OTTER BROOK LAKE
Keene, New Hampshire

Master Plan

2023

US Army Corps
of Engineers
New England District ®

Executive Summary

This master plan covers the 458 acres of federally owned land at the Otter Brook Lake. The plan prescribes a land and water management plan, and resource objectives. The master plan provides design and management concepts which provide the best possible combination of responses to the needs of the region, resources capabilities, and interests and desires consistent with the projects authorized flood control purposes. The master plan covers resources such as fish and wildlife, vegetation, cultural, interpretive, recreational and out-granted lands, easements and water.

Inputs to the planning process included surveys and management plans for natural, wetland and cultural resources, and an analysis of recreational use, capacity and projected needs for project lands. Natural and man-made resources were located, identified and analyzed, including wetlands, exemplary natural communities, and cultural resources that require management efforts for their protection. These were integrated into a series of project wide objectives to protect and enhance project resources and promote and develop, as appropriate, those resources for public use, education, and access.

Recreational opportunities were identified through an analysis of regional needs and the public participation process. The planning process identified opportunities for the improvement of existing recreational facilities, enhancement of boat and beach facilities, picnic area and play fields, and multiple resource management to enhance and protect important natural and cultural resources. Enhancing and preserving the resources by careful management of user conflicts were also identified.

This Master Plan provides guidance for future development at Otter Brook Lake. The natural and man-made resources at the project will continue to be managed to provide the best combination of responses to regional and ecosystem needs, project resources and capabilities.

During the implementation phase period of the Master Plan, the New England District will continue to be responsible for the administration and management of the project.

All specific proposals for recreational or other development at the project must comply with this Master Plan, the Upper Connecticut River Basin flood risk management requirements, the National Environmental Policy Act, and all federal requirements.

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1. INTRODUCTION

1.1 Project Authorization

Authorization of Otter Brook Lake is contained in the Flood Control Act of 1936 (Public Law 738, 74th Congress) as amended by the Flood Control Act of June 28, 1938. Authorization for development and use of the reservoir area for public recreation, wildlife management, stewardship, and other purposes is contained in Section 4 of the Flood Control Act of December 22, 1944 (Public Law 534, 78th Congress), as amended, and the Fish and Wildlife Coordination Act 1958 amendment. Construction of Otter Brook Lake began May 1956 and was completed in August 1958 at a cost of approximately $4 million.

1.2 Purpose

The operation of Otter Brook Dam provides substantial flood protection for the town of Roxbury and Keene, NH as well as other communities in the Connecticut River Basin. The Otter Brook Lake project is located in the towns of Keene and Roxbury, New Hampshire, about 4.9 miles above the confluence of the Branch and Ashuelot River. Otter Brook Lake is operated in conjunction with Surry Mountain Lake, located in Surry, New Hampshire, on the Ashuelot River. Through June 2022, the facility has prevented approximately $50.9 million in flood damages.

Additional flood protection in the Upper Connecticut River Basin is provided by five other Corps projects, Union Village Dam and North Hartland Lake, North Springfield Lake, and Ball Mountain and Townshend Lakes.

In addition to flood control, the project lands also provide opportunity for public recreation, fish and wildlife management and open space preservation.

1.3 Purpose and Scope of the Master Plan

By definition, Master Plans for Corps reservoirs are land and recreational use management plans that do not address the technical aspects of water management for flood risk management, navigation, or water supply. This Master Plan presents an inventory of land resources, land classifications for management, modernization of existing park facilities, an analysis of resource use, anticipated influences on project operation and management, and an evaluation of existing and future needs required to provide a balanced management plan to improve outdoor recreation opportunities and sustain natural resources.

The Master Plan provides direction for project development and use as well as guidance for appropriate uses, development, enhancement, protection, and conservation of the natural, cultural, and man-made resources at the Otter Brook Lake. It is a vital tool for the responsible stewardship of project resources for the benefit of present and future generations. A master plan is programmatic and identifies conceptual types and levels of activities, not designs, project sites, or estimated costs. All actions by the Corps and the agencies and individuals granted leases to the Corps lands (out-grantees) must be consistent with the master plan. Therefore, it must be kept current in order to provide effective guidance in the Corps decision-making.

The Master Plan is based on responses to regional and local needs, resource capabilities and suitability and expressed public interests consistent with authorized project purposes and pertinent legislation and regulations. It provides a District-level policy consistent with national and State and regional goals and programs. The plan is distinct from the project-level implementation emphasis of the Operational Management Plan (OMP). Policies in the Master Plan are guidelines implemented through provisions of the OMP, specific Design Memorandums and the Annual Management Plans. This Master Plan supersedes the previous 1967 Otter Brook Lake Master Plan.

This document presents data on existing conditions, anticipated recreational use, types of facilities needed to service the anticipated use, and an estimate of future requirements. In accordance with Engineering Regulation (ER) 1130-2-550, Change 07, dated 30 Jan 2013 and Engineering Pamphlet (EP) 1130-2-550 Change 05, dated 30 Jan 2013, master plans are required for most USACE water resources development projects having a federally-owned land base. This revision of the Otter Brook Lake Master Plan is intended to bring the Plan up to date to reflect changes in outdoor recreation trends as well as ecological and socio-demographic changes that are currently impacting the lake and those anticipated to occur within the planning period of 2022-2047, a 25-year period. The revised Plan focuses on overall goals and objectives and not on details of design, routine management, and administration. The Master Plan is not intended to address the specifics of regional water quality, shoreline management, or water level management; these areas are covered in a project's shoreline management plan or water management plan.

This Master Plan provides a comprehensive and coordinated guide for the conservation, enhancement, development, management and use of recreation resources of the lands and waters owned by the United States Government at Otter Brook Lake. These recreation development plans are intended to maximize public use of project resources, within the constraints of land suitability, recreation demand and flood control operations of the project.

This Master Plan for the management of natural resources and outdoor recreation has been prepared in accordance with the objectives and policies governing the planning, development, and management of these resources at Corps of Engineers water resources projects. These objectives and policies are outlined in ER 1130-2-540, "Environmental Stewardship Operation and Maintenance Policies"; ER 1130-2-550, "Recreation Operations and Maintenance Policies"; EP 1130-2-550, "Recreation Operations and Maintenance Guidance and Procedures"; ER 1165-2-400, "Recreational Planning, Development, and Management Policies"; and other related or referenced regulations and policies.

ER 1130-2-540 established the following program objectives for management of a project's natural resources.

- Manage natural resources on Corps of Engineers administered land and water in accordance with ecosystem management principles to insure their continue availability.

- Provide a safe and healthful environment for project visitors.

Utilizing this general guidance, ER 1130-2-550 and EP 1130-2-550 provide the specific policy for preparation of project master plans. Each master plan must cover all resources, including, but not limited to fish and wildlife, vegetation, cultural, aesthetic, interpretive, recreational, mineral, and commercial and out granted lands, easements, and water. Based on EP 1130-2-

550, the primary goals of the Otter Brook Lake Master Plan are to prepare a concept document that prescribes an overall land and water management plan that establishes resource objectives, and associated design and management concepts, which:

- Provide the best combination of responses to regional needs, resource capabilities and suitability, and expressed public desires consistent with authorized project purposes;
- Contribute towards providing a high degree of recreational diversity within the region;
- Emphasize the particular qualities, characteristics and potentials of the project;
- Exhibit consistency and compatibility with national objectives and other state and regional goals and programs.

ER 1130-2-550 further defines these goals as they relate to recreation management and established the following program objectives:

- Provide a quality outdoor recreation experience which includes an accessible, safe and healthful environment for a diverse population;
- Increase the level of self-sufficiency for the Corps recreation program;
- Provide outdoor recreation opportunities on Corps of Engineers administered land and water on a sustained basis;
- Optimize the use of leveraged resources to maintain and provide quality public experiences at Corps water resources projects.

1.4 Brief Watershed and Project Description

Otter Brook Lake is located on Otter Brook, 2.4 miles upstream from its junction with the Minnewawa River which becomes the Branch River that flows 2.5 miles to the Ashuelot River in Keene, NH. Otter Brook is a tributary of the Connecticut River, in the Upper Connecticut River Basin. The dam is located in the townships of Keene and Roxbury, Cheshire County, New Hampshire.

The project lands are comprised of 458 acres of fee-owned land and 124 acres of flowage easement land. The dam and office is located at 480 Branch Road, Keene, NH 03431, approximately 2.5 miles east of Keene, on NH State Highway 101, then two miles north on Branch Road. The recreation area is located at 66 Route 9, Keene, NH 03431.

1.5 Prior Design Memorandums

Separate Design Memorandums were prepared from 1955 thru 1967 setting forth design criteria for all aspects of the project including the prime flood risk management facilities, real estate acquisition, road and utility relocations, reservoir clearing, and the master plan for recreation development and land management. Copies of these memorandums are located at the project office.

1.6 Pertinent Project Information

Reservoir land for the project consists of 582 acres, of which 458 acres are fee ownership and 124 acres are flowage easements. Project operations consist of the dam area and gatehouse, comprising 108 acres of the projects total acreage. Developed recreation land including the day-use area and disc golf course, consists of 260 acres. Land classified as Multiple Resource Management consists of 90 acres of land for fish and wildlife. A map of land classification can be found in Appendix A.

The dam is a rolled-earth filled structure that is 1,288 feet long and has a maximum height of 133 feet above the stream bed. The top width of the dam is 25 feet and accommodates a paved access road. The permanent pool at elevation 701 feet msl extends about one mile upstream and inundates an area of 85 acres to a maximum depth of approximately 30 feet.

The spillway is separated from the dam by a rock spur, which rises above the top of the dam. The dam was originally constructed with an uncontrolled overflow concrete ogee weir spillway that was 145 feet long founded on rock with a crest elevation of 781 feet msl (mean sea level) located at the west abutment of the dam. The ogee weir spillway was replaced with a Fusegate System spillway that was completed in 2006.

The dam outlet is a Boston horseshoe conduit that is 589 feet long and 6 feet high. The inlet elevation is 683 feet above msl. Three hydraulic slide service gates, each 2’ 6” by 4’ 6”, are operated from a combined tower intake and gate structure. The center gate has a concrete weir in front of it to maintain a permanent 90 acre pool at the recreation depth of 20 feet. The weir helps to minimize day-to-day fluctuations during the non-winter months. During the winter the weir is submerged and the pool is maintained at 21 feet to keep the flood control gates free from ice. The drainage area of the reservoir is 47.2 square miles. Downstream channel capacity of Otter Brook is about 650 cubic feet per second (cfs).

2. PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT

2.1 Description of Reservoir

2.1.1 Reservoir Management General

Otter Brook Lake is operated and maintained by the Operations Division of the New England District, North Atlantic Division of the U.S. Army Corps of Engineers. Otter Brook Lake and Surry Mountain Lake are a jointly operated project and are staffed by a project manager and three permanent park rangers who perform operation, maintenance, and administrative duties. The resources are shared between both projects. Temporary park rangers are hired during the summer months to assist project staff and help cover weekends and holidays. In addition to their primary flood risk management duties, project staff is also responsible for implementation of the Master Plan through the Operational Management Plan, recreation and natural resource management, visitor assistance and interpretive services.

A permanent 90-acre, 20 foot deep recreation pool is maintained by a concrete weir upstream of the middle flood control gate. The maximum pool of record occurred in April 1987 when it reached 99.4 feet utilizing full storage capacity, and cresting over the original ogee weir spillway. During flood control operations the reservoir has a maximum surface area of 374 acres (17,600 acre feet) which is approximately 7.0 inches of runoff and 5.9 billion gallons of water. The reservoir has been operated for flood control purposes on numerous occasions, but storage has rarely exceeded 50 percent of capacity.

Water level fluctuations are unavoidable at flood control dams. Exact figures on pool fluctuations for Otter Brook Lake are available at the project office. Water level fluctuations can be both detrimental and beneficial to the aquatic environment with the extent of damage depending on many factors such as, the time of year, the amount of fluctuation, and the direction of fluctuation. For a majority of the year, outflow from the dam matches natural conditions with fluctuations to match the inflow of Otter Brook. Additional regulation of flow is initiated when heavy rainfall occurs over the Otter Brook drainage basin or when downstream communities are threatened by potential flooding.

2.1.2 Operation and Maintenance

Otter Brook Lake is performed in accordance with the projects Operational Management Plan (OMP) and the Operation Maintenance (O&M) Manual. Some of the duties included are monitoring, inspections, maintenance, testing, reporting and record keeping. These duties make possible the operation and maintenance for the dam, appurtenant structures, buildings, bridges, utilities, roads, electrical and mechanical equipment and tools. Specific plans for related programs are contained in sections of the Operational Management Plan and include safety, security, visitor assistance, and other activities.

In addition to inspections and reports required by the OMP and O&M Manual, periodic inspections are performed by a team of specialists from the Engineering Division, Planning Division, and Operations Division of the U.S. Army Corps of Engineers, New England District every five years.

2.2 Hydrology

Otter Brook Lake is operated primarily to desynchronize flood flows of Otter Brook and the Ashuelot River from flood flows of the Connecticut River. Flow from the reservoir is reduced whenever forecasts indicate the channel capacity of the Connecticut River could be exceeded. The operation of this project is coordinated with the operation of Surry Mountain Lake and other reservoirs in the Connecticut River Basin to obtain the maximum reduction in overall flood damages. The top five flood control events are listed below as well as annual high pool stages at Otter Brook Lake.

Table 2.1 – Top 5 Flood Events

Rank	Date	Capacity	Pool Level (Ft.)
1	April 1987	100%	99.4
2	June 1984	81%	88.7
3	October 2005	75%	85.1
4	April 1969	70%	82.6
5	April 1960	69%	81.8

Table 2.2 – Pool Stage Frequency

OTTER BROOK LAKE
Keene, New Hampshire
(1936, 1958-2002)
(D.A. = 47 square miles)

FREQUENCY	Pool Stage	STORAGE		
(yr.)	(ft.)	(acre-feet)	(inches)	(percent full)
2	44	3,140	1.3	18
5	61	6,550	2.6	38
10	73	9,640	3.8	55
50	94	16,450	6.5	91
100	99	17,940	7.2	100+

Permanent Pool Level = 20.0 ft.
Spillway Crest = 96.0 ft.
Gate Invert = 683.0 ft-NGVD

Table 2.3 – Annual High Pool Stages

Otter Brook Dam, Otter Brook
Peak Pool Levels
by Water Year
(1958 - Present)
Drainage Area: 47 sq. miles
Normal Pool: 20 ft. (Summer), 21 ft. (Winter)
Gate Invert Elev.: 683 ft. NGVD
1" Runoff = 2,507 ac-ft
Storage at Spillway Crest: 7.0 in. / 17,600 ac-ft

Date	Annual Peak Pool Level (ft)	Storage Utilized		
		Inches	Acre-Feet	Percent
01 May 1958	66.3	3.1	7,864	45
12 Apr 1959	65.0	3.0	7,545	43
07 Apr 1960	81.8	4.8	12,120	69
28 Apr 1961	30.5	0.5	1,140	6
11 Apr 1962	56.9	2.3	5,694	32
06 Apr 1963	43.4	1.2	3,035	17
18 Apr 1964	43.0	1.2	2,965	17
17 Apr 1965	22.2	0.1	327	2
27 Mar 1966	33.2	0.6	1,476	8
05 Apr 1967	43.8	1.2	3,105	18
26 Mar 1968	65.3	3.0	7,619	43
25 Apr 1969	82.6	4.9	12,360	70
05 Apr 1970	35.0	0.7	1,715	10
19 Apr 1971	27.5	0.3	820	5
25 Apr 1972	52.4	1.9	4,742	27
02 Jul 1973	40.0	1.0	2,460	14
24 Dec 1973	53.5	2.0	4,968	28
21 Apr 1975	32.0	0.5	1,260	7
30 Jan 1976	40.7	1.0	2,576	15
18 Mar 1977	61.9	2.7	6,807	39
10 Jan 1978	39.5	1.0	2,382	14
12 Mar 1979	63.4	2.9	7,159	41
24 Mar 1980	40.8	1.0	2,592	15
27 Feb 1981	36.9	0.8	1,985	11
21 Apr 1982	56.5	2.2	5,608	32
22 Mar 1983	44.0	1.3	3,140	18
05 Jun 1984	88.7	5.7	14,290	81
14 Mar 1985	31.7	0.5	1,284	7
21 Mar 1986	55.2	2.1	5,328	30
08 Apr 1987	99.4	SPILLWAY DISCHARGE		

29 Mar 1988	44.1	1.3	3,158	18
08 Apr 1989	41.0	1.0	2,625	15
22 Mar 1990	57.2	2.3	5,758	33
26 Dec 1990	32.1	0.5	1,333	8
25 Nov 1991	30.5	0.5	1,140	6
19 Apr 1993	59.6	2.5	6,282	36
17 Apr 1994	54.3	2.0	5,134	29
27 Dec 1994	39.8	1.0	2,429	14
29 Jan 1996	49.0	1.6	4,059	23
03 Dec 1996	36.7	0.8	1,962	11
04 Apr 1998	50.6	1.7	4,386	25
18 Sep 1999	33.6	0.6	1,524	9
29 Feb 2000	27.7	0.3	844	5
26 Apr 2001	74.6	4.0	10,051	57
02 Apr 2002	32.0	0.5	1,330	8
01 Apr 2003	55.1	2.1	5,302	30
04 Apr 2004	55.3	2.1	5,310	30
05 Apr 2005	58.1	2.4	5,930	34
17 Oct 2005	85.1	5.2	13,000	75
22 Apr 2007	67.5	3.3	8,158	46
13 Apr 2008	45.6	1.4	3,428	20
31 Mar 2009	30.8	0.5	1,172	7
02 Apr 2010	69.7	3.5	8,713	50
12 Mar 2011	54.2	2.0	5,100	29
31 May 2012	51.4	1.8	4,548	25
01 Nov 2012	34.2	0.6	1,608	9
17 Jul 2014	37.3	0.8	2,039	12
15 Apr 2015	35.3	0.7	1,757	10
26 Feb 2016	38.5	0.9	2,235	13
27 Feb 2017	40.0	1.0	2,460	14
16 Jan 2018	56.0	2.2	5,508	31
07 Nov 2018	46.4	1.4	3,572	20
16 Dec 2019	33.4	0.6	1,498	9
22 Jul 2021	57.5	2.3	5,823	33

Regulations of Otter Brook Lake is performed and directed by the Reservoir Regulation Section at the New England District Regional Headquarters in Concord, Massachusetts. The Reservoir Regulation Section is the "command center" for all Corps-operated dams in New England. They constantly monitor river levels and weather conditions and direct the operation of the dams during high flows. Contact is maintained on a weekly basis between the Reservoir Regulation Section and the project office and more frequently during flood events.

There are emergency operating procedures available in the event that the park manager is unable to communicate with the Reservoir Regulation Section by normal or emergency methods. Otter Brook Lake has a Flood Emergency Plan (FEP) updated and in place for such emergencies.

Reservoir pool stage levels, tail water levels, and accumulated rainfall measurements are collected locally and stored by a Sutron data collection platform located in the office. A United States Geological Survey (USGS) gauging station is located downstream from the dam at the intersection of the Branch and Ashuelot rivers and provides a continuous record of releases from the project. The stored data is transmitted via satellite to the reservoir regulation section team for assistance in regulating project outflows.

Reservoir regulation is normally conducted in three phases. Phase I involves the initial appraisal of storm and river conditions that lead to regulation of flows. Phase II concerns regulation during the event as flood flows crest and move downstream. Phase III includes emptying of the reservoir following recession of the flood.

The U.S. Army Corps of Engineers New England District works with the U.S. Fish and Wildlife Service to minimize impacts to aquatic life from routine dam operations. At Otter Brook Lake, the minimum outflow and rate of change in outflow (ramping rate) have been adjusted to soften the impacts by keeping enough flow at all times to sustain life and to moderately change outflow. However, during flood events, more extreme operations are allowed to minimize destruction to life and property downstream. The minimum outflow at Otter Brook Lake has been set at 25 (cfs) or inflow, whichever is less, during normal operation.

2.3 Sediment and Shoreline Erosion

Otter Brook Lake project has nearly 3 miles of shoreline, including the meandering Otter Brook and Ferry Brook.

Sediment and shoreline erosion concerns at the project are dependent on exposure to wind, lake fetch and topography. Soil type is another factor governing the rate of shoreline erosion. Sediment accumulation in the reservoir is affected primarily by winter flooding through ice transport, stream currents transporting sediment, storm water runoff associated with the park activities, and to a much lesser extent by wave-induced erosion along the lake shoreline.

All recreational areas experience erosion problems to varying degrees. Erosion control efforts have been implemented as needed to protect the recreation facilities, sensitive habitats, or other resources by a combination of efforts such as vegetation plantings and structural solutions.

2.4 Water Quality

The New Hampshire Department of Environmental Services has designated the waters of Otter Brook Lake and its tributaries as class B, indicating that they should have no objectionable physical characteristics and are considered to be acceptable for bathing and other recreational purposes. The water must have dissolved oxygen (DO) concentrations of at least 75 percent of saturation, pH levels between 6.5 and 8.0 standard units or as naturally occurs, and not more than 240 total coliform bacteria per 100 milliliters.

Water quality monitoring is preformed to check for compliance with state standards, monitor swimming water quality, monitor potable water quality from project wells, determine the sources of nutrients and bacteria, and monitor trends. Water quality conditions in the lake are good in that they generally meet state standards and are usable for intended purposes including recreation, aquatic habitat, and aesthetics. The primary water quality concern is E. coli contamination from waterfowl and cyanobacteria blooms. Beach monitoring is required to protect public health and comply with state standards. In accordance with New Hampshire requirements, water samples are collected before the beach is opened. Subsequent samples are taken weekly during the bathing season and prior to reopening the beach after closing for any reason. The samples must be analyzed for E. coli.

In the past, testing for water quality in the lake, above the lake, and downstream of the lake has been conducted by USACE staff. Sample parameters commonly included indicator organisms (E. coli), turbidity, nitrogen, phosphorus, hardness, mercury, alkalinity, dissolved oxygen, pH, conductivity, temperature, and chlorophyll a. The beach is monitored and tested weekly for E. coli and cyanobacteria. The most recent water quality evaluation of Otter Brook Lake was completed in 2016 by the New Hampshire Department of Environmental Services (NH DES). Results of this testing are kept on file at the project office.

Water quality concerns for Otter Brook Lake mainly concern nutrient levels and algal blooms. Flocks of waterfowl, especially Canada Geese, can be a serious nuisance in areas where they congregate in large numbers, and their flocks have increased dramatically in the past two decades. They are often attracted to areas with fields of mown grass near small lakes with aquatic weed beds, a condition typical of most New England District projects with conservation pools. Their droppings are the biggest problem and can contaminate water by adding nutrients and bacteria. Geese congregate near the beach at Otter Brook Lake, and there is evidence that they have been elevating bacteria counts in the weekly water samples. Project staff are attempting landscape modifications, scare tactics, and other deterrents to minimize the impacts on the lake.

2.5 Project Access

New Hampshire State highway 101 is located to the south of the reservoir and provides access to the dam and project office. The day-use recreation area can be accessed directly from NH state highway 9, north of the dam and reservoir. Many highways converge on the city of Keene, two miles west of project, providing good accessibility to the reservoir. A vicinity map can be found in Appendix A.

2.6 Climate

Southern New Hampshire has a variable climate characterized as humid continental with four distinct seasons. The region lies in the path of the prevailing westerly's, a belt of generally eastward air movement in the middle latitudes. Air masses affecting the state are of three types: 1) cold, dry air originating in subarctic North America, 2) warm, moist air from the Gulf of Mexico and eastward, and 3) cool, damp air from the North Atlantic. While the ocean air occasionally modifies the climate, the principal weather influence is the alternating eastern flow of warm and cold air masses.

The irregular procession of contrasting warm and cold air masses is frequently accompanied by the passage of storms. These storms often include abrupt changes in temperature, wind direction and speed, with occasional heavy precipitation and thunderstorms. In addition to frontal storms of inland continental origin, three other types of storms can affect the area. Atlantic coastal storms, locally known as northeasters, can bring heavy rain or snow accompanied by strong northeast winds circulating counterclockwise around the low pressure center. Storms of tropical origin, sometimes of hurricane intensity, can also affect the region, primarily in the summer or fall. While these storms only rarely maintain hurricane force winds, more frequent damage may occur from the effects of heavy rainfall. During the warm humid days of summer, local convective activity can also produce thunderstorms like those occurring with frontal system movement.

In the Upper Connecticut River Basin, the period of greatest runoff generally occurs in the spring from the combination of snowmelt and rainfall. According to NOAA (National Oceanic and Atmospheric Administration) the mean annual precipitation in the region is approximately 42 inches and slightly more at higher elevations. Average annual snowfall is about 68 inches. Average monthly temperatures range from about 83°F in July to about 31°F in January. The average annual temperature is about 46 degrees Fahrenheit. Average daily temperatures range from very infrequent high of over 100 degrees to occasional lows below minus 20 degrees.

2.7 Topography, Geology and Soils

2.7.1 Topography

The topography of the area is hilly with moderate relief. In the reservoir area, the valley is steep-sided and narrow which is conducive to rapid-runoff. The floor is about 300 feet wide at the dam and about 1,200 feet wide at the upstream limit of the permanent pool. The hills on the east side reach an elevation of 1,400 feet msl. A map of topography can be found in Appendix A.

The Ashuelot River watershed is located in the southwest corner of New Hampshire in Sullivan and Cheshire counties. The watershed is diamond-shaped with a length of 42 miles and a width of 17 miles. The drainage area at the confluence of the Ashuelot and Connecticut Rivers is 421 square miles. Otter Brook is approximately 13.2 miles in length and has a total drainage area of 54.5 square miles, of which 47 square miles lie above the project. The stream is moderately fast flowing and averages about 35 feet in width. The mean depth varies seasonally, with depths of 12-18 inches during the winter. For the most part the stream-bed is composed of sand, gravel, and cobble.

2.7.2 Geology

The soils and geology of Otter Brook Lake were reshaped and formed during the recession of the last Laurentide ice sheet approximately 15,000 years ago. Glaciofluvial deposits in the form of kames and outwash deposits left by glacial melt waters are common. Soils here are in the Gloucester-Merrimack series. They are hilly to fairly level, somewhat excessively to excessively drained, sandy, and gravelly in texture and have in-buffering ability. Extensive areas of the valley floor were stripped of topsoil during dam construction.

The thin overburden on the right abutment consists of gravelly, silty sand and forest debris. On the left abutment where the rock is deeply buried, overburden is glacial till under lain by variable deposits of outwash materials. In the valley bottom the overburden is variable silty, gravelly sand. A shallow layer of silt occurs throughout the narrow flood plain on the easterly side of the stream.

2.7.3 Soils

Soils present at the project are classified in the Gloucester-Merrimack series. They are hilly to fairly level, somewhat excessively to excessively drained, sandy, and gravelly in texture and have in-buffering ability. Further soil examination revels the terraces near the river consist of Merrimac fine sandy loam and gravelly pits. These soils are well drained, have fair water-holding capacity but are not extremely fertile. In 2009, the Natural Resources Conservation Service completed a Soil Survey Geographic Database for New Hampshire and the soils within Otter Brook Lake were included in this survey. Soil types and acreage were identified as well as drain class, slope, hydrological group and hydric rating. The results from this survey are kept on file at the project office.

2.8 Resources Analysis

Numerous Federal laws and executive orders establish national policy for, and Federal interest in, the protection, restoration, conservation, and management of fish and wildlife resources. The U.S. Army Corps of Engineers is responsible directly or indirectly for the maintenance, restoration, and stewardship of natural resources on the flood control projects it owns and manages.

2.8.1 Fish and Wildlife

Hunting and fishing are permitted at Otter Brook Lake following all state and federal rules and regulations. A variety of wildlife can be found at Otter Brook Lake. Land available for wildlife management totals about 90 acres. Wildlife species that may be expected to occur within the project can be found on the following NH Fish and Game website: http://www.wildlife.state.nh.us/wildlife/species-list.html. The project manager issues trapping and tree stand permits for the project. The lake provides approximately 80-90 acres of good quality waterfowl habitat, although the production potential of the marsh is limited by water-level fluctuations during the spring nesting season.

Otter Brook Lake contains both warm water and cold water fishery habitat. The lake is classified as warm water fishery, while Otter Brook and Ferry Brook are cold water fisheries. New Hampshire Fish and Game stock trout in Otter Brook both above and below the dam. The permanent pool contains populations of brown bullhead (*Ameiurus nebulosus*), chain pickerel (*Esox niger*), golden shiner (*Notemigonus* crysoleucas), sunfish (*Lepomis* spp.), white sucker (*Catostomus commersoni*), fallfish (*Semotilus corporalis*), pumpkinseed (*Lepomis gibbosus*), spottail shiner (*Notropis hudsonius*), blacknose dace (*Rhinichthys* atratulus), common shiner (*Notropis* cornutus), longnose dace *(Rhinichthys* cataractae), tessellated darter (*Etheostomea* olmstedi), creek chub (*Semotilus atromaculatus*), American eel (*Anguilla* rostrata), rainbow trout (*Salmo* gairdneri), brook trout (*Salvelinus* fontinalis), johnny darter (*Etheostoma* nigrum), largemouth bass (*Micropterus salmoides*), and yellow perch (*Perca flavecens*). The species listed above represent only a sample of possible fish species found in the lake.

2.8.2 Vegetative Resources

Engineer Regulation 1130-2-550 mission statement states “The Army Corps Natural Resource Management Mission is to manage and conserve those natural resources, consistent with ecosystem principles while providing quality public outdoor recreation experience to serve the needs of present and future generations”. Ecosystem management implies sustainable forestry which seeks to preserve natural communities and all the elements of a forest as well as benefit the human communities who will utilize the resources. Otter Brook Lake has approximately 276 acres of forested land. The forest consists of mixed hard and soft woods, characteristic of the upland areas of southern New Hampshire. The principle cover types include white pine (*Pinus strobus*), Northern red oak (*Quercus rubra*), white ash (*Fraxinus americana*), sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), yellow birch (*Betula alleg haniensis*), Eastern hemlock (*Tsuga canadensis*), basswood (*Tilia americana*), gray birch (*Betula populifolia*), red maple (*Acer rubrum*), and aspen (*Populus tremuloides*). A forestry map can be found in Appendix A.

A Natural Features Survey conducted in 1998 by the New Hampshire Natural Heritage Inventory and The Nature Conservancy identified multiple natural communities of forest cover type at Otter Brook Lake. Hemlock-beech-oak-pine forest was found to be the dominant terrestrial forest on the property, occupying the upland glacial till and gravelly glacial outwash soils. The canopy was variably dominated by softwoods and hardwoods. Hemlock-beach-oak-pine forests are a very common, broadly defined community found on till and terrace soils of low to mid elevations in central and southern New Hampshire, with extensions into the White Mountains.

Another natural forest community found during the survey was the red maple stream bottom floodplain forest/swamp complex along Ferry Brook, northwest of Otter Brook Lake. The lower reaches of the complex have been heavily disturbed by ice damage, beaver activity, and selective cutting. This area had a sparse over story of mature trees, and a dense shrub layer that exhibited evidence of extensive crushing and scouring of woody vegetation from ice activity. Detailed results of this survey are kept on file at the project office.

2.8.3 Rare, Threatened and Endangered Species

The Otter Brook Lake project includes habitat that is vital to Federally and State listed rare, threatened, and endangered species (RT&E). The latest RT&E survey was conducted in 1998

by the NH Natural Heritage Inventory. RT&E species found on the project include plants, mammals, birds, reptiles, and mollusks. A list of RT&E species can be found in the survey which is kept locally at the project office. RT&E species are considered in all management decisions and coordinated with local and state resources.

Vasey's Pondweed

Vasey's pondweed (*Potamogeton vaseyi*) is a delicate, floating-leaved aquatic plant that is a threatened species in New Hampshire. It has state rank of S2 (imperiled), and global rank of G4 (globally secure). One small population was found in the deep emergent marsh community on the northwest side of the lake. Potential habitat for this species on the property includes all quiet-water deep emergent marsh and aquatic bed areas in Otter Brook Lake. The relatively small number of individuals makes this population susceptible to extinction from chance environmental fluctuations, anthropogenic disturbance, herbivory, or disease.

Fragrant Umbrella Sedge

A single plant specimen of Fragrant Umbrella Sedge (*Cyperus odoratus*) was collected at Otter Brook Lake in 1967 along the edge of the lake. This plant species is currently endangered in New Hampshire. There have been no recent discoveries of this plant species, but it may still occur within the project area. Project staff will continue to monitor the lake shoreline for this sedge.

Table 2.4 RT&E Species

Species Name	Federal Status	State Status
Vasey's pondweed (*Potamogeton vaseyi*)	--	E
Fragrant umbrella sedge (*Cyperus odoratus*)	--	E
E=Endangered T=Threatened SC=Special Concern		

2.8.4 Invasive Species

Executive Order 13112 (Invasive Species, 3 February 1999), directs the Corps of Engineers and other Federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasives species cause. Additional guidance include, "Memorandum, HQUSACE, CECW-ZA, 2 JUN 2009, Subject; US Army Corps of Engineers Invasive Species Policy" and "Memorandum, HQUSACE, CECW-CO, 17 DEC 2009, Subject; Guidance on authorities for project Specific Restoration to Manage the Introduction of Invasive Species". Otter Brook Lake will adapt management goals, practices and policies used by the National Invasive Species Council (NISC) 2008-2012 National Invasive Species Management Plan and adopt a Long-term Management Plan. The strategic goals include: Prevention, Early Detection and Rapid Response, Control and Management, Restoration, and Organizational Collaboration.

Invasive species are organisms that are not native to a geographical region and cause a problem in that ecosystem. They threaten resources, preventing or seriously hindering the operation of navigation, adversely affecting flood control, hydropower generation, and water supply, and limiting recreation use by the public. The economic costs can be staggering, and introductions of new invasive species are continuing. The staff at Otter Brook Lake have taken steps to properly manage invasive species, including developing an Invasive Species Management Plan that implements integrated pest management techniques which utilize both mechanical and chemical treatment techniques. This combination of management techniques reduces the amount of chemicals used to treat invasive species and has been known to be a more effective method. Staff are currently implementing this technique and monitoring and recording results. USACE staff plan on conducting future investigations into the impact that herbicides may have on the environment.

Terrestrial invasive plant species continue to be the greatest threat to our natural resources. Species such as European glossy buckthorn (*Frangula alnus*), Japanese knotweed (*Fallopia japonica*), Japanese honeysuckle (*Lonicera japonica),* Japanese barberry *(Berberis thunbergii),* and autumn olive *(Elaeagnus umbellate)* are quite pervasive in almost all areas on the project lands. Japanese knotweed in particular has a significant impact on project lands and is the greatest threat to the native ecosystem. Long term eradication and control methods are implemented by project staff. Additional information on individual species can be located here through USDA http://www.invasivespeciesinfo.gov/index.shtml.

2.8.5 Ecological Settings

Otter Brook Lake is located in the Northeastern Highlands Worcester/Monadnock Plateau eco-region. This region covers parts of north-central Massachusetts and south-central New Hampshire. Elevations range mostly from 500 feet to 1,400 feet, with some higher peaks over 2,000 feet. The rock types consist of mainly gneiss, schist, and granite. Monadnocks, residual hills or mountains usually composed of more resistant rocks, occur in many parts of the region. The general vegetation types include transition hardwoods and northern hardwoods. Forested wetlands are common and surface waters tend to be acidic.

The Otter Brook Lake project area lies within a large area of elevated terrain in central and southern New England referred to as New England Upland, a region of hills and mountains underlain by schist, granite, and gneiss bedrock. The region is characterized by extremes in elevation, from the peaks of the mountains, hills, and ridges with moderately steep slopes to broad, marsh covered valleys. Mount Monadnock lies in the southeastern edge of the Ashuelot basin and has an elevation of 3,165 ft. NGVD (National Geodetic Vertical Datum). Otter Brook is a 13.2 mile long river. It is a tributary of the Branch, which is a tributary of the Ashuelot River, which is itself a tributary of the Connecticut River, which flows to Long Island Sound. Otter Brook begins at the outlet of Chandler Meadow, in the town of Stoddard, New Hampshire. It flows southwest through the towns of Nelson, Sullivan, and Roxbury, eventually entering the city of Keene, where it joins the Minnewawa Brook to form the Branch river.

2.8.6 Wetlands

The Army Corps of Engineers New England District conducted a wetlands determination on Otter Brook Lake in 1997. A total of 123.6 acres were found on the project area. Wetland mapping for the project is shown in Appendix A. The purpose of the wetland classification

project was to identify and describe the various wetland communities on government-owned property at the Otter Brook Lake flood control facility. A modified version of the *Classification of Wetland and Deepwater Habitats* (Cowardin et al., 1979) classification system was used to classify wetlands greater than 1/4 acre in size. These findings provided an improved understanding of wetland interaction with the surrounding landscape, and the data collected has been used as a valuable planning tool for the Army Corps of Engineers.

Table 2.5 Wetland Descriptions

Wetland Description	Acres
Lake Open Water (LOW)	76.5
Lacustrine Emergent (LEM)	3.7
Palustrine Open Water (POW)	2.8
Palustrine Emergent Persistent (PEM1)	1.2
Palustrine Scrub-Shrub Broad-Leaved Deciduous (PSS1)	21.6
Palustrine Scrub-Shrub Broad-Leaved Deciduous/Palustrine Emergent Persistent (PSS1/PEM1)	5.4
Palustrine Forested Broad-Leaved Deciduous (PFO1)	4.8
Palustrine Forested Broad-Leaved Deciduous/ Palustrine Scrub-Shrub Broad-Leaved Deciduous (PFO1/PSS1)	1.0
Riverine Open Water (ROW)	6.0
Moss/Scrub-Shrub Broad-Leaved Evergreen (PM/PSS3)	0.4
TOTAL	**123.6**

2.9 Cultural Resources

2.9.1 Historical Context

Land in the area of the dam was formerly woodland and pasture, while the land in the recreation area was principally farmland, with a few cabins near the present picnic area. Keene was first settled by Europeans in 1736, was abandoned and resettled in the late 1740s and gradually shifted from a primarily agricultural town in the 18th century to a major manufacturing and commercial center of southern New Hampshire. Though the center of population in Keene was to the west of the reservoir, several historic sites existed within the reservoir boundaries. Land use included a small motel, upland farming, and small industrial sites on the brook.

No known prehistoric sites have been identified at Otter Brook Lake. The reservoir and surrounding area may be characterized as typical New England upland terrain, with steep slopes above narrow watercourses with highly variable flow. Archaeological sites in such an environment may be expected to be small and single component in nature, reflecting probably seasonal exploitation of resources.

2.9.3 Archaeological Resources

An archaeological reconnaissance survey for the operation and maintenance of Otter Brook Lake was conducted by the U.S. Army Corps of Engineers in 1992. The purpose of the reconnaissance level survey was to provide information on the archaeological sensitivity of the Otter Brook Lake project area, and review the possible effects of current project operations on cultural resources. A total of 31 historic sites were identified during the survey. No prehistoric resources were located.

The majority of the 31 historic sites were identified from Corps real estate maps and/or historic maps, and were found to have been razed during or prior to dam construction. Nine of the sites were considered to be potentially significant based on the limited information collected during the survey. In addition, a number of areas of high and moderate prehistoric archaeological sensitivity were identified.

2.9.4 Prehistoric Resources

There were no prehistoric resources located during the field survey. The archeological reconnaissance survey identified several zones of high and moderate prehistoric archaeological sensitivity within the Otter Brook Lake project area. In general, the Otter Brook Lake area was found to include some substantial sections of relatively undisturbed, forested land with expected prehistoric archaeological sensitivity. There were only several small areas which were assessed as possessing high archaeological sensitivity. These areas are located along the southerly and easterly side of Otter Brook in the recreation and picnic areas. Areas ranked with moderate archaeological sensitivity were located on the more gently sloping and less disturbed portions of the project area. These areas tend to be fairly well defined by the surface topography, drainage patterns (brook, tributary streams, and wetland areas), and soils occurring within the project area. It is possible that additional, intensive level archaeological survey in these high to moderate archaeological sensitivity areas could identify small, temporary, and/or task specific prehistoric sites. However, it is considered unlikely that large or long term occupation sites would be present within the project area. Approximately 200 acres of the Otter Brook Lake project area have archaeological sensitivity. Records containing the locations of these areas are keep at the project office.

2.9.5 Historic Resources

The archaeological reconnaissance survey resulted in thirty one historic sites. Further archeological evaluation, consisting of subsurface testing and/or additional detailed historic background and deed research, was recommended for eight historic sites. Six of these sites were identified as residential/agrarian, one industrial, and one commercial. No further archaeological work was recommended for 11 transportation related sites, one public site, and three well/cisterns. Eight historic period sites in the Otter Brook Lake project area were destroyed during dam construction, and no further investigations were considered necessary.

In 2001 a historic properties management plan was written by the U.S. Army Corps of Engineers. This plan includes policy and guidance, an overview, a land use guide, and an action plan for the historic properties identified in the 1992 archaeological reconnaissance study.

2.10 Demographics

2.10.1 Population

Table 2.6 – Population Projections (2015-2040)

Comprehensive Economic Development Strategy for Southwest New Hampshire

Population Projections 2015-2040

	Census	OEP Projections					Change
	2015	2020	2025	2030	2035	2040	2015-2040
New Hampshire	1,330,389	1,349,908	1,374,702	1,402,530	1,422,530	1,432,730	8.7%
Cheshire County	77,342	77,653	78,002	78,315	78,543	78,695	1.8%
Hillsborough County	404,322	409,478	416,445	424,492	429,538	431,284	2.0%
Keene	23,550	23,641	23,743	23,839	23,908	23,954	1.7%
Roxbury	226	220	215	216	216	217	-4.0%
Marlborough	2,110	2,130	2,151	2,160	2,166	2,170	2.8%
Sullivan	688	670	651	654	656	657	-4.5%

Source: New Hampshire Population Projections, New Hampshire Office of Energy and Planning

2.10.2 Education and Employment

Table 2.7 – Education Attainment

Comprehensive Economic Development Strategy for Southwest New Hampshire

2014 Education

	High School	Some College	Associates	Bachelors	Prof. Degree	% HS or Higher	% Bachelors or Higher
New Hampshire	267,359	173,926	88,466	197,937	117,855	92.0%	34.4%
Cheshire County	17,729	9,869	4,083	9,868	6,196	91.7%	30.8%
Hillsborough County	76,122	51,017	26,353	62,701	35,535	90.9%	35.5%
Keene	3,893	2,769	1,013	3,229	2,458	93.2%	39.7%
Roxbury	55	47	18	35	16	94.5%	28.2%
Marlborough	419	253	152	262	147	89.5%	29.7%
Sullivan	200	62	21	93	62	87.6%	31.0%

Source: New Hampshire Population Projections, New Hampshire Office of Energy and Planning

Table 2.8 – Unemployment Rate

Comprehensive Economic Development Strategy for Southwest New Hampshire

Unemployment Rate

	2008	2009	2010	2011	2012	2013	2014
New Hampshire	3.9%	6.2%	6.1%	5.4%	5.5%	5.1%	4.3%
Keene	3.4%	6.1%	5.6%	5.1%	5.1%	4.7%	4.1%
Roxbury	3.4%	5.3%	5.3%	5.0%	4.8%	4.9%	4.3%
Marlborough	5.1%	7.9%	8.3%	7.8%	3.9%	4.0%	2.9%
Sullivan	3.2%	5.7%	4.9%	4.1%	5.4%	5.2%	4.4%

Source: New Hampshire Population Projections, New Hampshire Office of Energy and Planning

2.10.3 Household Income

Table 2.9 – Median Household Income

Comprehensive Economic Development Strategy for Southwest New Hampshire

Median Household Income 1980-2014

	1980	1990	2000	2014
New Hampshire	$17,013	$36,329	$49,467	$65,986
Cheshire County	$16,037	$316,548	$42,382	$56,139
Hillsborough County	$18,689	$40,404	$53,384	$70,906
Sullivan County	$15,304	$29,053	$40,938	$56,851
Keene	$16,462	$31,235	$37,033	$52,327
Roxbury	$14,205	$40,569	$49,375	$61,964
Marlborough	$16,558	$31,383	$44,904	$52,813
Sullivan	$16,118	$31,083	$51,058	$48,056

Source: New Hampshire Population Projections, New Hampshire Office of Energy and Planning

2.11 Recreational Facilities, Activities and Needs

2.11.1 Recreational Facilities

The following is an overview of the facilities located at Otter Brook Lake. Recreation facilities are located in the developed park and at the dam site area. A map of the locations of recreational activities and facilities that are presently offered for public use can be found in Appendix A.

2.11.1.1 Park

Otter Brook Lake Recreation Area is located off of NH Highway Route 9 in Keene, NH and consists of 260 acres adjacent to the 90-acre lake. There are three picnic shelters that can be reserved in the park. The recreation area offers a swimming beach, picnic tables with grills, restroom facilities, and a boat ramp. A disc golf course is located at the northern end of the recreation area near the entrance to the park. The course was developed and is maintained by the Keene Disc Golf Club. There is parking available at the base of the entrance road for visitors to use during the recreation season but visitors can also walk in and use the course when the

park is closed. The recreation areas are open to foot traffic year-round and visitors enjoy winter activities during the off-season.

Visitors can also recreate at the Otter Brook Dam area where there is a parking area, picnic tables at the outlet of the dam, public restrooms, and access to trails. Hunting and fishing are permitted in accordance with Federal and State laws, as well as any posted regulations. A recreational white water release is available in late April/early May in conjunction with spring flooding and high outflows. The length of the water release from Otter Brook Lake is dictated by pool storage and current river flow.

2.11.1.2 Beach Monitoring

Beach monitoring is required in order to protect the health of visitors and comply with state standards. Samples are collected before opening the beach for the recreation season, and once a week throughout the season. If the beach has to be closed for any reason, the water must be retested again before opening for E. coli or any other bacteria.

The beach swim area is also monitored for cyanobacteria blooms. New Hampshire does not require routine analyses for algae, but in the event an algal bloom or scum appears, a sample must be collected and analyzed for the presence of toxin-producing cyanobacteria. If such a species is found to dominant a sample, an advisory against swimming must be issued until the bloom is gone or additional sampling shows it is no longer dominated by toxin-producers. A bloom is considered to exist if it is visible, and a sample is considered dominated if more than 50 percent of the sample consists of toxin-producing cyanobacteria.

2.11.1.3 Potable Water

Otter Brook Lake has two active wells, both of which are Corps-operated. One serves the recreation area and meets the definition of a public, transient, non-community water supply. The other serves the project office and is classified as a private water supply.

The private well is open year-round and monitored quarterly for total coliforms. The public well is only monitored during the months that the recreation area is open. Monitoring has shown that the potable water meets appropriate standards for total coliform, nitrates and nitrites, sodium, and volatile organic compounds.

2.11.2 Zones of Influence

The majority of visitation to Otter Brook Lake is from local cities and towns. A thirty mile radius surrounding Otter Brook Lake was analyzed as the zone of influence on the project. A map of this zone can be found in Appendix A.

2.11.2.1 Regional Recreation Facilities

In order to assess the future recreation facilities needs at Otter Brook Lake, it is necessary to inventory and compare other recreation facilities available in the region. An inventory of public recreation facilities within thirty miles of Otter Brook Lake was compiled and is summarized in the table below. The following table lists the major public recreation areas within thirty miles of Otter Brook Lake along with the activities offered at each.

Table 2.10 Regional Recreation Facilities within 30 miles of Otter Brook Lake

Area	Distance (miles)	Boating	Camping	Fishing	Hiking	Picnicking	Snowmobiling	Swimming	Hunting
Federal Parks									
Surry Mountain Lake (USACE), NH	11	X		X	X	X	X	X	X
Edward MacDowell Lake (USACE), NH	22	X		X	X	X		X	X
Birch Hill Dam (USACE), MA	30	X	X	X	X	X		X	X
Tully Lake (USACE), MA	28	X		X	X	X	?	X	X
Vernon Dam Area, VT	29	X		X		X			X
State Parks									
Monadnock State Park, NH	23		X		X	X			
Rhododendron State Park, NH	19				X	X			
Pisgah State Park, NH	21			X	X	X	X		X
Pillsbury State Park, NH	26	X	X	X	X	X			
Greenfield State Park, NH	23	X	X	X		X		X	
Miller State Park, NH	29				X	X			
Chesterfield Gorge State Park, NH	8				X	X			
Lake Dennison State Park, MA	30		X	X	X	X		X	X
Fort Dummer State Park, VT	24		X		X	X			

The region inventoried encompasses most of the Monadnock region of New Hampshire as well as a portion of north-central Massachusetts and south-eastern Vermont. Within this region is a diverse landscape of mountains, hills and lakes. Regionally, there are five other federally owned recreation areas, nine State parks and ten State forests within a 30 mile radius. In addition, there are over 30 town-owned recreation areas with ponds and lakes with public access points within 30 miles of the project.

Cities and towns offer the largest number of recreation facilities in the region. The most common activities are picnicking, field sports, playgrounds and swimming. The 15 town beaches available in the region reflect the local abundance of lakes and ponds. However, these facilities tend to be more locally oriented than State-owned areas. Ski-touring facilities with groomed and marked trails are provided at several sites in the region including State forests and State parks. For more information, available trails and maps please visit the New Hampshire Snowmobile Association (http://nhsa.com/).

White water canoeing is available on some stretches of the Ashuelot River from Marlow through Keene to Hinsdale, and on Otter Brook below Otter Brook Dam.

In summary, the recreation activities now available at Otter Brook Lake are found throughout the Monadnock Region, but the recreation use at Otter Brook Lake tends to be more localized. The availability of three shelters to rent for events, is a unique feature to the park, in that they are large in size, include electricity, and are affordable. That in conjunction with the large swimming beach and maintained facilities, makes the recreation area a popular destination.

2.11.3 Visitation Profile

The majority of visitors to Otter Brook Lake are local residents. Besides the local population, visitors come from Massachusetts, Connecticut, New York and New Hampshire. According to the National Recreation Reservation Service, during the 2014 recreation season, eighty seven percent of the reservations were made by visitors from New Hampshire and five percent of the reservations were made by visitors from Massachusetts. The following visitation data is from VERS from fiscal year 2014 to fiscal year 2021. Years that have lower visitation numbers are correlated with flood events when the parks were partially closed and/or when traffic counters were malfunctioning.

Table 2.11 Annual Visitation Otter Brook Lake (from VERS)

Fiscal Year	Visits
2014	75,172
2015	84,577
2016	71,338
2017	69,462
2018	72,252
2019	66,578
2020	66,010
2021	78,820

2.11.4 Recreational Analysis

2.11.4.1 Natural and Scenic Qualities

The project area, like much of the Monadnock region of southwest New Hampshire, is a scenic area with many natural features. The majority of these natural areas can be accessed by a three mile trail that completes a loop around the entire project. From this trail, visitors can enjoy views anywhere from the top of the dam, to rock outcroppings on the western shore line, to the beach in the recreation area. Terrain is flat to moderately hilly, with access to wetlands, forests, and fields. Otter Brook Lake also has natural communities of local significance including marsh, swamp, and riverbank communities. Other natural communities include hemlock-beech-oak-pine forest and red maple stream bottom floodplain forest/swamp complex. The environmental resources of Otter Brook Lake project provide for important and valuable natural resource and recreational opportunities. The project maintains a wide variety of fish and wildlife resources, and provides popular recreational facilities for the surrounding areas.

2.11.4.2 Recreational Analysis

Otter Brook Lake's recreation areas, trails, and water add to the attractiveness, vitality, and appreciation for the outdoors. These areas provide a place that allows a growing population to enjoy outdoor recreation opportunities in an ever growing suburban landscape. With the ever increasing public demand for outdoor recreational activities, an area that retains its natural qualities while providing the resources for a variety of recreational uses can be expected to be in constant demand. Otter Brook Lake's recreation areas and improvements to the recreation areas are always needed to meet these demands.

2.11.6 Recreational Carrying Capacity

2.11.6.1 Projected Use

The demand for recreation at Otter Brook Lake is expected to remain high in the future. This is based on existing and past use of the facility, which is mainly recorded using traffic counters at each project site area (PSA). Visitation is also reported annually through Recreation One Stop (R1S), which is the national reservation service for Corps projects. Utilization of the national reservation system for reservations at Otter Brook Lake began in 2014. Prior to that reservations were made locally at the project office. Reports generated through R1S include facility utilization reports, occupancy reports, park revenue reports, park visitation reports, and usage by site reports which show visitation and utilization trends over the past two years. These reports, along with traffic counter data allow us to determine that the demand for recreation at Otter Brook Lake is increasing over time and will likely continue to increase in the future.

2.11.6.2 Park Carry Capacity

The recreation carrying capacity of a lake is the amount of development, use, and activity any lake and associated recreational lands can sustain without being permanently adversely impacted. Due to the nature of the project being a flood control facility, the carrying capacity is subject to change based on the accessibility of parking areas and access to the recreation areas. At an average of 2.5 people per car and 380 parking spaces, approximately 950 people can visit the project at any given time. Some of the land classified as recreation area has not been fully developed and there is room for limited expansion. While there is room for some recreational development, we need to keep in mind the original purpose and authority of this facility. Based on the above analyses, there are no serious carrying capacity deficiencies at Otter Brook Lake. Since future use of these and other facilities is expected to remain high, continued maintenance and improvement of these and other areas should be practiced to ensure high quality recreation experiences.

2.12 Real Estate and Land Use and Acquisition Policy

All lands at Otter Brook Lake were acquired for flood control operations at the project. This included areas for permanent structures, construction, borrow, highway relocation, and reservoir. There are currently 458 acres owned in fee and 124 acres held in flowage easement. The acres owned in flowage and easement are shown in the real estate tract map found in Appendix A. Approximately 60 percent of the project is forested, 15 percent is open fields and non-forested and 20 percent is water area. There are several easements and land use out grants associated with the project land. Copies of these real estate agreements are locally at the project office.

Government property is monitored by Otter Brook Lake personnel to identify and correct instances of unauthorized use, including trespasses and encroachments. The term "trespass" includes unauthorized transient use and occupancy, such as mowing, tree cutting and removal, livestock grazing, cultivation and harvesting crops, and any other alteration to Government property done without USACE approval. Unauthorized trespasses may result in a Title 36 citation to appear in Federal Magistrate Court, which could subject the violator to fines or imprisonment (See 36 C.F.R. Part 327 Rules and Regulations Governing Public Use of Water Resources Development Projects Administered by the Chief of Engineers). More serious

trespasses will be referred to the USACE Office of Counsel for enforcement under state and federal law, which may require restoration of the premises and collection of monetary damages.

The term "encroachment" pertains to an unauthorized structure or improvement on Government property. When encroachments are discovered, lake personnel will attempt to resolve the issue at the project level. Where no resolution is reached, or where the encroachment is a permanent structure, the method of resolution will be determined by Real Estate, with recommendations from Operations Division, Office of Counsel, and lake personnel. USACE's general policy is to require removal of encroachments, restoration of the premises, and collection of appropriate administrative costs and fair market value for the term of the unauthorized use.

2.13 Pertinent Public Laws

The following laws and regulations provide for the development and management of Federal projects:

1. The Historic Sites, Buildings and Antiquities Act of 1935 (16 U.S.C. 461-467), commonly known as the Historic Sites Act, declares a national policy to preserve historic sites and objects of National significance including those located on refuges. It provides for designation, acquisition, administration, and protection of such sites. Additionally, National Historic Landmarks are designated under the authority of this Act.

2. Otter Brook Lake was authorized by the Flood Control Act approved 22 June 1936, Public Law 74-738, as amended by the Flood Control Act approved 28 June 1938, Public Law 75-761. Authorization for development and use of the reservoir area for public recreation, wildlife management, stewardship, and other purposes is contained in Section 4 of the Flood Control Act of December 22, 1944 (Public Law 534, 78th Congress), as amended, and the Fish and Wildlife Coordination Act 1958 amendment.

3. Public Law 78-534 (The Flood Control Act of 1944) as amended by the Flood Control Acts of 1946, 1954, 1960 and 1962, authorizes the Corps of Engineers to construct, operate and maintain public park and recreation facilities at water resource development projects, and permit local interests to construct, operate, and maintain such facilities.

4. Public Law 85-624 (The Fish and Wildlife Coordination Act of 1958) requires that the Corps of Engineers and any agency impounding, diverting, or controlling water, consult with the United States Department of the Interior, Fish and Wildlife Service. The Department of the Interior would evaluate proposed water resources development measures, and determine potential impacts on wildlife resources and measures needed to prevent such impacts.

5. Public Law 86-717 (Forest Cover Act, 6 September 1960) provides a statutory mandate for multiple use forest management, or other vegetative cover management, on project lands and waters.

6. Public Law-72 (The Federal Water Project Recreation Act of 1965), accompanied by House Committee Report No. 254, requires that the Corps of Engineers and other Federal agencies give full consideration to fish and wildlife enhancement. It also provides for non-Federal participation in land acquisition, and in the development and management of recreational facilities and fish and wildlife resources.

7. Watershed Management Partnership Agreement (19 November 2004), the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers signed the Watershed Management Partnership Agreement to promote watershed health, economic sustainability and community vitality through effective management of the Nations watersheds. This partnership builds on existing EPA and USACE efforts and will employ innovative approaches to support watershed restoration, stewardship and management.

8. Public Law-190 (The National Environmental Policy Act of 1969), directs the Corps of Engineers and other Federal agencies to prepare environmental impact statements or assessments that describe the environmental effects of proposed projects and measures necessary to minimize any adverse effects.

9. Public Law 91-604 (The Clean Air Act, as amended), specifies that any Federal activity, which may result in discharge of air pollutants, comply with Federal, state, interstate, and local requirements concerning control and abatement of air pollution.

10. Public Law 03-205 (The Endangered Species Act of 1973, as amended) requires Federal agencies to utilize their authorities to carry out programs for conservation of endangered and threatened species protected by the Act.

11. Executive Order 11990 (Protection of Wetlands, 24 May 1977) requires that all Federal agencies take action to minimize destruction, loss or degradation of wetlands. It stipulates that Federal agencies must avoid providing assistance for new construction located in wetlands unless no practicable alternatives exist, and the proposed action includes measures to minimize harm to wetlands.

12. Executive Order 13112 (Invasive Species, 3 February 1999), directs the Corps of Engineers and other Federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasives species cause.

13. Public Law 95-217 (Clean Water Act of 1977, as amended). Section 404 imposes requirements with respect to dredge and fill activities in waterways of the United States, including wetlands. Any fill activities in wetlands must comply with Section 404(b) (1), Guidelines for the Specification of Disposal Sites for Dredge or Fill Material. These guidelines allow fill activities for only the least environmentally damaging practicable alternative.

14. Public Law 96-95 (Archaeological Resources Protection Act of 1979 - RPA). This statute provides protection for archaeological resources by requiring any interested parties to apply for a permit from the controlling Federal agency to excavate, or remove any archaeological resource located on public or Indian lands. The Act also provides for civil and criminal penalties for individuals disturbing or looting sites (including military personnel that allow such actions).

15. National Register of Historic Places, Nominations by States and Federal Agencies (36 CFR 60). These regulations govern the process whereby State and Federal agencies nominate specific resources under their control to the National Register of Historic Places.

This is the country's basic inventory of historic resources and it is maintained by the Secretary of the Interior. This inventory includes buildings, structures, objects, sites, districts, and archaeological resources that may be significant at the national, state or local level.

16. Advisory Council on Historic Preservation, Protection of Historic Properties (36 CFR 800). These are the implementing regulations which govern the Section 106 review process established by the National Historic Preservation Act of 1966, as amended for Federal agencies. These regulations implement procedures for assessing the effects of federally approved, assisted, or funded undertakings on properties which are, or may be eligible for listing on the National Register of Historic Places.

17. Public Law 89-72, Federal Water Project Recreation Act of 1965. This act requires that not less than one-half the separable costs of· developing recreational facilities and all operation and maintenance costs at Federal reservoir projects shall be borne by a non-Federal public body. An OCE/OMB implementation policy made these provisions applicable to projects completed prior to 1965.

18. Public Law 89-90, Water Resources Planning Act (1965). This act established the Water Resources Council and gives it the responsibility to encourage the development, conservation, and use of the Nation's water and related land resources on a coordinated and comprehensive basis.

19. Public Law 93-251, Water Resources Development Act of 1974. Section 107 of this law establishes a broad Federal policy which makes it possible to participate with local governmental entities in the costs of sewage treatment plan installations.

2.14 Corps of Engineers Guidance

The Master Plan has been prepared in accordance with guidance contained in the following Corps regulations, pamphlets, and manual:

1. ER 1130-2-500 Project Operations, Partners and Support, Work Management Policies

2. ER 1130-2-540 Environmental Stewardship, Operations and Maintenance Policies

3. ER 1130-2-550 Recreation, Operations and Maintenance Policies

4. ER 1165-2-400 Recreation Planning, Development and Management Policies

5. EP 1130-2-500 Project Operations, Partners and Support, Work Management Guidance and Procedures

6. EP 1130-2-540 Environmental Stewardship, Operations and Maintenance Guidance and Procedures

7. EP 1130-2-550 Recreation, Operations and Maintenance Guidance and Procedures

8. EM 1110-1-400 Recreation Planning and Design Criteria

3. RESOURCE OBJECTIVES (ENVIRONMENTAL, RECREATIONAL, CULTURAL)

3.1 Introduction

The purpose of a USACE Master Plan is to establish the guidelines for sustainable stewardship of natural and recreational resources managed directly and indirectly on USACE fee lands. Resource considerations at Otter Brook Lake exist primarily due to user demands on the project. Multiple user types have interests in the project lands, recreation facilities, and waters. Such demands occasionally create conflicts. USACE is obligated to manage these resources for the overall interest of the public and not for a select group of individuals.

Providing an environmentally sound balance of these demands is the responsibility of the project and the agency. Impacts on the environment will be assessed during the decision making process prior to any change to management plans or strategies.

The Corps' vision for the future management of the land, water and recreational resources of Otter Brook Lake will be managed to protect, conserve, and sustain natural and cultural resources, especially environmentally sensitive resources, and provide quality outdoor recreation opportunities that complement project resources for the benefit of present and future generations.

3.2 Natural Resource Objectives

The following objectives are the priorities for consideration when determining management objectives and development activities:

- Manage existing natural resources and recreation facilities in compliance with all pertinent laws, regulations and policies.

- Provide for the management of all natural resources associated with the project to include the protection and preservation of rare, threatened, and endangered species, the harvesting of forest products, the protection of water quality, and the implementation of programs to manage invasive and non-native species.

- Conserve natural resources, such that Corps lands and waters are left in a condition equal to or better than their condition when acquired, and such that those natural and cultural resources are available to serve the needs of present and future generations.

- Maintain the health and biodiversity of the forest ecosystem. Provide a range of species, age classes, and structural diversity intended to enhance and maintain the biological diversity of species, communities, and ecosystems.

- Protect and preserve existing Government property from erosion and overuse through natural resource management.

- Enhance and protect fish and wildlife habitat for indigenous species through the use of various woodland, wetlands, and open land management activities. Care will be taken to maintain the structural components of the forest (live trees, snags, woody debris, shrubs, and ground cover) that are needed by wildlife.

- Protect and conserve wetlands, rare plant and animal habitats such as vernal pools. Wetlands are highly productive sites for a variety of ecological functions, as well as for the enhancement of water quality. All forest management operations in or adjacent to wetlands will be planned and conducted in a manner that protects these functions. Forest management activities in wetlands will take place on frozen ground during the winter to minimize rutting.

- Care will be taken to minimize soil impacts by limiting the soil area impacted by infrastructure (roads, landings, and primary skid trails) and by careful consideration of timing, equipment being used, and harvesting methods.

- Provide quality recreational experience by maintaining an attractive natural landscape.

- Promote awareness of environmental values and adhere to sound environmental stewardship, protection, compliance, and restoration practices.

- Promote the public's use of the project for both consumptive (hunting) and non-consumptive (bird-watching) activities.

- Coordinate dam releases with U.S. Fish and Wildlife and the USACE Reservoir Regulation Section to minimize negative impacts on aquatic life.

- Minimize impacts on water quality from visitor and project operation and maintenance activities.

- Monitor sedimentation accumulation in the reservoir to maintain quality water and habitat for warm water fishery.

- Minimize negative impacts from reservoir level fluctuations and dramatic outflow changes on fish and other aquatic life.

- Improve suitable fish habitat in streams and spawning areas by enhancing cover and by implementing habitat protection and restoration.

- Protect the riparian corridor along the rivers and streams.

- Control woody vegetation on the dam and toes, intake, outlet, and spillway channels to prevent degradation of flood damage reduction structures. Control vegetation to keep access roads passable by vehicle. Control spread of invasive species throughout project land.

- Protect representative areas of natural cover types and associations, large or unique trees, and overlooks for aesthetic reasons.

- Protect against insect infestations, disease, and fire through monitoring.

- Monitor forest health and wildlife habitat through periodic inventories.

- Maintain existing open fields and forest openings with mowing.

- Cooperate with N.H. Fish and Game for specific wildlife management activities to support their regional efforts to improve habitat and wildlife species diversity throughout New Hampshire's forests.

- Establish priority areas for waterfowl breeding habitat and enhance the habitat in those areas.

- Manage for biodiversity in accordance with the NH Wildlife Action Plan.

- Plant and protect available hard and soft mast food sources.

- Provide artificial nesting boxes for owls, wood ducks, songbirds, and bats at strategic locations throughout the property.

- Provide and manage habitat that attracts and supports pollinator species.

3.3 Cultural Resource Objectives

- Protect known and documented prehistoric and historical archaeological sites.

- Monitor the project area for evidence of unauthorized excavation or collection of cultural resources and damage to sites. Known sites will be maintained and preserved as important project resources.

- Archaeological site and sensitivity maps available at the project office will be examined, and if necessary, the Corps of Engineers archaeologist will be consulted prior to any development or disturbances on Corps of Engineers property.

- Support interpretive programs for historic and archaeological resources where appropriate and in accordance with Federal laws and directives.

3.4 Recreation Resource Objectives

- Maintain the facilities in the recreation areas to ensure high quality recreation experiences, universal accessibility access, and public health and safety.

- Identify and evaluate the development of potential recreation sites, with input from the local community, to afford the public a diversity of recreational opportunities and/or enhance public use of project lands.

- Support the State stocking programs and use of the project lands for these activities.

- Maintain trails through project lands to meet regional and local needs for designated recreational trails, and provide the public with opportunities to view unique natural areas.

- Maintain the existing visitor assistance program including interpretation to enhance the public's understanding and appreciation of the role of the Corps of Engineers in development and administration of Otter Brook Lake.

Implementation of these objectives is based upon time, manpower, and budget. The objectives provided in this chapter are established to provide high levels of stewardship to USACE managed lands and resources while still providing a high level of public service. These goals will be pursued through the use of a variety of mechanisms such as: assistance from volunteer efforts, hired labor, contract labor, permit conditions, remediation, and special lease conditions.

4. LAND ALLOCATION, LAND CLASSIFICATION, WATER SURFACE, AND PROJECT EASEMENT LANDS

4.1 Land Allocation

Land allocation is identified as the congressionally authorized purpose for which the project lands were purchased. There are three categories of allocation identified as Operations, Recreation, and Natural Resource Management. The following land use allocation categories are based on those given in Engineering Regulation 1120-2-400.

4.1.1 Operations

There were 582 total acres acquired in fee for construction of Otter Brook Lake. Of this total, 458 acres were purchased in fee and 124 acres acquired in flowage easement. The land designated for project operations is described in Section 4.2 below.

4.1.2 Recreation

There were no separable lands acquired specifically for the purpose of recreational development at Otter Brook Lake. Portions of acquired lands were ultimately classified for recreational purposes as described in Section 4.2 below.

4.1.3 Natural Resource Management

There were no separable lands acquired specifically for the purpose of natural resource management. Portions of lands acquired for project construction and operation were ultimately classified for this purpose as described in Section 4.2 below.

4.2 Land Classification

In accordance with U.S. Army Corps of Engineers regulation, ER 1130-2-550, and pamphlet, EP 1130-2-550, these allocated project lands are further classified to provide for development and resource management consistent with authorized project purposes, and the provisions of the National Environmental Policy Act (NEPA) and other Federal laws. Land classification categories are described below and are shown in the land classification map found in Appendix A. The land classification acres can be found in table 4.1 below.

4.2.1 Project Operations

This classification includes land required for flood risk management structures, administration and maintenance facilities, and operation of the project. There are 108 acres classified as project operations at Otter Brook Lake.

4.2.2 High Density Recreation

Land developed for intensive recreational activities by the visiting public, including day use areas, campgrounds, and concession areas. There are 260 acres of land classified for high density recreation, consisting mainly of the day-use area.

4.2.3 Environmentally Sensitive Areas

These are areas where scientific, ecological, cultural, and aesthetic features have been identified. This designation limits and can prohibit any further development within the area. There are no acres classified for environmentally sensitive areas to manage and protect species.

4.2.4 Multiple Resource Managed Lands

This classification is for the predominant use of low density recreation, wildlife or vegetative management, and future/inactive recreation with the understanding that other compatible uses can occur within the area. This classification is divided into three sub-classifications identified as: Low Density Recreation, Natural Resource Management, and Future/Inactive Recreation Areas. There are 90 acres of land that are under this classification. The following identifies the amount contained in each sub-classification:

- Low Density Recreation. These are lands with minimal development or infrastructure that support passive public use (e.g., fishing, hunting, wildlife viewing, shoreline use, hiking, etc.). The intention of these classified lands is to assure available lands for low density recreation between areas classified as recreation intensive use and wildlife management. There are no lands designated as low density recreation at Otter Brook Lake.

- Natural Resource Management. These lands are designated for the management of Fish and Wildlife resources and vegetative resources. There are 90 acres of land under this classification at Otter Brook Lake.

- Future or Inactive Recreation. These are lands with site characteristics compatible with potential future recreation development or recreation areas that are closed or open but no longer maintained. These areas will be managed as multiple resource land until an opportunity to develop or reopen these areas. There are no acres under this classification at Otter Brook Lake.

Table 4.1 Land Classification Acreages

Classification	Acres
Project Operations	108
High Density Recreation	260
Environmentally Sensitive	0
Multiple Resource Managed Lands: Low Density Recreation	0
Multiple Resource Managed Lands: Natural Resource Management	90
Multiple Resource Managed Lands: Future/Inactive Recreation Areas	0
Flowage Easement Lands	124
Total	**582**

4.3 Project Easement Lands

These are lands on which easement interests are held but not fee title ownership. These are typically composed of three different classification identified as Operations Easement, Flowage Easement, and Conservation Easement. There are 124 acres of easement lands at Otter Brook Lake.

4.3.1 Operations Easement

These are easements USACE purchased for the purpose of project operations. There are no acres of operation easements at Otter Brook Lake.

4.3.2 Flowage Easement

These are easements purchased by USACE giving the right to temporarily flood private land during flood risk management operations. There are 124 acres of flowage easement lands located at Otter Brook Lake.

4.3.3 Conservation Easement

These are easements purchased by USACE for the purpose of protecting wildlife, fisheries, recreation, vegetation, archeological, threatened and endangered species, or other environmental benefits. There are no conservation easements at Otter Brook Lake.

5. RESOURCE PLAN

5.1 Management by Classification

This chapter describes the management plans for each area of classification within the Master Plan. The classifications which exist at Otter Brook Lake are Project Operations, High Density Recreation, and Multiple Resource Management Lands. The management plans identified are in broad terms of how these project lands will be managed. A more descriptive plan for managing these lands can be found in the Otter Brook Lake Operations Management Plan (OMP).

5.1.1 Project Operations

This land is classified for security reasons pertaining to project operations. This is land associated with the dam, spillway, office, maintenance facilities, and other areas solely for the operation of the project. There are 108 acres of land under this classification which are managed by the USACE. The management plan for this area is to continue providing physical security necessary to ensure continued operations of the dam and related facilities. The goal for these classified lands is to continue operating as done historically in order to ensure project operations. This entails continuing to repair and maintain flood control structures and facilities as recommended in the periodic inspections.

5.1.2 High Density Recreation

Otter Brook Lake has 260 acres classified as High Density Recreation. These are lands developed for intensive recreational activities for the visiting public including the day use area.

The goal for these classified lands is to maintain and improve existing facilities to meet current safety and security standards.

5.1.3 Environmentally Sensitive Areas

These are areas where scientific, ecological, cultural or aesthetic features have been identified. Designation of these lands is not limited to just lands that are otherwise protected by laws such as the Endangered Species Act, the National Historic Preservation Act or applicable State statues. These areas must be considered by management to ensure they are not adversely impacted. Typically, limited or no development of public use is allowed on these lands. No agricultural or grazing uses are permitted on these lands unless necessary for a specific resource management benefit, such as prairie restoration. These areas are typically distinct parcels located within another, and perhaps larger, land classification, area. There are no lands at Otter Brook Lake under this classification.

5.1.4 Multiple Resource Management Lands

Multiple Resource Management Lands are organized into three sub-classifications. These sub-classifications are: Low Density Recreation, Natural Resource Management, and Future/Inactive Recreation Areas. The following is a description of each sub-classification's resource objectives, acreages, and description of use.

- Low Density Recreation. These are lands with minimal development or infrastructure that support passive public use. There are no lands designated as low density recreation land at Otter Brook Lake.

- Natural Resource Management. These are lands designated for the stewardship of fish and wildlife resources and vegetative resources. There are currently 90 acres of land designated to this classification. The primary goal for this land is to continue to manage for fish and wildlife while giving special consideration to wetland areas, invasive species, and rare, threatened, and endangered species. All plans and surveys shall be updated for all features of this land classification.

- Future/Inactive Recreation Areas. These are areas with site characteristics compatible with potential future recreational development or recreation are that are closed. There are no lands classified under this classification at Otter Brook Lake.

6. SPECIAL TOPICS/ISSUES/CONSIDERATIONS

To the extent possible within the constraints of the primary mission of flood risk management, the Corps will endeavor to balance the needs of all user groups.

Recreation

Otter Brook Lake strives to provide high quality recreational opportunities while balancing all pursuits with our natural and cultural resources;

- Upgrade existing trail systems for compliance and research options for potential expansions.
- Continue to evaluate the carrying capacity of the recreation areas.
- Upgrade and maintain existing infrastructure.
- Continue to correct impacts associated with invasive species.

Partnerships and Coordination
To sustain healthy and productive public lands and waters with the most efficient approach requires that individuals and organizations recognize their unique ability to contribute to commonly held goals;

- The Interpretive Services and Outreach Program (ISOP) – Moving forward, the Corps understands that new technologies must be embraced to connect and communicate with the public to meet their needs.
- Continue to pursue volunteering and partnering opportunities that allow the Corps to effectively manage recreation and environmental resources. Volunteer initiatives include tasks such as clean shorelines, restore fish and wild life habitat, and maintain park trails and facilities.

7. PUBLIC AND AGENCY COORDINATION

The objectives for a Master Plan revision were to update the Project Master Plan to comply with new agency requirements for Master Plan documents in accordance with ER 1130-2-550, Change 7, 30 Jan 13 and EP 1130-2-550, Change 5, 30 Jan 13.

Public Meeting held in…TBD

8. SUMMARY OF RECOMMENDATIONS

It is recommended that the Otter Brook Lake Master Plan be approved as a guide to the orderly use and development of natural and man-made resources at Otter Brook Lake flood control project. Approval of this Master Plan would rescind Master Plan for Recreation Resources Development, dated January 1967.

This master plan provides guidance for future development at Otter Brook Lake. The natural and man-made resources at the project will continue to be managed by the New England District to provide the best combination of responses to regional and ecosystem needs, project resource capabilities and sustainability, and public desires consistent with the project's authorized flood risk management purpose.

Natural and man-made resources have been identified and analyzed. This included wetlands, forestry, threatened and endangered species, and cultural resources which require specific management efforts for their protection. Recreational opportunities were identified through an analysis of regional needs and expressed public desires.

Through land use classification, the master plan has designated areas for project operations, recreation, environmental protection, and multiple resource management.

All specific proposals for recreational or other development at the project must comply with this master plan, flood risk management requirements of the Upper Connecticut River Basin, and the National Environmental Policy Act and other Federal requirements.

This Master Plan conceptually establishes and guides the orderly development, administration, maintenance, preservation, enhancement and management of all natural, cultural, and recreational resources at Otter Brook Lake. The Master Plan is a land use management document and does not address water management operations, or associated prime facilities (dam, spillway etc.) as those operations are outlined in separate documents. This Master Plan is stewardship-driven and seeks to balance recreational development and use with protection and conservation of natural and cultural resources.

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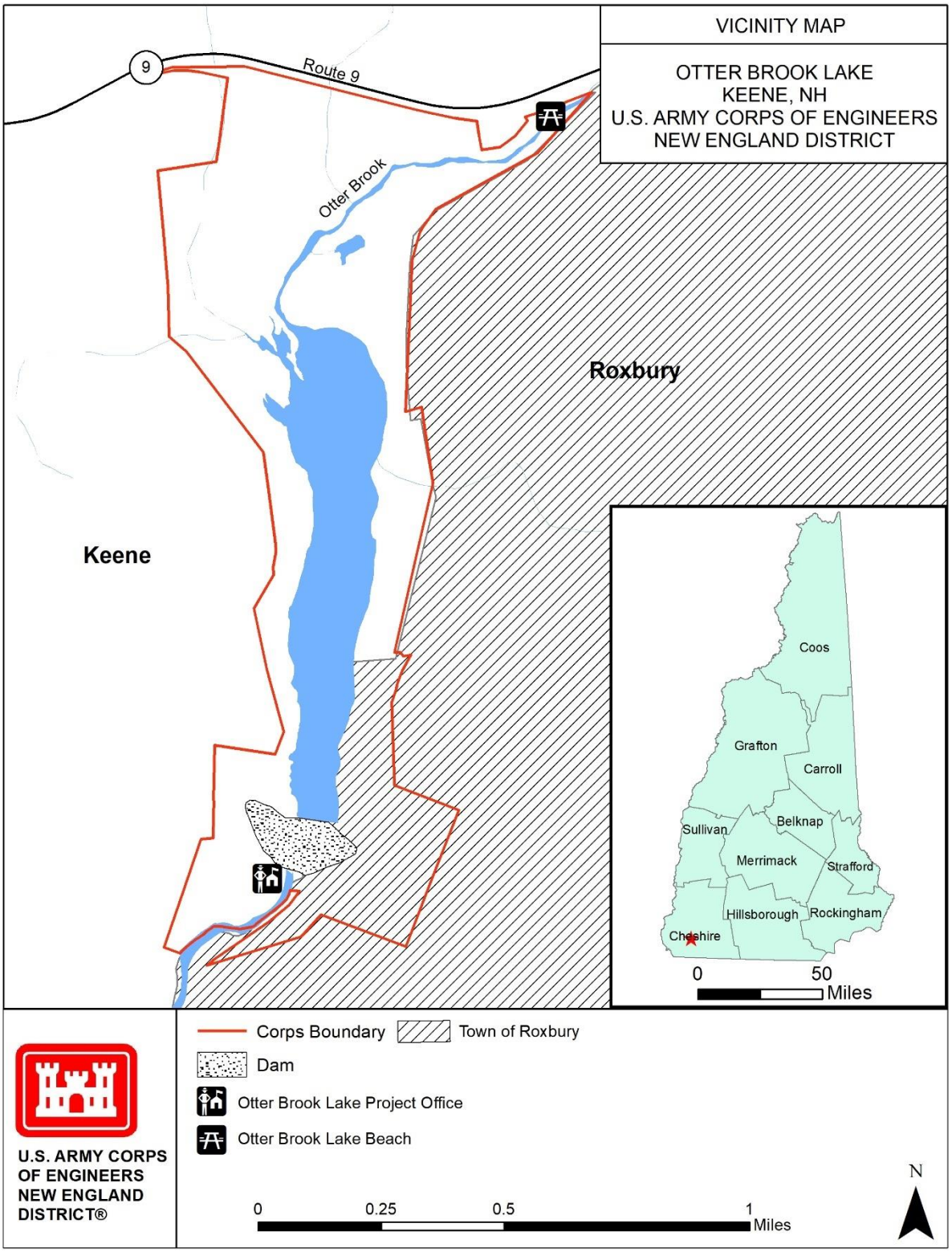
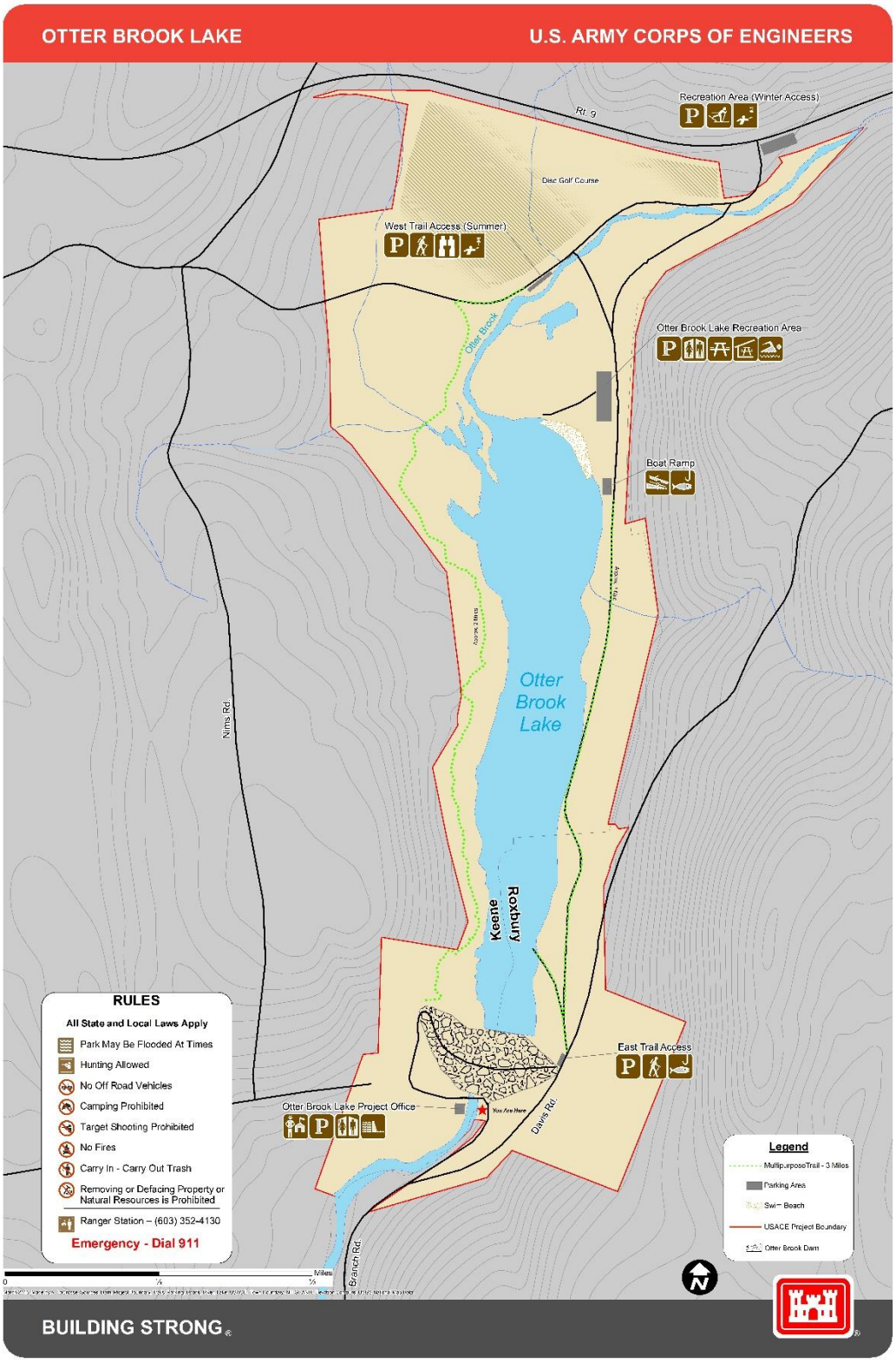
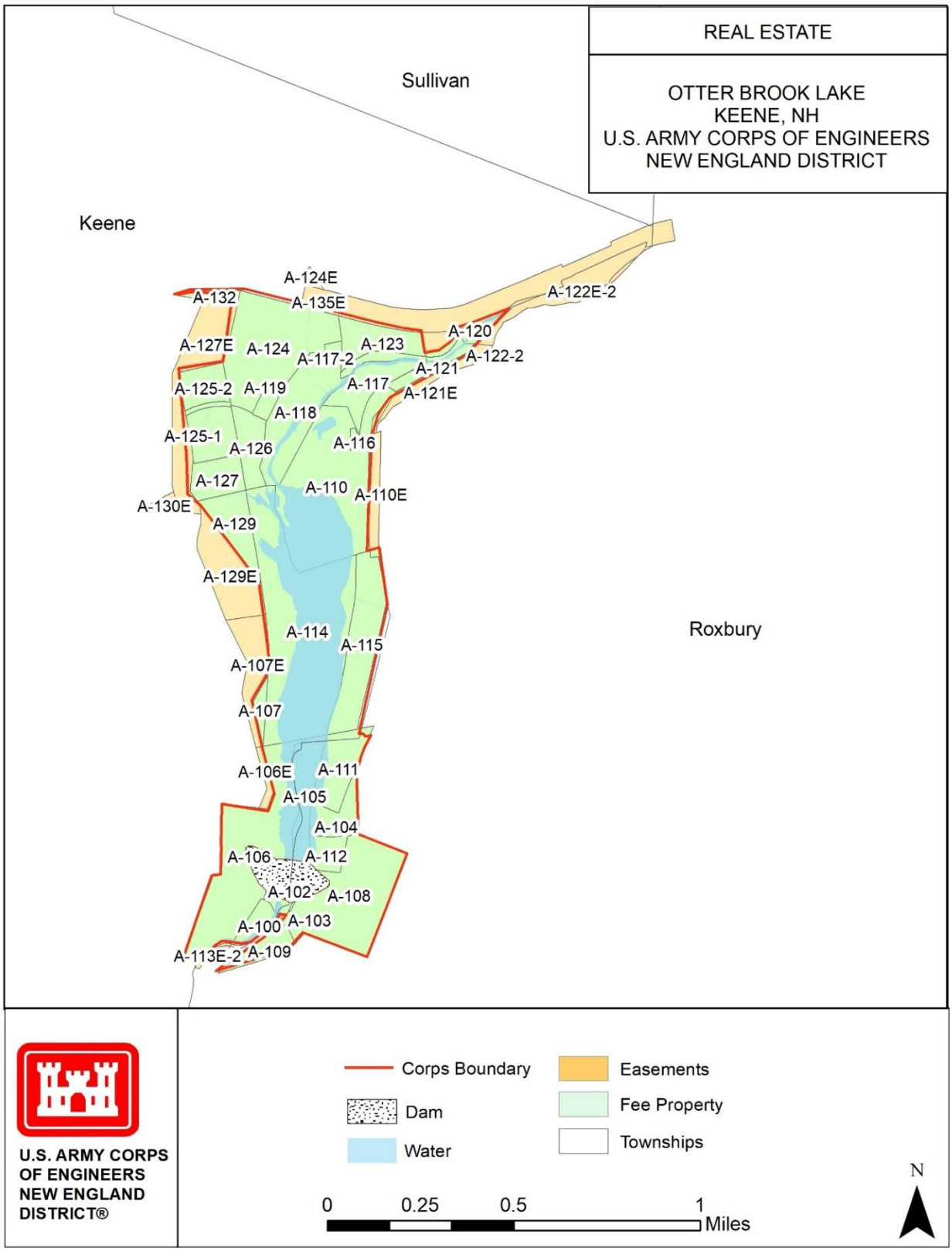
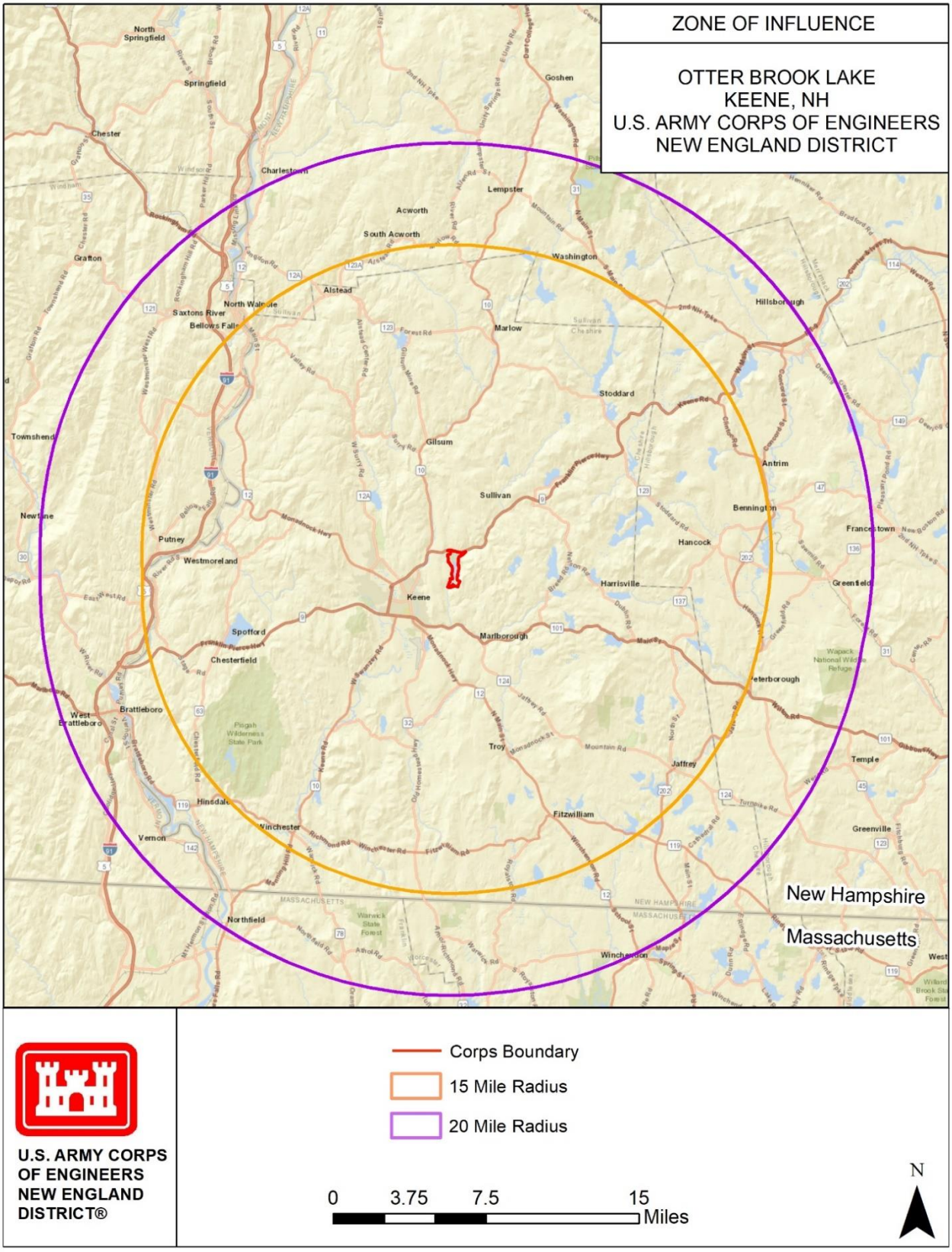
APPENDIX A – MAPS




OTTER BROOK LAKE
U.S. ARMY CORPS OF ENGINEERS
Recreation Area (Winter Access)
Rt. 9
Disc Golf Course
West Trail Access (Summer)
Otter Brook
Otter Brook Lake Recreation Area
Boat Ramp
Nims Rd.
Otter Brook Lake
Keene
Roxbury
East Trail Access
Otter Brook Lake Project Office
You Are Here
Davis Rd.
Branch Rd.
RULES
All State and Local Laws Apply
Park May Be Flooded At Times
Hunting Allowed
No Off Road Vehicles
Camping Prohibited
Target Shooting Prohibited
No Fires
Carry In - Carry Out Trash
Removing or Defacing Property or Natural Resources is Prohibited
Ranger Station – (603) 352-4130
Emergency - Dial 911
Legend
Multipurpose Trail - 3 Miles
Parking Area
Swimming Beach
USACE Project Boundary
Otter Brook Dam
Miles
BUILDING STRONG®


REAL ESTATE
OTTER BROOK LAKE
KEENE, NH
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
Sullivan
Keene
Roxbury
A-124E
A-132
A-135E
A-122E-2
A-120
A-127E
A-124
A-123
A-117-2
A-122-2
A-121
A-125-2
A-119
A-117
A-121E
A-118
A-125-1
A-126
A-116
A-127
A-110
A-110E
A-130E
A-129
A-129E
A-114
A-115
A-107E
A-107
A-106E
A-111
A-105
A-104
A-106
A-112
A-102
A-108
A-100
A-103
A-113E-2
A-109
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT®
Corps Boundary
Dam
Water
Easements
Fee Property
Townships
0
0.25
0.5
1
Miles
N



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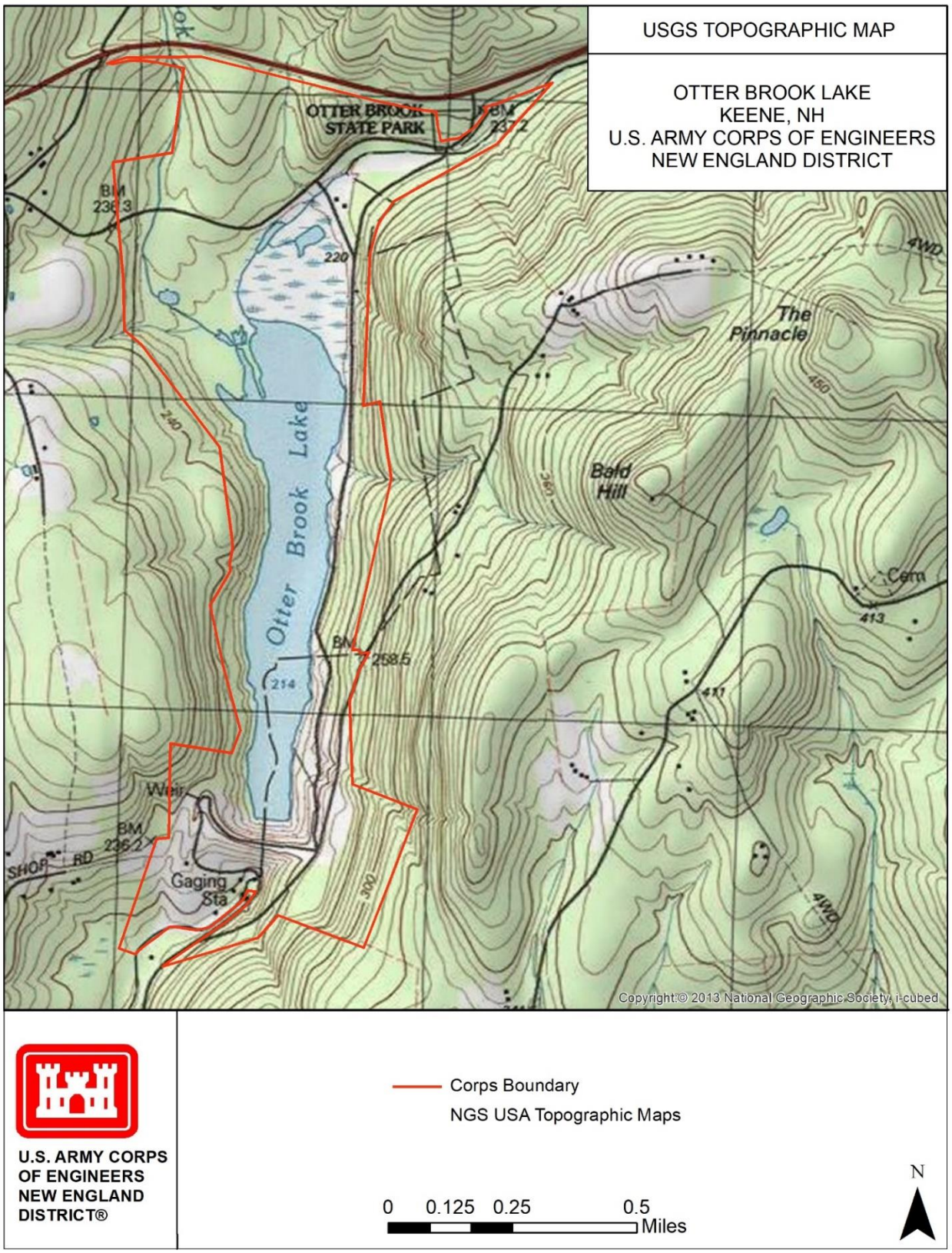
Otter Brook Lake
Keene, New Hampshire


USGS TOPOGRAPHIC MAP
OTTER BROOK LAKE
KEENE, NH
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
OTTER BROOK STATE PARK
BM 2372
BM 2383
220
240
Otter Brook Lake
4WD
The Pinnacle
450
Bald Hill
360
Cem
413
411
BM 2585
214
Weir
BM 2362
SHOP RD
Gaging Sta
300
4WD
Copyright © 2013 National Geographic Society, i-cubed
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Corps Boundary
NGS USA Topographic Maps
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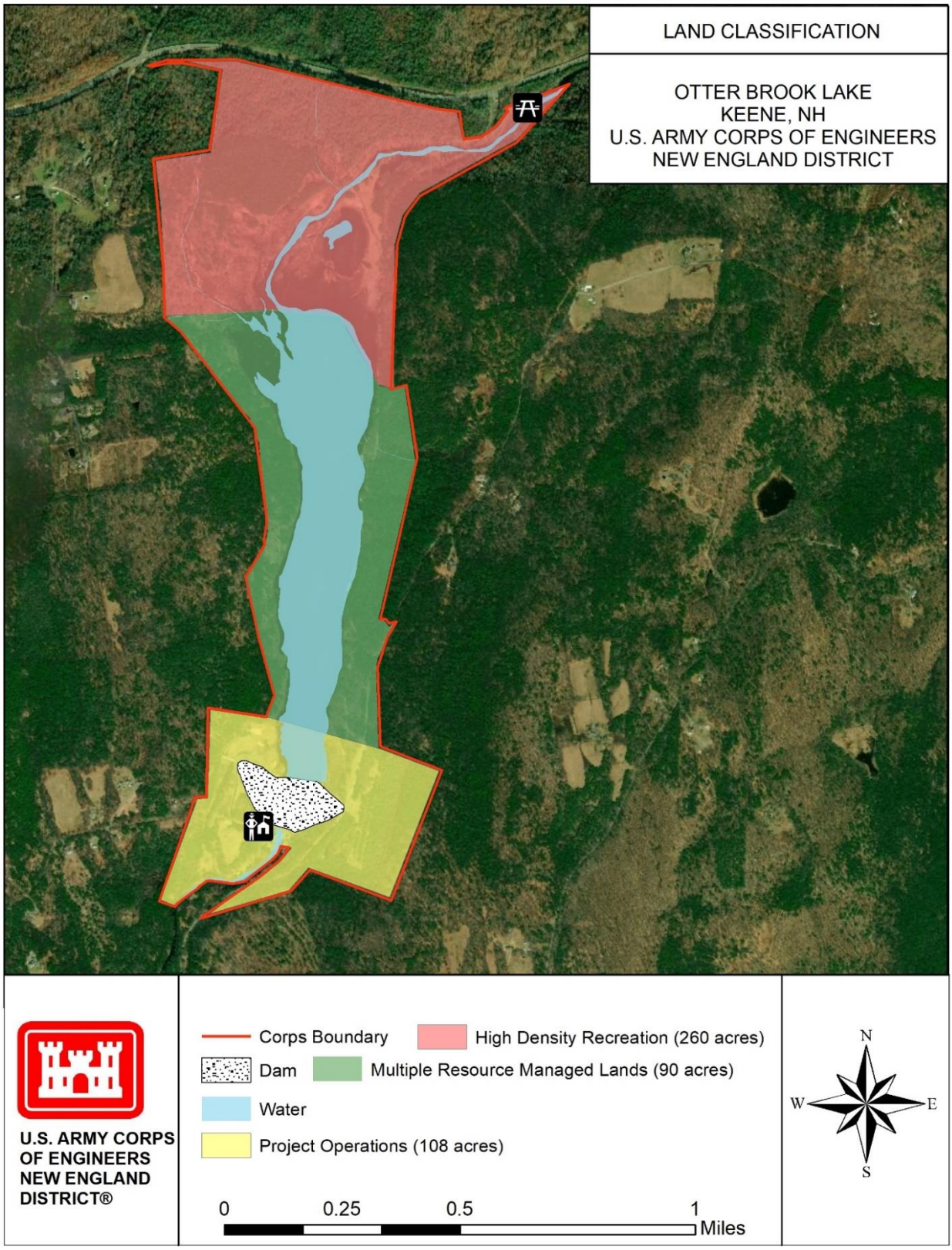
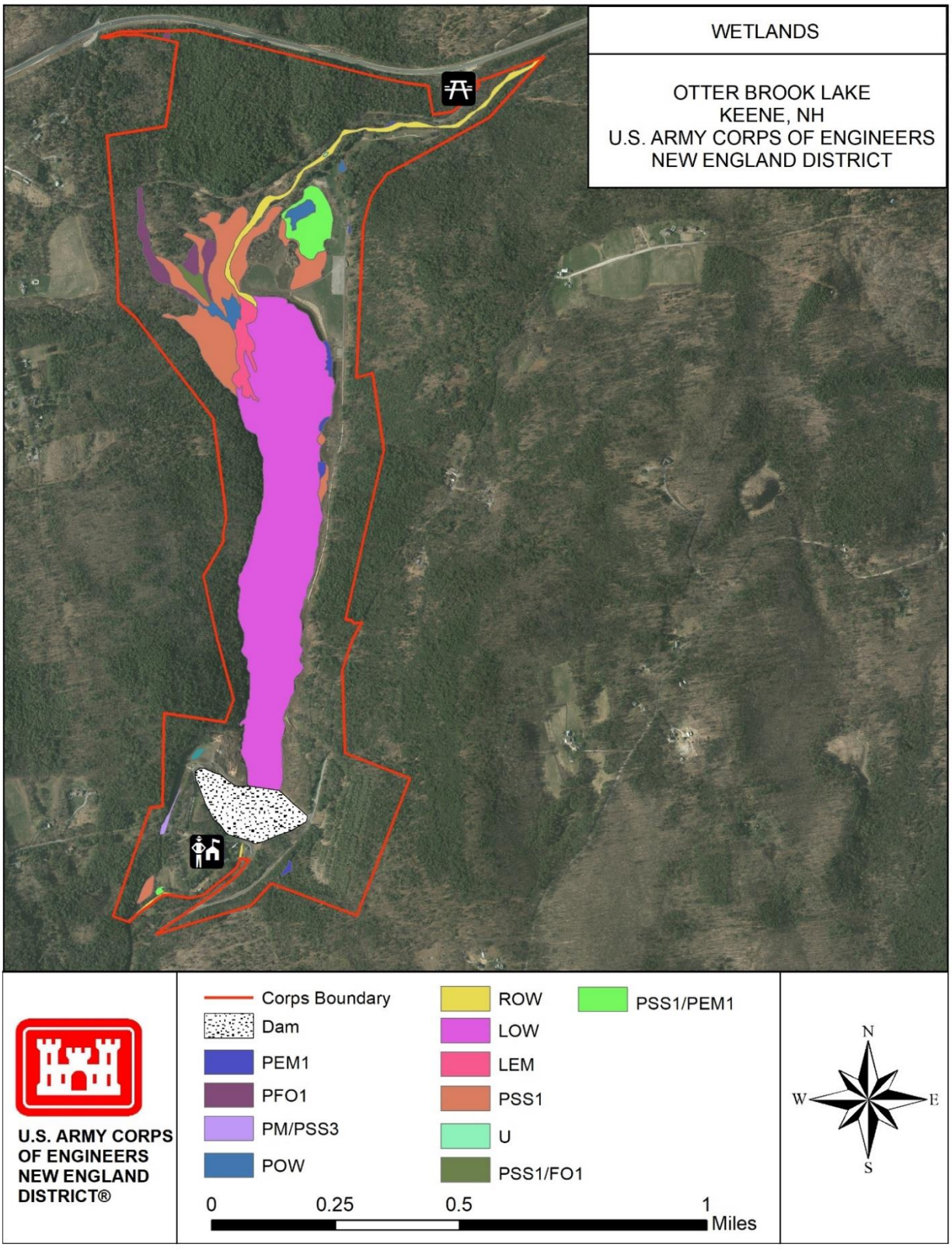

LAND CLASSIFICATION
OTTER BROOK LAKE
KEENE, NH
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT®
Corps Boundary
Dam
Water
Project Operations (108 acres)
High Density Recreation (260 acres)
Multiple Resource Managed Lands (90 acres)
0
0.25
0.5
1
Miles
N
W
E
S


WETLANDS
OTTER BROOK LAKE
KEENE, NH
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT®
Corps Boundary
Dam
PEM1
PFO1
PM/PSS3
POW
ROW
LOW
LEM
PSS1
U
PSS1/FO1
PSS1/PEM1
0
0.25
0.5
1
Miles
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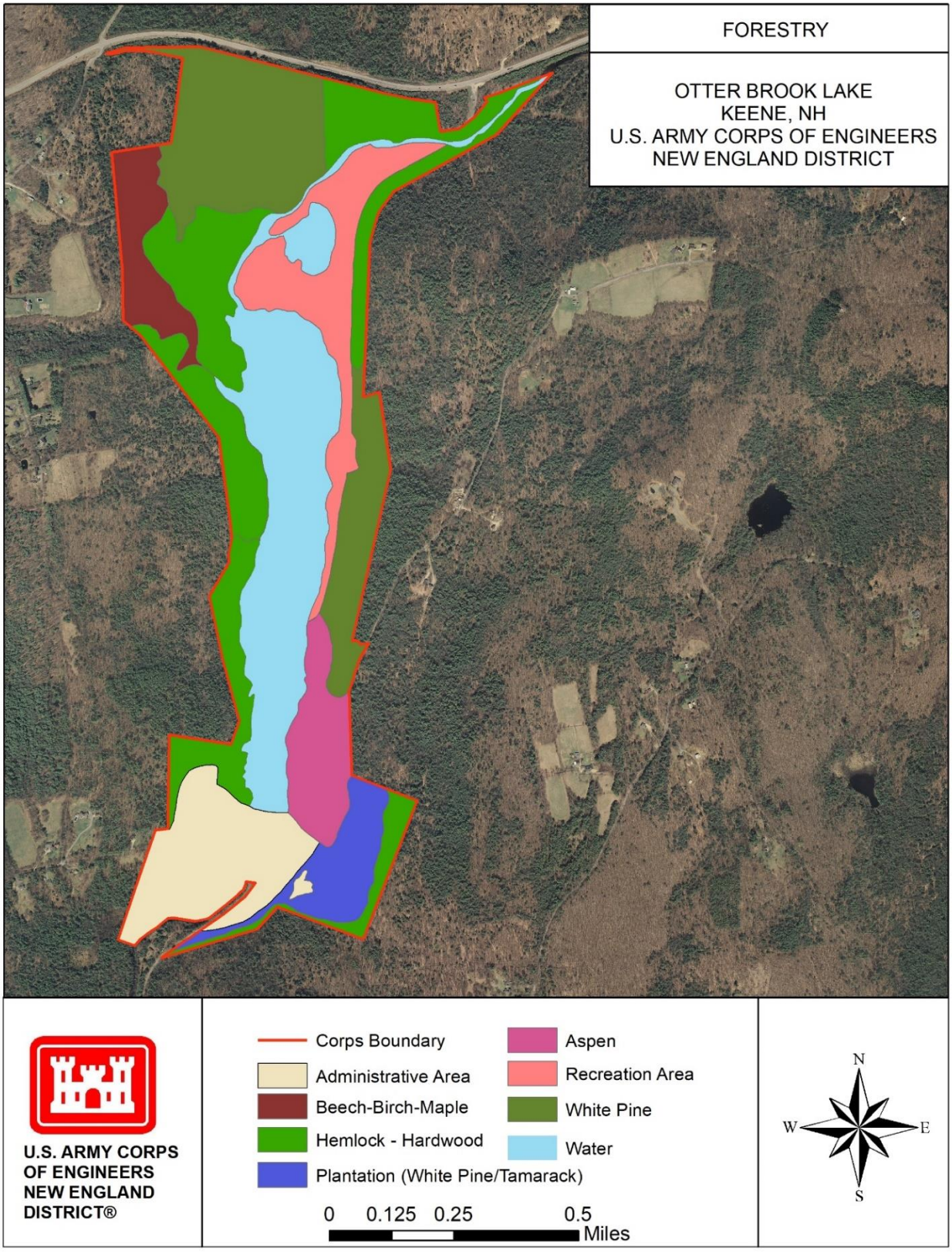
S


FORESTRY
OTTER BROOK LAKE
KEENE, NH
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT®
Corps Boundary
Administrative Area
Beech-Birch-Maple
Hemlock - Hardwood
Plantation (White Pine/Tamarack)
Aspen
Recreation Area
White Pine
Water
0 0.125 0.25 0.5
Miles
N
W
E
S