
SURRY MOUNTAIN LAKE

Surry, New Hampshire

Master Plan

2023



US Army Corps
of Engineers
New England

Executive Summary

This master plan covers the 1,689 acres of federally owned land at the Surry Mountain 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 Surry Mountain 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 Surry Mountain 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 Surry Mountain Lake began August 1939 and was completed in June 1942 at a cost of \$2.3 million. Authorization for inclusion of a 265-acre permanent recreation pool was approved January 19, 1960.

1.2 Purpose

The operation of Surry Mountain Dam provides substantial flood protection for the town of Surry and Keene, NH as well as other communities in the Connecticut River Basin. The Surry Mountain Lake project is located in the town of Surry, New Hampshire, on the Ashuelot River about 5 miles northwest of Keene, New Hampshire and about 34.6 miles above the confluence of the Ashuelot and Connecticut Rivers. Surry Mountain Lake is operated in conjunction with Otter Brook Lake, located in the city of Keene, New Hampshire, on Otter Brook, a tributary of the Branch River, which in turn is a tributary of the Ashuelot River. Through June 2022, the facility has prevented approximately \$166.5 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 Surry Mountain 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 1981 Surry Mountain 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 Surry Mountain 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 Surry Mountain 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 Surry Mountain 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

Surry Mountain Lake is located on the Ashuelot River, a tributary of the Connecticut River, in the Upper Connecticut River Basin. The dam is located in the township of Surry, Cheshire County, New Hampshire, approximately five miles northwest of Keene, New Hampshire and about 34.6 miles upstream of the confluence of the Ashuelot and Connecticut Rivers.

The project lands are comprised of 1,689 acres of fee-owned land and 108 acres of flowage easement land. The dam and office is located at 108 Surry Dam Road, Surry, NH 03431. The recreation area is located at 273 Route 12A, Surry, NH, 03431. The project is managed out of the main office at Otter Brook Lake located at 480 Branch Road, Keene, NH 03431.

1.5 Prior Design Memorandums

Separate Design Memorandums were prepared from 1940 thru 1966 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 1,797 acres, of which 1,689 acres are fee ownership and 108 acres are flowage easements. Project operations consist of the dam area and gatehouse, comprising 80 acres of the projects total acreage. Developed recreation land including the day-use area, consists of 90 acres. Land classified as Multiple Resource Management consists of 1,519 acres, of which 50 acres is low density recreation land, and 1,469 acres is wildlife management land. A map of land classification can be found in Appendix A.

The dam consists of rolled earth with rock slope protection, and is approximately 1,800 feet long with a maximum height above the stream-bed of 86 feet. The top width is 30 feet and the elevation for the top of the embankment is 568 feet above msl (mean sea level) which provides 12.4 feet of spillway surcharge and 5.6 feet of freeboard. The spillway, located at the west abutment, consists of a 338 foot L-shaped side channel ogee weir with crest at elevation 550 feet above msl.

The outlet is a Boston horseshoe conduit that is 383 feet long and 10 feet high. Two cable operated broome gates, each 4' 6" by 10', are operated from a combined tower intake and gate structure, as well as one similar sized emergency gate. The inlet elevation is 485 feet above msl. The permanent pool is controlled by a concrete weir with a crest elevation of 499.5 feet above msl located immediately upstream of both flood control gates. The 265-acre permanent pool is maintained by a weir located upstream of both gates at approximately 15 feet during the warm temperature months, and at approximately 17 feet during the cold weather months to keep the gates from freezing. The weir helps to minimize day-to-day fluctuations. Downstream channel capacity of the Ashuelot River is about 1,250 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

Surry Mountain 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. Surry Mountain Lake and Otter Brook 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 265-acre, 15 feet deep recreation pool is maintained by a concrete weir upstream of both flood control gates. During the winter the weir is submerged and the pool is maintained at approximately 17 feet to keep the flood control gates free from ice.

The maximum pool of record occurred in April 1987 when it reached 66.1 feet utilizing full storage capacity, and cresting over the spillway. The floodwater storage pool at spillway-crest elevation, 550 msl (65 feet), would be 970 acres in extent, and would contain 31,680 acre-feet of flood control storage above the conservation pool. This volume represents 5.9 inches of runoff from the upstream drainage area of 100 square miles, which equates to approximately 10.6 billion gallons of water.

Water level fluctuations are unavoidable at flood control dams. Exact figures on pool fluctuations for Surry Mountain 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 the Ashuelot River. Additional regulation of flow is initiated when heavy rainfall occurs over the Ashuelot River drainage basin or when downstream communities are threatened by potential flooding.

2.1.2 Operation and Maintenance

Surry Mountain 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

Surry Mountain Lake is operated primarily to desynchronize flood flows of 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 Otter Brook Lake and other reservoirs in the Connecticut River Basin to obtain the maximum reduction in overall flood damages.

The reservoir has been operated for flood control purposes on numerous occasions, but storage has rarely exceeded 50 percent of capacity. Full capacity was reached only once, during the flood of April, 1987 when the pool reached 66.1 feet and crested over the spillway. The top five flood control events are listed below as well as annual high pool stages at Surry Mountain Lake.

Table 2.1 – Top 5 Flood Events

Rank	Date	Capacity	Pool Level (Ft.)
1	April 1987	100%	66.1
2	October 2005	96%	63.5
3	June 1984	91%	61.4
4	March 1948	80%	57.6
5	April 1969	74%	55.5

Table 2.2 – Pool Stage Frequency

SURRY MOUNTAIN LAKE Surry, New Hampshire (1936, 1938, 1943-2002) (D.A. = 100 square miles)				
FREQUENCY	Pool Stage	STORAGE		
(yr.)	(ft.)	(acre-feet)	(inches)	(percent full)
2	37	9,500	1.8	30
5	48	17,000	3.2	54
10	54	21,700	4.1	60
20	59.8	26,950	5.1	84
50	64	30,700	5.8	97
100	66	32,700	6.1	100+
200	67.2	33,800	6.4	100+

Permanent Pool Level = 15.0 ft.
Spillway Crest = 65.0 ft.
Gate Invert = 485.0 ft-NGVD

Table 2.3 – Annual High Pool Stages

Surry Mountain Dam, Ashuelot River
 Peak Pool Levels
 by Water Year
 (1943 - Present)
 Drainage Area: 100 sq. miles
 Normal Pool: 15 ft. (Summer), 18 ft. (Winter)
 Gate Invert Elev.: 485 ft. NGVD
 1" Runoff = 5,333 ac-ft
 Storage at Spillway Crest: 5.9 in. / 31,694 ac-ft



Date	Annual Peak Pool Level (ft)	Storage Utilized		
		Inches	Acre-Feet	Percent
1943 ¹	25.8	0.7	3,801	12
27 Apr 1944	40.2	2.2	11,558	37
22 Mar 1945	38.7	2.0	10,618	34
12 Mar 1946	31.3	1.2	6,422	21
17 Apr 1947	41.5	2.3	12,400	40
29 Mar 1948	57.6	4.7	24,831	80
08 Jan 1949	36.7	1.8	9,410	30
07 Apr 1950	30.1	1.1	5,812	19
10 Apr 1951	50.3	3.5	18,739	60
16 Apr 1952	44.0	2.6	14,086	45
02 Apr 1953	53.8	4.0	21,569	69
21 Apr 1954	28.5	0.9	5,032	16
19 Apr 1955	20.8	0.3	1,814	6
04 May 1956	50.6	3.6	18,975	61
25 Jan 1957	21.0	0.4	1,885	6
26 Apr 1958	43.5	2.6	13,743	44
07 Apr 1959	36.5	1.7	9,292	30
07 Apr 1960	54.8	4.2	22,409	72
28 Apr 1961	24.2	0.6	3,124	10
11 Apr 1962	40.8	2.2	11,944	38
06 Apr 1963	31.3	1.3	6,681	21
16 Apr 1964	32.9	1.4	7,265	23
18 Apr 1965	26.0	0.7	3,887	12
27 Mar 1966	23.0	0.5	2,641	8
30 May 1967	31.0	1.2	6,266	20
25 Mar 1968	44.0	2.6	14,086	45
25 Apr 1969	55.5	4.3	23,006	74
12 Apr 1970	26.0	0.7	3,887	12
16 Apr 1971	22.5	0.5	2,448	8
21 Apr 1972	33.0	1.4	7,318	23

03 Jul 1973	31.6	1.2	6,577	21
24 Dec 1973	43.5	2.6	13,743	44
21 Apr 1975	25.0	0.6	3,124	10
03 Apr 1976	36.4	1.7	9,175	29
16 Mar 1977	45.5	2.8	15,144	49
10 Jan 1978	29.0	1.0	5,270	17
12 Mar 1979	49.6	3.4	18,194	58
14 Apr 1980	36.1	1.7	9,058	29
28 Feb 1981	34.1	1.5	7,921	25
22 Apr 1982	44.0	2.6	14,086	45
23 Mar 1983	34.8	1.6	8,314	27
04 Jun 1984	61.4	5.3	28,274	91
14 Mar 1985	24.1	0.6	3,083	10
22 Mar 1986	37.5	1.9	9,886	32
07 Apr 1987	66.1		SPILLWAY DISCHARGE	
29 Mar 1988	31.0	1.2	6,266	20
09 Apr 1989	34.1	1.5	7,921	25
24 Mar 1990	47.6	3.1	16,676	53
26 Dec 1990	24.7	0.6	3,332	11
13 Mar 1992	26.1	0.7	3,932	13
19 Apr 1993	43.9	2.6	14,017	45
18 Apr 1994	42.3	2.4	12,930	41
18 Jan 1995	40.9	2.3	12,008	38
31 Oct 1995	36.9	1.8	9,533	31
22 Apr 1997	30.2	1.1	5,877	19
04 Apr 1998	40.5	2.2	11,745	38
19 Sep 1999	27.8	0.9	4,720	15
11 Apr 2000	23.7	0.5	2,933	9
26 Apr 2001	46.6	3.0	15,909	51
03 Apr 2002	24.6	0.6	3,290	11
01 Apr 2003	39.4	2.1	11,047	35
04 Apr 2004	38.0	1.9	10,169	33
06 Apr 2005	46.9	3.0	15,950	51
17 Oct 2005	63.5	5.7	30,200	96
23 Apr 2007	49.6	3.4	18,194	58
14 Apr 2008	35.0	1.6	8,426	27
03 Aug 2009	36.5	1.8	9,310	29
03 Apr 2010	51.5	3.7	19,666	62
12 Mar 2011	39.0	2.0	10,800	34
31 May 2012	31.8	1.2	6,692	21

05 Jul 2013	43.3	2.5	13,626	43
18 Apr 2014	32.3	1.3	6,966	22
26 Dec 2014	24.8	0.6	3,356	11
27 Feb 2016	33.7	1.4	7,717	24
27 Feb 2017	31.0	1.2	6,241	20
16 Jan 2018	42.3	2.4	12,933	41
07 Nov 2018	41.3	2.3	12,265	39
16 Dec 2019	24.1	0.6	3,069	10
02 Aug 2021	42.2	2.4	12,867	41

Notes:

1. Missing Date of Peak Pool
2. Spillway Discharge

Regulations of Surry Mountain 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. Surry Mountain 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 Surry Mountain 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 Surry Mountain Lake has been set at 75 (cfs) or inflow, whichever is less, during normal operation.

2.3 Sediment and Shoreline Erosion

Surry Mountain Lake project has nearly 6 miles of shoreline, the majority of which is located along the meandering Ashuelot River.

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 Surry Mountain 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 performed 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 Surry Mountain Lake was completed in October 2007 by the Corps of Engineers where these baseline parameters were all evaluated.

Based on these reports, possible water quality concerns included low levels of dissolved oxygen and low pH readings. During a prolonged flood event biological oxygen demand within the reservoir could reduce the dissolved oxygen level in outflow. The risk is greatest for floods occurring during late summer or early fall when the water is relatively warm and the biological oxygen demand exerted by decomposing organic matter is likely to be highest.

The pH levels at Surry Mountain Lake have been low with more than half the readings below the desirable 6.5 to 8.3 range for class B waters, which is not unusual for New England waters. The cause of this low pH appears to be natural conditions in the watershed including the effects of acid precipitation on poorly-buffered, granite soils. These low pH levels will stress aquatic life, but they are not unusual for New England waters and will not likely prevent establishment of a good fishery by New Hampshire standards.

High nutrient levels are another water quality concern. Reservoirs act as nutrient sinks and gradually become more eutrophic over time. Levels of total phosphorus, nitrogen, and chlorophyll are in the range of mesotrophic conditions. Such lakes typically have fairly high algal productivity. As lakes become more nutrient rich, algal productivity increases. Some of this algal productivity is exported downstream.

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 Surry Mountain 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 12A is located to the west of the reservoir and provides access to Surry Mountain Lake. The day-use recreation area can be accessed directly from highway 12A, and the dam and project office is located off of Surry Dam Road from highway 12A. Many highways converge on the city of Keene, five miles south of Surry, 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 characterized by hilly land with moderate relief. The general vicinity of the reservoir is marked by a wide river valley about 2,000 feet in width cut by the serpentine of the Ashuelot River. The walls of the valley are comparatively steep, rising to as much as 1,000 feet above the floor. The reservoir is elongated in shape with a generally north-south axis and a length of 42 miles and a width of 17 miles. Most of the area is wooded, composed of mixed hard and soft woods characteristic of upland areas of southern New Hampshire.

The Ashuelot River flows through the reservoir with an average slope of about 20 feet per mile. Relocated New Hampshire State Route 12A parallels the west side of the reservoir. The reservoir lands consist of a flat flood plain which rises sharply to a wooded hillside to the east. To the west, open land rises moderately to a plateau on which the village of Surry is located. A map of topography can be found in Appendix A.

2.7.2 Geology

The soils and geology of Surry Mountain 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.

Rising above the river on the eastern side of the Ashuelot River is Surry Mountain. This protrusion of bedrock consists of a Lyman-Tumbridge-Rock outcrop complex, with 25 to 50 percent slopes that extend down to the flood plains of the river.

Surry Mountain Lake's watershed is mostly granite bedrock overlain with glacial deposits. This results in a fairly stable watershed with minimal sediment loads in the rivers, at least compared to other parts of the country. Landslides are very rare. The granite nature of the watershed soils tends to make runoff and groundwater very soft with minimal buffering capacity. Throughout the river corridor there are remnants of past glacial activity including varved clay deposits, deltas, drumlins and glacial Lake Ashuelot. Also of interest are the many quarries in the area producing

sand, gravel, and semi-precious stones, and the high potential aquifers found in the river corridor.

The Ashuelot drainage basin is underlain by igneous and metamorphic bedrock that was later sculptured by glacial scouring and the erosive action of surface waters. A veneer of relatively recent glacial till and stratified deposits is now found in most places overlying topography earlier formed by the structural evolution of the region and by subsequent geomorphological processes. The Ashuelot River valley generally conforms to the control imposed by the structure of the bedrock. Glacial and surface alluvial deposits are thickest in the lower elevations of the region where streams and ponds exist.

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 reveals 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.

Soils on the terraces near the river consist of Merimac fine sandy loam and gravelly fine sandy loam. These soils are well drained, have fair water-holding capacity but are not extremely fertile. Podunk-Rumney series is a medium texture and is characterized by poor natural drainage. The Ondawa fine sandy loam is coarse textured and consequently well drained. These soils are suitable for pasture and hayfields. The better drained Podunk-Rumney and much of the Ondawa are used for cultivation.

Soil mapping for the area shows the project areas as primarily floodplain soil subject to seasonal flooding and high water tables, with adjacent terraces of sandy outwash soils produced during the glacial retreat. The slopes of Surry Mountain and the hills to the west of the project include stony upland soil types.

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 Surry Mountain Lake following all state and federal rules and regulations. A variety of wildlife can be found at Surry Mountain Lake. Land available for wildlife management totals about 1,369 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>. Pheasants are stocked by New Hampshire Fish and Game during the hunting season. The project manager issues trapping and

tree stand permits for the project. The lake provides approximately 50 - 100 acres of good quality waterfowl habitat, although the production potential of the marsh is limited by water-level fluctuations during the spring nesting season.

Surry Mountain Lake contains both warm water and cold water fishery habitat. The lake is classified as a warm water fishery, and the Ashuelot River, upstream and downstream of the lake, is a cold water fishery. The fishing is described as fair to good. While most fishing pressure occurs during the summer, there is a certain amount of ice fishing during the winter months. New Hampshire Fish and Game stocks the Ashuelot River yearly with fish, mainly trout species. Fish stocking occurs primarily from mid-March to early July. Additional stocking may occur in late July when surplus fish are released into suitable waters.

Of particular interest are the efforts to establish a largemouth bass fishery in the lake, and the presence of large eels. For over 20 years, New Hampshire Fish and Game (NHF&G) and the Corps have attempted to develop a largemouth bass fishery at Surry Mountain Lake. Studies have been conducted to assess and manage the fishery. Fishery assessments were conducted by the Corps of Engineers in 1979, 1980, 1982, 1987, 2000, 2002, and 2018. The most recent fisheries study found the presence of Bluegill (*Lepomis macrochirus*), Chain Pickerel (*Esox niger*), Common Shiner (*Luxilus cornutus*), Largemouth Bass (*Micropterus salmoides*), Pumpkinseed (*Lepomis gibbosus*), Smallmouth Bass (*Micropterus dolomieu*), White Sucker (*Catostomus commersonii*), and Yellow Perch (*Perca flavescens*). There were six sample sites taken strategically around the lake where the electroshocking occurred. The species type, length, and weight were recorded during the survey and records are kept locally at the project office. The species listed 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.

Surry Mountain Lake has approximately 941 acres of forested land. The forest consists of mixed hard and soft woods characteristic of the upland areas of southern New Hampshire. The principle softwoods includes white pine (*Pinus strobus*) and eastern hemlock (*Tsuga canadensis*); the principle hardwoods are northern red oak (*Quercus rubra*) and hickory (*Carya*), while on the higher elevation yellow birch (*Betula alleghaniensis*), American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*) and black cherry (*Prunus serotina*) may be found. Along the river elm (*Ulmus americana*), red maple (*Acer rubrum*), alder (*Alnus*) and aspen (*Populus tremuloides*) are the dominant trees. 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 exemplary floodplain natural communities at Surry Mountain Lake. A sycamore floodplain forest occurs along the Ashuelot River north of Surry Mountain Lake. Although planted in New Hampshire, natural populations of sycamore (*Plantanus occidentalis*) are uncommon in the state because the tree is near the northern limits of its range. A silver maple floodplain forest also occurs along the Ashuelot River

south of Surry Mountain Lake. This community is dominated by a sparse to moderate canopy of large silver maple (*Acer saccharinum*) with red maple (*Acer rubrum*) and black cherry (*Prunus serotina*) subdominant. Information on more exemplary natural communities can be found in the surveys located at the project office.

2.8.3 Rare, Threatened and Endangered Species

The Surry Mountain 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 Table 2.4 below. RT&E species are considered in all management decisions and coordinated with local and state resources.

Northern Long-Eared Bat

The northern long-eared bat (NLEB), a federally threatened species, was known to occur in the project area (2009) but has since precipitously declined because of White-nose Syndrome. No NLEB were identified during the latest bat mist-net survey conducted in 2016, which identified the presence of five state-endangered small-footed bats and one little brown bat, also state-endangered, although the level of effort could not conclusively document this species' absence. A state-endangered tricolored bat was identified onsite in 2010.

Surry Mountain Lake falls within the NLEB habitat range, and all federal actions that may affect NLEB will follow separate consultation under Section 7 of the Endangered Species Act (87 Stat. 884, as amended: 16 U.S.C. 1531, et seq.).

Wood Turtle

Wood turtle, a species of state conservation concern, has been historically observed at Surry Mountain Lake. The wood turtle is a species of high regional conservation concern. Life history traits including late sexual maturation (Ontario: 17-18 years, Brooks et al. 1992) and limited fecundity (Garber 1989, Farrell and Graham 1991, Ross et al. 1991, Brooks et al. 1992) make wood turtles extremely vulnerable to increased adult mortality. Wood turtles depend on high rates of adult survival to compensate for a large mortality in the early stages of life. Recommendations by NHF&G may be considered in the future for the benefit of this species.

Dwarf Wedgemussel

The federally endangered dwarf wedgemussel (*Alasmidonta heterodon*) is found in a 6.5-mile stretch of the Ashuelot River downstream of the weir below Surry Mountain Lake. Of chief concern to NAE are two locations that are on or about Corps property, that have had the two largest and most significant colonies of mussels on the Ashuelot River. These are a 50-meter reach below the gaging weir downstream from the project outlet, and a similar reach at the East Surry Road Bridge. In 2007, 78 individual dwarf wedgemussels were identified. In 2014, 15 individuals were identified. In 2016, only two

individual dwarf wedgemussels were found (S. Johnson 2017, Draft 2016 and 2017 Dwarf Wedgemussel Surveys). The latest survey conducted in 2019 found a total of 19 individuals. Staff will continue to coordinate with U.S Fish and Wildlife Services to protect and manage for these mussels.

Table 2.4 RT&E Species

Species Name	Federal Status	State Status
Allegheny-vine (<i>Adlumia fungosa</i>)	--	E
American ginseng (<i>Panax quinquefolius</i>)	--	T
Cut-leaved toothwort (<i>Cardamine concatenata</i>)	--	E
Eastern waterleaf (<i>Hydrophyllum virginianum</i>)	--	T
Greater fringed-gentian (<i>Gentianopsis crinita</i>)	--	T
Hollow Joe-Pye weed (<i>Eutrochium fistulosum</i>)	--	E
Large-fruited sanicle (<i>Sanicula trifoliata</i>)	--	T
Northern bog violet (<i>Viola nephrophylla</i>)	--	E
Reflexed Sedge (<i>Carex retroflexa</i>)	--	E
Slender muhly (<i>Muhlenbergia tenuiflora</i>)	--	E
Virginia stickseed (<i>Hackelia virginiana</i>)	--	E
Small Footed Bat (<i>Myotis lebbii</i>)	--	E
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	--	T
Common Loon (<i>Gavia immer</i>)	--	T
Smooth Green Snake (<i>Opheodrys vernalis</i>)	--	SC
Wood Turtle (<i>Glyptemys insculpta</i>)	--	SC
Dwarf Wedge Mussel (<i>Alasmidonta heterodon</i>)	E	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 invasive 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”. Surry Mountain 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 Surry Mountain 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 umbellata*) are quite pervasive in almost all areas on the project lands. Glossy buckthorn 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.

Aquatic plants such as purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*), although discovered on the project, were not found to be pervasive. They do require monitoring to ensure that they do not continue to spread and treatment is conducted before their potential to overtake the surrounding habitat and becoming a serious problem. Additional information on individual species can be located here through USDA <http://www.invasivespeciesinfo.gov/index.shtml>.

2.8.5 Ecological Settings

Surry Mountain 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 Surry Mountain 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). The topography of the Surry Mountain Lake area is hilly with moderate relief. The general vicinity of the reservoir is marked by a river valley approximately 2,000 ft. wide with comparatively steep walls which rise as much as 1,000 ft. above the floor. The Ashuelot River flows through the reservoir with an average slope of about 20 ft. per mile. The reservoir lands consist of a flat

floodplain which rises sharply to a wooded hillside to the east. To the west, open land rises moderately to a plateau on which is located the Village of Surry.

2.8.6 Wetlands

The Army Corps of Engineers New England District conducted a wetlands determination on Surry Mountain Lake in 1997. A total of 741 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 Surry Mountain 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)	253.2
Lacustrine Emergent Non-Persistent (LEM2)	17.6
Palustrine Open Water (POW)	0.3
Palustrine Emergent Persistent (PEM1)	7.1
Palustrine Emergent Non-Persistent (PEM2)	2.7
Persistent/Palustrine Scrub-Shrub Broad-Leaved Deciduous (PEM2/PSS1)	1.5
Palustrine Scrub-Shrub Broad-Leaved Deciduous (PSS1)	261.8
Palustrine Scrub-Shrub Broad-Leaved Deciduous/Palustrine Emergent Persistent (PSS1/PEM1)	18.7
Palustrine Forested Broad-Leaved Deciduous (PFO1)	59.8
Palustrine Forested Broad-Leaved Deciduous/ Palustrine Scrub-Shrub Broad-Leaved Deciduous (PFO1/PSS1)	88.8
Palustrine Forested Needle-Leaved Evergreen (PFO4)	2.7
Riverine Open Water (ROW)	1.5
Riverine Stream Bed (RSB)	25.4
TOTAL	741.4

2.9 Cultural Resources

2.9.1 Prehistoric Period

Documentation of prehistoric and contact period occupation of the Ashuelot Valley within the town comes primarily from an early 20th century history of the town. The area between the Connecticut and Ashuelot Rivers was occupied ethnohistorically by the “Ashuelot” or

“Squakeag” Indians, whose territory extended into adjoining parts of Massachusetts until King Philip’s War. Their main villages were at Northfield, Massachusetts and in Hinsdale and Swanzy, New Hampshire. In the 1740s and 50s, raiding parties used the Ashuelot Valley as a route to the English settlements of northern Massachusetts. Other locations in the valley may have been used as camping places during this period as well as prehistorically.

Mineral resources played a small but continuing role in Surry’s economy during both prehistoric and historic times. Quartz, which may have been used for prehistoric tools, is available in mine ledge, two kilometers west of the project site and at other locations in the southwest part of town. Tradition claims that contact period Indians mined lead from outcrops on Surry Mountain to manufacture musket balls.

Prehistoric subsistence activity would have concentrated in the valley, with little use of the surrounding uplands. The high well drained terraces on either side of the valley seem most suitable as camping places and both recorded sites appear to have been in such areas.

Historic record indicates extensive use of the Ashuelot Valley as a transportation corridor during the contact period, and two prehistoric sites were roughly located within the town of Surry. Moderate over-all food resources potential, high geologic resource potential, and high frequency of suitable site locations indicate probable use of the area prehistorically as a migration and transportation corridor, and a by winter land resource area related to late prehistoric and contact period sites in the Connecticut River Valley.

2.9.2 Historic Period

Surry’s settlement began almost immediately following the close of the French and Indian War, and the town was incorporated on March 9, 1769. Farms were dispersed in location, a pattern typical of New England settlement during this period, and the basically agrarian economic base was augmented by a number of taverns and small water powered industries. The best farmland in town was on the Ashuelot Valley floodplain. Because of this and conveniences to mills along the river, a slightly increased settlement density occurred along the north-south road passing through the present village.

As with most upland New England towns, Surry experienced a pattern of abandonment of small holdings during the early part of the 19th century, consolidation of these into sheep pasture in the second quarter, and gradual reversion of upland property to woodland in the late 19th century. From the 1880s into the early 20th century, a small logging industry developed to exploit this resource. This period also saw several abortive attempts to exploit mineral resources on Surry Mountain (gold, silver, copper, and lead). Population and commercial establishments became more concentrated in the Ashuelot Valley during this period. This may reflect the partial abandonment of upland farms and minor increase in water power use on the river. Opening of several taverns and stores near the center may reflect an increase in commerce directed at through traffic on the Cheshire Turnpike. All of these ventures may be viewed as an effort to diversify the local economy from a declining agrarian base, adapting to local environmental shifts as well as to more regional economic trends.

When Surry Mountain Dam was constructed in the late 1930s considerable portions of the road system were abandoned or rerouted leaving Surry Center on a point of terrace overlooking the

project. Most of the flood plain farmland in town was purchased and approximately 13 dwellings moved or demolished.

2.9.3 Archaeological Resources

A cultural resource reconnaissance study for the operation and maintenance of Surry Mountain Lake was conducted by the U.S. Army Corps of Engineers in 1979. A total of 18 historic sites have visible surface features while 17 others may have subsurface remains. No prehistoric resources were located.

Most of the sites with surface evidence and some proportion of those with subsurface remains may be eligible for inclusion in the National Register of Historic Places. Because these sites constitute a unified settlement unit, it appears probable that some portion of the area would be eligible as a historic archaeological district. Recommended mitigation of current impacts includes monitoring of possible impacts upon a small number of sites and minor restrictions in areas of agricultural leases. Recommended future management of the property emphasizes avoidance of located sites in development planning and maintenance of their present condition.

2.9.4 Prehistoric Resources

There were no prehistoric resources located during the field survey. There are several possible reasons for this result. Some relate to the conditions of the field survey itself. Most of the areas of high or moderate potential were covered by vegetation at the time of survey, making subsurface investigations the only reliable means of locating prehistoric features or materials. Subsurface testing at this level of study was limited by extent, sampling areas of high and moderate potential areas below maximum flood pool elevations. Other reasons for not locating prehistoric resources relate to past and present environmental factors.

Both of the recorded prehistoric or contact period sites within the town appear to have been above the floodplain. The locations of the above sites, together with the known seasonal flooding patterns of the Ashuelot suggest that occupation in late pre-historic times may be generally confined to such terrace areas 6-12 meters above the river. Earlier sites may or may not have been similarly located.

Though no prehistoric sites were identified within the project, the background and field survey enable some recommendations to be made concerning potential prehistoric resources within the project. These recommendations can be found in the Cultural Resource Reconnaissance study.

2.9.5 Historic Resources

The historic site survey resulted in ninety one structure locations of which thirty seven have visible surface remains, one is standing and in use, and a further thirty one have no surface evidence but may have subsurface components. Twenty-two structures or complexes of structures were destroyed during construction of the dam and recreation area.

The study discovered multiple domestic historic sites including eight 18th century farmyard sites. Four of these were abandoned before 1858. Seven domestic sites first occupied in the 19th century were located through surface features. These were all occupied into the 20th century.

Only three domestic sites of 20th century construction date existed within the Government property bounds. All of these are of typical early 20th century type, and have little historic or archeological value.

Craft-commercial sites were discovered including seven 19th century sites consisting of a blacksmith shop, shoe shops, and taverns and stores. The only 20th century craft-commercial-industrial sites with the Government property was an uncompleted blacksmith shop. Industrial sites discovered included two 19th century sites consisting of a mine and a wood slide car, and one 20th century site which was another mine. Five 18th century domestic sites are probably eligible for inclusion in the National Register of Historic Places, as well as five 19th century domestic sites.

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 1997 Cultural Resource Reconnaissance study.

2.10 Demographics

2.10.1 Population

Table 2.5 – 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%
Surry	741	755	769	772	774	776	4.7%
Gilsum	814	817	820	824	826	828	1.7%
Alstead	1,950	1,938	1,927	1,934	1,940	1,944	-0.30%

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

2.10.2 Education and Employment

Table 2.6 – 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
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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%
Surry	205	144	81	190	60	95.6%	35.2%
Gilsum	191	86	37	78	51	89.0%	25.9%
Alstead	404	222	115	278	240	92.8%	38.20%

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

Table 2.7 – 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%
Surry	3.5%	5.7%	5.7%	7.1%	4.1%	3.6%	3.8%
Gilsum	4.0%	6.3%	5.7%	5.1%	5.0%	4.9%	3.9%
Alstead	3.4%	4.7%	5.6%	4.8%	4.4%	3.9%	3.4%

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

2.10.3 Household Income

Table 2.8 – 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
Surry	\$21,446	\$41,364	\$56,964	\$71,875
Gilsum	\$16,845	\$34,821	\$43,359	\$46,429
Alstead	\$14,439	\$30,956	\$43,191	\$62,969

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 Surry Mountain 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

Surry Mountain Lake Recreation Area is located 1.5 miles north of the dam off of Route 12A and consists of 90 acres adjacent to the 265-acre lake. There are three picnic shelters that can be reserved in the park. The recreation area offers a 600-foot long sandy beach with a swimming area, change house, picnic tables with grills, sanitary facilities, a playground, and a boat ramp. The recreation areas are open to foot traffic year-round and visitors enjoy winter activities during the off-season. Three miles north of Surry Mountain Lake Beach is another access to a small undeveloped recreation area off of Dort Road in Surry, NH. Visitors use this area for dispersed, multi-use recreation and access to approximately 6 miles of trails. At Surry Mountain Dam there is a parking area for visitors, public restrooms, and access to the 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 May in conjunction with spring flooding and high outflows. The length of the water release from Surry Mountain 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

Surry Mountain Lake has two active wells, both of which are Corps-operated. One (SM-DW-4) serves the recreation area and meets the definition of a public, transient, non-community water supply. The other (SM-DW-1) 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 Surry Mountain Lake is from local cities and towns. A thirty mile radius surrounding Surry Mountain 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 Surry Mountain 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 Surry Mountain Lake was compiled and is summarized in the table below. The following table lists the major public recreation areas within thirty miles of Surry Mountain Lake along with the activities offered at each.

Table 2.9 Regional Recreation Facilities within 30 miles of Surry Mountain Lake

Area	Distance (miles)	Boating	Camping	Fishing	Hiking	Picnicking	Snowmobiling	Swimming	Hunting
Federal Parks									
Otter Brook Lake (USACE), NH	11	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 Surry Mountain Lake are found throughout the Monadnock Region, but the recreation use at Surry Mountain Lake tends to be more localized. Although 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 Surry Mountain 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. In 2016, a traffic counter was removed from the Campground Road, because of the road being mainly used for traffic to a private, non-Corps campground. The decrease in visitation starting in 2016 represents this change.

Table 2.10 Annual Visitation Surry Mountain Lake (from VERS)

Fiscal Year	Visits
2014	96,984
2015	128,087
2016	79,720
2017	55,808
2018	65,773
2019	56,793
2020	50,520
2021	52,967

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. Surry Mountain Lake is unique in that the project lands include a significant portion of the westerly slope of Surry Mountain. This provides access to upland terrain and exemplary natural forest communities. These exemplary communities include a rich mesic forest, rich red oak-sugar maple/ironwood talus forest/woodland community, and a semi-rich mesic sugar maple-beech forest. Floodplain exemplary communities include a riverside

sand and gravel barren community, a silver maple floodplain forest, and a sycamore floodplain forest.

The lower elevations of project lands include old fields and apple orchards, as well as wetlands and mixed forests, all of which are accessible for public use with parking areas and trail access. The environmental resources of Surry Mountain 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

Surry Mountain 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. Surry Mountain 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 Surry Mountain 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 Surry Mountain 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 Surry Mountain 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. Park capacity or Recreation Unit Day Availability (RUDA) is a formula that measures total "possible" recreation units (site days/nights) that can be provided during an open season. It does not measure the actual use of the facilities. RUDA is calculated by multiply the number of parking spaces by the number of days open in year. At Surry Mountain Lake there are approximately 330 parking spaces at the day-use beach area, 9 parking spaces at the dam area, and 14 parking spaces at the Dort Road dispersed use area. After multiplying the parking spaces by the number of days open at these areas, the park carry capacity or RUDA is 41,725 visitors. 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 Surry Mountain 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 Surry Mountain 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 1,689 acres owned in fee and 108 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 57 percent of the project is forested, 26 percent is open fields and non-forested and 17 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 Surry Mountain 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. Surry Mountain 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 Surry Mountain 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 Surry Mountain 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 Surry Mountain 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 1,797 total acres acquired in fee for construction of Surry Mountain Lake. Of this total, 1,689 acres were purchased in fee and 108 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 Surry Mountain 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 80 acres classified as project operations at Surry Mountain 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 90 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 1,519 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 50 acres of low density recreation land at Surry Mountain Lake. There is a two mile multi-use trail within this classified land.

- Natural Resource Management. These lands are designated for the management of Fish and Wildlife resources and vegetative resources. There are 1,469 acres of land under this classification at Surry Mountain Lake. Approximately 285 acres of water is classified for this purpose as well, including the 265-acre pool and 20 acres of the Ashuelot River.
- 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 Surry Mountain Lake.

Table 4.1 Land Classification Acreages

Classification	Acres
Project Operations	80
High Density Recreation	90
Environmentally Sensitive	0
Multiple Resource Managed Lands: Low Density Recreation	50
Multiple Resource Managed Lands: Natural Resource Management	1,469
Multiple Resource Managed Lands: Future/Inactive Recreation Areas	0
Flowage Easement Lands	108
Total	1,797

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 108 acres of easement lands at Surry Mountain 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 Surry Mountain 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 108 acres of flowage easement lands located at Surry Mountain 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 Surry Mountain 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 Surry Mountain 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 Surry Mountain 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 80 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

Surry Mountain Lake has 90 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 statutes. 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 Surry Mountain 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 50 acres of low density recreation at Surry Mountain Lake located on the eastern shore. The goal for this classified land is to maintain and improve the existing multi-use trail while protecting and managing the localized environmentally sensitive areas within this classification.

- Natural Resource Management. These are lands designated for the stewardship of fish and wildlife resources and vegetative resources. There are currently 1,469 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 areas that are closed. There are no lands classified under this classification at Surry Mountain 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

Surry Mountain 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 TBD

8. SUMMARY OF RECOMMENDATIONS

It is recommended that the Surry Mountain Lake Master Plan be approved as a guide to the orderly use and development of natural and man-made resources at Surry Mountain Lake flood control project. Approval of this Master Plan would rescind Master Plan for Recreation Resources Development, dated January 1981.

This master plan provides guidance for future development at Surry Mountain 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.

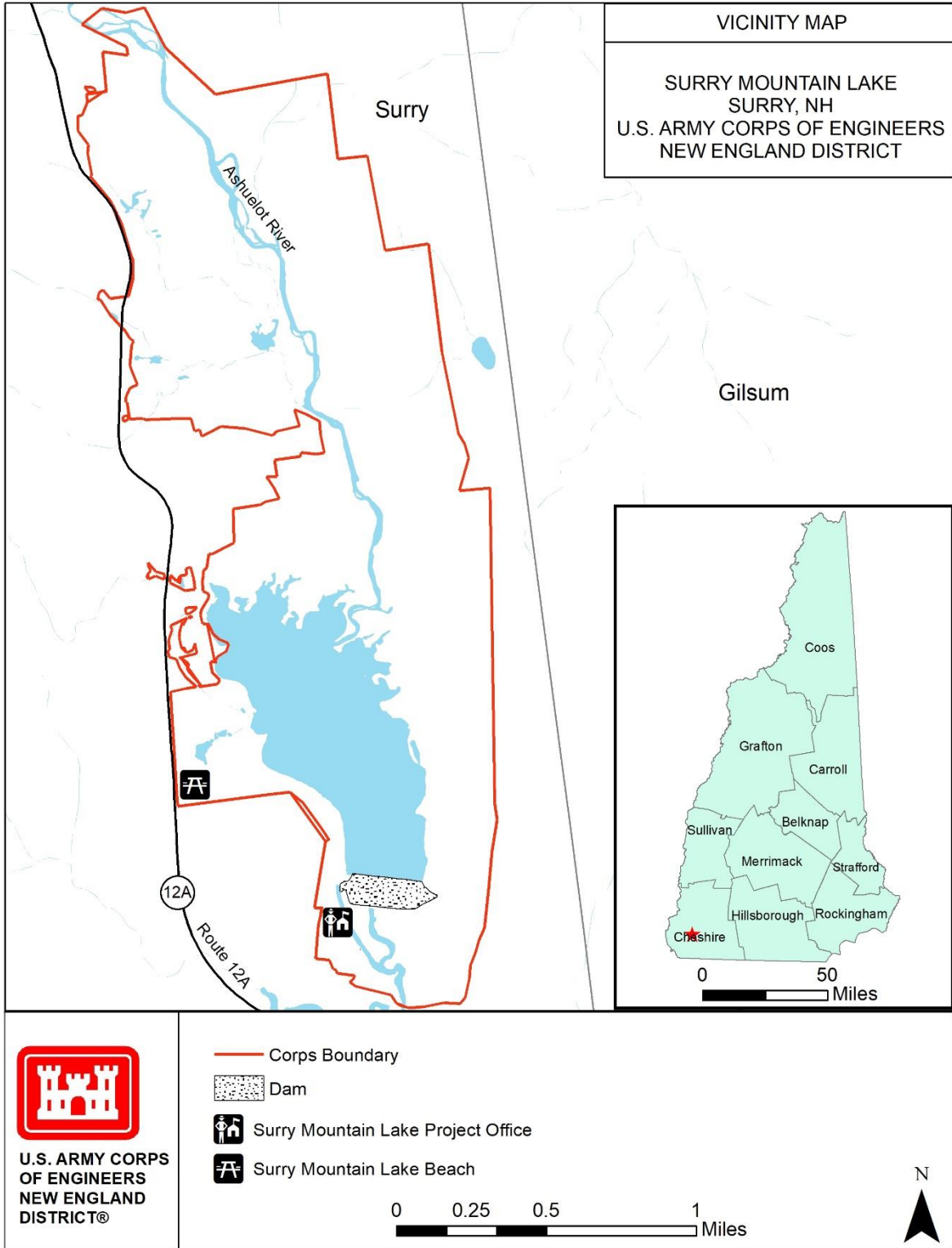
This Master Plan conceptually establishes and guides the orderly development, administration, maintenance, preservation, enhancement and management of all natural, cultural, and recreational resources at Surry Mountain Lake. The Master Plan is a land use management document and does not address water 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.

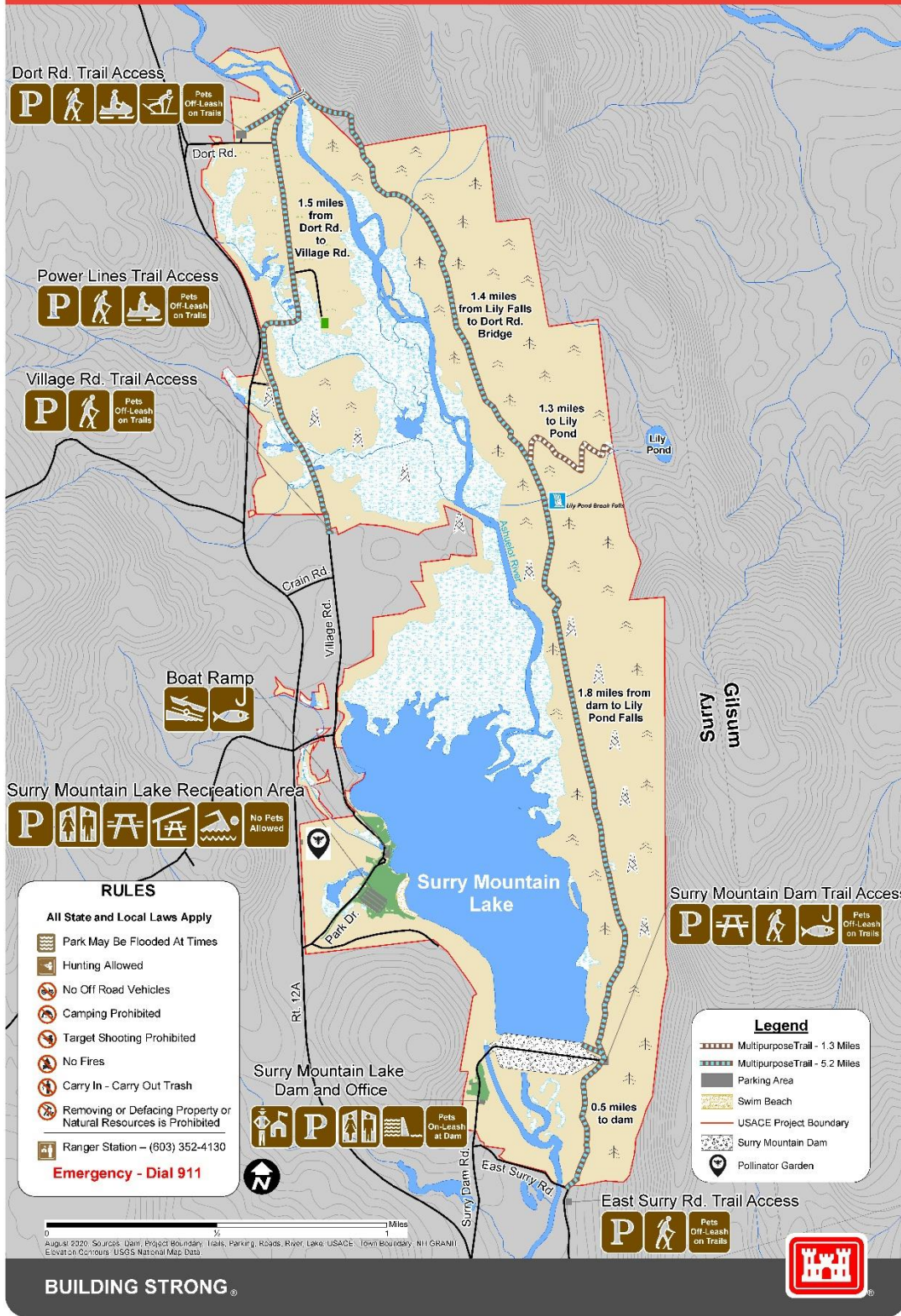
9. BIBLIOGRAPHY

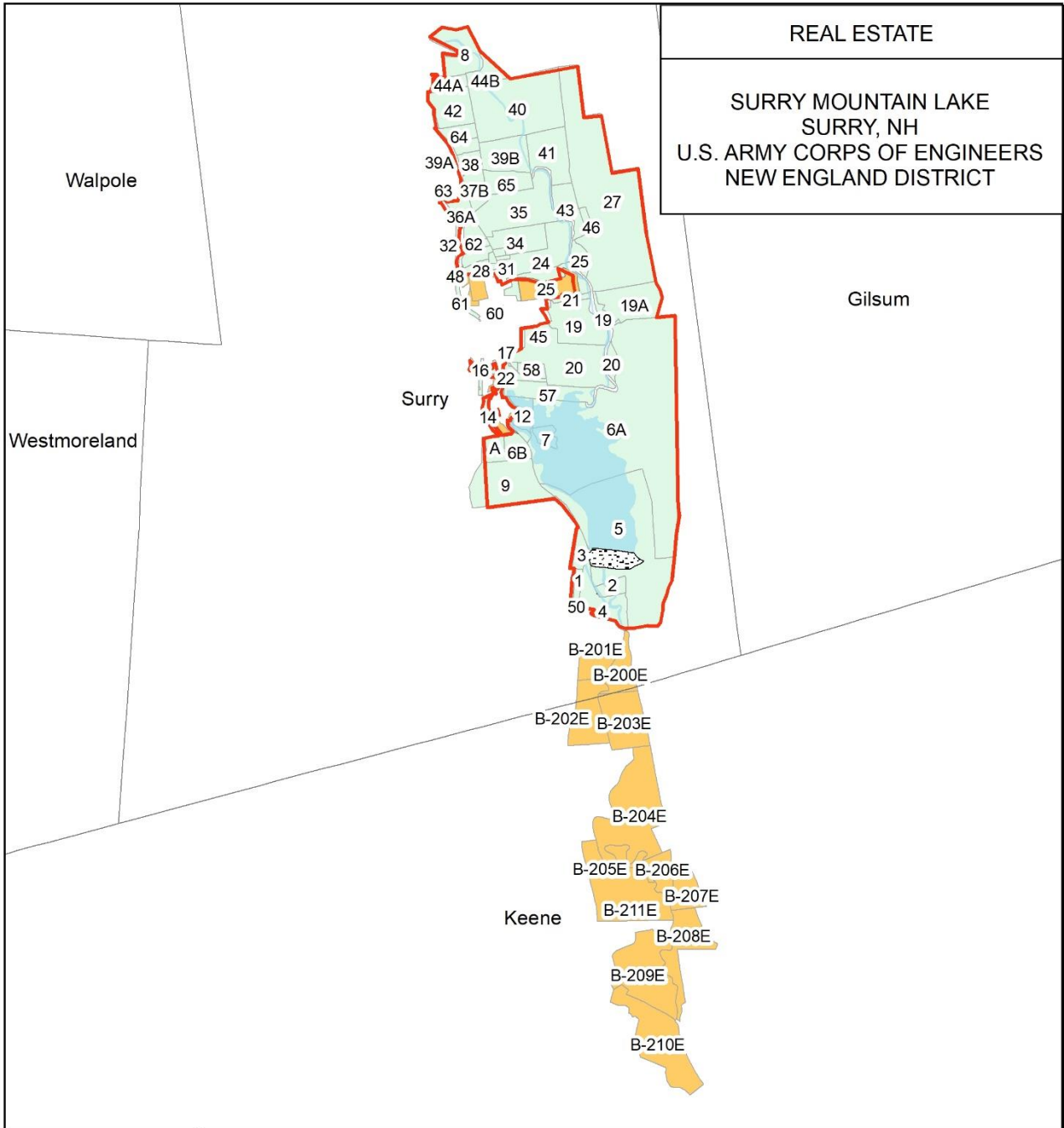
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APPENDIX A – MAPS







REAL ESTATE

SURRY MOUNTAIN LAKE
 SURRY, NH
 U.S. ARMY CORPS OF ENGINEERS
 NEW ENGLAND DISTRICT







Walpole

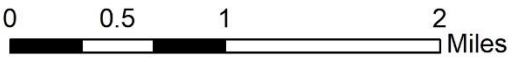
Westmoreland

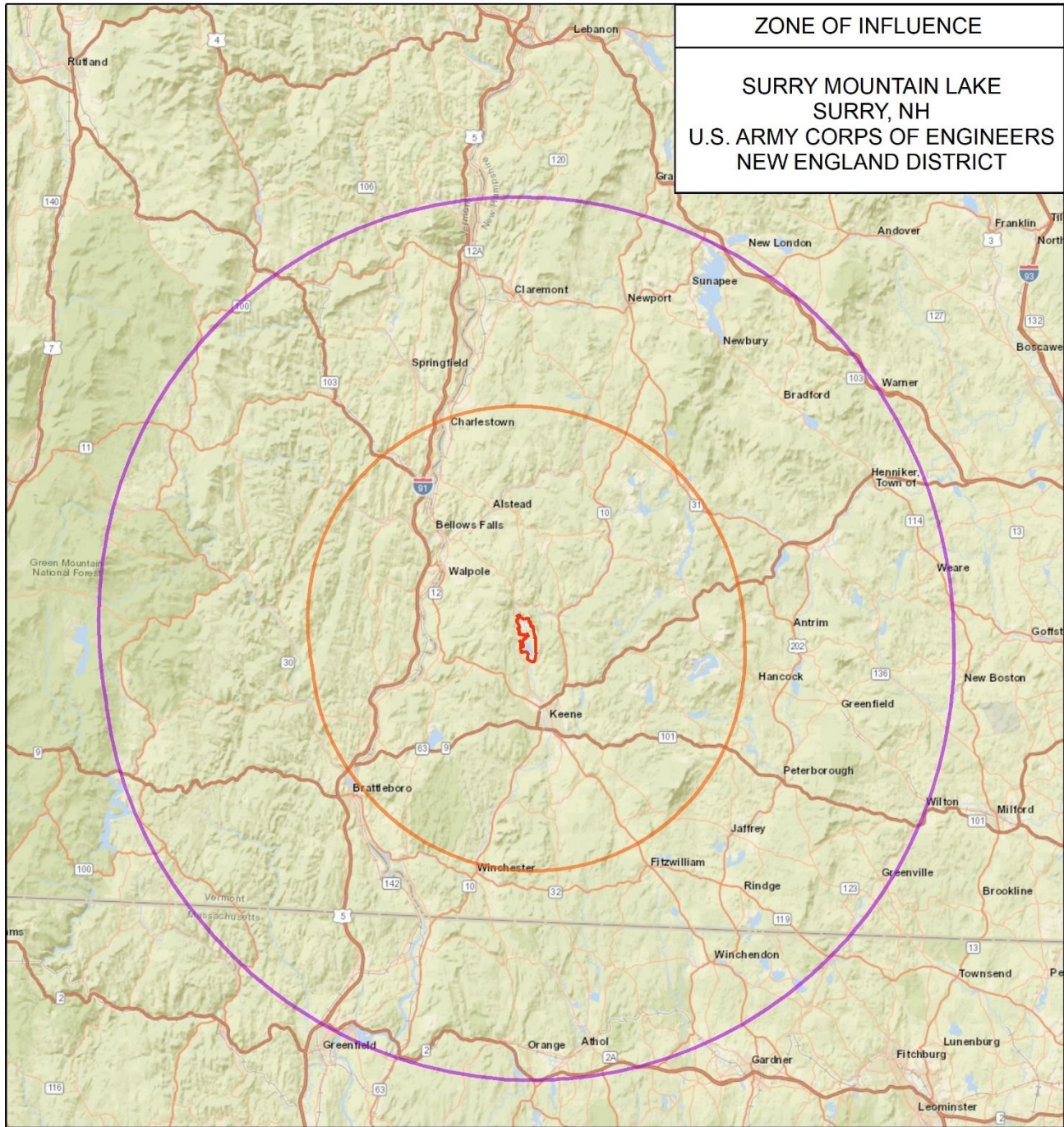
Gilsum

Keene



-  Corps Boundary
-  Dam
-  Water
-  Easements
-  Fee Property
-  Townships



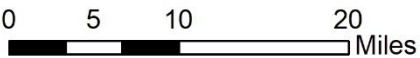


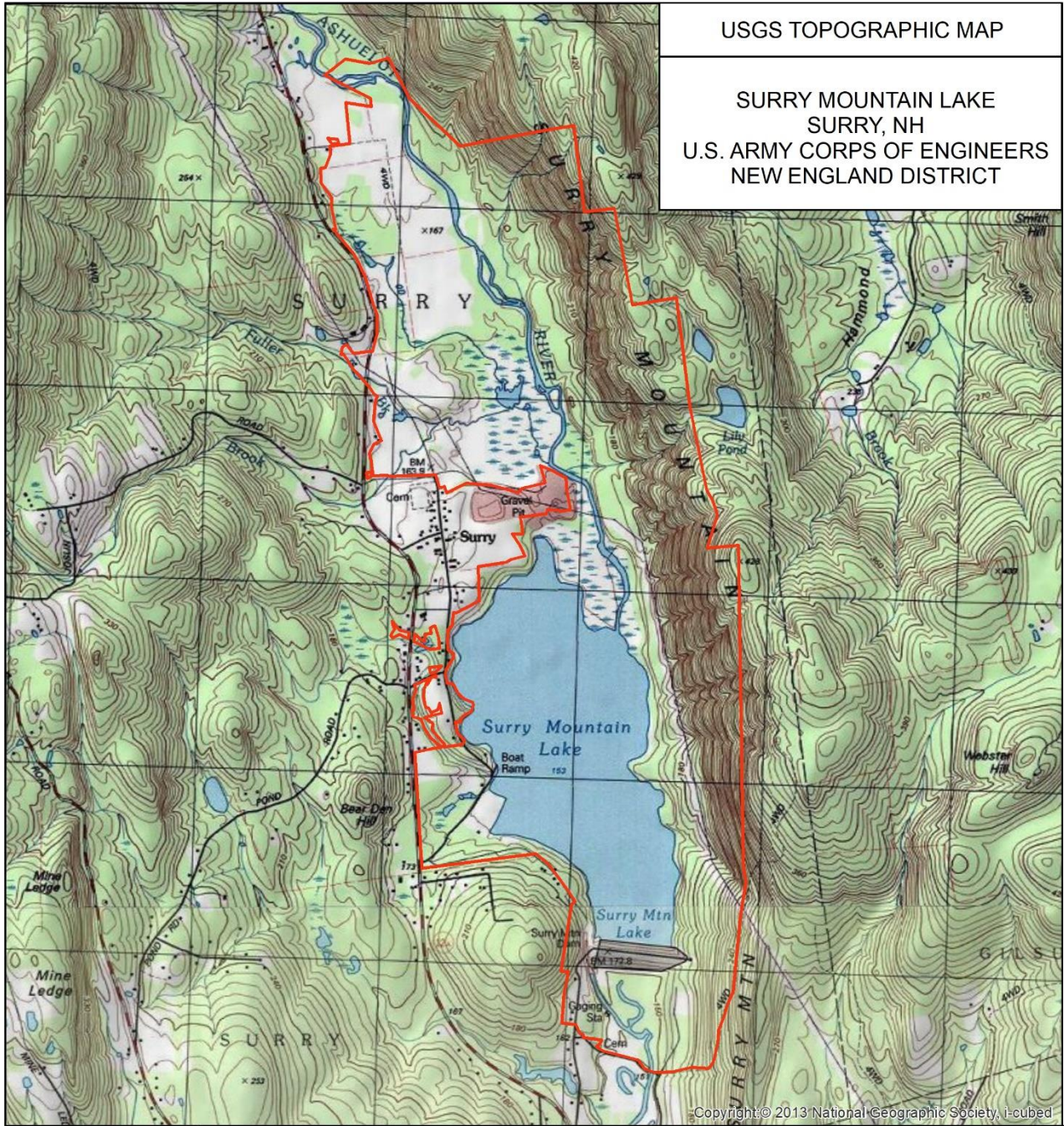
ZONE OF INFLUENCE

SURRY MOUNTAIN LAKE
SURRY, NH
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT



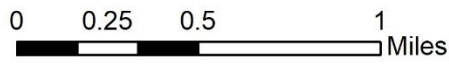
-  Corps Boundary
-  15 Mile Radius
-  20 Mile Radius





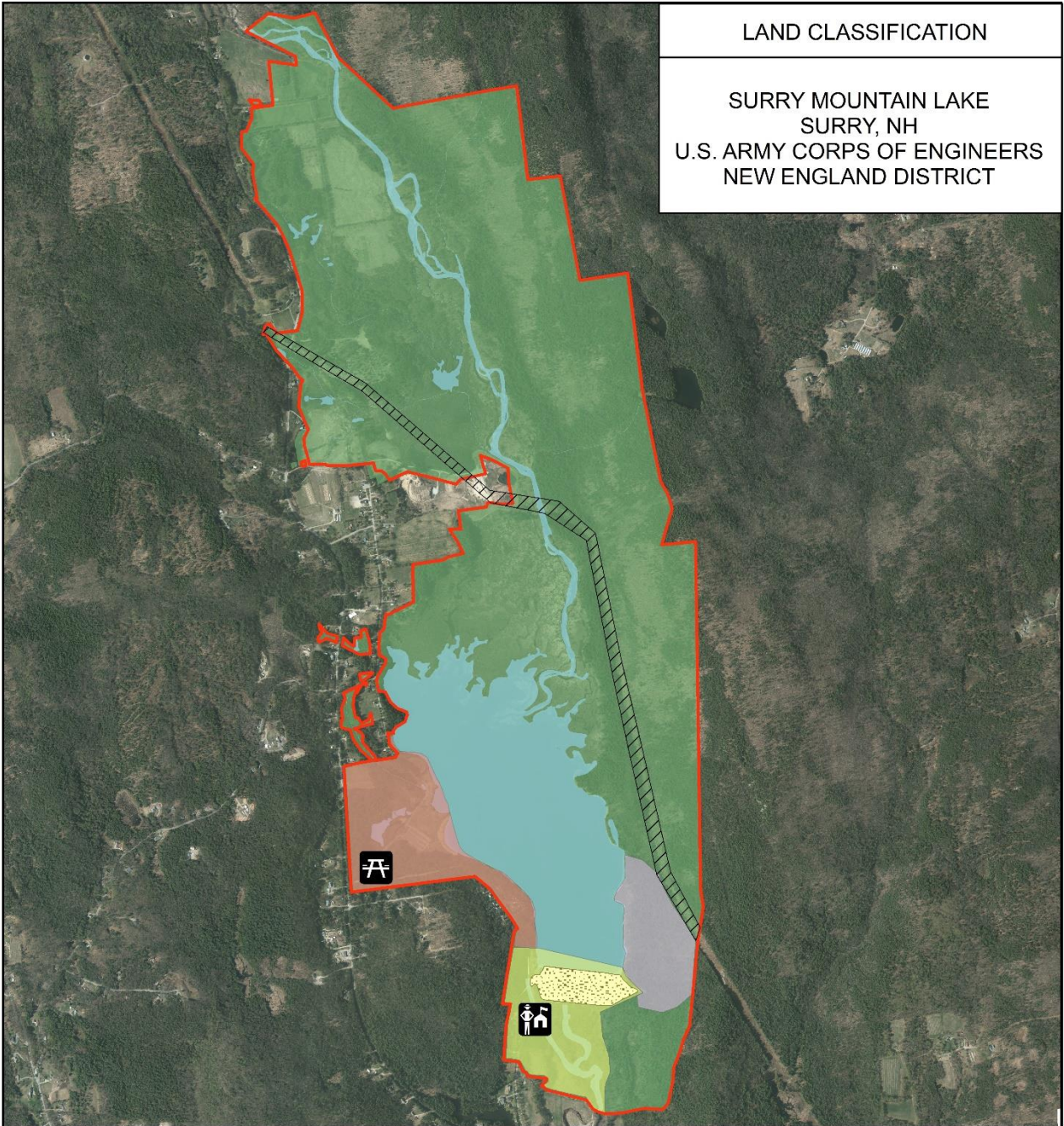
**U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT®**

— Corps Boundary
NGS USA Topographic Maps



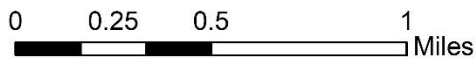
LAND CLASSIFICATION

SURRY MOUNTAIN LAKE
SURRY, NH
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT

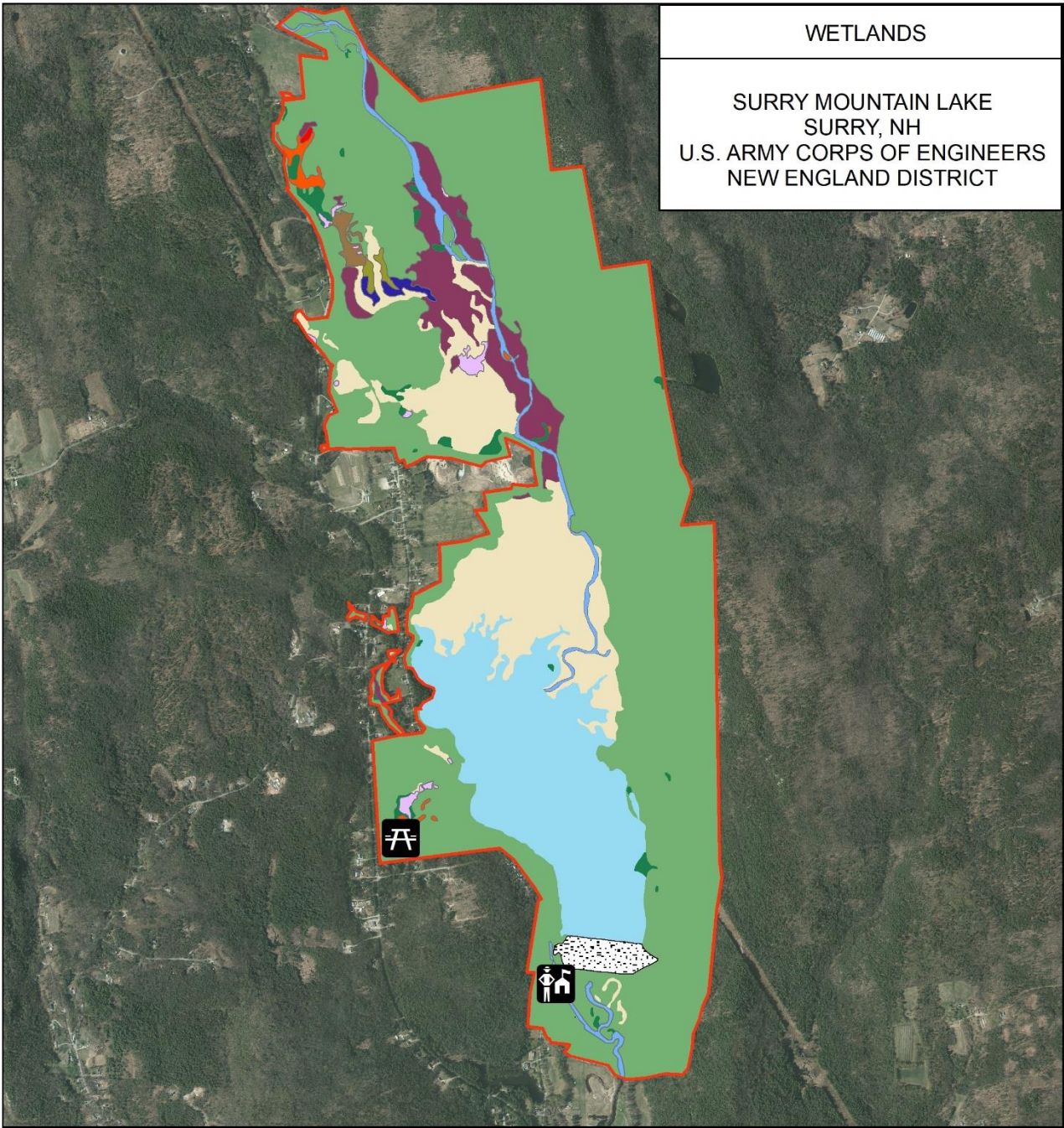


U.S. ARMY CORPS
OF ENGINEERS
NEW ENGLAND
DISTRICT®

- Corps Boundary
- Dam
- Water
- Project Operations (80 acres)
- High Density Recreation (90 acres)
- Low Density Recreation (50 acres)
- Natural Resource Management (1,469 acres)
- Existing Utility Corridor



Surry Mountain Lake
Surry, New Hampshire



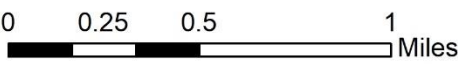
WETLANDS

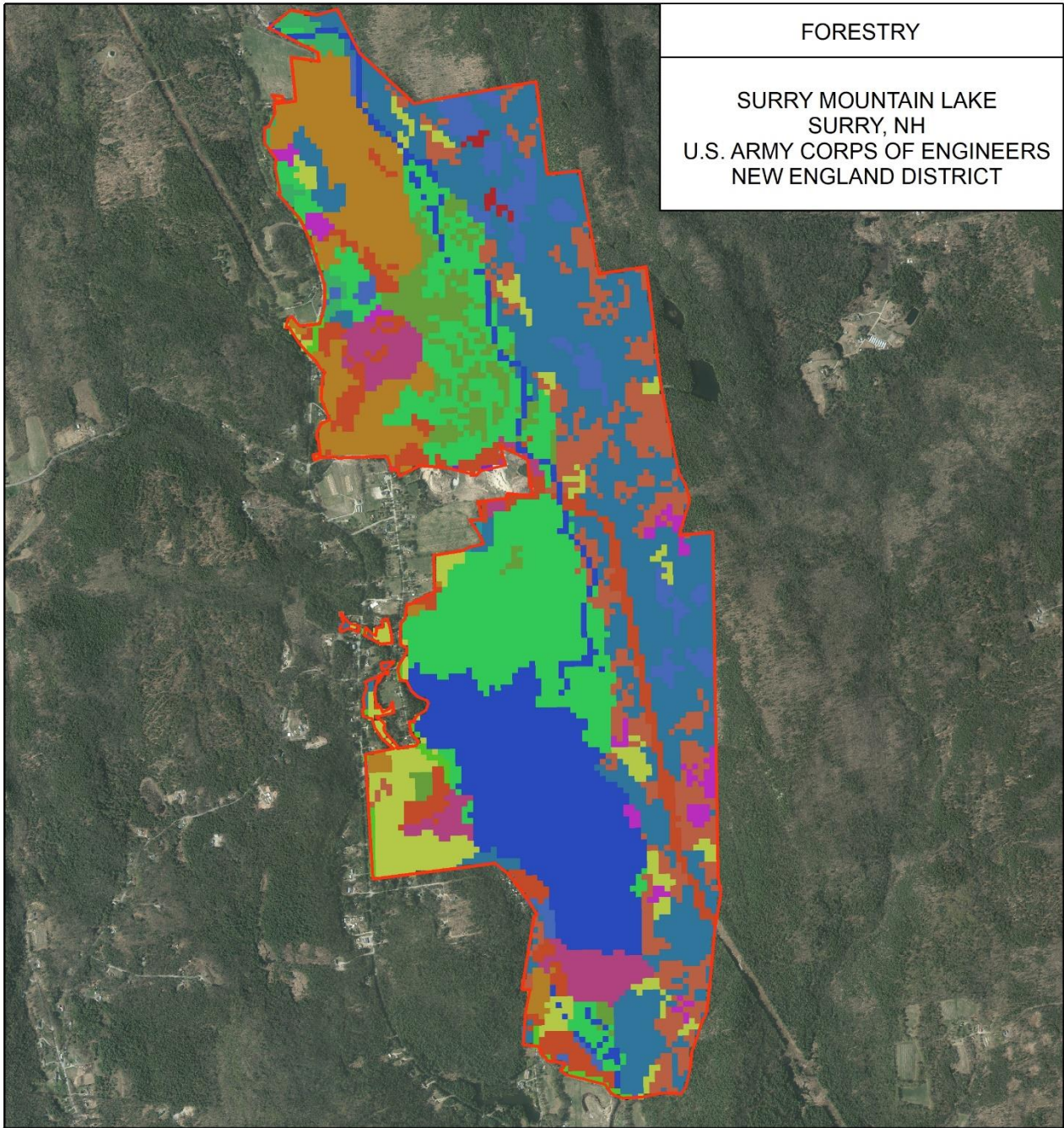
**SURRY MOUNTAIN LAKE
SURRY, NH
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT**



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OF ENGINEERS
NEW ENGLAND
DISTRICT®**

- | | | |
|----------------|----------|----------|
| Corps Boundary | PFO4 | PSS1/FO4 |
| Dam | POW | ROW |
| LOW | PSS1 | U |
| PEM1 | PSS1/EM1 | |
| PFO1 | PSS1/FO1 | |
| PFO1/SS1 | | |





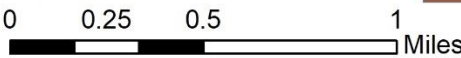
FORESTRY

SURRY MOUNTAIN LAKE
SURRY, NH
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NEW ENGLAND DISTRICT



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- | | | | |
|-------------------------|---------------------|---------------------|---------------------|
| — Corps Boundary | ■ Paper Birch/Aspen | ■ Mixed Forest | ■ Tidal Wetland |
| ■ Commercial/Industrial | ■ Hemlock | ■ Alpine (Krumholz) | ■ Tundra |
| ■ Transportation | ■ Other Hardwoods | ■ Open Water | ■ Disturbed Land |
| ■ Row Crops | ■ White/Red Pine | ■ Forested Wetland | ■ Sand Dunes |
| ■ Hay/Pasture | ■ Spruce/Fir | ■ Open Wetland | ■ Bedrock/Vegetated |
| ■ Orchards | ■ Pitch Pine | ■ Other Cleared | |
| ■ Beech/Oak | | | |



Data Source:
USACE & GRANIT

