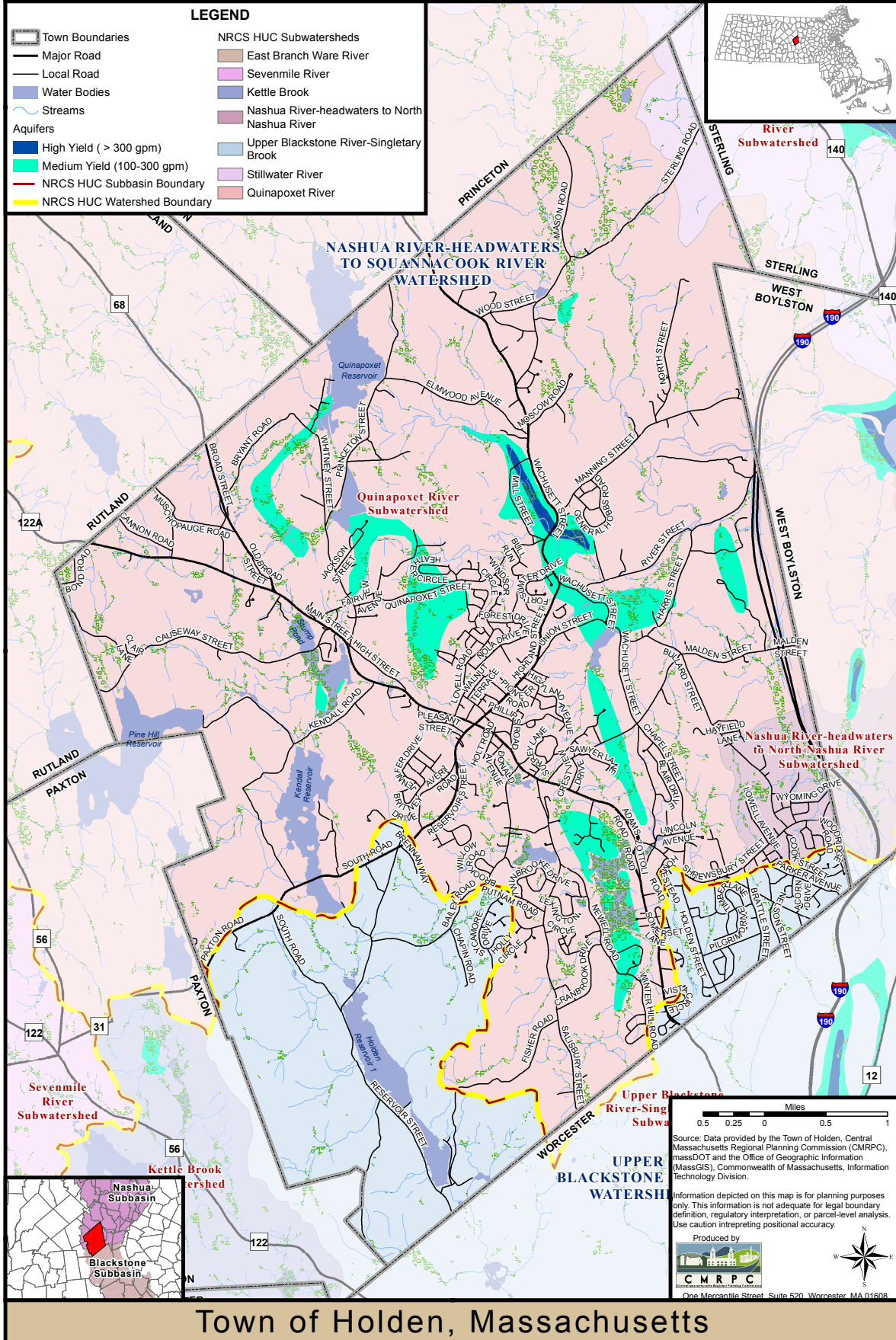
The development limitations imposed by soils include high groundwater, which may limit the installation of septic systems and basements; stones or boulders, which may increase construction costs; as well as shallow soils over bedrock, which may limit construction and increase costs. The largest areas in Holden with few development limitations are the southwest and north of Town Center. As some of these areas north of the Town Center overlie sand and gravel deposits, they may present a hazard for contamination of groundwater if they are used for septic system absorption fields. Many of the soils in these areas readily absorb but do not adequately filter septic system effluent. Slope negatively impacts commercial development more than residential development. In many areas throughout Town, municipal sewers minimize the development limitations that would otherwise be imposed by some soil classes. Elevation and slope also constrain development.

Typically, elevations in Holden range between 650 and 750 feet above mean sea level with gentle to moderate slopes that offer a variety of views of the landscape. Asnebumskit Hill at the Paxton/Holden border is the highest point in Holden at 1,395 feet above mean sea level. The lowest point in Holden is approximately 550 feet above mean sea level, where the Quinapoxet River flows into West Boylston. In the western and northern sections of Holden, slopes become slightly steeper, especially on some hillsides or riverbanks. Many types of development are limited on slopes over 15%, which equates to approximately 7% of the Town's total area.

Water Resources

In total, there are 362 acres of open water in Holden (Map 5 - 3). More than six miles of the Quinapoxet River meander through Holden, offering residents and visitors opportunities for active and passive recreation, education, and habitat preservation. The River begins at the Quinapoxet Reservoir and serves as part of the regional Metropolitan Boston water supply. Holden residents are not consumers of this potable water. The Quinapoxet River is a major tributary of the Wachusett Reservoir in West Boylston, part of the water supply system for the

Water Resources Map 1 2019 MASTER PLAN



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City of Worcester Public Water Supply, No Trespassing Sign (CMRPC, 2019)

City of Boston and surrounding communities. The Department of Conservation and Recreation (DCR) manages protection of this water resource. In recent years DCR has increased land acquisitions in order to more effectively manage water quality. Through the Watershed Protection Act Regulations, DCR regulates development in close proximity to the rivers and streams that are tributary to the Wachusett Reservoir. Holden sits between the Nashua Watershed to the north, which includes most of the Town, and the Blackstone Watershed to the south and southwest, including the areas around Holden Reservoirs 1 and 2.

Notable ponds in Holden include: Dawson Pond, Chaffin Pond, Eagle Lake and Stump Pond, Maple Spring Pond, Cournoyer Pond, and Unionville Pond. The reservoirs (Quinapoxet, Pine Hill, Kendall, and Holden Reservoirs 1 and 2) are restricted from public access. Eagle Lake includes a Town beach and a shallow boat launch area, although the future of the lake as a recreational destination remains uncertain as of 2019. Other ponds, including Dawson, Maple Spring, Chaffin, and Unionville lack designated public access areas but are frequented by fishermen and other small boat users. Major streams in Holden include:

- Wadsworth Brook and Tatnuck Brook, which flow into Holden Reservoir 1 along with Silver Spring Brook and Scott Brook
- Poor Farm Brook, which flows into Chaffin Pond
- Chaffin Brook, which flows into Unionville Pond
- Warren Tannery Brook

- Asnebumskit Brook, which flows into the Quinapoxet River
- Cold Brook, which flows into Cournoyer Pond
- Trout Brook, which flows into the Quinapoxet River
- Ball Brook, which flows into Trout Brook

Beyond the Quinapoxet River and Reservoir, Holden contains four additional water supply reservoirs. These include Pine Hill Reservoir, Kendall Reservoir, and Holden Reservoirs 1 and 2, which are located in Holden and owned by the City of Worcester. The reservoirs in Holden are the backbone of the City of Worcester public water supply system, which provides water to the city's approximately 185,000 residents. The City of Worcester owns and protects important tracts of undeveloped Holden forestland within the watershed of the reservoirs. Water from a significant portion of the land that lies within the natural drainage basin of the Quinapoxet River is collected within a series of reservoirs. This water is then transmitted by man-made diversions in the City of Worcester water supply system. Outflows from Maple Spring Pond (also known as Peter Carr Pond) enter the Quinapoxet Reservoir. Water from the Quinapoxet Reservoir provides some flow to form the headwaters of the Quinapoxet River; however, in large part is pumped out of the Nashua River watershed to the City of Worcester reservoir system in the southern part of Holden. Additionally, water from Pine Hill Reservoir (located primarily in Paxton and Rutland), and Kendall Reservoir is directed in large part to Holden Reservoir 1, within the Worcester potable water system. Consequently, Eagle Lake and Stump Pond are the main source of water to Asnebumskit Brook.



Holden Reservoir No. 2 (CMRPC, 2019)

Approximately 80% of the Town is served by public water. The water supply in Holden encompasses groundwater sources owned and operated by the Town and interconnections with the City of Worcester water system. The result is a blend of groundwater from Town sources and surface water from Worcester sources. The drinking water supply in Holden is primarily drawn from wells. Public water is also drawn from the City of Worcester reservoirs, treated at the Worcester Treatment Plant, and piped into Holden homes. Muschopauge Pond, a previous source of drinking water, was taken offline at the end of 2000. It is currently utilized as an emergency water supply. The Town of Holden groundwater sources consists of five wells and two interconnections within the City of Worcester. Table 5 - 1 summarizes these drinking water resources. Additionally, there is a well field at Poor Farm Brook off Newell Road that has not received Massachusetts Department of Environmental Protection (DEP) approval due to potential wetland drawdown effects on wildlife.

The remaining portion of Holden's drinking water supply is provided by Worcester reservoirs. Based upon the existing sources and the Intermunicipal Agreement with the City of Worcester, the Town's water system is considered adequate relative to water supply. It has sufficient capacity to serve projected development demands through at least 2030; however, it is crucial that proposed development in Town be evaluated in terms of its potential impact on the watershed.

In 2018, the City of Worcester agreed to pay \$95,000 for conservation restrictions on nearly 50 acres of watershed off of South Road in Holden. This land contains the headwaters of the Wadsworth Brook, a tributary to Holden Reservoir No. 1. The conservation restriction acquisition is intended to protect Holden Reservoir No. 1 by preventing the development of those parcels, as any development in that area would degrade reservoir water quality. It will be important for the Town of Holden to continue to work regionally to protect its valuable water resources from threats such as contamination, drought, and overuse.

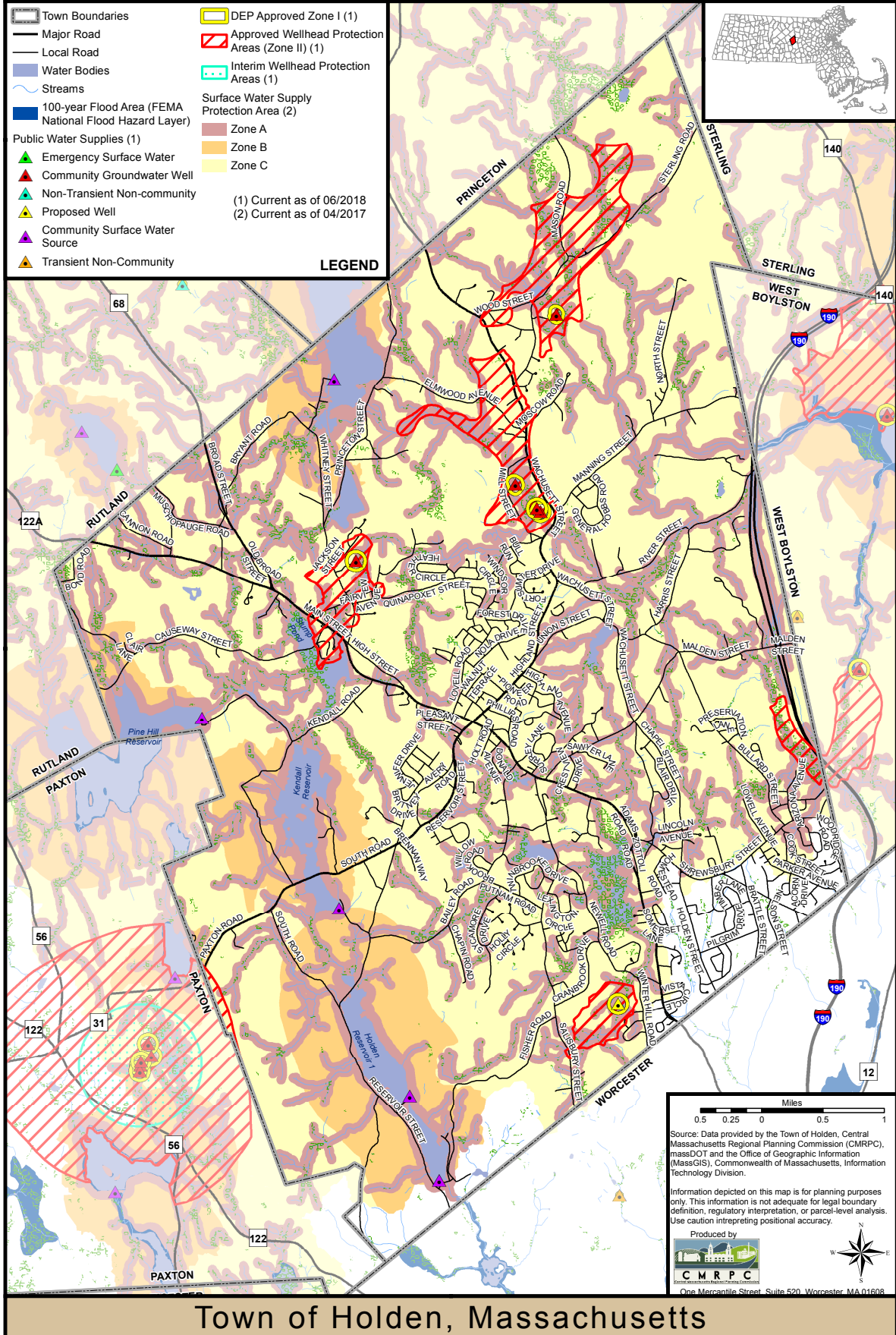
Title 5 Regulations

The Water Resources Map 5 - 4 shows the Title 5 buffer areas of the Massachusetts Environmental Code (310 CMR 15.00) around mapped streams, ponds, and wetlands. Not all streams and wetlands are mapped, and there are additional buffer areas around these unmapped areas. The buffer area spans 50 feet around all hydrologic features and wetlands, except within the drainage basin for a public surface water supply, a category encompassing the majority of Holden. In this case, the buffer zones are increased to 100 feet around wetland features, 200 feet around streams and ponds, and 400 feet around public surface water supplies, such as designated reservoirs. The purpose of these buffers is to prevent the contamination of water supplies from private septic systems. As most of Holden lies within the watersheds of the City of Worcester or DCR reservoirs, these municipal sewers eliminate the need for private septic systems, thereby protecting drinking water resources.

Table 5 - 1: Holden Drinking Water Supply Sources (Town of Holden Water Quality Report, 2017)

Source Name	DEP Source ID #	Source Type	Location of Source
Quinapoxet Wells	2134000-02G 2134000-06G	Two Gravel Packed Wells	Adjacent to Wachusett Street
Mill Street Well Field	2134000-03G	Tubular Well Field	Adjacent to Mill Street
Mason Road Well Field	2134000-04G	Tubular Well Field	Adjacent to Mason Road
Spring Street Well	2134000-05G	Gravel Packed Well	Adjacent to Spring Street
Brattle Street Interconnection	2134000-01P	Interconnection with Worcester	Brattle Street
Salisbury Street Interconnection	2134000-02P	Interconnection with Worcester	Salisbury Street

Water Resources Map 2 2019 MASTER PLAN



Wetlands

Wetlands play an important role in flood control and maintaining water quality. They provide necessary water storage, absorb stormwater runoff, and provide valuable wildlife habitat and scenic beauty. Table 5 - 2 shows the distribution of wetland types in Holden. Rather than expansive areas of wetlands, Holden is characterized by smaller, scattered wetlands.

Table 5 - 2: Holden Wetlands by Type (MassDEP, 2017)

Wetland Type	Acres	% Wetlands
All Wetlands	2209.00	100%
Forested Wetland	1,646.68	7.08%
Non-forested Wetland	429.20	1.85%
Aquatic Bed	122.26	0.53%
Unconsolidated Shore	10.65	0.05%

Enacted in 1996, the Massachusetts Rivers Protection Act was an amendment to the Massachusetts Wetlands Protection Act (1972). The amendment added a new wetland resource: Riverfront Area. In most municipalities, the Riverfront Area is 200 feet wide and is measured from each side of the river from the mean annual high-water line outward horizontally and parallel to the river. Since its establishment, the Rivers Protection Act has designated \$30 million for the acquisition of land bordering rivers and streams. The Holden Conservation Commission administers the State's Wetlands Protection Act regulations at the local level. The Commission also regulates wetlands in Holden under the authority of the Holden Wetlands Protection Bylaw, adopted by the Town in 2001 to provide additional protection to these significant natural resources. The Wetlands Protection Bylaw was revised and adopted again in 2011 to identify uncertified vernal pools as a wetland resource as well as require a 25 foot No Disturb Zone from the wetland line.

Aquifer Recharge Areas

A number of significant aquifers or groundwater recharge and source areas are located in Holden. Beneath the Quinapoxet well fields lies a small, high-yield aquifer consisting of coarse sand and gravel soils with a potential well yield of more than 300

gallons per minute (gpm). Medium-yield aquifers (100 to 300 gpm potential well yield) are located along Asnebumskit Brook and Warren Tannery Brook along Chaffin Brook and Unionville Pond. Additionally, a medium-yield aquifer is located along a portion of Trout Brook. The Quinapoxet aquifer and the medium-yield aquifers are host to the Town's existing water supply wells.

Hazardous Material and Underground Storage Tank Sites

The Soil and Limitations Map shows sites of known spills, releases of oil, hazardous materials, and underground storage tanks. It is important to be aware of these sites because they are potential sources of water supply contamination. As of 2019, seven DEP oil or hazardous material sites with activity and use limitation (AUL) exist in Holden. Contaminated sites are classified under DEP regulations based upon the degree of risk they pose to potential human and environmental receptors. Sites are classified in decreasing degree of risk as Tier 2, 1D, 1C, 1B, and 1A. Three Tier 1 sites are located on Elmwood Ave. Other sites include 359 Main Street (Tier 2); 156 Princeton Street (Tier 1D); 1146-1148 Main Street (Tier 1D); and 1401 Main Street (Tier 1D).

Additionally, there are nine known underground storage tank locations in Holden. Although most of the sites are located along Main Street, a few sites are located in other areas of Town.

Floodplains

Holden's hilly topography has resulted in a number of floodplains; however, most of the Town falls within areas of minimal flooding. Most water bodies in Town are described as Zone A- Area of 100-year flood. Base flood elevations and flood hazard factors are not available for this category. Some waterbody shorelines and low-lying areas are described as Zone B- Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one foot of where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. Most of Holden's land areas are described as Zone C- Areas of minimal

flooding. Holden has approximately 1,793 acres of land that lies within the 100-year floodplain.

Flood hazard areas described as Zone A and Zone B are listed in Table 5 - 3. Flood-prone areas serve as sponges that are able to soak up large amounts of water and protect downstream areas. Currently, development in Zone A and Zone B areas is restricted by environmental regulations. The Town of Holden participates in the Federal Emergency Management Agency (FEMA) National Flood Insurance Program, which allows property owners to insure against flood losses.

Exotic Weeds

In recent years, five water bodies in Holden have been found to contain populations of exotic weeds. These include Chaffin Pond, Dawson Pond, Eagle Lake, Stump Pond, and Unionville Pond. Exotic weeds are invasive because they have few natural predators and often crowd out native vegetation. If not controlled, exotic weeds can become a nuisance and impair water quality. This greatly impacts drinking water and water-based recreation opportunities.

As of 2019, Holden is engaged in limited efforts to control the spread of exotic weeds. Biannual drawdown helped control the milfoil in Eagle Lake but has not been conducted in three years. Weed

growth in Eagle Lake, particularly in the beach swimming area, has become an issue and calls for a comprehensive plan for clearing weeds. To take preventive measures, residents and businesses should be encouraged to minimize the use of fertilizers, which are contributors to weed growth. Additionally, efforts should be made to ensure that all septic systems are fully functional and that connections are made to the sewer system where feasible. The rapid spread of exotic weeds in Holden’s waterbodies necessitates implementation of a comprehensive plan to manage their growth, likely including resuming bi-annual winter drawdown or even dredging.

Vernal Pools

Vernal pools are small, seasonal wetlands that provide an important wildlife habitat, particularly for amphibians and invertebrates. Also known as ephemeral pools, autumnal pools, and temporary woodland ponds, they typically fill with water in the autumn or winter due to rising groundwater and rainfall. The pools remain through the spring and into summer then dry completely by the middle or end of summer each year, or every few years. There is currently one Vernal Pool Core in Holden, located along the northwest Holden/Princeton Town border. Vernal Pool Cores depict the top 5% most interconnected clusters of potential vernal pools in Town. Each cluster of pools is buffered to

Table 5 - 3: Flood Hazard Areas in Holden (FEMA, 2017)

Zone	Flood-Prone Areas	
Zone A (Area of 100-year flood)	Pine Hill Reservoir	Quinapoxet River
	Eagle Lake	Trout Brook
	Asnebumskit Brook	Unionville Pond
	Maple Spring Pond	Cedar Swamp Brook
	Kendall Reservoir	Holden Reservoirs 1 and 2
	Quinapoxet Reservoir	Chaffin Pond
Zone B (Area between limits of 100-year flood and 500-year flood)	Worcester Brook	Low-lying area between Mason and Moscow Roads
	Warren Tannery Brook	Low-lying areas near Pine Haven Drive, Chapel Drive, Lowell Avenue, and Mark Circle
	Dawson Pond	
	Poor Farm Brook	
	Low-lying area east of Kendall Reservoir	

create vernal pool habitat areas that include the pools themselves and the surrounding habitat. This allows for successful breeding, dispersal, overwintering, foraging, and migration. There are 27 Massachusetts Natural Heritage and Endangered Species Program (NHESP) Certified Vernal Pools in the Town of Holden, the most recent of which was certified in 2015. The Town also contains 118 potential vernal pools.

According to MassWildlife, a targeted approach towards clusters of vernal pools can be more effective than targeting individual pools. Clustering maximizes the resistance and resilience of vernal pool habitats and their resident species in the context of climate change. The Town of Holden Wetland Protection Bylaw restricts development within close proximity of vernal pools.

Vegetation and Wildlife Resources

Agricultural Land

The Town of Holden contains 99 acres of cultivated land, 524 acres of pasture, and 482 acres of grassland. The map depicts these land use types, which comprise 1,105 acres or 5% of the Town's total area. Agricultural land remains significant for maintaining diversity of wildlife in Holden. Small farm parcels are scattered throughout Town; however, the majority of agricultural land is located in the northern section of the Town, north of Main Street and River Street.

Agricultural land attracts grassland birds such as eastern meadowlarks and bobolinks. These species can still be found in hayfields, meadows, and pastures in Holden; however, as is the case in many Massachusetts towns, these populations are dwindling as a result of fields that are too small and too scattered. To maintain the existing habitats, the Town must avoid further loss or fragmentation of grasslands and croplands. Many other bird species use these fields to nest, hunt, and feed on seeds, insects, and small mammals. Migrant songbirds can be found feeding in farm fields in Holden and nearby Towns during migration periods. Many hawks and owls, such as American kestrels and northern harriers, rely on grasslands for hunting small mammals. Other species such as

voles, white-tailed deer, woodchucks, coyotes, and eastern cottontail rabbits also rely on agricultural areas. Snakes such as the eastern hognose snake and the northern brown snake can also be found in fields and pastures.

Open Land

Power line corridors and unused open land, such as agricultural fields that are no longer being cultivated, are used by many of the same species that favor agricultural land. Other species use these areas as their primary habitat. There are approximately 230 acres of power line corridors and open land in Holden (1% of the total area). Power lines and other utility right-of-ways are also often used as movement corridors for wildlife, providing a means of getting from one habitat to another. Map 5 - 6 depicts the Major Habitats in Holden.

Forest Land

Holden continues to possess an abundance of forestland; however, residents have expressed concerns over large lot developments and expanding suburbs, and the resulting loss of natural resources. The Major Habitats Map shows 15,489 acres of forest in Holden (67% of the town's total area). Predominant forest types include Central Hardwoods-Hemlock-White Pine association, and to a lesser degree Swamp Hardwood association. The Central Hardwood Forest type is generally located on drier outwash soils and tills. Commonly found trees include red oak, hemlock, red maple, aspen, hickories, and gray birch. On more sandy soils, white pine trees can be located. For many decades, portions of forest owned by the City of Worcester surrounding Worcester reservoirs have remained uncut. These areas contain unusually mature and tall woodlots. Common forest shrubs and herbs include lowbush blueberries, wintergreen, clubmosses, and witch hazel. The Central Hardwood Forest habitat type is likely to be the most threatened because it is generally suitable for development. Table 5 - 4 shows the animals, birds, and mammals commonly found in Central Hardwood Forests.

Map 5 - 5: Major Habitats

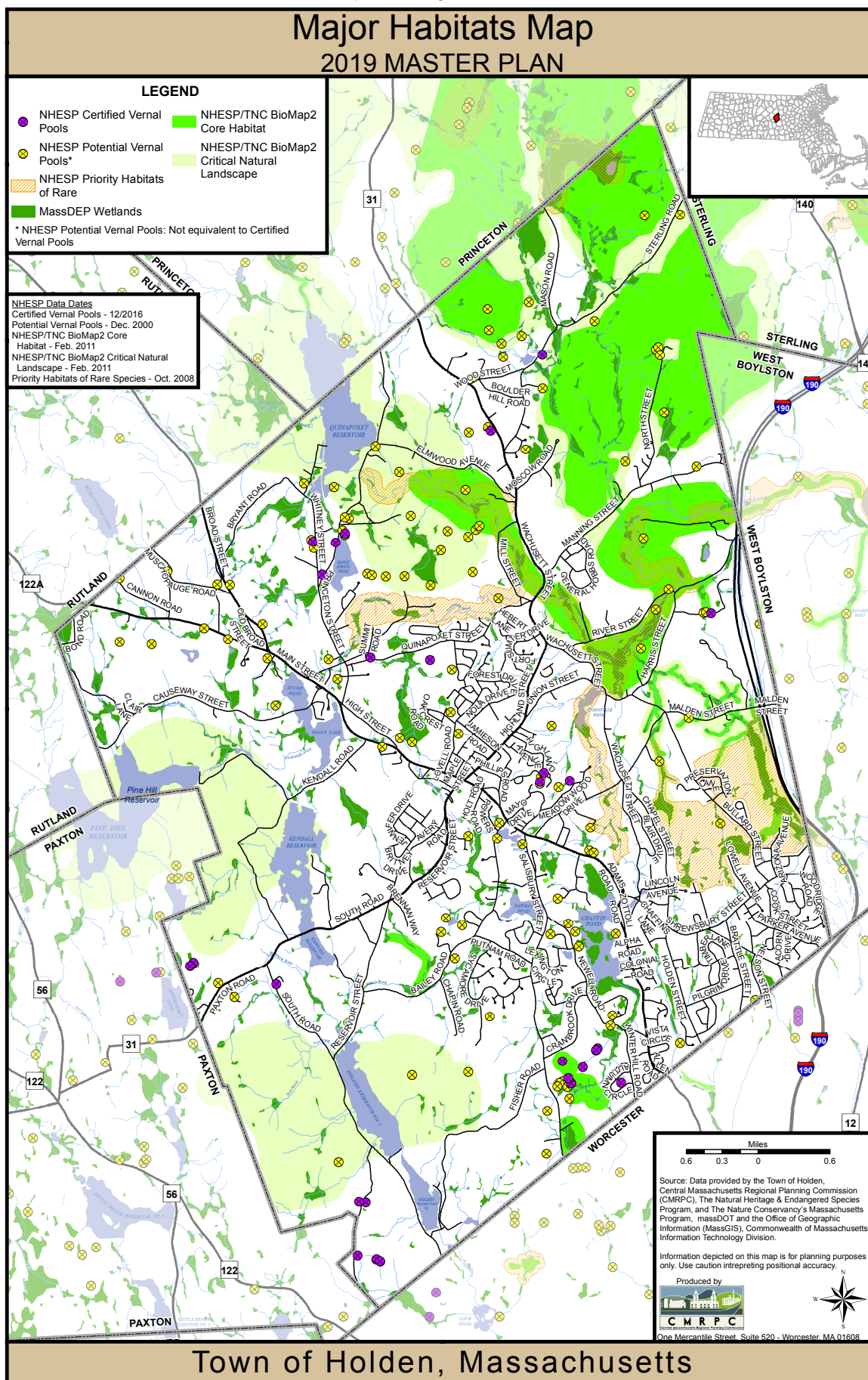


Table 5 - 4: Central Hardwood Forests Species (Holden Master Plan, 2008)

Class	Species	
Amphibian	Spotted salamander	American toad
	Redback salamander	Eastern milk snake
	Wood frog	Eastern garter snake
Bird	Red-tailed hawk	Ovenbird
	Cooper's hawk	Yellow-rumped warbler
	Mourning dove	Baltimore oriole
	Downy woodpecker	Pileated woodpecker
	Great-horned owl	Red-eyed vireo
	Eastern wood pewee	Broad winged hawk
	Blue jay	Ruffed grouse
	American crow	Black-capped chickadee
	White-breasted nuthatch	Wood thrush
	Brown creeper	Indigo bunting
Mammal	Scarlet tanager	Wild turkey
	Virginia opossum	Red Fox
	Eastern chipmunk	Eastern coyote
	Woodchuck	Raccoon
	Gray squirrel	River otter
	Red squirrel	White-tailed deer
	White-footed mouse	Striped skunk

Swamp Hardwoods, found in the scattered wetland areas of Town and along streams, are dominated by red maples and often are referred to as Red Maple Swamps. This type of forest can also contain trees such as the American ash, cedars, and black gum. Wetland understory shrubs including alder, viburnums, and blueberries are common in Swamp Hardwoods. Additionally, herbs are abundant and include sedges, ferns, false hellebore, and skunk cabbage. This habitat is often home to a variety of species that do not occupy Central Hardwood Forests. Table 5 - 5 highlights some of the species that occupy Swamp Hardwoods but not Central Hardwoods Forests.

Table 5 - 5: Swamp Hardwoods Species (Holden Master Plan, 2008)

Class	Species
Amphibian	Northern spring peeper
	Gray tree frog
	Bullfrog
	Northern water snake
	Northern ringneck snake
Bird	Red-shouldered hawk
	Swamp sparrow
	Barred owl
	Cedar waxwig
	Yellow warbler
	Common grackle
Reptile	Common snapping turtle
	Painted turtle

Forest Fragmentation

Many species depend on large expanses of uninterrupted forest habitats (and the interior portion of such areas in particular) for a significant portion of their lifecycle. Ecologists concur that forest fragmentation is one of the biggest threats to natural communities and biodiversity in Massachusetts and New England. The loss of large uninterrupted tracts of forest is contributing to the decline of many species of birds and mammals, making it all the more urgent to protect large forest areas in Holden.

There are three relatively large forest areas in Holden. The Town's western boundary includes many protected watershed lands and is highly forested. A second large forest area runs along the northern boundary of the Town from North Main Street to Manning Street. This area includes many state-owned watershed lands. A third large forested area in Holden runs along the eastern boundary of the Town from Manning Street and closely approaches Shrewsbury Street. It also includes several state-owned watershed lands.

To reduce forest fragmentation, the Town should continue to partner with local land trusts and conservation non-profit organizations to identify, acquire, and protect important additional natural resources areas including forests.

Non-forested Wetlands

The 2016 land use map identifies 429 acres of non-forested wetlands in Holden (2% of the total area) and 730 acres of water (3% of the total area). Most of the Town's non-forested wetlands can be found upstream of Chaffin Pond and near Stump Pond and Eagle Lake. These wetlands include bogs, meadows, shallow marshes, deep marshes, shrub swamps, and ponds. Other non-forested wetlands are scattered throughout Holden.

Level Bogs: These lands are dwarf shrub peatlands, generally with pronounced hummock and hollow formations. Since they receive little overland water input and are not connected to the water table, wetland peatlands are acidic and nutrient-poor. Poutwater Pond bog in Holden is a level bog that provides habitats for rare plants including dwarf mistletoe.

Wet Meadows: These lands are characterized by sedges and cattails, a surface water depth of up to six inches in winter and early spring, and exposed but saturated soil surface in summer. They typically provide habitat to wildlife species including the northern leopard frog, big brown bat, star-nosed mole, and short-tailed shrew.

Shallow Marsh: These lands are characterized by persistent emergent vegetation, such as cattails, and water depths up to 1.5 feet. They provide preferred habitat for the following wildlife species: northern spring peeper, painted turtle, northern leopard frog, great blue heron, green heron, Wilson’s snipe, Virginia rail, mallard duck, tree swallow, red-winged blackbird, American goldfinch, Virginia opossum, little brown bat, muskrat, mink, and raccoon.

Deep Marsh: These lands are characterized by emergent vegetation and floating-leafed plants such as water lilies, and water depths up to six feet. They provide preferred habitats for the following wildlife species: painted turtle, spotted turtle, red-spotted newt, wood duck, migrating pied-billed grebe, American coot, and the same mammal species found in Shallow Marshes.

Shrub Swamp: These lands are characterized by buttonbush, alder, silky dogwood, and red maple. Wildlife species that prefer these habitats include: American woodcock, yellow warbler, common yellowthroat, common grackle, song sparrow, swamp sparrow, American goldfinch, Virginia opossum, little brown bat, eastern cottontail, and raccoon.

Pond: Ponds are small bodies of water that are characterized by emergent vegetation such as cattails or floating-leafed plants, or both. Vernal pools are small seasonal ponds that often are not connected to streams or other water bodies. Thus, these standalone bodies of water depend on groundwater, snowmelt, and rainwater, and they usually become dry by late summer. Vernal pools are critical habitats for some salamander species, wood frogs, and a variety of other wildlife. Ponds and vernal pools also provide preferred habitat for the following species: pickerel frog, eastern painted turtle, little brown bat, big brown bat, mink, and beaver.

Rare or Endangered Species

The NHESP lists 11 occurrences of rare or endangered plants and animals in Holden, including the date of the most recently recorded local observation. As shown in Table 5 - 6, the three rare or endangered plants observed in Holden are dwarf mistletoe (a species of concern) and Houghton’s flatsedge and pod-grass (an endangered species). Table 5 - 7 shows recent sightings of eight state-listed animal species, two of which are threatened (Blanding’s Turtle and Bald Eagle) and six of which are of special concern (Eastern whip-poor-will, tulle bluet, wood turtle, spine-crowned clubtail, brook snaketail, and water shrew). These plants and animals are particularly vulnerable to habitat

Table 5 - 6: Endangered Species Observations in Holden- Vegetation (NHESP, MassWildlife, 2018)

Taxonomic Group	Scientific Name	Common Name	MESA Status	Most Recent Observation
Vascular Plant	<i>Arceuthobium pusillum</i>	Dwarf Mistletoe	SC	2008
Vascular Plant	<i>Cyperus houghtonii</i>	Houghton’s Flatsedge	E	2008
Vascular Plant	<i>Scheuchzeria palustris</i>	Pod-grass	E	1917
(E = Endangered; T = Threatened; SC = Special Concern)				

Table 5 - 7: Endangered Species Observations in Holden- Wildlife (NHESP, MassWildlife, 2018)

Taxonomic Group	Scientific Name	Common Name	MESA Status	Most Recent Observation
Bird	<i>Caprimulgus vociferus</i>	Eastern Whip-poor-will	SC	2017
Reptile	<i>Emydoidea blandingii</i>	Blanding's Turtle	T	1999
Dragonfly/Damselfly	<i>Enallagma carunculatum</i>	Tule Bluet	SC	Historic
Reptile	<i>Glyptemys insculpta</i>	Wood Turtle	SC	2016
Dragonfly/Damselfly	<i>Gomphus abbreviatus</i>	Spine-crowned Clubtail	SC	2016
Bird	<i>Haliaeetus leucocephalus</i>	Bald Eagle	T	2017
Dragonfly/Damselfly	<i>Ophiogomphus aspersus</i>	Brook Snaketail	SC	2016
Mammal	<i>Sorex palustris</i>	Water Shrew	SC	2011
(E = Endangered; T = Threatened; SC = Special Concern)				

destruction, invasive species, climate change, and human disturbances such as development or logging. Careful consideration should be given to species such as these when planning for Holden's natural resources.

Invasive Species

A major threat to the hardwood trees of Holden is the Asian longhorned beetle (ALB). Native to China, Japan, Korea, and the Isle of Hainan, the ALB is a destructive pest of hardwood trees that was first detected in the United States in 1996. The ALB attacks healthy hardwood tree species including maple, horse chestnut, birch, poplar, willow, and elm. The beetles lay eggs in and feed on the trees, eventually killing them. Each year a new generation of ALB is produced, making its threat to New England forests all the more severe. Should the pest expand into hardwood forests in the United States, the nursery, maple syrup, and forest product industries would experience severe devastation and economic losses.

The ALB was first detected in Worcester County in August 2008. Following its detection, DCR issued an order to prevent the insect's spread in Worcester County and Massachusetts. Orders consisted of identifying the affected areas, indicating an indefinite quarantine period, and regulating articles and activities. Treatment consists of removing the host trees and injecting pesticides into trees surrounding the host trees. In order to prevent the rapid spread of a beetle infestation, a 110-square-mile quarantine

zone that encompassed all of Worcester, West Boylston, Boylston, and Shrewsbury, and parts of Holden and Auburn, was established. More than 35,000 infested and high-risk host trees were removed. The last reported detection of the ALB in Holden occurred on December 29, 2014. While the beetle has not been officially eradicated in the area, the number of infested trees has significantly decreased. The loss of thousands of trees in Holden and other communities resulted in unrecognizable neighborhoods; however, efforts from the Worcester Tree Initiative (WTI) and DCR resulted in 30,000 trees replanted in the quarantine area. The Town should continue to pursue tree replanting efforts within the quarantine area if there are still significant gaps where trees used to be abundant.



Adult Asian Longhorned Beetle (Mass.gov)

Riparian Corridors

Riparian corridors are 100-meter natural corridors along waterways providing avenues of movement for some wildlife species and fulfilling other

ecological functions. These corridors are significant to people and the environment as they filter sediment from runoff before it enters rivers and streams, control erosion by absorbing and slowing stormwater runoff, provide a storage area for flood waters, provide food and habitat for fish and other wildlife, and preserve open space and aesthetic surroundings. If these corridors are disturbed or interrupted, damage to habitat and species population will result. Disruptions such as roads, parking lots, manicured lawns, or large commercial developments threaten the sustainability of these valuable wetland habitats. The preservation of riparian corridors should be prioritized by the community and enforced by the Conservation Commission.

Core Habitats

Holden has 10 areas identified by the state's BioMap2 Project as "core habitats" for conserving biodiversity for future generations. These core habitats include two exemplary or priority natural community cores, three forest cores, seven wetland cores, two aquatic cores, and seven species of conservation concern cores. The NHESP flagged these Core Habitats as "hotspots" for biodiversity. These areas are identified as the most viable natural communities and habitats for rare plants and animals and the most critical sites for biodiversity conservation across the State. Holden's BioMap2 core habitats consist of 3,361 acres. The protected core habitat consists of 2,538 acres, or 75% of the total core habitat. Summaries of the core habitats in Holden are included in Table 5 - 8 as well as a map of the core habitats included as Map 5 - 6.

Wildlife Management Areas

The Poutwater Wildlife Management Area (WMA) is a 378-acre property consisting of three parcels. The terrain is generally rough but moderately sloped. Access to the Poutwater WMA is located off of Mason Road and Sterling Road. There is an unmaintained dirt parking lot with five parking spaces located on Mason Rd near the Princeton Town border. Vegetation consists of mixed hardwood and conifer forest, while the small, northwestern parcel is dominated by thick shrub

swamp. A cold-water stream named Governor Brook flows through the northern parcel of the WMA and contains native trout. Additionally, wildlife in the WMA includes grouse, deer, gray squirrel, fox, turkey, and numerous non-game species. There are no special regulations at this wildlife management area. (Massachusetts Department of Fish & Game, MassWildlife Lands Viewer, 2018)

ISSUES AND OPPORTUNITIES

Maintaining the rural character of Holden while ensuring that it is a scenic and livable community requires a careful balancing of preservation, conservation, and development. The issues and opportunities in the following section were identified through analysis of previous reports, timely data, and the needs and concerns expressed by community members as part of the Master Plan public outreach process. The identification of these issues and opportunities is intended to help protect important land, water resources, and vegetation and wildlife, while encouraging connectivity and conservation.

Through community outreach efforts, Holden residents were able to voice their ideas, needs, and concerns about the Town's natural resources. Among the many responses, several themes stood out, including:

Concerns about valuable natural resources at risk of development

Appreciation of local water sources

Challenges protecting Eagle Lake

Better ADA Accessibility

Map 5 - 6: BioMap2 Core Habitat in Holden (BioMap2 Natural Heritage and Endangered Species Program)

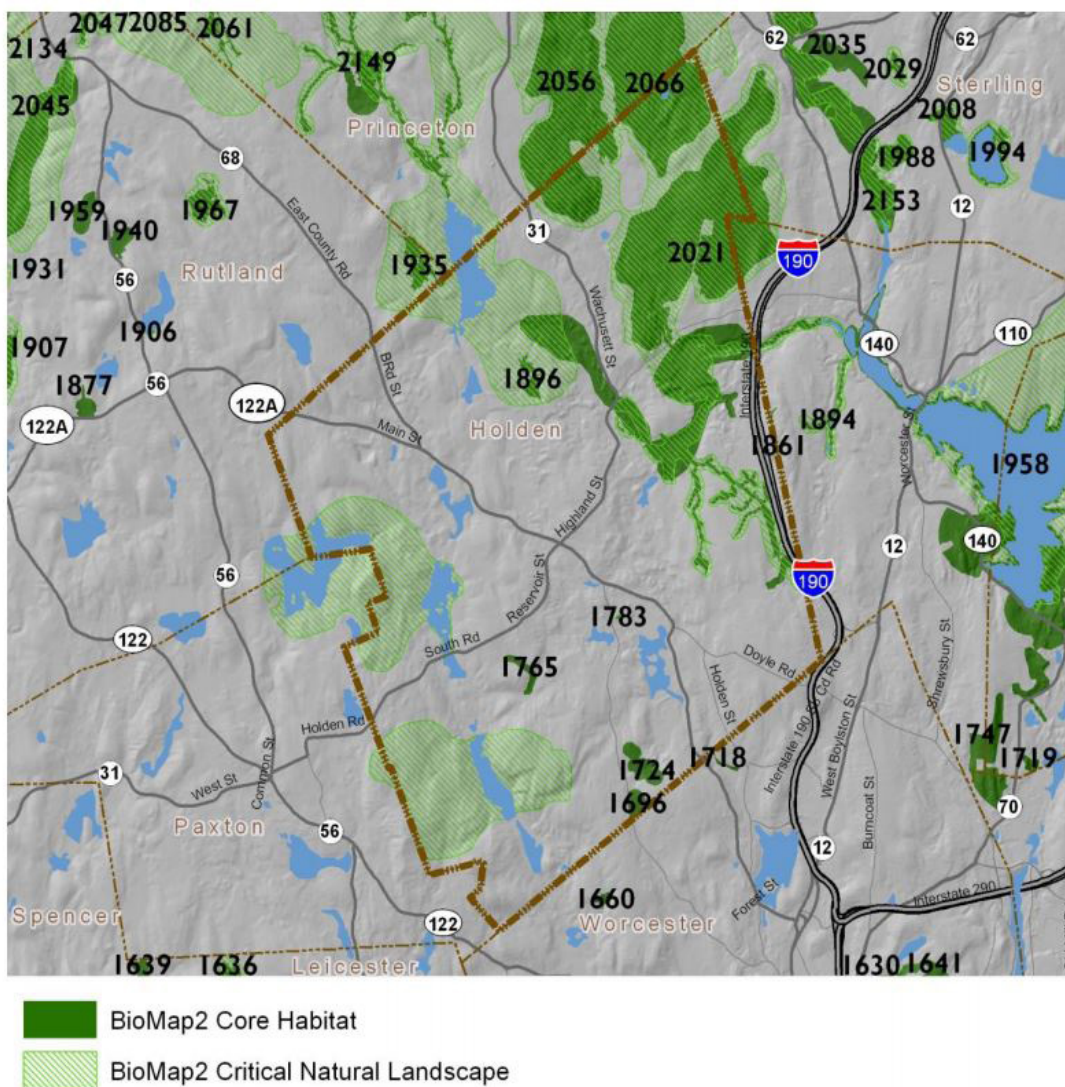


Table 5 - 8: BioMap2 Core Habitats in Holden (BioMap2 Natural Heritage and Endangered Species Program)

Core 1696	34-acre Core Habitat featuring a Species of Conservation Concern (four-toed salamander)
Core 1724	76-acre Core Habitat featuring a Species of Conservation Concern (four-toed salamander)
Core 1765	31-acre Core Habitat featuring a Species of Conservation Concern (spring salamander)
Core 1783	<1-acre Core Habitat featuring a Priority Natural Community (black gum swamp)
Core 1861	9-acre Core Habitat featuring a Species of Conservation Concern (Houghton's Flatsedge)
Core 1896	36-acre Core Habitat featuring Wetland Core
Core 1935	75-acre Core Habitat featuring Wetland Core
Core 2021	2,962-acre Core Habitat featuring Forest Core, Wetland Core, Aquatic Core, and Species of Conservation Concern (Brook Snaketail; Spring Salamander; Wood Turtle)
Core 2056	1,164-acre Core Habitat featuring Forest Core, Wetland Core, Vernal Pool Core, and a Species of Conservation Concern (Marbled Salamander)
Core 2066	1,057-acre Core Habitat featuring Forest Core, Wetland Core, Priority Natural Communities (Level Bog), and Species of Conservation Concern (Christmas Mistletoe; Four-toed Salamander)

The beauty and value of Holden's natural resources were clearly highlighted by the community. The following issues and opportunities aim to preserve these natural resources into the future.

Eagle Lake

Eagle Lake is a highly valued natural resource in Holden whose future is in question. The lake contains the Town Beach and is one of the most popular recreational spots in Town according to the Community Survey. Half of the community survey respondents stated they had visited Eagle Lake Town Beach in the past year. Despite its local popularity, recent years have given way to many issues. While the lake is Town-owned, the dam is not, creating a controversy with few options that will appeal to all parties. There are approvals in place that will allow the Lake to be drained approximately 4.5 feet. The dam is owned by multiple parties, one of which is a non-profit land trust with limited funds and expertise to manage, maintain, and repair the dam. Another of the three parties refutes ownership. This makes addressing issues related to Eagle Lake a challenging process.

In 2017, the Eagle Lake Committee was formed to review options for Eagle Lake. The committee continues to pursue options to save the community's prized resource. The Committee produced a report for the Town of Holden Board of Selectmen and Town Manager in 2018 that outlines issues and options in regard to Eagle Lake. Options presented in the report are summarized in the Open Space and Recreation chapter. In coordination with the owners of the dam, it is recommended that the Town work collaboratively with all interested parties to determine the most appropriate course of action in relation to the Eagle Lake dam. Potential courses of action include:

- Acquire and restore the dam
- Press the current owners to complete dam repairs
- Withhold permission to permanently lower Eagle Lake
- Revisit agreements with the City of Worcester regarding the amount of water diverted to

Worcester

- Remove the dam, thereby restoring the area to the natural, free-flowing state of a stream

Since Eagle Lake is a highly important resource to the community, public input should be sought throughout the decision-making process of the lake.

If the lake is not drawn down, there are a number of improvements beyond dam repairs that are necessary to restore Eagle Lake and the Town Beach to a healthier and more publicly accessible state. First, the spread of exotic aquatic weeds must be addressed. It is recommended that a comprehensive plan for controlling exotic weeds in Holden's water bodies, including Eagle Lake, be created and implemented in the near future.

Additionally, the swimming facilities at the Eagle Lake Recreation Area are in need of restoration, as recommended in the Eagle Lake Committee Report. In order to make the lake more accessible for all of Holden's residents, an improved and handicapped accessible launching point for kayaks and canoes should be installed. Eagle Lake and the Town Beach are Holden's treasured natural resources; much-needed maintenance at these popular spots should not go unattended.

Scenic Landscapes

Residents of Holden value the rural, scenic amenities throughout the Town. The beautiful natural features and historic small-Town landscape attract visitors during all seasons and are one of the many benefits of residing in the Holden.

The Scenic Road Act (Massachusetts General Laws Chapter 40, Section 15C) states that after a road has been designated as a scenic road, any repair, maintenance, reconstruction, or paving work done with respect thereto shall not involve or include the cutting or removal of trees, or the tearing down or destruction of stone walls, except with the prior written consent of the Planning Board. By adopting the Scenic Road Act at Town Meeting and creating a scenic roads bylaw, the Town of Holden could act upon the need to retain and protect the scenic

character and historical charm of designated roadways. A scenic roads bylaw is a preservation planning tool that protects the picturesque qualities of mountains, hills, and rolling terrain. It does so through additional design criteria requirements for new construction within these scenic landscapes. This type of bylaw can also be adapted into a scenic overlay district or address specific portions of a viewshed. The Town may wish to explore adopting the Scenic Road Act and a scenic roads bylaw. Map 5 - 7 show six unofficial scenic routes in Holden identified during the Open Space mapping effort (2008) that could be potentially designated:

- Bryant Rd. and Whitney St.
- Reservoir St.
- River St.
- Causeway St.
- Mason Rd.
- South Road

Trails are one of the most important ways for visitors to relish in scenic landscapes. To encourage greater use of the trail system in Holden, a wayfinding program for recreational trails should be implemented. A comprehensive system of signage and maps would help residents and visitors orient themselves with the Town's trails and paths. It would also promote safety, inclusivity, and encourage users to not stray from trails, which can be a major disturbance to natural habitats. There are numerous local organizations the Town can partner with, such as Wachusett Greenways, to explore establishing a trail wayfinding program.

Access to scenic landscapes is a significant issue that the Town should promptly address. While there are great expanses of open space in Holden, these natural resources are not readily available to all residents and visitors. Improving various trails to be compatible with Americans with Disabilities Act (ADA) standards is a step the Town should consider in order to allow all residents to enjoy Holden's natural beauty. Additionally, ADA compliant parking spaces at trailheads and other recreation areas should be a prioritized investment in the next five years.

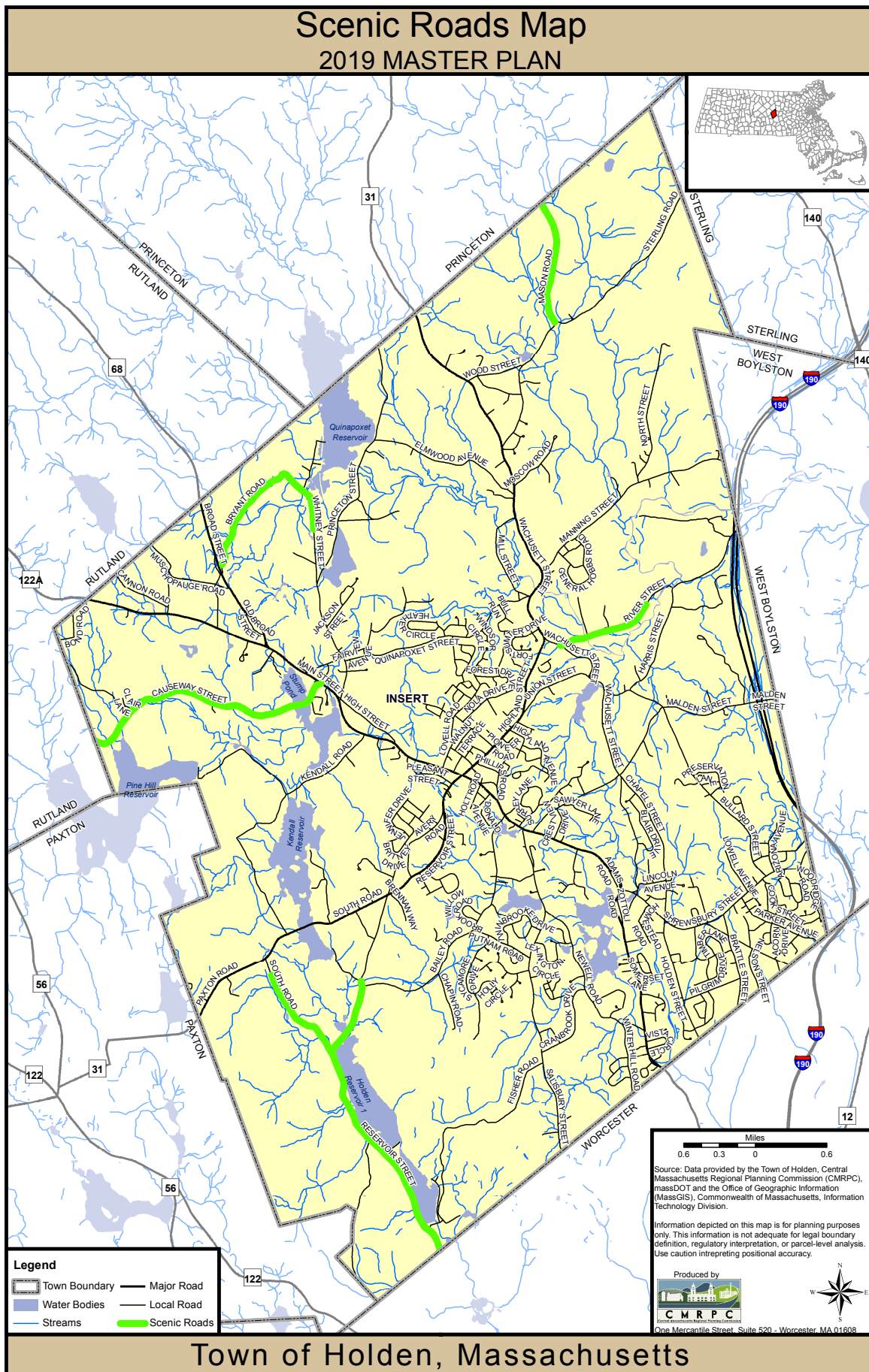
White Oak Land Conservation Society

The White Oak Land Conservation Society (WOLCS) is a small non-profit organization created to purchase, hold, advocate for, preserve, or transfer critical open space parcels in the Holden area. The organization endeavors to acquire and maintain land for preservation of wildlife so that current and future generations can enjoy the mental and physical well-being that wilderness and the natural environment provide. WOLCS is a local organization that has many of the tools and resources to assist the Town of Holden in preserving its natural resources. WOLCS owns 369 acres of open space and 242 acres of Conservation Restrictions in Holden. Porcupine Hill, Potter Sanctuary, Oak Hills, Holbrook Forest, North Street are the largest open space properties. One of the greatest concerns among Holden residents is the rate of development occurring in Holden and the loss of open space. The Town has partnered with WOLCS to acquire Holbrook Woods and should utilize a partnership with the WOLCS as a means of preserving land from development, preventing forest fragmentation, and maintaining the rural characteristics of the Town. The existing partnership between the Town and WOLCS should continue as a means of preserving land from development, preventing forest fragmentation, and maintaining the rural characteristics of the town.

Greater Worcester Land Trust

The Greater Worcester Land Trust (GWLT) is a small non-profit organization created to purchase, hold, advocate for, preserve, or transfer critical open space parcels in the Greater Worcester Area. The organization endeavors to acquire and maintain land for preservation of wildlife. GWLT is a local organization that has many of the tools and resources to assist the Town of Holden in preserving its natural resources. Kinney Woods, Cascades West, and Holbrook Woods in Holden are all included in the Four-Town Worcester Greenway created by GWLT. One of the greatest concerns of residents is the rate of development occurring in Holden and the loss of open space. The Town should utilize a partnership with the Greater Worcester Land Trust as a means of preserving land from development and maintaining the rural characteristics of the Town.

Map 5 - 7: Scenic Roads



GOALS, OBJECTIVES, AND ACTION ITEMS

The Master Plan recommends the following action items based on the goals and objectives crafted with careful consideration of the public outreach results, analysis of current conditions, and progress achieved since 2008.

CAPITAL ITEMS

Install and improve ADA compliant parking spaces at trailheads and other recreation areas, and ADA-friendly trails to accommodate accessibility for all

Install ADA-friendly trails to accommodate accessibility for all

Develop and implement wayfinding program for recreational trails

Implement a comprehensive plan to control the spread of exotic aquatic weeds, likely including resuming bi-annual winter drawdown or potentially dredging

Continue tree replanting efforts following significant tree removal to eradicate ALB

Goal 5.1: Protect natural resource areas from environmental degradation, disturbances, and development.

Objective 5.1.1: Utilize zoning, regulatory, and legislative resources to enhance natural resource conservation efforts.

- **Action Item 5.1.1.1:** Review the zoning bylaws and update regulations to better protect priority preservation areas (PPAs) and farmland.
- **Action Item 5.1.1.2:** Pursue adoption of conservation-related bylaws and policies, particularly zoning incentives for preserving open space and natural resources. Examples may include increases in financial incentives for creative and environmentally appropriate project proposals from developers or amending bylaws to require low impact development in sensitive natural resource areas.
- **Action Item 5.1.1.3:** Create an Open Space and Natural Resource Committee to coordinate protection and preservation initiatives.
- **Action Item 5.1.1.4:** Update and adopt stormwater regulations to reflect new Department of Environmental Protection (DEP) guidelines.
- **Action Item 5.1.1.5:** Update the 2006 Town Forest Stewardship Plan.
- **Action Item 5.1.1.6:** Determine status of forest management planning, particularly on lands owned by the Town and Commonwealth, in order to reduce wildfire threats and encourage management of invasive species.
- **Action Item 5.1.1.7:** Continue to work with local land trusts and non-profits to identify and acquire important unprotected natural resource areas for permanent protection.

Objective 5.1.2: Collaborate with local, regional, and state conservation organizations on natural resource management.

- **Action Item 5.1.2.1:** Work with local land trusts and non-profits to identify and acquire important unprotected natural resource areas for permanent protection.
- **Action Item 5.1.2.2:** Work with Massachusetts Department of Fish and Game's Natural Heritage and Endangered Species Program (NHESP) to identify and certify vernal pools that have not been certified.

Objective 5.1.3: Encourage development and management practices that minimize destructive impacts on valuable natural resources.

- **Action Item 5.1.3.1:** Establish a best practices training program for site contractors, landscapers, facilities managers, and others to learn about techniques to reduce stormwater runoff and pollution, deal with invasive species, reduce the use of toxic pesticides and herbicides, and maintain lands in a way that enhances protection of native species.
- **Action Item 5.1.3.2:** Develop comprehensive invasive species management from inventory stage through management planning and implementation in order to address existing invasive populations that threaten natural features such as open space or forests as well as to anticipate new invasive species which are likely to move into the area as a result of climate change.
- **Action Item 5.1.3.3:** Provide education and outreach on fertilizer effects to inform landowners about the negative water quality impacts of nutrient pollution and the relation to algal blooms.
- **Action Item 5.1.3.4:** Assess mosquito, tick, and other pest control options.

- **Action Item 5.1.3.5:** Develop an education and outreach program to inform the public about health risks associated with mosquitoes, ticks, and other pests. Determine future risks to human health due to increases in type and quantity of pests and disease vectors resulting from climate change.

Goal 5.2: Expand appropriate public access to the Town's natural resources.

Objective 5.2.1: Increase public access to ponds, streams, and, where appropriate, watershed protection areas.

- **Action Item 5.2.1.1:** Identify water resource access opportunities; pursue property rights as appropriate.
- **Action Item 5.2.1.2:** Identify the accessibility status of existing water resources. Undertake maintenance and improvements as necessary to meet the access needs of all populations.

Objective 5.2.2: Increase public access to the Town's forests and open spaces.

- **Action Item 5.2.2.1:** Assess the accessibility status of existing hiking and biking trails. Undertake maintenance and improvements as necessary to meet the access needs of all populations.
- **Action Item 5.2.2.2:** Encourage community involvement in trail maintenance activities to keep trails well-maintained and increase longevity.

Goal 5.3: Improve public awareness of Holden's natural resources.

Objective 5.3.1: Expand youth awareness of local natural resources.

- **Action Item 5.3.1.1:** Continue and expand current watershed education programs with Dawson and Mayo Schools, and expand to include Davis Hill.

Objective 5.3.2: Expand opportunities for community service and involvement in natural resource conservation.

- **Action Item 5.3.2.1:** Partner with local conservation organizations including the White Oak Land Conservation Society, Greater Worcester Land Trust, and Mass Audubon to host community events such as bird counting, trail maintenance, and volunteer days.
- **Action Item 5.3.2.2:** Create an internship program in coordination with the Conservation Commission and Conservation Agent to involve students in local conservation issues and activities.

Objective 5.3.3: Educate the public about the importance of natural resource protection.

- **Action Item 5.3.3.1:** Collaborate with local land trusts and non-profit organizations to host workshops, produce signage, and create and distribute informational brochures along with other educational materials.





What does
Holden think
about Natural
Resources?

NATURAL RESOURCES

Holden Community Survey Results

HOLDEN'S MOST VALUED NATURAL FEATURES

