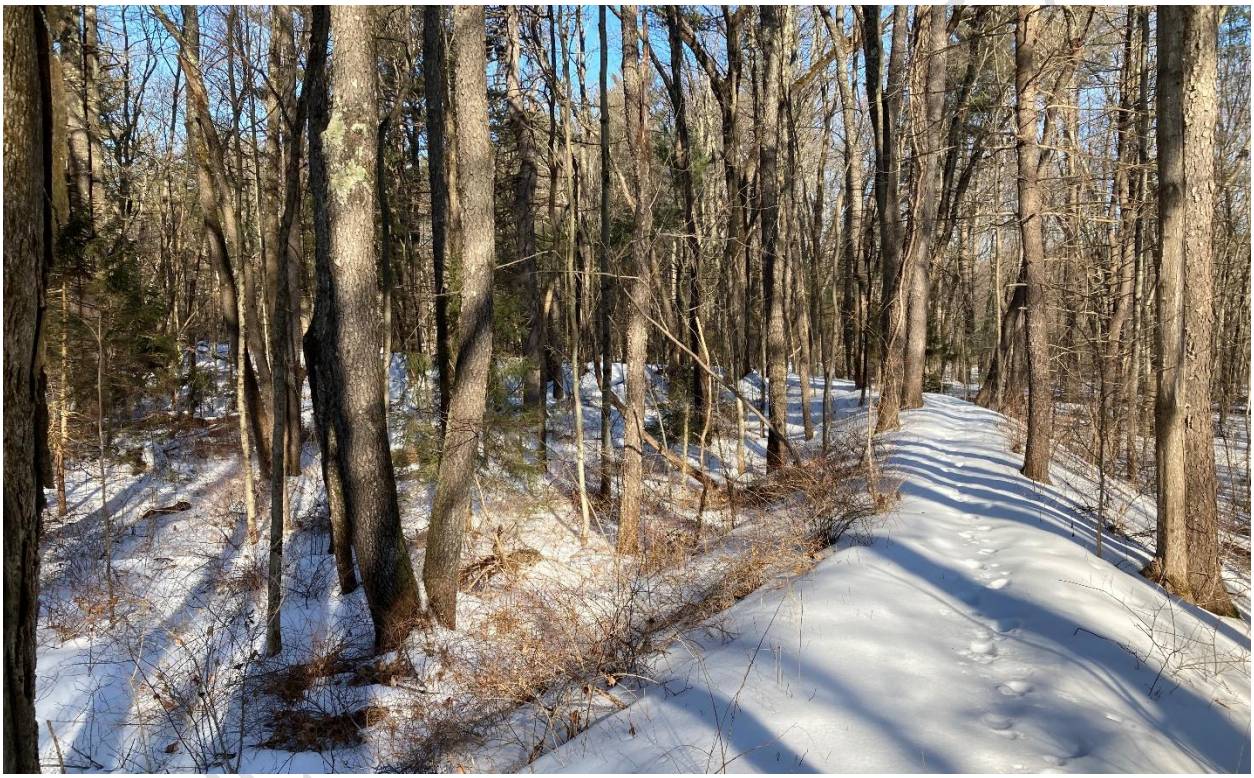
dcr
Massachusetts

Resource Management Plan
Johnny Appleseed State Park



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
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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 people 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.

Johnny Appleseed State Park

https://www.mass.gov/locations/leominster-state-forest

1. Property Overview

Characteristic	Value
Date Established	1979
Location	Leominster
Ecoregion	Southern New England Coastal Plains and Hills
Watershed	Nashua
DCR Region	Central
DCR District	Central Highlands
DCR Complex	Wachusett
Management Forestry District	Mid-State
Fire Control District	North Worcester
Size (acres)	150.2
Boundary Length (miles)	7.3
Elevation - Minimum (feet)	277.4
Elevation - Maximum (feet)	333.8
Environmental Justice (acres)	150.5
Estimated Annual Attendance (2023)	2,000
Interpretive Programs (# programs, 2023)	0
Interpretive Programs (# attendees, 2023)	0

2. Landscape Designations

Designation	Acres
Parkland	122.4
Reserve	0.0
Woodland	0.0
No Designation	28.1

3. Regulatory Designations

Designation	Acres
Area of Critical Environmental Concern - Central Nashua River Valley	130.9

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
North Nashua River
Trails

8. Natural Resources

Resource	Value
Tree Canopy (acres)	147.1
Rivers and Streams (miles)	0.2
Open Water (acres)	0.0
Wetlands (acres)	58.1
Certified Vernal Pools (#)	0
Potential Vernal Pools (#)	2
State-Listed Species (# Regulatory)	1
State-Listed Species (# Non-Regulatory)	1
Federally Listed Species (#)	0
Aquatic Invasive Plants (# known species)	0
Terrestrial Invasive Plants (# known species)	9

9. Forest Management (Since 2012)

Management Objective	Acres
None	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)	126.5
Flood (0.2%-chance)	134.9
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	0
Historic - National Register Listed	0
Historic - National Historic Landmark	0

14. Recreation Resources

Resource	#
Trails System	1

15. Recreation Activities

Activity
Bicycling, mountain
Dog walking, on-leash
Fishing, fin fish
Hiking/walking
Hunting
Running/jogging
Snowshoeing

16. Roads and Trails

Metric	Value
Roads - Unpaved (miles)	0.0
Roads - Paved (miles)	0.0
Forest Roads - Unpaved (miles)	0.0
Forest Roads - Paved (miles)	0.0
Trails - Unpaved (miles)	1.6
Trails - Paved (miles)	0.0
Trails - Unauthorized (miles)	2.8
Trail Density (miles/acre)	0.029
Area of Impact (acres)	135.2

17. Parking

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

INTRODUCTION

Johnny Appleseed State Park (Johnny Appleseed or the Park) is located in the City of Leominster (the City) near the convergence of I-190 and Massachusetts Route 2. Nestled amongst residential homes, Johnny Appleseed plays an important role in floodplain protection and provides residents with an escape to a natural area at the outskirts of the City. The Park is split into east and west sections by a Massachusetts Department of Transportation (MassDOT) property that includes the main channel of the North Nashua River and associated riverbanks. A Leominster Land Trust parcel protects a portion of the west bank of the river adjacent to the Park, and Lancaster Land Trust and Town of Lancaster properties help protect the river corridor downstream of the Park.

The Park plays a role in the City-designated North Nashua River Greenway and state-designated Area of Critical Environmental Concern (ACEC). The greenway, which includes Johnny Appleseed, is 254-acres in area and protects approximately five miles of banks along the North Nashua River (City of Leominster 2021). The Central Nashua River Valley Area ACEC protects 20 miles of the North Nashua and Nashua rivers running through the City of Leominster, and towns of Lancaster, Bolton, and Harvard. Established in 1996, the ACEC contains lands representing unique landscapes in Massachusetts, including lands and waters that provide habitat to rare species (Coxe 1996).

The Park is on land shaped by generations of Indigenous peoples and non-Indigenous inhabitants. Past and present Indigenous residents embody fluid, relational connections to the places and spaces now known as Johnny Appleseed State Park. Groups and individuals, including peoples known as the Nipmuc and Agawam, are recorded in available documentation (Native Land Digital 2023) as having relationships to this place over seasons and generations. The Nashaway group of the Nipmuc intensively used the Nashua River Valley in the vicinity of the Park; hunting and gathering in the surrounding uplands and establishing an important camp in nearby portions of Lancaster (Massachusetts Historical Commission (MHC) 1984: 2). Following Indigenous people dispossession, the City of Leominster was incorporated in 1740, initially benefiting from dispersed agriculture and adding industrial development in the 1700s (MHC 1984). During the 1890s, the Leominster & Clinton Street Railway Co. dammed the North Nashua River near Lancaster Street to create a hydroelectric generation plant. A timber and concrete spillway blocked the river channel and connected to a lengthy earth berm that ran across what is now the Park. This dam created a 400-acre impoundment and the railway company established Leominster & Clinton Street Railway Park (i.e., Leominster Park) adjacent to the power plant as a public attraction. Much of what is now Johnny Appleseed was beneath that lake. Johnny Appleseed State Park was established in 1979, through a property transfer from the Department of Public Works (DPW; now MassDOT) to the Department of Environmental Management (now DCR). Under the terms of a Clean Water Act Section 404 Permit, the DPW was required to mitigate for substantial alterations to wetland resources associated with the construction of I-190. This mitigation took the form of permanently protecting approximately two miles of river corridor along the North Nashua River as a state park. The Park is named after John Chapman, also known as Johnny Appleseed, whose birthplace is near the Park. Not far from the eastern park boundary, on Johnny Appleseed Lane, is a monument erected in 1963 by the Leominster Historical Society, to identify the birthplace of Johnny Appleseed and commemorate his life.

Johnny Appleseed State Park rewards visitors with the sounds of nature, providing a peaceful escape for a quick hike, and interesting cultural history. As part of the Central Nashua River Valley ACEC, the Park helps protect the floodplain of the North Nashua River, a tributary of the Nashua River; helping to

conserve wildlife habitat and offer some opportunities for trail-based recreation. The Park contains both evergreen and deciduous forested areas and forested wetlands, with some pockets of open wetland. Remnants of several earth berms on the property give nod to the historic industrial uses at the Park.

PARK IDENTITY

Johnny Appleseed State Park is strongly identified with the North Nashua River. The Park provides flood control to surrounding areas and protects crucial fish and wildlife habitat. Its cultural history is also connected to the river, with remnants of a mill and elevated berms indicating past efforts to harness the waters of the North Nashua River. A small trail system winds along the river's west bank and through adjacent woodlands providing river access and limited recreational opportunities. All future activities and improvements should be consistent with protecting the Park's natural and cultural resources while providing passive recreation opportunities within a flood zone and Parkland Landscape Designation.

DEFINING RESOURCES AND VALUES

Resources that define the park are related to its location near the Nashua River. They include:

- The Park contributes to conservation of the North Nashua River riparian corridor, which provides important ecosystem services through floodplain protection and contributes to the greater Central Nashua River Valley ACEC.
- Trails at Johnny Appleseed provide surrounding residents and visitors a quick escape into woodlands nestled within a suburban neighborhood.
- The berms, as well as nearby dam and powerhouse remnants, at Johnny Appleseed provide a glimpse into the past industrial uses of the area.
- The Park provides recreational amenities to, and enhances environmental quality and equity for, Environmental Justice (EJ) communities in the Fitchburg-Leominster-Lancaster area.

STATEMENTS OF SIGNIFICANCE

Statements of Significance describe the importance or distinctiveness of a place and its resources (National Park Service 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 cover 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 Johnny Appleseed State Park. The sequence of these statements does not reflect their level of significance.

- The construction of Interstate 190 included the alteration of a substantial acreage of wetland resources. In order to replace the lost conservation value, the Army Corps of Engineers required the Commonwealth to acquire this land for the conservation of fish and wildlife resources.
- Johnny Appleseed State Park sits within the Central Nashua River Valley Area of Critical Environmental Concern (ACEC). The primary features of the ACEC are the North Nashua and Nashua Rivers; approximately 2 miles of the North Nashua River flows near the Park. The site is almost entirely within the floodplain of the river which create prime agricultural soils of statewide significance.
- A portion of the site is classified as Priority Habitat (covered by the Massachusetts Endangered Species Act). Upland, floodplain, and wetland habitats in this Park promote the long-term persistence of a variety of common and rare species that use the aquatic, forested, wetland, riverbank, and vernal pool habitats in this park.

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 Johnny Appleseed State Park is:

> Projects must sometimes be mitigated to offset environmental impact, leading to new protected space.

VISITOR EXPERIENCE

Johnny Appleseed State Park provides a neighborhood natural area with a variety of visitor experiences, including the following:

- **Virtual Experience**. Potential visitors will find little information about Johnny Appleseed State Park on DCR's web site. The "Find a Park" tool (https://www.mass.gov/info-details/find-a-park) identifies the Park'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 Leominster State Forest web page does not list Johnny Appleseed as being one of its "related parks."
- **Entering the Park**. Johnny Appleseed lacks a formal gateway, with visitors entering the Park from Leominster Land Trust property and the Babe Ruth League of Leominster's John B. McLaughlin Park located at 1000 R Lancaster Street, Leominster. Visitors are not greeted by any official signage about Johnny Appleseed State Park or the Massachusetts Department of Conservation and Recreation. Without an official parking area, visitors arriving by car may park in a shared parking area at John B. McLaughlin Park.
- **Trail-based Passive Recreation**. Visitors seeking neighborhood recreational opportunities may access a modest trail network. Nearly two miles of official trails extend along the riverbank and through woodlands, providing the opportunity for a light hike and park exploration.

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 24).

Natural Resources

Threats

- Johnny Appleseed is a mostly landlocked parcel divided into several sections by Fall Brook and the North Nashua River, impeding access for monitoring and maintenance.
- Property boundaries are not marked, leading to several potential encroachment issues with abutters that may be negatively affecting natural resources at the park.
- The following nine species of invasive plants have been identified in the Park, as identified by BSC Group (2017) and DCR: Asiatic bittersweet, autumn olive, common buckthorn, garlic mustard, glossy buckthorn, Japanese knotweed, lesser celandine, multiflora rose, reed canary-grass, and tree of heaven. One Likely Invasive species (Tatarian honeysuckle) is also present. Invasive species may negatively impact both the biological health of the ecological integrity and biodiversity of the Park. These species were identified in the Park before boundary corrections and may reflect some occurrences outside park boundaries.
- Unauthorized OHV and snowmobile use may be negatively impacting vegetation and wetlands through unauthorized trail creation and trail widening.
- Temporary encampments have the potential to negatively impact natural resources through dumping and resource harvest.
- Due to inaccuracies in mapped park boundaries, current Landscape Designations extend onto abutting private property and other conservation land, contributing to inaccurate acreage counts for Parkland Landscape Designations.
- The Massachusetts Department of Environmental Protection (MassDEP) has identified several water quality impairments in Fall Brook Assessment Unit (MA81-39) (MassDEP 2023), resulting in this stretch of the river being classified as not suitable habitat for sustaining a native, naturally diverse community of aquatic flora and fauna (MassDEP 2021). Because MassDEP updates its Integrated List of Waters on a regular basis, readers are directed to refer to the most recent version of that document for current information.

Opportunities

- Some of the Forest's two potential vernal pools may "support rich communities of vertebrates and invertebrates" (Massachusetts Division of Fisheries and Wildlife (MassWildlife) 2009) and serve as important habitat components for other wildlife, including one of the Forest's state-listed species.

Surveying and certifying these pools (DCR (n.d.) and MassWildlife (2009)), as appropriate, may help better protect these animals.

- Increasing awareness of the property as part of DCR and associated regulations, through posted signage, boundary markings, and website, could better protect the state listed reptile from collection. Working with the Town and the Massachusetts Department of Transportation to establish protected road crossing could decrease road mortality.
- Non-Regulatory Habitat for two MESA-protected species is present in the Park. 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, Non-Regulatory Habitat is protected under the Massachusetts Endangered Species Act (MESA; 321 CMR 10.00). Requesting pre-filing consultation with NHESP for "all works, projects, or activities" in the Park will ensure continued protection of this habitat and compliance with the MESA.
- There is an opportunity to enhance the Park's ecological integrity and biodiversity through targeted removal of invasive plant species.
- There may be opportunities to restore the floodplain forest through forest management.
- An opportunity exists to engage volunteers in park maintenance activities on an ongoing basis. For example, a past volunteer project, spearheaded by a teacher and students from Narragansett Regional High School and assisted by DCR staff, involved the removal of tires from the Park. Establishing a more formal relationship with a local group, such as a school, could help facilitate natural resource protection at Johnny Appleseed.
- Increasing the presence of Environmental Police Officers and DCR rangers may deter unauthorized OHV and snowmobile use.
- Approximately 28.0 acres of the Park has no Landscape Designation (DCR 2012). Designation of these areas could help protect associated natural resources and ensure management consistent with DCR properties statewide.
- The Landscape Designation acreage exceeds that of the current Park acreage. Revising the Landscape Designation GIS data for the Park could provide a more accurate understanding of the acreage.

Cultural Resources

Threats

- DCR's Office of Cultural Resources has insufficient information for preservation planning at the Park.
- Remnants of an old dam and powerhouse, once part of Leominster & Clinton Street Railway Park, exist near the southern portion of the Park on the North Nashua River. The ownership of these remnants is unknown due to ongoing boundary issues at Johnny Appleseed.
- Approximately 90% of the park is within the 1.0%-chance flood zone and 94% is within the 0.2%-chance flood zone. (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 (MassGIS 1997).) Erosion associated with these events may impact unknown archaeological and cultural resources at Johnny Appleseed.

- Unauthorized OHV and snowmobile use may be negatively impacting known and unknown cultural resources at the Park.

Opportunities

- An archaeological reconnaissance survey (950 CMR 70), including research into related ancient and historical period contexts, could help to identify, protect, and interpret archaeological sites in the Park. Due to the Park's proximity to the North Nashua River, Johnny Appleseed has high potential for indigenous archaeological resources. DCR staff can help protect any undocumented resources by avoiding ground disturbing activities.
- Further research into the history of the Leominster & Clinton Street Railway Park and powerhouse may provide an interpretive opportunity at Johnny Appleseed.
- The Park is recognized for its scenic, natural, and historic qualities through inclusion in the Freedom's Way National Heritage Area, which offers opportunities for agency partnerships, grants, and potentially higher visibility for the Park (Freedom's Way Heritage Association 2015).
- Approximately 28.0 acres of the Park has no Landscape Designation (DCR 2012). Designation of these areas could help protect associated cultural resources and ensure management consistent with DCR properties statewide.

Recreation

Threats

- Limited official information available on Johnny Appleseed State Park, including the lack of an official DCR web page for the Park, inhibits public awareness of the property and its recreational opportunities.
- Johnny Appleseed lacks a gateway and dedicated parking lot for park visitors, potentially impeding the public's ability to gain access to the Park or awareness of the Park's existence.
- While the park does not currently have built infrastructure within the floodplain, berms and nearly 1.4 miles of trails are located within the 1.0%-chance flood zone. An additional 0.3 miles of trails are exposed to 0.2%-chance flood zone. (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 (MassGIS 1997).)
- Fall Brook divides the park and isolates trail segments impeding access to the northern portion of trails at Johnny Appleseed. However, visitors frequently cross Fall Brook to access trails and sometimes build crossings that eventually get carried downstream.
- The Park's trails system lacks identifiable DCR signage, internal navigation signs, trail markers, and property maps, potentially impacting awareness of the Park as a DCR property and ability to navigate an official trails system.
- The Park includes network of unauthorized user-created trails, including trails east of the North Nashua River, which were constructed with neither authorization nor regulatory review. These trails contribute to the current trail density (0.0318 miles/acre), which is above the 0.0226 miles/acre (i.e., 9 km/km2) threshold for Parklands and is considered Excessive (DCR 2019a).

- Unauthorized OHV and snowmobile use occurs and may negatively impact the experience of other visitors.
- The Park lacks a central entrance or daily staff making annual attendance estimates approximate.
- Property boundaries are not marked, leading to potential encroachments along Florence Street, Garfield Street, and Barnes Street that might negatively impact park aesthetics.
- The stability of the dam and powerhouse remnants are unknown but are frequently visited by hikers and used by groups as an informal gathering spot, with some unauthorized activities like alcohol consumption and defacing public property occurring.
- A cable attached to trees is used by staff and park visitors to navigate down a steep hill to access the northern area of Johnny Appleseed from St. Cecilia Cemetery. The stability of the cable and hillside is unknown, and it's unclear if the cable is on DCR property.
- Unauthorized campsites used by unhoused individuals at Johnny Appleseed have the potential to negatively impact visitor experience.

Opportunities

- Adding a web page for Johnny Appleseed State Park to DCR's website could help increase public awareness of the Park and its recreational opportunities.
- Contact Babe Ruth League of Leominster and Leominster Land Trust about establishing formal trailheads, with welcome wayside, could help increase public awareness of the Park and other nearby conservation lands.
- Creating a map for the park would allow visitors to better understand the official trail system and prepare for a visit.
- Improving access and/or connections to trails at each section of the Park would better facilitate trail-based recreational activities at Johnny Appleseed.
- Adding trail markers and trail navigational signage will help orient visitors at the Park.
- Installing trail counters at trailheads would provide more accurate estimates for property visitation and better inform future planning and interpretation efforts.
- Increasing signage, including for related rules and regulations, at Johnny Appleseed may decrease instances of unauthorized use at the Park.
- Increasing property boundary markers would better inform visitors where Johnny Appleseed meets private property.
- Establishing and following a protocol for removal of campsites for unhoused persons could provide better guidance for DCR staff addressing these issues at properties. Ensuring the safety of park visitors, the person(s) temporarily inhabiting the park, and staff should be a top priority.
- The entire Park is within an EJ tract. There may be opportunities to advance environmental justice and equity via DCR's Environmental Justice Strategy (see pages 79–88 in Massachusetts Executive Office of Energy and Environmental Affairs (EEA) 2024a), in alignment with the EEA's EJ Policy (EEA 2021) and the Executive Order on Environmental Justice (No. 552) (Patrick 2014).

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 (EEA 2024b). 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

Fall Brook, a tributary of the North Nashua River, has been identified a Coldwater Fisheries Resource by the Massachusetts Division of Fisheries and Wildlife. 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 (MassGIS 2021). The entire length of this brook within the Park is exposed to climate impacts.

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 2018). 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 and snow-dependent sports (i.e., cross-country skiing, snowmobiling, and snowshoeing).

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 Johnny Appleseed State Park was designated Parkland. Identification of Land Stewardship Zones within Johnny Appleseed was performed in the context of the Parkland Landscape Designation.

The following Land Stewardship Zoning is recommended to guide management and any future development. (See Figure 1. Land Stewardship Zoning Map, page 20.)

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 Johnny Appleseed State Park have been designated Zone 1.

- No areas within the park have been designated Zone 1.

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 Johnny Appleseed State Park have been designated Zone 2.

- All portions of Johnny Appleseed have been designated as zone 2.

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 Johnny Appleseed State Park are currently developed, appropriate for potential future development, or intensively used for recreation. They have been designated Zone 3.

- No areas within the park have been designated Zone 3.

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 Overlay was developed for Johnny Appleseed State Park:

- **Area of Critical Environmental Concern Overlay**. The Central Nashua River Valley ACEC, designated in 1996, encompasses a 20-mile riparian corridor. Most of Johnny Appleseed State Park falls within the ACEC. Projects and activities within ACECs must minimize adverse effects on sensitive resources and are guided by a variety of regulations and programs that are summarized in the ACEC Guide to State Regulations and Programs (DCR 2017).

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/.

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 21.)

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 24. 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 24) into CAMIS as a separate work order, noting "*RMP" in the description field. Non-traditional work orders (e.g., volunteer trail work, posting of Massachusetts Department of Public Health (DPH) Fish Consumption Advisory posters, certification of vernal pools) should be closed out by the property manager, once the recommendation has been implemented.

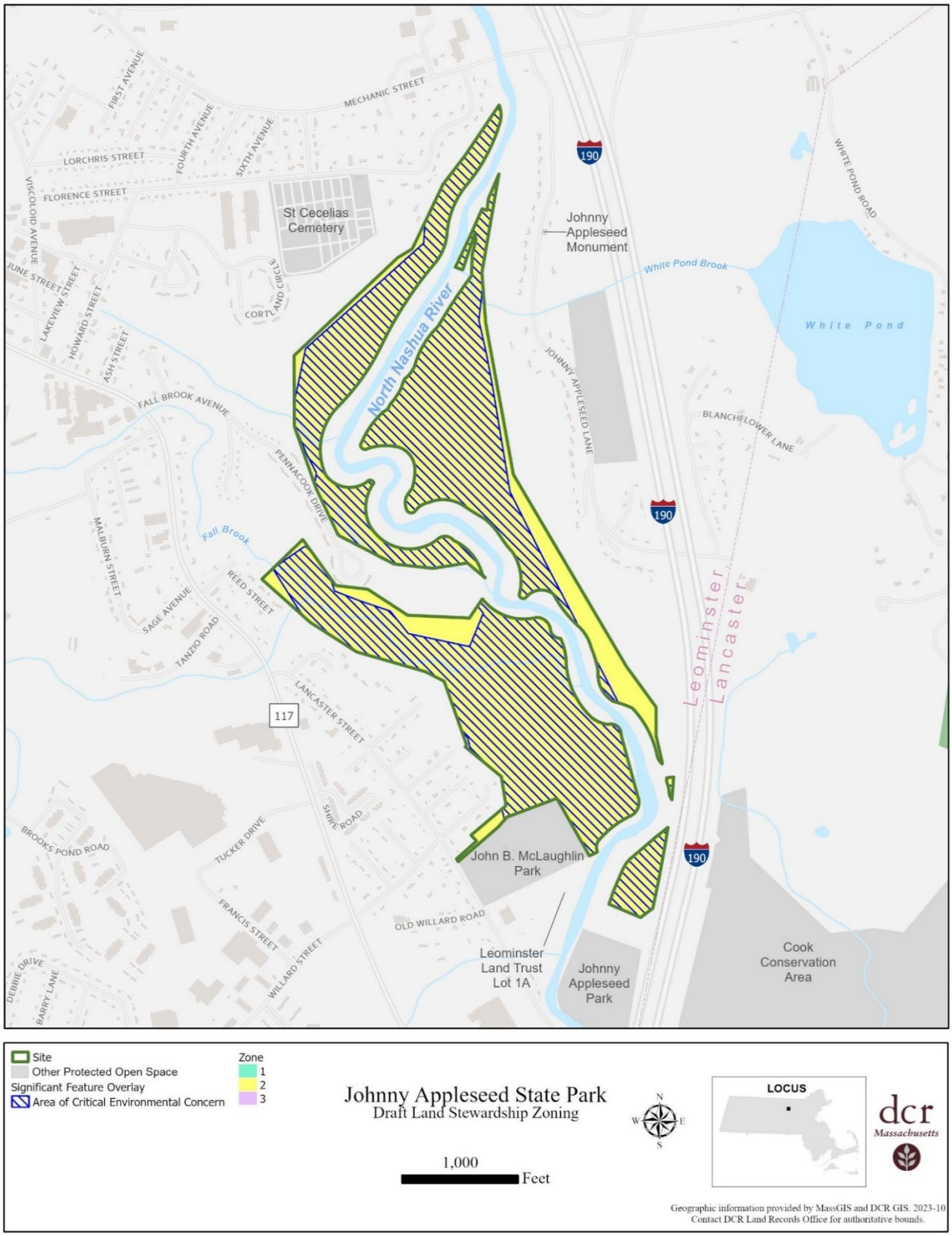

Figure 1.Land Stewardship Zoning Map.

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.	N/A
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.	Yes
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.	No
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.	N/A
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.)	N/A
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.	Unknown
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.	Unknown
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.	No
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.	Unknown
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.	Unknown
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.	Uknown
Recreation	1. Types of recreation, levels of recreational use, and types and extent of recreation infrastructure are consistent with the park's identity statement.	No

Category	Metric	Status
Recreation	2. Trail density is consistent with the park's Landscape Designation(s). (See Trails Guidelines and Best Practices Manual (DCR 2019a) for density thresholds.)	No
Recreation	3. All authorized trail construction was performed in accordance with an approved Trail Proposal Form.	No
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.	N/A
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 Johnny Appleseed State Park. 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	Apply Landscape Designations to those portions of the Park currently lacking such designations.	Management Forestry (Lead), GIS Program
Natural Resources	Remove Landscape Designations applied to properties not considered part of the Park.	Management Forestry (Lead), GIS Program
Natural Resources	Following appropriate review and approval, implement species-specific management recommendations as described in the Central Region Invasive Plant Management Plan (BSC Group 2017).	Management Forestry, Office of Natural Resources (Lead), Park Operations, Partner
Cultural Resources	Conduct a cultural resources and archaeological reconnaissance survey (950 CMR 70) to identify archaeologically sensitive areas, archaeological sites, and cultural landscape features. Complete appropriate Massachusetts Historical Commission archaeological site forms for identified archaeological resources.	Consultant, Office of Cultural Resources (Lead)
Recreation	Update GIS Open Space to align with surveyed boundaries.	Management Forestry (Co-Lead), GIS
Recreation	Resolve potential encroachments in accordance with draft Agency-wide guidance and Best Management Practices (DCR 2019b).	Management Forestry (Lead), Office of the General Counsel, Park Operations
Recreation	As appropriate, promote EEA's Environmental Justice Policy goals (EEA 2021) at Johnny Appleseed State Park.	Land Protection Program (Co-Lead), Trails and Greenways Section (Co-Lead), Interpretive Services (Co-Lead), Partners
Recreation	Establish a DCR web page for Johnny Appleseed State Park and create a trail map.	Interpretive Services, Regional Staff (Lead), State Parks Operations, Web Content Creator

Category	Recommendation	Implementation
Recreation	Contact Babe Ruth League of Leominster and Leominster Land Trust about establishing formal trailheads.	Land Protection Program (Co-Lead), Park Operations (Co-Lead)
Recreation	Assess the potential for connecting trails in the northern and southern portions of the Park that are currently separated by Fall Brook.	Park Operations, Trails and Greenways Section (Lead)
Recreation	Resolve trail-related threats and opportunities identified in this RMP, in accordance with Trails Guidelines and Best Practices (DCR 2019, or update), through the following actions: • Maintain authorized trails, as identified in the DCR Trail Data Layer provided to the Natural Heritage and Endangered Species Program in 2021, and in accordance with the Recreational Trail Maintenance and Biodiversity Conservation 2021 update. • Evaluate trail segments for discontinuation or active closure, including those that are: unauthorized, unsafe, connecting to privately-owned property, located in environmentally or culturally sensitive areas, or otherwise inconsistent with DCR Trails Guidelines and Best Practices. Provide an updated trail data layer to the Natural Heritage and Endangered Species Program. • Establish new trails, as warranted, following regulatory review. Provide an updated trail data layer to the Natural Heritage and Endangered Species Program.	Management Forestry, Office of Cultural Resources, Office of Natural Resources, Park Operations (Co-Lead), Partners, Trails and Greenways Section (Co-Lead)
Recreation	Contact Leominster Land Trust to explore possibilities for improving access to the Park.	Land Protection Program (Lead)

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