dcr
Massachusetts

Resource Management Plan
Lake Dennison Recreation Area

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.

Lake Dennison Recreation Area

https://www.mass.gov/locations/lake-dennison-recreation-area

1. Property Overview

Characteristic	Value
Date Established	1996
Location	Winchendon
Ecoregion	Worcester Plateau
Watershed	Millers
DCR Region	Central
DCR District	Central Highlands
DCR Complex	Wachusett
Management Forestry District	Mid-State
Fire Control District	North Worcester
Size (acres)	225.7
Boundary Length (miles)	5.7
Elevation - Minimum (feet)	826.1
Elevation - Maximum (feet)	863.2
Environmental Justice (acres)	0.0
Estimated Annual Attendance (2023)	Unknown
Interpretive Programs (# programs, 2023)	55
Interpretive Programs (# attendees, 2023)	523

2. Landscape Designations

Designation	Acres
Parkland	121.3
Reserve	0.0
Woodland	0.0
No Designation	104.7

3. Regulatory Designations

Designation	Acres
Priority Habitat	25.4

4. Long-Term Agreements

Agreement	Expiration Year
Department of the Army lease for public park and recreational and fish and wildlife purposes.	2026
Massachusetts Department of Environmental Management sub-lease with Massachusetts Division of Fisheries, Wildlife and Environmental Law Enforcement, for fish and wildlife purposes.	2026
Supplemental Agreement No. 3 between the Secretary of the Army and the Commonwealth of Massachusetts.	2026

5. Concessions

Concession Type
None

6. Partners & Friends

Group(s)
Coldbrook Snowmobile Club
US Army Corps of Engineers

7. Features of Interest

Feature
Lake Dennison

8. Natural Resources

Resource	Value
Tree Canopy (acres)	175.9
Rivers and Streams (miles)	0.9
Open Water (acres)	15.2
Wetlands (acres)	26.1
Certified Vernal Pools (#)	0
Potential Vernal Pools (#)	1
State-Listed Species (# Regulatory)	2
State-Listed Species (# Non-Regulatory)	0
Federally Listed Species (#)	0
Aquatic Invasive Plants (# known species)	1
Terrestrial Invasive Plants (# known species)	5

9. Forest Management (Since 2012)

Management Objective	Acres
Reduce the impact of biological stressors	59.8

10. History of Wildfires and Conditions Influencing Future Wildfires

Wildfire Attribute	Value or Characteristic
Number of wildfires on property; 2019–2023	3
Acres burned by wildfires on property; 2019–2023	1.5
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)	175.3
Flood (0.2%-chance)	175.3
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	7
Historic - Total MACRIS Listed	2
Historic - National Register Listed	0
Historic - National Historic Landmark	0

14. Recreation Resources

Resource	#
Waterfront Areas	2
Boat Ramp	1
Campground	1
Pavilion	1
Picnic Area	1
Trails System	1
Volleyball Court	1

15. Recreation Activities

Activity
Bicycling, mountain
Boating, non-motorized
Boating, sail
Camping
Canoeing/Kayaking
Dog sledding
Dog walking, on-leash
Endurance events
Field Day events
Fishing, fin fish
Geocaching/Letterboxing
Hiking/Walking
Hunting
Picnicking
Running/Jogging
Running, races (road or trail)
Skiing, cross-country
Snowmobiling
Snowshoeing
Swimming/Sunbathing
Tetherball
Volleyball
Wildlife viewing

16. Roads and Trails

Metric	Value
Roads - Unpaved (miles)	0.0
Roads - Paved (miles)	0.1
Forest Roads - Unpaved (miles)	0.0
Forest Roads - Paved (miles)	0.0
Trails - Unpaved (miles)	0.0
Trails - Paved (miles)	0.0
Trails - Unauthorized (miles)	5.0
Trail Density (miles/acre)	0.030
Area of Impact (acres)	130.3

17. Parking

Parking Resources	#
Lots	2
Parking Spaces - Total	215
Parking Spaces - Accessible (HP)	4
Parking Spaces - Other	211

INTRODUCTION

Lake Dennison Recreation Area (Lake Dennison or the Recreation Area) is a campground and day use area located in the Town of Winchendon. It is situated in the Worcester Plateau Ecoregion, approximately 30 miles northwest of Worcester and immediately northeast of the confluence of the Millers and Otter Rivers. The Recreation Area, which is located on the shores of Lake Dennison, is owned by the U.S. Army Corps of Engineers (USACE) and leased to DCR, which manages the facility for recreation and fish and wildlife purposes. The Recreation Area is bordered on the east by Route 202 (Baldwinville Road) and on all other sides by the USACE's Birch Hill Dam property. Lake Dennison is approximately 0.1 miles north of Otter River State Forest.

The Recreation Area 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 Lake Dennison Recreation Area. Groups and individuals, including Indigenous peoples known as the Wabanaki (Dawnland Confederacy), Pennacook, and N'dakina (Abenaki/Abenaquis), are recorded in available documentation (Native Land Digital 2023) as having relationships to this place over seasons and generations. European settlement began in Winchendon in 1752. By the time the Town was officially established in 1764, a grist mill and sawmill had already been built along the Millers River (DCR 2006). In the 1930s, the shores of Lake Dennison "were dotted with summer cottages," and a summer camp and dance hall were present in what is today's Recreation Area (USACE 2023). In the early 1940s, the U.S. government constructed Birch Hill Dam, acquiring land in fee and easements to create the 3,200-acre Birch Hill Dam Reservoir Area. This flood storage area, which is normally empty, is capable of storing up to 16.26 billion gallons of water for flood control purposes (USACE 2021). In 1950, the Massachusetts Department of Conservation (DOC) licensed portions of the Birch Hill Dam Reservoir Area for the purpose of fish and wildlife management. Fifteen years later, in 1965, the Massachusetts Department of Natural Resources (DNR) began leasing land for public park and recreational purposes (Lease No. DA-19-016-CIVENG-66-121). As of June 2025, DCR leases 4,207 acres of the Reservoir Area from USACE, and sub-leases 4,018 acres to the Massachusetts Division of Fisheries and Wildlife (MassWildlife). The remaining 189 acres of leased land is incorporated into two DCR properties, Lake Dennison Recreation Area and Otter River State Forest (see associated RMP). Because the exact boundaries of the Recreation Area are not mapped, property boundaries used in this RMP are estimates based upon best available information. The Recreation Area was previously managed under a 1996 Department of Environmental Management (DEM) Guidelines for Operations and Lands Stewardship (GOALS) plan for the Northeastern Connecticut Valley region (DEM 1996).

Lake Dennison rewards visitors with outstanding recreational opportunities. The day use area provides visitors with opportunities to picnic, sunbathe, swim, and generally enjoy the benefits of a lakeside retreat close to home. The well-developed campground provides many wooded, private campsites for campers. Day use visitors and campers alike may come across remnants of old buildings or decide to hike to Otter River State Forest. Lake Dennison Recreation Area provides exciting opportunities for daytime adventures and weekend getaways.

PARK IDENTITY

Lake Dennison Recreation Area is strongly identified with its namesake feature, Lake Dennison (the Lake). The Lake provides the foundation for numerous activities and helps make the Recreation Area a

popular summer destination. All future activities and improvements should be consistent with the Recreation Area's Parkland Landscape Designation, ensure continued high-quality day and overnight recreation, protect and enhance the Lake's water quality, steward upland and riparian resources and habitats, protect known and potential cultural resources, and apply responsible forest management to improve forest health.

DEFINING RESOURCES AND VALUES

Resources and values that define the Recreation Area are all associated with Lake Dennison, an 83-acre freshwater lake with an average depth of 9 feet (Massachusetts Department of Environmental Protection (MassDEP) 2023a, MassWildlife 2016). They include:

- The Lake itself. Lake Dennison provides opportunities for boating, fishing, and swimming, and contributes to park aesthetics by providing campsites and picnic areas with scenic waterfront views.
- Lake Dennison's day use area, located along the Lake's south and west shores, provides a pleasant destination for picnicking and water-based recreation.
- Lake Dennison's campground, located along the Lake's north and east shores, provides facilities for a variety of types of camping (e.g., tent campers, pop-up campers, self-contained campers).
- The property plays a crucial role in USACE flood management, with periodic intentional flooding to reduce downstream impacts during heavy rain events. This intentional flooding can result in the closure of some recreation facilities.

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 may 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 Lake Dennison Recreation Area. The sequence of these statements does not reflect their level of significance.

- The USACE took the land, after damages caused by floods in 1936 and 1938, for flood control purposes. Birch Hill Dam, adjacent to the Lake Dennison Recreation Area, is the oldest of the flood control dams in New England. It was completed in 1942 and today protects the towns of Athol and Orange.

- Lake Dennison has served as a recreational destination for local residents since the early 1800s. Beginning in 1955, it became publicly managed by the Town of Winchendon. Today, public management and access to the property continue under DCR.
- Though managed by DCR, the property is owned by the U.S. Army Corps of Engineers and has been leased to the state since 1976. This arrangement means that USACE and DCR work closely together to manage the property.

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 Lake Dennison Recreation Area is:

> Recreational opportunities in a natural setting build a better quality of life for individuals, families, and communities.

VISITOR EXPERIENCE

Lake Dennison Recreation Area provides a variety of visitor experiences, including the following:

- **Virtual Experience.** Potential visitors will find information about Lake Dennison Recreation Area on DCR's web site. The Recreation Area has its own web page that provides potential visitors information needed to plan a visit. (https://www.mass.gov/locations/lake-dennison-recreation-area)
- **Entering the Park.** Visitors enter the park from Winchendon Road, with separate entrances for the campground and Day-use Area. Campers are greeted at a contact station before navigating to their reserved campsite. Day use visitors are greeted by a large identification sign and a tree-lined drive to the day use area's large parking area.
- **Camping.** A wooded campground is accessed through a separate entrance on Winchendon Road, just north of the entrance for the Day-use Area. Campers are greeted by DCR staff at the contact station before navigating to their reserved campsite. An unnamed stream and associated wetlands divide the campground into two distinct areas: the North Dennison Camping Area and the East Dennison Camping Area. The North area is located along the north shore of Lake Dennison and contains 51 individual campsites, the Recreation Area's only group site, comfort stations, water fountains, a dump station, and "Camper's Beach," an unguarded waterfront area. A volleyball court, tetherball pole, and funnel ball apparatus are located at the group site. Campers obtain game balls from the contact station. The East Dennison Camping Area includes 100 campsites, comfort stations, and water fountains.
- **Day-use Area.** Lake Dennison's Day-use Area includes ample parking, a waterfront area, a bathroom, picnic facilities with a pavilion, a large field for sports and games, shoreline fishing access, and a boat ramp.

- **Swimming.** Visitors may spend the day at the groomed and guarded waterfront area swimming, sunbathing, and playing in the water.
- **Picnicking.** The Day-use Area's two picnic areas provide tables, grills, and pavilions along the pond shore for visitors to gather with friends and family or take a break from swimming, hiking, or other activities in the area.
- **Fishing.** Lake Dennison is a popular destination for fishing. It is home to several native fish species and is annually stocked with trout in the spring and fall. According to MassWildlife (2016), "abundant access via foot paths makes shore fishing for trout in the spring easy," but "as the weather warms up and water temperatures increase, trout move to deeper, cooler areas in the Lake where a boat is required to fish for them."
- **Sports and Games.** The Day-use Area has an approximately 2-acre area of maintained lawn that extends from New Boston Road to the south Shore of Lake Dennison. This field provides visitors opportunities for activities such as sack races and three-legged races, as well as the space to throw a baseball or toss around a football.
- **Boating.** The Lake's boat ramp is accessed through the Day-use Area. A single car-top boat ramp is located on the Lake's western shore, along Royalston Road South. Visitors may launch canoes, kayaks, and small boats powered by electric motors. A bulletin board adjacent to the ramp displays boating and fishing information; associated parking is located along the west shoulder of Royalston Road South.

- **Interpretive Programming**. A seasonal interpreter, based at Otter River, provides informative programming to visitors to the Recreation Area and to visitors to nearby Otter River State Forest.
- **Trail-based Passive Recreation**. Day-use visitors and campers seeking other recreational opportunities may access a modest trails network in the Recreation Area. For an extended hike or mountain bike ride, trails from Lake Dennison connect to trails at USACE's Birch Hill Dam property, MassWildlife's Birch Hill Wildlife Management Area, and Otter River State Forest, allowing recreationists to extend their travels and explore more landscapes. In the winter, with appropriate snow cover, visitors use these same trails for snowshoeing and cross-country skiing.
- **Trail-based Active Recreation.** In winter, under appropriate snow conditions, visitors may use snowmobiles on the Recreation Area's road network and on roads in the adjacent Birch Hill Dam property.
- **Hunting.** Lake Dennison is open to all legal hunting.
- **Special Events.** Competitive triathletes participate in the annual Massachusetts State Triathlon (organized by permittee Max Performance) held at Lake Dennison every summer.

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 27).

Natural Resources

Threats

- The MassDEP has identified water quality impairments to Lake Dennison (AU ID MA35017) resulting in the Lake being classified as not suitable habitat for sustaining a native, naturally diverse community of aquatic flora and fauna (MassDEP 2023a). 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.
- Unauthorized use of off-highway vehicles (OHVs) is negatively impacting natural landscapes through erosion.
- There is limited information on the presence or distribution of invasive plants at Lake Dennison, however, the following six species are known from the Recreation Area: Asiatic bittersweet, common reed, garlic mustard, glossy buckthorn, Japanese knotweed, and purple loosestrife. Invasive species may negatively impact both the ecological integrity and biodiversity of the Recreation Area.
- Because the extreme northern and southern portions of the Recreation Area were not included in the Landscape Designation process (DCR 2012), due to the lack of accurate boundary data, the lack of Landscape Designations in these areas may potentially impede proper management of natural resources.

Opportunities

- Accurately identifying and mapping the Recreation Area's boundary and applying Landscape Designations to the entire property would help ensure appropriate management of its natural resources.
- Increasing patrols by Environmental Police Officers, DCR Rangers, and staff presence may reduce unauthorized activities, like dumping, unregistered camping, and OHV use, and improve resource protection.
- 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, 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.
- Within the Recreation Area 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.

- The Recreation Area 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 Lake Dennison should review the latest 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).
- An opportunity exists to enhance the aquatic connectivity and climate resilience of the Forest's coldwater streams (i.e., streams where maximum summer water temperatures generally do not exceed 22° C). Three of the park's culverts could be replaced with structures consistent with the Massachusetts Stream Crossing Handbook (Massachusetts Department of Fish and Game 2018) and the most current Climate Resilience Design Standards (e.g., Commonwealth of Massachusetts 2022). The University of Massachusetts' Critical Linkages Project has identified these three culverts (ID nos. 10151, 10156, and 10159) as being in the top 10% for restoration potential statewide. See http://www.umasscaps.org/applications/critical-linkages.html for additional information on this project.
- There is an opportunity to enhance the Recreation Area's ecological integrity and biodiversity through targeted removal of invasive plant species.

Cultural Resources

Threats

- Erosion and ground impacts associated with campground improvements and maintenance activities not otherwise reviewed by DCR's Office of Cultural Resources, pose a potential threat to archaeological resources.
- Erosion and ground impacts associated with water level changes and management activities by the USACE on the Birch Hill Dam property pose a potential threat to archaeological resources.
- Because the extreme northern and southern portions of the Recreation Area were not included in the Landscape Designation process (DCR 2012), due to the lack of accurate boundary data, the lack of Landscape Designations in these areas may potentially impede proper management of cultural resources.

Opportunities

- Accurately identifying and mapping the Recreation Area's boundary and applying Landscape Designations to the entire property would help ensure appropriate management of its cultural resources.
- The Recreation Area was subject to archaeological site examinations funded by the USACE and completed in 2011 (Donohue et al. 2011). There may be future opportunities for DCR to refine or revisit the findings of the previous site examinations as part of a new sensitivity assessment or as part of any future review of ground-disturbing activities.

- Park buildings date from either the 1960s or 1970s, an evaluation of their relative architectural significance in context of statewide park development in the mid-20th century could better inform stewardship of the buildings.

Recreation

Threats

- Signage for Lake Dennison is inconsistent. Some signs inform visitors that they are entering 'Lake Dennison Recreational Area,' other signs indicate 'Lake Dennison at Otter River State Forest.' These inconsistencies could be confusing for visitors.
- There are accessibility issues property-wide that are identified in the May 2020 Lake Dennison Recreation Area, Winchendon, MA: Program Accessibility Assessment (Institute for Human Centered Design (ICHD) 2020). These accessibility issues threaten the access to and quality of experiences at the Recreation Area for people with disabilities.
- Eight potentially accessible campsites were added to the East Dennison and North Dennison camping areas in Fiscal Year 2022. These sites cannot be offered as accessible because of the lack of accessible comfort stations.
- The contact station is too small for operational needs, is not accessible, and lacks internet and phone connections.
- As a popular recreation destination with 151 campsites and a large Day-use Area, operation and maintenance of Lake Dennison's facilities are challenging. As a result, there is a backlog of deferred maintenance needs at the campground, picnic areas, and roadways.
- The roads, trails, and structures at Lake Dennison are not recorded in DCR's trails data, making it difficult to monitor the condition of these resources and to identify trail needs. (Trail metrics presented in Table 10 are derived from crowd sourced data and not DCR's trail data set.)
- Approximately 77% of the park is within the 1.0%-chance flood zone and the 0.2%-chance flood zone (Massachusetts Bureau of Geographic Information (MassGIS) 1997). All of the Day-use Area and most of the campground exists within this area. (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.)
- Dog walkers often ignore leash laws, potentially negatively impacting the experience of other recreationists, including campers.
- Unauthorized OHV use within the Recreation Area may be negatively affecting the experience for other visitors to Lake Dennison.
- Portions of the campground and Day-use Area are flooded annually due to the routine holding of water at Birch Hill Dam. When this occurs, primarily in the spring, these areas are closed to the public. During periods of severe flooding, recreation infrastructure including the beaches, Day-use Area, and even the entire campground may be closed and potentially damaged by flood waters.
- A Public Health Fish Consumption Advisory has been issued for Lake Dennison due to the presence of Mercury and Per- and Polyfluorinated Substances (PFAS) (Massachusetts Department of Public

Health (DPH) 2023). Signs informing the public of this health advisory are absent from both beaches and from the boat ramp.

- Between 2018 and 2022, Lake Dennison's day-use beach and camper's beach each had four reported Enterococci exceedances, resulting in 25 days of posted closures (DPH 2023, 2022, 2021, 2020, 2019). Such closures prevent enjoyment of one of the Recreation Areas most popular recreational resource. Because the DPH did not report all exceedances and postings, for all years, it is likely that the impacts of Enterococci on swimming were greater than indicated by the above data.

Opportunities

- An assessment of the contact station's ability to provide office space to staff while meeting the needs of all members of the public would identify whether modification or replacement of the contact station is the appropriate course of action.
- There is an opportunity to expand and improve the visitor experience of people with disabilities by addressing identified accessibility issues in the Recreation Area (IHCD 2020).
- Modernizing the campground's comfort stations would enhance the camping experience.
- Adding cabins to the campground could increase accessible camping options and afford the possibility of a winter camping program that leverages the site's popularity for winter recreation.
- A 2015 Comprehensive Campsite Assessment identified the campground's roads as "needing complete re-paving and drainage improvements such as grading and deep well dry sumps" (Arcadis U.S., Inc. 2015: 13-2). Such improvements would help improve access to campsites.
- Although most of the recommendations from the Energy Audit Study of Lake Dennison/Otter River Complex (Rise Engineering 2017) have been implemented, an opportunity exists to implement the remaining recommendations and to address the items in "Other Measures Evaluated." These measures would increase visitor and staff comfort while helping the Commonwealth meet its targets for reductions in energy costs, energy consumption, and greenhouse gas emissions.
- An increased presence by Environmental Police Officers and DCR rangers would help deter unauthorized OHV use, dumping, and other unauthorized activities in the Recreation Area.
- Leases between DCR and USACE and DCR's sublease and MassWildlife expire in January 2026. The opportunity exists for DCR to continue to provide public recreation opportunities at Lake Dennison Recreation Area by entering into a new lease agreement with USACE. The lease renewal process also provides an opportunity to add detailed spatial information, including GIS data sets, on the boundaries of DCR's lease area. Addition of this information will allow for better management of Lake Dennison.
- Posting signs informing anglers about mercury and PFAS levels in fish and encouraging catch and release fishing would contribute to protecting public health and would better inform visitors about best fishing practices at Lake Dennison.

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

Climate change may cause some vernal pools to dry earlier in the season than they have historically, potentially interfering with amphibian life cycles (Cartwright et al. 2022). Because of this, some of the Recreation Area's pools and associated amphibians may be negatively impacted.

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

The Recreation Area's known cultural resources with high exposure to climate change hazards are the, which are within most recent FEMA 1.0%-chance flood zone (MassGIS 1997). (Precipitation changes due to climate change (see EEA 2022b 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.)

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 Recreation Area 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). Other recreation activities may see increased participation, especially those associated with the waters of Lake Dennison. Fishing, swimming, and other water-based activities may experience increased participation due to the anticipated increase in temperature (i.e., more than 30 additional days with temperatures over 90° F; Table 12).

Recreation infrastructure with exposure to increased precipitation and flooding associated with climate change include the facilities surrounding the Lake (e.g., waterfront area, boat ramp and associated parking, picnic areas, and bath house) and most of the campground. 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). (As noted above, precipitation changes due to climate change are not factored into FEMA flood plain models and 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 Lake Dennison Recreation Area was designated Parkland. Identification of

Land Stewardship Zones within Lake Dennison 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 23.) Because accurate boundary data were unavailable at the time of preparation of this RMP, the following Land Stewardship Zoning should be considered preliminary. Zoning should be revisited once accurate boundary data are available.

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 Lake Dennison 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 Lake Dennison have been designated Zone 2.

- All areas not identified as Zone 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 Lake Dennison are currently developed, appropriate for potential future development, or intensively used for recreation. They have been designated Zone 3.

- Most of Lake Dennison, including the following developed areas:
  - Campground
  - Day-use Area
  - Boat launch
  - Parking lots
  - Dump station

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 Lake Dennison.

- **Presumed DCR Operational Area Overlay.** This overlay corresponds to the area that DCR operates as Lake Dennison Recreation Area. The Presumed DCR Operational Area is a subset of land within the approximately 4,221-acre area that DCR leases from the Department of the Army for "public park

and recreational and fish and wildlife purposes." Activities within, and management of, this area proceed in accordance with the following lease agreements:

- Department of the Army lease for public park and recreational and fish and wildlife purposes. DACW33-1-77-6. Executed 13 May, 1977.
- Massachusetts Department of Environmental Management sub-lease with Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement, for fish and wildlife purposes. Executed 18 October, 1988.
- Department of the Army, New England District, Corps of Engineers, 696 Virginia Road, Concord, Massachusetts 01742-2571. Supplemental agreement No. 3 between the Secretary of the Army and the Commonwealth of Massachusetts. Lease No. DACW33-1-77-6, Birch Hill Dam Project, MA. Executed 13 November, 2014.

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 24.)

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

Nine priority management recommendations were developed for this property. They are presented in Table 19, page 27. 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 27) 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.

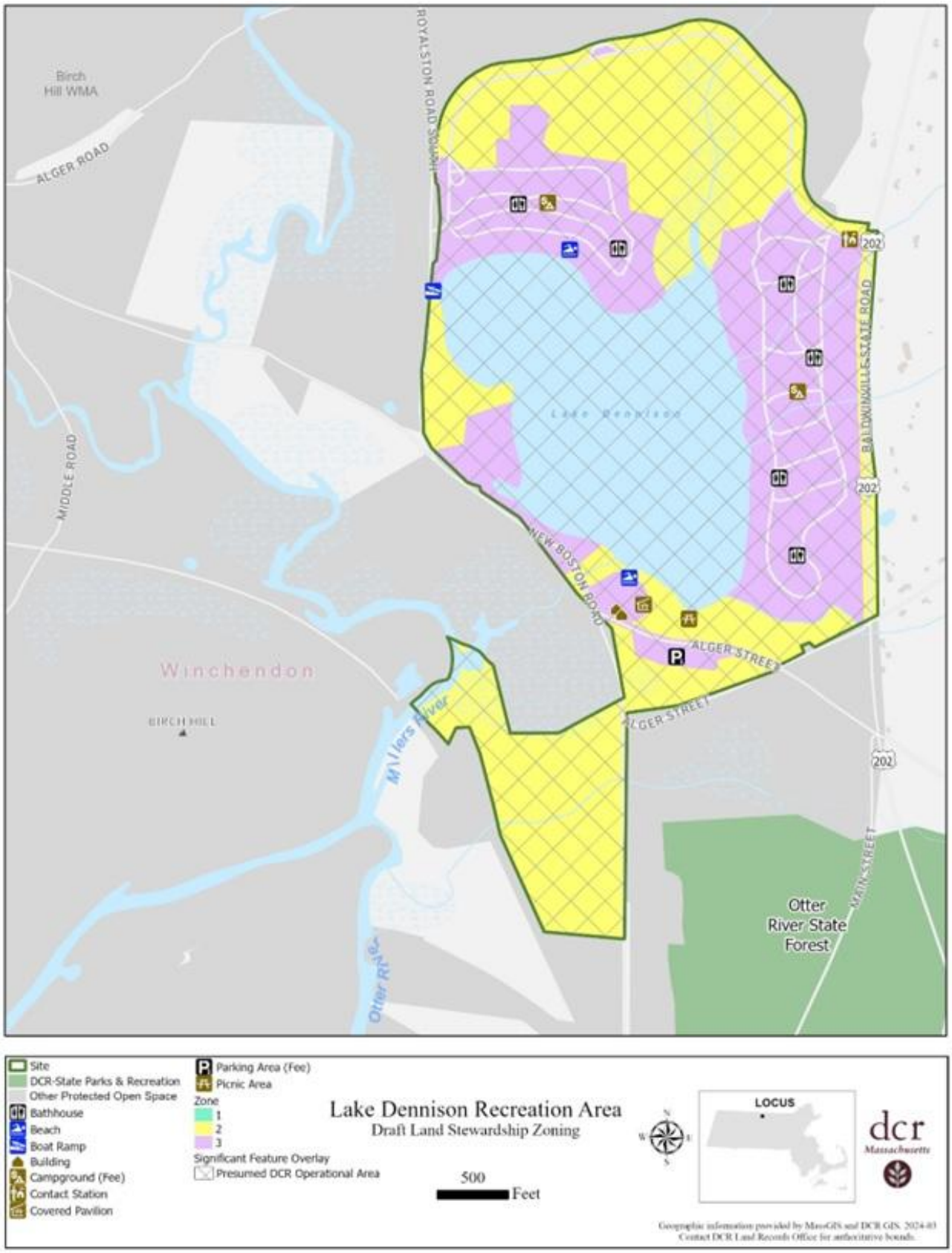

Figure 1. Land Stewardship Zoning Map.

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.	Unknown
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.	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.	No
Natural Resources	6. The extent of native vegetation in campground and/or picnic sites is stable or increasing. (As assessed by property manager.)	No
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.)	Yes
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.	No
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.	Unknown
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.	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.	Yes
Recreation	4. Over 90% of the park's official trails network is classified as being in Fair or better condition.	Unknown
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.)	Yes
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 2023b); DPH fish consumption advisories; and/or water quality testing at waterfront areas.	No
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 Lake Dennison Recreation Area. 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	Assess the three culverts (ID nos. 10151, 10156, and 10159) with high restoration potential for replacement (as assessed by the Critical Linkages Project (see http://www.umasscaps.org/applications/critical-linkages.html)) with structures consistent with the Massachusetts Stream Crossing Handbook (Massachusetts Department of Fish and Game 2018) and the most recent Climate Resilience Design Standards (e.g., Commonwealth of Massachusetts (2022), as applicable). Where viable, program funds for culvert replacement and replace culverts.	Design and Engineering (Co-Lead), Management Forestry, Office of Climate Resiliency, Office of Cultural Resources, Office of Natural Resources (Co-Lead), Trails and Greenways Program
Recreation	Conduct an assessment of the existing contact station to determine whether it meets all operational needs.	Design and Project Management (Lead), Park Operations, Universal Access Program,
Recreation	Collect standard DCR roads and trails data and create a GIS data set for Lake Dennison Recreation Area, and update property map.	GIS Program (Co-Lead), Trails and Greenways Program (Co-lead)
Recreation	Rehabilitate or replace two comfort stations in the East Dennison Camping Area and one comfort station in the North Dennison Camping Area so that they are accessible.	Facilities Engineering (Lead), Park Operations, Universal Access Program
Recreation	Implement Key Recommendations from the 2022 Program Accessibility Assessment (IHCD 2020).	Architecture Section, Contractor, Park Operations, Universal Access Program (Lead)
Recreation	As funding allows, prioritize and implement recommendations and items from "Other Measures Evaluated" section of the AEP Report (Rise Engineering 2017).	Contractor, Facilities Engineering (Lead), Park Operations

Category	Recommendation	Implementation
Recreation	Initiate discussions of a new lease agreement with the U.S. Army Corps of Engineers and MassWildlife. Ensure the lease renewal process includes the development of detailed spatial information on the boundaries of DCR's lease area.	GIS Program, Partner, Office of the General Counsel (Lead), Regional Staff
Recreation	Following the development of detailed spatial information on the boundaries of DCR's lease area, redo Landscape Designation(s) and Land Stewardship Zoning for Lake Dennison Recreation Area.	Bureau of Fire Control and Forestry, GIS Program (Lead), Office of Cultural Resources
Recreation	Ensure that Department of Public Health Fish Consumption Advisory Posters (https://www.mass.gov/doc/fish-consumption-advisory-poster-for-marine-and-fresh-water-bodies-0/download) are posted at all fishing access locations.	Park Operations

REFERENCES

AECOM. 2013. The impact of climate change and population growth on the National Flood Insurance Program through 2100. Prepared for Federal Insurance and Mitigation Administration and Federal Emergency Management Agency.
https://aecom.com/content/wp-content/uploads/2016/06/Climate_Change_Report_AECOM_2013-06-11.pdf (PDF)

Arcadis U.S., Inc. 2015. Massachusetts Department of Conservation and Recreation, Division of State Parks (MassParks), Comprehensive campground assessment. Final report. December 2015.

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)

Cartwright, J., T. L. Morelli, and E. H. Campbell Grant. 2022. Identifying climate-resistant vernal pools: Hydrologic refugia for amphibian reproduction under droughts and climate change. Ecohydrology 2022, 15, e2354.
https://onlinelibrary.wiley.com/doi/epdf/10.1002/eco.2354 (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)

Donahue, B., M. Dudek, S. Charles, D. Duranleau, D., D. Lassman, T. Mailhot, T. Mancl, and M. Roberts. 2011. American Recovery and Reinvestment Act 2009 Section 110 Compliance Report for the U.S. Army Corps of Engineers, New England District, NHPA, Cultural Resources Investigations, Technical Report No. 4 (Volume 2), Archaeological Site Examinations Conducted for 26 Sites at the Birch Hill Dam Reservoir Area in the Towns of Royalston, Templeton, and Winchendon, Worcester County, Massachusetts. NHPA, Cultural Resources Investigations Technical Report, No. 4, Vol. 2. St. Louis, MO: US Army Corps of Engineers Mandatory Center of Expertise for the Curation and Management of Archaeological Collections, St. Louis District.

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.

Institute for Human Centered Design (IHCD). 2020. Lake Dennison Recreation Area, Winchendon, MA. Program Accessibility Assessment, May 2020.

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 Department of Capital Asset Management and Maintenance (DCAMM). 2012. Facility Energy Advisory Services, Lake Dennison, 219 Baldwinville State Road, Winchendon, MA 01436. Energy Audit Report #: LDEN4. December 11, 2012.

Massachusetts Department of Conservation and Recreation (DCR). n.d. Best Management Practices: Vernal pool certification on DCR lands.
https://www.mass.gov/media/810286/download (PDF)

Massachusetts Department of Conservation and Recreation (DCR). 2006. Winchendon Reconnaissance Report: Freedom's Way Heritage Landscape Inventory.
https://www.mass.gov/doc/winchendon/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). 2023a. Final Massachusetts integrated list of waters for the Clean Water Act 2022 Reporting Cycle. Appendix 17. Millers River Basin. Assessment and listing decision summary. May 2023. Prepared by: Watershed Planning Program, Division of Watershed Management, Bureau of Water Resources. https://www.mass.gov/doc/2022-integrated-list-of-waters-appendix-17-millers-river-basin-assessment-and-listing-decision-summary/download (PDF)

Massachusetts Department of Environmental Protection (MassDEP). 2023b. 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 Department of Public Health (DPH). 2019. Massachusetts Freshwater Beaches [2018]: Water quality data for public and semi-public beaches.
https://www.mass.gov/doc/2018-freshwater-beach-data/download

Massachusetts Department of Public Health (DPH). 2020. Massachusetts Freshwater Beaches [2019]: Water quality data for public and semi-public beaches.
https://www.mass.gov/doc/2019-freshwater-beach-data/download

Massachusetts Department of Public Health (DPH). 2021. Massachusetts Freshwater Beaches [2020]: Water quality data for public and semi-public beaches.
https://www.mass.gov/doc/2020-freshwater-beach-data-0/download

Massachusetts Department of Public Health (DPH). 2022. Massachusetts Freshwater Beaches [2021]: Water quality data for public and semi-public beaches.
https://www.mass.gov/doc/2021-freshwater-beach-data-0/download

Massachusetts Department of Public Health (DPH). 2023. Freshwater fish consumption advisory list. February 2023.
https://www.mass.gov/doc/public-health-freshwater-fish-consumption-advisories-2023-0/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 Division of Fisheries and Wildlife. MassWildlife. 2016. Lake Dennison, Winchendon. Updated 2016. [Pond map.]
https://www.mass.gov/files/documents/2016/08/ra/dfwdeni.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)

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)

Rise Engineering. 2017. Accelerated Energy Report: Lake Dennison/Otter River Complex. CAMIS Site Code: LDEN4. DCAMM Project Number: AEP1702E UT1. Date: January 19, 2017.

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)

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)

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)

United States Army Corps of Engineers (USACE). 2023. Birch Hill Dam, Royalston, Massachusetts.
https://www.nae.usace.army.mil/Missions/Recreation/Birch-Hill-Dam/

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)