dcr
Massachusetts

Resource Management Plan
Petersham State Forest

Adopted by the DCR Stewardship Council Month, 2025

Massachusetts Department of Conservation and Recreation
Division of Conservation and Resource Stewardship
Office of Cultural Resources

Maura T. Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Rebecca L. Tepper, Secretary
Nicole LaChapelle, Commissioner

Purpose

Resource Management Plans (RMPs) are foundational documents that identify a park, forest, or reservation's defining natural, cultural, and recreational resources and identify potential threats and opportunities to guide DCR's continued stewardship of the property and to inform future decisions about the property in a way that celebrates and preserves its identity.

RMPs are prepared for "all reservations, parks, and forests under the management of the department" (M.G.L. c. 21, § 2F). These plans "shall include guidelines for the operation and land stewardship of the aforementioned reservations, parks and forests, shall provide for the protection and stewardship of natural and cultural resources and shall ensure consistency between recreation, resource protection, and sustainable forest management." DCR finalizes RMPs following a public process and adoption by the DCR Stewardship Council. The contents of this RMP represent the best available information at the time of adoption by the Stewardship Council.

Mission and Core Principles

The Massachusetts Department of Conservation and Recreation (DCR), an agency of the Executive Office of Energy and Environmental Affairs, oversees 450,000 acres of parks and forests, beaches, bike trails, watersheds, dams, parkways, and over 100 National Register listed properties. The agency's mission is to protect, promote, and enhance our common wealth of natural, cultural, and recreational resources for the well-being of all.

DCR strives to be an exemplary leader in conservation and recreation. DCR's staff is passionate, dedicated, and continuously employs best practices, expertise, and a sense of place in carrying out the mission. The following core principles ground the agency in its work. For the benefit and well-being of all—people and the environment—DCR pledges to:

- Provide access to a diversity of outdoor recreational experiences and unique landscapes that is equitable, inclusive, and welcoming.
- Conserve lands, water, and forests by integrating science, research, and technical expertise into the management of our natural resources.
- Advance climate change mitigation and adaptation efforts by implementing sustainable practices and advancing resiliency across our infrastructure, assets, and resources.
- Support healthy communities by providing places for people to connect with nature and each other.
- Inspire generations of stewards by recognizing and honoring our legacy through partnerships, public engagement, and education.

Stewardship

DCR honors Indigenous peoples for their care, throughout many generations, of the land that DCR now stewards on behalf of the people of the Commonwealth. DCR embraces this legacy of stewardship, fostering a sense of shared responsibility by all people for protection of the waters, lands and living things for the enjoyment and appreciation of all.

To learn more about the DCR, its facilities, and programs please visit us at www.mass.gov/dcr. Contact us at mass.parks@mass.gov.

Petersham State Forest

https://www.mass.gov/locations/otter-river-state-forest

1. Property Overview

Characteristic	Value
Date Established	1996
Location	Athol, Petersham
Ecoregion	Worcester Plateau
Watershed	Chicopee, Millers
DCR Region	Central
DCR District	Central Highlands
DCR Complex	Otter River
Management Forestry District	Mid-State
Fire Control District	North Worcester
Size (acres)	644.4
Boundary Length (miles)	11.3
Elevation - Minimum (feet)	715.3
Elevation - Maximum (feet)	1,107.3
Environmental Justice (acres)	0.0
Estimated Annual Attendance (2023)	Unknown
Interpretive Programs (# programs, 2023)	0
Interpretive Programs (# attendees, 2023)	0

2. Landscape Designations

Designation	Acres
Parkland	0.0
Reserve	0.0
Woodland	643.8
No Designation	0.9

3. Regulatory Designations

Designation	Acres
Outstanding Resource Waters - Quabbin Reservoir	32.8
Priority Habitat (MESA)	39.4

4. Long-Term Agreements

Agreement	Expiration Year
None Identified	N/A

5. Concessions

Concession Type
None

6. Partners & Friends

Group(s)
None

7. Features of Interest

Feature
Nelson Brook
Riceville Brook
Riceville Pond

8. Natural Resources

Resource	Value
Tree Canopy (acres)	560.3
Rivers and Streams (miles)	2.7
Open Water (acres)	44.4
Wetlands (acres)	38.7
Certified Vernal Pools (#)	0
Potential Vernal Pools (#)	1
State-Listed Species (# Regulatory)	9
State-Listed Species (# Non-Regulatory)	0
Federally Listed Species (#)	0
Aquatic Invasive Plants (# known species)	0
Terrestrial Invasive Plants (# known species)	3

9. Forest Management (Since 2012)

Management Objective	Acres
N/A	0.0

10. History of Wildfires and Conditions Influencing Future Wildfires

Wildfire Attribute	Value or Characteristic
Number of wildfires on property; 2019–2023	0
Acres burned by wildfires on property; 2019–2023	0.0
Number of wildfires in Fire Control District; 2019–2023	294
Acres burned by wildfires in Fire Control District; 2019–2023	1169.6
Type of Wildland-Urban Interface	Intermix
Predicted rate of spread, based on Fire Behavior Fuel Model 13	Rapidly Spreading

11. Natural Hazards

Hazard Type	Acres
Flood (1.0%-chance)	87.7
Flood (0.2%-chance)	87.7
Hurricane Inundation (Cat. 1)	N/A
Hurricane Inundation (Cat. 4)	N/A

12. Climate Change (By 2070)

Type of Change	Amount of Change
Increase in annual days over 90° F	>30
Change in annual maximum daily rainfall (inches)	>10
Massachusetts Coastal Flood Risk Model area of inundation (acres)	N/A

13. Cultural Resources

Resource Type	#
Archaeological	0
Historic - Total MACRIS Listed	3
Historic - National Register Listed	0
Historic - National Historic Landmark	0

14. Recreation Resources

Resource	#
Riceville Pond and Dam	1
Trail System	1

15. Recreation Activities

Activity
Dog walking, on-leash
Hiking/walking
Hunting
Nature study/Photography

16. Roads and Trails

Metric	Value
Roads - Unpaved (miles)	0.7
Roads - Paved (miles)	0.3
Forest Roads - Unpaved (miles)	1.9
Forest Roads - Paved (miles)	0.0
Trails - Unpaved (miles)	0.4
Trails - Paved (miles)	0.0
Trails - Unauthorized (miles)	0.0
Trail Density (miles/acre)	0.004
Area of Impact (acres)	169.5

17. Parking

Parking Resources	#
Lots	0
Parking Spaces - Total	3
Parking Spaces - Accessible (HP)	0
Parking Spaces - Other	3

INTRODUCTION

Petersham State Forest (Petersham or the Forest) is located along the Petersham-Athol town line, approximately three miles northwest of the Petersham town center, and 30 miles northwest of the City of Worcester. The Forest is predominantly within the Town of Petersham. Federation of Women's Clubs State Forest, which is also predominantly within the Town of Petersham, is situated two miles south of the Forest, and DCR's Division of Water Supply Protection's (DWSP) Quabbin Watershed Lands are approximately one mile south of the Forest. Petersham consists of two tracts located in the Lower Worcester Plateau Ecoregion, they are:

- **Riceville Pond Tract**. This tract, the Forest's main tract, is located north of Tom Swamp Road and east of New Sherborn Road, primarily in Petersham. It is named for the tract's most prominent feature, the 61-acre Riceville Pond, an artificial impoundment along Riceville Brook that was constructed by the Civilian Conservation Corps (CCC) in the 1930s. Water enters the pond from Tom Swamp to the south and Nelson Brook to the east, and flows northwestward through the tract, exiting over Riceville Pond Dam. The tract is bordered to the south and much of the east and west by Harvard University's Harvard Forest. (See The President and Fellows of Harvard College (2021) for additional information on Harvard Forest.) Other adjacent land uses are primarily low-density residential development and undeveloped land. Nearly all of the Forest's trails, most notably a trail that parallels the pond's north shore, are located on this property.
- **New Sherborne Road Tract**. This tract is located along Riceville Brook in Athol, west of New Sherborn Road. It is surrounded by vacant land and rural residential properties. Riceville Brook, which flows from Riceville Pond, passes through this tract. A single trail segment, approximately 0.4-miles-long, passes through this tract to adjacent private properties.

The Forest is on land shaped by generations of Indigenous and non-Indigenous inhabitants. Past and present Indigenous residents embody fluid, relational connections to the places and spaces now known as Petersham State Forest. Indigenous groups and individuals, including peoples known as the Wabanaki (Dawnland Confederacy) and Pennacook, are recorded in available documentation (Native Land Digital 2023) as having relationships to this place over seasons and generations. Following Indigenous peoples' dispossession, the Commonwealth granted lots to 71 veterans, who served during the 1720s, in 1732 (Massachusetts Historical Commission (MHC) 1984). The "Volunteers Town" continued to grow and was incorporated as Petersham in 1754. In the late 18th and early 19th century, wood products contributed to the local economy as the forests were cleared for agriculture and settlement. The cleared land then enabled cultivation for crops or use as pasture. By 1885, approximately two-thirds of the Town's land was being used for hay and pasture (MHC 1984). "Although the entire region was farmed in the 1700s and 1800s, little agriculture remains today" (Clark 2014: 11). The Town's boundaries expanded in 1936 when portions of the Town of Dana not flooded by the creation of Quabbin Reservoir were added to Petersham (Clark 2014). As of 2014, 44.3% of the Town was permanently protected open space owned by DCR (39.8%) or by the Massachusetts Division of Fisheries and Wildlife (4.5%) (Clark 2014).

Petersham State Forest was established in 1924, with the acquisition of 248.15 acres (Massachusetts Department of Conservation (DOC) 1925). The Forest decreased by 40.8 acres in 1933, before gaining 270.9 acres in 1935 and an additional 148.66 acres in 1936 (DOC 1934, 1936, 1937). It has undergone little change in size since then. The CCC was active in the Forest between June 1935 and March 1941, creating and improving roads and truck trails, constructing buildings, building waterholes, improving

forest stands, removing brush and downed trees that could contribute to wildfires, and other similar activities (Berg 2001). In 1935, Camp S89, Company 1142, was established in the Forest; they remained only through January 1936. Among their accomplishments was the creation of Riceville Pond through the construction of the Riceville Pond Dam. A second CCC Camp, Camp S95, Company 120, was present in the Forest from July 1939 through March 1941. In the summer and fall of 1941, a public service camp, for conscientious objectors to military service, worked in the Forest reducing the fire hazard caused by the hurricane of 1938 (Berg 2001).

Harvard Forest, which abuts much of Petersham State Forest, has a historic connection to State forestry efforts. Harvard Forest was established in 1907 as a campus for experimental forestry. In 1921, the State Forester and Harvard Forest conducted a cooperative study of the white pine weevil in relation to forest management (DOC 1922). In the early 1920s, the Director of Harvard Forest provided three-day trainings to assistant foresters, district wardens, and superintendents of state forests (DOC 1926). In 1930, the Assistant Director of Harvard Forest supervised forestry work on nearby Federation of Women's Clubs State Forest (DOC 1931). There is no longer a formal relationship between DCR and Harvard Forest. Today, Harvard Forest provides a natural buffer for much of Petersham State Forest, and the two properties are physically and hydrologically connected, enhancing each other's ecological and social values.

Petersham State Forest rewards visitors with many unique natural resources. Riceville Pond can be viewed from many trail locations in Petersham. The Forest also protects many important natural areas including Priority Habitat for rare and endangered species.

PARK IDENTITY

Petersham State Forest is strongly identified with the history of forestry and conservation in Massachusetts, exemplified through the work of the CCC and the protection of rare species and rare species habitat. All future activities and improvements should be consistent with the Forest's Woodland Landscape Designation, emphasize protection of rare species and their habitats, ensure compatible recreation opportunities, protect known and potential cultural resources, and incorporate responsible forest management.

DEFINING RESOURCES AND VALUES

Resources that define the Forest are related to the protection of rare species and their habitats; the historic presence of the Civilian Conservation Corps, which continues to influence the Forest; and opportunities for passive recreation. They include:

- Contributions to landscape-scale resource protection.
  - Petersham is part of a broad conservation landscape to the north and east of Quabbin Reservoir. The Forest contributes to a contiguous land block with DWSP's Quabbin Reservoir Watershed lands, Harvard Forest, the Massachusetts Division of Fisheries and Wildlife's (MassWildlife) Popple Camp and Phillipston Wildlife Management Areas (WMAs), The Trustees' Brooks Woodland Preserve, the Massachusetts Audubon Society' (Mass Audubon) Rutland Brook Wildlife Sanctuary, municipal conservation lands, and properties with conservation restrictions.
- Endangered or uncommon natural resources.

  - Nine state-listed species have been documented in the Forest. All nine are associated with wetlands, streams, or lake and pond shores.
  - Approximately 39 acres of Priority Habitat, all associated with Riceville Pond and adjacent wetlands in the Forest, and contiguous with Priority Habitat on Harvard Forest.
  - A large Red Spruce Swamp, a priority natural community (S3, Vulnerable) abuts the Forest, which buffers and helps protect this community type.
- CCC resources, including roads, water holes, pine plantations, and the Riceville Pond Dam (Berg 1998).
- Riceville Pond, which adds to the Forest's aesthetics and enhances recreational opportunities in the Forest.
- Due to a near absence of recreation infrastructure and low levels of visitation, the Forest's natural and cultural resources are believed to remain relatively undisturbed.

STATEMENTS OF SIGNIFICANCE

Statements of Significance describe the importance or distinctiveness of a place and its resources (National Park Service (NPS) 1998). These statements reflect current scholarly inquiry and interpretation and go beyond a simple listing of resources to include contextual information that makes the facts more meaningful. Significance statements consider the following categories of information:

- The property's significance at the time of its establishment.
- How the property, or society's understanding of the property, has changed since its acquisition that makes it significant or unique within the state park system today.
- The property's role in recreation and its importance to the community it supports, particularly regarding activities that are unique to that property.

For park planning, these statements focus management actions on the preservation and enjoyment of those attributes that most directly contribute to the importance of the place. For interpretive planning, they comprise the information upon which the interpretive themes and overall program are built.

The following Statements of Significance have been identified for Petersham State Forest. The sequence of these statements does not reflect their level of significance.

- Beyond the original intents of timber harvesting, pest control, and fire control, DCR forest management objectives have evolved to include carbon sequestration and storage, diverse wildlife habitats, forest resiliency, safety, and water quality.
- The Massachusetts State Forest system was founded on the principles of scientific forest management. These practices contrasted with ongoing un-managed destructive practices throughout the country. This effort focused on the long-term cultivation of forests to achieve a sustainable harvest. Foresters worked to maximize production and provide a sustained yield over time, aiming for long-term stewardship over short term profits. The State Forests were also meant to serve as a model for private landowners, who the state foresters assisted in this endeavor.

UNIFYING THEME

The Unifying Theme is a statement that ties a property's stories together and shapes the overall interpretive message that DCR wants to share with visitors in their experience at the property. The theme provides an overarching conclusion for visitors to contemplate (Ham 2013) and answers the question "so what?" The theme guides all interpretation for the park, both personal (i.e., formal and informal interactions with visitors) and non-personal (e.g., exhibits, signage, brochures).

The Unifying Theme for Petersham State Forest is:

> Managing our State Forests for diversity and resilience leads to a healthier environment.

VISITOR EXPERIENCE

Petersham State Forest provides a variety of visitor experiences, including the following:

- **Virtual Experience.** Potential visitors will find little information about Petersham State Forest on DCR's web site. The "Find a Park" tool (https://www.mass.gov/info-details/find-a-park) identifies the Forest's location and lists Hiking/Walking as activities that visitors may enjoy here. There is no additional information to help potential visitors plan a trip. The Otter River State Forest web page does not list Petersham as being one of its "related parks."
- **Entering the Forest.** The Forest lacks a formal gateway, welcome wayside, or Main Identification Sign. Visitors park along the shoulder of New Sherborn or Nelson Roads and enter the Forest through informal trailheads.
- **Trail-based Passive Recreation.** Visitors may access a modest trails network of slightly over 2 miles of official trails and forest roads that extend along the pond shore and meander through the forest, providing visitors the opportunity for a light hike and Forest exploration.
- **Hunting.** The Forest is open to all legal hunting.

THREATS AND OPPORTUNITIES

The following information identifies potential threats to the park's natural and cultural resources and identifies opportunities to enhance their protection and stewardship. Although recreation is not considered a resource under statute (M.G.L. c. 21, § 2F), it is included below because recreation is an important part of the park-going experience, helps define a park's values, and is a key part of assessing the consistency of activities taking place in the Commonwealth's forests, parks, and reservations.

Threats and opportunities identified below are used to inform the development of management recommendations. Potential recommendations must meet prioritization criteria to be included in the Priority Recommendations table (Table 19, page 25).

Natural Resources

Threats

- Some culverts on trails and roads have been crushed, impeding natural water movement.
- All nine of the Forest's State-listed species are associated with aquatic resources. Changes to water quality or changes in hydrology may negatively impact these species.

- A small section of Red Spruce Swamp extends onto Petersham and is threatened by changes in hydrology (Swain 2020).
- The following three species of terrestrial invasive plants have been identified in the Forest: Asiatic bittersweet, Japanese barberry, and Norway maple (BSC 2017). Invasive species may negatively impact both the ecological integrity and biodiversity of the Forest.

Opportunities

- The Forest's one potential vernal pool may "support rich communities of vertebrates and invertebrates" (MassWildlife 2009) and serve as important habitat components for other wildlife. Surveying and certifying these pools (DCR (n.d.) and MassWildlife (2009)), as appropriate, may help better protect these animals.
- Within the Forest are occurrences of two types of rare species habitat, Regulatory and Non-Regulatory. Regulatory habitat is based on verified records of state-listed species and has associated mapped Priority Habitat. Non-Regulatory habitat is based on the presence of suitable habitat for state-listed species; there is no associated mapped Priority Habitat. On state lands, both are protected under the Massachusetts Endangered Species Act (MESA; 321 CMR 10.00). Requesting pre-filing consultation with the Natural Heritage and Endangered Species Program (NHESP) for "all works, projects, or activities" in the Forest, regardless of location in or out of Priority Habitat, will ensure continued protection of this habitat and compliance with the MESA.
- There is an opportunity to protect the Forest's ecological integrity and biodiversity through targeted removal of invasive plant species.
- Most of the Forest is located within the DCR Priority Watershed "selected Millers River Basin Lakes." DCR construction projects within Priority Watersheds maximize Stormwater Control Measures, potentially beyond those necessary to meet regulatory criteria (VHB 2022). By maximizing treatment, DCR addresses existing impairments in the receiving waters and contributes to improving water quality in the Priority Watershed. Designers of future projects at Petersham should review the latest Massachusetts Department of Environmental Protection (MassDEP) 303d list to understand other impairments of the receiving water and to fine tune stormwater treatment to address these pollutants, in accordance with the DCR Stormwater Design Handbook (VHB 2022).
- Maintaining, replacing, or installing culverts would allow for the free flow of water and decrease impacts to sensitive resource areas.
- Installing gates to deter off-highway vehicle (OHV) use could help better protect natural resources at Petersham from rutting, erosion, and trail widening.
- The Forest is located within the Quabbin to Cardigan Initiative's (Q2C) project area. This initiative is a public-private collaborative effort to conserve the Monadnock Highlands of north-central Massachusetts and western New Hampshire. The Forest's location within the project area offers opportunities to participate in organizational partnerships, grants, and land acquisitions in support of DCR's and Q2C's mutual conservation and recreation goals (Q2C 2023).
- The limited extent of trails and absence of other recreation infrastructure creates an opportunity for a "clean sheet" approach to ensuring consistency between the Forest's recreation and natural resources. Natural and Cultural resource surveys could determine the appropriate location, types, and levels of passive recreation within the Forest.

Cultural Resources

Threats

- Several potentially extant Civilian Conservation Corps (CCC) resources need to be identified, including water holes, fire roads and remnants of CCC camps.
- A CCC interpretive panel was previously located south of Riceville Pond Dam but has gone missing, with only the broken, rusted frame remaining.
- A lack of knowledge concerning archaeological resources in the Forest threatens their effective management and protection.

Opportunities

- Replacing the CCC interpretive panel and frame could better inform the public of the origin of the dam and the role of the CCC at Petersham.
- There is an opportunity to improve management, protection, and interpretation of significant cultural resources in the Forest through completion of a Forest-wide cultural resources reconnaissance survey in partnership with municipal, tribal, and regional entities.
- The entire Forest is located in the Sacred Ceremonial Hill Site, a "highly significant Native American "prayer hill" containing stone features" (Matthews 2008). This site has been determined to be eligible for listing on the National Register (Matthews 2008). The "site is considered by Tribal authorities to be part of a ceremonial district" (Shutesbury Historical Commission (SHC) 2021). Although the boundaries of the district "are presently undetermined," its approximate boundary is "a 16-mile radius around the Turners Falls Site" (SHC 2021). Because of the Forest's location within this potential district, there is a possibility that Indigenous ceremonial stone features occur within the Forest.
- A 2021 Phase I Inspection/Evaluation of Riceville Pond Dam (MA00014) identified the dam as being in Fair condition with eight deficiencies noted (Pare Corporation 2021). Implementing the plan's seven recommendations would address these deficiencies (Pare Corporation 2021).
- The limited extent of trails and absence of other recreation infrastructure creates an opportunity for a "clean sheet" approach to ensuring consistency between the Forest's recreation and cultural resources. Cultural resource surveys could determine the appropriate location, types, and levels of recreation within the Forest.

Recreation

Threats

- Approximately 14% of the park is within the 1.0%-chance flood zone and the 0.2%-chance flood zone. There are approximately 500 ft of trails within the flood zones that may be damaged by flood events (Massachusetts Bureau of Geographic Information (MassGIS) 1997). (These data are derived from the FEMA's paper Flood Insurance Rate Maps, or FIRMS, dating to 1979. Because of their age, FIRMS may only be used to portray zones of uncertainty and possible risks associated with flooding, not the absolute delineation of flood boundaries.)

- Limited official information is available on Petersham State Forest, including the lack of an official DCR webpage and map for the Forest, inhibiting public awareness of the property, its natural and cultural resources, and its recreational opportunities.
- Some culverts on trails and roads have collapsed leading to declining trail and road conditions.
- The Forest lacks a parking area, bike rack, and nearby public transit, potentially limiting visitor access to Petersham State Forest.
- The Riceville Road Tract is accessed via a trail across private property. No legal agreement to allow agency or public access through this property was identified during the preparation of this RMP.
- Petersham lacks internal navigation signage, impeding visitors from adequately navigating the trail system.
- Low-levels of unauthorized OHV use within the park might negatively impact visitor experience and current trail infrastructure.

Opportunities

- Adding a webpage for Petersham State Forest to DCR's website could help increase public awareness of the Forest, its natural and cultural resources, and recreational opportunities.
- Establishing a formal park gateway, with parking and park information, would create a destination for visitors and inform them of the key resources, rules, and recreation opportunities within the Forest.
- Adding trail signs and markings would help recreationists navigate the property.
- Establishing legal access to the Riceville Road Tract will ensure ongoing public access to this resource.
- Installing gates to deter OHV use could help improve trail conditions and visitor experience.
- There is an opportunity to ensure a compatible level and location of trails by conducting natural and cultural resource inventories prior to any creation, expansion, or improvement of trails.

CLIMATE CHANGE

Climate change impacts nearly every aspect of DCR's properties, from ecosystem health, to infrastructure, to recreation. (See DCR 2024 for an overview of these impacts.) The Department is actively working to mitigate and adapt to current and future impacts through such actions as forest management; decarbonizing DCR's buildings, vehicles, and power equipment; protecting wetlands; and using nature-based solutions to minimize stormwater impacts. Information on these, and other, efforts is incorporated into RMPs as available and appropriate.

Any discussion of climate change requires a shared understanding of terminology. Because of this, this RMP section adopts commonly accepted terms to the greatest extent possible. In general, climate-related technical terms used in this RMP are as defined in the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2021). Exceptions to this are the terms Adaptation, Risk, and Sensitivity, which are used as defined in DCR's Climate Change Vulnerability Assessment (CCVA; Weston and Sampson 2022).

DCR manages its forests to provide a range of ecosystem services such as recreation, clean water, wood commodities, and wildlife habitat (DCR 2020). For ecosystems under its management, DCR carefully considers both their vulnerability to climate change and their ability to mitigate the effects of climate

change by storing carbon in ecosystems and harvested wood products. Several approaches are used to monitor DCR forests and to design forest management strategies to adapt to climate change and provide ecosystem services. (See Swanston et al. (2016) for information on adaptation strategies and approaches associated with DCR's forest management.) Established in 1957, DCR's Continuous Forest Inventory (CFI) system uses a network of more than 2,000 permanent plots on which repeated measurements are taken on an ongoing basis. The CFI measures the status, size, and health of over 100,000 trees; other vegetation; down woody material; and the forest floor. (See DCR 2022 for additional information on the CFI system.) This information helps DCR understand at a strategic scale the current character, condition, and trends of forest ecosystems under its care. DCR also uses operational inventory to help plan specific treatments and evaluate their outcomes. Using these different scales of information, remotely sensed data, and local and regional external expertise, DCR plans projects that help its stands, forests, and other lands adapt to climate change and mitigate greenhouse gas emissions. The conservation and science-based management of forest lands are an essential element to ensuring crucial carbon storage and advancing climate change resilience (Massachusetts Executive Office of Energy and Environmental Affairs (EEA) 2024). For additional information on the relationship between DCR's forest management practices and climate change, please see pages 77–85 in Massachusetts Forest Action Plan 2020 (DCR 2020) and Managing Our Forests…For Carbon Benefits (DCR 2023).

The Department is actively assessing and addressing the vulnerability of its properties and facilities to the impacts of climate change. In 2022, DCR conducted a Climate Change Vulnerability Assessment (Weston and Sampson 2022). Findings from this CCVA are being used by DCR to enhance park operations and maintenance, inform resilient investment, and provide a framework for hazard mitigation and climate adaptation for natural resources, cultural resources, recreational activities, buildings, facilities, and other infrastructure. Property-specific climate change information from the CCVA is included in the Climate Change (by 2070) table (Table 12) at the beginning of this RMP. An overview of the impacts of climate change on DCR facilities and operations is presented in the DCR Climate Impacts Story Map (DCR 2024).

Climate Exposure and Impacts

A summary of the ways in which the Commonwealth's natural, cultural, and recreational resources may be impacted by climate change is provided below. During the preparation of Resource Management Plans some resources may be identified as having particularly high exposure and/or sensitivity to the anticipated hazards or consequences of climate change. When this occurs, these resources and the projected impacts to them are described. In some instances, the potential impacts of climate change on a given resource are not well understood. When this occurs, only exposure is discussed.

Natural Resources—General Impacts

Climate change affects temperature, precipitation, and atmospheric and ocean chemistry, which in turn directly and indirectly affect the natural environment, including the plants, animals, and natural communities of DCR's forests, parks, and reservations.

Climate is known to influence the presence, absence, distribution, reproductive success, and survival of both native and non-native plants (Finch et al. 2021). Native northern and boreal species, including balsam fir, red spruce, and black spruce may fare worse under future conditions, but other species may benefit from the projected changes in climate (Janowiak et al. 2018). Some non-native invasive species

will be affected by climate change while others will remain unaffected, and some non-invasive non-native species are likely to become invasive (Finch et al. 2021). In general, elevated temperature and CO_2 enrichment associated with climate change increases the performance of non-native plants more strongly than the performance of native plants (Liu et al. 2017). Climate change may result in the presence of new non-native invasive plants on a property, and changes to the distribution and/or abundance of invasives already present on a property.

Exposure to a changing climate affects wildlife in a variety of ways. For animals that live in or near aquatic environments, "changes in habitat and hydrological regimes are expected to shift their abundance and distribution" (Isaak et al. 2018: 89). Impacts to terrestrial animals are expected to be highly variable (Halofsky et al. 2018) but may be considered to fall into the following four categories: 1. habitat loss and fragmentation; 2. physiological sensitivities (i.e., innate characteristics that influence the ability to cope with changing temperature and precipitation conditions); 3. alterations in the timing of species' life cycles; and 4. indirect effects (e.g., disruption of ecological relationships) (Friggens et al. 2018). Although all Northeast wildlife are exposed to hazards associated with climate change, some groups, "including montane birds, salamanders, cold-adapted fish, and freshwater mussels, could be particularly affected by changing temperatures, precipitation, sea and lake level, and ocean processes" (MassWildlife 2015: 357). In addition, it is the position of the Massachusetts Natural Heritage and Endangered Species Program that state-listed species and Priority Natural Communities are likely to be highly sensitive to climate change and that all state-listed species will be negatively affected by hydrologic changes, changes in water, soil, and air temperature, and changes in forest composition.

Natural Resources—Property-Specific Exposure and Impacts

Riceville Brook, located on the Riceville Road and Riceville Pond Tracts, has been identified as a Coldwater Fisheries Resource by the MassWildlife. Such streams provide important habitat for coldwater species, which are typically more sensitive than other species to alterations in stream flow, water quality, and temperature (Massachusetts Bureau of Geographic Information (MassGIS) 2021). Riceville Brook, from the center of Riceville Pond downstream through the New Sherborn Road Tract, is exposed to climate impacts.

Climate change facilitates invasion by Japanese barberry "because of higher growth and germination in warmer climates" (Merow et al. 2017: E3276). Because of this, it is anticipated that barberry will further spread at Petersham.

Cultural Resources—General Impacts

Climate change may negatively affect cultural resources, their preservation, and maintenance (EEA 2022; International Council on Monuments and Sites (ICOMOS) Climate Change and Cultural Heritage Working Group 2019; Rockman et al. 2016: 3, 18; United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Center 2007). In Massachusetts, cultural resources may be exposed to the following natural phenomena that are correlated with adverse impacts: higher annual average temperature (especially in winter), increased numbers of freeze-thaw cycles, increased precipitation intensity, higher relative humidity, higher wind speeds, an increase in severe storm events, increased numbers and severity of wildfires, more severe seasonal droughts, increase in number and severity of inland flood events, increased coastal flooding and erosion, increased probability of landslides, changes in groundwater levels, shifts in native and invasive species distribution, performance, and phenology;

and changes in oceanic and atmospheric chemistry (Rockman at al. 2016; Commonwealth of Massachusetts 2023: 5.1-31–5.1-61).

The phenomena listed above may produce a variety of adverse impacts to Massachusetts' cultural resources. Sensitivity and potential impacts vary based on resource category (i.e., archaeological sites, cultural landscapes, ethnographic landscapes and sites, and buildings and structures). Resource-specific factors such as location, design, materials, condition, etc. will also influence sensitivity and consequent impacts. All categories of cultural resources may be subject to complete or partial destruction through wildfire, inland flooding, sea level rise, storm surge, or landslides. Additionally, these resource categories may be subject to other types of impacts, as follows. Archaeological sites may have site stratigraphy disrupted by changes in hydrography, may suffer accelerated decomposition of artifacts and features, and may be impacted inadvertently during disaster response. Cultural landscapes may lose plantings due to a variety of stressors (e.g., drought or flood, pests, soil salinity), may be infiltrated by invasives, may be eroded by surface runoff, may experience more rapid deterioration of hardscaping and site furnishings, and may be damaged by high wind or heavy snow events. Ethnographic landscapes, traditional cultural places, and associated communities (including Indigenous peoples) may suffer both tangible and intangible impacts such as loss or diminishment of natural species used for food, ceremony, or medicine; alterations in timing of hunts, etc.; increased difficulty of vulnerable subgroups (e.g., the elderly) to perform outdoor tasks; and a loss of cultural knowledge associated with resources and practices. Buildings and structures may be damaged or destroyed by high wind or heavy snow events, suffer accelerated deterioration through a variety of mechanisms (e.g., elevated humidity, chemical reactions, destructive pests and organisms), may be destabilized by hydrological changes, or be damaged by inadequate gutters or drainage systems (ICOMOS Climate Change and Cultural Heritage Working Group 2019: 73–89; Rockman et al. 2016: 20–24). (See Rockman et al. 2016: 19–24 for a detailed assessment of the potential impacts of climate change on cultural resources.)

Cultural Resources—Property-Specific Exposure and Impacts

No cultural resources with known elevated exposure or sensitivity to potential consequences of climate change were identified at this property.

Recreation—General Impacts

Outdoor recreation and park visitation are dependent on weather and climate and will be affected by a warming climate (Wilkins and Horne 2024). Higher temperatures positively affect participation in most outdoor activities, except snow-based activities (Wilkins and Horne 2024). "Winter is warming substantially faster than other seasons, and winter warming is especially pronounced in the...Northeastern United States" (Wilkins and Horne 2024: 15). Exposure to this climate change phenomenon is projected to significantly reduce the length of winter recreation seasons for downhill skiing, cross-country skiing, and snowmobiling, decreasing recreational opportunities and causing substantial economic impacts (Wobus et al. 2017). Whitewater rafting, primitive area use, and hunting are also projected to be negatively impacted by exposure changing weather patterns associated with climate change (Askew and Bowker 2024). Although "coldwater fishing habitat is expected to decline under a warming climate, which will likely result in fewer fishing days," overall fishing participation in the Northeast is projected to rise "due to the more favorable temperatures" (Wilkins and Horne 2024: 11). Horseback riding on trails, boating, swimming, and visiting interpretive sites are also expected to see higher participation in the Northeast under climate change (Askew and Bowker 2018). Temperature

preferences of campers indicate that the "number of ideal days" for camping will also increase (Wilkins and Horne 2024: 13). Participation in biking is also projected to increase, especially in the winter and shoulder months (Wilkins and Horne 2024: 13). Climate change may also impact outdoor recreation through increased impacts to recreation infrastructure (e.g., flooding impacts), and increased exposure to disease vectors (e.g., mosquitoes and ticks), longer pollen seasons, and heat-related illnesses (O'Toole et al. 2019).

Recreation—Property-Specific Exposure and Impacts

Recreation activities at the Forest likely to be negatively impacted by exposure to weather changes resulting from climate change include hunting.

Trail segments located within the most recent FEMA flood zones (MassGIS 1997) are exposed to the anticipated increase in precipitation (i.e., a greater than 10-inch increase in maximum daily rainfall; Table 12). (Precipitation changes due to climate change (see EEA 2022 and Weston and Sampson 2022) are not factored into FEMA flood plain modeling. Climate change may result in additional exposure to and impacts from flooding for cultural resources in the future. A FEMA-contracted report (AECOM 2013) finds that: "For the riverine environment, the typical 1% annual chance floodplain area nationally is projected to grow by about 45%, with very large regional variations ... approximately 70% of the 45% (or 31.5%) growth in the 1% annual chance floodplain is due solely to climate change" (AECOM 2013: ES6–ES7). Site-specific projections for future floodplain areas were not available at the time this RMP was prepared.)

APPLIED LAND STEWARDSHIP ZONING

DCR assesses the appropriate uses and stewardship of its properties at two spatial scales: the landscape level and the property level.

Landscape Designation

In 2012, DCR engaged in a comprehensive system-wide assessment of lands managed by its Division of State Parks and Recreation, designating them as Reserve, Woodland, or Parkland. (See Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines (DCR 2012) for details.) Multiple Landscape Designations may apply to individual properties with diverse resources and levels of development. All of Petersham State Forest was designated Woodland. Identification of Land Stewardship Zones within Petersham was performed in the context of the Woodland Designation.

The following Land Stewardship Zoning is recommended to guide management and any future development. (See Figure 1. Land Stewardship Zoning Map, page 21.)

Zone 1

Zone 1 areas have highly sensitive ecological and/or cultural resources that require additional management approaches and practices to protect and preserve these special features and their values (DCR 2012). The following areas of Petersham have been designated Zone 1.

- Tom Swamp and adjacent wetlands and uplands within the Forest, for the purpose of conserving and managing the Forests' state-listed species. This area is bordered by Tom's Swamp, Tom's Swamp Road, and Nelson Road.

Zone 2

Zone 2 areas provide for a balance between resource stewardship and recreational opportunities that can be appropriately sustained. They include stable yet important cultural and natural resources. These areas provide a buffer for sensitive resources, recharge areas for surface and groundwaters, and large areas where existing public recreation activities can be managed at sustainable levels (DCR 2012). The following areas of Petersham have been designated Zone 2.

- All areas not identified as Zones 1 or 3.

Zone 3

Zone 3 areas include altered landscapes in active use and areas suitable for future administrative, maintenance, and recreation areas (DCR 2012). The following areas of Petersham are currently developed, appropriate for potential future development, or intensively used for recreation. They have been designated Zone 3.

- Riceville Pond Dam, including the aprons, spillway, and other existing development needed to operate, maintain, or repair this dam.

Significant Feature Overlay

Significant Feature Overlays provide precise management guidance in order to maintain or preserve recognized resources features regardless of the zone in which they occur. The following Significant Feature Overlays were developed for Petersham.

- **Watershed Protection Act Overlay.** Land uses and activities within this overlay should be consistent with Massachusetts Watershed Protection Act (WsPA) regulations. Overlay boundaries on map encompass WsPA Primary and Secondary Protection Zone and are approximate, other geographic areas may be regulated under the WsPA. See 313 CMR 11.00 for regulations and the associated guidance document (DCR 2017) for details on the processes used for implementation of the act.

DCR Stewardship Map Tool

This RMP should be viewed in conjunction with DCR's Stewardship Map, a GIS-based tool that allows users to view a property's natural, cultural, and recreational resources. The Stewardship Map tool is dynamic, and information continues to be updated after adoption of an RMP. Guidance for using the tool, as well as Best Management Practices for resource stewardship, are located on the Stewardship Map site: https://dcrsgis-mass-eoeea.hub.arcgis.com/.

Because authorized trails are located within State-Listed Species Habitat on this property, managers should consult an additional GIS-based tool, the Natural Heritage and Endangered Species Program NHESP 2022 Guidance Codes for DCR Trail Maintenance Map. (https://mass-eoeea.maps.arcgis.com/home/item.html?id=cb252e8df40d408c81fe8fcf690e14f6) This tool allows users to select specific trail segments and identify restrictions and regulatory review associated with performing 10 common trail maintenance activities on these segments. Because site-specific rare species information is confidential under Massachusetts law (M.G.L. c. 66, § 17D), access to this tool is restricted.

CONSISTENCY REVIEW

Resource Management Plans "shall ensure consistency between recreation, resource protection, and sustainable forest management" (M.G.L. c. 21, § 2F). For planning purposes, an activity is considered consistent with resource protection if it has no significant, long-term, adverse impact on resources. To this end, a series of indicators were developed to evaluate the impacts of recreation and forest management on natural and cultural resources.

Many activities with the potential to negatively affect resources are already subject to agency and/or regulatory review (e.g., forest management activities, projects within Priority Habitat). For these activities, compliance with state regulations, regulatory authority guidance, DCR policies and processes, and Best Management Practices (BMPs) is considered an indicator of consistency between park use and resource protection. New indicators were generated for activities not subject to agency or regulatory review, and are based on available data, information readily identifiable via aerial imagery or site visits, assessments by DCR subject matter experts, or the property manager's knowledge of park conditions and use. (See Table 18, page 22.)

Indicators are applied during the RMP planning process in order to ensure a standardized assessment of consistency across all properties in the DCR system. Inconsistencies identified via the application of indicators are used to inform the development of management recommendations.

The status of indicators (Yes, No, Unknown, and N/A) were accurate at the time this RMP was prepared and were used for planning purposes. However, they represent a snapshot in time and may not reflect future conditions. In addition, the status of indicators will change as recommendations get implemented.

MANAGEMENT RECOMMENDATIONS

Twelve priority management recommendations were developed for this property. They are presented in Table 19, page 25. All recommendations are of equal importance.

Priority management recommendations derive from Threats, Opportunities, and Consistency Assessment information presented in this RMP. For a recommendation to be considered a priority and listed in the table, it must meet one or more of the criteria listed below. Maintenance and management needs not meeting one or more of these criteria are not included in the table but are identified in the Threats and Opportunities sections.

The following types of recommendations are considered priority:

- Natural resource stewardship and restoration activities consistent with park identity and intended to improve ecological function and connectivity.
- Cultural resource management activities consistent with park identity and intended to prevent the loss of integrity of significant cultural resources.
- Improvements consistent with park identity that are needed to support intended park activities.
- Actions required for regulatory compliance or compliance with legal agreements.
- Activities that prevent or ameliorate threats to the health and safety of park visitors and employees.
- Activities that address inconsistencies among recreation, resource protection, and sustainable forest management, as identified through use of the Consistency Assessment checklist.

Progress toward implementing priority recommendations is tracked through the use of DCR's Capital Asset Management Information System (CAMIS). The property manager should enter each recommendation listed in Table 19 (page 25) into CAMIS as a separate work order, noting "*RMP" in the description field. Non-traditional work orders (e.g., volunteer trail work, posting of DPH Fish Consumption Advisory posters, certification of vernal pools) should be closed out by the property manager, once the recommendation has been implemented.

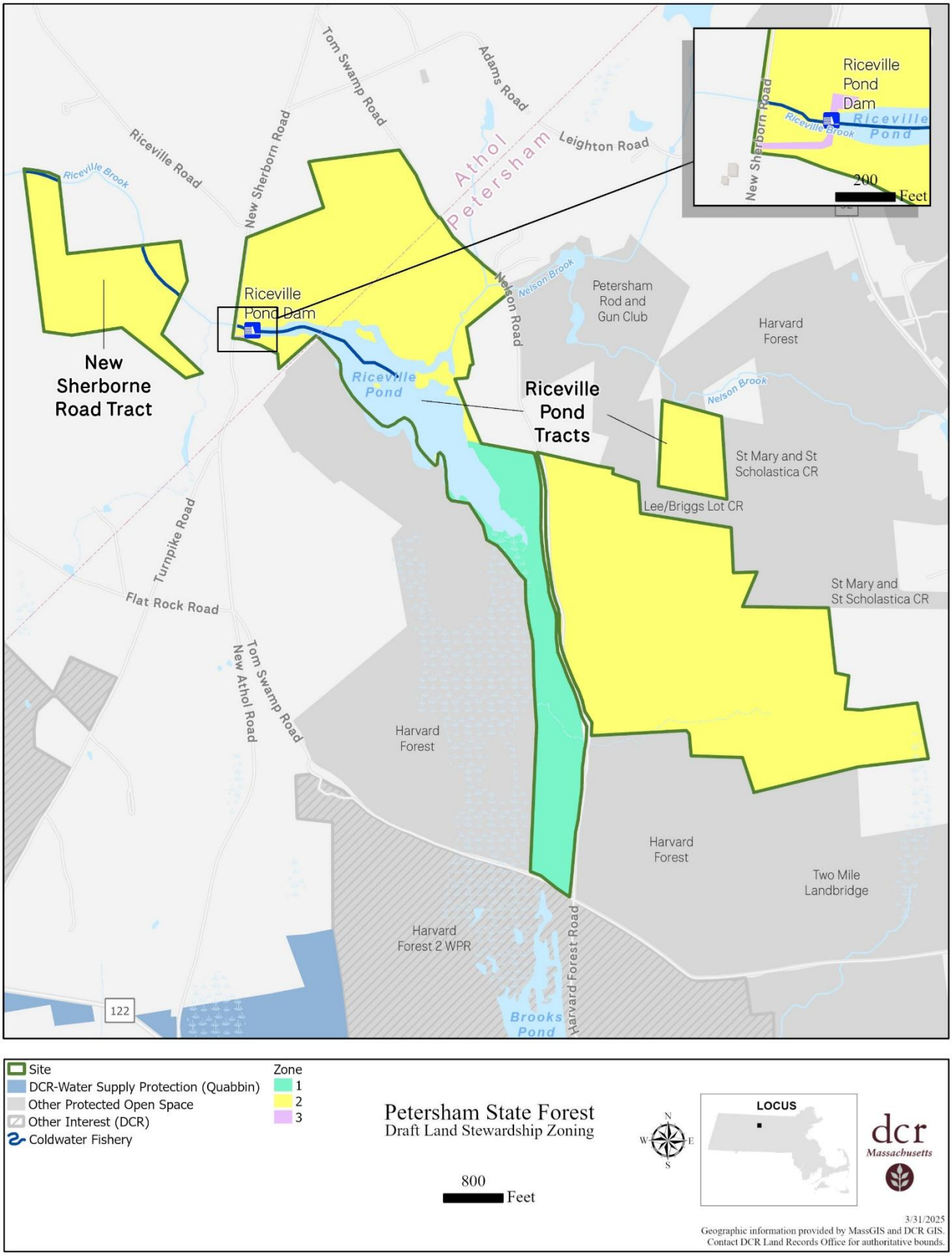

Figure 1. Land Stewardship Zoning Map.

Table 18. Consistency Assessment. This assessment represents a snapshot in time and may not reflect future conditions.

Category	Metric	Status
Landscape Designation	1. All development and uses of the park since 2012, or currently planned for the park, are consistent with its Landscape Designation(s).	Yes
Natural Resources	1. All projects (normal maintenance activities, special projects, volunteer projects) conducted within Priority Habitat were reviewed and approved through DCR's internal review process and by NHESP for potential impacts to rare species and their habitats.	Uknown
Natural Resources	2. All projects conducted within areas subject to state and/or federal wetlands or waterways regulations were reviewed and approved through DCR's internal review process; reviewed and approved through the appropriate, local, state, and/or federal review process; and were carried out in accordance with the terms of a valid permit.	Unknown
Natural Resources	3. Sensitive resource areas, such as steep slopes, riverbanks, streambanks, pond and lakeshores, wetlands, and dunes are free of desire paths and other user-created trails.	Uknown
Natural Resources	4. Aquatic areas adjacent to beaches, boat ramps and launches, roads, and hiking trails are free of eroded sediments.	No
Natural Resources	5. The extent of exposed soil in campground and/or picnic sites is stable or decreasing.	N/A
Natural Resources	6. The extent of native vegetation in campground and/or picnic sites is stable or increasing. (As assessed by property manager.)	N/A
Natural Resources	7. Area of trail impacts in Reserves is less than 50% of total area. (See Naughton (2021) for information on primary area of trail impacts.)	N/A
Natural Resources	8. Congregations of breeding, migratory, or wintering wildlife are protected from disturbance by temporary (e.g., seasonal) restrictions on recreational access.	Unknown
Natural Resources	9. Geocaches, letterboxes, orienteering control locations, and other discovery destinations are located outside sensitive natural resource areas and their locations have been reviewed and approved by park personnel. (As assessed by property manager.)	No
Natural Resources	10. Zone I wellhead protection areas are free of vehicle parking, chemical storage, or concentrated recreation.	N/A

Category	Metric	Status
Natural Resources	11. All boat ramps and launches have cleaning stations and/or educational signs and materials on preventing the spread of aquatic invasive organisms. (As assessed by property manager.)	N/A
Natural Resources	12. For each barrier beach there is a current, approved Barrier Beach Management Plan and all beach-related activities are conducted in accordance with this plan.	N/A
Cultural Resources	1. All maintenance activities and projects with the potential to cause sub-surface disturbance are being reviewed by the DCR archaeologist for potential impacts to archaeological resources.	Uknown
Cultural Resources	2. All maintenance activities and projects affecting historic properties (buildings, structures, and landscapes over 50-years-old) are being reviewed by the Office of Cultural Resources to avoid adverse impacts.	Uknown
Cultural Resources	3. Historic buildings, structures, and landscapes are being used, maintained, and repaired in a manner that preserves their cultural integrity and conveys their historic significance to park visitors.	Uknown
Cultural Resources	4. Recreational activities such as hiking, biking, and boating are not eroding cultural properties such as archaeological sites or historic landscapes through creation of desire lines, rutting in the landscape, damage to historic built features, or excessive scouring (erosion) of coastal and shoreline areas.	Uknown
Cultural Resources	5. Geocaches, letterboxes, and other discovery destinations are located away from sensitive cultural resources, and their locations have been reviewed and approved by park personnel.	No
Cultural Resources	6. Historic buildings, structures, landscapes, archaeological sites, and concentrations of historic resources are located outside of areas predicted to be subject to flooding, storm surge, or sea-level rise.	Unknown
Recreation	1. Types of recreation, levels of recreational use, and types and extent of recreation infrastructure are consistent with the park's identity statement.	Yes

Category	Metric	Status
Recreation	2. Trail density is consistent with the park's Landscape Designation(s). (See Trails Guidelines and Best Practices Manual (DCR 2019) for density thresholds.)	Yes
Recreation	3. All authorized trail construction was performed in accordance with an approved Trail Proposal Form.	Unknown
Recreation	4. Over 90% of the park's official trails network is classified as being in Fair or better condition.	No
Recreation	5. Recurring use by OHVs is restricted to authorized trails. (As assessed by property manager.)	No
Recreation	6. There is a high level of compliance with dog leash regulations and policies. (As assessed by property manager.)	No
Recreation	7. Athletic fields are free of recreation-caused impacts (e.g., bare spots) to turf. (As assessed by property manager.)	N/A
Recreation	8. Water-based recreation is consistent with "Uses Attained" designation as identified by MassDEP in its most current integrated list of waters (e.g., MassDEP 2023); DPH fish consumption advisories; and/or water quality testing at waterfront areas.	Yes
Recreation	9. Recreation facilities are located outside of areas subject to flooding, storm surge, or sea-level rise.	No
Sustainable Forest Management	1. Forestry activities are consistent with Landscape Designation and associated forestry guidelines.	N/A
Sustainable Forest Management	2. Forestry activities are consistent with current Forest Resource Management Plan.	N/A
Sustainable Forest Management	3. Tree cutting is performed in accordance with an approved cutting plan, if required under the Massachusetts Forest Cutting Practices Act (M.G.L. c. 132, §§ 40–46).	N/A

Table 19. Priority Recommendations for Petersham State Forest. All recommendations are of equal importance. When multiple agency parties are responsible for implementing a recommendation, the lead party, or parties, are identified parenthetically in the Implementation column. Property managers should enter these recommendations as work orders in CAMIS to ensure their tracking and implementation.

Category	Recommendation	Implementation
Natural Resources	Following appropriate review and permitting, implement species-specific management recommendations as described in the Invasive Plant Management Plan: Central Region (BSC Group 2017).	Office of Natural Resources (Lead), Park Operations, Partner
Natural Resources	Survey, document, and submit documentation to certify potential vernal pools, in accordance with DCR (n.d.) and MassWildlife (2009), as warranted.	Office of Natural Resources (Lead), Volunteers
Natural Resources	Repair or replace collapsed culverts on forest roads and trails.	Management Forestry, Office of Cultural Resources, Office of Natural Resources, Park Operations (Co-Lead), Trails and Greenways Program (Co-Lead)
Cultural Resources	Conduct an archaeological reconnaissance survey (950 CMR 70) in cooperation with municipal, tribal and non-profit partners, including the Towns of Petersham and Athol. Complete appropriate Massachusetts Historical Commission archaeological site forms for identified archaeological resources.	Consultant, Office of Cultural Resources (Lead), Partners
Cultural Resources	Work with Indigenous partners to inventory, document, conserve, and interpret Indigenous peoples' resources and Indigenous peoples' history within the Forest.	Office of Cultural Resources (Lead), Partner
Cultural Resources	Implement recommendations in Phase I Inspection/Evaluation Report of Riceville Pond Dam (Pare Corporation 2021).	Contractor, Office of Cultural Resources, Office of Dam Safety (Lead)

Category	Recommendation	Implementation
Cultural Resources	Replace Civilian Conservation Corps interpretive panel at Riceville Pond Dam.	Office of Cultural Resources, Interpretive Services (Lead)
Recreation	Establish a formal agreement to allow DCR and public access across private property to access the New Sherborn Road Tract.	Land Protection Program (Co-Lead), Office of the General Counsel (Co-Lead), Park Operations
Recreation	Add standard DCR trails signage and assurance blazes to existing trails to "keep people from getting lost and contribute to a positive user experience" (DCR 2019: 44).	Park Operations (Lead), Trails and Greenways Program
Recreation	Establish a DCR web page for Petersham State Forest.	Interpretive Services, Regional Staff (Lead), Park Operations, Web Content Creator
Recreation	Following completion of natural and cultural resources surveys, revisit the Land Stewardship Zoning and adjust as needed to reflect new information on the Forest's resources.	Office of Cultural Resources
Recreation	Establish a Forest gateway area with parking, Identification Sign, Welcome Wayside, and kiosk.	Design & Project Management (Lead), Facilities Engineering, Interpretive Services, Park Operations

REFERENCES

Askew, A. E., and J. M. Bowker. 2018. Impacts of Climate change on outdoor recreation participation: Outlook to 2060. Journal of Park and Recreation Administration 36: 97–120. https://www.srs.fs.usda.gov/pubs/ja/2018/ja_2018_bowker_001.pdf (PDF)

Berg, S. 1998. Petersham State Forest – Riceville Pond (PET.903). Massachusetts Historical Commission Form F – Structure. On file, Massachusetts Historical Commission, Boston, MA. https://mhc-macris.net/details?mhcid=PET.903

Berg, S. P. 2001. The Civilian Conservation Corps, shaping the forests and parks of Massachusetts. A statewide survey of Civilian Conservation Corps resources. Prepared for the Department of Environmental Management, Boston, MA, by Shary Page Berg, Landscape Preservation Planning and Design, Cambridge, MA. https://archives.lib.state.ma.us/handle/2452/835790

BSC Group. 2017. Invasive Plant Management Plan: Central Region. June 2017

Clark, R. A. 2014. Town of Petersham Open Space & Recreation Plan 2014. Prepared by Robert A. Clark, Chair, Petersham Conservation Commission, Chair, Open Space & Recreation Committee. https://townofpetersham.weebly.com/uploads/2/7/5/3/27531945/osrp_2014_complete.pdf (PDF)

Commonwealth of Massachusetts. 2023. ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan. ResilientMass Action Team, Boston, Massachusetts. https://www.mass.gov/doc/resilientmass-plan-2023/download (PDF)

Finch, D. M., J. L. Bitler, J. B. Runyon, C. J. Fettig, F. F. Kilkenny, S. Jose, S. J. Frankel, S. A. Cushman, R. C. Cobb, J. S. Dukes, J. A. Hicke, and S. K. Amelon. 2021. Effects of Climate Change on invasive species. Chapter 4 *in* T. M. Poland, T. Patel-Weynand, D. M. Finch, C. F. Miniat, D. C. Hayes, and V. M. Lopes (Editors) Invasive species in forests and rangelands of the United States: A comprehensive science synthesis for the United States forest sector. Springer. https://library.oapen.org/bitstream/handle/20.500.12657/46792/2021_Book_InvasiveSpeciesInForestsAndRan.pdf?sequence=1&isAllowed=y (PDF)

Ham, S. H. 2013. Interpretation: Making a difference on purpose. Fulcrum Publishing, Golden, CO.

Intergovernmental Panel on Climate Change (IPCC). 2021. Annex VII: Glossary [Matthews, J.B.R., V. Möller, R. van Diemen, J.S. Fuglestvedt, V. Masson-Delmotte, C. Méndez, S. Semenov, A. Reisinger (eds.)]. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 2215–2256, doi:10.1017/9781009157896.022. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_AnnexVII.pdf (PDF)

International Council on Monuments and Sites (ICOMOS) Climate Change and Cultural Heritage Working Group. 2019. The Future of our Pasts: Engaging Cultural Heritage in Climate Action. ICOMOS, Paris, France.
https://civvih.icomos.org/wp-content/uploads/Future-of-Our-Pasts-Report-min.pdf (PDF)

Isaak, D. J., M. K. Young, C. Tait, D. Duffield, D. L. Horan, D. E. Nagel, and M. C. Groce. 2018. Effects of climate change on native fish and other aquatic species. Pages 89–111 *in* Halofsky, J. E., D. L. Peterson, J. J. Ho, N. J. Little, and L. A. Joyce (Eds.). Climate change vulnerability and adaptation in the Intermountain Region. Gen. Tech. Rep. RMRS-GTR-375. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Part 1. Pp. 1–197.
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd578946.pdf (PDF)

Liu, Y., A. M. O. Odour, Z. Zhang, A. Manea, I. M. Tooth, M. R. Leishman, X. Xu, and M. Van Kleunen. 2017. Do invasive alien plants benefit more from global environmental change than native plants? Global Change Biology (2017), doi: 10.1111/gcb.13579.
https://www.researchgate.net/profile/Xingliang-Xu/publication/310902903_Do_invasive_alien_plants_benefit_more_from_global_environmental_change_than_native_plants/links/5a20bb30a6fdcccd30e032dc/Do-invasive-alien-plants-benefit-more-from-global-environmental-change-than-native-plants.pdf (PDF)

Massachusetts Bureau of Geographic Information (MassGIS). 1997. MassGIS Data: FEMA Q3 Flood Zones from Paper FIRMs.
https://www.mass.gov/info-details/massgis-data-fema-q3-flood-zones-from-paper-firms

Massachusetts Bureau of Geographic Information (MassGIS). 2021. MassGIS data: MA Wildlife Coldwater Fisheries Resources. February 2021.
https://www.mass.gov/info-details/massgis-data-ma-wildlife-coldwater-fisheries-resources

Massachusetts Department of Conservation (DOC). 1922. Annual report of the Commissioner of Conservation and State Forester for the year ending November 30, 1921.
https://archives.lib.state.ma.us/items/cfa04883-a0bb-4fbb-b248-d19aaa515799

Massachusetts Department of Conservation (DOC). 1925. Annual report of the Commissioner of Conservation and State Forester for the year ending November 30, 1924.
https://archives.lib.state.ma.us/items/e2e91101-2b5c-4677-a0e5-abebf8bc03ca

Massachusetts Department of Conservation (DOC). 1926. Annual report of the Commissioner of Conservation and State Forester for the year ending November 30, 1925.
https://archives.lib.state.ma.us/items/5ae91809-9f3f-4855-a480-e7ae724cb03e

Massachusetts Department of Conservation (DOC). 1931. Annual report of the Commissioner of Conservation and State Forester for the year ending November 30, 1930.
https://archives.lib.state.ma.us/items/845bcaf5-55df-43db-aa06-682c2981328d

Massachusetts Department of Conservation (DOC). 1936. Annual report of the Commissioner of Conservation and State Forester and Director of Parks for the year ending November 30, 1935.
https://archives.lib.state.ma.us/items/9b40287a-74f3-42f6-a2ba-cd8622605ce4

Massachusetts Department of Conservation (DOC). 1937. Annual report of the Commissioner of Conservation and State Forester and Director of Parks for the year ending November 30, 1936. https://archives.lib.state.ma.us/items/7ac9bc8a-d81b-4235-b5bb-d2454776dc7a

Massachusetts Department of Conservation and Recreation (DCR). n.d. Best Management Practices: Vernal pool certification on DCR lands. Office of Regional Planning, Boston, MA. https://www.mass.gov/doc/vernal-pool-certification-on-dcr-lands/download (PDF)

Massachusetts Department of Conservation and Recreation (DCR). 2012. Landscape designations for DCR parks & forests: Selection criteria and management guidelines. March 2012. Boston, MA. https://archives.lib.state.ma.us/handle/2452/200210

Massachusetts Department of Conservation and Recreation (DCR). 2014. Manual for continuous forest inventory field procedures. Bureau of Forestry, Division of State Parks and Recreation, February 2014. https://archives.lib.state.ma.us/handle/2452/624791

Massachusetts Department of Conservation and Recreation (DCR). 2019. Trails guidelines and best practices manual. Updated July 2019. https://www.mass.gov/doc/dcr-trails-guidelines-and-best-practices-manual/download (PDF)

Massachusetts Department of Conservation and Recreation (DCR). 2020. Massachusetts State Forest Action Plan 2020. Executive Office of Energy & Environmental Affairs, Department of Conservation and Recreation, Massachusetts Bureau of Forest Fire Control and Forestry. https://archives.lib.state.ma.us/handle/2452/840801

Massachusetts Department of Conservation and Recreation (DCR). 2022. Manual for Continuous Forest Inventory field procedures. Bureau of Forestry, Division of State Parks and Recreation. Rev. March 2022.

Massachusetts Department of Conservation and Recreation (DCR). 2023. Managing our forests…for carbon benefits. https://www.mass.gov/info-details/managing-our-forests-for-carbon-benefits

Massachusetts Department of Conservation and Recreation (DCR). 2024. DCR Climate Impacts. Story Map series highlighting the expected impacts caused by climate change across the DCR's facilities and operations in Massachusetts. https://storymaps.arcgis.com/collections/666258ae0e3543efa3612b9bf380bb30

Massachusetts Department of Environmental Protection (MassDEP). 1995. Wellhead protection tips for small public water supply systems. https://www.mass.gov/files/documents/2016/08/op/welltips.pdf (PDF)

Massachusetts Department of Environmental Protection (MassDEP). 2011. Implementation of Zone I requirements. DWP Policy 94-03. Effective Date: 3/10/2008. Amended Date: 5/01/2011. https://www.mass.gov/files/documents/2016/08/qs/9403a.pdf (PDF)

Massachusetts Department of Environmental Protection (MassDEP). 2023. Final Massachusetts integrated list of waters for the Clean Water Act 2022 Reporting Cycle. CN. 568.1. May 2023. Prepared by: Watershed Planning Program, Division of Watershed Management, Bureau of Water Resources. https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-2022-reporting-cycle/download (PDF)

Massachusetts Division of Fisheries and Wildlife (MassWildlife). 2009. Guidelines for the certification of vernal pool habitat, March 2009. https://www.mass.gov/doc/guidelines-for-the-certification-of-vernal-pool-habitat/download (PDF)

Massachusetts Division of Fisheries and Wildlife (MassWildlife). 2015. Massachusetts State Wildlife Action Plan 2015. Westborough, MA. https://www.mass.gov/info-details/state-wildlife-action-plan-swap

Massachusetts Historical Commission (MHC). 1984. MHC Reconnaissance Survey Town Report: Petersham. Massachusetts Historical Commission, Boston, MA. https://www.sec.state.ma.us/mhc/mhcpdf/townreports/Cent-Mass/pet.pdf (PDF)

Massachusetts Executive Office of Energy and Environmental Affairs (EEA). 2022. 2022 Massachusetts Climate Change Assessment, Volume II – Statewide Report. Executive Office of Energy and Environmental Affairs, Boston, MA. https://www.mass.gov/doc/2022-massachusetts-climate-change-assessment-december-2022-volume-ii-statewide-report/download (PDF)

Massachusetts Executive Office of Energy and Environmental Affairs (EEA). 2024. Response to the report of the Climate Forestry Committee. https://www.mass.gov/doc/forests-as-climate-solution-response-to-cfc-report/download (PDF)

Matthews, J. S. 2008. Determination of Eligibility Notification: The Turners Falls Sacred Ceremonial Hill Site. National Register of Historic Places, National Park Service, Washington DC.

Merow, C., S. T. Bois, J. N. Allen, Y. Xie, and J. A. Silander, Jr. 2017. Climate change both facilitates and inhibits invasive plant ranges in New England. Proceedings of the National Academy of Sciences E3276–E3284. https://www.pnas.org/doi/pdf/10.1073/pnas.1609633114

National Park Service (NPS). 1998. Planning for interpretation and visitor experience. Prepared by the Division of Interpretive Planning, Harpers Ferry Center, Harpers Ferry, WV. 1998. https://www.nps.gov/subjects/hfc/upload/interp-visitor-exper.pdf (PDF)

Native Land Digital. 2023. Native Land Digital. https://native-land.ca/

Naughton, M. 2021. Wildlife and recreation: Understanding and managing the effects of trail use on wildlife. Prepared for Vermont Fish and Wildlife and Vermont Forests, Parks, and Recreation. November 2021. https://anr.vermont.gov/sites/anr/files/2023-01/wildlife_and_recreation_%20M_naughton_2021.pdf (PDF)

O'Toole, D., L. A. Brandt, M. K. Janowiak, K. M. Schmitt, P. D. Shannon, P. R. Leopold, S.D. Handler, T. A. Ontl, and C. W. Swanston. 2019. Climate adaptation strategies and approaches for outdoor recreation. Sustainability 2019, 11, 7030.
https://www.mdpi.com/2071-1050/11/24/7030/pdf (PDF)

Pare Corporation. 2021. Riceville Pond Dam. Phase I Inspection/Evaluation Report. Date of Inspection: May 4, 2021.

Quabbin-to-Cardigan Partnership. 2023. The Quabbin-to-Cardigan Partnership.
https://q2cpartnership.org/

Rockman, M., M. Morgan, S. Ziaja, G. Hambrecht, and A. Meadow. 2016. Cultural Resources Climate Change Strategy. National Park Service, Cultural Resources, Partnerships, and Science and Climate Change Response Program, Washington, D.C.
https://www.nps.gov/subjects/climatechange/upload/NPS-2016_Cultural-Resoures-Climate-Change-Strategy.pdf (PDF)

Shutesbury Historical Commission (SHC). 2021. Introduction to Indigenous cultural sites in Shutesbury, Massachusetts.
https://www.shutesbury.org/sites/default/files/offices_committees/historical/Introduction%20to%20Indigenous%20Cultural%20Sites%20in%20Shutesbury_0.pdf (PDF)

Swanston, C. W., M. K. Janowiak, L. A. Brandt, P. R. Butler, S. D. Handler, P. D. Shannon, A. Derby Lewis, K. Hall, R. T. Fahey, L. Scott, A. Kerber, J. W. Miesbauer, L. Darling, L. Parker, and M. St. Pierre. 2016. Forest adaptation resources: Climate change tools and approaches for land managers, 2nd ed. Gen. Tech. Rep. NRS-GTR-87-2. U.S. Department of Agriculture, Forest Service, Northeast Research Station. Newtown Square, PA.
https://www.fs.usda.gov/nrs/pubs/gtr/gtr_nrs87-2.pdf (PDF)

The President and Fellows of Harvard College. 2021. Harvard Forest: About Us.
https://harvardforest.fas.harvard.edu/about-us

United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Center. 2007. Climate Change and World Heritage. Report on predicting and managing the impacts of climate change on World Heritage and strategy to assist States parties to implement appropriate management responses. World Heritage Reports 22. UNESCO World Heritage Center, Paris, France.
https://whc.unesco.org/uploads/activities/documents/activity-474-1.pdf (PDF)

VHB. 2022. DCR stormwater design handbook. October 19, 2022. Prepared for Massachusetts Department of Conservation and Recreation, 251 Causeway Street, Boston, MA.
https://www.mass.gov/doc/dcr-stormwater-design-handbook/download (PDF)

Weston and Sampson. 2022. Climate change vulnerability assessment. September 2022. Report prepared for Massachusetts Department of Conservation and Recreation.

Wilkins, E. J., and L. Horne. 2024. Effects and perceptions of weather, climate, and climate change on outdoor recreation and nature-based tourism in the United States: A systematic review. PLOS Climate 3(4): e0000266.
https://journals.plos.org/climate/article?id=10.1371/journal.pclm.0000266 (PDF)

Wobus, C., E. E. Small, H. Hosterman, D. Mills, M. Rissing, R. Jones, M. Duckworth, R. Hall, J. Creason, and J. Martinich. 2017. Projected climate change impacts on skiing and snowmobiling in the United States. Global Environmental Change. 45(2017) 1–14.
https://www.sciencedirect.com/science/article/am/pii/S0959378016305556 (PDF)