Bear Brook State Park

Management Plan

State of New Hampshire

Department of Natural and Cultural Resources

2021

Cover: Sign at the main entrance to Bear Brook State Park. Photo by Billy Kunelius

ACKNOWLEDGEMENTS

This management plan was prepared by a technical team of natural resource professionals from the various state agencies charged with managing the resources at Bear Brook State Park.

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The Technical Team worked under the oversight of the Steering Committee which was comprised of members of the public who represented the various recreational uses and environmental interests of the park.

Bear Brook State Park Management Plan Steering Committee	
Representative	*Name/Title*
Town of Allenstown	Sandra McKenney, Selectman
Town of Candia	Tom St. Martin
Town of Deerfield	Brian Adams, Conservation Commission
Town of Hooksett	Mathew Lavoie, Code Enforcement
State Park System Advisory Council	Suzanne Smith, State Representative
Statewide Trail Advisory Council (Recreation At-large)	Tom DiMaggio, Chair
New England Mountain Bike Association (Non-motorized Recreation)	Dan Dwyer, Vice President
Derry Trail Riders (Non-motorized Recreation)	Avis Rosenfield
Southern New Hampshire Snow Slickers (Motorized Recreation)	Steve Hampl
New Hampshire Wildlife Federation (Big-game and Sportsmen)	Eric Orff
New Hampshire Audubon (Non-game Wildlife)	Carol Foss, Senior Advisor for Science and Policy
The Nature Conservancy, New Hampshire Chapter (Forest Ecology)	Jeff Lougee, Director of Stewardship and Ecology
Society for the Protection of New Hampshire Forests (Forest Management)	Wendy Weisiger, Managing Forester
Fort Mountain Trucking (Forest Products Industry)	Jeff Eames, President
Cultural and Historic Resources	Armand Verville

FOREWORD

This document marks the first revision of the Bear Brook State Park Management Plan since the last plan was created and adopted in 1994. The new plan is the result of a two-year planning process involving numerous department staff, multiple partners and organizations, the Bear Brook State Park Steering Committee, and active engagement by the public via meetings and written comments. As the last plan was an overarching document with a management approach meant to be timeless, this new version used that plan as the foundation, and built upon the great work of our predecessors.

Bear Brook State Park continues to be a prime destination for outdoor enthusiasts in the southeast part of the state. Finding the right balance between recreational use and natural resource management and protection has not always been easy or obvious, but by following the goals of the Vision in Chapter 2 we will ensure that the property provides continued public access for outdoor recreation; contributes to the forest economy through the sale of wood products; and that the area's wildlife, ecological values, and natural beauty remain intact.

While this plan continues to utilize a management approach based on a system of disturbance-based criteria, using both even-aged and uneven-aged silviculture, as well as setting aside thousands of acres of undisturbed landscape, it also contains several notable changes of contemporary interest. For instance, this version now has a new chapter dedicated solely to climate change and adds discussion regarding carbon markets. It better defines allowable timber harvest levels using both area control and volume regulation. It contains newly-created maps using the latest in geographic information system technology. It provides a much more in-depth discussion of wildlife species and habitat requirements as well the natural communities occurring within the park. Finally this plan provides a thorough analysis of the facilities and recreation occurring on the property, and identifies the needs and impacts of the various user groups.

The department would like to thank each and every person who contributed in some way, whether large or small, to the creation of this new plan. The decisions we make today will have lasting impacts upon this wonderful resource far beyond the life of any plan, so a collaborative and cooperative planning process is imperative to ensure we make the best decisions on behalf of the land and the people of our state. It is our hope and belief that this plan accomplishes that lofty goal, and that Bear Brook State Park will continue to be the southern flagship of the state reservation system.

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Patrick D. Hackley
Director/State Forester
Division of Forests and Lands

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Philip A. Bryce
Director
Division of Parks and Recreation

I approve the Bear Brook State Park Management Plan.

_____ _____

Patrick D. Hackley, Director
Division of Forests and Lands
Department of Natural and Cultural Resources
Concord, NH

Date

_____ _____

Philip A. Bryce, Director
Division of Parks and Recreation
Department of Natural and Cultural Resources
Concord, NH

Date

_____ _____

Sarah Stewart, Commissioner
Department of Natural and Cultural Resources
Concord, NH

Date

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1. BEAR BROOK STATE PARK

1.1 INTRODUCTION

Located in the towns of Allenstown, Deerfield, Hooksett, and Candia, Bear Brook State Park is the third largest state reservation in New Hampshire, totaling 9,976 acres. Bear Brook State Park has long contributed to New Hampshire's forest-based economy, providing important statewide, regional, and local value from conservation, recreation, wildlife habitat, and forest products.

Bear Brook State Park plays an important role in the quality of life for the people of the region. Its large size and close proximity to the cities of Concord and Manchester, and the surrounding suburbs, provide numerous outdoor recreational opportunities to a significant portion of the state's population. Bear Brook State Park's many natural features such as ponds, brooks, mountaintops, and contiguous forestland provide ecological values and natural beauty at a scale not readily found in this ever and rapidly developing region. Bear Brook State Park also has a rich history of timber harvesting and wildlife habitat management providing opportunities for sportsmen and supporting New Hampshire's forest products industry.

The Department of Natural and Cultural Resources is responsible for balancing these multiple uses and protecting the park resources. Through its various divisions, and in cooperation with other state agencies, the department manages all state reservations in accordance with RSA 227-H:1:

> *227-H:1 Declaration of Purpose. – It is hereby recognized and declared that state-owned reservations contribute to the conservation of natural resources and distinctive quality of life in the state. The public welfare of this state is served by the prudent acquisition and management of reservations to provide forest benefits and for the purposes of demonstrating sound forestry principles, protecting habitat for plants, animals, and other organisms, conserving forested watersheds, preserving areas of rare and exemplary natural beauty and ecological value, and providing for perpetual public access and use.*

The aforementioned "forest benefits" are further defined in RSA 227-G:2:

> *"Forest benefits" include, but are not limited to, forest products, a viable forest-based economy, recreation opportunities, scenic values, healthful surroundings, climate mitigation, clean water, and biologically diverse populations of plants and animals.*

Division of Forests and Lands

The Division of Forests and Lands is responsible for the management of natural resources on state reservations. The division's mission is to:

> *…protect and promote the values provided by trees and forests.*

Various bureaus within the Division of Forests and Lands oversee different aspects of natural resource management on state reservations.

The Forest Management Bureau is responsible for the sustainable harvest of forest products and the implementation of wildlife habitat improvement projects on state lands.

The Land Management Bureau is responsible for acquiring and surplusing land, maintaining property boundaries, issuing special use permits, and administering leases on DNCR lands.

The Natural Heritage Bureau conducts and maintains inventories of rare and endangered plants and exemplary natural communities statewide.

The Forest Protection Bureau is charged with enforcing timber and forest fire laws across the state.

The Planning and Community Forestry Bureau over sees urban and community forestry programs and statewide forest planning.

Division of Parks and Recreation

The Division of Parks and Recreation is responsible for managing recreation activities on state reservations and elsewhere. The mission of the Division of Parks and Recreation is:

> *…to provide New Hampshire's citizens and guests with outstanding recreational, educational, and inspirational experiences through the responsible management and cooperative stewardship of the state's natural, recreational, and cultural resources.*

The Division of Parks and Recreation has several bureaus that are responsible for the operation and maintenance of developed recreation areas and other dispersed recreation areas including trails. Developed recreation areas offer amenities and other facilities to the recreating public beyond that of simple outdoor space, including campgrounds, picnic areas, ski areas, beaches, historic sites, and interpretive trail loops associated with specific features. Many of these developed recreation areas charge a fee for admission, which supports the operation of the self-funded State Park system.

The Bureau of Parks Operations is charged with the day-today management of the park system.

The Bureau of Trails is charged with the management of recreational trails on public and private lands. Much of this bureau's focus is on motorized recreational trails for snowmobiles and off-highway recreational vehicles. Registration fees collected support the maintenance of motorized recreational trails and program staff. Most non-motorized trails on state reservations do not require a fee for use.

The Bureau of Historic Sites works in conjunction with the Division of Historical Resources to manage the State Historic Sites and the cultural resources on the state reservations. Many of the State Historic Sites offer tours that interpret the history of New Hampshire.

Division of Historical Resources

The Division of Historical Resources is responsible for managing the historical, archeological, architectural, engineering, and cultural heritage of New Hampshire. The mission of the Division of Historical Resources is:

…to preserve and celebrate New Hampshire's irreplaceable historic resources through programs and services that provide education, stewardship, and protection.

The Division of Historical Resources oversees a number of programs designed to promote, conserve, preserve, and protect historical resources for the education, inspiration, pleasure, and enrichment of the citizens of New Hampshire.

Various programs administered by the Division of Historical Resources include, but are not limited to, the State Conservation and Rescue Archaeology Program (SCRAP), the New Hampshire Historical Highway Marker Program, the Certified Local Government Program (CLG), and the Historic Preservation Review and Compliance Program.

The Division of Historical Resources also facilitates the survey and inventory of historical resources, the listing of resources to the State and National Register of Historical Places, the development of preservation easements, and the distribution of preservation grants.

Cooperative Land Management Program

The Cooperative Land Management Program (CLMP) is a three-tiered, chartered program between multiple state agencies that hold land and manage resources. The program derives its authority from RSA 227-H: 2, RSA 227-G:3, RSA 215-A:9, and RSA 227-C:9, whereby its members cooperate in an effort to strive for conformity of policies across state lands and coordination of recreation and natural resource conservation management.
Presently, CLMP includes the following agencies:

- Fish And Game Department
- Division of Forests and Lands, DNCR
- Division of Parks and Recreation, DNCR
- Division of Historic Resources, DNCR
- Water Division, DES
- Department of Transportation

State Land Management Team

The State Land Management Team (SLMT) is a subcommittee of CLMP that provides coordinated review of proposals for state reservations and other state lands at the project level. SLMT consists of technical resource management professionals from state agencies participating in CLMP, including specialists in fish and wildlife habitat management, forestry, natural heritage, cultural heritage, trail and park recreation, forest health and protection, and land management. SLMT members may also participate as part of multi-disciplinary technical teams, for long-range comprehensive land and natural resource management plans for state reservations.

As part of the planning process for state reservations, the Department of Natural and Cultural Resources often assembles various teams of resource professionals and potential affected interests who utilize the property to assist in the development of a management plan. The role of the planning teams is to help ensure that the public is being well served, the natural resources are being protected, and that as many interests as possible are being addressed. In addition the Department of Natural and Cultural Resources solicits and considers public input, and attempt to

address and minimize any conflicts. If decisions are ultimately made by the department that individuals or organizations are not in agreement with, they will at least have had the opportunity to make their case and receive adequate consideration in the planning process. This revision of the Bear Brook Management Plan consisted of two such teams.

Technical Team

The Technical Team was assembled from natural resource professionals from the various state agencies charged with managing the resources at Bear Brook State Park. The task of the Technical Team was to develop the vision statement and construct the body of the management plan. The Technical Team members were the principle authors of the plan under the oversight of the steering committee (See Acknowledgments for a complete list of members of both teams).

Steering Committee

The Steering Committee was comprised of members of the public who represented the various recreational uses and environmental interests of the park. The task of the group as set forth by the Commissioner of the Department of Natural and Cultural Resources was as follows:

"The Steering Committee shall serve in an advisory capacity, providing advice to the Technical Team during the process of updating the Bear Brook State Park Management plan to ensure the representation of the multiple interests that utilize the park, as well as the protection of the natural and cultural resources contained within the park. …they shall participate in four to six public meetings, review draft plan revisions, listen to and consider public comment, and make recommendations to the Technical Team to assist in the production of an updated management plan that meets the spirit of the vision and best serves the public for the next 15 years."

1.2 HISTORY

In 1916, the state accepted a gift of 413 acres on the south side of Deerfield Road and west of Bear Brook from George Blake of Pembroke. This area included Catamount Hill and Catamount Brook southward to the current boundary line, and was known as Bear Brook State Forest.

Soon after, much of the "marginal farmland" that was to become present day Bear Brook State Park was purchased by the federal government as a National Park Service Demonstration Area. In 1935, the Civilian Conservation Corps (CCC) came to work at "Camp Bear Brook". Much of the early work was completed by the 1123rd Co. and consisted of tree planting, including the 1939 Daughters of the American Revolution red pine plantation, which was harvested in 2013 due to an outbreak of the red pine scale insect. The CCC also established an extensive trail and road network throughout the property, and built a fire tower on Bear Hill that went into service in 1940, and was eventually closed and removed in 1974.

By 1941, the CCC had completed several day use areas and the camps at Bear Hill and Spruce Pond. At that time, the day use areas were managed by the state under a lease. During World War II the CCC camp (now known as the Depot) was used to accommodate large groups of soldiers that came from nearby Grenier Field in Manchester. In 1992 the Depot was placed on the National Historic Register. It was the longest running CCC camp in the state of New Hampshire and is known to be one of the few relatively intact camps left in the nation. The CCC Museum opened there in the early 1990s.

In 1943, The National Park Service transferred a total 6,436 acres to the state, and "Bear Brook State Forest" expanded into "Bear Brook State Park" that we know today. In the post-war recreation boom following transfer to the state, Bear Brook State Park saw several hundred patrons on the weekends. The tollbooth was erected in the late 1940's, and in 1949, the campground at Beaver Pond opened with 20 sites. To accommodate the increased public demand for recreation in the late 50's early 60's, then Governor Wesley Powell supported a $9 million dollar bond for state parks, which was adopted by the legislature. Passage of this bond allowed for some additional expansion of the park in the early 1960's through the purchase of several private inholdings. With the inception of the Land and Water Conservation Fund in 1965, federal and state matching funds further expanded the park, with the last acquisition coming in 1981.

Over the years, the park has hosted several long-term partnerships. The University of New Hampshire Cooperative Extension 4-H program held overnight and day camps at the Bear Hill Pond Camp for over 70 years, discontinuing the program in the early 2000's. The Audubon Society ran an environmental education program at the park's Nature Center for over 20 years, ceasing in the early 1980's.

From its earliest days as a park, wildlife management has been recognized as an important aspect of the overall management within Bear Brook State Park. The "Game Refuge" was established in 1943 under RSA 212:13, setting aside 3,000 acres for archery only hunting. The New Hampshire Fish & Game Department installed two dams to regulate water depth to manage waterfowl habitat. The first dam, at Hall Mountain Marsh, was installed in 1956. The second dam, at Hayes Marsh was installed in 1968. A dam at Archery Pond, a universally accessible fly fishing only pond, is also maintained by Fish & Game. Other dams, at Catamount Pond, Bear Hill Pond, and Beaver Pond were constructed by the Department of Environmental Services, and are maintained by the Department of Natural and Cultural Resources to provide water recreation opportunities

Recreation has a long history at Bear Brook State Park, and so too does sustainable forest management, which has helped shape the landscape of the park over the years. Since its earliest days various forest management activities have been undertaken at Bear Brook State Park, including tree planting, timber stand improvement, thinning, timber harvests, and wildlife habitat improvement projects, including prescribed burns, mowing, plantings, and the creation of early successional and young forest habitat.

The first forest management plan was written in 1948 when the property was only 6,849 acres. In 1994, the second and more encompassing *"Bear Brook State Park Management Plan"* was crafted to address the need for long-term strategy and multiple use management of Bear Brook State Park. This current plan seeks to encompass changes in policy, practices, and technology that have transpired in the intervening 25 years while continuing to emphasize long term management strategies and multiple uses.

2. VISION AND MANAGEMENT APPROACH

A comprehensive Vision for the management of Bear Brook State Park has been evolving since it was designated a state park in 1943.

"Its recreational potential, forest cover, and wildlife effect the economic and social well-being of the surrounding and visiting populace both directly and indirectly, and like all public holdings, should be managed with the Greatest Public Good as the primary objective."

John Bork
1948 Bear Brook Plan

The Technical Team spent considerable time developing the current Vision, which elaborates on the Management Focus found in the 1994 Bear Brook Plan.

2.1 VISION

Bear Brook State Park will be managed within the context of the surrounding natural and developed landscapes to accommodate a wide variety of uses without compromising the integrity of the resources. Management will balance recreation with the needs for timber production, wildlife habitat, water quality, and natural and cultural resource protection. Over the next 15-years, the management of Bear Brook State Park shall:

- Provide a variety of year round recreational opportunities that are sited appropriately for land conditions and resource protection.

- Practice sustainable forest management that contributes to the values of the other resources in the park, and that produces forest products that contribute to the economy of New Hampshire.

- Maintain a diversity of wildlife habitat conditions through both active and passive management of natural vegetation.

- Protect water quality, aquatic habitat, and the ecological integrity of wetlands and riparian management zones.

- Document and protect occurrences of rare plant and animal species, exemplary natural communities, and unique and sensitive habitats.

- Identify, preserve, and interpret historical and cultural resources.

2.2 MANAGEMENT APPROACH

Biological Diversity and Natural Disturbance
Bear Brook State Park provides a diverse range of habitats for a variety of trees, plants, animals, and natural communities. This biological diversity has resulted from the adaptation of local plants and animals in response to the various levels of natural forest disturbance that have occurred across the New England landscape at regular intervals since the last ice age. Many species have adapted to require heavily disturbed conditions to maintain viable populations, while other species require undisturbed sites. Still other species are best suited somewhere along the gradient of conditions fitting between the two extremes. Forest disturbances generally fall into three categories that each provide a distinct set of habitat conditions, and together provide a diverse landscape.

Undisturbed forests contain stands of mature, shade-tolerant trees that have the ability to reproduce beneath themselves, maintaining a dynamic equilibrium. Often referred to as "steady-state", undisturbed forest tend to possess a balanced and sustainable distribution of tree sizes. Forest openings are usually very small and the result of natural mortality of a single stem or a small group of stems caused by lightning, wind, snow, ice, insects, disease or poor vigor.

Moderately disturbed forests contain larger areas impacted by more severe, or more wide-spread natural disturbances like those mentioned above. Mortality occurs in groups of stems and larger forest openings are created. As a result, the temperature and amount of light are greater than what are found in an undisturbed forest. This favors species that prefer moderate to higher light conditions. Tree ages vary, and some individual stems may become rather old but seldom reach the ages attained in stands where little disturbance results.

Heavily disturbed forests result from large-scale disturbances that wipe out entire stands of trees within the forest. Major stand replacing events such as hurricanes, fires, and floods have been recorded at regular, periodic intervals over time in southern New Hampshire. Due to the vast size of the openings created by these large-scale disturbances, both the light levels and temperatures that result within these heavily disturbed forests are much more extreme than those found within even moderately disturbed forests. This favors the establishment of even-aged stands of shade intolerant species.

Management Criteria
The 1994 *"Bear Brook State Park Management Plan"* introduced a system of Management Criteria, which provides for biological diversity across the park based upon natural disturbance tendencies, while integrating the natural resource management of the Park with the recreation uses occurring there.

The system is comprised of four Management Criteria, each of which has a set of standards for governing the type and degree of disturbance that will occur in specific locations of the park. Starting with an unmanaged core, each successive criteria allows for progressive levels of disturbance that radiate outwards. This management approach has provided a high degree of species richness, and has significantly contributed to the overall biological diversity of the park over the past 25-years. In addition to providing a diverse range of vegetation and habitats, this

approach has also provided a broad spectrum of high quality recreation opportunities.
One of the major benefits of the Criteria system is that it provides a landscape approach to the management of both the natural resources and recreation that occur on the property. The Criteria approach outlines the general guidelines and the type of practices that may occur at any given location. It provides management focus across the entire property. This allows resource managers of various disciplines to more easily work together to make informed recommendations and decisions when evaluating future projects.

Division of Parks and Recreation planners can identify areas where expansion and improvements may occur without threatening decades of effort to accomplish natural resource management goals on the property. Conversely, by knowing where probable expansion may take place, natural resource managers can modify efforts in those areas.

Division of Forests and Lands foresters can identify the types of harvesting that will occur in various areas of the park and can anticipate concerns from other disciplines when developing timber harvest plans, which can then be addressed very early on in the planning process.

Department of Fish and Game habitat biologists can identify areas where various wildlife habitat needs may be met by being able to anticipate where certain vegetation types occur and will continue to occur in the future.

Vegetative Management
Many of the natural resource management objectives and recreational opportunities for Bear Brook State Park will be achieved through vegetative manipulation, as permitted within the four Management Criteria. Since Bear Brook is a forested landscape, this vegetative manipulation will primarily result from the implementation of forest management practices including commercial timber harvesting. For a more in depth description of the vegetative management at Bear Brook State Park, please see Chapter 7, Wildlife Habitat Management and Chapter 10, Forest Management.

Management Criteria 1, Undisturbed Landscape - 2,167 acres
Undisturbed landscape components provide important habitats for many plants, animals and natural communities. Park visitors often tend to desire a more remote outdoor recreational experience that these landscapes provide. Large, relatively undisturbed areas provide an excellent baseline for research on the impact of management and recreation activities going on in other areas of the park as well as on other state and private forestlands.

As the third largest state reservation, Bear Brook State Park provides a unique opportunity to establish a large, relatively undisturbed area in the southeast part of the state. The 1994 plan designated two areas within the interior of the park as Criteria 1. Over the last 25-years these areas have received little or no management, but rather have been left to progress through natural disturbance regimes and the processes of forest succession. These areas are now starting to take on an appearance significantly different to the managed areas of the park.

While Criteria 1 may attain old growth characteristics over time, the influences of atmospheric and biotic factors around the property may never allow these areas to revert completely to a fully undisturbed state. Minimizing man-made disturbances in Criteria 1, such as commercial timber harvesting, will ultimately allow the natural progression of late successional species and provide habitats for animals requiring these later seral stages. However, it is recognized that natural disturbances will occur, and that some may be large and catastrophic. In addition, large-scale disturbances are anticipated from unnatural sources such as introduced insects, diseases, and invasive plant species. As a result, in certain situations, management activities, including timber salvages, may be necessary. Timber salvages within Criteria 1 require a recommendation from the Forest Health Program, the Natural Heritage Bureau, the Forest Management Bureau, and review by the State Lands Management Team. Recommendations for harvests will be based on identified threats to other Criteria1 areas, adjacent public or private woodlands, or to the public health and welfare. Efforts to control the outbreak of the exotic red pine scale insect required such a salvage harvest in Criteria 1 in 2013. All wildfires must be extinguished per RSA 227-L.

Non-motorized recreation activities are an acceptable use of lands in Criteria 1, provided that the integrity of Criteria 1, as relatively undisturbed areas, is maintained.

Management Criteria 2, Transition Zone - 3,342.5 acres

The area in Criteria 2 serves as a transition between the unmanaged core areas in Criteria 1, and those areas that are most heavily disturbed around the outer edges of the park in Criteria 3. By receiving only light to moderate levels of man-made disturbance, Criteria 2 mitigates the hard edge impact that heavy disturbance could have on the plants, animals, and natural communities that occur in Criteria 1.

The management of Criteria 2 involves minimal to moderate impact from human activity. Forest management practices that promote a mostly intact canopy with a balanced mix of age and size classes, and that favor mid-successional species and communities tied to moderate disturbance regimes are implemented here.

Recreation focuses more on dispersed multiple use, and includes wintertime, motorized recreation.

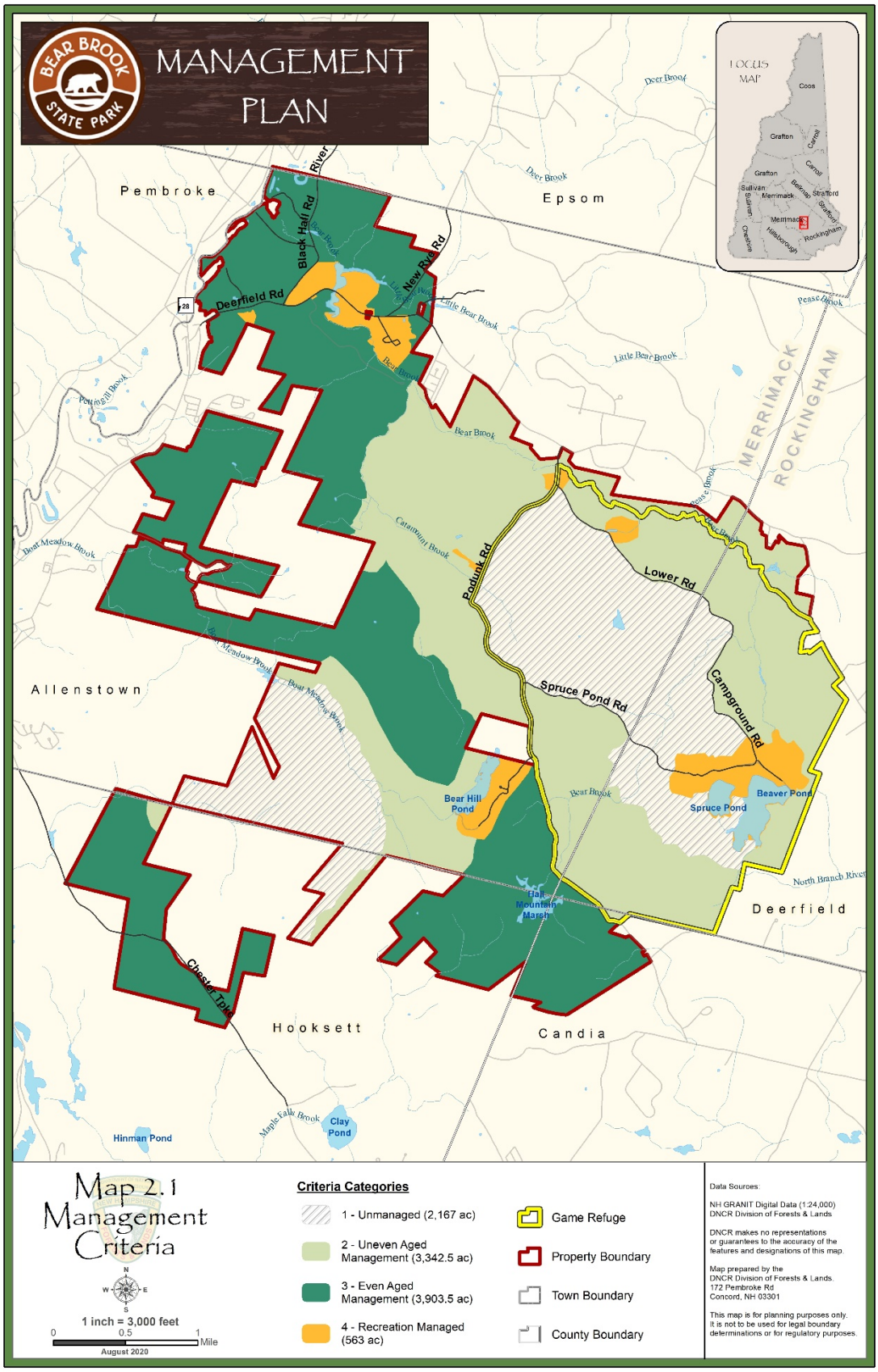
Management Criteria 3, Disturbed Landscape - 3,903.5 acres

Young forest and early successional habitats are dependent on large-scale disturbances. Many species of trees, plants, and animals are tied to young forest and early successional habitats, which result as the forest regrows after large-scale disturbances. These habitats are in decline in southern New Hampshire. In the past natural events such as fires, floods, and weather events provided the disturbance necessary to create new young forest habitat. In addition, abandoned agricultural lands reverting to forest also played an important role in providing these habitats in the last century. However, with the advent of fire suppression, flood control, and loss of farmlands, weather events alone have proven inadequate to provide enough young forest habitat at the scale required for wildlife.

Where site conditions allow, Criteria 3 uses forest management practices to create large-scale openings to create viable amounts of young forest and early successional habitats.

Management within Criteria 3 also accommodates the demand for recreational opportunities tied to the species that utilize these habitats such as hunting and bird watching.
Bear Brook State Park has a long established pattern of heavy snowmobile and winter OHRV use. Such motorized recreational activities in these more heavily disturbed landscape components are less likely to conflict with other recreational users seeking a more remote or wilderness experience in the undisturbed landscape of Criteria 1.

Management Criteria 4, Developed Recreation - 563 acres
Criteria 4 is comprised of those areas that support developed recreation that offer amenities and facilities to the public beyond that of simple outdoor space such as the campgrounds, day use areas, and the beach. The primary purpose of vegetative management in Criteria 4 is to provide a safe recreational environment and enhance visitor's experiences.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
LOCUS MAP
Coos
Grafton
Carroll
Sullivan
Merrimack
Belknap
Strafford
Hillsborough
Rockingham
Cheshire
Pembroke
Epsom
Allenstown
Deerfield
Hooksett
Candia
Deer Brook
Black Hall Rd
New Rye Rd
Deerfield Rd
Little Bear Brook
Pease Brook
Bear Brook
Catamount Brook
Beat Meadow Brook
Poduck Rd
Lower Rd
Spruce Pond Rd
Campground Rd
Bear Hill Pond
Spruce Pond
Beaver Pond
Hall Mountain Marsh
North Branch River
Chester Tpke
Maple Falls Brook
Clay Pond
Hinman Pond
MERRIMACK
ROCKINGHAM
Map 2.1
Management Criteria
1 inch = 3,000 feet
0 0.5 1 Mile
August 2020
Criteria Categories
1 - Unmanaged (2,167 ac)
2 - Uneven Aged Management (3,342.5 ac)
3 - Even Aged Management (3,903.5 ac)
4 - Recreation Managed (563 ac)
Game Refuge
Property Boundary
Town Boundary
County Boundary
Data Sources:
NH GRANIT Digital Data (1:24,000)
DNCR Division of Forests & Lands
DNCR makes no representations or guarantees to the accuracy of the features and designations of this map.
Map prepared by the DNCR Division of Forests & Lands.
172 Pembroke Rd
Concord, NH 03301
This map is for planning purposes only. It is not to be used for legal boundary determinations or for regulatory purposes.

3. INFRASTRUCTURE

Bear Brook State Park is a highly designed and developed park with infrastructure that supports recreation and property management including buildings, roads, parking lots, dams, campsites, beaches, picnic areas, septic systems and water systems. In addition, there are utility corridors, easements, boundary lines and areas under agreement that the Department has responsibility for monitoring or direct management.

The Fixed Asset Management System Database (FARMS) located in the Planning and Development section in Concord contains information on 134 buildings and recreational facilities at Bear Brook State Park, grouped into six administrative units; Catamount Pond, Depot Area, Podunk Road, Bear Hill Camp, Spruce Pond Camp and Beaver Pond Campground.

Table 3.1 Buildings and Facilities at Bear Brook State Park

Location	*FARMS Building ID*	*Description*	*Year Built*
Catamount Pond Area	BBR27	Violette Pavilion	1935
	BBR28	Picnic Shelter	1935
	BBR29	Toilet Building	1940
	BBR30	Group Shelter Building	1930
Depot Area	BBR06	CCC Museum	1935
	BBR08	Nature Center	1935
	BBR09	Carpenter Shop	1935
	BBR11	Snowmobile Museum	1935
	BBR12-17	Administrative Buildings	Various
	BBR77-83	Depot Storage	Various
	BBW81A/81B/82	Warehouse	Various
	BBW83	Warehouse	2008
Podunk Road Area	BBR01/02	Residence/Garage	1935
	BBR03	Fish & Game Storage	1935
	BBR04	Park Storage	1935
	BBR05	DPR Regional Office	1930
Bear Hill Pond Area	BBR32-39	Camp Administration Buildings	1936
	BBR43A-H/44/45	Oaks Unit	1935
	BBR46A-H/47/48	Maples Unit	1935
	BBR49A-H/50/51	Pines Unit	1935
	BBR52/53A-H/54	Ledges Unit	1935
	BBR74/74A	Water Tower/Pump House	1936
	BBR98	Pavilion	1998
	BBR99	Toilet/Shower Building	2000
	BBR100	Pioneer Toilet Building	1998
Spruce Pond Area	BBR55-60	Camp Administration Buildings	1935
	BBR62/64/67/70/72	Wash Houses	1936
	BBR63A-H/68	Unit 2	1936
	BBR65/66A-H	Unit 1	1936
	BBR69/71A-G	Unit 4	1936
	BBR73B-D	Unit 3 Sleeping Cabins	1936
Beaver Pond Area	BBR18	Toilet/Shower Building #1	2007
	BBR19	Toilet Building #2	1972
	BBR20-23	Campground Storage	Various
	BBR24	Store/Office	1952
	BBR93	Toilet Building #3	1994

3.1 ROADS, GATES AND PARKING LOTS

Roads

RSA 233:8 classifies the roads in Bear Brook State Park as Class III Recreational Roads. This statute assigns the Department of Transportation (DOT) with the responsibility for reconstruction and maintenance of class III roads, but is silent on funding. DOT District 5 staff grade Podunk Road annually, but maintenance of the other gravel roads, ditch lines, culverts, and asphalt roads remain un-funded.

The Student Conservation Association Program (SCA) under agreement with the Division of Parks and Recreation, has winter maintenance responsibility of Campground Road (plowing/sanding) for their use. The public is not permitted to use this road with vehicles once the gate is closed by park staff for the season.

Gates

There are many gates on the property which control vehicle access to trails and internal park management units. Some trails and roads are gated during certain times of year, to manage certain public uses of the park and protect road conditions. Older chain-style gates have mostly been replaced to metal post gates. The Podunk Road and Campground Road gates remain open until December 15th, unless winter conditions become unsuitable for wheeled vehicle use sooner.

Parking Lots

There are nine designated public parking areas in the park. Visitors pay entry fees at tollbooths located on Deerfield and Podunk Roads or at the various iron rangers. Public parking is allowed in the following parking lots;

- Deerfield Road – This approximately 2 acre gravel parking lot is generally referred to as the “snowmobile” parking lot. This parking lot is remote from the Catamount Area tollbooth and is only open in the winter or by special use permit.
- Catamount Pond Day-Use Area – This 275 vehicle parking lot serves visitors to the beach/picnic area and trail users. The lot is unpaved, however, parking islands and parking bumpers delineate parking spaces.
- Catamount Pond Group-Use Pavilion – This 1 acre gravel parking lot is usually gated unless a group has reserved the area. Fishermen park along the roadway adjacent to the lot.
- Podunk Road – This half acre lot is often referred to as the “hiker-biker lot” and is the starting point for many trail users. This parking lot is used year-round by the non-motorized users. The gravel lot spaces are not delineated.
- Archery Pond – This parking area is primarily used by archery target shooters and fisherman. The NH Department of Fish and Game manages programs under a MOA with DNCR.
- Hayes Field – This grassy parking area is primarily used by equestrians, however, hikers and mountain bikers are allowed to park. Trailer parking permitted.
- Depot Road – Parking along Depot Road serves the museum complex. There is a paved parking area at the Warehouse and is for warehouse business and staff. There is no public parking in the Warehouse/shop areas.

- Currier Road – This small 3 car parking lot is located adjacent to Currier Road in the Town of Candia provides access to the Lynx and Beaver Pond trails.
- Hall Mountain Marsh – This small 5 car parking lot is located off Podunk Road in the Town of Candia provides access to the Hall Mountain trail network.

3.2 DAMS

There are five dams on the property of various hazard classifications. The dams are registered and regulated by the Department of Environmental Services, Dam Bureau.

- Catamount Pond Dam (004.10): This dam is managed by DNCR. The primary construction is earth/stone and was built in 1944. This dam impounds water for the day-use swimming area. The height is 7.0 feet and it impounds 18 acres.
- Beaver Pond Dam (061.07): This dam is managed by DNCR. The primary construction is earth and was built in 1992. The height is 2.0 and it impounds 50 acres. The dam impounds water for the campground beach.
- Bear Hill Pond Dam (004.01): This dam is managed by DNCR. Built in 1885 the primary construction is earth/stone. The height is 7.5 feet and impounds 33 acres. The dam was reconstructed in 1994.
- Hall Mountain Marsh Dam (004.11): The Fish and Game Department manage this dam built in 1988 for wildlife habitat. Primary construction is cement dam with a spillway. The height is 5 feet and it impounds 31 acres.
- Hayes Marsh: The Fish and Game Department manage this dam built in 1968 for wildlife habitat. The dam's primary construction is earthen with a downtube spillway and is maintained by the Department of Environmental Services.
- Archery Pond: The dam is maintained by the Department of Environmental Services and administratively assigned to the Fish and Game Department.

3.3 UTILITY SYSTEMS

Septic Systems

There are 35 septic systems in the park, many dating from the CCC development period. Seventeen of these systems are at Spruce Pond and Bear Hill Pond camps. The septic systems should be assessed for maintenance and extent of service life and a plan for septic system replacement should be initiated.

Water Systems

There are three public water systems in the park registered with the Department of Environmental Service, Drinking Water Bureau. Managing seasonal public water systems requires the annual well restart and water quality testing.

Table 3.2 Drinking Water Systems at Bear Brook State Park

Location	*Town*	*PWS ID*
Bear Hill Camp	Allenstown	0047020
Spruce Pond Camp	Allenstown	0047050
Beaver Pond Campground	Deerfield	0047010

The water at many sites in the park has high iron content, depending on these levels and the associated issues it may be necessary to use filtering and softening systems. Casing in ledge 80' or more can help block some iron in upper level soft ledge from entering the well.

The municipal water system operated by Pembroke Water Works, supplies the Park Office (BBR26) and the Catamount Pond Bathhouse (BBR27). The water is provided, up to 50,000 GPD at no charge to the Department per an easement agreement with the Pembroke Water Works (a private entity) whose wells are located on park property just off Deerfield Road. In future it is recommended to connect the Catamount Pond Area facilities and Depot Area facilities to the municipal water system as capacity allows.

Power

There are miles of overhead and underground power lines in the park consisting of primary and secondary lines. In most cases the utility is responsible for the primary lines to the meters. There are two known locations where DNCR owns a portion of the primary lines including the feed to the warehouse (BBR83) /depot complex and at Bear Brook campground. All secondary lines are the responsibility of the park to maintain.

Table 3.3 Electric Power Suppliers at Bear Brook State Park

Facility	*Building ID*	*Meter*	*Utility*
South Region Office	BBR05	697201	NH Electric Coop
Warehouse	BBW83	S72271433	Eversource
Warehouse	BBW81B	Secondary (BBR83)	Eversource
Warehouse	BBW81A	Secondary (BBR83)	Eversource
Shop/office	BBR15	Secondary (BBR83)	Eversource
Beaver Pond Campground – Office	BBR24	S71440061	Eversource
Beaver Pond Campground – Toilet Bld #1	BBR18	S71088065	Eversource
Beaver Pond Campground – Toilet Bld #2	BBR20	Secondary (BBR24)	Eversource
Beaver Pond Campground – Toilet Bld #3	BBR93	S71439915	Eversource
Catamount Pond – Violette Pavilion	BBR27	S1607446	Eversource
Catamount Pond – Picnic Area Toilet Bld	BBR29	S71088064	Eversource
Catamount Pond – Pavilion	BBR30	S71088065	Eversource
Catamount Pond – Tollbooth	BBR85	S71088063	Eversource
Bear Hill – Scannel Hall	BBR37	S71013053	Eversource

3.4 CATAMOUNT POND RECREATION AREA

This area includes the beach, bath house/shelter, and the group picnic area/shelter on Deerfield Road, adjacent to Catamount Pond. A new campground serving campers with horses located in the former family picnic area is under development.

The park service charge is collected for public use in this area from a tollbooth located on the south side the Deerfield Road on the westerly approach to the area. A small seasonal park office building is located opposite the tollbooth on the north side of the road.

This developed recreation area offers a variety of recreation opportunities. Swimming and picnicking are predominant uses. Catamount Pond is well-stocked with trout, and fishing

(allowed on the south side of the road) is popular. The parking for the beach area also serves as a trailhead for the Catamount Trail and connects to the One-Mile Trail. The picnic shelters are used for group-use outings, and are popular for that purpose.

Catamount Pond Beach and Violette Pavilion
Catamount Pond Beach is one of four developed beaches that are on the property. The swimming area is an impoundment of Bear Brook maintained by park staff. The pavilion (BBR27) is named for Richard "Dick" Violette, a CCC alumni and founder of the CCC Museum. The pavilion is available to be rented and can accommodate 100 persons

Playground/Picnic Area
The playground was installed in 2007 and has accessible play elements. The Catamount picnic area has grills and picnic tables. There are no designated accessible picnic units in the picnic area.

Catamount Group Pavilion
The group pavilion (BBR30) is available to be rented and can accommodate up to 400 persons. The pavilion has seasonal flush toilets, a working fireplace and barbeque pit.

Catamount Camping Area
The Catamount camping area is under construction by Division staff. Formally, this area was the "family picnic area" however, it has been unused since the red pine scale sanitation harvest in 2013. Existing infrastructure, toilet building (BBR29) and pavilion (BBR28), will be used to service the campground. The proposed 8 site camping area is for overnight guests with horses. Construction of the campground began in the spring of 2019. Riders will access the trail network by a new connector trail that utilizes existing social/management trails. Day use is not permitted and visitors with horses will continue to park at Hayes Field on Podunk Road.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
Bear Brook
Dam
Black Hall Rd
Picnic Area
Playground
Beach
Parking
Catamount Pond
Bath house
Future Horse Camping Area
Deerfield Rd
Park Office
Toll Booth
Gate
Fishing Area (South of Deerfield Rd)
Pavilion Reservation Parking Only
One Mile
Bear Brook
Horse Camp
Group Pavilion Area
Snowmobile Loop
Map 3.1
Administrative Unit 1
Catamount Pond Recreation Area
N
W
E
S
1 inch = 200 feet
0
195
390
Feet
August 2020
Property Boundary
Town Boundary
Multi-Use Trail
Municipal Road
Park Road
Woods Road
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
DNCR Forests & Lands
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Map Produced by DNCR
Division of Forests & Lands.
172 Pembroke Rd
Concord, NH 03301
Ph: (603) 271-2214
This map is for planning purposes only. It is not to be used for legal boundary determinations or for regulatory purposes.

3.5 THE DEPOT AREA

The complex of twenty-one buildings located off the Deerfield Road are known as the "Depot". The Civilian Conservation Corps built several of the structures in this area and these buildings received National Historic Landmark status in 1992. Over the years, these buildings have served a variety of purposes. Public use is restricted to a small portion of the Depot Area. The department maintenance facilities, fuel pumps and warehouse contribute to a relatively high level of vehicular traffic and other activity at the Depot. Use of buildings for maintenance and administration is consistent with the original purpose of the Depot Area.

Museum Complex
Presently two of the buildings house museums: the New Hampshire Snowmobile Museum (BBR11) and the Civilian Conservation Corps (CCC) Museum (BBR06).

Warehouse and Associated Buildings
The warehouse building (BBW83), named in honor of Alfred Grimes in 2009, serves as the centralized warehouse for the department, offices for staff and the USFS Forest Inventory and Analysis. Other buildings are used for short and long term storage of equipment and materials (BBW81A/B, BBW82).

Shop and Associated Buildings
The shop (BBR15) is the facility where vehicle and facility maintenance for the department is coordinated. Outlying buildings store materials and equipment.

Other Facilities
Park staff use the carpenter shop (BBR09) as a maintenance facility. The “Red House” (BBR78) is employee housing and monitor the area. The Department of Safety has an agreement with the Department of Natural and Cultural Resources to use a portion of the area for administrative purposes.

Underground Fuel Storage Tanks
The Department of Natural and Cultural Resources operates a gasoline dispensing site in the Depot Area that includes a 4,000 underground fuel tank that is regulated by the Department of Environmental Services. Users include local municipalities, program partners and Department of Natural and Cultural Resources employees. In addition, there is a #2 heating oil tank at the maintenance shop that is also regulated by the Department of Environmental Services. Both sites require a Class A certified operator who conducts schedules annual inspections and maintenance and contracts service as necessary.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
New-Rye-Rd
Deerfield-Rd
CCC Museum
(Public Access)
P
Museum
Parking
Depot-Rd
Snowmobile Museum
(Public Access)
Dred-Cir
Ccc-Cir
Warehouse, Shop, and other Facilities
(No Public Access)
Map 3.2
Administrative Unit 2
Depot Area
1 inch = 100 feet
0 125 250 Feet
August 2020
Depot Area
Public Access Building
Building Not Open to Public
Multi-Use Trail
Municipal Road
Park Road
Woods Road
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
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3.6 PODUNK ROAD AREA

This area is the access to the southern part of the park. This access point divides into the two primary park roads, Campground (Lower) Road and Podunk Road. These roads provide vehicle access seasonally to Archery Pond, Beaver Pond Campground, Bear Hill Pond Camp and Spruce Pond Camp in addition to the trail network.

The park service charge is collected for public use of facilities and the trail system from a tollbooth. The Division of Parks and Recreation South Region Office (BBR05) and the park manager's residence (BBR01) is located in this area. Two service buildings are used for seasonal storage; BBR03 by the NH Fish and Game Department and BBR04 by park staff.

The Podunk Road parking area serves non-motorized users year-round. The road network in this section of the park are important trails to the winter users of the park. Snowmobiles and mushers use Podunk Road when there is adequate snow cover. Winter hikers/snowshoers/skiers access the trail network from the Podunk Road parking area.

Archery Pond

The Fish and Game Public Affairs Division and Facilities and Lands Division have programmatic responsibility for the Archery Course and the fishing facilities including the dam. The facility was refurbished in 2003 using federal Pittman-Robertson program funding. Persons using this site are granted complimentary admission to the site per an agreement between the Department of Natural and Cultural Resources and the Fish and Game Department. The management agreement between the agencies has expired and needs updating to include maintenance standards and responsibilities.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
Deerfield Rd
Bear Brook
Clearview Dr
Kenwood Dr
Little Bear
Parking
Toll Booth
Administrative Use
Regional Office
Podunk Rd
Big Bear
Squirrel
Gravel Pit
Hemlock
Salt Lick
Camp
Pitch Pine
Lower Rd
Fishing Access
Archery Pond
Dam
Parking
Archery Range
Map 3.3
Administrative Unit 3
Podunk Road Area
1 inch = 300 feet
0 300 600 Feet
August 2020
Municipal Road
Park Road
Woods Road
Multi-Use Trail
Property Boundary
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
DNCR Forests & Lands
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3.7 BEAR HILL POND CAMP

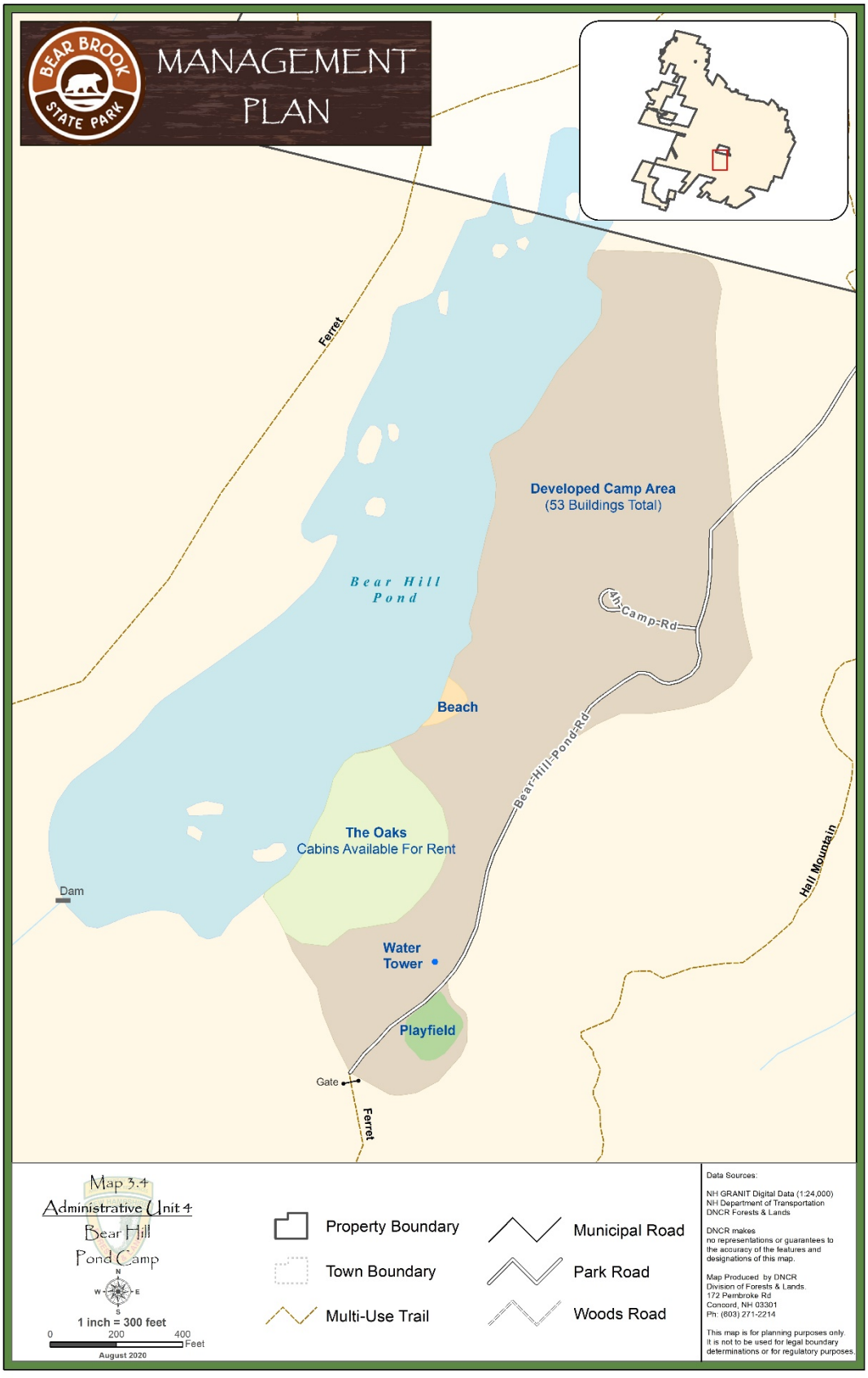
Bear Hill Pond Camp is one of three public camping areas within the Park. Bear Hill Camp was constructed by the CCC and is the site of former 4H youth camp operated by UNH Cooperative Extension for approximately 75 years. The facility has been determined eligible for the national register and their repair and management require consultation with the Division of Historical Resources per RSA 227-C:9.

In 2018 the Division of Parks and Recreation renovated the Oaks Unit opening 3 cabins for overnight guests. There are two sizes of furnished cabins (maximum occupancy of 4 or 6 persons) available for rent. Cabins do not have electricity or heat. The Division plans to renovate the existing shower building for the camper's use. Visitors to Bear Hill have easy access to the Hall Mountain trail network, a swimming beach, and non-motorized boating and fishing on Bear Hill Pond.

Buildings
The 53 buildings and grounds of the camp are in fair shape despite their age and deferred maintenance required. The buildings were recently roofed and are weather tight.

Utilities
Records and surveys of the utility system are not complete. Most of the septic systems date from the CCC era and have had limited maintenance. The electrical system does not meet today's standards. Water system is seasonal with most piping surface mounted.

Beach
The beach at the camp is one of four beaches that were developed by the Civilian Conservation Corps on the property. Bear Hill Pond beach will be reclaimed as part of the redevelopment of the area. Weekly grooming should be done to stop vegetation from encroaching.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
Ferret
Developed Camp Area
(53 Buildings Total)
Bear Hill Pond
Camp Rd
Beach
Bear Hill Pond Rd
The Oaks
Cabins Available For Rent
Dam
Water Tower
Playfield
Gate
Ferret
Hall Mountain
Map 3.4
Administrative Unit 4
Bear Hill Pond Camp
1 inch = 300 feet
0 200 400 Feet
August 2020
Property Boundary
Town Boundary
Multi-Use Trail
Municipal Road
Park Road
Woods Road
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
DNCR Forests & Lands
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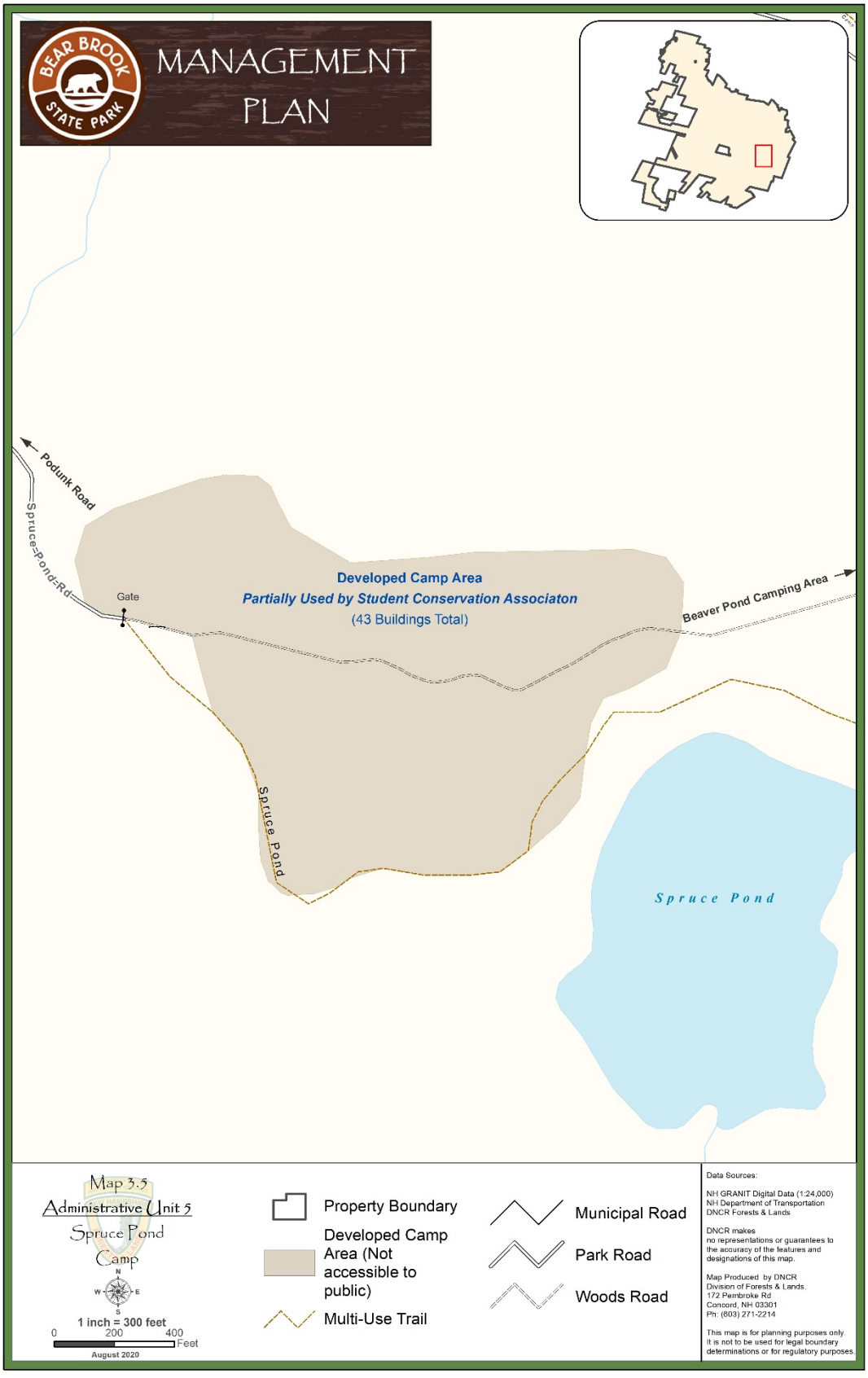
3.8 SPRUCE POND CAMP

The 43 building Spruce Pond Camp is located just north of the Bear Pond Campground and is accessed either from Podunk Road or through the campground. The facility has been licensed to the Student Conservation Association (SCA) for the NH Parks AmeriCorps program since 1995.

The SCA only use a fraction of the camp buildings for housing and administrative space. In 2004 an ARRA grant funded the restoration and stabilization of some of the “summer cabins”. The buildings not in use by the SCA are in poor shape and in 2019 in consultation with the Division of Historical Resources per RSA 227-C:9 agreed to the demolition several cabins.

The buildings and grounds of the camp are in fair shape and use and occupation of the camp is recommended to continue since buildings without use deteriorate quickly. The SCA NH Corps has a small maintenance budget for Spruce Pond Camp and after 25 years of occupation DPRs investments made in 1995 are aging. Many buildings at Spruce Pond Camp need sill and other structural work which is being done by the DD&M crew and SCA staff as time permits.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
Podunk Road
Spruce Pond Rd
Gate
Developed Camp Area
Partially Used by Student Conservation Associaton
(43 Buildings Total)
Beaver Pond Camping Area
Spruce Pond
Spruce Pond
Map 3.5
Administrative Unit 5
Spruce Pond Camp
1 inch = 300 feet
0 200 400 Feet
August 2020
Property Boundary
Developed Camp Area (Not accessible to public)
Multi-Use Trail
Municipal Road
Park Road
Woods Road
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
DNCR Forests & Lands
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3.9 BEAVER POND AREA

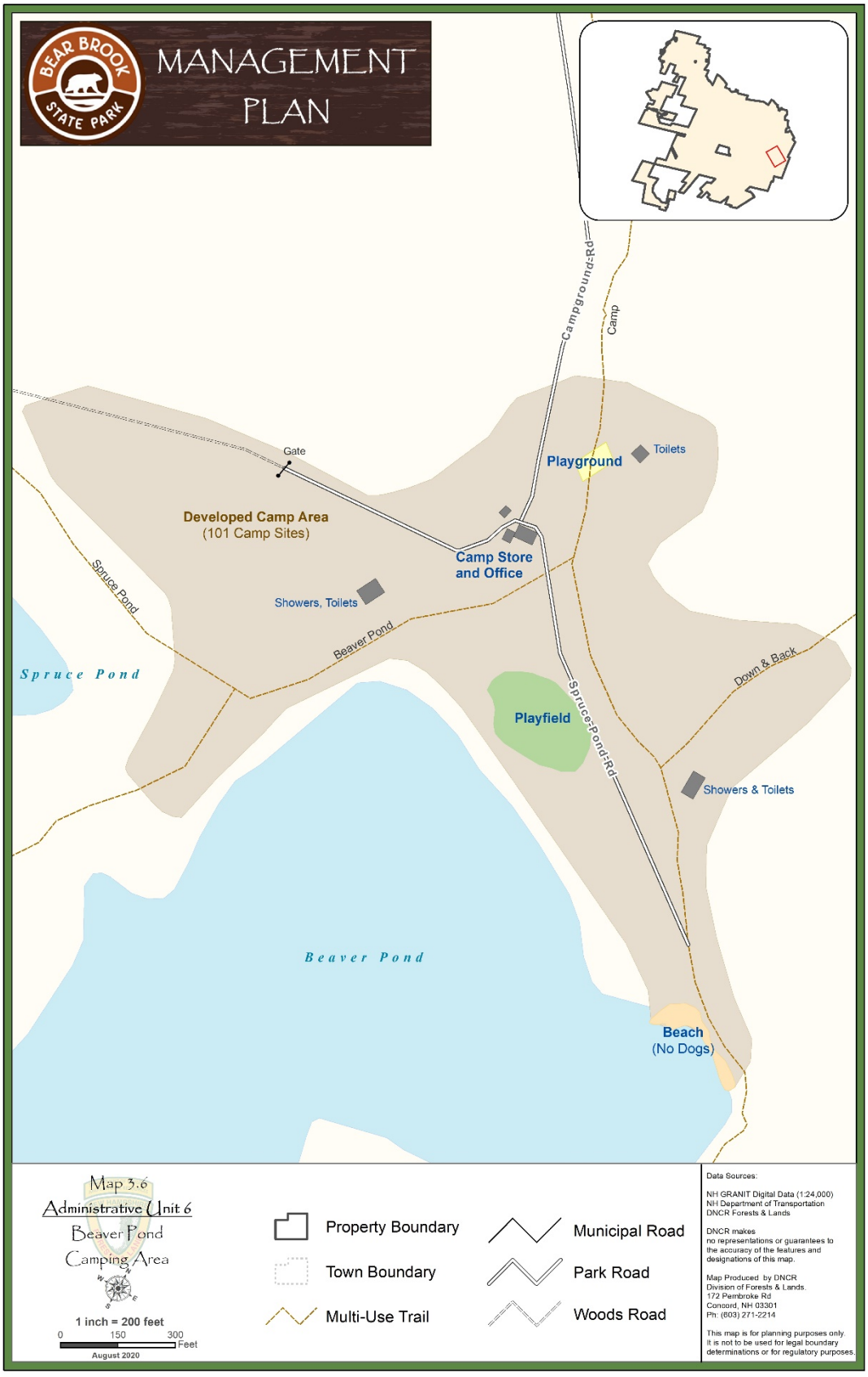
The 101 site Beaver Pond Campground was developed in the mid-1950's and expanded in the 1960's. The campground is approximately 3 miles from the Catamount Area and is accessed through Podunk Road. The "camper's only" beach is an attractive amenity in this location. Campers can rent boats and enjoy the field and playground, and have easy access to the trail system.

Beaver Pond Camping Area
Visitation to the Beaver Pond campground has remained relatively constant in recent years, with the levels of use strongly related to the weather. Campground seasonal occupancy averages 50% (3.5 days/week).

There are three bathhouses with toilets (two with showers) in the campground (BBR18, BBR19, BBR93). Another building at the campground houses the store and office (BBR20). Campsites in the campground contain on-site vehicle parking, a picnic table, and a fireplace grill. The campsites have no electric, water, or septic hookups. Water is available at a number of outlets situated through the campground. There are universally accessible campsites with accessible fire ring and picnic table installed.

Smith Pond Shelter
The Smith Pond shelter (BBR103) is an Adirondack-style, lean-to shelter that was built in 1937 by members of the Civilian Conservation Corps (CCC). The shelter sits atop a hill that overlooks Smith Pond and has two wide wooden bunks inside the shelter, a stone cook place, and two outhouses. This site is hike-in only; cars are parked at the trailhead entering the site off campground road.

Playground
The playground was installed in 2007 and has accessible play elements.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
Campground Rd
Camp
Gate
Playground
Toilets
Developed Camp Area
(101 Camp Sites)
Camp Store
and Office
Showers, Toilets
Spruce Pond
Beaver Pond
Spruce Pond
Down & Back
Playfield
Spruce Pond Rd
Showers & Toilets
Beaver Pond
Beach
(No Dogs)
Map 3.6
Administrative Unit 6
Beaver Pond
Camping Area
1 inch = 200 feet
0 150 300 Feet
August 2020
Property Boundary
Town Boundary
Multi-Use Trail
Municipal Road
Park Road
Woods Road
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
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3.10 AGREEMENT AND EASEMENTS

The Department of Natural and Cultural Resources has numerous management agreements and easements at Bear Brook State Park with other state agencies and organizations. Many of the agreements are over 10 years old, and should be reviewed for content and current legal standard.

Table 3.4 Agreements and Easements at Bear Brook State Park

Agreement	*Termination*	*Summary*
SCA NH Corps	September 30, 2016	Use of Spruce Pond Camp
Pembroke Water Works	Perpetual	Construct and maintain two municipal public water supply wells
NH Fish and Game Department, Game Refuge	January 1, 2005	Administration and maintenance and defines boundaries of the refuge
NH Fish and Game Department, Archery Pond	Expired	Construct and maintain fishing facility and archery range.
Department of Safety	Perpetual	Administrative storage

3.11 RECOMMENDATIONS

Park-wide

- Ensure all facilities are adequately maintained and resources are provided.
- Enter into a MOU with NHDOT to agree on maintenance schedule and standards for the roads. Biannually agree on budget and scope of work.
- Update agreement with NHFG to be sure they are maintaining sites under their management adequately for park visitors.
- Design parking areas along Podunk and Campground Roads for 6-8 cars to disperse use and improve access to trails and features.
- Replace older pit toilets in the park, especially the Podunk Road and Hayes Field pit toilets.
- Develop a Park Operations and Maintenance Plan for facilities and grounds.

Catamount Pond

- Designate a winter non-motorized parking area at the Catamount Pond Area to allow access to the One-mile Trail.
- Renovate the Catamount bathhouse and pavilion.
- Add new pit toilets at the Catamount Pond parking area and kiosks with trail destinations and major trailheads.

Podunk Road

- Redesign the Podunk Road entrance to accommodate a tollbooth and redesign gate system so areas can be gated by each season.

Bear Hill Pond Camp

- Continue to restore Bear Hill Pond Camp to make it available for public use and overnight camping.

Beaver Pond Campground

- Renovate and add showers to Beaver Pond Campground bathroom building BBR19.
- Add tent platforms in Beaver Pond Campground to reduce soil compaction.
- Install water and electric for selected sites Beaver Pond Campground.

4. LANDSCAPE ANALYSIS

When considering the management of a state reservation, particularly one as large as Bear Brook State Park, it is important to not only consider the property itself, but also how the management (or lack of management) occurring on the reservation may influence the surrounding landscape. In addition, consideration must be given to how the surrounding landscape dynamics and the activities occurring there may influence the reservation and the management decisions that are made. Wildlife, vegetation, and water know no boundaries, and as a result, ecosystems expand beyond boundary lines and work collectively with the surrounding matrix. Examining the surrounding landscape can help us better understand the complexities of the region's ecosystem, the strain it faces from development and fragmentation, and how Bear Brook State Park may be managed as an integral part of this dynamic environment.

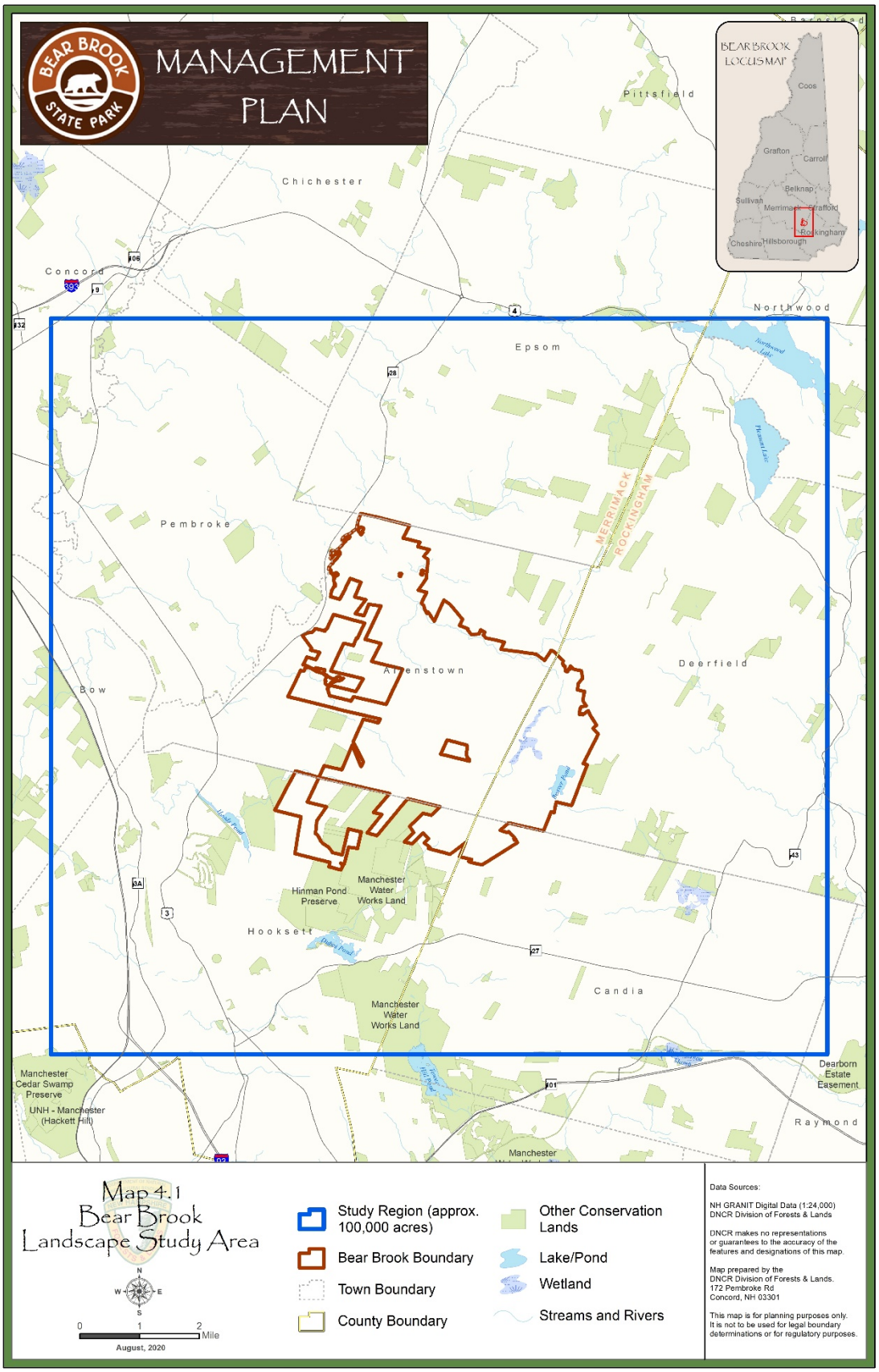
The benefits of considering the surrounding lands include:

- Awareness of potential negative impacts from outside the park such as permanent land use change, invasive species, forest pests, and prohibited recreational uses.
- Foster working relationships with other landowners in the region.
- Maintain connectivity of regional, multi-use trail systems.
- Coordination of vegetative and wildlife habitat management.
- Ensure that the overall management objectives fall within the context of the surrounding landscape.

This landscape analysis looks at an area approximately ten times the size of the park. This area size was chosen because it is considered appropriate for landscape level analysis due to Bear Brook State Park's size (O'Neill et al., 1996), and gives a good overview of the landscape and environment that the park is placed within. This landscape view (*study area*) will cover 102,161 acres, 3 counties and 12 towns.

Table 4.1 Landscape Analysis Study Area

Counties Assessed	*Acres*	*% of Area*
Merrimack	64,310	63%
Rockingham	37,694	37%
Hillsborough	157	0.10%


BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEARBROOK LOCUS MAP
Coos
Grafton
Carroll
Belknap
Sullivan
Merrimack
Strafford
Rockingham
Cheshire
Hillsborough
Pittsfield
Chichester
Concord
Northwood
Epsom
Pembroke
MERRIMACK
ROCKINGHAM
Allenstown
Deerfield
Bow
Hooksett
Hinman Pond Preserve
Manchester Water Works Land
Manchester Water Works Land
Candia
Manchester Cedar Swamp Preserve
UNH - Manchester (Hackett Hill)
Dearborn Estate Easement
Raymond
Manchester
Map 4.1
Bear Brook
Landscape Study Area
N
W
E
S
0
1
2
Mile
August, 2020
Study Region (approx. 100,000 acres)
Bear Brook Boundary
Town Boundary
County Boundary
Other Conservation Lands
Lake/Pond
Wetland
Streams and Rivers
Data Sources:
NH GRANIT Digital Data (1:24,000)
DNCR Division of Forests & Lands
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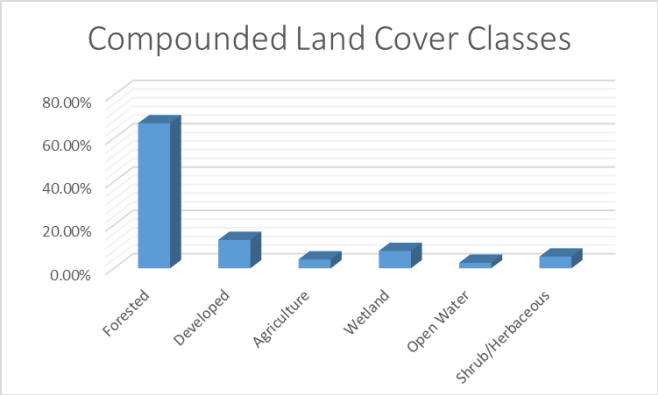
This map is for planning purposes only. It is not to be used for legal boundary determinations or for regulatory purposes.

4.1 LANDCOVER

Bear Brook State Park is located in an area where there is a high percentage of undeveloped land, despite being located in close proximity to Concord, the State Capital and Manchester, the State's largest city. This provides many great opportunities for people to enjoy the outdoors without traveling far from their homes, and creates a carbon sink close to areas where large amounts of carbon are emitted into the atmosphere. However, this area also faces the probability of urban expansion into undeveloped areas in the future. Over the next 80 years, there is an anticipated growth in developed areas, although it will be a steady growth pattern, and not a sudden spike in development. Depending on the types of land use regulations adopted in the future, land use regulations could limit the future erosion of surrounding forestland. In any case, some degree of a continued steady loss of forestland is expected.

Fig 4.1 *Current land cover statistics for the study area as determined using the National Land cover dataset from 2011.*



4.2 REGIONAL FORESTED LANDSCAPE

Bear Brook State Park sits within the Northeastern Coastal Zone level III Eco-region as laid out by the U.S. Environmental Protection Agency. This region covers the southeastern portion of the state of New Hampshire, and brings with it a mixture of deciduous and coniferous trees. Commonly found deciduous trees include the oak family (red, black, and white), red maple, hickory, black and white birch and beech. Pockets of nutrient rich soils will often produce sugar maple, white ash and yellow birch. Coniferous trees include white and red pine, and eastern hemlock. Some lowland sites will produce red spruce, although it typically does not grow well in this area.

Conservationists, biologists, ecologists, and many recreational users value large blocks of contiguous forest. These forests have proportionately less contact with developed areas than smaller or more fragmented forests and therefore have less of the negative impacts from development and "edge" effects including: fewer invasive plant species, less unnatural or manmade hazards for wildlife, less noise from roads, greater abundance of species that require forest interior habitats, greater habitat connectivity, greater resilience/recovery from natural or anthropogenic disturbance, and many others. Bear Brook State Park, along with property owned by Manchester Water Works, other conservation groups, and private landowners comprises a

large, connected, tract of unfragmented and undeveloped forestland that is approximately 17,000 acres in size. A piece of forestland this large within the greater Concord/Manchester area has a significant environmental value within the region. Within the reviewed landscape area surrounding Bear Brook State Park, over 66% of the land is considered to be forested. This shows that even with smaller parcel sizes and plentiful agricultural lands, the Park is situated in an area where forestland is a key part of the landscape.

This region has been a steady producer of quality timber within the state, and timber harvesting has been increasingly pursued in the southern portion of New Hampshire as areas in Maine and northern New Hampshire are recovering from heavier harvests of industry owned land. Abundant white pine and red oak sawtimber with quality stems has made this area well known for its timber products, and has garnered worldwide attention from log and lumber buyers and brokers in Canada, as well as far away countries such as China, Japan, Hungary, Turkey and Pakistan. The red oak in the New England region, primarily New Hampshire, is considered to be some of the finest red oak in the world, with tight growth rings and excellent dark red color. Both red oak sawlogs and veneer are highly sought after by sawmills across the world. Pine and hemlock are a popular export product to the Middle East for structural construction material. An excellent highway system that bisects the region provides well-built infrastructure to allow easy access and transportation for logs to cross the border into Canada, as well as be loaded into containers and shipped out of ports in Boston and New York.

The forests in this region provide great benefit to many wildlife species. The importance of large unfragmented parcels of land, such as Bear Brook State Park provide key infrastructure and habitat for wildlife in an area where undisturbed land is diminishing. Many wildlife species travel a large area each year, and large unfragmented parcels of land allow them to travel without having to cross roads or come into contact with humans or domestic animals, which increases their chance of survival and reduces their level of stress.

4.3 WATERSHED/WATER SUPPLY

Bear Brook Sate Park and the surrounding landscape are encompassed mainly by the Merrimack River watershed (75% of the study) area and Piscataquog River watershed (25% of the study area). The southern area of the park plays a small role as the headwaters to Lake Masebesic (city of Manchester water supply). Pembroke Water Works manages two public wellheads located near the Suncook River. These two wellheads combined produce 630 gallons of water per minute. They serve as a public water supply to Allenstown, Pembroke and a small portion of Hooksett. Numerous bodies of water and streams are scattered throughout the area and contribute to the landscapes diversity and wildlife habitat values.

4.4 RECREATION TRAILS

Bear Brook State Park is one of the largest publicly owned forestlands located in southeastern New Hampshire. Over 500,000 people live within a forty-five-minute drive of the park. Its proximity to high populace centers makes it convenient for outdoor recreation opportunities. The park also provides over 70% of the documented recreational trails within the landscape. With

over 60 miles of roads and trails throughout the nearly 10,000 acres there are ample opportunities for many types of outdoor recreation activities, making the park a popular destination.

Bear Brook State Park is well known for its snowmobiling, mountain biking as well as equestrian use. The park's recreational trails are linked to other adjacent conservation lands within the study area such as Bear Paw Regional Greenways and Manchester Water Works properties. The snowmobile parking lot is a popular winter trail head location to a major connecting snowmobile trail corridor (15) that runs through the park. Recreational trail demands have increased substantially since the last plan was written 25 years ago. Further loss of open space and increasing populations will continue to increase the recreational demands placed on the park's landscape in the future.

4.5 RECENT AND PROJECTED POPULATION CHANGES

Bear Brook State Park straddles both Merrimack and Rockingham Counties making it close proximity to some of the state's highest population centers. The Southern New Hampshire counties of Merrimack, Hillsborough and Rockingham are projected to increase in population by 9% by the year 2040. This is an estimated increase of over 70,000 people from 2015. Increases in population result in fragmentation from both residential and commercial development. Both types of development will have major impacts on habitat and its connectivity, as well as on recreation and timber resources in the future.

4.6 REGIONAL CONSERVATION AND PROTECTED OPEN SPACE

According to data collected through New Hampshire Granit in 2008, there were 16,479 total protected acres within the study area surrounding Bear Brook State Park or roughly 16% of study area. In 2018 there were 20,312 total protected acres within the same study area, or roughly 20% of study area. This shows a net increase of 4% of protected forestland over a ten-year period.

Within this region there are two major land conservation organizations actively seeking to permanently protect more forestland through easements or ownership. Bear-Paw Regional Greenways mission has been working to permanently conserve a network of lands that protects the region's water, wildlife habitat, forests and farmland between Bear Brook and Pawtuckaway State Parks. Another significant conservation organization within the region is the Southeast Land Trust (SELT). SELT's mission is to protect and sustain the significant lands in local communities for clean water, outdoor recreation, fresh food, wildlife, and healthy forests. Their conservation work targets both Rockingham and Strafford counties. Both organizations have either adjacent or nearby conservation lands to Bear Brook State Park.

Many landscape ecologists and planners have recognized the importance of large blocks of natural vegetation to wildlife, the forest products industry, and the ecology of a region. Large blocks are often cited as the most important features to protect in regional conservation plans. Bear Brook State Park plays a significant part filling this role. At 9,976 acres, it is the largest protected land base in the study area and in the entire southeastern area of the state.

4.7 RECOMMENDATIONS

As stated earlier in the Vision, Bear Brook State Park *"will be managed in the context of the surrounding natural and developed landscapes to accommodate a wide variety of uses without compromising the integrity of the resources. Management shall balance recreation with the needs for timber production, wildlife habitat, water quality, and natural and cultural resource protection"*. In order to make this vision a reality, it is vital that resource managers look outside the park and consider both the effects of the surrounding landscape on the park and the parks effects on the surrounding landscape when creating, implementing, and adapting management activities. Where it is practical and consistent with the Vision, and in compliance with existing DNCR policies and practices, managers should collaborate with regional conservation organizations, recreational groups and land managers to:

- Acquire or conserve inholdings and abutting parcels of land as they become available.
- Coordinate the continuity, amount, and type of recreational trails that utilize the trail system within Bear Brook State Park as part of a larger or regional trail system.
- Consider the forestry management and wildlife habitat needs occurring on the surrounding lands.

5. ECOLOGICAL ASSESSMENT

5.1 TOPOGRAPHY AND BEDROCK GEOLOGY

Bear Brook State Park comprises nearly 10,000 acres of forest and wetland in the Merrimack Valley of south-central New Hampshire. Most of the property is in the watershed of the Suncook River, a major tributary of the Merrimack. Southern portions of the park flow into other small tributaries of the Merrimack, while a small area around Beaver Pond in the southeast corner of the park is in the watershed of North Branch, which eventually flows into the Lamprey-Piscataqua River system.

The topography of the Bear Brook State Park is generally rolling with moderate gradients, although steep slopes on hillsides and stream valleys can be found throughout the park. Elevations range from just under 300' along the banks of the Suncook River in the northwest corner of the park, up to over 930' at the summit of Hall Mountain in the southwest corner. In addition to Hall Mountain, other notable high points include Bear Hill in the center of the property at over 800' and Catamount Hill in the northwest part of the park at over 700'.

The bedrock geology of Bear Brook State Park is fairly simple, as virtually the entire property has been mapped as a single unit of Concord granite. The exceptions are relatively small areas of schists of the Rangely Formation at the north end of the park and of the Berwick Formation along the southeast boundary of the property. However, despite being mapped as a single homogenous feature, it is not uncommon for these granite mapping units to actually be an area of older country rock injected by large and small dikes and sills of granite (Billings, 1956).

5.2 GLACIAL HISTORY AND SOIL DEVELOPMENT

Covering the bedrock across much of Bear Brook State Park is a layer of unconsolidated deposits known as glacial till. This material was deposited by melting glaciers as the last ice sheets retreated approximately 14,000 years ago. The glacial till of Bear Brook State Park is an unsorted jumble of fine particles, pebbles, cobbles, and boulders that settled out as the ice melted.

Soils derived from this glacial till include a variety of sandy loams, including soils in the Canton, Chatfield, Hollis, Montauk, and Paxton Series. These soils occur across a broad set of slope conditions at Bear Brook State Park, from essentially flat to very steep (60% slope), and can range from quite deep on lower slopes to very shallow with rock outcrops on hilltops.

While most of the upland soils at Bear Brook State Park are derived from glacial till, one notable exception is an elongated area of glacial outwash generally parallel to Bear Brook in the northern portion of the park. These are deep sandy loams in the Windsor soil series, and were deposited as outwash from a glacial lake. These outwash deposits are rapidly drained and generally on gentle terrain, although slopes can be steep where streams have cut down through sediments.

Outside of upland settings, there are several soil series associated with the extensive wetland areas at Bear Brook State Park. Chocorua and Ossipee soils are mucky peats typically associated with open marshes and fens, while Greenwood mucky peat and Scarboro muck can be found in both forested and non-forested wetlands.

5.3 VEGETATION PATTERNS AND NATURAL COMMUNITIES

The vegetation patterns of Bear Brook State Park are described using natural community descriptions following Sperduto and Nichols (2011). A natural community classification is a way to describe and provide context to the natural landscape. The New Hampshire Division of Forests and Lands Natural Heritage Bureau has developed a classification in which a **natural community** is defined as recurring assemblages of plants found in particular physical environments. Each natural community type is distinguished by three characteristics: (1) a definite plant species composition; (2) a consistent physical structure (such as forest, shrubland, or grassland); and (3) a specific set of physical conditions (such as different combinations of nutrients, drainage, and climate conditions). Natural communities include both wetland types (e.g., sedge meadow marsh) and uplands such as forests (e.g., hemlock - spruce - northern hardwood forest) and cliffs (e.g., montane - subalpine acidic cliff).

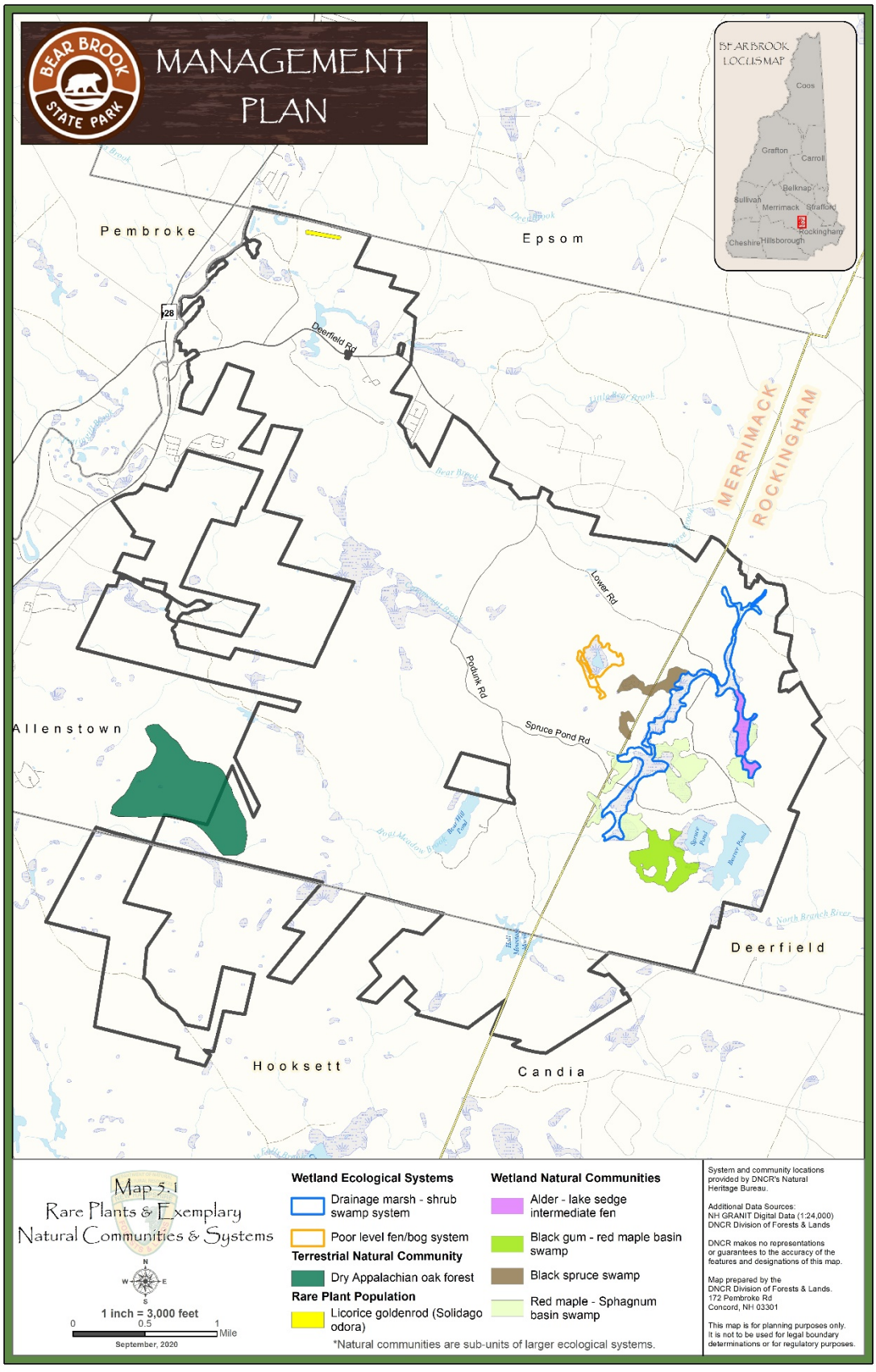
Natural communities can be grouped into units called natural community systems. A **natural community system** is an association of natural communities that repeatedly co-occur in the landscape and are linked by a common set of driving forces, such as landforms, flooding, soils, and nutrient regime. Natural community systems are often useful for describing and mapping areas where a number of different natural communities occur in a complex mosaic.

For each natural community or system type, the Natural Heritage Bureau assigns a State Conservation Rank (S-Rank), indicating the rarity and vulnerability of the community within New Hampshire. S-Ranks are on a scale of 1 to 5, from S1, designating the most imperiled natural community types in the state, to S5 for the most secure.

The vegetation of Bear Brook State Park is composed primarily of two matrix forest types, along with approximately 10% of the park's acreage in wetland. The distribution of these forest system types is determined by a number of environmental factors, including soil attributes like texture, moisture holding capacity, and depth to bedrock, as well as landform characteristics like slope angle and aspect. However, the relationship of forest type to these variables is complicated by the property's long history of agriculture and forest management. As it stands, the descriptions of natural community systems within the park are based on typical examples, but there is often significant variability in terms of structure and species composition within a system type as a result of land use history and local site conditions.

The following descriptions of the vegetation at Bear Brook State Park are here presented at the natural community system level, with additional information provided on the component natural communities of these systems. It should be noted that, although the material is presented in this format, occurrences of natural communities on the ground often do not occur at the scale of a natural community system.

Most of the natural community and system descriptions are based on Sperduto and Nichols (2011). However, Natural Heritage Bureau staff have conducted targeted field surveys at specific locations within Bear Brook State Park associated with previous projects. Whenever possible, community and system types will be described using data collected within the park. Names of natural community systems are **bolded**, while natural community types are ***italicized and bolded***.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEARBROOK LOCUS MAP
Coos
Grafton
Carroll
Belknap
Sullivan
Merrimack
Strafford
Rockingham
Cheshire
Hillsborough
Pembroke
Epsom
Allenstown
Deerfield
Hooksett
Candia
28
Deerfield Rd
Lower Rd
Podunk Rd
Spruce Pond Rd
MERRIMACK
ROCKINGHAM
Map 5.1
Rare Plants & Exemplary Natural Communities & Systems
1 inch = 3,000 feet
0
0.5
1
Mile
September, 2020
Wetland Ecological Systems
Drainage marsh - shrub swamp system
Poor level fen/bog system
Terrestrial Natural Community
Dry Appalachian oak forest
Rare Plant Population
Licorice goldenrod (Solidago odora)
Wetland Natural Communities
Alder - lake sedge intermediate fen
Black gum - red maple basin swamp
Black spruce swamp
Red maple - Sphagnum basin swamp
*Natural communities are sub-units of larger ecological systems.
System and community locations provided by DNCR's Natural Heritage Bureau.
Additional Data Sources:
NH GRANIT Digital Data (1:24,000)
DNCR Division of Forests & Lands
DNCR makes no representations or guarantees to the accuracy of the features and designations of this map.
Map prepared by the DNCR Division of Forests & Lands.
172 Pembroke Rd
Concord, NH 03301
This map is for planning purposes only. It is not to be used for legal boundary determinations or for regulatory purposes.

UPLAND NATURAL COMMUNITY SYSTEMS

Hemlock - hardwood - pine forest system (S5)

The **hemlock - hardwood - pine forest system** is the dominant forest type throughout much of central and southern New Hampshire and is the most widespread forest system at Bear Brook State Park. The primary natural community that defines this system is the ***hemlock - beech - oak - pine forest***. While hemlock (*Tsuga canadensis*) and American beech (*Fagus grandifolia*) are the dominant late-successional trees in this community, the majority of stands in the park are dominated by some combination of red oak (*Quercus rubra*) and white pine (*Pinus strobus*). Most of the old-field white pine stands in southern New Hampshire are successional examples of this system, and large white pine stands in the park are frequently the result of forest management. At Bear Brook State Park, white oak (*Quercus alba*) and black oak (*Quercus velutina*) can also be present in this community, but are not abundant as they are in the **Appalachian oak - pine forest system**.

Other communities that comprise this system at Bear Brook State Park include ***hemlock forest***, which typically occurs on steep slopes and in low areas along drainages, and ***dry red oak - white pine forest***, which can be found on thin rocky sites or sandy soils that may maintain oak and pine dominance with repeated disturbance.

Component communities:

- ***Hemlock - beech - oak - pine forest*** **(S5)**
- ***Hemlock forest*** **(S4)**
- ***Dry red oak - white pine forest*** **(S3S4)**

Appalachian oak - pine forest system (S3)

The **Appalachian oak - pine forest system** occurs mostly at elevations below 900’ in southern New Hampshire, and is generally on drier and warmer sites than the **hemlock - hardwood - pine forest system**. The exact extent of this system at Bear Brook State Park is unknown, but it likely occupies about one quarter of the upland forest acreage within the property. In Bear Brook State Park, the only significant natural community in this system is the ***dry Appalachian oak forest***. This community is characterized by the dominance of southern oak species like white oak and black oak, although red oak is often co-dominant as well. Other southern species that can occur in this community include scarlet oak (*Quercus coccinea*), pitch pine (*Pinus rigida*), and sassafras (*Sassafras albidum*). Beech and hemlock are typically less frequent than in **hemlock - hardwood - pine forests**. These forests often have a dense cover of heath shrubs in the understory, particularly lowbush blueberry (*Vaccinium angustifolium*), black huckleberry (*Gaylussacia baccata*), and sheep laurel (*Kalmia angustifolia*).

In the southwestern portion of Bear Brook State Park, approximately 60 acres of ***dry Appalachian oak forest*** has been designated as exemplary by the Natural Heritage Bureau. This is actually part of a larger 250-acre occurrence that extends beyond the property boundaries onto adjacent conservation lands. Additionally, just to the south of the park boundary is an exemplary

dry Appalachian oak forest that is over 600 acres in size, and is the largest documented exemplary occurrence of this community in New Hampshire.

Component communities:

- ***Dry Appalachian oak forest*** **(S3)**

Temperate ridge - cliff - talus system (S3S4)

This system is found on steep slopes and adjacent rocky ridges, mainly in southern and central New Hampshire. Due to the limited amount of rugged topography at Bear Brook State Park, communities within this system only occur in small patches within the park, and likely not at a system scale. Probable locations for these communities include Hall Mountain, Bear Hill, Catamount Hill, and some steep slopes around Beaver Pond.

The communities most likely to be encountered at Bear Brook State Park are the ***Appalachian oak - pine rocky ridge*** and ***red oak - pine rocky ridge***. Both of these communities occupy ridgetops and upper slopes and have a woodland or sparse woodland structure, with extensive bedrock exposure. The presence of Appalachian species like white and black oaks would distinguish the Appalachian community from the ***red oak - pine rocky ridge***.

A similar tree species composition distinction characterizes the difference between the ***red oak - black birch wooded talus*** and ***Appalachian wooded talus*** communities. Otherwise, both of these communities occur on slopes covered by accumulations of large boulders, and have variable understories of tall shrubs, herbs, vines, and rock polypody (*Polypodium virginianum*) on boulders. On sites where the abundance and size of boulders limits soil development and plant cover, the ***temperate lichen talus barren*** may occur.

Finally, in areas where bedrock slabs have slopes greater than 65 degrees and are taller than 10', small ***temperate acidic cliffs*** may occur.

Component communities:

- ***Appalachian oak - pine rocky ridge*** **(S3)**
- ***Red oak - pine rocky ridge*** **(S3S4)**
- ***Appalachian wooded talus*** **(S1S2)**
- ***Red oak - black birch wooded talus*** **(S3S4)**
- ***Temperate lichen talus barren*** **(S2S3)**
- ***Temperate acidic cliff*** **(S4)**

WETLAND NATURAL COMMUNITY SYSTEMS

Poor level fen/bog system (S3)

Poor level fens are open, highly acidic peatlands with a very limited amount of nutrient inputs from surrounding uplands, and very little or no groundwater or stream influence. They occur in a variety of landscape settings, ranging from nearly closed basins to broad drainages with sluggish, meandering streams. They are most frequent in areas of glacial outwash. Peat is generally quite deep and poorly decomposed in the upper layers.

There is one documented exemplary occurrence of the **poor level fen/bog system** at Bear Brook State Park, associated with Smith's Pond in the northern part of the park. This wetland has a small central area of open water, surrounded by vegetation in the ***leatherleaf - sheep laurel shrub bog*** and ***large cranberry - short sedge moss lawn*** communities, along with a few other communities in smaller patches. Dominant species in these communities include leatherleaf (*Chamaedaphne calyculata*), white beaksedge (*Rhynchospora alba*), and three-way sedge (*Dulichium arundinaceum*).

It is possible that other examples of this system occur in the park, but they would likely be very small and restricted to small basins or small portions of larger wetland complexes.
Component communities:

- ***Leatherleaf - sheep laurel shrub bog*** **(S2S3)**
- ***Leatherleaf - black spruce bog*** **(S3)**
- ***Sphagnum rubellum - small cranberry moss carpet*** **(S3)**
- ***Large cranberry - short sedge moss lawn*** **(S3)**
- ***Highbush blueberry - mountain holly wooded fen*** **(S3S4)**
- ***Marshy moat*** **(S4)**

Medium level fen system (S3S4)

This is a peatland system that typically occurs along quiet waters of impounded streams and pond shores. **Medium level fens** are less acidic than **poor level fen/bog systems**, and generally occur in settings with greater movement of surface water and receive more inputs of groundwater and/or upland runoff. However, they are more acidic than **drainage marsh - shrub swamp systems**, and are distinguished from them by organic soils dominated by peat mosses (*Sphagnum* spp.). **Medium level fens** can be comprised of a large variety of natural communities, which are typically characterized by a mix of sedge and shrub species.

An example of the **medium level fen system** at Bear Brook State Park has been documented at Hall Mountain Marsh, and it is likely that additional occurrences can be found at wetland sites across the property.

Component communities:

- ***Sweet gale - meadowsweet - tussock sedge fen*** **(S4)**
- ***Wire sedge - sweet gale fen*** **(S3)**
- ***Large cranberry - short sedge moss lawn*** **(S3)**
- ***Highbush blueberry - sweet gale - meadowsweet shrub thicket*** **(S4)**
- ***Winterberry - cinnamon fern wooded fen*** **(S4)**
- ***Alder wooded fen*** **(S3S4)**

Drainage marsh - shrub swamp system (S5)

This natural community system consists of herbaceous and shrub wetland communities, and generally occurs on mineral soils along low-gradient streams. These systems are often under the influence of beaver activity, and variation in natural community structure frequently reflects stages in the cycle of flooding and draining associated with beaver dam construction and

abandonment. At Bear Brook State Park, communities within this system can be found on all the major streams within the property, as well as along the Suncook River at the northwest corner of the park.

At Bear Brook State Park, the Natural Heritage Bureau has documented an exemplary occurrence of the **drainage marsh - shrub swamp system** along the upper reaches of Bear Brook, covering over 120 acres. This system is comprised of a diverse complex of open wetland communities, as well as small areas of forested swamp along the upland edge. The component natural communities include herbaceous types such as ***emergent marsh***, ***short graminoid - forb meadow marsh/mudflat***, ***tall graminoid meadow marsh***, ***lake sedge seepage marsh***, and ***sedge meadow marsh***, as well as wetlands dominated by trees and tall shrubs, including ***seasonally flooded red maple swamp***, ***highbush blueberry - sweet gale - meadowsweet shrub thicket***, and ***red maple - lake sedge swamp***.

Within the exemplary drainage marsh system, one community, the ***alder - lake sedge intermediate fen***, has also been documented as exemplary, and occupies 25 acres along a short branch of the main stem of Bear Brook. This is an uncommon wetland type in New Hampshire associated with groundwater seepage, and can be associated with both marsh and fen systems. The vegetation of the community is characterized by scattered speckled alder (*Alnus incana* ssp. *rugosa*) and a dense herbaceous layer dominated by lake sedge (*Carex lacustris*), along with species like bluejoint (*Calamagrostis canadensis*), tussock sedge (*Carex stricta*), and bog goldenrod (*Solidago uliginosa*).

Component communities:

<u>Emergent marshes and aquatic beds</u>

- ***Tall graminoid meadow marsh*** **(S4)**
- ***Short graminoid - forb meadow marsh/mudflat*** **(S4)**
- ***Sedge meadow marsh*** **(S4)**
- ***Herbaceous seepage marsh*** **(S3)**
- ***Lake sedge seepage marsh*** **(S3)**
- ***Emergent marsh*** **(S5)**
- ***Cattail marsh*** **(S4)**
- ***Aquatic bed*** **(S4S5)**

<u>Shrublands, shrub thickets, and wooded swamps</u>

- ***Mixed tall graminoid - scrub-shrub marsh*** **(S4S5)**
- ***Highbush blueberry - winterberry shrub thicket*** **(S4)**
- ***Buttonbush shrubland*** **(S4)**
- ***Alder - dogwood - arrowwood alluvial thicket*** **(S4)**
- ***Alder - lake sedge intermediate fen*** **(S2S3)**
- ***Meadowsweet alluvial thicket*** **(S3S4)**
- ***Mixed alluvial shrubland*** **(S4)**
- ***Seasonally flooded red maple swamp*** **(S4S5)**

Temperate peat swamp system (S3S4)

This system consists of forested peatlands throughout central and southern New Hampshire. They occupy closed basins or stagnant, open wetlands with limited drainage. Soils are typically organic, with deep, well-decomposed peat.

The most widespread and abundant community within this system is the ***red maple - Sphagnum basin swamp***, which can be found in many small basins through Bear Brook State Park. The canopy of this community is dominated by red maple (*Acer rubrum*), but other tree species are commonly present, including hemlock, yellow birch (*Betula alleghaniensis*), and white pine. There is typically a tall shrub layer of highbush blueberry (*Vaccinium corymbosum*) and common winterberry (*Ilex verticillata*). Cinnamon fern (*Osmundastrum cinnamomeum*) is often abundant in the herbaceous layer, with lesser quantities of other herbs. *Sphagnum* mosses often densely cover the ground surface.

The Natural Heritage Bureau has documented an exemplary occurrence of the ***red maple - Sphagnum basin swamp*** in several poorly drained basins adjacent to the exemplary **drainage marsh - shrub swamp system** along Bear Brook. This occurrence is spread out over six separate basins that collectively cover over 100 acres.

A closely related community to the ***red maple - Sphagnum basin swamp*** is the ***black gum - red maple basin swamp***. The composition of the two communities is quite similar, but the latter is distinguished by the presence of frequent black gum (*Nyssa sylvatica*) in the tree canopy. These swamps are notable because of the extraordinary age of black gum trees in many swamps in the southern part of the state. A study of these swamps in southern New Hampshire by NHB has found that black gum trees can routinely reach over 300 years of age, and trees as old as 700 have been documented. At Bear Brook State Park, an exemplary ***black gum - red maple basin swamp*** has been documented by the Natural Heritage Bureau in the large basin immediately to the west of Spruce Pond. At roughly 65 acres, this is the largest known exemplary occurrence of this community in the state.

Component communities:

- ***Red maple - Sphagnum basin swamp*** **(S4)**
- ***Black gum - red maple basin swamp*** **(S3)**
- ***Highbush blueberry - winterberry shrub thicket*** **(S4)**
- ***Highbush blueberry - mountain holly wooded fen*** **(S3S4)**
- ***Winterberry - cinnamon fern wooded fen*** **(S4)**

Black spruce peat swamp system (S2S3)

This is a forested wetland system that is found primarily in central and northern New Hampshire, and is very uncommon in the southern part of the state. The primary community in this system is the ***black spruce swamp***, in which black spruce (*Picea mariana*) dominates over a dense ground cover of *Sphagnum* mosses. At Bear Brook State Park, the Natural Heritage Bureau has documented an unusual southern occurrence of the ***black spruce swamp*** community as exemplary. This swamp occupies two basins between the exemplary **drainage marsh - shrub**

swamp system along Bear Brook and the exemplary **poor level fen/bog system** at Smith's Pond. This occurrence differs from typical expressions of the swamp by having several species that are not generally found in this community, including highbush blueberry, white pine, hemlock, and pitch pine.

Component communities:

- ***Black spruce swamp*** **(S3)**
- ***Highbush blueberry - mountain holly wooded fen*** **(S3S4)**

5.4 RARE PLANT SPECIES

Despite the large geographic extent of Bear Brook State Park, until recently, no rare plant species had been identified on the property, although there are some old rare plant records from the surrounding landscape. This lack of rare species may be due to several factors, including the relative homogeneity of the natural communities in the park, the absence of bedrock types that would contribute increased levels of mineral nutrients to the soil, and the land use history of the property. However, in 2019, a previously undocumented rare plant species was found in the park. This population is described below, as well as a species that has the potential to occur in the park.

Licorice goldenrod (*Solidago odora*)

Licorice goldenrod is a southern species that reaches the northern limit of its range in southern New Hampshire. It usually occurs on dry, warm, sunny sites, often in disturbed settings like roadsides and utility corridors. In 2019, a population of this species was discovered growing in a power line corridor at the far northern end of the park. This population consists of several hundred plants and appears healthy. If the current vegetation management regime is maintained in the corridor, this population should persists indefinitely. It is possible that additional populations of this species may occur at Bear Brook State Park within suitable habitat.

Small whorled pogonia (*Isotria medeoloides*)

Small whorled pogonia is an orchid that is listed as federally threatened by the US Fish and Wildlife Service. It generally grows in mixed woods that appear fairly unremarkable, but seems to have rather particular habitat requirements that include gently sloping ephemeral drainages and a certain amount of decaying wood. The species can also be somewhat unpredictable, apparently disappearing for a site for a time, only to reappear a few years later.

A small population of this species was discovered in 1984 at a site called Pinkney Hill, immediately to the west of the park boundary. Unfortunately, subsequent surveys in 1987 found that the area had been heavily logged, and the plants could not be relocated. However, considering that the original record may have been poorly mapped, and knowing the biology of the species, it is quite possible that this species could be found on the state park property if suitable habitat is located.

5.5 RECOMMENDATIONS

- Given the comparative lack of information on the plant and natural community resources at Bear Brook State Park, the Natural Heritage Bureau should prioritize surveys in selected areas of the property most likely to support rare species and exemplary communities.
- Areas where exemplary natural communities are documented should be set aside from commercial timber management and have management buffers consistent with Good Forestry in the Granite State.
- Conduct a comprehensive survey of invasive plant species within the park. Control documented populations when possible, particularly prior to management activities such as timber harvesting and field mowing.
- The entire property should be evaluated for the suitability of prescribed fire management. Appalachian oak – pine forests in particular are fire-adapted communities, where occasional fire events can control late successional species like beech and hemlock and create regeneration opportunities for oak and pine species.
- Develop an interpretive brochure and map for the park's ecological resources.

6. CULTURAL RESOURCES

6.1 BACKGROUND

Formal archaeological investigations have been completed for only a small portion of the relatively large area composing Bear Brook State Park. As a result, only three archaeological sites (one Pre-Contact site and two Post-Contact sites) have been recorded within the park boundary. However, given the richness and diversity of natural resources, including those associated with Bear Brook and the Suncook River, it can be assumed that a variety of previously unidentified archaeological resources, both Pre-Contact Native American sites (habitation and resource procurement and processing sites), and Post-Contact European-American sites (rural residential, milling, quarrying, and logging sites) exist within the park boundary. In addition to a single Pre-Contact site identified within the park, a number of Pre-Contact sites have been identified just outside the park along the Suncook River. This suggests a high potential for additional Pre-Contact archaeological sites to exist within the park, particularly in areas along the Suncook River. Historical plat maps of the area demonstrate that portions of the park, particularly those areas along Podunk Road in Allenstown and Old South Road in Deerfield, were once home to small communities consisting of residences, mills, schools, and cemeteries. This suggests a high likelihood that previously unrecorded Post-Contact archaeological sites, such as cellar holes associated with residences and water control structures associated with milling operations, exist within the park.

A significant amount of survey work has been completed to document the historical aboveground structures and cultural landscape features within the park. The survey, inventory, and evaluation of these historical aboveground structures and cultural landscape features resulted in the designation of the park as a historic district eligible for listing in National Register of Historic Places (NRHP). Prior to this designation, smaller areas within the park were evaluated, including Allenstown Meetinghouse (National Register listed), Bear Brook Civilian Conservation Corps Camp Historic District (National Register listed), and the Bear Hill Pond 4-H Camp (determined eligible for listing in the National Register).

The Bear Brook State Park Historic District is best charcterized as a forested expanse, dissected by streams and dotted with ponds, exhibiting areas of recreational development including swimming beaches, picnic areas and shelters, campsites, rustic cabins and buildings, an archery range, hunting and fishing areas, and an extensive network of trails. Bear Brook State Park Historic District is significant for its recreation and conservation history, association with Depression-era public works programs, and for its 1960s expansion when the popularity and use of New Hampshire State Parks were on the rise. In addition, the park is significant at the State-level for its rustic Park Service architecture and landscape architecture including trail construction and features of conservation plantings as well as other natural and designed landscapes.

6.2 CULTURAL SETTING

The record of human occupation in New Hampshire begins as the glaciers retreated between 13,000 to 14,000 years ago or before present (B.P.). The chronology is subdivided into five major time periods: Paleoindian, Archaic, Woodland, Contact, and Post-Contact. The first three periods constitute the time before European contact commonly referred to as Pre-Contact. Each Native American Pre-Contact Period is broken into sub-periods that are defined by the development of specific traditions associated with the particular resource base and lithic tool types. This general chronology is commonly accepted not only for New Hampshire but for the broader New England area. The period during which the European influence began to be felt directly by Native American populations is the Contact Period and the period of European settlement is the Post-Contact Period. The following is a broad overview of each period.

6.3 PALEOINDIAN PERIOD (12,500-9,000 B.P.)

Human migration and settlement into New Hampshire followed glacial retreat some 12,000 years ago. As these populations adapted to their new environment, the natural landscape and resources slowly changed over time, as did the locations that were attractive for human occupation. Understanding the landscape occupied by Native American groups, evidence of which is still extant on the modern landscape (albeit in fragmented form) is an important first step in analyzing potential site locations. Bear Brook State Park is a great example of a large tract of land that provides an excellent opportunity for future archaeological research.

The New Hampshire environment that Paleoindian groups initially encountered was much different from today. As glaciers retreated, a tundra-like environment was left across much of the state, while large areas were submerged beneath the water of lakes created by ice dams and moraines, most notably glacial Lakes Hitchcock and Merrimack, but also Lakes Colebrook, Coos, Israel, Ashuelot, Newbury and Winnipesaukee. Other large glacial lakes have drained and are now rivers. Isostatic depression of the land also permitted a marine incursion by as much as 70-75 m above present sea levels in Maine and New Hampshire following ice retreat, crustal rebound led to a fall in local relative sea level to -60 m between 12,000 and 12,500 B.P. By about 11,000 B.P. sea level rose rapidly following this lowstand period to about 20-25 m below present sea level before stabilizing and slowly rising over time to present-day levels.

Paleoindians hunted caribou as well as smaller animals found in the sparse, tundra-like environment. A recent discovery from Jefferson, NH identified bear protein on a recovered tool, whether it was used for food or for the pelt we can only hypothesize. In other parts of the country, Paleoindian groups hunted larger Pleistocene mammals such as mastodon or mammoth. At this point in current research for New England there is no evidence that these mammals were utilized by humans as a food source, however mastodon remains have been encountered in New Hampshire.

The Paleoindian Period deposits identified in New Hampshire consist of “quarry” lithic extraction sites, lithic workshops, small-scale forager-hunter transient camps, and aggregated base camps. Material from quarry sites can be found as far away as southern Massachusetts, and to the north in Quebec.

Evidence of Paleoindian settlement can be expected on the former shores of now-drained glacial lakes, marked by terraces well above current river channels, though their presence may also be found in now- inundated offshore environments. Research indicates, however, that an additional parameter for Paleoindian site location is access to wetland complexes and kettle ponds. Several well-known Paleoindian sites have been discovered in the southwestern part of the state in association to large wetland complexes and bogs. These parameters would suggest that a preference for locations with access to such environments with a diverse resource base would be likely to hold Paleoindian sites. Bear Brook State Park exhibits several large wetland complexes; and therefore, has the potential to contain sites from the Paleoindian Period.

6.4 ARCHAIC PERIOD (9,000-3,000 B.P.)

During the Archaic Period, humans adapted to an evolving temperate forest, which flourished after a warming trend in New England. These groups had access to a wide range of resources. This period is characterized by hunter-gatherer economies in varying levels of sociocultural complexity, with a focus on large mammals such as moose, and deer, as well as a greater reliance on fishing. The people fished in riverine, lacustrine (lake) and ocean environments. Coastal populations also collected shellfish.

The wide range of resources is reflected in the diversity of tools dating to the Archaic Period. Many variable shapes and sizes of projectile points are noted, likely the result of the variety of tool functions required. Evidence also suggests that birch bark containers as well as soapstone (steatite) bowls were manufactured. People lived in seasonal camps. They hunted animals and gathered plants as defined by the time of year. During this time period, the population began to increase. This is probably a result of the increased number of resources available and a trend toward more settled lifestyles. Ceremonialism, in the form of planned burial, became more common in the Archaic Period. The Archaic Period is broken into three phases, the Early Archaic (9,000-8,000 BP), the Middle Archaic (8,000-6,000 BP) and the Late Archaic (6,000-3,000 BP). Paleoindian and Early Archaic finds are among the earliest in New England.

In New Hampshire, during the Early Archaic, stone technologies are characterized by assemblages of cores, scrapers, and cobble tools, and are predominantly of quartz. During the Middle Archaic, locally available vein quartz was supplemented by higher quality lithic raw materials from particular regions. Mount Jasper rhyolite was an important resource of workable stone, while hornfels sources in Tamworth, New Hampshire were also exploited. Quarry sites are tied to locations where lithic resources are at or near the surface rather than to environmental features, such as wetlands, that would have been attractive to settlement on the basis of food resources.

The low incidence of Early Archaic sites in New Hampshire and across northern New England may reflect a relatively low population density similar to that of the Paleoindian period. The increasing size, number, and setting of Middle Archaic sites suggest a greater population density in this period than in preceding periods. Large riverine sites functioned as seasonal base camps, while smaller sites specialized in extraction/procurement or were sited along tributaries and smaller perennial streams and on high terraces away from immediate water sources. The Late Archaic Period in New England is marked by three broad technological/tool traditions along with

the introduction of steatite vessels and early ceramic production towards the end. Most sites in New Hampshire have been identified along major rivers.

Bear Brook State Park abuts a large river, the Suncook; and several tributaries, such as Bear Book, dissect the park. Therefore, there is a good potential for the park to contain both seasonal base camps and smaller procurement sites dating to the Archaic Period.

6.5 WOODLAND PERIOD (3,000 B.P-1600 A.D.)

Across the Eastern Woodlands, a region that extends from the Great Lakes and Mid-Atlantic up through New England and into New Brunswick, Nova Scotia and Newfoundland (Canada), the Woodland period is traditionally marked by the adoption of ceramic technology, small-scale horticultural activities, and the establishment of sedentary life including palisaded and unpalisaded villages, as well as increased sociocultural complexity and ceremonialism. In New Hampshire, there is little evidence of horticulture during the Woodland period, this may be attributed to the effects or impacts of development through the centuries in areas most typically thought to hold Woodland period archaeological sites. Otherwise, the Woodland period in New Hampshire is most clearly marked by changing ceramic technologies and the appearance of exotic raw materials, particularly lithic types that could only be acquired through long- distance contact and trade.

There is a continual increase in site density and presumably population throughout the Late Woodland period. On the Merrimack River, Late Woodland people reoccupied landforms occupied in Paleoindian and Middle Archaic times, suggesting that similar settlement systems may have been in place. It is generally accepted that since approximately 1,000 BP, Woodland peoples practiced "slash and burn" farming. They cultivated many plant types including maize, beans, squash and other formerly wild species such as *Chenopodium album* (commonly called Lamb's Quarters, White Goosefoot, or Pigweed).

Archaeological and historical evidence suggests that Woodland era sites consisted of large villages and smaller peripheral sites surrounded by agricultural fields. Many of the small peripheral sites were occupied to take advantage of seasonally available food and to seek lithic and other raw materials for tool manufacture.

The Bear Brook State Park area would have provided ample resources for Native American populations during this period. Several Woodland Period sites have been identified along the Suncook River just beyond the park boundary. As a result, it is expected that previously unrecorded Woodland Period sites exist within the park, particularly in well-drained areas in close proximity to the Suncook River.

6.6 CONTACT PERIOD (1600-1730 A.D.)

Prehistory ends with the coming of Europeans in the 17th century and the introduction to history in written documents. The first Europeans to enter New Hampshire encountered native groups who still practiced a Woodland economy. The seasonal round of the Western Abenaki at and after contact can be summarized as consisting of dispersal into upland hunting grounds

associated with family bands, typically comprised of related nuclear families from late fall to late winter/early spring, with the remainder of the year spent predominantly at villages along river and streams navigable by canoe.

Exploitation of anadromous fish runs was an important aspect of the economy, and this also influenced village location, as did the availability of arable land. Although practiced, horticulture in northern New England was secondary to hunting, fishing, and gathering, unlike in the south, because of a shorter and less reliable agricultural season. Villages were characterized by longhouses of extended family bands scattered along sections of rivers or streams. More compact and even palisaded villages were known perhaps as responses to pressures arising from contact and conflict, direct or indirect, with Europeans.

Archaeologically, the Contact Period is identified by the presence of European style trade goods. Copper projectile points and cooking vessels became desired items. Other raw materials, such as glass, were offered to the Indians by the Europeans. Huge networks were established to trade fur. By the mid-seventeenth century, population decline was already well under way in the wake of disease and warfare brought by Europeans. Researchers suggest that there may have been as many as 10,000 to 12,000 Western Abenaki at the time of contact, but that number dwindled to as few as 250 at the end of this period.

6.7 POST-CONTACT HISTORIC PERIOD (1730-Present)

The first European settlers arrived in the Suncook River Valley in the late 1720s. Those choosing to settle in East Allenstown were of English, Scotch, and Irish ancestry hailing from Rye, Stratham, and New Castle and were the descendants from the original settlers of Dover and Portsmouth. The area that is now Bear Brook State Park contained tracts of good soil for agriculture along the Suncook River and exhibited an abundance of tall standing timber from which to build homes and mills. Bear Brook and the Suncook River provided sufficient water flow to power saw mills and grist mills. Clay deposits near Bear Brook provided material for brick making and a large expanse of exposed granite was available for harvesting at the Catamount. Food resources such as strawberries, blueberries, and an assortment of wild game were abundant and available to the settlers.

In the 1770s, people residing in the area lived a fairly simple agrarian lifestyle, which focused on raising livestock and maintaining orchards. The population continued to grow; and local communities witnessed the establishment of schools and post offices in the 1820s and 1830s. By 1840 the industrial revolution had arrived. Some residents were drawn away from their agrarian lives to the thriving businesses in the Suncook Valley. Some farms in the area were sold or abandoned and the population slowly began to decline despite the fact that the lumber industry in the Bear Brook area continued to be a solid economic base and farming continued to be the preferred way of life for many in the area.

May 27, 1914 marked the onset of a devastating fire that raged out of control for several days. The fire severely altered the Bear Brook landscape and drastically changed the land use of the area. The fire destroyed thousands of acres of timber. The barren land, resulting from the fire and excessive lumbering practices, in combination with the hilly terrain and sandy soils of the area,

resulted in significant erosion. Farms that were not burned in the fire were abandoned in the wake of the compromised agricultural land and lack of local employment due to the incapacitated lumber industry. The Bear Brook area had become an abandoned wasteland; and the Great Depression was on the horizon.

In 1933, the Emergency Relief Act was passed and the Civilian Conservation Corps (CCC) was born. A year later in 1934 the Recreational Demonstration Area (RDA) program was developed. The purpose of RDAs was to demonstrate the recreational value of lands found to be unsuitable for agricultural purposes. The lands were to be located near large population centers so as to provide low-cost outdoor recreational opportunities for a large portion of the population including the working class. The Bear Brook area was selected as an RDA because it was sub-marginal land located in close proximity to dense population centers. The Bear Brook Reservation was approved as an RDA in July of 1935. A CCC camp was established in the park and by October of 1935 the newly formed CCC Co. #1123 occupied the camp. Recreational facilities such as camps, swimming beaches, hiking trails, and picnic shelters were developed. The Bear Brook Reservation was managed by the National Park Service until 1941 when the state took over management. The CCC camp was vacated in 1942 and the reservation became a state park in 1943. The campground on Beaver Pond opened with 20 sites and a camp store in 1949. The state continued to purchase additional parcels, consistently adding to the state park. In 1964-1965 the State purchased a stretch of woodland extending west to the Suncook River, housing the abandoned bed of the Suncook Valley Railroad.

Land use in the park has remained relatively constant since it was built. Over the last 50 years only a small amount of additional land was purchased, bringing the park to its current size of 9,976 acres. The fire tower, built in 1939-1941, was removed in 1974. The CCC camp buildings were adapted as small museums and the campground on Beaver Pond was expanded to 101 sites.

Historical plat maps of the area demonstrate that portions of the park, particularly those areas along Podunk Road in Allenstown and Old South Road in Deerfield, were once home to small communities consisting of residences, mills, schools, and cemeteries. Therefore it is expected that previously unrecorded Post-Contact archaeological sites (e.g., cellar holes, water control features, roadways, stone walls, etc.) have the potential to be identified within the park.

The oldest above-ground resources in the park are the Old Allenstown Meetinghouse and the Meetinghouse Cemetery on Deerfield Road. The circa 1816 meetinghouse was restored in 2006. While the meetinghouse and cemetery are owned separately from the park (though enveloped by it), they add to our understanding of the historical evolution of the area and are an important part of the cultural landscape. The park contains several other small historic cemeteries, including the Leavitt Cemetery and the Clark Cemetery.

The park was originally designed by the National Park Service and CCC with specific separate facilities for different functions throughout the park. The park office is on Deerfield Road near the toll booth that defines the western park entrance. The day-use area is located on both sides of Deerfield Road at Catamount Pond and includes a bathhouse pavilion, beach edged by stone walls, stone dam, bridges and two picnic areas with group shelter, family shelter and associated buildings. The CCC Camp is a discrete complex, now park museums and adjacent maintenance

area, centrally located just off the main road on Depot Road. The park manager's residence and garage, the Division of Parks and Recreation Regional Office and a garage are at the upper end of Podunk Road, which accesses the three camp areas, archery course and fishing ponds. The two group camps and the campground are in separate isolated locations, each with its own pond and swimming areas.

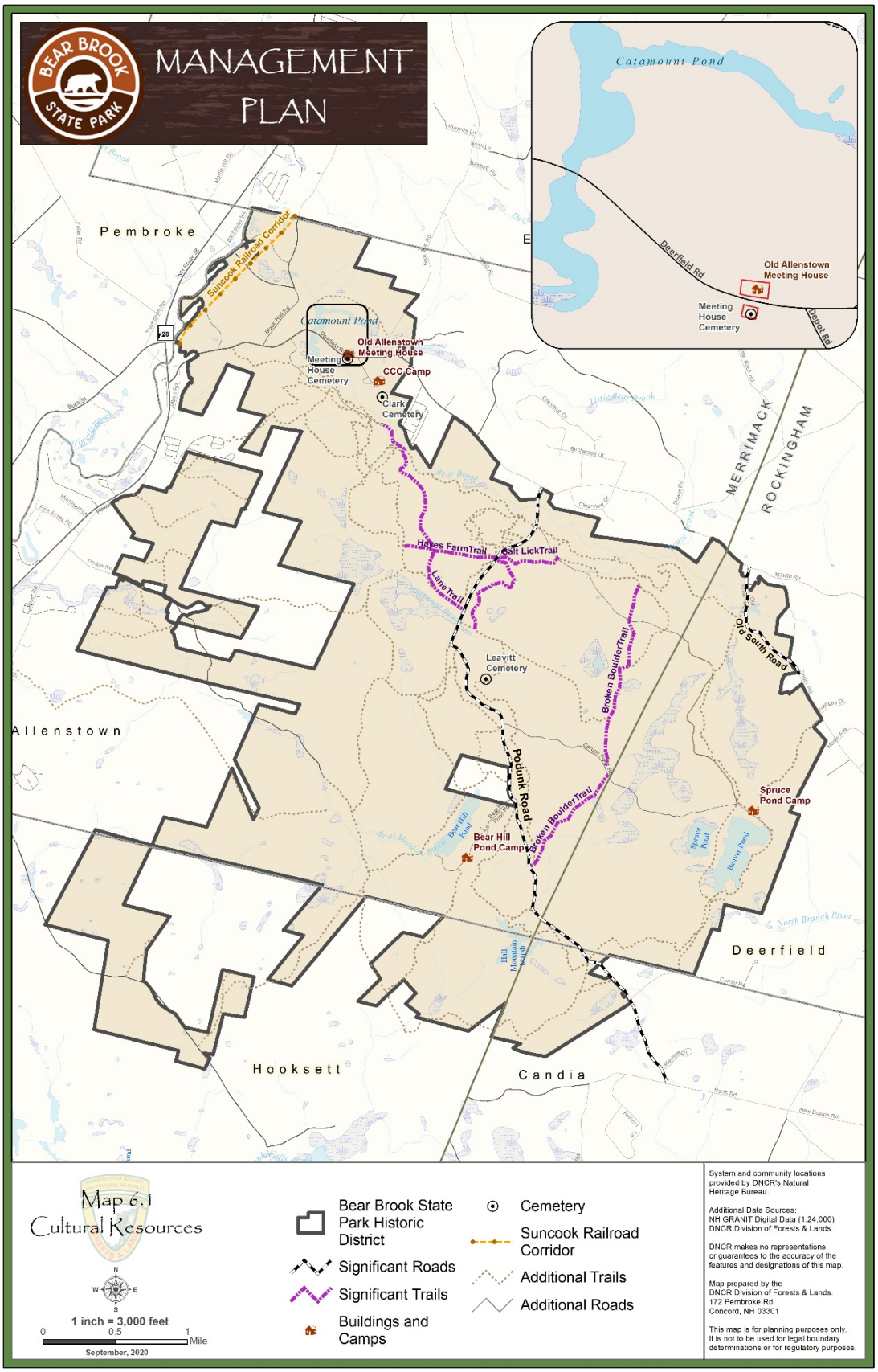
The Bear Brook CCC Camp survives as one of the most intact CCC camps in the country, with former headquarters, barracks, mess hall, education building, garage and workshop. Since its National Register listing, no buildings have been lost or demolished from this CCC district. The park manager's house and office at Podunk Road are similar buildings with exposed timbers, stone foundations and chimney and waney edged slab siding. Garages have the same siding and trim. These buildings are similar in design to those in the organized camps.

The two summer camps, Bear Hill Pond Camp and Spruce Pond Camp are typical of group camps in RDA's throughout the country. Bear Hill Pond Camp is in the south central part of the park, within the town of Allenstown, several miles from the park headquarters. There are 61 buildings and structures that continue to follow the camp's original layout of 1936-37. The main buildings include the dining hall, central washhouse, infirmary and staff cabins, craft cabin and nature lodge. 32 sleeping cabins are arranged in four units, all facing the pond, two units on either side of the central complex. Each group has a lodge, washhouse and eight cabins. All buildings have the same one-story form and low-pitched gable roof, rough-sawn siding with waney natural edges, square port timbers, exposed rafter tails, stone foundations and chimneys. Spruce Pond Camp includes a similar complex of buildings, including dining hall, main lodge, infirmary, cook's cabin, water tower and pump-house. Spruce Pond had four units, each with eight cabins, unit lodge and latrine. Cabins are sheathed in board and batten, while the lodges have wane board siding. The unit washhouses are nearly identical to those at Bear Hill Pond Camp.

Construction of Bear Brooks' swimming and picnic area at Catamount Pond was a multi-year project beginning in 1936 with the Day Outing Area opening in 1940. The 16-18 acre man-made pond has a small sandy beach on the west shore, with a timber crib dam downstream to the north on Bear Brook. A wooden footbridge upstream near the road connects the beach and family picnic area. The bathhouse pavilion is a stone and timber-framed building with dressing rooms on the lower level and a picnic pavilion above. The surrounding tall pines contribute to the area's setting. East of Catamount Pond across a wooden footbridge is the family picnic area, which has as smaller rustic picnic shelter, ball field, and restrooms. South of Deerfield Road is the large group picnic shelter, which has the same stonework and timber framing as the bathhouse. Typical of National Park Service group shelter designs, it has an open central pavilion with stone fireplace at one end and attached cooking area and restrooms at opposite ends of the building. North of the road, the Park Office is a waney-board sided building. All buildings and structures in the Day-Use Area are stained grey, except the office which is dark brown like buildings elsewhere in the park.

Hiking trails were part of the National Park Service design for the park. Many of the trails originated as logging roads and discontinued local roads, including Broken Boulder Trail, Saltlick Trail, Hayes Farm Trail and Lane Trail. The existing network of trails is similar to the

original plan but has been somewhat modified over time. Catamount Hill offers the principal scenic vistas in the park. The park was enlarged with the purchase of multiple parcels by the state in 1964-65. The land between Catamount Pond and the Suncook River became part of the park, taking in unoccupied woodland and gravel pits, little-used local roads and the former corridor of the Suncook Railroad. While the rail corridor currently exists only in segments with track removed, stone railroad trestle abutments still stand at the former crossing of Bear Brook. Other woodlots, open areas, and natural features may have been incorporated into the design of the park by the National Park Service, however, sufficient survey of these elements has not taken place to understand their contribution to the historic significance of the Park.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
Catamount Pond
Deerfield Rd
Old Allenstown Meeting House
Meeting House Cemetery
Depot Rd
Pembroke
Suncook Railroad Corridor
28
Catamount Pond
Old Allenstown Meeting House
Meeting House Cemetery
CCC Camp
Clark Cemetery
MERRIMACK
ROCKINGHAM
Haynes FarmTrail
Salt LickTrail
Lane Trail
Leavitt Cemetery
Broken BoulderTrail
Old South Road
Allenstown
Podunk Road
Spruce Pond Camp
Bear Hill Pond Camp
Deerfield
Hooksett
Candia
Map 6.1
Cultural Resources
1 inch = 3,000 feet
0 0.5 1 Mile
September, 2020
Bear Brook State Park Historic District
Significant Roads
Significant Trails
Buildings and Camps
Cemetery
Suncook Railroad Corridor
Additional Trails
Additional Roads
System and community locations provided by DNCR's Natural Heritage Bureau.
Additional Data Sources:
NH GRANIT Digital Data (1:24,000)
DNCR Division of Forests & Lands
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6.8 RECOMMENDATIONS

As previously stated, formal archaeological investigations have been completed for only a small portion of the relatively large area composing Bear Brook State Park. As a result, only three archaeological sites have been recorded within the park boundary. These three sites include one Pre-Contact site consisting of a single quartz core and two Post-Contact sites, one a granite quarry and the other a deposit associated with the Allenstown Meeting House. A more comprehensive archaeological survey and systematic inventory of the archaeological resources present within the park is needed in order to achieve a more complete understanding of the area and to coordinate any development or management activities so that any important sites would be protected and not be adversely affected. Such a survey would need to be carried out as the responsibility of the Department of Natural and Cultural Resources, with the coordination of the State Archaeologist in the Division of Historical Resources, as stipulated under RSA 227-C.

Cultural landscapes bring together the natural and built environment along with archaeological sites to understand the full chronology and evolution of an area. While extensive survey has occurred for the above-ground resources, information on how landscape features, both natural and designed, contribute to the historic significance of the Park is needed. An effort to combine archaeological, architectural, landscape and other cultural features would benefit the public's understanding of this significant property. The following recommendations are suggested to identify and preserve significant cultural/historical resources for future research and public interpretation.

Identify and survey areas of probable archaeological sensitivity.

- Conduct a short-range archaeological resources sensitivity assessment and survey of areas threatened by immediate or potential impact.
- Carry out an ecologically integrated long-range archaeological resources sensitivity assessment and survey of the entire Bear Brook State Park reservation.

Evaluate location, nature, extent, and significance of identified archaeological resources.

- Interpret the Pre and Post-Contact Period sites, to the extent possible.
- Develop an archaeological baseline of integrated ecological and cultural resource data.
- Establish and implement archaeological research and education programs.

Identify and Evaluate location, nature, extent, and significance of both natural and designed landscape features.

- Work with Landscape Architect/Architectural Historian to conduct survey of both natural and designed landscape features to determine their contribution to the Park's historic significance.

Implement a monitoring and protection program for all identified cultural resources.

- Provide and implement standards and guidelines for protection of known cultural resources for later research and/or interpretation.
- Develop and coordinate monitoring and protection protocols with other federal and state agencies.

- Consider the location and preservation of cultural resources during the planning, layout and implementation of all management activities, including public use.

7. WILDLIFE HABITAT MANAGMENT

7.1 INTRODUCTION

One of the “forest benefits” that the Department of Natural and Cultural Resources is charged with providing through its management of state reservations is “biologically diverse populations of plants and animals” as stated in RSA 227-G:2. Bear Brook State Park is perhaps one of the most important state reservations in this regard when considering the sheer number and diversity of wildlife species known to inhabit the park, including important strongholds of several Species of Greatest Conservation Need in the state.

Species of Greatest Conservation Need (SGCN) are wildlife species that have been identified in the 2015 New Hampshire Wildlife Action Plan as declining in numbers in the state, and include protected species that are state threatened or endangered, as well as Species of Special Concern that could potentially become threatened in the near future.

The abundance and diversity of wildlife species found within the park are directly tied to the wide range of high quality habitats the park provides. At nearly 10,000 acres, the sheer size of unfragmented forested block the park provides, combined with direct connectivity to abutting conservation lands, results in the majority of the park being ranked as tier 1, highest ranked habitat for the state, based on the New Hampshire Wildlife Action Plan (see Map 7.1).

Bear Brook State Park also supports strong populations of the most sought after game species, including white-tailed deer, as well as a high diversity of bird species that provide excellent wildlife-based recreation opportunities for both sportsmen and wildlife observers.

The Fish & Game Department protects and manages the fish, wildlife, and marine resources of the state. The Department of Natural and Cultural Resources and the Fish and Game Department have a long history of cooperatively managing wildlife on state lands, including Bear Brook State Park. For nearly half a century, the two departments have worked collaboratively under a memorandum of understanding that promotes cooperation and coordination between the state's land management agencies to ensure comprehensive consideration of multiple uses and resource values on state-owned lands. This cooperation includes meeting monthly to discuss resource management plans and projects, and sharing staff and other resources to complete habitat and forest improvement projects on state lands.

The Fish & Game Department has several divisions that work in partnership with the Department of Natural and Cultural Resources to conserve, manage, and protect the wildlife resources and their habitats within Bear Brook State Park.

Wildlife Division

Staff within the Division’s Habitat Program and Nongame and Endangered Wildlife Program (Nongame Program) provides wildlife-based technical assistance on forest and recreation management projects. Nongame Program staff have a particular focus on pre-empting impacts or helping to avoid impacts to threatened or endangered species or other species of greatest conservation need and their habitats as well as habitat restoration or creation projects. Habitat

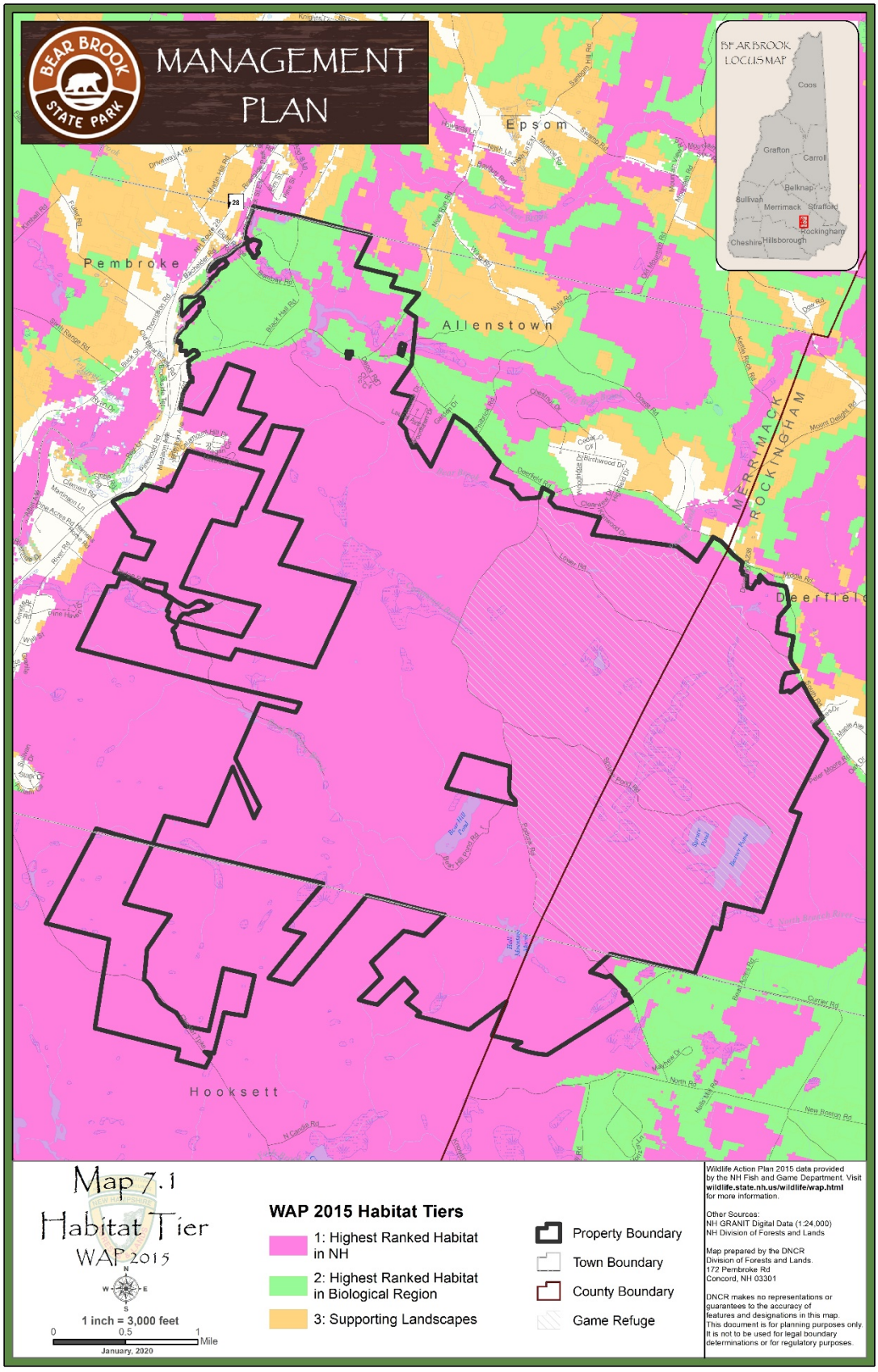
Program staff may manage habitat projects within the park. Game Program staff coordinate the pheasant stocking that occurs statewide including within the park.

Inland Fisheries Division
The Fish Habitat Biologist within the Inland Fisheries Division provides fish habitat-based technical assistance on forest and recreation management projects within the park. The Division's hatchery system also provides hatchery-raised trout to stock some of the park's ponds and streams.

Law Enforcement Division
Conservation officers within this division enforce all laws, rules and regulations pertaining to wildlife within the game refuge and elsewhere in the park. This includes hunting and fishing regulations as well as threatened and endangered species laws. They also have the primary authority to enforce OHRV regulations.

Public Affairs Division
This division houses outdoor education programs such as the Hunter Education and Let's Go Fishing Program. Hunter Education maintains the archery course near Archery Pond.

Facilities and Lands Division
The Boat Access Program within this division maintains the universally accessible fishing platforms at Archery Pond.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEARBROOK LOCUS MAP
Coos
Grafton
Carroll
Belknap
Sullivan
Merrimack
Strafford
Rockingham
Cheshire
Hillsborough
Epsom
Pembroke
Allenstown
Hooksett
MERRIMACK
ROCKINGHAM
Map 7.1
Habitat Tier
WAP 2015
1 inch = 3,000 feet
0
0.5
1
Mile
January, 2020
WAP 2015 Habitat Tiers
1: Highest Ranked Habitat in NH
2: Highest Ranked Habitat in Biological Region
3: Supporting Landscapes
Property Boundary
Town Boundary
County Boundary
Game Refuge
Wildlife Action Plan 2015 data provided by the NH Fish and Game Department. Visit wildlife.state.nh.us/wildlife/wap.html for more information.
Other Sources:
NH GRANIT Digital Data (1:24,000)
NH Division of Forests and Lands
Map prepared by the DNCR Division of Forests and Lands.
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7.2 WETLANDS AND AQUATIC HABITATS

Wetlands serve as critical habitat for multiple Species of Greatest Conservation Need. Bear Brook State Park contains a wide extent of diverse and high-quality wetland habitats across the entire property. Over 1,360 acres of wetlands have been identified to date throughout the park. This mosaic of wetlands in various successional stages includes isolated peatlands, shrub wetlands, vernal pools, forested wetlands, scrub-shrub wetlands, emergent herbaceous wetlands, beaver meadows and beaver ponds that cover approximately 13% of the park (see Map 7.2).

Ponds

Bear Brook State Park contains eight named ponds and marshes encompassing 173 acres. These ponds include Archery Pond, Bear Hill Pond, Catamount Pond, Hall Mountain Marsh, Hayes Marsh, Smith Pond, Spruce Pond and Beaver Pond. Of the eight named ponds, only Smith Pond is considered a natural pond. The rest are actually impoundments that were created for recreational or waterfowl management purposes. Hall Mountain Marsh and Hayes Marsh also contain marsh and shrub wetlands and peatlands, and are discussed further below.

These ponds provide habitat for a number of aquatic and semi-aquatic species such as beaver, otter, mink, raccoon, moose, common loon, hooded merganser, mallard, belted kingfisher, red-spotted newt, green frog, bullfrog, Northern water snake, painted turtle, snapping turtle and aquatic invertebrates. Bats, swallows, chimney swifts, cedar waxwings, and flycatchers forage above and near ponds because of the abundance of flying insects.

Archery Pond: This is a 1-acre created by a dam on a tributary of Bear Brook. The intention of this pond was to provide recreational shore bank angling (fly-fishing only). The pond is annually stocked with hatchery-raised brook and rainbow trout and includes universally-accessible fishing platforms that were constructed in 2005 by NH Fish and Game under a Memorandum of Understanding with the Department of Natural and Cultural Resources.

In 1967, there was a fish kill in the pond that was determined to be due to very acidic conditions, likely a result of the combination of naturally-occurring acidic soils and acidic precipitation (“acid rain”) due to fossil fuel burning throughout the United States. As a result, stocking was discontinued for several years until the acidic conditions improved. There was another fish kill, which affected only the rainbow trout in 2005, again due to acidic conditions, but the duration of the acidic conditions was short and the stocking schedule was not altered as a result.

Bear Hill Pond: This is a 30-acre manmade, warm water pond. Bear Hill Pond has an average depth of eight feet and a maximum depth of 23 feet, and hosts a warm water fishery of black crappie, largemouth bass, chain pickerel and brown bullhead.

Catamount Pond: This is a shallow 16-acre manmade coldwater pond, associated with the park’s day-use area. The pond has an average depth of three feet and a maximum of ten feet and is stocked annually with hatchery-raised brook trout.

Hall Mountain Marsh: This 21-acre manmade pond and marsh system is focused on waterfowl conservation, particularly wood ducks and mallards, but also likely benefits other wetland birds such as American bittern and rails, and amphibians such as Blanding's and spotted turtles. Waterfowl impoundments such as this are periodically subjected to drawdowns of the water level to allow vegetation to regrow. New vegetation provides waterfowl food and cover once the water levels are restored. Records of such drawdowns are sparse. One such drawdown occurred in 1988. It began on June 20. One hundred fifty pounds of millet was planted on June 30, and the water level began recharging on September 8, concluding on September 19. There are also pictures dated summer 2006 that appear to be of a drawdown, but no other information is available.

Hayes Marsh: This 69-acre manmade pond and marsh system is also focused on waterfowl conservation. There is only one record of a drawdown occurring here. That was in 1987 and the area was seeded with 75 pounds of millet at that time. Hayes Marsh and the surrounding upland and nearby water body features, including vernal pools, serve as critical habitat for several SGCN, including state-listed species such as Blanding's and spotted turtles.

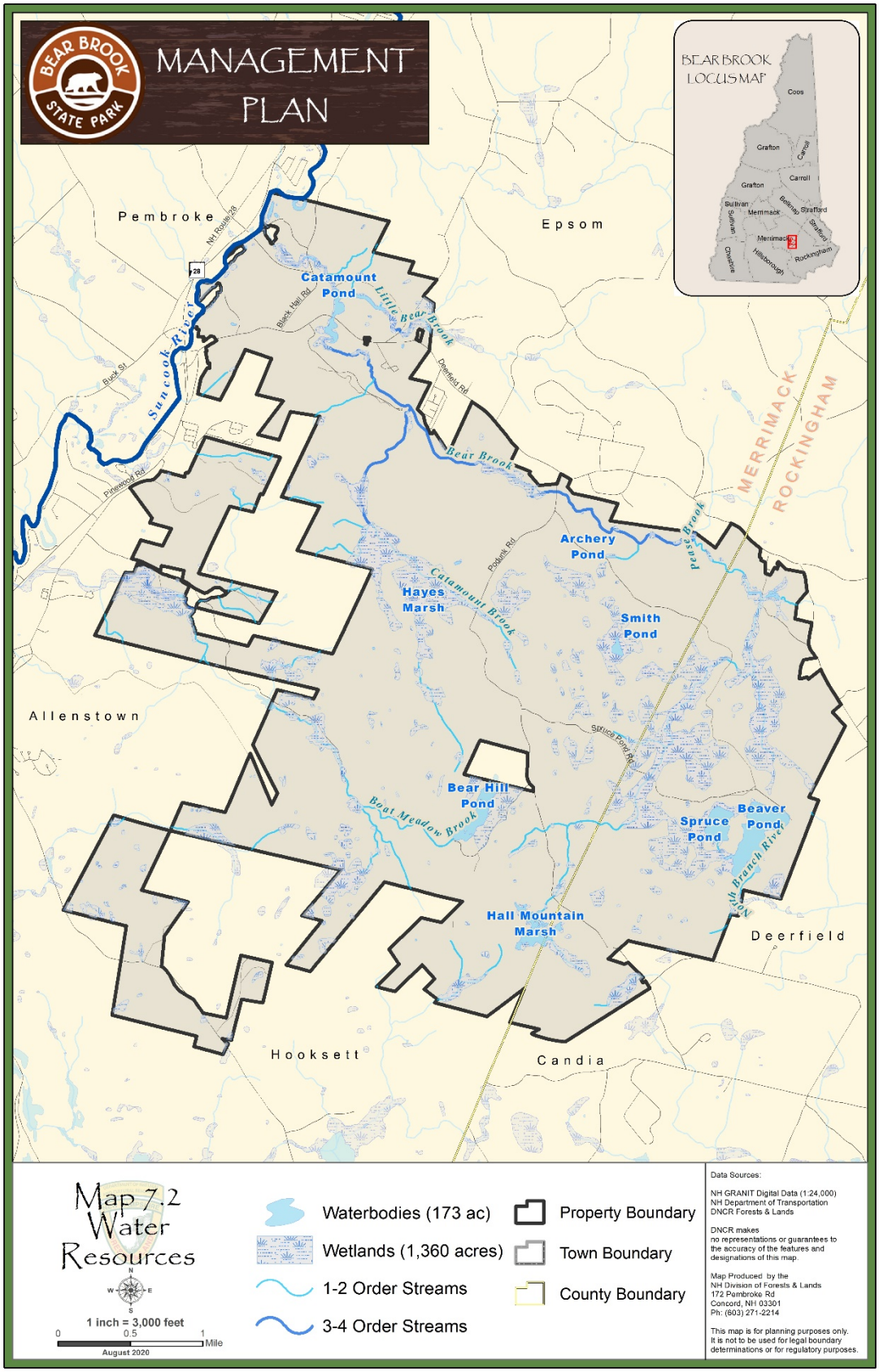
Beaver Pond: This 62-acre manmade warm water pond has an average depth of 14 feet and a maximum depth of 47 feet. Beaver Pond supports a warm water fishery comprised of largemouth bass, chain pickerel, brown bullhead, bluegill, common sunfish, yellow perch, and black crappie.

Spruce Pond: This 21-acre natural warm water pond has an average depth of 11 feet and a maximum depth of 20 feet. Like nearby Beaver Pond, the fishery here is comprised of largemouth bass, chain pickerel, brown bullhead, bluegill, common sunfish, yellow perch, and black crappie.

Smith Pond: This 33-acre warm water pond and marsh complex is also naturally occurring and is documented by the Natural Heritage Bureau as an exemplary occurrence of a poor level fen/bog system. This wetland has a small central area of open water, surrounded by vegetation in the leatherleaf - sheep laurel shrub bog and large cranberry - short sedge moss lawn communities, along with a few other communities in smaller patches. No fish or water quality surveys have been conducted in Smith Pond. Although the physical habitat appears to be suitable for fish, it may be too acidic. It has good habitat for amphibians and turtles.

Beaver Ponds

There are numerous active beaver ponds throughout the park that contribute to the dynamics and diversity of the overall wetland system. The Park hosts all or portions of at least five beaver ponds encompassing approximately 63 acres. Beaver impoundments can have positive effects on an ecosystem by drastically changing the ecology of wooded areas which can often result in great habitat for wildlife. Active beaver ponds progress through a natural plant succession over time benefiting different wildlife species throughout the stages. However, the presence of beaver and resulting implications of their activities can also create potential conflicts for humans, such as road or trail flooding or damage. Beaver management (trapping) or dam removal is sometimes necessary. See *Mammals* below for more information on beaver in the Park.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEAR BROOK LOCUS MAP
Coos
Grafton
Carroll
Sullivan
Merrimack
Belknap
Strafford
Rockingham
Hillsborough
Cheshire
Pembroke
Epsom
Allenstown
Hooksett
Candia
Deerfield
NH Route 28
Catamount Pond
Little Bear Brook
Black Hall Rd
Buck St
Suncook River
Pinewood Rd
Deerfield Rd
Bear Brook
Archery Pond
Pound Rd
Catamount Brook
Hayes Marsh
Smith Pond
Spruce Pond Rd
Bear Hill Pond
Boat Meadow Brook
Spruce Pond
Beaver Pond
North Branch River
Hall Mountain Marsh
MERRIMACK
ROCKINGHAM
Map 7.2
Water Resources
N
W
E
S
1 inch = 3,000 feet
0
0.5
1
Mile
August 2020
Waterbodies (173 ac)
Wetlands (1,360 acres)
1-2 Order Streams
3-4 Order Streams
Property Boundary
Town Boundary
County Boundary
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
DNCR Forests & Lands
DNCR makes
no representations or guarantees to
the accuracy of the features and
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Map Produced by the
NH Division of Forests & Lands
172 Pembroke Rd
Concord, NH 03301
Ph: (603) 271-2214
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determinations or for regulatory purposes.

Vernal Pools

Vernal pools are found scattered throughout much of Bear Brook State Park. These seasonal wetlands typically contain water only during the spring portion of the year. They can range in size from several square feet to several acres and can occur as isolated wetlands or as part of a larger wetland complex or floodplain system.

Vernal pools are important wetlands that provide a unique habitat for many species that are not found in other areas. Due to their ephemeral nature, vernal pools provide essential breeding habitat for invertebrates such as fairy shrimp and fingernail clams, as well as for amphibians such as wood frogs and spotted salamanders, whose tadpoles and larvae are especially vulnerable to fish predation in other wetland settings.

Vernal pools are also recognized as important habitat for the state endangered Blanding's turtle and the state threatened spotted turtle. Both of these species are found within the park and use vernal pools for foraging or mating.

The area surrounding vernal pools is also very important to their function as most amphibians that utilize vernal pools for breeding spend the rest of the year in the surrounding uplands. Changes in the landscape that alter hydrology and significantly increase light levels can result in detrimental water temperature changes and holding capacity, which in turn may degrade or destroy the function of vernal pools.

Because of their importance, vernal pools are protected in New Hampshire as wetlands or surface waters under the wetlands dredge and fill law, RSA 482-A. In 2008, the Department of Environmental Services adopted rules regarding vernal pools. Vernal pools are also recognized as a Special Wetland by the USACE as recognized in the USACE Programmatic General Permit for the State of New Hampshire (effective date August 3, 2012).

Peatlands

Peatlands are wetland ecosystems that contain peat, an organic material formed by partially decayed wetland plants, and is associated with acidic or stagnant water that is low in oxygen. Typical vegetation in a peatland includes sphagnum moss, leatherleaf, northern white cedar, white beaksedge and three-way sedge. Peatland habitats are vital to the continued existence of many rare plant and wildlife species in New Hampshire, such as the state endangered ringed boghaunter, a dragonfly whose habitat is restricted to wetlands containing extensive floating or submerged vegetation and the nearby surrounding uplands. According to the 2015 Wildlife Action Plan habitat maps, there are 115 mapped peatland features within the Park totaling 360 acres.

Marsh and Shrub Wetlands

Bear Brook State Park is located in an area which is known to have some of the highest concentrations of marsh and shrub wetlands in the state. There are approximately 400 acres of marsh and shrub wetlands in the park, including portions of Hayes Marsh and Hall Mountain Marsh (discussed above under Ponds). Marsh and shrub wetlands are influenced primarily by groundwater levels and contain rich habitats with soils that stay wet most of the year. This system can be divided into three broad categories: wet meadows, emergent marsh habitats and

scrub-shrub wetlands. Many wildlife species use marsh and shrub wetlands including common species such as beavers, painted turtles and red-winged blackbirds. These wetlands are also essential habitat for protected turtles and ringed boghaunters.

Streams

There are nearly 31 miles of rivers and streams that flow through Bear Brook State Park (see Table 7.1).

Table 7.1 *Rivers and Streams that flow through Bear Brook State Park*		
Stream/River	*Length of Flow (Miles)*	*Stream Order*
Un-named	14.30	1
Bear Brook	9.6	1-4
Boat Meadow Brook	3.10	2-3
Catamount Brook	2.60	2
Little Bear Brook	0.58	3
North Branch River	0.30	1
Pease Brook	0.06	3
Suncook River	0.14	5

Upstream of Catamount Pond, Bear Brook itself contains surprisingly few fish species, only wild brook trout and white sucker. Interestingly, fish surveys conducted in the late 1980s documented the presence of substantial numbers of brown bullhead, a type of catfish, in Bear Brook near Podunk Road, but surveys in 2014 and 2018 found no brown bullhead at the same or nearby locations. Much of the upper reaches of Bear Brook in Deerfield contain no fish, likely due to naturally acidic conditions that preclude the establishment of fish populations. It may also be possible that the summer water temperatures there are too warm for brook trout and the stream is too small for viable populations of white sucker. Additionally, because the stream flows through a number of open, mucky wetlands, the dissolved oxygen concentrations there are probably too low for fish as well.

Hatchery-reared brook trout are stocked annually into Bear Brook near Podunk Road, where the water quality is suitable for fish. Areas that have no naturally reproducing fish populations are not stocked.

There are no known state-listed threatened or endangered fish species in the Park, but wild brook trout are a Species of Greatest Conservation Need. Three tributaries to Bear Brook are known to contain wild brook trout. Catamount Brook, which flows out of Hayes Marsh, has wild brook trout near its confluence with Bear Brook, although apparently at a relatively low density. Archery Pond Brook also contains wild brook trout upstream and downstream of Archery Pond. A very small, unnamed tributary near the state park offices contains some wild brook trout.

7.3 TERRESTRIAL HABITAT TYPES

Appalachian Oak-Pine Forest

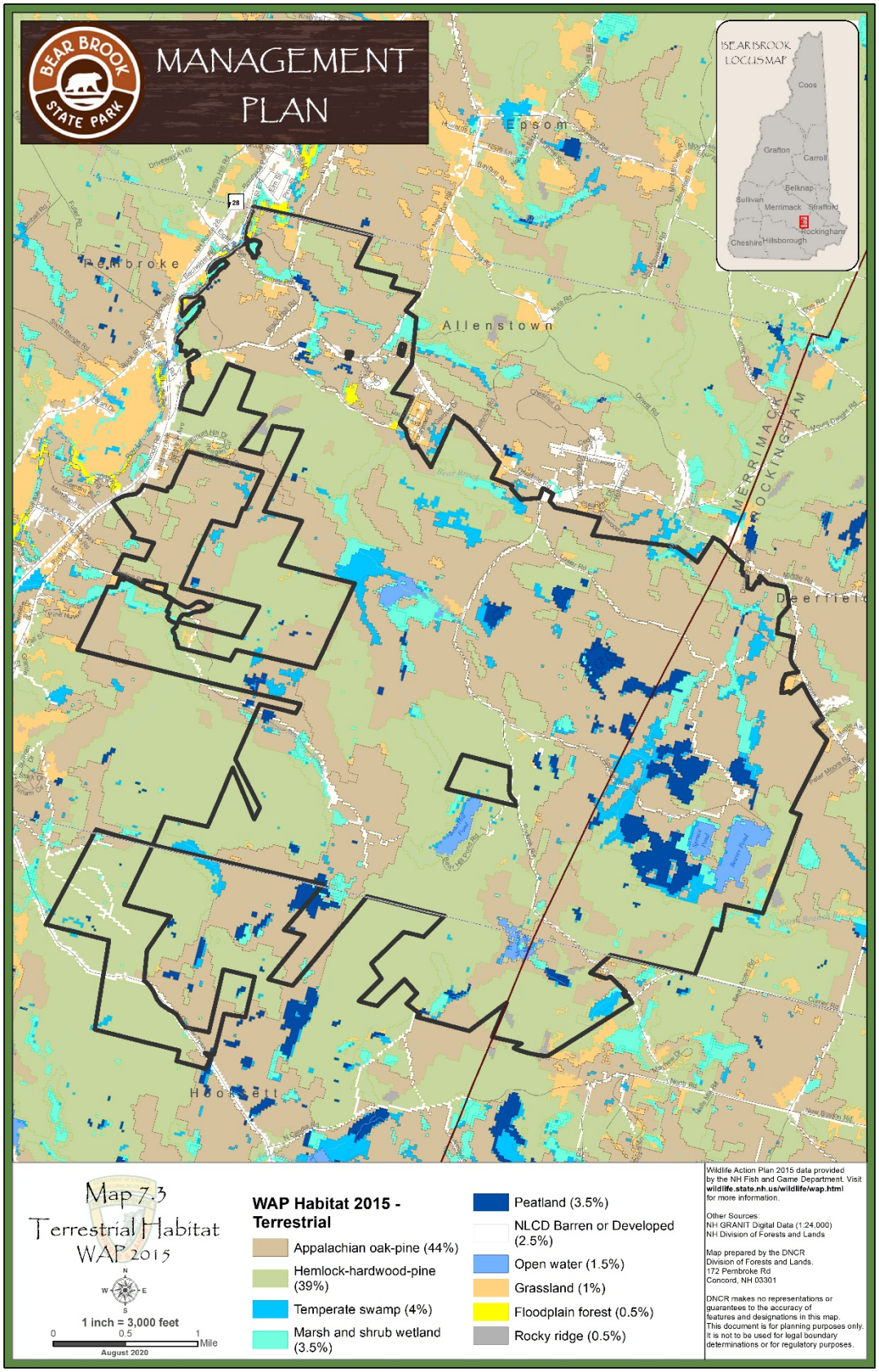
Appalachian oak-pine forests are found mostly below 900 feet elevation in southern New Hampshire and along the Connecticut River in western New Hampshire. The nutrient-poor, dry, sandy soils and warm, dry, climate influences the typical vegetation including white pine, oak including red, white, and black oak, shagbark hickory, mountain laurel, and red maple. The 2015 Wildlife Action Plan habitat maps indicate that approximately 44% of Bear Book State Park (4,389 acres) is comprised of Appalachian oak-pine forest (see Map 7.3). Refer to Chapter 5, Ecological Assessment, for more information on the characteristics of Appalachian oak-pine forests.

Many wildlife species use these forests for part or all of their life cycle including whip-poor-wills, black bears, Northern black racers, and northern long-eared bat, all of which are known or could occur within the Park. Additionally, Appalachian oak-pine forests, with their abundance of nut-bearing oaks and hickories, provide a rich food source for wildlife such as ruffed grouse, turkey, black bear, squirrels, mice and chipmunks. In turn, raptors such as northern goshawk feed on small mammals and find nesting and perching sites in white pines in the tree canopy.

Many stands of Appalachian oak-pine forest in the state and in the park are of the same age, roughly 80-100 years old. These stands developed after farms were abandoned throughout the last century and after the 1938 hurricane. It is possible that some of these forests may have historically been pine barrens prior to agricultural use. A few pockets of barrens still remain such as a degraded barren at the north end of Blackhall Road. Many wildlife Species of Greatest Conservation Need found in Appalachian oak-pine forests are attracted to patches of old or young trees within the larger forested landscape. Without a diverse range of ages and sizes of trees, even-aged Appalachian oak-pine forests support fewer wildlife species.

The dry soils and warm temperatures in southern New Hampshire have historically provided conditions that allowed occasional low intensity fires to burn in the forest. In the past, fires were caused by both lightning and Native Americans. Oak trees are relatively resistant to fire and are able to sprout from stumps after a burn, so fire helped maintain a large component of oak in the forest. Without fire, and the as a result of agricultural abandonment, today's forests likely have a higher proportion of white pine, hemlock, red maple, and birch. This mix of species is less tolerant of fire and does not provide as rich a supply of nuts for wildlife. Today's mature Appalachian oak-pine forests may also be denser, as historical low ground fires would have created a more open understory in the forest, important for such species as whip-poor-wills and northern goshawks.

American chestnut may have been a dominant player in historic Appalachian oak-pine forests in the park, potentially making up as much as 25-30 percent of the forest. Chestnut sprouts are commonly seen in regenerating clearcuts in the park. Chestnuts were a much more consistent producer of nuts, and more nutrient dense compared to red or white oak, which would have benefitted bear, deer, turkey, small mammals and other wildlife.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEARBROOK LOCUS MAP
Coos
Grafton
Carroll
Belknap
Sullivan
Merrimack
Strafford
Rockingham
Cheshire
Hillsborough
Epsom
Pembroke
Allenstown
MERRIMACK
ROCKINGHAM
Deerfield
Hooksett
Map 7.3
Terrestrial Habitat
WAP 2015
N
W
E
S
1 inch = 3,000 feet
0
0.5
1
Mile
August 2020
WAP Habitat 2015 - Terrestrial
Appalachian oak-pine (44%)
Hemlock-hardwood-pine (39%)
Temperate swamp (4%)
Marsh and shrub wetland (3.5%)
Peatland (3.5%)
NLCD Barren or Developed (2.5%)
Open water (1.5%)
Grassland (1%)
Floodplain forest (0.5%)
Rocky ridge (0.5%)
Wildlife Action Plan 2015 data provided by the NH Fish and Game Department. Visit wildlife.state.nh.us/wildlife/wap.html for more information.
Other Sources:
NH GRANIT Digital Data (1:24,000)
NH Division of Forests and Lands
Map prepared by the DNCR
Division of Forests and Lands.
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Hemlock-Hardwood-Pine Forest

Hemlock-hardwood-pine forests are comprised of mostly hemlock, white pine, beech, and red oak. Since this is a transitional forest, it can occur at different elevations and over different types of soil and topography, so the composition of vegetation can be variable. White pine and eastern hemlock are most often the dominant trees, but these forests are highly variable and contain a mix of trees common in other forest types. In typical hemlock-hardwood-pine forests, you'll also find beech and occasionally patches of sugar maple and white ash (on rich sites) as well as red oak (on drier sites). The understory often includes trees such black birch, black cherry, and ironwood, and shrubs such as witch hazel, and maple-leaved viburnum, with starflower and Canada mayflower on the forest floor. This forest type is the most common in New Hampshire and covers nearly 50% of the state. The 2015 Wildlife Action Plan habitat maps indicate that approximately 39% (3,891 acres) of Bear Brook State Park is comprised of hemlock-hardwood-pine forest (see Map 7.3). Refer to Chapter 5, Ecological Assessment, for more information on the characteristics of hemlock-hardwood-pine forests.

Although hemlock-hardwood-pine forests are common, they play an important supporting role by surrounding and supporting many smaller and unique ecosystems that provide important habitat types in southern New Hampshire. Most wildlife that require vernal pools, marsh habitat, headwater streams, floodplains, shrublands, grasslands, or peat bogs will also use the surrounding forest to meet their needs for food, cover, or breeding.

Red oak acorns and beech nuts found in these forests are important food for many species including black bear, deer, ruffed grouse, chipmunk, squirrels and blue jay. In turn, raptors such as northern goshawk and Cooper's hawk feed on small mammals, and find nesting and perching sites in white pines in the tree canopy. Large areas of hemlock-hardwood-pine provide habitat for other forest birds such as scarlet tanager, hermit thrush, Blackburnian warbler and black-throated green warbler.

Many stands of hemlock-hardwood-pine forest in New Hampshire and at Bear Brook State Park are the same age, roughly 80-100 years old. They grew back after extensive timber harvesting and abandonment of farms throughout the last century and after the 1938 hurricane. Many wildlife Species of Greatest Conservation Need found in these forests are attracted to patches of old or young trees within the larger forest area. Even-aged forests don't support the same high diversity of wildlife species as forests that contain a diversity of live and dead trees of different ages and sizes. Providing this diversity of habitat can be difficult at times, as the public may prefer to view extensive, unbroken mature forest. As a result, in the past managers have been less likely to make large openings (e.g., clearcuts) that will regenerate into the young forests required by many wildlife species.

Since the inception of the 1994 Bear Brook State Park Management plan, the Division of Forests and Lands has been managing the park using a criteria system based upon varying levels of vegetative disturbance. Twenty five years of applied silvicultural management has helped to break up the uniform and aging forest structure at Bear Brook State Park and has begun to create a more varied forest structure with a diversity of age and size class.

Criteria 1: This area receives little or no timber management and has been left to progress through natural disturbance regimes and the processes of forest succession. Such undisturbed landscape components have long been recognized as providing important habitats for many plants, animals and natural communities.

Criteria 2: This area serves as a transition between the unmanaged area in Criteria 1, and the area which will be most heavily disturbed in Criteria 3. Uneven-aged forest management, including group selection and single tree selection, are implemented in Criteria 2 to promote long rotations of mid (e.g., oak and pine) to late successional species (e.g., hemlock) across a balance of age classes.

Criteria 3: Where site conditions allow, this area emphasizes large scale openings to create viable amounts of young forest habitat. Many species of plants and animals are tied to young forest habitats. Such habitats are characterized by a diverse mix of small trees, shrubs, wildflowers, and grasses. Young forest tends to be thick, tangled, and less than 20 feet tall. These habitats are in decline in southern New Hampshire and are dependent on high levels of light resulting from large scale disturbances, such as those created in even-aged forest management (shelterwood, overstory removal and clearcutting). The size of Bear Brook State Park allows for a rare opportunity to implement the practice of even-aged management on a wide scale to create much needed habitat in the southern part of the state.

Criteria 4: This area of the park is primarily managed for developed recreation. However, these areas still provide important wildlife habitat, and some Species of Greatest Conservation Need may be found within these areas.

Grasslands/Upland Openings

Grasslands and upland openings are comprised of grasses, sedges, and wildflowers with few to no shrubs and trees. Pre-colonial grasslands in New Hampshire were probably maintained by beaver and fires started by lightning and Native Americans. The numerous agricultural lands maintained by early European settlers provided ideal habitat for some wildlife species that need grassland habitat. As these agricultural lands were abandoned, these wildlife populations began to decline and several of these species are now Species of Greatest Conservation Need. Other species also benefit from open grass fields, such as wild turkey, white-tailed deer, wood turtle, smooth green snake, various songbirds, and numerous species of butterflies that seek nectar and lay their eggs on host plants. Development and natural forest succession have reduced grassland and upland opening habitats in the state. The remaining habitat patches require maintenance and must be mowed to prevent them from becoming shrublands or forests.

Based on the 2015 Wildlife Action Plan habitat maps, only one percent of Bear Brook State Park (~100 acres) is comprised of grassland and upland openings (see Map 7.3). This is comparable to the acreage of non-forested habitats indicated by the forest resource inventory of the park, (124 acres, see Table 7.2). Most of this habitat type is found in Hayes field, little Hayes field, the hayfield at the entrance to the park, just south of Deerfield Road, and the wildlife habitat project at the north end of Blackhall Road.

In addition to grassland /upland openings, much of the acreage associated with the wildlife project is shrubland and young forest habitat. Fish and Game Habitat Program staff have regularly coordinated the habitat work here. In 1989 a wildfire burned most of the area east of Blackhall Road resulting in establishment of dense young aspen, birch, and hazelnut. This area has been mowed with a brontosaurus mower periodically to maintain this valuable shrubland and young forest habitat. Additionally, in 2000 a 3-acre warm-season grass field was established in an adjacent area to provide a fall food source and winter cover. This area has continued to be managed with both prescribed fire, brush hogging, and targeted herbicide applications to deter encroachment from woody plants.

Table 7.2 Grassland/Upland Openings at Bear Brook State Park

Type	*Number*	*Acres*	*Average Size*
Field/Grass	14	96.66	6.90
Landing	8	1.73	0.22
Utility ROW	1	14.15	14.15
Sand	2	8.95	4.48
Gravel	1	2.41	2.41
Total	26	123.90	

Without the work of land managers, farmers, and other landowners, most grasslands in New Hampshire would quickly revert to forest. However, the timing of mowing can affect a field's ability to provide habitat for grassland-nesting birds and other wildlife. Farmers growing high-quality forage for livestock usually mow their fields two or three times during the summer. At least one of these mowings typically occurs between May and mid-July, a time that corresponds with the nesting season for most grassland-nesting birds. Mowing during this period can destroy nests and eggs, kill fledglings, or cause adult birds to abandon their nests. The 13-acre hayfield near the entrance to the park is the only field large enough to support grassland birds. This area is under agricultural agreement with a local farmer. The current agreement does not restrict the farmer from harvesting hay during the nesting season.

Rocky Ridges

Rocky ridge communities usually occupy ridgetops and upper slopes and have a woodland or sparse woodland structure typically comprised of oaks, pitch or white pines, and other temperate species with extensive bedrock exposure. These bedrock outcrops include slabs with less than 65 degree slopes. This habitat type corresponds to the temperate ridge - cliff - talus system referenced to in Chapter 5, Ecological Assessmnet.

Rocky ridges provide crucial habitat for several Species of Greatest Conservation Need, including state endangered wildlife. Wildlife Action Plan habitat maps predict the occurrence of approximately 50 acres of rocky ridge habitats within Bear Brook State Park.

Due to the views of the surrounding landscape rocky ridges often provide, recreational use of these habitats tends to be high. Hiking, biking, and off-road vehicle use in such areas can sometimes cause damage to these important habitats but more often cause disturbance to the sensitive wildlife using them.

7.4 WILDLIFE SPECIES

Threatened and Endangered Species

The Northern long-eared bat is the only federally listed wildlife species known to occur within Bear Brook State Park at the present time. This species is considered a threatened species by the USFWS and is afforded protection under the Federal Endangered Species Act of 1973 (ESA; 16 U.S.C. § 1531 et seq.) (see USFWS Final 4(d) Rule, January 14, 2016 – https://fws.gov/mammals/nleb). Occurrences of this species have been confirmed through bat echolocation surveys conducted in or near the park in recent years.

Several state-listed species are found within and in the vicinity of Bear Brook State Park. State-listed species in the Park include several reptiles, invertebrates, and a mammal (see relevant taxonomic discussions below for additional information). State threatened and endangered wildlife species are protected under RSA 212-A. The list of New Hampshire's endangered and threatened wildlife is maintained by Fish and Game's Nongame and Endangered Wildlife Program under RSA:212-A. State species listings are current as of March 24, 2017 and are used to determine protection and management actions necessary to ensure the survival of the state's endangered and threatened wildlife. This list is periodically updated, and species status as detailed in this management plan may change over time. Current listing information can be found on the Fish and Game Nongame Program webpage. Because some threatened and endangered wildlife species are sensitive to disturbance, and subject to collection or direct persecution, precise locations of species are not released to the public. It is illegal to "take" a state-listed species as defined under RSA 207:1.

Invertebrates

Due to the diversity of plant communities, water features, and geological variabilities, there is likely a high biodiversity of invertebrate species within the Park. However, to date, limited formal invertebrate surveys have been conducted. Those that were, were focused on Zanclognatha Martha a moth Species of Greatest Conservation Need. While the taxonomy of some macroinvertebrate orders is relatively accessible, identification of most invertebrates is highly technical and requires microscopic examination. No documentation of mollusks, dragonflies, or butterflies within the park has been be conducted by Fish and Game staff. Table 7.3 provides a list of invertebrate Species of Greatest Conservation Need that are known or likely to be found in the park.

Table 7.3 Invertebrate SGCN that occur or could occur at Bear Brook State Park

Invertebrate	*Species Status**
American Bumble Bee	SGCN
Monarch	SC, SGCN
Pine Barrens Lepidoptera	SGCN
Ringed boghaunter	END, SGCN
Rusty-patched Bumble Bee	FE, SE, SGCN
Skillet clubtail	SC, SGCN
Yellow Bumble Bee	SGCN
Yellowbanded Bumble Bee	SGCN
Brook Floater	SE, SGCN

**SGCN = Species of Greatest Conservation Need (New Hampshire Wildlife Action Plan, 2015); SC = Species of Special Concern (New Hampshire Wildlife Action Plan, 2015); END = state endangered (NHFG 2017); ST = state threatened (NHFG 2017); FE = federally endangered (USFWS).*

Fish

Ten fish species have been documented in Bear Brook State Park. With the exception of Archery Pond, warmwater fish communities are found in the ponds and also the Suncook River, while coldwater fish communities, dominated by wild brook trout which are native, are in Bear Brook and several of its tributaries. Archery Pond and the brook that enters and leaves it contain wild brook trout as well as hatchery-reared brook trout and rainbow trout. The fish species in the warmwater ponds are likely native to those ponds, with the exception of largemouth bass which were stocked throughout much of southern New Hampshire in the 1850s and later. Swamp darter was found in only one location, the Suncook River. Table 7.4 contains a list of invertebrate Species of Greatest Conservation Need that are known or likely to be found in the park.

Table 7.4 Fish Species that occur at Bear Brook State Park

Fish	*Species Status**
Brook trout	SGCN
Swamp darter	SGCN
Brown bullhead	---
Black crappie	---
Common (Pumpkinseed) sunfish	---
Common white sucker	---
Eastern chain pickerel	---
Golden shiner	---
Largemouth bass	---
Yellow perch	---

**SGCN = Species of Greatest Conservation Need (New Hampshire Wildlife Action Plan (2015).*

Reptiles and Amphibians

Bear Brook State Park is home to a diverse assemblage of reptiles and amphibians, several of which are afforded protection by the New Hampshire Endangered Species Conservation Act (RSA 212-A) (see Threatened and Endangered Species above).

As of the date of this management plan, no formal surveys for amphibians have been conducted at Bear Brook State Park. Based on the available habitat and species distribution records reported and verified by biologists through the Reptile and Amphibian Reporting Program, it is likely that eight of the ten species of frogs and toads found in New Hampshire occur in the park. These species include the Northern leopard frog (a species of Greatest Conservation Need), green frog, Gray treefrog, American toad, pickerel frog, bullfrog, spring peeper, and wood frog. It is likely that eight species of salamanders occur in the park, including the blue-spotted salamander and the blue-spotted/Jefferson salamander complex (both Species of Greatest Conservation Need) as well as the more common dusky salamander, four-toed salamander, two-lined salamander, red-backed salamander, Eastern newt, and spotted salamander.

In recent years, the Fish and Game Nongame and Endangered Wildlife Program have conducted some reptile surveys with efforts focused on state-listed species and Species of Special Concern. Snake surveys include those for Northern black racers, a state-threatened species. Suitable habitat currently exists in some portions of the park; however, habitat management is necessary to maintain early successional habitat for this species. Timber rattlesnakes, a state-endangered species, have been reported in the park. Several common species of snakes have been observed in the park including two Species of Greatest Conservation Need, the smooth green snake and the Eastern ribbon snake. Other common species include the common garter snake, red belly snake, milk snake, ring-necked snake, brown snake, and Northern water snake.

Bear Brook State Park provides critical habitat for three turtle Species of Greatest Conservation Need, Blanding's turtle, a state endangered species; spotted turtle, a state threatened species, and wood turtle, a Species of Special Concern. Surveys for all three species in recent years have verified the presence of these species within the park and multi-year research efforts have identified the park as a high priority area for Blanding's turtles. Additional spotted turtle research is currently underway. Radio telemetry studies of Blanding's turtles have provided important information on movements and preferred habitat within the Park. Vernal pools, winter hibernacula, and upland nesting sites, all critical habitats necessary for all life stages for Blanding's and spotted turtles have been identified within the park. Other species of turtles that can be found in the park include snapping turtles, painted turtles and musk turtles. Table 7.5 contains a list of amphibian and reptile Species of Greatest Conservation Need that are known or likely to be found in the Park.

Table 7.5 Reptile and Amphibian SGCN that occur or could occur at Bear Brook State Park

Amphibians	*Species Status**
Frogs	
Northern leopard frog	SC, SGCN
Salamanders	
Blue-spotted salamander	SGCN
Blue-spotted/Jefferson salamander complex	SC, SGCN
Reptiles	
Snakes	
Eastern ribbon snake	SGCN
Smooth green snake	SC, SGCN
Northern black racer	ST, SGCN
Timber rattlesnake	SE, SGCN
Turtles	
Blanding's turtle	SE, SGCN
Spotted turtle	ST, SGCN
Wood turtle	SC, SGCN

**SGCN = Species of Greatest Conservation Need (New Hampshire Wildlife Action Plan, 2015); SC = Species of Special Concern (New Hampshire Wildlife Action Plan, 2015); SE = state endangered (NHFG 2017); ST = state threatened (NHFG 2017); FE = federally endangered (USFWS).*

Birds

One hundred and one species of birds have been recorded at Bear Brook State Park in the last 20 years (see Table 7.6). These include species closely associated with middle-aged to mature forests such as ovenbird and scarlet tanager; species of young forest habitats such as prairie warbler, eastern towhee, and ruffed grouse; species commonly found in upland openings and old fields such as field and song sparrows; and species of wetlands such as mallard and wood duck. Some are associated with human development (e.g., rock pigeon and European starling). Others are likely seasonal migrants (e.g., bay-breasted warbler and blackpoll warbler). The diversity of species likely corresponds to the diversity of habitats provided within the park.

Table 7.6 Birds recorded at Bear Brook State Park in the last 20 years*

Alder flycatcher	Chestnut-sided warbler	Herring gull	Rock pigeon
American black duck	Chipping sparrow	Hooded merganser	Rose-breasted grosbeak
American crow	Common grackle	House finch	Ruby-crowned kinglet
American goldfinch	Common loon	Least flycatcher	Ruby-throated hummingbird
American redstart	Common raven	Mallard	Ruffed grouse
American robin	Common yellowthroat	Merlin	Scarlet tanager
Bald eagle	Cooper's hawk	Magnolia warbler	Solitary sandpiper
Baltimore oriole	Dark-eyed junco	Mourning dove	Song sparrow
Barred owl	Double-crested cormorant	Nashville warbler	Spotted sandpiper
Bay-breasted warbler	Downy woodpecker	Northern cardinal	Swainson's thrush
Belted kingfisher	Eastern bluebird	Northern flicker	Swamp sparrow
Black-and-white warbler	Eastern kingbird	Northern goshawk	Tree swallow
Blackburnian warbler	Eastern phoebe	Northern parula	Tufted titmouse
Black-capped chickadee	Eastern screech owl	Northern waterthrush	Turkey vulture
Blackpoll warbler	Eastern towhee	Ovenbird	Veery
Black-throated blue warbler	Eastern whip-poor-will	Palm warbler	White-breasted nuthatch
Black-throated green warbler	Eastern wood pewee	Pileated woodpecker	White-throated sparrow
Blue jay	European starling	Pine warbler	White-winged crossbill
Blue-headed vireo	Evening grosbeak	Prairie warbler	Wild turkey
Broad-winged hawk	Field sparrow	Purple finch	Wood duck
Brown creeper	Golden-crowned kinglet	Red-bellied woodpecker	Wood thrush
Brown-headed cowbird	Gray catbird	Red-breasted nuthatch	Yellow-bellied sapsucker
Brown thrasher	Great blue heron	Red-eyed vireo	Yellow-rumped warbler
Bufflehead	Great-crested flycatcher	Red-tailed hawk	Yellow warbler
Canada goose	Hairy woodpecker	Red-winged blackbird	
Canada warbler	Hermit thrush	Ring-necked duck	
Cedar waxwing			

*Based on Hillman (2012) and eBird.org (2019)

Of all the bird species recorded using the park for breeding, only 13 are considered Species of Greatest Conservation Need (see Table 7.7). None of these are state or federally listed as threatened or endangered. An additional six Species of Greatest Conservation Need could potentially occur in the park.

Table 7.7 Bird SGCN that occur or could occur at Bear Brook State Park

Bird	*Species Status**
American black duck	SGCN
American kestrel	SC, SGCN
American woodcock	SGCN
Bald eagle	SC, SGCN
Black-billed cuckoo	SGCN
Bobolink	SGCN
Brown thrasher	SGCN
Canada warbler	SGCN
Chimney swift	SGCN
Eastern towhee	SGCN
Eastern whip-poor-will	SGCN
Field sparrow	SGCN
Northern goshawk	SGCN
Prairie warbler	SGCN
Purple finch	SGCN
Ruffed grouse	SGCN
Scarlet tanager	SGCN
Veery	SGCN
Wood thrush	SGCN

**SGCN = Species of Greatest Conservation Need (New Hampshire Wildlife Action Plan, 2015); SC = Species of Special Concern (New Hampshire Wildlife Action Plan, 2015); SE = state endangered (NHFG 2017); ST = state threatened (NHFG 2017); FE = federally endangered (USFWS).*

Most of the birds recorded at Bear Brook State Park are songbirds (75/101 species). The others include eight raptors, six species of waterfowl, six other wetland birds such as great blue heron and double-crested cormorant, and a few others. The more secretive wetland birds such as American bittern and sora are not accounted for. Targeted surveys would need to be done to determine if they use the park; however, suitable habitat exists and the Park is within their known state distribution area.

Two species that have been regularly surveyed are ruffed grouse and wild turkey as part of a statewide survey. Every spring biologists drive a standardized 10 mile route, stopping at every mile and listening for drumming grouse and gobbling turkeys for four minutes per stop. The average number of grouse detected per survey since 2001 was 1.5 and the average number of turkeys was 1.9. The most grouse detected was six in 2010. The most turkey detected was six in 2018.

Wood duck boxes are maintained on Hayes Marsh and Hall Mountain Marsh to enhance waterfowl reproduction. Surveys from 2001-2017 showed a decline from 24 functional boxes in 2001to ten in 2017 as boxes deteriorated and were not replaced. Boxes originally placed on trees will not be replaced as the waterfowl biologist has found that they are predated more regularly than boxes on posts. Boxes are used approximately 50:50 by hooded mergansers and wood ducks and use is generally high, averaging 65 percent at Hall Mountain Marsh and 80 percent at Hayes Marsh.

Farm-raised pheasants are stocked annually at the grass and shrubland area on Blackhall Road for hunters and bird dogs to pursue during the pheasant hunting season, which runs from October 1 through December 31. This is one of 63 stocking sites in 44 towns that receive pheasants annually. Pheasant hunting has a long history in New Hampshire – the first pheasants were stocked here over a hundred years ago.

The only other bird monitoring or research completed in the park in recent years was a 2012 Masters project that looked at breeding bird assemblages in scrub-shrub habitat resulting from timber harvests in the park (Hillman 2012). The results of the study supported previous studies that demonstrated that timber harvests can create the habitat structure preferred by scrub-shrub bird species such as common yellowthroat, eastern towhee, and chestnut-sided warbler.

Mammals

Up to 50 species of mammals could potentially occur at Bear Brook State Park based on available habitats and location in the state (see Table 7.8). Most are relatively common and therefore are likely inhabitants of the park (e.g., deer, coyote, skunk, voles).

Table 7.8 Mammals that occur or could occur at Bear Brook State Park

Bat, Big Brown	Deer, White-tailed	Mouse, Woodland Jumping	Skunk, Striped
Bat, Eastern Red	Fisher	Muskrat	Squirrel, Gray
Bat, Hoary	Fox, Gray	Opossum, Virginia	Squirrel, Northern Flying
Bat, Little Brown	Fox, Red	Otter, River	Squirrel, Red
Bat, Northern Long-eared	Hare, Snowshoe	Pipistrelle, Eastern	Squirrel, Southern Flying
Bat, Silver-haired	Mink	Porcupine	Vole, Meadow
Bat, Small-footed	Mole, Hairy-tailed	Raccoon	Vole, Southern Red-backed
Bat, Tricolored	Mole, Star-nosed	Rat, Norway	Vole, Woodland
Bear, Black	Moose	Shrew, Masked	Weasel, Long-tailed
Beaver	Mouse, Deer	Shrew, Pygmy	Weasel, Short-tailed (Ermine)
Bobcat	Mouse, House (i)	Shrew, Short-tailed	Woodchuck
Chipmunk, Eastern	Mouse, Meadow Jumping	Shrew, Smoky	
Coyote	Mouse, White-footed	Shrew, Water	

Of the 50 mammals, eight are Species of Greatest Conservation Need (see Table 7. 9). All but one of these are bats. Bat echolocation surveys conducted in or near the park in recent years recorded the presence of little brown bat, big brown bat, eastern red bat, hoary bat, northern long-eared bat, and silver-haired bat, which are all Species of Greatest Conservation Need. Northern long-eared bat are federally threatened and state endangered. Little brown bat is also state endangered.

Table 7.9 Mammal SGCN that occur or could occur at Bear Brook State Park	
Mammal	*Species status**
Big Brown Bat	SC, SGCN
Eastern Red Bat	SC, SGCN
Hoary Bat	SC, SGCN
Little Brown Bat	SE, SGCN
Moose	SGCN
Northern long-eared bat	FT, SE, SGCN
Silver-Haired Bat	SC, SGCN
Tricolored Bat	SE, SGCN

**SGCN = Species of Greatest Conservation Need (New Hampshire Wildlife Action Plan, 2015); SC = Species of Special Concern (New Hampshire Wildlife Action Plan, 2015); SE = state endangered (NHFG 2017); ST = state threatened (NHFG 2017); FE = federally endangered (USFWS).*

Historically deer populations were low in the area and a game refuge was established in the park in 1943 by authority of RSA 212:13 to help bolster the population. Hunting within the 3,175-acre game refuge is limited to archery for white-tailed deer only. Currently deer populations in the area surrounding Bear Brook State Park are some of the highest in the state. The population had been relatively stable in this part of the state for several years. However, since about 2010 the population has grown substantially and is currently above Fish and Game's population density objective. This rapid population growth was aided in part by several winters of well below average severity. Fish and Game's 2016 Game Management Plan calls for a 22% decrease in deer density for this part of the state.

Moose populations in this part of the state have never been robust. Even so, given the size of Bear Brook State Park and the extent of forage in the form of seedling/sapling hardwoods that are a result of regular timber harvests, the park acts as something of a stronghold for moose in this part of the state. At least five moose have been observed by visitors to the park during the writing of this management plan, and when moose hunting permits are issued in this part of the state, a moose is typically harvested from the park. According to the Fish and Game's 2016 Game Management Plan, the current density of moose in the surrounding area is only 0.10 moose per square mile.

The current bear density in this part of the state is 0.06 bears per square mile, indicating that bears, like moose, are not common. Fish and Game seeks to maintain low bear densities here to deter bear-human conflicts.

Fish and Game administers furbearer trapping permits for state lands, including Bear Brook State Park. Trapping is a highly regulated activity in New Hampshire. Trapper education is required, trapping is limited to specific times of year, and harvest is limited to a specific number of animals, among many other regulations. All harvested animals, regardless of whether they occurred on state lands or otherwise, are reported to Fish and Game by town. Given that Bear Brook State Park incorporates most of the town of Allenstown, furbearer harvest for Allenstown from 2006-2016 is presented here as an indication of furbearer populations in the park (see Table 7.10).

Seven species of furbearers were harvested in Allenstown during that time period. These include fisher, gray fox, mink, otter, raccoon, beaver and muskrat. Harvests are tallied using a catch per 100 trap nights index that allows comparisons to be drawn among years and regions of the state. The number of trap nights equals the number of traps set multiplied by the number of nights deployed. Based on this index, the harvest rate of fisher, otter, raccoon, beaver and muskrat was considerably lower in the park than the rest of southeast New Hampshire. This may simply be a reflection of trapper efficacy or differences in habitat compared to other parts of the region. In contrast, the harvest of gray fox was much higher than the rest of the region, but that is likely an artifact of low sample size (only targeted in one year) and/or or the trapper targeting a known individual.

Table 7.10 Trapping effort and success in the town of Allenstown from 2006-2016 with a comparison to trapping success in southeast NH for the same time period

Species	*#Years Pursued*	*#Taken*	*#Trap Nights**	*Avg Catch/ 100 Trap Nights^*	*Average Catch/ 100 Trap Nights in Southeast NH*
Fisher	8	9	1,185	0.72	1.90
Gray Fox	1	1	30	3.33	0.84
Mink	6	12	1,180	1.02	1.33
Otter	10	21	2,310	1.48	2.29
Raccoon	7	8	930	1.17	3.82
Beaver	10	58	3,100	1.81	6.18
Muskrat	7	38	2,320	1.72	6.13

* #Trap nights = #traps x #nights deployed so 4 traps set for 5 nights = 20 trap nights

^ Catch/100 Trap nights provides a standardized index of success to allow comparisons with historic data and other regions of the state.

Focal Species

Fish and Game biologists have identified 37 species of management concern, so considered because of rarity in the state or region, particular sensitivity to habitat alteration or human disturbance, potential impacts on habitats, and/or social or economic importance. Table 7.11 details species habitat descriptions and needs as well as management recommendations to ensure the continued presence of these species within the Park. It is important to note that the species presented in Table 7.11 are not listed in order of management priority. Where there are conflicts in management recommendations between species, consideration for state-listed species should take precedence because of state laws protecting those species. In addition, this list may be revised by the Fish and Game Department during the life of this management plan in response to new species information and federal and state species listing status.

Table 7.11 Bear Brook State Park focal species of management concern with habitat recommendations

This table identifies focal species of management concern at Bear Brook Sate Park, and provides habitat descriptions, needs, and management recommendations to ensure the continued presence of these species within the park. All species in this table are Species of Greatest Conservation Need but may also have state or federal listing status. It is important to note that the species presented in this table are not listed in order of management priority. Several species in this table utilize the same habitats and share similar management recommendations, however, where there are conflicting recommendations, recommendations should be considered first for state-listed species. In addition, this list may be revised by Fish and Game during the life of this management plan in response to new species information and to reflect changes in the status of species listings at the federal and state level.

FISH

Focal Species: Eastern Brook Trout
Relevant Management Criteria: 1, 2, 3, 4
Justification: SGCN, sensitive to the management of riparian areas.
Habitat: Coldwater and coolwater streams
Status in Bear Brook State Park: Documented in several streams
Management Recommendations:
• Maintain a 50 foot, no harvest riparian buffer along streams with documented populations of wild brook trout. A wide, well vegetated buffer provides adequate shading to maintain cooler summer water temperatures, as well as providing adequate instream material from falling trees, limbs, and leaves which provide critical habitat.

REPTILES

Focal Species: Eastern ribbon snake
Relevant Management Criteria: 1, 2, 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Being semi-aquatic, Eastern ribbon snakes are found near emergent marshes, wet meadows, scrub-shrub wetlands, beaver impoundments, bogs, river and stream floodplains, and vegetated shorelines of ponds and lakes. They will use muskrat (Ondatra zibethica) bank burrows and lodges, ant mounds, mammal tunnels, and rock crevices for hibernation.
Status in Bear Brook State Park: Documented
Management Recommendations:
• Maintain vegetated buffers along the edges of wetlands and vernal pools in accordance with the recommendations found in Good Forestry in the Granite State.
• Eastern ribbon snakes utilize similar habitats as Blanding's turtles. See Blanding's turtle Management Recommendations for guidance.

Focal Species: Northern black racer
Relevant Management Criteria: 3
Justification: State Threatened species. Suitable habitat exists and can continue to exist with management.
Habitat: Black racers use a wide variety of open and disturbed habitats, including brushy areas, utility rights-of-way, grasslands, old fields, the edges of agricultural fields, sand-pits, rocky ridges and ledges, and young forests. They often move between forested habitats to reach their preferred habitats. Black racers use mammal burrows, rock crevices, rotting logs, and accumulated vegetation as nest sites, retreats, and for hibernation. Multiple snakes can use the same den site.
Status in Bear Brook State Park: Rare, documented

Management Recommendations:
• Maintain large clusters of old fields, shrublands, and young forests through rotational mowing and/or commercial timber harvesting.
• Coordinate winter harvest activities with NHFG to reduce potential impacts to areas where snakes are likely to hibernate in Criteria 3.
• Enhance understory regeneration in forested stands between old fields, shrublands, and young forests through timber management when possible.
• Allow dead trees and woody material to decompose naturally.
• After timber harvests, leave stumps, blowdowns, snags, and other woody material to provide nesting and foraging areas.
• Rock outcrops are used as den and basking sites. If shaded, thin or girdle trees to allow adequate sunlight for improved basking opportunities for snakes.

Focal Species: Smooth green snake
Relevant Management Criteria: 1, 2, 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Smooth green snakes are typically found in upland grassy fields, pastures, meadows, blueberry barrens, and forest openings with plenty of herbaceous cover and direct sunlight. Their preferred habitats include old fields, wet meadows and clearings in forests. They overwinter underground in animal burrows, under rock crevices and sometimes in ant mounds.
Status in Bear Brook State Park: Documented
Management Recommendations:
• Maintain large clusters of old fields, shrublands, and young forests through rotational mowing and/or commercial timber harvesting.
• Enhance understory regeneration in forested stands between old fields, shrublands, and young forests through timber management when possible.
• Allow dead trees and woody material to decompose naturally.
• After timber harvests, leave stumps, blowdowns, snags, and other woody material to provide nesting and foraging areas.

Focal Species: Timber rattlesnake
Relevant Management Criteria: 1, 2, 3, 4
Justification: State Endangered species. Suitable habitat exists and can continue to exist with management.
Habitat: Timber rattlesnakes require large areas of mature, deciduous or mixed forests with adequate openings in the canopy for basking. Females require exposed basking sites to develop their young. These basking sites typically consist of rocky outcroppings with protective cover such as crevices, patches of dense vegetation and fallen woody material. Rocky hillsides with southern exposures and crevices that extend below the frost line are often used as den sites. Multiple snakes may use the same den site.
Status in Bear Brook State Park: Rare, documented
Management Recommendations:
• Continue to maintain large tracts of forests, preferably with no recreational activity, but minimally with limited recreational activity.
• Create and maintain canopy openings through forest harvesting to improve habitat by creating foraging opportunities and basking locations for gestating females.
• Avoid forestry activities from mid-April to late-October in areas of the park that contain known populations of rattlesnakes (consult with NHFG on locations and timing of harvest activities).
• Allow dead trees and woody material to decompose naturally.
• After timber harvests, leave stumps, blowdowns, snags, and other woody material to provide foraging opportunities.

• Rock outcrops are used as den and basking sites. If shaded, thin or girdle trees to allow adequate sunlight for improved basking opportunities for snakes (consult with NHFG).
• Consider seasonal trail closures, relocations, or permeant closures to preserve habitat suitability consult with the NHFG to identify key areas).

Focal Species: Blanding's turtle
Relevant Management Criteria: 1, 2, 3, 4
Justification: State Endangered species. Suitable habitat exists and can continue to exist with management.
Habitat: Blanding's turtles require large intact landscapes with a diversity of wetland types as well as areas with sandy openings for nesting. They are often associated with buttonbush swamps, highbush blueberry-winterberry shrub thickets, and deep marshes with emergent vegetation. Vernal pools are also an important habitat requirement for this species. Between mid-May and early July, Blanding's turtles may travel as far as 1.5 miles to reach nesting locations. Vernal pools provide foraging areas and refuge during these upland movements.
Status in Bear Brook State Park: Rare, documented
Management Recommendations:
• Avoid forestry activities within 328 feet (100 meters) of vernal pools, potential vernal pools, scrub-shrub swamps, and emergent wetlands, or other wetlands known or predicted to be used by Blanding's turtles, during the active season from March 1st to September 15th, unless snow and ice cover remains by March 1st. When possible, schedule forestry activities during the winter inactive season between November 1st and February 28th (consult with NHFG to identify key areas when planning harvests).
• Avoid forestry activities within the connecting areas between wetlands and vernal pools that occur within 656 feet (200 meters) of one another during the active season from March 1st to September 15th, unless snow and ice cover remains by March 1st (consult with NHFG to identify key areas when planning harvests).
• Follow recommendations for buffers around vernal pools and other wetlands as outlined in Good Forestry in the Granite State (consult with NHFG on the size of buffers, particularly in Management Criteria 3 where openings tend to be larger).
• Do not stage forestry equipment in known or potential nesting areas, such as gravel pits from May 15th to September 15th (consult with NHFG for specific site recommendations).
• Avoid siting new trails within high priority areas and reroute existing trails away from nesting areas and wetland movement corridors when possible. Where such trails already exist, and relocation is not an option, consider seasonal closures or delayed trail openings. Most trail and turtle conflicts occur in June, when turtles are seeking nesting sites (consult with NHFG on location of trails – see Recreational Chapter for further discussion).

Focal Species: Spotted turtle
Relevant Management Criteria: 1, 2, 3, 4
Justification: State Threatened species. Suitable habitat exists and can continue to exist with management.
Habitat: Spotted turtles require large intact landscapes with a diversity of wetland types and sizes. They have been found using a variety of wetland habitats—marshes, wet meadows, ponds, forested and shrub swamps, fens, shallow slow-moving streams and rivers, and vernal pools. They hibernate in wetland habitats under the cover of dense clumps of herbaceous vegetation or within cavities created by the roots of trees or shrubs. Seasonal shifts in habitat use will vary, with both upland and wetland movements, sometimes greater than 1,500 feet. In the spring, wetlands and vernal pools with abundant wood frog (Lithobates sylvaticus) egg masses are commonly used. Females will seek out open-canopied uplands with loose, well-drained soils between late May and early July for nesting.
Status in Bear Brook State Park: Rare, documented

Management Recommendations:
• Avoid forestry activities within 328 feet (100 meters) of vernal pools, potential vernal pools, scrub-shrub swamps, and emergent wetlands, or other wetlands known or predicted to be used by Blanding's turtles, during the active season from March 1st to September 15th, unless snow and ice cover remains by March 1st. When possible, schedule forestry activities during the winter inactive season between November 1st and February 28th (consult with NHFG to identify key areas when planning harvests).
• Avoid forestry activities within the connecting areas between wetlands and vernal pools that occur within 656 feet (200 meters) of one another during the active season from March 1st to September 15th, unless snow and ice cover remains by March 1st (consult with NHFG to identify key areas when planning harvests).
• Follow recommendations for buffers around vernal pools and other wetlands as outlined in Good Forestry in the Granite State (consult with NHFG on the size of buffers, particularly in Criteria Zone 3 where openings tend to be larger).
• Do not stage forestry equipment in known or potential nesting areas, such as gravel pits from May 15th to September 15th (consult with NHFG for specific site recommendations).
• Avoid siting new trails within high priority areas and reroute existing trails away from nesting areas and wetland movement corridors when possible. Where such trails already exist, and relocation is not an option, consider seasonal closures or delayed trail openings. Most trail and turtle conflicts occur in June, when turtles are seeking nesting sites (consult with NHFG on location of trails – see Recreational Chapter for further discussion).

Focal Species: Wood turtle
Relevant Management Criteria: 3
Justification: Species of Special Concern. Suitable habitat exists and can continue to exist with management.
Habitat: Wood turtles prefer slow-moving, sinuous rivers and streams with hard sand or gravel substrate, and make extensive use of surrounding uplands during the late spring and summer (within 1,000 feet of the river or stream). A mosaic of rivers or streams with overhanging riparian vegetation, field, forest, dense shrub thicket, and bare sand for egg laying is important.
Status in Bear Brook State Park: Rare, documented
Management Recommendations:
• Maintain a 300 foot, no harvest riparian buffer along streams that contain known populations of wood turtles or other key habitat components.
• Avoid harvesting timber from early April to late October in areas that contain known populations of wood turtles or key habitat components (consult with NHFG to identify key areas when planning harvests).
• Small group selection cuts within the 300 foot (100-meter) riparian buffer (implemented after October 15th) may enhance riparian habitat quality where young forests or nesting areas are lacking (consult with NHFG).
• Mow or clear fields during the inactive season (after October 15th).
• To reduce haying or mowing-related mortality, use sickle bar mowers with a height of greater than 6 inches instead of rotary blade mowers.
• Consider inactive season burning (after October 15th or prior to April 15th) or year-round grazing to keep areas open.
• Where little cover exists, plant alder (Alnus sp.), dogwoods (Cornus sp.), arrowwood (Viburnum sp.), and willow (Salix sp.) along with grasses and forbs in the riparian area next to agriculture fields, using the buffer widths above when practical.
• Avoid siting new trails within areas that contain known populations and reroute existing trails away from known or potential nesting areas Where such trails already exist, and relocation is not an option, consider seasonal closures or delayed trail openings. Most trail and turtle conflicts occur in June, when

turtles are seeking nesting sites (consult with NHFG on location of trails - see Recreational Chapter for further discussion).

BIRDS

Focal Species: American black duck
Relevant Management Criteria: 1, 2, 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Found in freshwater wetlands including beaver ponds, brooks lined by speckled alder, shallow lakes and ponds with emergent vegetation, and wooded swamps. Ground nester on dry land that is close to water. Nests are generally concealed under overhanging grass or other vegetation. Occasional nests are located in crotches, hollows, or cavities of large trees.
Status in Bear Brook State Park: Documented, relative abundance and breeding status unknown.
Management Recommendations:
• Maintain health of freshwater wetlands.
• Group selection (1/4-1/2 acre groups) along the marsh edge will provide concealed nesting habitat and forage for beavers to maintain breeding ponds. This would be most appropriate for Management Criteria 2 and 3.
• Periodic, temporary water drawdowns of Hayes and Hall Mountain Marsh will rejuvenate wetland vegetation resulting in improved food and cover for black ducks and other waterfowl. This should be done in consultation with the Nongame and Endangered Species Program to ensure timing does not negatively impact state-listed species.

Focal Species: Brown thrasher
Relevant Management Criteria: 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Thickets, brush, shrubbery. Breeds in areas of dense low growth, especially thickets around edges of deciduous or mixed woods, shrubby edges of swamps, or undergrowth in open pinewoods.
Status in Bear Brook State Park: Documented, relative abundance unknown.
Management Recommendations:
• Continue to implement periodic clearcuts within Management Criteria 3 to maintain suitable habitat. Will not use habitats resulting from partial cuts.
• Maintain old fields and powerline rights of way in shrubland condition.

Focal Species: Canada warbler
Relevant Management Criteria: 2,3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Deciduous, coniferous, and mixed forests with heavy deciduous undergrowth; wooded swamps and bogs; streamside thickets, and cutover areas. Nests on the ground usually near a pond, stream, or small wetland.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Maintain or create mixed wood stands with 50-70% canopy cover, a dense understory (0-5') and midstory (6-30'), and an uneven forest floor. Will also use regenerating clearcuts. Populations peak 8-15 years post-harvest.
• Leave as much woody debris on site as possible, and avoid disturbing tip-ups or logs in or near wet areas during harvest.
• Retain softwood inclusions in hardwood stands.

Focal Species: Eastern towhee
Relevant Management Criteria: 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Dense brushy understory with well drained soils. Uses a variety of early successional and other shrub-dominated habitats, including pine barrens, old fields, power line corridors, and occasionally the shrubby portions of bogs and fens. Also occurs in forested habitats with scattered overstory trees and a well-established shrub layer.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Implement silvicultural practices to maintain suitable habitat including shelterwood, seed tree, or clearcut harvests. Populations peak 2-12 years post-harvest.
• Maintain old fields and powerline rights of way in shrubland condition.

Focal Species: Eastern whip-poor-will
Relevant Management Criteria: 2, 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Prefers areas of dense shrubs or young forest and avoids closed-canopy mature forests. Most home ranges included either a significant edge (e.g., wetland, powerline right-of-way, gravel pit) or a large area (> 7.5 ac) of forest regeneration or shrubby thicket. In the absence of such features, birds select areas of open canopy forests that results from thinning, shelterwood, or single tree selection silviculture. Whip-poor-wills tend to reach higher densities in pine barrens than in pine/hardwood forests, and are almost entirely absent from hardwood dominated landscapes.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Create a mosaic of open forest and shrubby openings (e.g., old fields, powerline ROWs, young forest habitat). Shrubby openings should be ~ 7.5-10 ac.
• Implement silvicultural practices to maintain suitable habitat including thinnings (removing up to 50% of basal area), shelterwoods, clearcuts, and overstory removal particularly in areas with established regeneration in place.
• Prescribed burns also appear beneficial.

Focal Species: Field sparrow
Relevant Management Criteria: 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Found at all seasons in brushy overgrown fields, second growth, woodland edges, and hedgerows in open country. Sometimes around brushy edges of marshes. Does not usually live in wide-open grassy fields unless they contain scattered shrubs.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Implement silvicultural practices to maintain suitable habitat including shelterwood, seed tree, or clearcut harvests.
• Maintain old fields and powerline rights of way in shrubland condition.

Focal Species: Northern goshawk
Relevant Management Criteria: 1, 2
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: White pine is most common nesting tree but will also use paper birch, yellow birch, big-toothed aspen, and red maple. Forest stands with nests tend to be mature, containing some large diameter trees, and have relatively dense canopies with open understories. Most have been somewhat disturbed. Nest trees are often situated close to some type of forest opening (e.g., small breaks in the canopy, trails, forest roads, and upland openings). Forage in closed canopy forests with open

understories where prey is accessible, but younger stands and openings are important for prey production.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown. If breeding, likely only one or two breeding pairs as breeding territories are quite large.
Management Recommendations:
• Maintain 60 – 100% crown closure using uneven-aged management.
• Follow "Good Forestry in the Granite State" recommendations when harvesting near raptor nests.
• Retain and manage for abundant woody debris to provide habitat for prey populations.
• Maintain wildlife openings for prey production.

Focal Species: Prairie warbler
Relevant Management Criteria: 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Occupies shrubby habitats formed after a disturbance opens up the forest canopy. Breeds in openings with patches of dense woody understory vegetation, such as overgrown fields with shrubs or young forest habitat. Nests are placed low in dense thickets or shrubs, and adults forage in the cover of shrubby vegetation.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Implement silvicultural practices to maintain suitable habitat including shelterwood, seed tree, or clearcut harvests.
• Maintain old fields and powerline rights of way in shrubland condition.

Focal Species: Purple finch
Relevant Management Criteria: 2
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Occupies thick hemlock, pine, or other conifer forests. In winter, they can be found feeding in other habitats such as orchards, shrublands, hardwood forests, or at birdfeeders, often roosting in nearby evergreens.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Use uneven-age management to create small groups ranging from 1/10 to 2 acres.

Focal Species: Ruffed grouse
Relevant Management Criteria: 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Inhabits brushy, uneven-aged forests, young to mature hardwood and mixed forests, often with aspen and birch as a component. Optimal habitat includes young (6-15 year old), even-aged deciduous stands typically supporting 50,000-62,500 woody stems/acre. Broods prefer areas with dense understory and fairly open herbaceous ground cover.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Use even-aged forest management.
• Retain aspen and birch where it occurs.
• In Appalachian oak forests, maintain a mosaic of young stands (< 20 years old) well interspersed with mature stands (> 40 years old) to provide both protective cover and a source of hard mast.
• When possible maintain log yards or create permanent wildlife openings to provide a source of insects and herbaceous vegetation.

Focal Species: Scarlet tanager
Relevant Management Criteria: 1, 2
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Uses a wide range of mature hardwood and mixed forest, especially with oaks. In most of its range the species is considered area sensitive, rarely occupies forest fragments smaller than 25-acres.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Maintain or create well-stocked, uneven-aged, hardwood sawtimber stands with >80% crown closure.
• Tanagers are area sensitive. In a heavily forested landscape (>70% crown closure), a patch of at least 40 acres is needed for successful breeding.

Focal Species: Veery
Relevant Management Criteria: 1, 2
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Inhabits deciduous or coniferous woodlands generally below 2,000 feet in elevation. In summer chooses forests with a thick regeneration layer of ferns and shrubs. Nests and forages on or near ground.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Maintain or create hardwood stands with 30-80% crown closure and a dense regeneration layer (0-5') proximate to wetlands and/or riparian areas.
• Retain slash, stumps, tip-ups, and woody debris on site as much as possible to provide shelter and nest sites.

Focal Species: Wood duck
Relevant Management Criteria: 1, 2, 3
Justification: Management priority for recreation (hunting and wildlife viewing) and wetland conservation. Waterfowl are the most economically important group of migratory birds in North America.
Habitat: Thrive in bottomland forests, swamps, freshwater marshes, and beaver ponds. Common along streams of all sizes, from creeks to rivers. Seem to fare best when open water alternates with 50–75% vegetative cover that the ducks can hide and forage in. Cover can consist of downed trees, shrubs such as alder, willow, and buttonbush, as well as emergent herbaceous plants such as arrowhead and smartweeds. Nests in cavities, both natural and manmade (i.e., nest boxes).
Status in Bear Brook State Park: Documented, known breeder, relative abundance known from duck box surveys.
Management Recommendations:
• Maintain health of freshwater wetlands.
• Retain cavity trees within wetland buffers to provide nesting opportunities. Augment cavity trees with duck boxes when needed.
• Periodic, temporary water drawdowns of Hayes and Hall Mountain Marsh will rejuvenate wetland vegetation resulting in improved food and cover for wood ducks and other waterfowl. This should be done in consultation with the Nongame and Endangered Species Program to ensure timing does not negatively impact state-listed species.

Focal Species: Wood thrush
Relevant Management Criteria: 1, 2
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Inhabits deciduous or coniferous woodlands generally below 2,000 feet in elevation. In summer chooses forests with thick understory of ferns and shrubs. Nests and forages on or near ground. Nests in shrub layer to sub-canopy (6-50 ft in height).
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Maintain or create well-stocked, uneven-aged, sawtimber hardwood stands with >80% crown closure and moist leaf litter.
• In a heavily forested landscape (>90% crown closure), an area of at least 70 acres is needed for successful breeding.
• consider operating in winter to avoid disturbance and desiccation of leaf litter and soil conditions..

MAMMALS

Focal Species: White-tailed deer
Relevant Management Criteria: 1, 2, 3
Justification: Species is a management priority both from a recreational standpoint and potential ecosystems impacts (if populations get too high). Most important game species in New Hampshire since pre-colonial days.
Habitat: A generalist species (i.e., adapted to a wide variety of habitat types). Populations are strongest in areas of high habitat diversity including fields, croplands, shrub lands, wetlands, and forests.
Status in Bear Brook State Park: Documented, Park is located in WMU L which has some of the strongest deer populations in the state.
Management Recommendations:
• Habitat already suitable in the park. Maintaining a diversity of habitats as prescribed throughout this chapter will also be beneficial to deer.
• Balance recreational activities to ensure hunting is feasible within most of the park to aid in meeting WMU L population objectives. Meeting population objectives will help minimize human-wildlife conflicts and ecosystem impacts while providing ample hunter and wildlife viewing opportunities.

Focal Species: Big brown bat
Relevant Management Criteria: 1, 2, 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Big brown bats use three types of habitat: forests, buildings, and caves or mines. Forests with associated openings, streams and wetlands are used for foraging from the time they emerge from hibernation in the spring to the time they enter hibernation in late fall. Bats will use trees for day and night roosts during this active season. They will use many kinds of buildings for night and maternity roosts and heated or unheated but insulated buildings for hibernating. They also use caves or mines or similar artificial subterranean structures such as bunkers for hibernating.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Provide a diverse landscape including young and old forest stands, snags, open areas, and clean, accessible water.
• Retain a network of large-diameter trees and snags as roost tree switching is common.
• When practical follow other guidelines in "Beneficial Forest Management Practices for WNS-affected Bats: Voluntary Guidance for Land Managers and Woodland Owners in the Eastern United States" (2018) or successor publications.

Focal Species: Eastern red bat
Relevant Criteria Zone: 1, 2, 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Roosts and forms maternity colonies in tree foliage in a variety of deciduous tree species, often in the largest trees high off the ground near the outer canopy edge and near sources of water. Timber harvesting can limit availability of suitable roost/maternity trees. Migrates south in fall.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Provide a diverse landscape including young and old forest stands, snags, open areas, and clean, accessible water.
• Retain a network of large-diameter trees and snags as roost tree switching is common.
• When practical follow other guidelines in "Beneficial Forest Management Practices for WNS-affected Bats: Voluntary Guidance for Land Managers and Woodland Owners in the Eastern United States" (2018) or successor publications.

Focal Species: Hoary bat
Relevant Management Criteria: 1, 2, 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Roosts in tree foliage during spring, summer, and fall. Typically roosts solitarily. Migrates south in the fall. Hoary bats forage within forest openings and along forest edges, as well as along riparian corridors.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Provide a diverse landscape including young and old forest stands, snags, open areas, and clean, accessible water.
• Retain a network of large-diameter trees and snags as roost tree switching is common.
• When practical, follow other guidelines in "Beneficial Forest Management Practices for WNS-affected Bats: Voluntary Guidance for Land Managers and Woodland Owners in the Eastern United States" (2018) or successor publications.

Focal Species: Little brown bat
Relevant Management Criteria: 1, 2, 3
Justification: State Endangered species. Suitable habitat exists and can continue to exist with management.
Habitat: Summer roosts close to water. Roosts include barns, attics, and outbuildings. Males may use tree cavities as well. Feeds primarily over wetlands and ponds. Use rivers, streams, and trails as travel corridors.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Provide a diverse landscape including young and old forest stands, snags, open areas, and clean, accessible water.
• Retain a network of large-diameter trees and snags as roost tree switching is common.
• When practical, follow other guidelines in "Beneficial Forest Management Practices for WNS-affected Bats: Voluntary Guidance for Land Managers and Woodland Owners in the Eastern United States" (2018) or successor publications.
• Continue with voluntary bat acoustic sampling prior to forest management or other large-scale tree harvesting activities (e.g., campground development). If present, restrict timber harvesting activities during the pupping season (May 15th to August 15th).

Focal Species: Northern long-eared bat
Relevant Management Criteria: 1, 2, 3
Justification: Federally Threatened species, State Endangered species. Suitable habitat exists and can continue to exist with management.
Habitat: Roosts singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags. Winters in caves and mines.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Provide a diverse landscape including young and old forest stands, snags, open areas, and clean, accessible water.
• Retain a network of large-diameter trees and snags as roost tree switching is common.
• When practical, follow other guidelines in "Beneficial Forest Management Practices for WNS-affected Bats: Voluntary Guidance for Land Managers and Woodland Owners in the Eastern United States" (2018) or successor publications.
• Continue with voluntary bat acoustic sampling prior to forest management or other large-scale tree harvesting activities (e.g., campground development). If present, restrict timber harvesting activities during the pupping season (May 15th to August 15th).

Focal Species: Silver-haired bat
Relevant Management Criteria: 1, 2, 3
Justification: SGCN. Suitable habitat exists and can continue to exist with management.
Habitat: Roosts in deep tree cavities generally in large tall trees, often in early to moderate stages of decay. Most often in mature stands with sugar maple, white cedar, and white birch. Migrates south in the fall.
Status in Bear Brook State Park: Documented, assumed breeder, relative abundance unknown.
Management Recommendations:
• Provide a diverse landscape including young and old forest stands, snags, open areas, and clean, accessible water.
• Retain a network of large-diameter trees and snags as roost tree switching is common.
• When practical, follow other guidelines in "Beneficial Forest Management Practices for WNS-affected Bats: Voluntary Guidance for Land Managers and Woodland Owners in the Eastern United States" (2018) or successor publications.

Focal Species: Eastern small-footed bat
Relevant Management Criteria: 1, 2, 3
Justification: State Endangered. Suitable habitat exists and can continue to exist with management.
Habitat: Roosts in rock crevices in outcrops and talus slopes. Hibernate in caves or mines free of human disturbance may also hibernate in rock crevices.
Status in Bear Brook State Park: Documented, relative abundance unknown.
Management Recommendations:
• Provide a diverse landscape including young and old forest stands, snags, open areas, and clean, accessible water.
• Retain a network of large-diameter trees and snags as roost tree switching is common.
• When practical, follow other guidelines in "Beneficial Forest Management Practices for WNS-affected Bats: Voluntary Guidance for Land Managers and Woodland Owners in the Eastern United States" (2018) or successor publications.
• Continue with voluntary bat acoustic sampling prior to forest management or other large-scale tree harvesting activities (e.g., campground development). If present, restrict timber harvesting activities during the pupping season (May 15th to August 15th).

Focal Species: Tricolored bat
Relevant Management Criteria: 1, 2, 3
Justification: State Endangered species. Suitable habitat exists and can continue to exist with management.
Habitat: Forages over open water and along forest-field edges, new clearcuts and group cuts. Roosts in tree foliage. Hibernate in caves or mines, although they occasionally use other structures. Females form maternity colonies in live or dead foliage of deciduous trees. The birth and weaning of young occur within these foliage roosts. Females may prefer to roost in oak and maple trees. Though a foliage-roosting species, individuals occasionally roost in man-made structures.
Status in Bear Brook State Park: Not documented in park, but park within specie's range.
Management Recommendations:
• Provide a diverse landscape including young and old forest stands, snags, open areas, and clean, accessible water.
• Retain a network of large-diameter trees and snags as roost tree switching is common.
• When possible, follow other guidelines in "Beneficial Forest Management Practices for WNS-affected Bats: Voluntary Guidance for Land Managers and Woodland Owners in the Eastern United States" (2018) or successor publications.
• Continue with voluntary bat acoustic sampling prior to forest management or other large-scale tree harvesting activities (e.g., campground development). If present, restrict timber harvesting activities during the pupping season (May 15th to August 15th).

7.5 RECOMENDATIONS

Assess and monitor the Focal Species identified in Table 7.11, and identify opportunities to implement research on these species of management concern in Bear Brook State Park.
A few formal surveys and incidental observations have yielded significant information on the occurrence and distribution of wildlife in the Bear Brook State Park. In addition, knowledge of regional wildlife distributions, habitat relationships and population trends enables some inference about the status of various species in the park. However, much remains to be learned. Biologists have compiled a list of focal species along with management recommendations based on habitat needs and species use of the Park (see Table 7.11). Research and monitoring efforts designed to determine the status, distribution, and habitat needs of these animals in the park will be a priority. It will also be an equally important priority to monitor wildlife response to forest and habitat management as well as recreational use and development that has occurred and will take place as a result of this management plan.

Wildlife inventory and monitoring require adequate personnel and funding. Both of these are limited within the state agencies involved in managing Bear Brook State Park. As a result, the state's ability to implement a wildlife inventory and monitoring program is currently severely restricted. Partnerships and cooperative funding agreements would need to be developed to carry out additional work. Wildlife research by academic interests such as the University of New Hampshire, Plymouth State University, and Dartmouth College should be promoted, as appropriate. In addition, consider partnering with non-profit conservation organizations or other relevant partners to conduct one or more bioblitzes, events that focus on finding and identifying as many species as possible in a specific area over a short period of time, usually 24 hours.

Manage for high priority wildlife habitat for the Focal Species listed in Table 7.11.
Bear Brook State Park contains a wide diversity of high-quality upland and wetland habitats that are critical to the survival of numerous wildlife, several of which are state-listed species and are disappearing or becoming impaired in New Hampshire, particularly in the southern part of the state. Maintaining, managing and restoring wildlife habitat in this large, relatively intact state park is vital to maintaining healthy, diverse populations of wildlife in New Hampshire.

Table 7.11 contains a list of species, which have been identified by biologists as those most in need of habitat conservation. Depending on the habitat type, recreational use, and landscape location, management recommendations have been included in this table for these species, but it is important to note that these recommendations may not always be applicable nor are the recommendations in this table exhaustive. Fish and Game and the Department of Natural and Cultural Resources will work together to determine appropriate management actions necessary that will benefit focal species in consideration of other land use needs.

Identify, document, and protect vernal pools and vernal pool complexes within Bear Brook State Park.
There is a lack of good data for identifying the size, location and number of vernal pools within the park. Identification and documentation should be standardized using GPS and incorporated into the GIS database as part of the normal natural resource management work flow process at the park. Resource managers should be provided training to identify vernal pools both in the active and dry seasons to better facilitate identification of vernal pools. When implementing projects, resource managers should follow recommendations for protecting vernal pools found in *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire* (2010), as well as consulting with the NH Fish and Game Nongame and Endangered Wildlife Program.

Protect the integrity and function of wetlands within Bear Brook State Park.
Wetlands serve as critical habitat for multiple focal wildlife species. Identification and documentation of wetlands should be standardized using GPS and incorporated into the GIS database as part of the normal natural resource management workflow process at the park. Healthy riparian management zones should be maintained, especially along streams with a recommended 50 foot unharvested buffer, to provide shade to keep summer water temperatures naturally cool for wild brook trout and to allow for the short- and long-term natural accumulation of fallen trees in streams. This natural instream wood provides excellent fish habitat.

Where possible, beaver activity including creation and abandonments of wetlands, should be permitted to ensure a variety of wetlands habitat in multiple successional stages. Water level management is not recommended aside of those areas that are currently managed for waterfowl. However, any water level drawdowns due to beaver dam removal that does occur should not occur during overwintering (October – April) to prevent fish mortality. Drawdowns should also be documented for future reference.

Provide a mix of forest age and size classes across the landscape of Bear Brook State Park. Continue to implement the silvicultural strategies within the Management Criteria system to work towards the following desired future condition for forest and non-forest (e.g., wildlife openings, fields, shrublands, etc.) structure to provide suitable habitat for the entire suite of focal wildlife. A full-range of forest age classes along with non-forested habitats, well-distributed across the landscape, is important to support the great diversity of wildlife dependent on these forest types and to provide resiliency in the face of climate change.

Table 7.12 Habitat structure goals based on maximum allowable regeneration by Criteria*

	Criteria 1			*Criteria 2*			*Criteria 3*	
	Acres	*Percent*		*Acres*	*Percent*		*Acres*	*Percent*
Forested Habitats								
Seedling	0	0%		150	4%		260	7%
Sapling-Pole	0	0%		450	13%		780	20%
Sawtimber	0	0%		750	22%		1,300	33%
Large Sawtimber	1,702	79%		1,716	50%		1,268	32%
Non-forested Habitats								
Upland Openings	13	1%		100	3%		100	3%
Wetlands	452	21%		260	8%		196	5%
Totals	2,167	100%		3,426	100%		3,904	100%

*Calculations exclude Criteria 4 (developed recreation)

In Management Criteria 1, allow natural forces to continue to operate on the forests. As the forests in this area mature they will provide nesting sites for northern goshawk, and an extensive area of largely undisturbed forest required by songbirds like scarlet tanager and veery. As large trees mature and die from disease, rot, or other causes, the loose bark and cavities that result will provide excellent roosting areas for bats. If located close to streams, trees that fall into those streams will greatly improve brook trout habitat. Blanding's and spotted turtles will benefit from an area largely undisturbed.

In Management Criteria 2, manage to emulate small gap dynamics using uneven-aged silvicutural treatments such as group selection, single tree selection and other uneven-aged techniques to provide vertical and horizontal vegetative complexity. Small gaps in the canopy will promote new forest growth that will enhance nesting opportunities for woodland songbirds that nest on or near the ground such as wood thrush and veery, provide basking opportunities for reptiles, and browse and foraging areas for deer and bats. Focal species from Table 7.11 that would benefit from this recommendation in addition to those already named include: smooth green snake, Canada warbler, eastern whip-poor-will, northern goshawk, purple finch, and scarlet tanager (if > 80% of canopy remains).

In Management Criteria 3, provide a continuous supply of young, regenerating forest habitat using silvicultural treatments such as shelterwood, overstory removal, and clearcutting to create openings 5 to 30 acres in size to enhance future cover for wildlife, berry-producing shrubs, hardwood stump sprouts, and other key features of young forest habitats. Generally speaking, the

larger the forest opening or clearcut, the greater benefit it has for breeding birds, including those breeding in surrounding forests. To further maximize the benefit of new forest openings to wildlife, when possible, create new openings near utility corridors, or old, brushy fields. Focal species from Table 7.11 that would benefit from this recommendation includes black racer, smooth green snake, wood turtle, brown thrasher, Canada warbler, eastern towhee, eastern whip-poor-will, field sparrow, prairie warbler, ruffed grouse, white-tailed deer, and all of the bats.

Maintain or provide within-stand features for wildlife.
Develop standards for forest resource inventory that will enable analysis of within-stand features such as downed woody material and snags that are important to many wildlife species. When conducting forest management activities in Criteria 2 or 3:

Maintain some overstory pine to provide additional wildlife cover, perches, seed sources, large future cavity trees, and raptor nest sites. ”Wolf pines” (large, branchy pines with low timber value) can be a good source for these wildlife habitat features.

Maintain downed woody material (fallen logs, branches, and leaves) on the forest floor as cover for small mammals, amphibians, and ground-nesting birds. Coarse woody material is used by more than 30 percent of the region's mammals, 45 percent of the amphibians, and 50 percent of the reptiles as feeding, hunting, or denning sites. Many wildlife rely on the prey that utilize downed woody material. Large downed logs (>18” diameter) provide “drumming sites” used by male ruffed grouse to attract females.

Maintain existing cavity trees and snags whenever possible. Cavity trees and snags at least 18” in diameter support the greatest diversity of wildlife species.

Re-introduce prescribed fire management at Bear Brook State Park.
Consider the use of prescribed fire as a wildlife management option in Criteria 3 and some areas of Criteria 2. Prescribed fire is an important tool in managing wildlife habitats and fire-influenced natural communities. Plants and wildlife both can benefit from prescribed fires.

As stated in Chapter 5, Ecological Assessment, Appalachian oak – pine forests in particular are fire-adapted communities, where occasional fire events can control late successional species like beech and hemlock and create regeneration opportunities for oak and pine species. There are also some pine barrens remnants that should be considered for restoration using a prescribed fire. One such area is adjacent to the habitat project area on the north end of Blackhall Road.

The acidic soils in much of the park support low bush blueberry, an important soft mast species that responds well to fire. Periodic prescribed burns in the late 1990’s and early 2000’s helped maintain berry productivity in the blueberry barrens off New Rye Road. During the red pine salvage harvest in 2013, the barren was expanded in size and is currently being maintained through periodic mowing. Use of prescribed burns should be considered for future maintenance.

Conserve grasslands and upland openings at Bear Brook State Park.
Existing grassland and upland openings should be maintained at Bear Brook State Park. Work with Fish and Game biologists to identify the need and suitable locations for additional wildlife

openings, particularly in Criteria 2, to meet non-forest habitat goals. Currently, Criteria 2 only has 16 acres of such habitats whereas it's generally recommended to have at least three percent, which would equate to 100 acres for Management Criteria 2 (Table 10). Criteria 3 is already at three percent. Such habitats provide important foraging opportunities (soft mast, herbaceous food, and insects) for wildlife including snakes, migratory songbirds (both forest and non-forest), raptors, ruffed grouse, bear, pollinator species and others. When possible openings should be 0.5-1 acre in size. Smaller openings would provide less habitat value. If planting is required; a mix of grasses, forbs, and shrubs benefit a greater diversity of wildlife than openings planted and maintained in a monoculture and will be easier to maintain in the long term.

Modify the agriculture agreement for the 13-acre field near the entrance of the park to include delayed mowing after July 15 to allow grassland birds to successfully nest and allows late-flowering wildflowers such as aster and goldenrod to provide nectar for migrating butterflies.

For the remaining fields, establish a rotational mowing program. This creates a patchwork of different grass heights that provides cover and feeding opportunities to the greatest number of wildlife. This technique will also help to prevent colonization of fields by trees by allowing some mowing outside of the dormant season. Also, work with NH Fish and Game staff to evaluate and implement the following recommendations for each field to be maintained for wildlife habitat within the park.

- For those fields important for turtle conservation mow after October 15 or before April 15. Alternatively, a minimum field buffer of25 feet should be retained until October 15.

- When managing for monarchs, mowing is recommended between June 20th and July 10th on a portion of available milkweed stands. This allows for milkweed to regrow for the last generation of monarchs; however, mowing within this timeframe should be coordinated with NH Fish and Game.

All fields, regardless if maintained for agriculture or wildlife, should be monitored for presence of invasive exotic plants and control actions taken as necessary to maintain native dominance.

Consider prescribed burning to aid in maintaining both ag fields and those managed for wildlife. Burning, particularly in areas with poor soilcan improve soil nutrients and mimic historical disturbances to grassland habitats. Burning will also help spread native grasses if they already exist in a field.

Assess the recreational trail systems at Bear Brook Sate Park for impacts to Focal Species in Table 7.11 and their habitats.

Recreational activities and infrastructure can have significant impacts on wildlife habitats and populations. Development of public use areas, such as parking lots and camping areas, consume habitat directly, while trails placed in or near sensitive habitats or too many trails can result in reduced wildlife abundance, reproduction, and survival. Thoughtful trail placement can help the public enjoy nature while minimizing disturbance to wildlife.

Park and resource managers should evaluate the existing trails and infrastructure using NH Fish and Game's "Trails for People and Wildlife" tool. Once areas of conflict are identified, park managers should conduct field reviews with Fish and Game biologists to assess conflicts and develop a plan to mitigate negative impacts. This process should also be applied to any future trail or recreational proposals early in the process (e.g., camping, orienteering and fat tire biking).

Consider trail relocations or seasonal closures to protect vernal pools, nesting areas, and other sensitive or core habitats. Core habitats are areas containing plant or animal species of concern, exemplary natural communities, or exceptional native diversity. Core habitats if impacted, would have a greater impact to the plant and/or animal species (Also see Chapter 5 for information on rare plant communities and exemplary natural communities).

Avoid or minimize new infrastructure or trails within critical habitat areas. Work with NH Fish and Game to map blocks of undisturbed habitat that include diverse habitat assemblages and rare habitats that should be identified as exclusionary zones for development, including recreation.

Identify hot spots for recreational equipment (e.g. mountain bikes and snowmobiles) collisions with wildlife. Work with NH Fish and Game to determine appropriate locations for road signage and in exploring other options to reduce road and trail wildlife injuries or mortality (e.g., speed bumps, gates, seasonal road closures, etc.).

Provide opportunities for the public to use and enjoy the wildlife resources at Bear Brook State Park including hunting, fishing, trapping, wildlife viewing and photography.
There continues to be strong public interest in maintaining traditional sportsmen activities at Bear Brook State Park. Hunting, trapping and fishing are among these traditional consumptive wildlife uses that are allowed under state law, and the Department of Natural and Cultural Resources has always provided for traditional consumptive and nonconsumptive wildlife uses on its state reservations. Maintaining hunting and reducing potential conflicts with other recreational users will help to reach population targets for white-tailed deer, which aim to minimize human-wildlife conflicts and ecosystem impacts while providing ample opportunities for harvest and wildlife viewing.

Evaluate and determine if the laws governing hunting in the game refuge should be modified to help meet population objectives of game species and/or social desires.
State laws governing the establishment of game refuges were enacted during a time when game populations were low and the Fish and Game Department was likely looking to limit harvest to restore those populations. Today deer populations in the southern part of the state, including in and around Bear Brook State Park, are strong and above population density objectives established by Fish and Game. Opening up the refuge to other methods of take such as muzzleloader or other firearms, could help in meeting those objectives, at least in the area surrounding the park, potentially reducing human-deer conflicts such as overbrowsing of the forest, deer-vehicle collisions, and other issues.
Even so, there are some hunters who enjoy the tradition of having an area still solely dedicated to archery hunting in the park but would like the opportunity to expand hunting by bow and arrow to other game species such as turkey or bear. RSA 212:15 provides the authority to allow the

expansion of hunting in game refuges. Fish and Game should work with the Department of Natural and Cultural Resources to evaluate the issue.

Work with partners to develop and deliver wildlife focused educational programs and improve wildlife habitat within the park.

In collaboration with state park staff and other interested agencies and organizations, develop programs and interpretive signage to help educate park users on the importance and value the wildlife habitat in Bear Brook State Park provides to Species of Greatest Conservation Need. Identify ways users can help protect these species. Develop and provide education on the connection between forestry practices, habitat management, recreational management and wildlife needs.

There are several conservation organizations, such as NH Audubon, the National Wild Turkey Federation, Ducks Unlimited, the Ruffed Grouse Society, the Quality Deer Management Association, and others, who have an interest in conserving and improving wildlife habitat on public and private lands. Managers should look for opportunities to partner with these groups to implement the wildlife monitoring and habitat management recommendations outlined in this plan.

8. FOREST HEALTH

Healthy forests are forests capable of providing quality diverse native habitat for both flora and fauna while at the same time responding to insect and disease attack, weather events, air pollution, and many other forest damage causing agents. Bear Brook State Park forests and their managers have a rich history of responding to stress from many severe damage causing events. The earliest documented forest health issues were the Chestnut blight shortly after the turn of the 19th century, the Blister rust epidemic of the early 1900's, the 1938 Hurricane, and the gypsy moth outbreaks in the late 1900's. These major events all had an effect on the forests we see at Bear Brook today. Some of the more recent issues include red pine scale, caliciopsis pinea, white pine needlecast, ozone damage, hemlock woolly adelgid, and emerald ash borer.

The Division of Forests and Lands Forest Health Program monitors and responds to forest health issues at Bear Brook State Park and statewide. This task is accomplished through aerial surveillance and GIS mapping, setting insect traps, inspecting areas of insect and disease outbreaks, direct service requests from landowners and foresters, cooperation with surrounding state and federal governments, education, outreach, and enforcement of quarantines.

The Division of Forests and Lands implements and enforces forest health programs and regulations to prevent the introduction or spread of exotic insects or diseases under the authority of RSA 430:2, 227-K:2 and 227-H:2. These statutes provide for the protection of forests from destructive insect and plant diseases. Currently regulated pests in New Hampshire include emerald ash borer, hemlock woolly adelgid, pine shoot beetle and white pine blister rust. State law (RSA 430:2 and RSA 227-K) gives both the Commissioner of the Department of Agriculture, Markets, and Food, and the Commissioner of the Department of Natural and Cultural Resources the authority to take whatever measures deemed reasonable and proper to control damaging insect or plant disease infestations anywhere in the state. In addition, New Hampshire has banned the importation of untreated firewood. The Statutory Authorities for the firewood quarantine are RSA 433:34, RSA 227-K:2 III, RSA 227-K:14; K:15; K:17, and RSA 227-G:3.

8.1 HISTORIC FOREST HEALTH ISSUES

The foresters and managers of Bear Brook State Park have a long history of responding to impacts from many influential forest health events over the last 100 years.

Chestnut Blight

This fungal disease was accidentally imported on Chinese chestnuts in 1904 and by 1950 most of the American chestnut ranging from Florida to New Hampshire were infected. As the chestnut dominated forests succumbed to the blight, they slowly converted to oak dominated forests across the entire range, including at Bear Brook State Park. The fungus kills chestnuts by causing cankers that slowly girdle the tree. However, it does not affect the root systems under the soil, and chestnut will continue to re-sprout and die in the understory for decades. These root sprouts will grow vigorously when exposed to full sunlight from disturbances, and it is not uncommon to find an abundance of chestnut sprouts after a timber harvest in the park, unfortunately, they eventually succumb to the blight, usually before they reach maturity.

White Pine Blister Rust
The earliest documented forest health activity at Bear Brook Sate Park was in 1930 when the land that was to become the park was scouted and mapped for the presence of gooseberries and currants as part of the statewide White Pine Blister Rust Eradication Program. Blister rust is another fungal disease accidentally imported to North America in the early 1900's at a time when millions of white pine seedlings were imported to re-forest abandoned agricultural lands. This fungal disease kills white pine by causing cankers, but requires an alternate host plant in the ribes genus to complete its life cycle. Black currants and gooseberries were the most common alternate ribes hosts in New Hampshire, often found in the same abandoned agricultural fields. Hundreds of people from 1917 to 1970 scouted for and destroyed millions of ribes plants to stop the disease from infecting white pine. Records show that by 1970, all of the towns that make up the present day park had been scouted at least once, and thousands of plants destroyed.

The Hurricane of 1938
Bear Brook State Park lands were not in the most damaged regions of the state, but historic maps do show moderate pine blowdown in the Hooksett and Allenstown areas.

Gypsy Moth Outbreaks
Gypsy moth outbreaks occurred in New Hampshire as early as 1900. From 1987 to 2001, gypsy moth defoliated more than half the total forest area of Bear Brook State Park on three separate occasions. These repeated defoliations caused widespread mortality of mature oaks and understory white pine. Massive pesticide and bio-control efforts across the Northeast continued until around 1993 when two biocontrol agents exploded throughout the forest environment and wiped out the population. Today gypsy moth is routinely controlled by these agents known as Entomophaga maimaiga fungi and Nuclear Polyhedrosis Virus. Both of which were introduced in the 1920's.

Fomes Root Rot Outbreaks
Small outbreaks of fomes root rot were occasionally observed in the red pine plantations throughout Bear Brook forests. The latest in 2009, was observed in red pine trees adjacent to Deerfield Road. Stumps of cut trees were treated with borax to contain this fungal infection.

Red Pine Scale
In 2012, the first outbreak of the exotic invasive red pine scale insect was discovered in New Hampshire at Bear Brook State Park. In an effort to slow the spread of this insect, which devastated red pine stands in Connecticut and Massachusetts, approximately 200 acres of mature red pine plantations established by the Civilian Conservation Corps in the 1930s were removed. This included areas in the normally unmanaged Criteria 1 portion of the park. As there is no economical method of widespread control, removal of nearly all the red pine in the park was the only option.

8.2 CURRENT FOREST HEALTH ISSUES

Today outbreaks of several insects and diseases are being treated, studied, or monitored at various locations in the park.

Hemlock Woolly Adelgid

Hemlock woolly adelgid is native to Asia and first discovered in North America in 1953. The first known population of hemlock woolly adelgid in New Hampshire was found in Portsmouth in 2000. Today hemlock woolly adelgid is documented in 126 towns including Deerfield and Allenstown. The adelgid is a tiny, wingless, piercing/sucking insect that attaches to fine twigs at the base of each needle. Spread of the adelgid is most common by birds and small mammals spending time in hemlock and subsequently carrying immature insects to new trees. Population levels fluctuate with winter temperatures. Extended periods of extreme cold result in winter mortality that ranges from 50% to 95%. Systemic pesticides work well to control hemlock woolly adelgid, and last several years in the tree, and are the safest environmental options available today. However the expense of such treatment prohibits there use on a wide scale, and is really only a practical option for protecting individual trees or groups of trees within the park. It is likely that infested hemlock in the park will also eventually be infested by elongate hemlock scale which may cause more mortality and tree decline than hemlock woolly adelgid.

Elongate Hemlock Scale

First documented in New Hampshire around 2006, elongate hemlock scale has spread to 71 towns including Deerfield and Candia. Elongate hemlock scale is another tiny, wingless, piercing/sucking insect, but attaches itself to the needles of the tree rather than the fine twigs like hemlock wooly adelgid. Feeding on the needles is more harmful than feeding on the phloem in the twigs, and generally results in faster mortality of the tree, making elongate hemlock scale a greater threat than hemlock wooly adelgid. However, the greatest mortality occurs at sites where hemlock trees are attacked both insects. Pesticides work well to control elongate hemlock scale as well but with the same economic limitations.

Caliciopsis Pinea

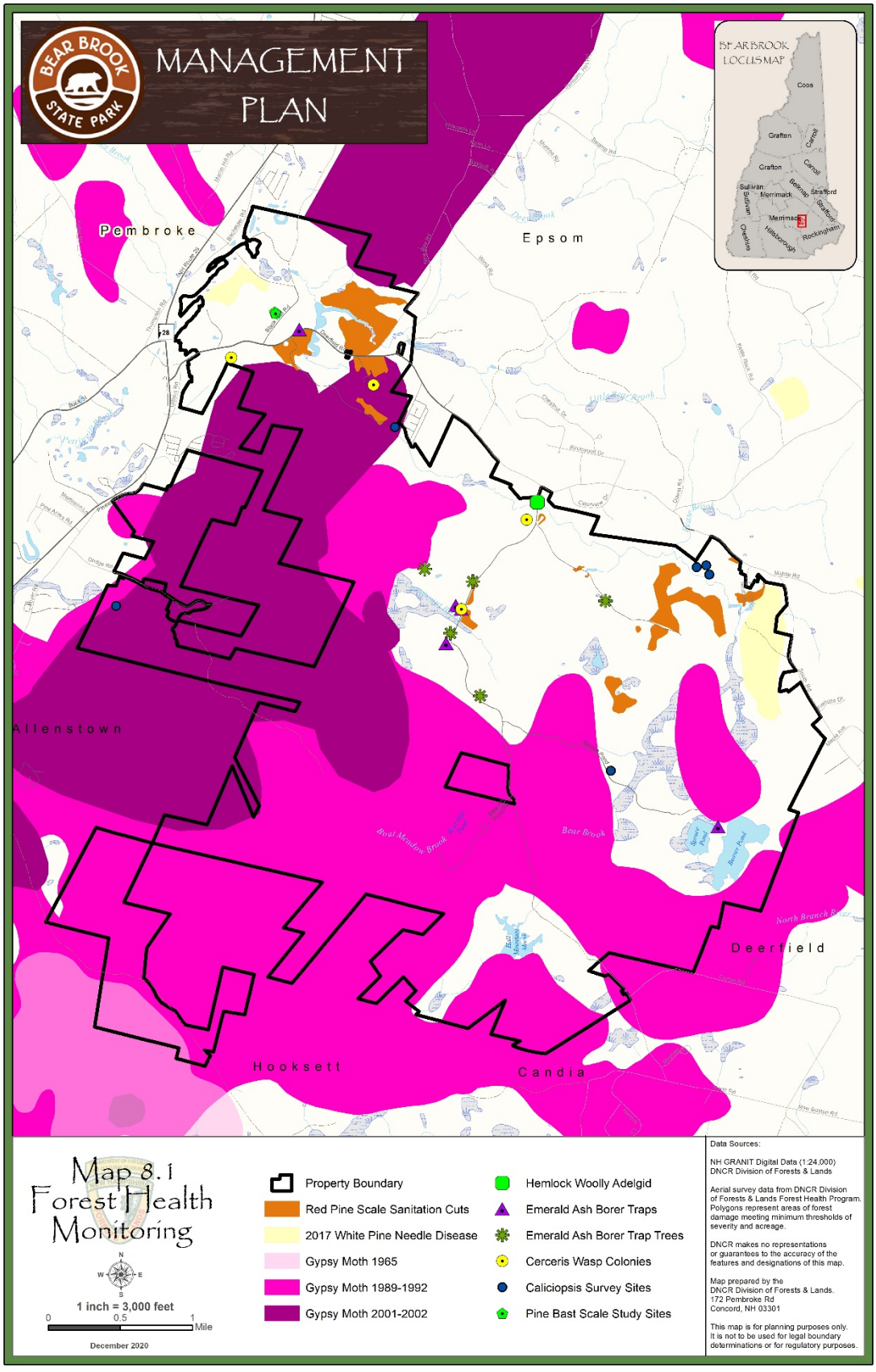
This canker disease, also known as “pine canker” or “caliciopsis” is a fungi which attacks thin barked portions of white pine tree. Spores find small insect feeding sites or lenticels and create lesions in the cambium. This disease was first reported in the state in 1996 and today evidence of caliciopsis damage can be found in most pine stands across New Hampshire and in Bear Brook State Park. White pines respond to infection with heavy pitch accumulation at the disease site causing resin flow or “pitching” on the outer bark. Caliciopsis fungi creates a dead cambium area that generally grows over leaving a defect in the growth rings. Severely infested trees will have hundreds of cankers and tree health may be compromised. The best strategy for limiting damage from this disease is to manage pine stands early in their development and manage using low density silviculture.

White Pine Needle Disease

White Pine Needle disease or "needlecast" is a group of three native fungi that infect white pine needles as they are first elongating in May and June. No damaging symptoms occur on the first year needles, but in the spring of the second year the infected needles fall off the tree. Periodic outbreaks have occurred many times in the past century. The current epidemic started around 2010 and has lasted longer than anticipated. Thousands of acres of white pine across the state are showing typical signs of infection. The live crown has an orange haze appearance in May or June before the older needles drop. For the remainder of the growing season pines are left with just the current year needles. This leaves the tree looking thin and transparent. There is no treatment option available other than through silviculture such as thinning to keep the stands as vigorous as possible.

Emerald Ash Borer

Emerald ash borer was first discovered in North America in 2000 throughout the Detroit area and first found in New Hampshire in 2013. This devastating wood borer is originally from China and was introduced in untreated shipping pallets coming through the St. Lawrence Seaway. Spread across the U.S has been predominately through the movement of firewood. There is no natural biocontrol or resistance in the eastern forest. Since 2013 it has spread slowly to all New Hampshire counties with the exception of Coos. Emerald Ash Borer has been found in Candia, Allenstown, and Deerfield between 2015 and 2016. It is suspected that some light level of infestation exists within Bear Brook State Park, but there is not a lot of ash in the park to monitor.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEARBROOK LOCUS MAP
Coos
Grafton
Carroll
Sullivan
Merrimack
Belknap
Strafford
Hillsborough
Rockingham
Cheshire
Pembroke
Epsom
Allenstown
Deerfield
Hooksett
Candia
Bear Brook
Peat Meadow Brook
North Branch River
Map 8.1
Forest Health Monitoring
1 inch = 3,000 feet
0 0.5 1 Mile
December 2020
Property Boundary
Red Pine Scale Sanitation Cuts
2017 White Pine Needle Disease
Gypsy Moth 1965
Gypsy Moth 1989-1992
Gypsy Moth 2001-2002
Hemlock Woolly Adelgid
Emerald Ash Borer Traps
Emerald Ash Borer Trap Trees
Cerceris Wasp Colonies
Caliciopsis Survey Sites
Pine Bast Scale Study Sites
Data Sources:
NH GRANIT Digital Data (1:24,000)
DNCR Division of Forests & Lands
Aerial survey data from DNCR Division of Forests & Lands Forest Health Program. Polygons represent areas of forest damage meeting minimum thresholds of severity and acreage.
DNCR makes no representations or guarantees to the accuracy of the features and designations of this map.
Map prepared by the DNCR Division of Forests & Lands.
172 Pembroke Rd
Concord, NH 03301
This map is for planning purposes only. It is not to be used for legal boundary determinations or for regulatory purposes.

8.3 GENERAL FOREST HEALTH PRACTICES

Maintaining forest health by balancing the mitigation of damage causing agents with timber management, wildlife habitat management, recreational opportunities and wilderness preservation takes skill and forethought by a variety of land managers with diverse expertise.

The following forest health recommendations should be implemented as practical during the course of forest management, wildlife habitat management, or recreation management. Recommendations are designed to minimize effects from the following general groups of damage causing agents.

Defoliating Insects
The loss of foliage during the growing season from pests like gypsy moths and other defoliators reduces the amount of carbohydrates trees are able to store in their root systems during the dormant season. A defoliated stand is most susceptible to root damage and basal wounding from logging equipment while it is recovering. Unless a complete salvage is being conducted immediately, it is best to wait at least three years to conduct a partial harvest to remove individual trees that have not recovered.

Wood Boring Insects
Trees showing signs of active wood boring activity such as exit holes, frass piles, missing bark, and insect gallery formation should be removed during timber harvests. Examples include white pine weevil, pine and oak borers, and Emerald Ash Borer. Any ash trees in developed recreation areas should be removed or placed on a pesticide treatment schedule.

Root Diseases (fungi)
Limit damage to the roots residual trees by laying out skid roads before the harvesting begins and consider limiting intermediate harvests to periods of frozen ground when if scarification for regeneration is not a silvicultural objective. Root rot infections can travel from cut stumps to stressed trees through root grafts in the soil. To avoid this, re-entry periods longer than 10 years should be considered to avoid exacerbating known root rot infections from previous timber harvests.

Stem Diseases (fungi)
Remove any trees that show sign of stem cankers which produce spores and can infect surrounding trees. Thinning infected stands will allow more sunlight and dry air which are less favorable conditions for fungi. Many fungi require alternate hosts and removing these species as well can help with control.

Weather Events
Trees grown for long periods of time in tight conditions or on shallow or wet soils are more susceptible to wind throw after thinning. Consider the rooting depth, butt flair, crown size and soil profile when proposing a partial harvest of large contiguous blocks of dense or overstocked forests. After a widespread, damaging weather event, identify areas with trees with broken off main stems versus trees blown over with roots still intact. Areas with a greater percent of trees broken off should be salvaged first. Areas with trees blown over but with roots still intact will remain alive and insect free for many months giving managers more time to plan the harvest.

Soil Compaction

Forest soils contain a host of microorganisms such as fungi, bacteria, algae (flora) and worms, arthropods and protozoa (fauna). One of the most important fungi in forest soil is mycorrhizae. This fungi lives on fine root hairs and plays a critical role in water and mineral uptake by most tree species. In exchange for providing important nutrients to the trees, mycohrrhizae benefit by consuming the carbon sugars exuded by the roots.

Forest management activities can have a significant impact on forest soils physical and chemical characteristics through compaction, rutting, puddling, displacemen,t and erosion. While a certain amount of soil impact is inevitable during a timber harvest, this impact should be kept to a minimum through the implementation of *New Hampshire Best Management Practices for Erosion Control on Timber Harvesting Operations.*

The coarse soils found across the majority of Bear Brook State Park tend to be more resilient to equipment compaction than fine textured, rich organic soils found on other sites. Designing a skid trail system before a harvest begins and limiting operations to frozen ground conditions are the best methods of limiting soil compaction. When silvicultural objectives require harvesting during the summer or fall, heavy soil compaction should be kept to less than 20% of the sale area. Limiting the size of the equipment and discussing the amount of acceptable soil disturbance with the logger prior to the start of any operations can help as well.

8.4 INVASIVE PLANTS

Invasive plant species have been identified as a significant threat to the ecological integrity of New Hampshire's natural communities and wildlife habitats in the Fish and Game Department's 2015 Wildlife Action Plan. Invasive plants can displace or suppress native species through competition, and can reduce natural diversity, impact endangered or threatened species, degrade wildlife habitat, create water quality impacts, stress and reduce forest and agricultural crop production (Cygan, 2011).

The state has addressed the issue of invasive species through RSA 430:55, which defines an invasive species as, "an alien species whose introduction causes or is likely to cause economic or environmental harm or harm to human health." The state has also produced a list of 27 invasive plant species that are considered "prohibited," and cannot be sold, moved, or planted.

At Bear Brook State Park, no comprehensive inventory of invasive plant species has been conducted, with anecdotal reports suggesting that invasive plants are not currently a significant problem on the property. However, winged euonymus or "burning bush" is known to exist on the perimeter of the Catamount Pond day use area near the dam.

8.5 RISK TREE MITIGATION PLAN

Risk is the probability of a tree failing, combined with the value of its potential target. All trees have some risk of breaking or falling regardless of individual health or structure. Wind, ice, car accidents, fire, lightning, floods, soil compaction, or insects can damage otherwise healthy trees resulting in unexpected impacts to targets. However, there are several, readily visible indicators that can help assess a tree's potential risk of causing harm.

The following Risk Tree Mitigation Plan for Bear Brook State Park will provide park staff with the ability to routinely and systematically inspect and document trees for basic structural or health issues, and provide a process to address assessed risks that warrant further action.

Training Standards

- Provide annual risk tree training to Bear Brook State Park staff. Training should include eight hours of contact time with certified arborists, professional forest health staffs, or other tree health experts.
- Bear Brook State Park staff should provide annual training to seasonal employees relative to ground based visual tree inspections and reporting procedures.

Timing and Prioritizing Inspections

- Complete an annual inspection of trees within striking distance of structures, campsites, and high traffic areas prior to opening the park to the public each spring.
- Conduct additional inspections of these areas after any major weather event.
- Park employees should conduct visual inspections of the trees within the developed recreation areas and along the trail systems during the execution of their regular work assignments.

Visual Inspection of Tree Structure and Health

- Crown Canopy
  1. Broken/dead branches
  2. Percent crown dieback
  3. Co-dominant stems
  4. Cracks, wounds, cavities, conks, cankers
- Trunk
  1. Forked stems
  2. Cracks between multiple stems
  3. Presence of bark inclusions
  4. Cracks, wounds, cavities, conks, cankers
  5. Lean
- Root System
  1. Condition of visible roots
  2. Conks, cracks along soil

Documentation and Reporting

- Assign one of the following risk categories after visual inspection of tree structure and health is complete:
  Category 1 - Healthy, low probability of failure
  Category 2 - Moderate probability of failure, increase frequency of monitoring or conduct light corrective action.
  Category 3 - High Probability of failure, needs corrective action taken or removal of targets.
  Category 4 - Imminent, needs corrective action taken immediately.

- Report any trees placed in category 2, 3, or 4 to the park manager, including:
  1. Location
  2. Date of inspection
  3. Reason for specifying category 2, 3 or 4
- Tree information for trees in Category 2 and 3 should be documented by the park manager in a permanent file organized in a way that the data can be accessed as needed for follow-up inspections or mitigation activities.

Mitigation

- Mitigation options may include:
  1. Removal of the entire tree
  2. Removing dead or damaged portions of the tree
  3. Removing targets
  4. Restricting access to target area
  5. Other corrective actions that stabilize tree structure
- Remove Category 4 trees immediately. Restrict public access to within a radius of 1.5x the height of the tree immediately, and until tree removal is completed.
- Address Category 3 trees before trees in Category 2. Schedule corrective action as soon as possible and remove any targets immediately. If targets cannot be removed, implement public access restrictions as above.
- Monitor Category 2 trees more frequently throughout the year, and always after a weather event. Schedule corrective action when possible.
- All tree work should be completed by certified arborists under state contract or by properly trained park staff.

Minimize Future Risk

- Develop an annual plan to remove and replace Category 3 trees.
- Educate visitors about the importance of not damaging trees in the developed recreation areas.
- Create a vegetation management plan designed to maintain an appropriate level of tree stocking and species diversity within the high use camping and traffic areas.
- Limit soil compaction effects by resting campsites on a rotational basis and utilizing chip mulch in high traffic areas to protect tree roots.
- Maintain vegetation free space around buildings by removing trees while they are small and easily manageable.

8.6 RECOMMENDATIONS

Managers at Bear Brook State Park should always report any suspected outbreaks or infestations to the Forest Health Section immediately so a mitigation strategy can be developed and implemented.

Criteria 1: Undisturbed Landscape

- Monitor Criteria 1 for exotic pest outbreaks as part of the statewide program of forest health monitoring by the Division of Forests and Lands. High risk sites should be

identified using the latest knowledge of regional exotic pest populations and an understanding of the vectors for those pests.

- There are several exotic forest pests listed under the jurisdiction of the USDA and the management of these pests, including sanitation harvesting, will be implemented by Federal Agencies to eradicate or slow their spread, regardless of the undisturbed designation of Criteria 1. An example is the Asian Long-horned beetle. Federally developed strategies for control would mandate tree removal regardless of the landowner or criteria designation.

- There is also the potential for exotic forest pest controls under State jurisdiction regardless of the criteria designation. RSA 227-K:1 through K:17 provides authority to the State Forester to designate control areas to protect forests from exotic pests. Control of hemlock woolly adelgid (HWA) and emerald ash borer (EAB) are recent examples. Control actions at the state level, including the removal of trees, insecticide treatments, and the release of bio-controls would likely occur regardless of the criteria designation if consensus is reached that actions would control or slow the spread to other forests in the area.

- If an infestation is suspected contact the Forest Health Program. The Forest Health staff will assess the threat and provide an action plan for mitigation as needed and in consultation with appropriate state and federal experts and authorities.

Management Criteria 2 and 3: Actively Managed Forests

- Limit pathways for introductions of exotic pests, and eradicate any new introductions as they occur.

- Prioritize forest stands for treatment based on risk of mortality from insects, diseases and weather events.

- Improve tree and stand vigor by properly maintaining stocking levels. Trees fighting for growing space and nutrients have smaller crowns and are more likely to succumb to attacks by forest pests.

- Manage for a diversity of forest structure including tree species, age, and height as well as stand type and size. This diversity is the best defense against insect and disease outbreaks. The scale at which to apply this tenant is important. While it is impractical and unproductive to create this diversity on every acre, you also lose effectiveness as the blocks of uniform structure grow in size.

- Conduct a comprehensive survey for invasive plants, and control as necessary, to mitigate impacts to forest and non-forest habitats. Use mechanical treatments where practical and effective (e.g., hand pulling or mowing). If herbicides are necessary, use targeted application techniques when feasible (e.g., cut-stem treatments). Implement control measures prior to undertaking management activities such as timber harvesting and field mowing by requiring equipment to be cleaned offsite, prior to entering the property.

Management Criteria 4: Developed Recreation Areas

- Educate campers about the out-of-state firewood quarantine. Discourage guests from traveling long distances within state with firewood from home, and ask for receipts to ensure firewood brought into the park has been obtained locally. Firewood available for purchase at the campgrounds should be heat treated when possible.

- Implement the Risk Tree Mitigation Plan for Bear Brook State Park outlined above.

9. CLIMATE CHANGE

Since the mid- 20th century, scientists have recorded an unprecedented warming of temperatures across the earth. The scientific consensus is that the cause is due to human influences, also known as anthropogenic climate change. (IPCC 2013, John et al. 2016) The largest human influence on rising temperatures, since the mid 1900's has been the increase of greenhouse gases such as carbon dioxide (CO_2), methane, and nitrous oxide in the earth's atmosphere. Within the Northeast, temperatures have increased by approximately 2.4 ºF (1.3 ºC) between 1901 and 2011 (Janowiak et al. 2017). Within New Hampshire, average annual temperatures have increased 3 ºF (www.statesummaries.ncics.org/nh), with the greatest warming occurring during the fall (2.4 – 3.9 ºF) and winter (1.5 – 3.5 ºF) seasons (Wake et al. 2014). These warming trends have resulted in warmer winter nights, days with temperatures below freezing reduced by two weeks, and a lengthening of the growing season by fifteen to fifty two days since 1960 in southern New Hampshire (Wake et al. 2014). Milder winters have led to a decrease in the amount of precipitation falling as snow and the duration of snowpack (Campbell et al. 2010).

9.1 IMPACTS OF CLIMATE CHANGE

Weather Events

One of the most obvious changes that has occurred as a result of climate change is that weather events are becoming more extreme (IPCC 2012, Melillo et al. 2014). New England in particular has experienced a substantial increase in extreme rain events as a result of climate change (Spierre and Wake et al. 2010). The observed changes in southern New Hampshire include an increase in mean annual precipitation of twelve to twenty percent since 1970 (Wake et al. 2014). Additionally, the timing of when precipitation falls has shifted as well, with the greatest increase in precipitation observed in the fall (+3.0 inches) and the smallest increase in winter (+0.6 inches) (Janowiak et al. 2017). Perhaps the greatest impact in New England of a changing climate is the occurrence of extreme precipitation events (Speirre and Wake 2010, Wake et al. 2014). The amount of precipitation falling in very heavy events (heaviest 1% of all daily events) across the Northeast have increased 71% between 1958 and 2012, more than any other region in the country (Melillo et al. 2014). Although it is not possible to attribute a single extreme weather event to having been caused by climate change, climate change does increase the likelihood for these events to occur (Kunkel et al. 2012). For example, there has been a strong increase in the intensity, frequency, and duration of hurricanes, especially the frequency of the strongest hurricanes (Category 4 and 5), in the North Atlantic since the 1970s due to warming sea surface temperatures (Walsh et al. 2014).

Major river and stream flooding events are generally expected to increase in frequency and intensity in the Northeast as a result of the increases in heavy precipitation (Demaria et al. 2016). Flooding events can have a dramatic impact on stream channels.by either adding or removing substrate from a section of river bottom, which can alter habitat for fish, mussels, and macroinvertebrates. Damage to roads, culverts, and other infrastructure can cause severe erosion resulting in sedimentation and pollution. The effects of such events on New Hampshire streams have been observed several times recently since 2005 (NHFG 2013).

Beyond extreme rainfall, other changes in climate are expected to affect hydrology, water quality, and aquatic habitats. Warmer air temperatures and longer growing seasons can increase water temperatures, making water bodies less suitable for trout and other coldwater species, even in the absence of increased hydrological variability. (Staudinger et al. 2015, Williams et al. 2015). Base flows in the region's streams may be reduced and low base flows may occur more frequently as a result of earlier peak flows, more variable summertime precipitation, and increased frequency of abnormally hot weather (Walsh et al. 2014, Demaria et al 2016). This may cause many of the smaller, perennial headwater streams and seeps within Bear Brook State Park to become intermittent, and could lead to local extirpations of aquatic organisms, especially in streams where groundwater influence is already low. However, streams with adequate sources of groundwater are generally more resistant to climate change (Chu et al. 2008). Populations of fish or other aquatic organisms that are already isolated as a result of river fragmentation may be particularly susceptible to additional stresses resulting from climate change. In such cases, fragmentation reduces the ability for species to recolonize an area where they have been extirpated (NHFG 2013).

Many of the species typical of coldwater streams, like trout in Bear Brook, will be affected by climate change. As the temperature warms, the distribution of coldwater streams is expected to shift north and to higher elevations in New Hampshire and other northern states (Lyons et al. 2010). At the same time, there is significant uncertainty on the effects of climate change on the timing of certain fish and wildlife behaviors, like spawning or hibernation, as well as its influence on interactions among species.

Vegetation

In southern New Hampshire, the growing season is predicted to extend by 2-5 weeks by the next century depending on the emission's scenario (Wake et al. 2014). The impact of how this changing environment will affect Bear Brook State Park can be hypothesized, but it is unclear how long it will be until these impacts are fully realized. A longer growing season means a shorter frost-free period with less snowfall and shorter duration of snowpack. With less snowpack, there is an increased risk of soil frost depth resulting in root damage during the winter from less insulation from the snow (Groffman et al. 2012). Increased summer temperatures and more variable summer precipitation increase the risk of stress on riparian and floodplain vegetation due to lower summer flows.

While there is scientific consensus that the climate will continue to warm in future decades, there is less certainty on the potential effects of warming temperatures and shifting patterns of precipitation on the distribution of plant species and the composition of ecological communities (NHFG 2013). The structure of forests, including the abundance of different tree species and the distribution of different ages of trees, is expected to change in response to climate change, but the degree of change may differ amongst forest types (Janowiak et al. 2017, Manomet and NWF 2012, NHFG 2013). It is likely that our species-based definitions of natural communities may change, as individual plants react differently to increases in temperature and changes in the hydrological regime (NHFG 2013). It is expected that certain species will do better in southern New Hampshire than other species considering the changes in climate that are projected in the coming decades.

Models of tree species abundance have been developed to provide insights into how tree species may respond into the future under low-emissions and high-emissions scenarios (Janowiak et al. 2017). For example, the *Climate Change Tree Atlas* (www.fs.fed.us/nrs/atlas) models future suitable habitat in the Northeast for 2100 and suggests that individual tree species will respond differently over time as the temperature warms. This model projects future suitable habitat of tree species, and suggests that Eastern hemlock will decline across the region (due to hemlock wooly adelgid), as will spruce and fir (Janowiak et al. 2017). However, red maple, black cherry and red oak are expected to fare well with a changing climate. Eastern white pine, a dominant species in Bear Brook State Park is predicted to see a slight decrease in the high emissions scenario, while under the low emissions scenario little change is expected in habitat suitability across the landscape.

There are relatively few occurrences of rare plant species in the park, and it is unknown how these populations might respond to the effects of climate change.

Wildlife

Wildlife will respond in several ways to habitat changes that occur as a result of climate change. The gradual shift in the vegetative species composition will correspondingly create changes in habitat types and distribution. These changes in habitat may have less of an impact to some species while others will feel these effects more profoundly. Species that are more mobile may have a greater ability to shift into habitats that have experienced less change and remain more suitable. Species which can only move short distances may experience accelerated declines or disappear locally in the event that habitat conditions change considerably over time. For example, the predicted decline in Eastern hemlock has the potential to diminish the habitat availability for wildlife that depends on softwood cover for their habitat needs (NHFG 2015). As a result, locations in the park, which continue to be favorable to the growth of softwood as the climate changes (known as refugia), may have increased importance for wildlife habitat over time as the abundance of hemlock species declines.

Warming temperatures and a corresponding decrease in the extent and duration of snowpack will likely also influence wildlife distribution. Mammals adapted to snow including snowshoe hare may shift to habitats at higher elevations where snow is more certain. Bear Brook State Park has several attributes, such as extensive forest cover and complex forest structures that suggest it may have more resilience than surrounding lands. It should also be able to maintain important wildlife habitats throughout the landscape to provide species with suitable habitat that may be diminishing in the surrounding forest. Additionally, changes to vegetation composition over time resulting from a changing climate may influence the growth of nut and berry (mast) producing species, impacting the type and amount of food resources available to wildlife. Impacts on the synchronicity, abundance and vigor of mast cycles may impact the fitness of individual animals and wildlife population productivity over time.

The NH Fish and Game Department created a *Climate Change Adaptation Plan* as an amendment to the *Wildlife Action Plan* (WAP) that addresses the potential impacts of climate change to wildlife and their habitats (NHFG 2013, 2015). This document provides a comprehensive analysis of how those species most vulnerable to climate change may be affected over time.

Forest Health

Climate change is expected to increase many threats to forest health, including insect pests, diseases and invasive plants. There are both direct and indirect impacts. Directly, some invasive plant species are disproportionality able to take advantage of an increased CO_2 environment, and many insect pests and invasive plant species may be able to expand their ranges northward in response to warmer temperatures (Ramsfield et al. 2016, Ziska et al. 2009). Some insect pests and invasive plants have so far been prevented from establishing or increasing in population in northern New Hampshire due to the cold winters. However, warming trends will likely limit the occurrence of lethal cold temperatures in the lower half of the state, and we may see northward migrations of insect species and invasive plant species. For example, mortality of hemlock woolly adelgid is dependent on cold temperatures during winter as well as the timing of cold snaps, and this pest has migrated from the warmer coastal areas to central New Hampshire in the last 15 years. Additionally, there is the potential for an accelerated life cycle of certain insect pests, allowing them to propagate more often and increase their populations rapidly with longer growing seasons (Ramsfield et al. 2016).

Alternatively, tree pests such as the spruce budworm is on the southern end of its range, and warming trends may limit the survival of this insect into New Hampshire in the future (Régnière et al. 2012). However, the warming temperatures increases a trees susceptibility to insects and diseases over time, as all of these forms of stress continue to increase. Importantly, these threats may add to the stressors impacting forests of the region caused by shifts in climate and thus be even more harmful to forest health. Increases in the populations of some invasive species could significantly alter the distribution and abundance of the native species with which they interact. (NHFG 2013)

Recreation

Recreational activities are already seeing some impacts due to climate change, largely due to direct effects of temperature shifts and changes to precipitation patterns and severity. There is the possibility that these effects may increase and have more significant impacts on recreational use in the future.

Trails utilized by all types of user groups are at high risk from both temperature and precipitation extremes. Unusually dry periods have the effect of destabilizing soils by causing overly dry surfaces and sub-surfaces, thus making them more susceptible to erosion by heavy precipitation or mechanical disturbances. Conversely, periods of heavy rainfall or extended periods can have the effect of making trails that were traditionally used, no longer viable due to overly wet trail surfaces that cannot be easily crossed without an investment in reconstruction and constant maintenance. The possibility exists that there will be a significant increase in trail maintenance costs associated with long-term trail maintenance from not only extreme climate events but also increased seasonal usage.

During winter, traditional patterns of freezing of wet soils is relied upon, as well as sufficient snowfall patterns and amounts in order to provide a connected winter trail network for over-the-snow trail uses. Unusually warm periods with rainfall, not typical in the winter, make it increasingly difficult to maintain a dependably connected winter trail system. Extended and shorter recreational seasons may change future use patterns and trail impacts as there is less reliability and more variability in the weather.

Heat, drought, fire and floods can alter the desired recreation people seek making them choose alternatives (Dolesh et al. 2017). The number of equestrian rider days may increase during extended snowless periods while heatwaves will most likely increase beach use and similarly hiking may decline. Park areas where shade is a major component will become more desirable making green infrastructure an important asset in attracting patrons (Dolesh et al. 2017). Depending on soil type and topography developed park areas may need to become temporary storm water detention basins mitigating the effects of heavy precipitation and runoff in certain areas (Dolesh et al. 2017).

Human health has been and will continue to be affected by climate change. Vector-borne diseases are on the rise and are one of the most studied diseases of climate change (Beard et al. 2016). Increases in diseases such as Lyme, triple E, west Nile virus, and many other mosquito and tick borne pathogens have been linked to changing seasonal weather patterns. Mild winters, and wet humid weather can influence survivability and productivity of biting insects (Beard et al. 2016). Variations in the distribution, abundance, and infection rate of mosquitoes and ticks will influence human exposure to bites from both of these biting insects, which is expected to alter risk for human disease (Beard et al. 2016). These vector borne diseases can affect outdoor recreationists and their participation rates due to poor health as well as fear.

Current Management

The management focus and practices currently being implemented at Bear Brook State Park are already helping to address climate change. Since 1994, forest management in the park has utilized a criteria system based on varying levels of disturbance to provide biological diversity across the landscape. This diversified management approach employs both uneven-aged and even-aged management techniques to provide a wider range of tree species and ages than typically found in most forests in the area. Young forests, like those created through even-aged management in Criteria 3, maximize carbon sequestration, or the rate at which carbon is stored, during the period of rapid growth that occurs between the ages of 30 to 70 years as the trees vigorously compete for resources in the developing forest stand (Catanzaro, D'Amato et al. 2019). In addition, the criteria system also sets aside nearly 2,200 unmanaged acres in two core blocks of forestland in Criteria 1. The older trees found in these undisturbed areas do not sequester carbon as fast as younger forests, but they play another critical role by locking up stored carbon for longer periods of time than the surrounding managed lands. The undisturbed landscapes found in Criteria 1 may also serve as potential refugia for certain species as the climate changes.

In addition, forest management operations at Bear Brook State Park and on all state reservations follow *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. Riparian buffer recommendations in this document help to increase resiliency and protect ecological functions during extreme weather events, as well as provide shade to mitigate temperature extremes on rivers, streams and associated wetlands.

Forest access roads are now constructed to account for 50 to 100 year storms as these events have become more common over the past two decades.

9.2 RECCOMENDATIONS

Mitigate against climate change

The ability of the forest to store carbon can help to mitigate against climate change. Forests are a critical component of the global carbon cycle, storing over 80% of the terrestrial above-ground carbon (Dixon et al., 1994). Forests aid in mitigating against increasing atmospheric carbon dioxide concentrations by sequestering carbon into new biomass of growing trees and storing carbon in both living and dead biomass. Carbon sequestration is the process by which carbon dioxide is removed from the atmosphere. Young forests typically sequester atmospheric carbon into biomass at a faster rate than older forests (Figure 16). Although older forests often sequester carbon at a slower rate, these forests do a better job of storing significant amounts carbon over long periods of time (Keeton et al. 2011). There are four different ways that carbon is stored in the forest: in living biomass, the organic layer, the soil and the course woody material (Figure 17). Overall, the total ecosystem stores more carbon the older it is in temperate forests, while in boreal forests carbon storage peaks when stand ages are between 70 and 200 years. At Bear Brook State Park, approximately 2,167 acres are designated as undisturbed forest in Criteria 1 where no timber harvesting will occur. As a result, these forests will grow into older age classes and continue to store greater amounts of carbon. Additionally, long rotations are employed in managed stands in Criteria 2, which result in older forest stands and additional carbon storage, enhancing mitigation in the areas where active management occurs. These management strategies will help to aid in mitigating against climate change over time.

Adapt to climate change

Another piece of the puzzle is adaptation, which is often defined as intentional actions that help human and natural systems accommodate climatic changes and subsequent impacts (Millar et al. 2007). Active management is an important and beneficial component in assisting forests to adapt to climate change. This works towards creating healthy forests that are able to maintain ecosystem integrity and continue to provide environmental benefits to people with a changing climate.

It is important to address both mitigation and adaptation when managing forestland, especially across a large landscape such as Bear Brook State Park. The forests in the park provide a wide range of benefits, including wood, wildlife habitat, recreation, scenic values and clean water, as well as carbon storage and sequestration. Not all uses can be maximized simultaneously, but there are management actions that can help forests adapt to changing conditions while maintaining the ability of the forest to store and sequester carbon and provide for other ecosystem benefits. For example, uneven-aged silvicultural approaches such as single tree selection and group selection methods that allocate adequate growing space for mid-tolerant species recruitment while also maintaining a large proportion of a given stand in mature forest conditions can maintain important elements of complexity and carbon storage in managed systems (D'Amato, et al. 2011). Even-aged silvicultural approaches such as the shelterwood method that establishes an understory, gives the young forest an advance start and speeds up the process of carbon sequestration when it is time to remove the mature overstory Additionally, practices that extend the period between harvests and retain biological legacies can also enhance the amount of carbon stored in forests (Nunery and Keeton 2010, Urbano and Keeton 2017) and enhance the adaptability of forests (Swanston et al. 2016).

There are three main adaptive options: resistance, resilience and transition (Nagel et al. 2017, Swanston et al. 2016).

Resistance actions improve the defenses of an ecosystem against anticipated changes in order for a community to remain unchanged when challenged by disturbance (Grimm and Wissel 1997). The forest must sustain normal functioning in a resistance approach, while the current conditions are being maintained. This is a good approach for a relatively short period of time, however, as the climate changes this will take more effort as the ecosystem shifts further from historic norms (Swanston et al. 2016).

Resilience actions enhance the capacity of a system to absorb disturbance and recover by returning to near-prior conditions (Holling 1973), either naturally or through management. Resilience is effective until the degree of change exceeds the ability of a system to cope. An example of a resiliency approach is altering the structure or composition of a forest type by increasing species or structural diversity to increase the ability of an ecosystem to bounce back from disturbance and continue functioning under changing environmental conditions (Swanston et al. 2016).

Transition is a response to intentionally anticipate and accommodate climate change. Whereas the aim of resistance and resilience actions is the persistence of the current ecosystem, transition actions intentionally facilitate the transformation of the current system into an ecosystem with different characteristics. Assisted migration is an example of a transition approach, which is planting trees in an area where they typically do not grow, but may be within its range in the future after temperatures have warmed. For example, pig nut hickory does not grow in Bear Brook State Park, but starting to plant such species would be a transition method to maintain a healthy and productive forest into the future as the climate changes. It can be difficult to implement transition actions because of the uncertainty regarding exactly how the climate may change in the future; thus, early steps to transition systems may focus on promoting species that are able to tolerate a variety of potential future climates.

During the life of this plan, management at Bear Brook State Park will predominately focus on a resistance and resilience approach. A resistance approach may include thinning to increase vigor and water availability while retaining the dominant species, such as red oak or white pine. A resilience approach might favor native species that are predicted to have increased habitat suitability under a future climate while maintaining considerable mature canopy to improving understory microclimate conditions and sustain a diversity of habitats (Nagel, Palik et al. 2017). Management will also continue encouraging structural retention and species diversity throughout harvest areas to improve resiliency (O'Hara and Ramage 2013). Due to the southerly location of the park and the adaptability of many of the tree species, there will be little to no transition management practiced at this time.

Consider a vulnerability assessment

Although some regional assessments are available, a climate change assessment has not been performed specifically for Bear Brook State Park. The climate change chapter in this plan is the beginning stage of determining how climate change poses risks to the ecosystems within the

park, but an assessment would help to fully understand specific forest vulnerabilities. The U.S. Forest Service report *Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers* assists land managers with the complicated task of addressing climate change. Chapter 2 of that document discusses the steps necessary to complete a vulnerability assessment. The Northern Institute of Applied Climate Science is willing to provide assistance and expertise if the Division of Forest and Lands moves forward with a vulnerability assessment. Additionally, a vulnerability assessment has been completed for New England and northern New York which will help inform a more specific assessment of climate change effects at Bear Brook State Park.

Conserve areas for habitat expansion and connectivity
Species compositions in many habitats are likely to change as climatic conditions change. Ensuring long-term viability of wildlife includes providing ways for them to move across the landscape. Land conservation should be focused on connecting habitats to facilitate migration of species and support intact ecosystems over time despite changes in climate (NHFG 2013). The presence of both small and large corridors on the landscape may help species to migrate without additional assistance (Heller and Zavaleta 2009).

Due to its large size, Bear Brook State Park already acts as a valuable corridor for the movement of species across latitudinal and to a lesser extent elevational gradients. The park has designated undisturbed areas (criteria1) as well as corridor areas. Future projects should work to ensure connectivity with other protected parcels in the surrounding landscape. Wildlife biologists and foresters will need to work collaboratively to detect and anticipate changes or losses to habitats due to climate change.

Utilizing documents such as the 2015 Wildlife Action Plan and "Resilient and Connected Landscapes for Terrestrial Conservation," which already identify regional conservation priorities for maintaining a network of resilient and connected habitats, will be beneficial in evaluating priorities.

Monitor and control insect pests, diseases, and invasive plant and animal species
Many insect pests, diseases and invasive species (including terrestrial and aquatic plants and forest pests/pathogens) are currently limited by temperature and may expand into New Hampshire as a result of climate change (NHFG 2013). Bear Brook State Park is likely to see an increase in the abundance and variety of invasive plant species and forest pests (such as red pine scale in 2012). The Foresters managing Bear Brook should work with the Forest Health Program and the Department of Agriculture to monitor for new infestations of exotic species, and to implement control activities to attempt to minimize their impacts to the ecological condition of the park See Chapter 8 Forest Health).

Work with research partners to document changes in forest composition and structure.
Modeling, research, and ongoing monitoring of species and ecosystems are critical to improving our understanding of the effects of climate change on NH's natural systems. New knowledge will allow for adaptive management of species and habitats. In this regard, Bear Brook State Park could serve as an ideal laboratory for performing this research. When possible, the Division of Forests and Lands should partner with universities or non-governmental organizations to establish or expand a network of monitoring plots to observe and coordinate climate related

changes. These monitoring efforts could include long-term wildlife population monitoring, invasive plant species, forest tree and other plant species composition, wetland hydrology, and phenology (NHFG 2013).

Disseminate public health messaging on vector-borne disease prevention.
Maintaining public participation in outdoor recreational activities is an important aspect in the Division of Parks and Recreation's financial resiliency. As the occurrence of vector borne illnesses continues to rise with climate change, the real life impacts of these diseases, along with media sensationalism could have a detrimental effect on the rate of participation in outdoor recreational activities.

Public education can greatly reduce the transmission of vector-borne diseases (Beard et al. 2016), instill preventative behavioral changes, and alleviate fears. Parks facilities and staff should promote the utilization of insect repellants and disseminate fact sheets provided by the New Hampshire Department of Health and Human Services available on their website https://www.dhhs.nh.gov/dphs/cdcs/lyme/index.htm to help increase public awareness of potential vector borne diseases from biting insects.

10. FOREST MANAGEMENT

New Hampshire is located in an extensive forested ecosystem that covers the northeastern United States and eastern Canada. Forests are valuable resources that sustain regional and local economies, diverse populations of plants and animals, provide important high quality water resources, and recreational opportunities for millions of residents, citizens and visitors. This community of trees is one of the State's greatest assets. Forest management is the care and maintenance of this asset. Forest management usually involves the periodic implementation of commercial logging to harvest timber for human use. Timber harvested locally benefits the citizens of our state by providing employment, raw materials for mills and secondary industries, and building materials and other wood products for homes including furniture, firewood, wood pellets and paper products. Forest management also provides valuable habitat for both game and non-game wildlife species by creating a diversity of tree species and forest age classes. Woods roads that are constructed or improved for forest management activities also provide access for people to recreate within the forest.

10.1 PAST FOREST MANAGEMENT AT BEAR BROOK STATE PARK

It can be inferred by the presence of cellar holes and stone walls, as well as the known history of New Hampshire and the local landscape, that most, if not all of the area that makes up present day Bear Brook State Park was once cleared for agriculture during the early 19th century. As these "marginal farmlands" were abandoned over the next hundred years, they began to revert to the pine-oak dominated forests we see today. Shortly after state acquisition from the National Park Service in 1935 (See Chapter 1, History), the natural process of reforestation was accelerated as fallow fields that occupied much of the area that was to became Bear Brook State Park was planted to white and red pine by the Civilian Conservation Corps. Soon after this first conscious act of forest management, the first *"Forest Management Plan"* was developed for the park in 1948. The management plan made mention of the low stocking levels and young age classes of the forest stands found upon approximately 5,000 acres of the 6,849 park acres at the time. Some of the local markets noted during that period included10 stationary sawmills within a 20-mile radius of the park, a veneer mill in Lakeport and a wood preserving plant in Nashua.

Planting of pine continued into the 1950s and 1960s. During this time, many acres of the park also received pre-commercial improvement treatments to release young developing pine stands from the encroachment of less desirable hardwood stems. These release treatments called "weeding" or "cleaning" were implemented by hand cutting, and/or the application of the hardwood herbicide 245-T. Smaller areas were treated using a manual technique called hack and squirt, where an ax was used to girdle the undesirable tree and 245-T was sprayed directly into the fresh wound. Aerial spraying of 245-T was also used on occasion to treat larger areas. As the released pine stands grew and matured, they became dense and crowded, and the focus shifted to thinning to improve vigor and growth. Early thinning operations in the red pine plantations produced thousands of fence posts for local markets. By the late 1970s and early 1980s commercial thinning operations and improvement harvests were implemented to reduce stand stocking levels and alter stand composition to maintain productive growth rates and desirable species.

By the early 1990s, the vast majority of the park was covered in even-aged, pine and oak-dominated stands of sawlog sized trees. Once again, the management focus began to shift. Shelterwood harvests were implemented to remove maturing trees and begin the natural process of forest regeneration. It was at this time, when faced with the daunting task of managing nearly 10,000 acres of rapidly maturing forests, in a setting that receives significant year-round recreational pressure, that foresters began to realize the overwhelming enormity of their task. The need was recognized for a systematic approach of regenerating the forest, that would result in a more diverse and natural landscape with a continuous distribution of age and size classes over time, and that could be implemented in conjunction with the recreational needs of the park. Thus began the collaborative process between the Division of Forests and Lands and the Division of Parks and Recreation with input from Fish and Game Department to develop the first comprehensive, overarching management plan for Bear Brook State Park. The resulting 1994 *"Bear Brook State Park Management Plan"* introduced a system of four Management Criteria based on varying levels of disturbance, which provide for a landscape level approach to the management of both natural resources and the recreation occurring on the property. In the 25 years since its implementation, this management plan has provided a harmonious approach that has resulted in a diverse range of vegetation and habitats, and has provided a broad spectrum of high quality recreation opportunities.

10.2 ECONOMIC IMPACT OF FOREST MANAGEMENT

New Hampshire forests have a long history of logging, lumber camps, and sawmills. Trees from this region have long been sought after, whether they be the tall, straight "king's pine" for ship masts during the early years of settlement, or the beautifully colored red oak lumber and veneer that is in high demand in today's global markets. Timber harvesting and forest products have always been an integral part of New Hampshire's economy.

According to "*The Economic Importance of New Hampshire's Forest-based Economy 2013*", a report published by the North East State Forester's Association, the state's forest products industry employees over 7,000 individuals and contributes nearly $1.4 billion dollars to the economy. Much of this economic impact is directly through the employment of foresters, loggers, truckers and mill workers and the production and sale of raw materials such as logs, lumber, firewood, and energy. Additionally the manufacture and sale of secondary value added products such as furniture, flooring, and paper products are also included here. When an economic multiplier is applied that factors in the rippling effect this industry has on other parts of the economy, these numbers jump to nearly 13,000 jobs and $2.4 billion dollars. This multiplier captures things such as the sale of logging and trucking equipment, fuel, supplies, meals, and repairs amongst other things.

Timber harvests also provide a direct source of revenue to local communities in the form of the timber yield tax. The New Hampshire timber tax rate is 10% of the stumpage value of any forest product harvested. This tax is paid directly to the town the timber was harvested in by the landowner or in the case of state reservations by the purchaser of the standing timber. The 2013 report by the North East State Forester's Association mentioned above estimates that $3 million dollars was paid in timber tax to New Hampshire communities.

The Importance of Local Timber

Lumber and other wood products utilized in the North East, including New Hampshire, are often imported from other regions of the United States and other parts of the world. Harvesting local timber to meet regional demands for forest products helps to keep income in the local economy and support local jobs, and can reduce dependence on imported products. Imported wood products contain a much larger carbon footprint by the time they arrive in New Hampshire, and those from other countries may often be harvested with little regard to environmental impacts to the country of origin. In addition, transportation of forest products from other regions and countries has been responsible for the movement of insects and diseases that have had disastrous impacts on our local forest ecosystems. Local, sustainably harvested forest products are renewable resources that support the local economy, reduce transportation costs and carbon emissions, and lesson the threat of introducing invasive species.

Forest management activities on state reservations are designed to improve the quality of the timber resources so they may be sold to regional markets. The regional markets reflect those uses that are usually important to local economies and communities. Some forest products have little value or poor local markets and are consequently more difficult to sell, while others are very desirable and have robust markets and are easy to sell. The primary forest products are described in the following section.

10.3 FOREST PRODUCTS

Trees provide a wide variety of forest products from cellulose based insulation, lumber and mass timber panels for constructing our homes and business, to the vast array of paper products and packaging and wood furniture we use in our everyday lives, to heat and electricity that we use to keep warm and functioning during our day-to-day routines. Forest products are a natural source of renewable goods and services, many of which provide benefits of reducing our carbon footprint when compared to alternative products such as steel, concrete and fossil fuels.

Veneer

Veneer is a thin layer of high quality wood that is glued to lower quality wood to give a better appearance to the product. Veneer is peeled or sliced from a log rather than being sawn out. This increases the yield of veneer from each log and eliminates waste such as sawdust. Veneer logs usually return the highest price of all timber products. In order to qualify for veneer, logs must be perfect with no knots or other defects, and generally have a small heart. In New England Veneer is commonly produced from high quality hardwood logs, such as red oak, sugar maple, black and yellow birch. Even on sites with good soils and excellent quality trees, veneer usually makes up a very small portion of harvested timber, typically only 10-15%. For the most part, the thin, rocky glacial till soils at Bear Brook State Park are not well suited for growing high quality red oak that will produce veneer quality logs. With the exception of a few sites, the red oak found in most areas of the park tends to be short-bodied and of low quality.

Sawtimber
Sawtimber refers to logs that are sawn to produce lumber, typically 10 to 16 feet in length. Sawtimber values can range from very high to very low depending on tree species, quality and size. Hardwoods usually bring the highest prices, however softwoods are capable of growing far more board feet per acre. Hardwood markets tend to be somewhat volatile with consumer preferences shifting back and forth from grainy woods like red oak and white ash to the "white woods" such as maple and birch. Softwoods generally have a stable market and white pine has been a backbone species of the Southern New Hampshire forest industry since the earliest days.

Young sawlogs should be grown in tight, well stocked, young stands to encourage "self-pruning", or the death of lower branches on the stem, resulting in better quality logs. This should be followed by periodic thinnings to encourage vigorous diameter growth. Longer rotations of 100 to 140 years for most hardwoods and 80 to 120 for softwoods can allow the timber enough time to grow to valuable diameters and realize its highest market value.

Pallet
Pallet logs are often a by-product of a good timber management program. Logs located above the sawlogs in many trees will have a greater number of larger knots and other defects. These lower quality logs are referred to as pallet logs. Hardwood pallet logs will have knots on three to four sides and softwood pallet logs will have large black knots (3 inches in diameter or larger). Both are typically cut eight feet in length. Traditionally, this term was used because softwood pallet logs yielded low quality lumber only suitable for making pallets for and shipping containers that only required strength. Pallet logs are now used to designate low quality logs of both hardwoods and softwoods. Hardwood pallet logs are often used for flooring, railroad ties, and pallets; and softwood pallet logs are used for landscape timbers and box or crate material.

Matlogs
In recent years, a new market has emerged for low quality or low value hardwood logs called matlogs. Matlogs are cut to 16-foot lengths and sawn into rough timbers to be manufactured into construction or "crane mats". These mats are used on construction sites and along utility corridors to protect sensitive ground from the impacts of large equipment. Crane mats are produced in easily transported sections that can be re-used from job site to job site.

Pulp
Low quality wood that cannot be used as sawlogs or pallet logs provides a cheap source of raw materials for paper called pulp. The wood fibers are mechanically or chemically separated, then formed into thin sheets as paper. Paper made from New England pulpwood was some of the finest quality paper in the world. Glossy publication paper used for catalogs and magazines often came from New England paper mills. Traditionally, there has been a fluctuating market for paper pulp for nearly a century. However, over the past decade, the closure of nearly all the remaining pulp mills in northern New England due to falling demand and stiff overseas competition decimated this low grade market.

Recently however, the trend in recyclable and environmentally friendly food packaging such as paper cups and straws, as well as increased online shopping and shipping, has created a surge in specialty paper and cardboard markets. Paper pulp plants that were mothballed within the last 5-

10 years have re-opened, and other mills have completed major upgrades to increase production. The pulp market is looking stronger than it has in years. Although pulpwood is a low value forest product, it can produce very high returns to a community's economy through high conversion returns from manufacturing and re-manufacturing when the market is healthy.

Firewood

Trees in New Hampshire forests have always produced firewood for heating homes. Locally produced firewood provides a good opportunity for sustainably heating local homes at an affordable price. Most hardwood trees are suitable for firewood although some species provide higher heating values than others. Species with the densest wood produce the highest heat values of British Thermal Units (BTUs). Firewood is produced from both the topwood of sawtimber trees and from small or defective trees that have been thinned from the forest. Like other low value products, firewood is a by-product of a well-managed forest.

Biomass Chips

When trees are cut during a timber harvest, the higher quality products mentioned above are removed from the tree. The remaining low grade parts of the tree such as branchy tops and limbs may be fed through a large chipper to produce biomass chips. The chips are blown into a trailer and delivered to a biomass power plant where they are fed into a boiler to generate electricity. There are eight biomass facilities in New Hampshire, six of these were built decades ago. The two newer biomass plants include a former coal plant in Portsmouth and a former pulp mill in Berlin that were converted to biomass. Older biomass plants are not very efficient, generating only electricity, but newer plants can be extremely efficient and can generate both electricity and heat. In recent years, the falling price of natural gas, which is used to produce electricity, has made it very difficult for biomass plants to remain competitive. Despite renewable energy credits and failed attempts at legislation to support the industry may of the older facilities have been forced to shut their doors or operate only during times of peak demand. This has resulted in a greatly diminished market for biomass chips and a significant drop in price. One area of growth has resulted from several schools, hospitals and community centers are converting their infrastructure to enable the use of biomass chips for heating purposes.

The burning of biomass chips as fuel does produce carbon dioxide that is released into the atmosphere. However, some people consider locally produced, sustainably harvested biomass chips to be a "green" fuel or a carbon neutral fuel because they are a renewable resource and they are typically the by-product of long rotation, high-quality timber management production. The carbon biomass chips produce is being recycled from the immediate environment, while offsetting the use/burning of fossil fuels which would release carbon products into the atmosphere that have been stored for millennia, and would have continue to be stored for a very long time. In addition, biomass is utilized at the local level, minimizing transportation and processing that would otherwise require additional fossil fuels.

Forest Carbon

Carbon storage is a topic that is generating much interest in respect to forests and forest products. Tree tissues are estimated to contain around 50% elemental carbon. As individual trees continue to grow and become larger over time, each tree captures and stores more carbon within its tissues. As parts of trees such as leaves, needles and lower branches die off they fall to the forest

floor and slowly decompose. From this decomposition process some carbon mixes with oxygen and then is cast off to the atmosphere as carbon dioxide (CO2), and some carbon is stored as organic materials on the forest floor and in the soil layers below. The capture of carbon from the atmosphere into the tree, forest floor and soil is referred to as carbon sequestration. While the retention of captured carbon in mature trees and the forest floor and soils is known as carbon storage. Scientists have long known that forests have the ability to sequester and store carbon that otherwise would be in the atmosphere and thereby reduce the amount of greenhouse gases that contribute towards climate change. Storing carbon was once considered to be an on-site process of naturally cycling forest biomass, but more recent analysis also takes into account the forest products being removed from the site. Manufactured wood products such as mass timber, veneer, and high quality lumber are generally long-lived products due to their use, and subsequently lock up carbon for long periods of time. Short-lived forest products such as wood chips, firewood wood which are burnt for electricity and heat as well as other products such as unrecycled paper and packing materials, release their carbon much more quickly.

Forest carbon is recognized as an "ecosystem service", a commodity that under certain conditions can be monetized through a market sale to "emitters" to offset their carbon emissions. In return for payment, the "offset provider" (land owner) commits to maintaining the carbon currently stored within the forest for a period of time (generally 100 years). The largest market for forest carbon offsets is the California regulatory cap-and-trade system, but several smaller independent markets are developing in the northeast. Forest carbon offset projects can include both reserved and managed forestlands, but to be financially viable they generally require several thousand acres of forest with annual growth that exceeds removal (harvesting). For more information on carbon storage at Bear Brook State Park, see Chapter 9, Climate Change.

10.4 FOREST RESOURCE INVENTORY

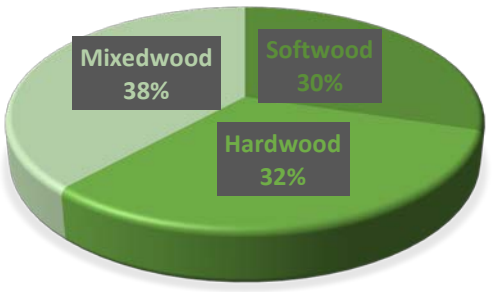
A timber cruise and forest resource inventory of Bear Brook State Park was completed in 1990. The work was conducted over several years by Division of Forests and Lands, Forest Management Bureau staff, who measured, mapped, and evaluated the timber and other natural resources across the entire property. Data was collected at 400 foot by 400 foot spacing using a compass and tape. Variable plot sampling of the timber resource was performed using a 10 basal area factor (BAF) prism. The Society of American Foresters (SAF) cover type classifications were used to identify stand types. Forest size classes were defined from seedling through large sawtimber, and sample trees were cored for ages. Locations of water bodies, wetlands, streams, stonewalls, cellar holes, roads, and trails were mapped. Notes on the presence of wildlife species and their habitats were also recorded.

The Forest Management Bureau is in the process of re-inventorying Bear Brook State Park. Timber cruise and other natural resource data is now collected on a 200 foot by 400 foot grid, with a variable plot system that uses a two-phase sampling technique utilizing 20 and 80 BAF angle prisms. In addition to the SAF cover types, the current resource inventory utilizes several additional cover types defined by the Forest Management Bureau to better capture southern New Hampshire stand types. The property is divided up into 11 management compartments and forest stands are mapped to areas of five acres or more. This information is used to develop silvicultural prescriptions and treatments for inclusion in forest operation plans for timber harvests.

Forest Composition

The forest cover at Bear Brook State Park is distributed between mixedwood, hardwood, and softwood, stand types with roughly one third of the park acreage in each catagory (figure 10.1).

FIGURE 10.1 FOREST COMPOSITION

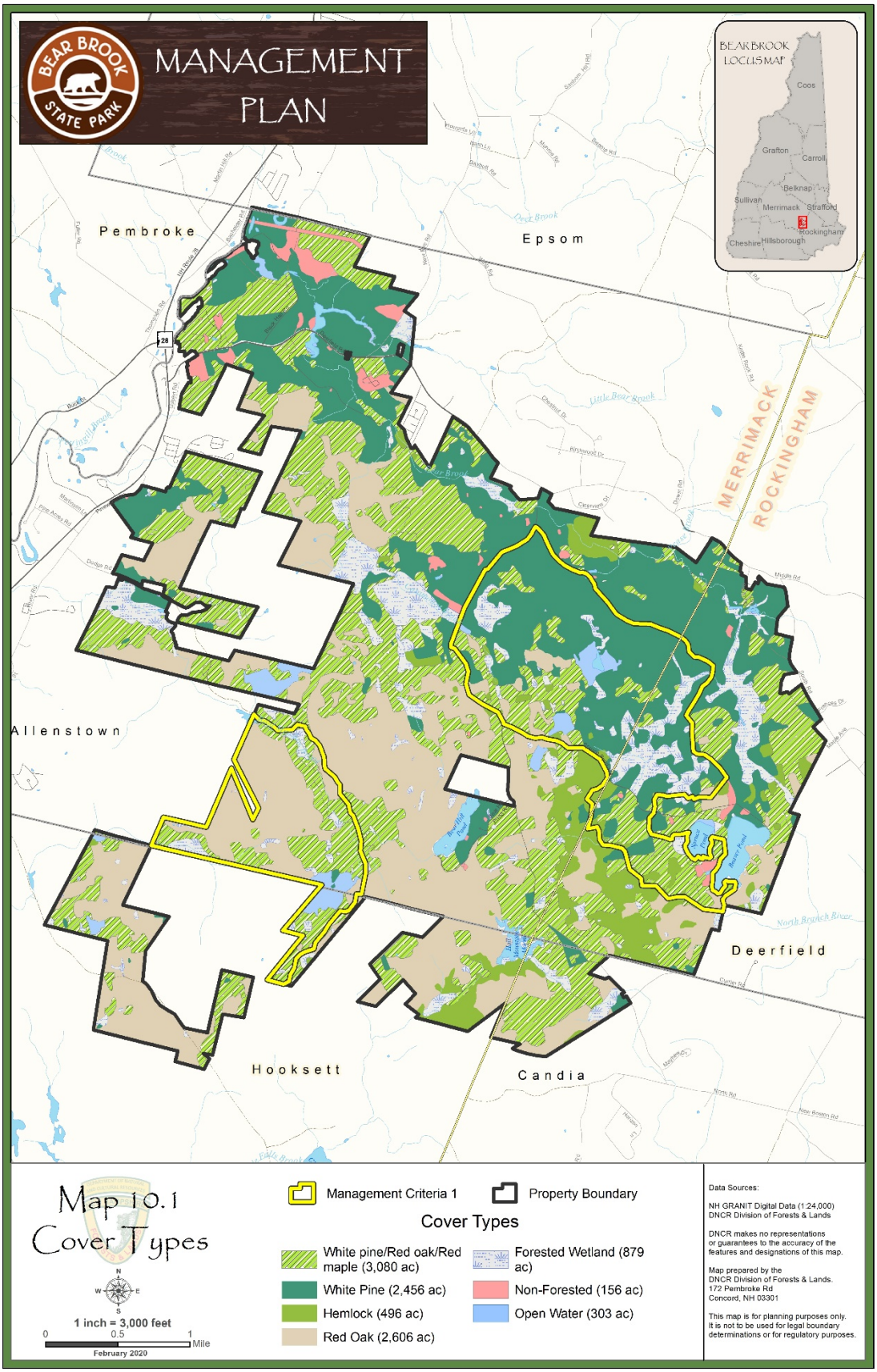


Softwood stand types, especially eastern hemlock, dominate the stream drainages and lowlands, while hardwoods tend to dominate the higher elevations with mixed forest types in between. Criteria 2, which contains much of the lowland areas, has the largest percentage of white pine and hemlock dominated stands. Many of the higher elevations found within the park are contained in Criteria 3, which tend to be composed of hardwood stands dominated by red oak with white oak, red maple and some black birch and white pine. Criteria 1, has an almost equal percentage of softwood, hardwood, and mixedwood dominated stands (figure 10.2).

White Pine-Red Oak-Red Maple: This mixedwood stand type is the most prevalent forest cover at Bear Brook State Park (38%). However, much of the past land use and management at the park such as the natural succession of abandoned agricultural pastures, planting, and early pre-commercial "weeding" of hardwoods resulted in many "pure" white pine, red pine, and mixed pine stands that otherwise would have likely been classified as mixedwood pine-oak-maple stands. White pine and red oak are the dominant species found in this mixed type, with lesser amounts of red maple. Other species commonly found in smaller numbers within this cover type include, hemlock, beech, white oak, black oak, and black birch (see Chapter 5, Ecological Assessment).

Red Oak: This is the dominant hardwood stand type found at Bear Brook State Park. Due to the poor, sandy soils derived from glacial till that cover the majority of the park, most of the red oak tends to be of marginal quality, with the exception of some deeper glacial outwash soils in the north of the park that are capable of growing better quality hardwoods. Good quality red oak will fetch the highest value of any species found within the park. Other species that may be present to a lesser extent in this stand type include white oak, black oak, red maple, black birch, beech, white pine, and hemlock.

White Pine: As mentioned above the "pure" white pine stands found within the park tend to be a result of past agricultural and management practices, such as old-field abandonment, planting, and early "weeding" of hardwood stems. Without the hand of man, these areas would likely have resulted in mixed stands of pine-oak-maple. Due to the wide spread volume and consistent demand and value, white pine is probably the most economically important species found within the park.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEARBROOK LOCUS MAP
Coos
Grafton
Carroll
Belknap
Sullivan
Merrimack
Strafford
Rockingham
Cheshire
Hillsborough
Pembroke
Epsom
Allenstown
Deerfield
Hooksett
Candia
MERRIMACK
ROCKINGHAM
Map 10.1
Cover Types
1 inch = 3,000 feet
0 0.5 1 Mile
February 2020
Management Criteria 1
Property Boundary
Cover Types
White pine/Red oak/Red maple (3,080 ac)
White Pine (2,456 ac)
Hemlock (496 ac)
Red Oak (2,606 ac)
Forested Wetland (879 ac)
Non-Forested (156 ac)
Open Water (303 ac)
Data Sources:
NH GRANIT Digital Data (1:24,000)
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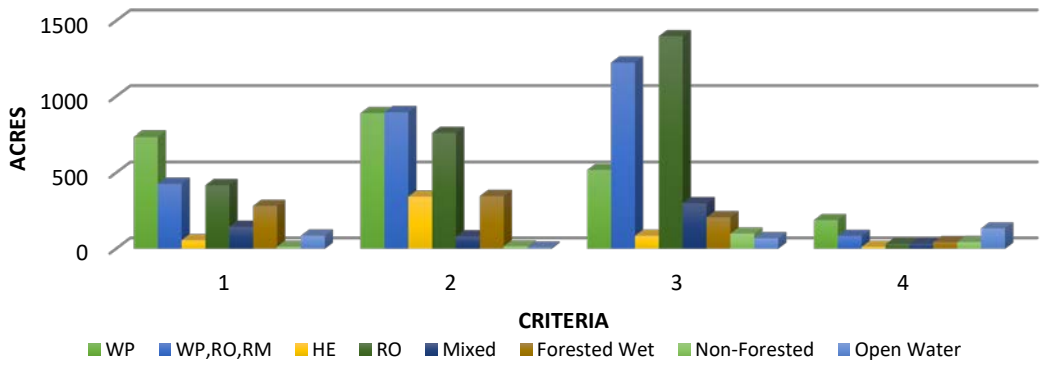
Red Pine: While some natural red pine may have existed in mixed stands in the Bear Brook State Park area in the past, the red pine plantations in the park were the result of planting efforts by the Civilian Conservation Corps in the 30s and 40s. Nearly all of the red pine plantations and red pine found in mixed stands were removed in sanitation harvests between 2013 and 2014 due to infestation of the exotic red pine scale insect (see Chapter 8, Forest Health).

Hemlock: Stands dominated by hemlock tend to be found within riparian areas and at low elevations within the park. These stands provide important winter habitat for deer, providing shelter from wind and decreased snow depths due to their thick cover. Hemlock has had traditionally fetched lower prices and has been a species of little economic importance. However, recent strength tests have shown it has promise in the construction of "mass timber" such as cross-laminated building panels. Hemlock has some health issues such as the hemlock wooly adelgid insect and hemlock scale insect that can impact its vigor and mortality (see Chapter 8, Forest Health).

FIGURE 10.2 FOREST COMPOSITION BY CRITERIA



Timber Volume and Quality

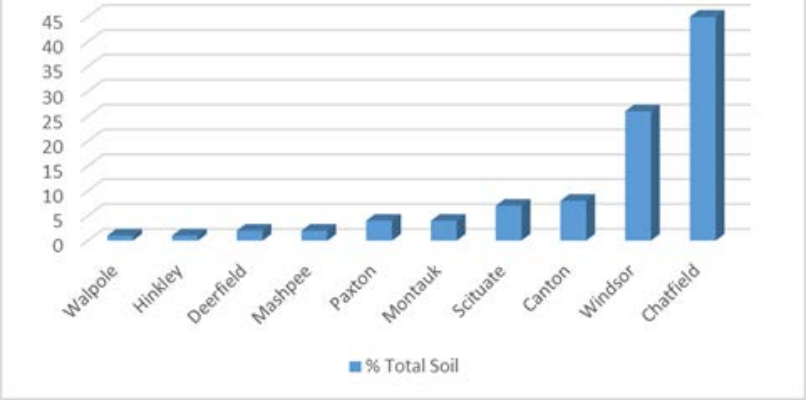
Overall timber volume is above average in most stands. Stand volumes from the 1990 inventory ranged from as low as 635 board feet per acre to as high as 29,785 board feet per acre. Subsequent inventory work conducted during the planning process for timber harvests has averaged around 8,000 board feet per acre. Quality is fair to average in most stands with a high proportion of acceptable growing stock. Timber harvests have yielded very little veneer with most sales yielding average grade logs with some low grade and pallet. Site conditions are most conducive to growing quality white pine sawlogs on the sandy outwash soils and mixedwood species on the glacial till soils.

Forest Soils

Soils play an important role in determining forest composition and productivity and are an important part of any forest resource inventory. Soils provide nutrients, water, and stability to trees and plants. Soil characteristics also have a significant influence on where plant species grow. The Natural Resource Conservation Service (NRCS) generates and updates soils maps for each state. A combination of GIS data and the NRCS Web Soil Survey has been used to identify the soils present at Bear Brook State Park.

The majority of soils in the park are sandy loams derived from glacial tills and glacial outwashes. Glacial tills typically occur across a variety of upland slopes within the park, while the out washes occur in the valleys and low areas. The most frequently mapped soil series are the Chatfield and Windsor soils (see Figure 10.3). The Chatfield series consists of well-drained, moderately deep glacial tills. This soil type can found in the elevated, hilly areas of the park between Catamount Hill, Bear Hill and Hall Mountain. The potential for forest productivity on these soils varies from low to high and supports tree species such as red oak and mixed stands of pine oak and maple within the park. The Windsor series consists of very deep, excessively drained glacial outwash soils. This soil type predominantly lies within the extent of Bear Brook drainage and the Suncook River valleys. These soils are most suitable to white pine production.

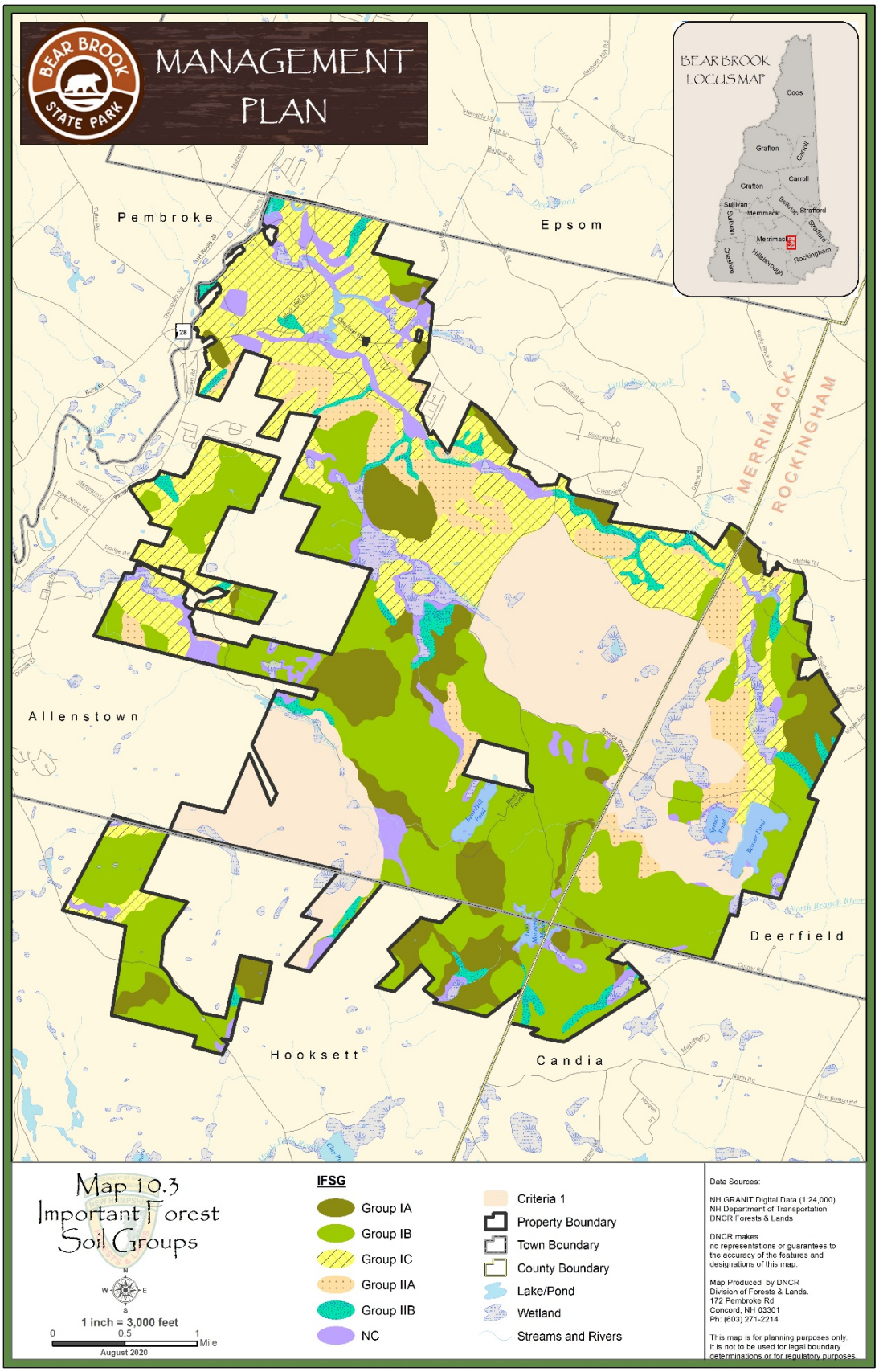
Figure 10.3 Major Soils Groups



The Natural Resource Conservation Service has also developed categories called important forest soils groups (IFSG), which break soils classifications down into groups based on their productivity for growing trees. These groupings allow foresters to evaluate the productivity of specific soils and to better understand patterns of plant succession and how soil and site interactions influence vegetation management decisions (See Map 10.3).

IA Soils: This group covers 13% of the park and consists of deeper, loamy textured, moderately well to well-drained soils. Generally, these soils are the most fertile and have the most favorable soil moisture relationships. As a result, hardwood competition is severe on these soils, and establishing and maintaining softwood regeneration is usually dependent upon persistent hardwood control. Successional trends on these soils at Bear Brook State Park frequently contain beech, red maple, aspen, white ash, and northern red oak in varying combinations with, hemlock, and occasionally white pine, ultimately cumulating in stands of shade tolerant hardwoods.

IB Soils: The soils in this group cover approximately 40% of the park. They are generally sandy, or loamy over sandy textures, and are slightly less fertile than soils in group IA. These soils are moderately well to well drained. Soil moisture is adequate for good tree growth, but may not be quite as abundant as in group IA soils. As a result, hardwood competition is moderate to severe on these soils and successful softwood regeneration is still dependent upon hardwood control. Successional trends on these soils at Bear Brook State Park frequently contain beech, red maple, aspen, white ash, and northern red oak in varying combinations with, hemlock, and occasionally white pine, ultimately cumulating in stands of shade tolerant hardwoods.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Hillsborough
Rockingham
Pembroke
Epsom
Allenstown
Deerfield
Hooksett
Candia
MERRIMACK
ROCKINGHAM
Map 10.3
Important Forest Soil Groups
1 inch = 3,000 feet
0 0.5 1 Mile
August 2020
IFSG
Group IA
Group IB
Group IC
Group IIA
Group IIB
NC
Criteria 1
Property Boundary
Town Boundary
County Boundary
Lake/Pond
Wetland
Streams and Rivers
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
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IC Soils: The soils in this group cover 24% of the park. They consist of outwash sands and gravels. Soil drainage is moderately well drained to excessively drained. Soil moisture is adequate for good softwood growth, but is limited for hardwoods. As a result, there is much less hardwood competition, and these soils are well suited for softwood production. With modest levels of management, white pine can be maintained and reproduced on these soils, making them ideally suited for forest management. Successional trends on these soils at Bear Brook State Park frequently contain white pine, red maple, and aspen, ultimately cumulating in stands of shade tolerant softwoods.

IIA Soils: The soils in this group cover 8% of the park. This diverse group includes many of the same soils as in groups IA and IB. However, these mapping units have been separated because of physical limitations which make forest management more difficult and costly, i.e., steep slopes, bedrock outcrops, erosive textures, surface boulders, and extreme rockiness. Due to the diverse nature of this group, it is not possible to generalize about successional trends or to identify special management opportunities.

IIB Soils: The soils in this group cover 4% of the park. They are poorly drained with a seasonal water table that is generally within 12 inches of the surface. Productivity of these poorly drained soils is generally less than soils in other groups. Successional trends are toward climax stands of shade tolerant softwoods, i.e., hemlock at Bear Brook State Park. Due to poor soil drainage, forest management is somewhat limited. Severe windthrow hazard limits partial cutting and harvesting is generally restricted to periods when the ground is frozen. Often these areas are better suited to a wildlife habitat management focus.

NC Soils: This group covers 11% of the park. Several mapping units in the survey are either so variable or have such a limited potential for commercial production of forest products they have not been considered. These includes muck and peat, borofibrists, dumps, organic material, gravel pits (existing), rock outcrops, steep rubble, etc.

Forest Structure

Forest structure describes the distribution of trees or stands by size within a forest. There is a general correlation between size class and age, but caution must be used in slow growing stands and uneven-aged stands where older trees may have not achieved significant size. Trees fall into four basic size classes:

Seedlings: Seedlings are small trees up to 2.5 inches in diameter at breast height (dbh). Stands of seedlings that are five acres in size or larger are known as “young forest”, a critical habitat during many wildlife species life cycles (see chapter 7, Wildlife Habitat Management).

Sapling and Poles: Saplings are small trees from 2.6 to 4.5 inches dbh. Poles range in size from 4.6 to 9.5 inches in dbh. These stands tend to be too small for a commercial timber sale, but are a good size to perform pre-commercial timber stand improvement work.

Small Sawtimber: Small sawtimber ranges in size from 9.6 to 14.9 inches dbh. This is the threshold at which stands have reached an adequate size to perform commercial timber harvests.

Large Sawtimber: Large sawtimber is over 15 inches dbh. This is timber that is starting to become financially mature. White pine are typically grown to18 to 20 inches dbh, while red oak, depending on quality, may be grown as large as 24 inches dbh.

At the time of the 1990 forest resource inventory, approximately 70% of Bear Brook State Park was in the small sawtimber size class, with only about 3% of the park in the seedling size class. This lack of size class distribution within the park was a result of the widespread, natural and assisted (planting) reversion of abandoned agricultural lands after state acquisition in the early part of the 20th century as discussed earlier in this chapter. Having the vast majority of the park acreage in a single size class is not beneficial for maintaining a sustainable flow of forest products, or for providing a variety of wildlife habitats and ecological conditions.

The 1994 Bear Brook Management Plan addressed the need to manage the park in a manner that develops and maintains a balance of forest size classes, wildlife habitats, and ecological diversity through the introduction of a system of Management Criteria. The system is comprised of four Management Criteria, each of which has a set of standards for governing the type and degree of disturbance that will occur in specific locations of the park (see Chapter 2, Vision and Management Approach). Starting with an unmanaged core, each successive criteria allows for progressive levels of disturbance that radiate outwards. This management approach has provided a high degree of species richness, and has significantly diversified the forest age and size classes within the park over the past 25-years.

Table 10.1 shows how the current forest structure at Bear Brook State Park has changed since the 1990 inventory, as well as how it compares to the desired forest structure developed by DeGraaf et al, 2006. The desired forest structure is designed to maintain a sustainable balance of size classes, and was developed by expertise in wildlife population modeling, wildlife habitat management, timber management, silviculture, and forest growth. These structural guidelines are based upon decades of research and are designed for New England forest types. These structure guidelines provide important broad level wildlife habitat conditions and reasonable rotation lengths for the development of high quality mature sawtimber.

Table 10.1 Comparison of the 1990 forest structure, current forest structure, and desired forest structure at Bear Brook State Park.

Forest Size Class	*1990 Forest Structure*	*Current Forest Structure*	*Desired Forest Structure (DeGraaf et al, 2006)*
Seedling	3%	8%	5-15%
Sapling/Poles	20%	22%	30-40%
Small Sawtimber	69%	64%	40-50%
Large Sawtimber	8%	6%	<10%

Area Suitable for Timber Management

Using the information gathered from the forest resource inventory, manageres can determine the acreage within the park that is available for timber production without site limitations or other restrictions. This manageable acreage is collectively known as the area suitable for timber management (ASTM). *It is important to note that the above analysis of forest structure was*

applied only to the ASTM. If the desired forest structure developed by DeGraaf et al, 2006 was applied to the entire park acreage, including those areas that are not suitable or available for timber management, such as Criteria 1, then the areas available for timber management would need to be harvested far more frequently to maintain the desired proportions in the seedling and sapling/pole size classes. Such a scenario would soon become unsustainable. Removing the unavailable acreage in Criteria 1, as well as acreage not suitable for timber management found in the other criteria from the forest structure calculations allocates the appropriate acreage of productive, manageable forest cover to each of the size classes.

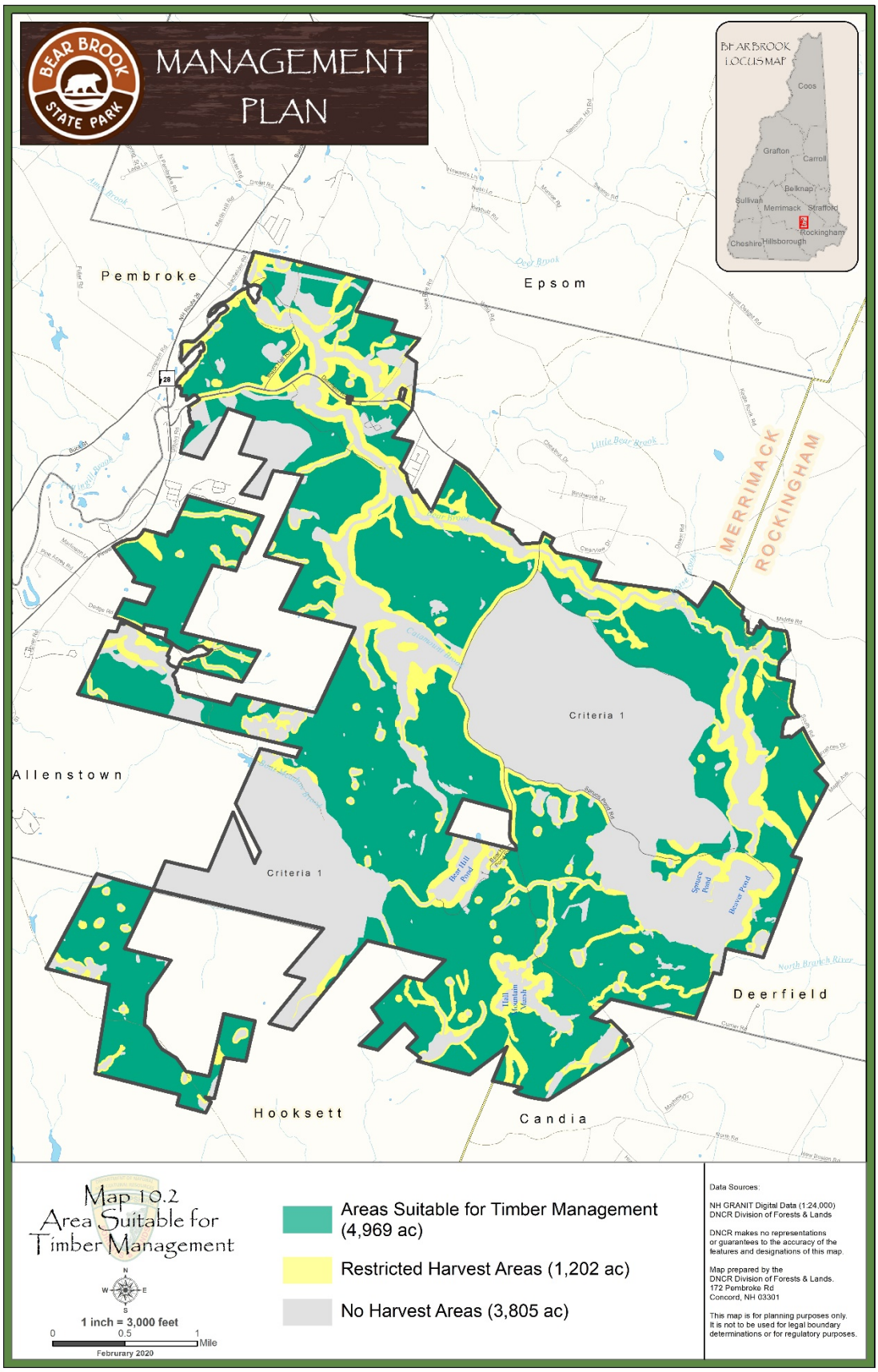
In addition to the unmanaged acreage that has been set aside in Criteria 1, the ASTM excludes areas found in the other three criteria that have physical site limitations or other restrictions that make them unsuitable for timber management; such as developed recreation sites, water bodies and wetlands, slopes greater than 30%, wet or shallow soils, riparian and roadside buffers, historic resources, and other sensitive sites. These areas are identified on the ground while conducting forest resources inventories and during the project planning process. With the advent of geographic positioning systems (GPS) and geographic information systems (GIS), the level of detail in identifying these areas has improved exponentially. In recent years the Division of Forest and Lands, Forest Management Bureau has hired a dedicated GIS Analyst. This position is responsible for creating and maintaining a GIS database for all state reservations.

A GIS analysis of the field data collected over the years, along with analysis of the various GIS data layers available, such as aerial photography, LIDAR, wetlands, soils, and WAP habitat maps, has determined that 3,805 acres are unsuitable for timber management. In addition, another 1,202 acres have been identified as only available for limited or restricted harvesting. These limited areas include buffers along roads, water bodies, and wetlands. This leaves 4,969 acres suitable for timber management at Bear Brook State Park (see Table 10.2 and Map 10.2).

Table 10.2 Analysis of Manageable Acres at Bear Brook State Park

	Criteria 1	*Criteria 2*	*Criteria 3*	*Criteria 4*	*Total*
No Harvest Areas	2,167.0	610.0	765.0	263.0	3,805.0
Restricted Harvest Areas	0.0	544.0	526.0	132.0	1,202.0
Areas Suitable for Timber Management (ASTM)	0.0	2,188.5	2,612.5	168.0	4,969.0
Total	2,167.0	3,342.5	3,903.5	563.0	9,976.0

The acreage unavailable for timber management in Criteria 1, and the acreage unsuitable for timber management in the other criteria account for just over half the total acreage of the park. While not counted toward the acreage used to calculate the desired forest structure, this acreage will contribute to the overall large sawtimber size class in the park, and will provide ample habitat for those species requiring late successional habitats (see Chapter 7, Wildlife Habitat Management) as well as store a significant amount of forest carbon (see Chapter 9, Climate Change), and provide a place for those who like to recreate in an undisturbed environment.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEARBROOK LOCUS MAP
Coos
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Cheshire
Hillsborough
Pembroke
Epsom
MERRIMACK
ROCKINGHAM
Criteria 1
Allenstown
Criteria 1
Deerfield
Hooksett
Candia
Map 10.2
Area Suitable for Timber Management
1 inch = 3,000 feet
0 0.5 1 Mile
Februrary 2020
Areas Suitable for Timber Management (4,969 ac)
Restricted Harvest Areas (1,202 ac)
No Harvest Areas (3,805 ac)
Data Sources:
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10.5 SUSTAINED YIELD

Timber resources are managed at Bear Brook State Park on a sustained yield basis, in a manner consistent with the other multiple use objectives identified within this plan, and without impairment to the productivity of the land or other natural resources within the park. This means that the flow of forest products will be part of the production of a mix of values identified in the Vision for the park (see Chapter 2, Vision and Management Approach).

Area Regulation

Sustained yield timber management at Bear Brook State park is guided by a simple and direct method called "area regulation." The principle of area regulation is that an approximately equal amount manageable area is treated at regular intervals. Area regulation provides flexibility for modifications to cutting techniques and harvest volumes to protect or enhance non-timber values. In this manner, the area treated for timber management will remain relatively constant but periodic harvest volumes may vary to some degree.

The annual amount of acreage that can be harvested sustainably using area regulation can be calculated based on the manageable acres in the ASTM and the average rotation age for each criteria as illustrated in Table 10.3 below.

Table 10.3 Annual Area Regulation Maximums for Regeneration and Tending Acres

Criteria	*ASTM Acres*	*Rotation (Target Age)*	*Tending Entries per Rotation*	*Tending Acres per Year*	*Regeneration Acres per Year*
2	2,188	120	3	54	18
3	2,612	100	2	52	26

Notes:
"ASTM" is the area suitable for timber management without site limitations or other restrictions.
"Rotation Age" is the average length of time to grow a stand based on trees species and site capabilities.
"Tending Entries" are the number of times even-aged stands of trees should be maintained with intermediate treatments during a rotation. Uneven-aged groups may also be treated as "mini-stands" that are periodically tended during a rotation as well.
"Tending Acres" represents the annual maximum acreage that may be treated for forest maintenance.
"Regeneration Acres" equals the ASTM acres divided by rotation age to provide the annual maximum acres that may be regenerated.
Criteria 4 areas are managed by park request as part of adjacent commercial projects.

The total acres regenerated (493) and the total acres tended (2,228) within the park over the past 25 years are illustrated in Table 10.4 below, and are well within the total area regulation acreages allowed for within the ASTM during that period of time using the information from Table 10.3 above as follows:

(18 acres + 26 acres) x 25 years = 1,100 possible regeneration acres
(54 acres + 52 acres) x 25 years = 2,650 possible tending acres

Table 10.4 Timber Sales Completed at Bear Brook State Park Over the Past 25 Years								
Project #	*Year*	*Criteria*	*Acres Regenerated*	*Acres Tended*	*Total Acres Treated*	*Board Feet Harvested*	*Tons Harvested*	*All Products as Cords*
1.358	1995	2	0	120	120	152,540	1,926	1,108
1.362	1996	3	0	78	78	315,000	1,935	1,436
1.377	1996	2	6.3	31.7	38	191,270	224	476
1.380	1996	2	13	0	13	165,775	460	523
1.382	1996	3	0	15	15	0	300	125
1.397	1998	3	36	9	45	461,555	1,815	1,679
1.415	1998	3	0	82	82	683,345	2,103	2,243
1.431	2000	2	5	41	46	177,293	339	496
1.446	2002	2	10.5	109.5	120	382,800	2,127	1,652
1.458	2004	2	20	138	158	632,575	1,640	1,948
1.466	2003	2&3	6	145	151	469,892	5,169	3,094
1.474	2005	3	35	145	180	302,700	3,798	2,188
1.477	2006	3	2	98	100	244,180	1,963	1,306
1.489	2007	3	35	108	143	234,198	3,694	2,008
1.515	2007	3	2	33	35	172,475	1,268	873
1.522	2008	3	30	70	100	341,650	2,530	1,737
1.528	2009	3	0	80	80	445,470	1,088	1,344
1.545	2010	2	20	52	72	158,160	1,753	1,047
1.549	2011	2	2	153	155	638,158	6,028	3,788
1.553	2011	3	0	115	115	217,395	4,235	2,199
1.580*	2013	3&4	118	0	118	1,663,147	2,757	4,475
1.587*	2014	1&2	11	84	95	596,655	3,616	2,700
1.592	2015	3	45	176	221	270,280	5,113	2,671
1.605	2016	2	17	63	80	229,245	2,720	1,592
1.613	2017	3	28	122	150	340,900	6,780	3,507
1.624	2018	3	51	0	51	212,073	4,382	2,250
1.631	2019	3	0	160	160	635,745	6,202	3,856
Total			493	2,228	2,721	10,334,476	75,964	52,321
25-Year Average			20	89	109	413,379	3,039	2,093

* A portion of the volume removed from these two Red pine salvage harvests came from Criteria 1 and Criteria 4, which are outside the regularly managed ASTM acres used to calculate the allowable harvest. The inclusion of this volume slightly inflates the average annual cords removed as compared to the allowable harvest which are based only on Criteria 2 and Criteria 3.

Volume Control

The area regulation method of sustained yield timber management can be checked to ensure that harvested volumes do not exceed annual growth using the "volume control" method. The amount of volume that can be harvested sustainably each year, or the "allowable harvest", can be calculated based on the annual growth rates and the manageable acres found in the ASTM.

The Forest Management Bureau is currently collecting growth data from state reservations from all across the south region of the state through the establishment of continuous forest inventory (CFI) sample plots. However, this is a recent endeavor and the preliminary results are not anticipated for another year. A proxy for direct growth data from state lands is the Forest Inventory and Analysis (FIA) data provided by the USDA Forest Service - Northern Research Station. According to FIA data, southern New Hampshire forests average growth of 43.34 cubic feet per acre or roughly ½ cord per acre per year (43.34/85 = .51).

Considering that Bear Brook State Park, and most of the other state reservations in the south region of the state, have had consistent management for nearly100 years, it is anticipated that growth rates for state lands will be in excess of ½ cord per acre per year as derived from the FIA data above. For now, using the more conservative FIA growth rates and the ASTM acres discussed above in Table 10.3, the allowable harvest can be calculated as follows:

1/2 cord x (2,188 acres + 2,612 acres) = 2,400 cords of growth per year.

Since the implementation of the 1994 *"Bear Brook Management Plan"*, 27 timber harvests have been completed in the park. Table 10.4 shows the commercial forest operations on record for this time period. In the last 25 years, approximately 10.3 million board feet of sawlogs and 76,000 tons of low-grade products have been harvested from the park. Converting board feet and tons to cords (last column in table 10.4), this equates to a little over 52,000 cords harvested for all forest products combined during that time period, or roughly 2,090 cords per year.

This equates to harvesting about 85% of the annual growth in the ASTM, and results in a surplus of about 310 cords annually:

2,400 cords allowable harvest - 2,090 cords harvested annually = 310 cords annual surplus

10.6 SILVICULTURAL TREATMENTS

As mentioned earlier in this chapter, and discussed in detail in the *"Management Approach"* section of Chapter 2, the 1994 *"Bear Brook State Park Management Plan"* introduced a system of four Management Criteria based on varying levels of disturbance across the park landscape to promote a sustainable balance of forest ages and size classes.

- Management Criteria 1, Undisturbed Landscape - 2,167 acres
- Management Criteria 2, Transition Zone - 3,342.5 acres
- Management Criteria 3, Disturbed Landscape - 3,903.5 acres
- Management Criteria 4, Developed Recreation - 563 acres

Many of the natural resource management objectives for Criteria 2 and Criteria 3 are achieved through the implementation of forest management practices including the application of silvicultural treatments through commercial timber harvesting.

Silviculture is the practice of manipulating forest establishment, growth, and composition to meet forest management objectives. A silvicultural system consists of a series of treatments (harvests) at regular intervals during the rotation of a stand of timber. There are two basic silvicultural systems.

Uneven-aged Management - Criteria 2

This silvicultural system utilizes treatments that maintain a continuous forest canopy, containing three or more age classes at least 15-20 years apart. Treatments remove individual stems, or small groups of stems that do not create large openings in the forest, and generally favor mid to late successional tree species such as white pine, red oak, red maple, black birch, hemlock, and beech. Depending on the specific site capabilities (see soils above) and the tree species, the rotations, or length of time trees are grown before being harvested, tend to range between 100 to 140 years for Criteria 2, with an average of 120 years. Treatments typically occur when trees or groups of trees have reached commercial size, usually at the age of fifty to sixty years old, and re-occur every 15-20 years.

The application of uneven-aged silvicultural treatments in Criteria 2 helps to mitigate the hard edge impact that heavy disturbance in Criteria 3 may have on the plants, animals, and natural communities that occur in Criteria 1, and allows Criteria 2 to serve as a transition zone between the two extremes. Two uneven-aged silvicultural treatments are commonly used in Criteria 2.

Single Tree Selection: Single tree selection is the periodic removal (every 15-20 years) of individual stems that results in an intact forest canopy with a uniform, *vertical* distribution of at least three size classes in the stand. When applying single tree selection, foresters typically focus on treating the poletimber, small sawtimber and large sawtimber size classes.

Group Selection: Group selection is the periodic removal (every 15-20 years) of groups of stems that have reached the desired rotation age to create small openings in the forest canopy that results in a *horizontal* distribution of at least three size classes in the stand. At Bear Brook State Park, groups typically range between ½ to 2 acres in size, but usually average an acre.

Even-aged Management - Criteria 3

This silvicultural system utilizes treatments that ultimately cumulate in a final stand replacing harvest at the end of the rotation, such as an overstory removal or a clearcut. Regardless of the specific regeneration practice employed, even-aged management results in the creation of larger openings in the forest, usually greater than five acres and sometimes as large as 30 acres. These openings are temporary, their purpose being the regeneration of shade intolerant and mid tolerant tree species such as aspen, birch, pine, oak, and maple; and for the creation of young forest habitat for numerous wildlife species (see Wildlife Habitat, Chapter 7). Depending on specific site capabilities (see soils above) and the tree species being grown, rotations tend to range between 80 to 120 years with an average of 100 years. Intermediate, or “tending” treatments, typically start when stands have reached commercial size, usually at the age of 50 to 60 years old, and re-occur every 15-20 years to maintain growth until a regeneration harvest is finally implemented at the end of the desired rotation.

Even-aged silvicultural treatments can be broken into three categories: pre-commercial treatments, intermediate treatments (forest maintenance), and regeneration treatments. Several even-aged silvicultural treatments from each category are commonly used in Criteria 3.

Timber Stand Improvement: Timber stand Improvement (TSI) is a pre-commercial thinning or release of a sapling or pole sized stand to give space and site resources to the best quality stems to increase the diameter growth and quality of the residual stand.

Improvement Cutting: An improvement cut is the first commercial harvest in a pole or small sawtimber size stand to remove stems of inferior quality or undesirable species, as a precursor to future tending practices.

Thinning: Thinning is the uniform removal of individual stems to reduce the stocking level of small sawtimber size stands to encourage crown expansion and diameter growth of the residual stems.

Crop Tree Release: A crop tree release is the allocation of space and site resources to the best quality stems in a pole or small saw timber size stand to maximally increase crown expansion and diameter growth with the intention of producing the highest quality stand in the shortest amount of time.

Shelterwood: A shelterwood consists of multiple treatments near the end of a stand's rotation to establish and develop advanced regeneration through the manipulation of light levels that reach the forest floor. At Bear Brook State Park, shelterwoods are most often used to regenerate white pine stands. The preparatory cut is often considered the last thinning in a stand and prepares the trees to provide seed by providing adequate space to the maturing tree crowns. The seed cut further reduces the stand stocking and removes any undesirable understory vegetation to allow more light to reach the forest floor. *This cut should be timed with a good seed year and conducted on bare ground to scarify the forest floor.* Once adequate white pine regeneration has been established and is growing well, a final cut, or overstory removal, is conducted to release the new stand.

Overstory Removal: An overstory removal is the final harvest of a mature stand to release established advanced regeneration to create a new stand. An overstory removal is most often the final cut in a shelterwood, but may be used any time adequate advanced regeneration has been established and the stand is ready for replacement.

Deferment: A deferment cut is the final harvest of most of the trees in a mature stand to release established advanced regeneration to create a new stand. A pre-determined number of mature trees per acre are retained for aesthetics, wildlife habitat, or silvicultural purposes.

Seed Tree: A seed tree cut is the final harvest of most of the trees in a mature stand *that does not have established advance regeneration of the desired type.* A set number of trees per acre are retained as a seed source to establish a new stand.

Clear Cut: A clearcut is a final harvest of all the trees in a mature, defective, damaged, or diseased stand that *does not have adequate advance regeneration of the desired type.* Establishment of a new stand relies on re-sprouting, seed banks, and seed crops at the time of harvest. A true silvicultural clearcut should strive to remove all of the stems in both the overstory and understory to give the next stand a fresh start. To be most effective from a wildlife habitat standpoint, clear cuts should range from 5 to 30 acres in size. Shade intolerant, early successional species such as aspen and birch benefit the most from clearcutting, but the wildlife benefits from the creation of young forest habitat can be gained from the regeneration of just about any species mix (see Chapter 7, Wildlife Management).

10.7 THE TIMBER SALE PROCESS

All timber harvests conducted on state reservations follow a 40-step timber sale process found in the Division of Forest and Lands, Forest Management Bureau *"Timber Sale Manual"*. Included amongst the many steps in the timber sale process is a project review by the State Lands Management Team (SLMT). The members of SLMT consist of technical, resource specialist from various state agencies responsible for the management of natural and other resources in the state. Another important step in the timber sale process is the public notification and comment period, which provides abutters and other members of the public the opportunity to provide input or voice concerns about the project early on in the process. All timber sales are planned, implemented, and administered by Forest Management Bureau, licensed foresters and are carried out in accordance with *"Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire"* and *"New Hampshire Best Management Practices for Erosion Control on Timber Harvesting Operations"*. The 40 steps of the timber sale process are listed below, and can be seen in their entirety in the most recent 2018 update of the *"Timber Sale Manual"*.

Timber Sale Planning
1. Priority Setting and Site Analysis
2. NHB Data Check
3. Prescription Cruise
4. Data Analysis and Prescriptions
5. Preliminary Review
6. State Lands Management Team Review
7. Contact Road Agent
8. Draft Planning Report
9. Planning Report Review
10. Public Notification
11. Final Approval of Planning Report

Timber Sale Preparation
12. Scheduling of Showing and Bid Opening Dates
13. Layout and Marking
14. Volume Computation and Timber Sale Variables
15. Timber Sale Notice Preparation
16. Distribution of Timber Sale Notice

17. Prospectus Preparation
18. Bid Package Preparation

Timber Sale Bidding
19. Showing
20. Completing and Handling Bid Forms
21. Bid Opening
22. Bid Status Letter
23. Purchaser's Documentation
24. Contract Preparation
25. Award Recommendation Package
26. Division and Department Review and Sign-off of Contract
27. Other Agency Review and Sign-off of Contract
28. Contract Signing and First Payment from Purchaser
29. Sale of Timber Letter to Municipalities

Timber Sale Implementation
30. Pre-harvest Site Review
31. Operation Inspections
32. Collection of Trip Tickets and Scale Slips
33. Periodic Stumpage Payments
34. Final Site Inspection

Timber Sale Close Out
35. Final Timber Scale Summary
36. Closeout Letter to Municipality
37. Closeout Memo to Business Office
38. Return of Performance Bond
39. Record Adjustment
40. Periodic Site Review

10.8 RESEARCH AND EDUCATION

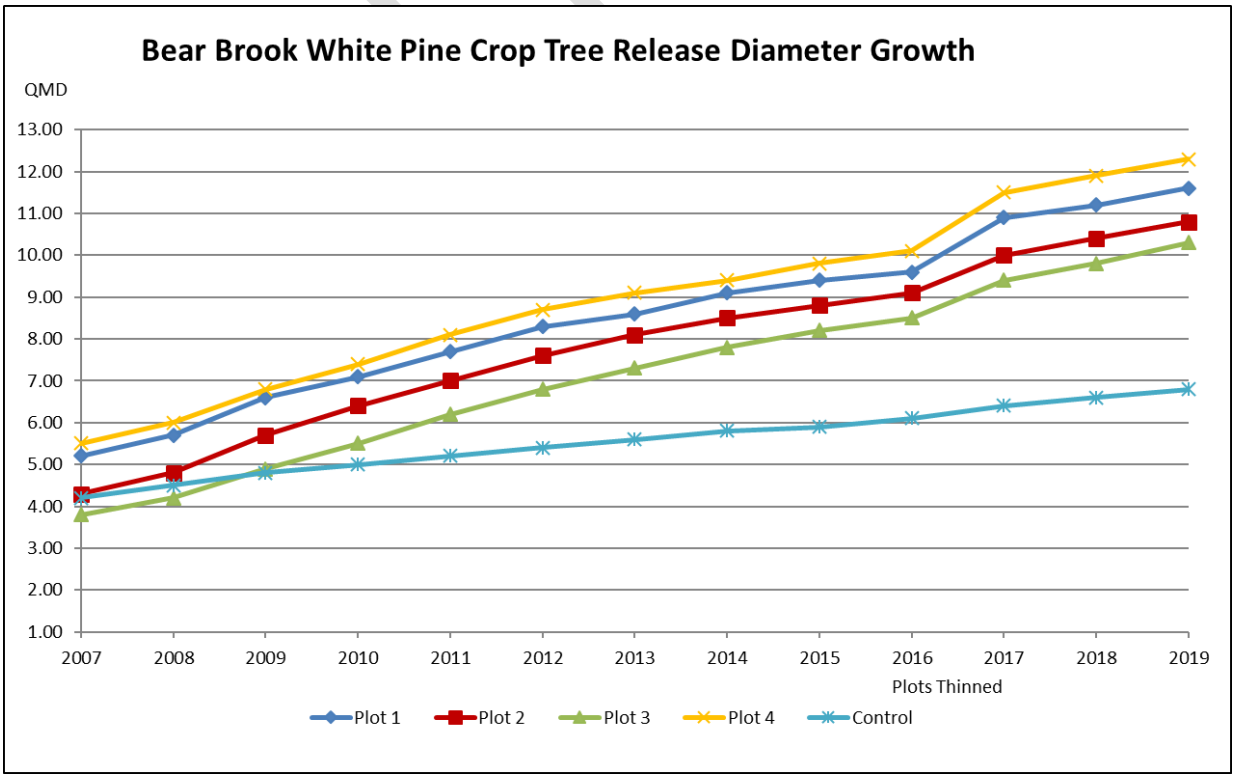
The Division of Forests & Lands supports the use of state reservations for educational opportunities and scientific research. Both the four-year University of New Hampshire forestry program and the two-year Thompson School of Applied Science forestry program bring their students to Bear Brook State Park for an annual tour as part of their curriculum. In addition, the University of New Hampshire Cooperative Extension program often utilizes the park as part of its series of workshops for foresters and other natural resource professionals.

Low-density White Pine Management
In 2007, research was begun by Forest Management Bureau foresters at Bear Brook State Park to study the effects of a low-density, pre-commercial release on the growth of white pine, specifically the potential for significantly reducing the rotation age.

The study site is located within a 30-acre overstory removal that released advanced white pine regeneration in 1997. Soils consist of excessively well drained Windsor soils, part of the important forest soils group 1C, and well suited to white pine management. In the fall of 2007, prior to treatment, the stand averaged nearly 2,500 stems per acre with an average diameter at breast height (dbh) of about 2 inches. A three-acre block was thinned using chainsaws and brush saws to an average of 160 stems per acre selecting the best, well-spaced trees for retention. Four 0.10 acre study plots were then established within the treatment area and the crop trees were measured and identified with script paint. Post treatment the dbh of the crop trees was about 4.5 inches. A fifth plot was established in an untreated block as a control, and potential crop trees were also selected, measured, and identified with script paint.

Re-measurements were taken annually. Boles were pruned gradually over time to 17 feet, being careful to maintain at least a 50% crown ratio. By 2016 the dbh of the treatment area had doubled to 9.3 inches. At this time the crowns were beginning to touch in numerous locations and a second thinning down to 110 stems per acre to provided additional room to maintain growth rates. The thinning pushed the dbh of the treatment area up to just over 10 inches and into the small sawlog size class.

Assuming a desired final dbh of 18 inches, it is anticipated that if current growth rates can be maintained with one additional thinning, the rotation age could be achieved in as little as 55 years with a final stocking of approximately 60 to 80 stems per acre. The trade off to the shortened rotation age and clear first log will be fewer stems per acre than a typical stand managed by traditional silvicultural methods. The actual economics of this application will be studied further and should also include carrying the cost of the initial investment in the pre-commercial release and pruning to the end of the rotation.



Hybrid American Chestnuts

Since 2007, the Division of Forests and Lands, Forest Management Bureau has been assisting the American Chestnut Foundation (TACF) with their efforts to develop blight resistant American chestnut hybrids. TACF uses backcrossed Chinese chestnut/American chestnut pollen to fertilize local remnant seed sources. The final product is the result of a series of six backcrosses and intercrosses to produce a final BC3F3 chestnut tree that is approximately 94% American. Ideally, the BC3F3 hybrids will retain the genetic resistance to the blight from the residual Chinese chestnut in its make-up, while retaining the magnificent timber form and high nutritional value and regular yield of nuts produced by the American chestnut. Several breeding and seed orchards have been established on state reservations as well as some initial progeny tests of several BC3F3 strains. The number of naturally occurring American chestnut sprouts that result after timber harvests in many of the stands at Bear Brook State Park speak to the considerable presence of this important forest tree on the property prior to the outbreak of chestnut blight in the early 1900's (see Forest Health chapter 8). Additional progeny tests of BC3F3 hybrid chestnut, developed from local, remnant American chestnut trees will be established in suitable openings created by timber harvests in the park in the future.

10.9 RECOMMENDATIONS

Continue to manage timber in concert with the other multiple uses of Bear Brook State Park.

- Utilize the Management Criteria System to provide a sustained yield of forest products in a manner that is consistent with the multiple uses of Bear Brook State Park, maintaining public recreation, and the conservation of other resource values.
- Follow the 40-step Timber Sale Process to integrate timber management with other resource values and land uses.
- Coordinate timber harvests with the State Lands Management Team and recreational user groups to ensure consideration of multiple resource values and user interests.
- Notify the public of each proposed timber harvesting operation to provide the opportunity for public input and response.
- Identify potential impacts and management opportunities associated with other resource values and land uses and implement appropriate modifications prior to timber harvests.
- Use timber harvesting as a vegetation management tool to provided and maintain wildlife habitat and enhance resource values and land uses.
- Provide interpretive opportunities for timber management practices and integration with other uses.

Update the timber cruise and forest resource inventory.

- Cruise and inventory each of the 11 compartments at Bear Brook State Park during the life of the plan.
- Identify and map any additional areas where other resource values or land uses take precedence over timber production to re-assess the area-suitable for timber management.

Continue to work towards achieving and maintaining the desired forest structure.

- Identify forest structure goals that provide a balanced distribution of ages and size classes based on species rotations and manageable acres for each criteria.
- Utilize an uneven-aged silvicultural system to achieve a fine scale distribution of size classes in Criteria 2.
- Utilize an even-aged silvicultural system to achieve a broad scale distribution of size classes in Criteria 3.
- Utilize silvicultural treatments that result in the natural regeneration of native species and that build upon soil/site capabilities.
- Emphasize the growth of long rotation, high quality forest products.

Continue to provide a sustained yield of forest products from the ASTM.

- Use *area regulation* to determine the amount of acreage that may be harvested annually based on the desired forest structure, rotation ages, and manageable acres (ASTM).
- Use *volume control* to determine the *allowable harvest*, or amount of volume that may be harvested annually based on FIA growth rates and the manageable acres (ASTM).
- Track the acreage harvested during each timber sale to ensure an adequate number of acres are being treated and regenerated to maintain the desired forest structure.
- Track the amount of volume harvested during each timber sale to ensure the average volume removed over time does not exceed annual growth.
- Update the *allowable harvest* with growth data from state reservations when the south region CFI plots have been re-measured.
- Maintain and periodically update a ten-year timber sale plan containing anticipated acreages to be harvested and volumes to be removed.
- Monitor and respond to changing and developing forest product market opportunities.

Identify timber management research needs and seek opportunities for collaboration.

- Work closely with other state and federal agencies, educational institutions, and others to implement forest management research.
- Utilize the unmanaged area in Criteria 1 as a baseline to evaluate the effects of timber management on forest composition, structure, and growth.
- Develop a database for all research projects within Bear Brook State Park.

11. RECREATION MANAGEMENT

11.1 RECREATIONAL SETTING

Much of Bear Brook State Park's rich cultural history is related to a long tradition of recreation, beginning with the construction of the developed recreational facilities by the Civilian Conservation Corps (see Chapter 6). The property contains areas of recreational development in Criteria 4 areas and a comprehensive trail network in Criteria 1, 2 and 3 areas surrounded by the extensive forest that makes up the park.

Located in the Merrimack Valley Region, Bear Brook State Park is close to the populous cities of Manchester (population 112,525) and Concord (population 43,412). A Zip Code survey conducted in 2018 found approximately 69% of day-use visitors lived within a forty-five minute drive to the park. In 2019, day visitors were interviewed and asked what their primary reason for the visit. A majority of users interviewed were there to use the trail network with mountain bikers as the primary users. The 2019 day-use visitor total was 21,657 persons

Forest management practices within Bear Brook State Park creates appealing forests through open areas, trails and road access which provides additional recreational opportunities and enhances visual diversity. These well-managed forests enhance opportunities to enjoy the outdoors through thoughtful wildlife habitat development, visual diversity and where applicable, scenic vistas. Managed forests create a diversity of plants and animals that benefit many outdoor activities like bird watching, hunting and wildlife watching. Continued forestry practices in the multiple use management of Bear Brook State Park is important to the overall outdoor recreational experience, forest vitality and its resilience to climate change into the future.

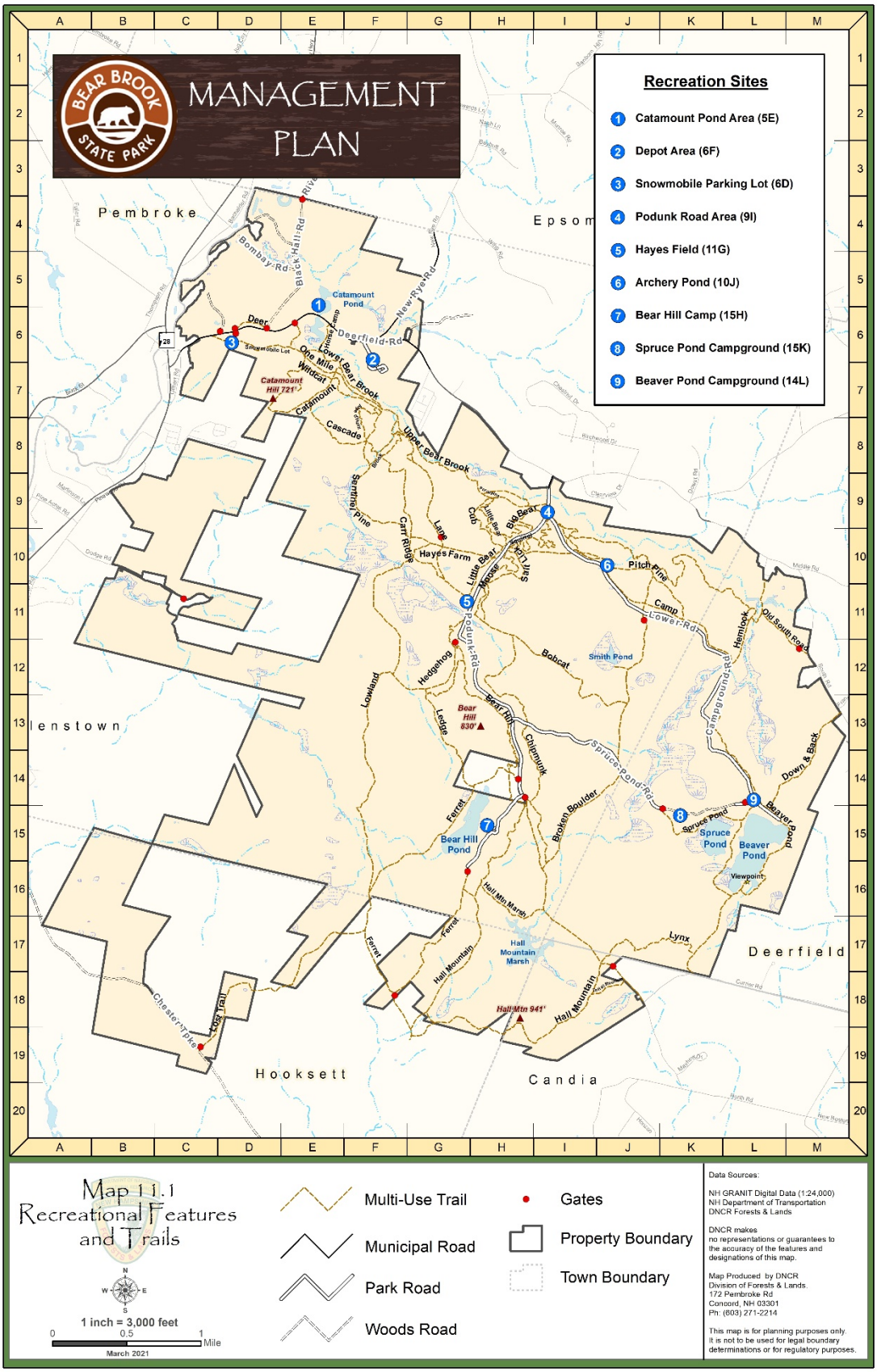
In this chapter, many features, facilities and trails are described and the coordinates provided are keyed to Map 15, Recreational Features and Trails.

11.2 MANAGEMENT POLICIES

The Divisions of Forests and Lands and Parks and Recreation cooperatively manage the state owned reservations for a variety of purposes as stated in RSA 216-A:1 and RSA 227-H:1. Other state agencies such as the Fish and Game Department, Department of Safety, Department of Transportation and the Department of Environmental Services have regulatory and programmatic responsibilities on the property.

Professional foresters, forest rangers, wildlife biologists, ecologists, cultural resource and recreational specialists manage the natural, cultural and recreational resources year round. The developed recreation facilities are located in management area Criteria 4.

Bear Brook State Park is protected in perpetuity by Section 6 (f)(3) of the Land and Water Conservation Act of 1965. Consultation with the Division of Parks and Recreation, Community Recreation Office is required when there is a change in management of the property or its facilities.


BEAR BROOK STATE PARK
MANAGEMENT PLAN
Recreation Sites
1 Catamount Pond Area (5E)
2 Depot Area (6F)
3 Snowmobile Parking Lot (6D)
4 Podunk Road Area (9I)
5 Hayes Field (11G)
6 Archery Pond (10J)
7 Bear Hill Camp (15H)
8 Spruce Pond Campground (15K)
9 Beaver Pond Campground (14L)
Pembroke
Epsom
Deerfield
Hooksett
Candia
Allenstown
Catamount Pond
Deer
Snowmobile Lot
Lower Bear Brook
One Mile
Wildcat
Catamount
Catamount Hill 721'
Cascade
Upper Bear Brook
Sentinel Pine
Carr Ridge
Hayes Farm
Little Bear
Moose
Big Bear
Cub
Pitch Pine
Camp
Lower Rd
Hemlock
Old South Road
Podunk Rd
Hedgehog
Lowland
Bobcat
Smith Pond
Bear Hill 830'
Ledge
Bear Path
Chipmunk
Spruce Pond Rd
Campground Rd
Down & Back
Ferret
Bear Hill Pond
Broken Boulder
Spruce Pond
Beaver Pond
Viewpoint
Hall Mtn Marsh
Hall Mountain Marsh
Hall Mountain
Hall Mtn 941'
Lynx
Chester Trail
Bombay Rd
Black Hall Rd
New Rye Rd
Deerfield Rd
Map 11.1
Recreational Features and Trails
1 inch = 3,000 feet
0 0.5 1 Mile
March 2021
Multi-Use Trail
Municipal Road
Park Road
Woods Road
Gates
Property Boundary
Town Boundary
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
DNCR Forests & Lands
DNCR makes no representations or guarantees to the accuracy of the features and designations of this map.
Map Produced by DNCR
Division of Forests & Lands.
172 Pembroke Rd
Concord, NH 03301
Ph: (603) 271-2214
This map is for planning purposes only. It is not to be used for legal boundary determinations or for regulatory purposes.

11.3 PARK USES

The public's use of the park is governed in part by agency administrative rules that have the force and effect of law**.** A complete list of the agency administrative rules are posted on the Department of Administrative services webpage.

Use Limitations
The State may control or limit public use and access in the interest to achieve management goals of the property (RES 7301.07). This could include restrictions on the use type, timing, and location. Examples include:

- Protection of fish and wildlife habitat values, unique or important natural communities or sites, and water quality.
- Management of recreational use to reduce conflicts between recreational activities.
- Restriction or closure of public access and trails to areas during routine forest management activities and wildlife habitat projects.
- Trail use may be closed by posting to protect natural or cultural resources or due to trail conditions.

Trails
Permitted Use on Trails per Res 7301.18 include hiking, nature walks, bird watching, horseback riding, bicycling, ski touring, snowshoeing and snowmobiling, mushing, and off highway recreational vehicles where permitted.

Camping
Camping is only permitted in designated campsites per Res 7302.02. Reservations for camping shall be made by contacting the camping reservation office or online reservation service.

Swimming
Swimming areas are designated by swim lines at Catamount Pond and Beaver Pond. Persons who swim at designated or remote areas swim at their own risk (7303.02(a-c)).

Snowmobile and ATV Use
Snowmobile and ATV use is permitted on designated trails December 15 – March 31 when there is sufficient snow cover. All Bureau of Trails (RES 8500) and Fish and Game rules apply for the use of off-highway recreational vehicles in the park.

Animals
Animals per RES 7301.08(d) are only allowed in the Beaver Pond campground and hiking trails at Bear Brook State Park. All animals shall be on a not greater than 6-foot length standard or retractable leash or lead, under the control of their handlers, and shall not be left unattended at any time or place (RES 7301.08(k)). In remote areas dogs shall be permitted off leash and under the control of their handlers in accordance with RSA 466:30-a provided that the dog is not or does not become a menace, a nuisance or vicious as defined in RSA 466:31, under which the owner or handler shall restrain, leash and remove the dog from the property. For purposes of this section, remote area means those areas and trails where and during a time when the dog owner or

handler and the dog will not come in contact with other users. The dog owner or handler shall leash the dog when other users are present (RES 7301.08(i)).

Equine and Other Animals Used for Utility
The use of equines or other utility animals shall be permitted on all roads and other established trails, unless prohibited or restricted in certain areas per RES 7307.09. Equines and other utility animals shall be prohibited in areas where the public congregates such as beaches, playgrounds and picnic areas or where there is the need to protect developed or improved facilities or natural resources.

Special Use Permits
Special Use Permits are required (RES 7403) by persons seeking to use the park when the activity is outside normal and routine recreational use by individuals and for commercial use. Special Use Permits issued for areas beyond the developed recreation areas in Criteria 4 are required to be reviewed by the department lands team and the permit application may be referred to the state lands team for review and comment.

Examples of uses for which a Special Use Permit is required include:

- Conservation / Forestry Education Classes and Tours
- Commercial or service-based use by individuals, businesses, groups or organizations
- Scientific Research
- Guiding Services
- Events that,
    - are beyond the normal or routine recreational use of a specific property as determined by the department, or
    - require the addition of equipment or structures onsite, including but not limited to party tents, tables and chairs, amplified musical equipment, generators, and portable lighting, or
    - host an event or activity in which the general public is invited, or
    - filming, photography or recording activities intended for commercial use and conducted by commercial entity.

Access for Persons with Disabilities
The Division of Parks and Recreation has adopted the USDA Forest Service *Accessibility Guidebook for Outdoor Recreation and Trails*, May 2006, as best management practices in the construction and maintenance of new recreational trails and facilities on State Reservations when practicable. The Department adopted a policy in 2013 that allows for the use of Other Powered Driven Mobility Devices (OPDMD) by persons with disabilities on all State Reservations. This policy enables the use mobility equipment powered by electric motors, but does not include the use of gas powered engines.

11.4 PARK OPERATIONS

The park is open year round for recreation; however, most public use facilities are generally closed November 1st through April 30th. Typical day-use facility summer operating hours begin the second Friday in June and run through Labor Day. Outside of these times, limited services may be available, weather permitting, through October or earlier in the spring.

Bear Brook State Park as shown in Table 11.1 operates at a profit returning revenue to the State Park Fund with the exception of Fiscal Year 2019 due to the one-time expenses to develop the Bear Hill Camping area.

Staffing

Positions allocated to Bear Brook State Park include a fulltime Park Manager IV, and seasonal staff including a Park Manager I, lifeguard, two night watch and 12 park crew who collect admissions, staff the store and maintain the park facilities. Staff is trained to perform their job duties and are cross trained on other job positions.

Table 11.1 Financial Performance Fiscal Year 2014-2019

Income	*2019*	*2018*	*2017*	*2016*	*2015*	*2014*
Camping	$214,958	$191,103	$169,202	$188,948	$158,246	$143,535
Day-Use	$58,718	$68,417	$70,082	$66,467	$59,548	$54,587
Other	$39,309	$26,453	$22,850	$40,088	$29,859	$22,527
Net Retail	$45,766	$70,918	$40,750	$54,549	$47,057	$40,348
Total Income	*$358,750*	*$356,891*	*$302,885*	*$356,022*	*$294,709*	*$260,997*
Expenses						
Compensation	($182,057)	($158,322)	($164,370)	($169,499)	($158,734)	($151,093)
Operations	($189,123)	($74,561)	($70,759)	($103,214)	($50,780)	($60,839)
Total Expenses	*($371,180)*	*($232,883)*	*($235,129)*	*($272,713)*	*($209,514)*	*($211,932)*
Net Income						
Total	($12,430)	$124,008	$67,756	$83,309	$85,195	$49,065

Fee Collection

The Division of Parks and Recreation is an operationally self-funded agency per RSA 216-A:3-I and the fees collected for park use, facilities, camping and retail sales support the state park system. Fees are collected at the park tollbooths and iron rangers. The most recent fee package was approved by the Fiscal Committee of the General Court in 2012; fees noted in this plan are what is currently charged.

The approved fees charged are:

- Day-Use Fee $4.00 adult $2.00 child (under 5, free)
- Campsite $25/night
- Cabin $55/night 6 persons $50/night 4 persons
- Violette Pavilion $200 - $400
- Catamount Pavilion $400 - $1,600

Catamount Area (5E): Park fees are collected during the operating season at the tollbooth located on Deerfield Road in Allenstown New Hampshire approximately 1 mile from the intersection of New Hampshire Route 28. The staff person provides park information, collects park fees and checks in pavilion reservations. This location uses the Aspira ticketing/fee collection system and has power, internet and the capability to accept credit cards for park fees.

Podunk Area (9I): Park fees are collected at the tollbooth located on Podunk road in Allenstown New Hampshire approximately 4 miles from Route 28. This fee collection site is the gateway to the southern section of the park providing access to the Beaver Pond and Bear Hill camping areas, Archery Pond Area and the heart of the trail system. The staff person provides park information and collects park fees. This location does not have electricity, telephone or internet.

Beaver Pond Campground Office (14L): The Beaver Pond campground office and store is located in Deerfield New Hampshire at the terminus of Campground (Lower) Road. Staff at this location register campers for both the Beaver Pond and Bear Hill Pond camping areas, provides information about the park, and sells retail items. Two staff members work at this location during operating hours.

The campground night watch staff is stationed from the office after hours and can check in late arrivals. Night Watch is also the emergency point of contact for local authorities and will call the manager if something is wrong.

Facilities

Violette Pavilion (5E)

- Reservations can be made up to 11 months in advance and 7 days prior to event
- Memorial Day through second weekend in September
- Capacity is 100 persons

Catamount Pavilion (6E)

- Reservations can be made up to 11 months in advance and 7 days prior to event
- June 1st through Columbus Day
- Capacity is 400 persons

Catamount Pond Bathrooms (5E)

- Weekends mid-May through mid-June and Labor Day to the second weekend in September, 8:00am – 6:00pm
- Daily mid-June through Labor Day, 7:30am – 6:00pm

Catamount Pond Retail (5E)

- Weekends mid-May through mid-June, 10:00am-6:30pm
- Labor Day – second weekend in September, 10:00am-6:30pm
- Daily mid-June through Labor Day, 10:00am – 6:30pm

Beaver Pond Campground (14L)

- Reservations can be made up to 11months in advance.
- May 1st through October 31st

Bear Hill Pond Campground (15H)

- Reservations can be made up to 11months in advance.
- May 1st through October 31st

Catamount Pond Campground (5F)

- Reservations can be made up to 11months in advance.
- (Currently under construction) May 1st through October 31st

Buildings and Grounds

Grounds: There is approximately 7+/- acres of mowing and trimming at the park in the following areas at the park that require mowing weekly; Catamount Pond Area and pavilions, the Depot Area, New Rye Road triangle, playfields and other areas including leach fields and Northwood Meadows State Park. A staff of three people mows 6 days a week.

Buildings and Utility Systems: Park staff is responsible for the general maintenance of the buildings used by park operations including housekeeping, interior and exterior painting, and general repair. In addition staff is responsible for turning on and off the seasonal water systems and taking drinking water samples per Department of Environmental Services regulations. The septic systems are contracted for maintenance.

Waterfront Management

Swim line: Swim line permits are issued by the Department of Safety (Saf-C 404.08) and identify the swim areas at Catamount Pond and Beaver Pond beaches. Swim lines are seasonally installed prior to Memorial Day and removed after Labor Day weekend. Swim line permits shall be reapplied for if the configuration changes.

Water Testing: The Department of Environmental Services, Beach Program is responsible for testing public swimming area per RES Env-Wq 1100.

Visitor Services

Wayfinding and Signing: The primary access to the park is via Deerfield Road from New Hampshire Route 28. The park's size and dispersed facilities makes it difficult for guests to find their way easily. Directional signage, mileage and reassurance signage are needed to allow guests to navigate to facilities. Signage should be installed at all access points.

Contact Station: The Park lacks a year round centralized point for administration and visitor information. Currently the fee collection sites at Catamount Pond and Podunk Road act as information centers, however, the time spent with visitors can cause backups and delay. Many of the questions relate to the trail system. The Podunk Road, gateway area has been identified as a probable area for a visitor contact station. Optimally it would be best to reuse existing infrastructure.

Education and Interpretation

The Division contracts with the Student Conservation Association (SCA) to provide education and conservation services statewide. The program has been located at located at Spruce Pond Camp (15K) since 1995. At Bear Brook State Park scheduled interpretive programs are offered Friday-Sunday at various times of the day throughout the park and the interpretive ranger also

staff the Old Allenstown Meeting House and the CCC Museum. Volunteers from the Allenstown Historical Society provide training to the interpretive ranger.

The Fish and Game Department provides training about species of concern to park staff and the SCA interpretive ranger. In addition, they have proposed to create informational posters about the wildlife resources in the park for display at kiosks and camping areas.

Museums and Collections
Bear Brook State Park is home to the Civilian Conservation Corps (CCC) Museum and the Snowmobile Museum located in the Depot Area (6F). The collections in the CCC Museum are the responsibility of the Division of Parks and Recreation. This museum has many articles, artifacts and other items related to the CCC, that the public can view. There is no interpretive plan for the museum. The CCC museum is open and staffed by the SCA interpreter Saturdays in July and August from 2-4pm and by request.

The Snowmobile Museum is operated by the New Hampshire Snowmobile Museum Association and the collection is the responsibly of the association. The Snowmobile Museum does not have regular hours of operation and is open by appointment or during special events. This museum contains antique snowmobiles and other artifacts related to snowmobiling and historic logging equipment.

Volunteers
The Supervisor of Volunteer Activities works with the park manager to identify projects and develop stewardship opportunities at the park. Individuals and volunteer groups from private businesses and companies assist with spring clean ups, park interpretation, trail maintenance and park maintenance.

The primary non-motorized trail maintenance volunteer groups are the Southern New Hampshire Chapter of NEMBA and The Derry Trail Riders. Each group submits an annual work plan to the Volunteer Coordinator for review and approval. Work days are scheduled with the Park Manager and Volunteer Coordinator.

The Bureau of Trails, working with the snowmobile club and park manager, make improvements to the snowmobile trail network. Funding is provided by the bureau through operating funds, the Grant in Aid program and club donations.

Northwood Meadows State Park
Bear Brook State Park is administratively assigned the management responsibility of Northwood Meadows State Park for general maintenance and is the liaison with the Friends of Northwood Meadows. The Friends of Northwood Meadows submits and annual work plan to the Volunteer Coordinator. Park staff assists the friend's group with projects providing technical advice and materials. The park manager attends the Friends of Northwood Meadows meeting monthly.

The park staff weekly cleans the pit toilet, stocks with supplies, empties the dog waste station, mows the lawn, and clears downed trees on the trail system. Park staff plows the parking lot as needed.

11.5 CAMPING ASSESSMENT

Bear Brook State Park has three main camping areas; Beaver Pond (14L), Bear Hill Pond (15H), Catamount Pond (5F, in development, equestrian only) and one remote campsite at Smith Pond. The total number of campsites are 118 sites, 94 are reserveable and the remainder are available to walk in customers.

The Division of Parks and Recreation has seen a steady growth in camping statewide and expects the demand to stay strong. Most campsites are without utilities. The addition of Bear Hill Pond and Catamount Pond camping areas is expected to draw in new campers and not replace existing campers at Beaver Pond camping area so total park camping occupancy will increase.

Table 11.2 Inventory of Site Types by Camping Area					
Camping Area	*Total # of Sites*	*Tent*	*Pop-up*	*Trailer/RV*	*Cabin/Shelter*
Beaver Pond	101	27	38	36	
Catamount Pond	8			8	
Bear Hill	8				8
Smith Pond	1				1
Total	118	27	38	44	9

Beaver Pond Campground

The Beaver Pond campground was constructed in the 1950's and expanded in the 1960's. Often times when we think of campground facilities, the focus is on bathrooms, playgrounds, visitor support facilities, and not the campsites themselves. At this site, there is significant campsite "creep", when campsites expand in size due to tree and understory loss, soil compaction, and limited understory regeneration. To maintain the campsite quality a program of campsite rest is proposed which will require new campsites to be created to keep the site inventory the same. Campsites would be closed for a period of time to allow regeneration between sites and reestablish and to allow trees respite from use.

Table 11.3 Occupancy by Calendar Year 2015-2019					
Beaver Pond	*CY2019*	*CY2018*	*CY2017*	*CY2016*	*CY2015*
Occupancy	46%	51%	48%	47%	42%
# of People	9,136	9,117	8,599	8,384	8,049

Table 11.4 Occupancy Detail Calendar Year 2019					
Beaver Pond	*# of sites*	*# of available nights*	*# of nights occupied*	*% occupied*	*# of people*
5/1/2019-6/15/2019	102	3,136	1,302	41%	1,649
6/16/2019-9/02/2019	102	8,040	4,644	57%	5,784
9/3/2019-10/31/2019	102	4,507	1,311	29%	1,703
Total		15,683	7,257	46%	9,136

Bear Hill Camp

In 2018 the staff with assistance from the SCA NH Corps began rehabilitation of the Oaks unit at Bear Hill Camp. Eight cabins (42 persons maximum occupancy) and the washhouse were rehabilitated. The SCA NH Corps assisted in removing risk trees around the complex. The cost

of this renovation was $82,373. In 2018 only 3 cabins were open during our "soft opening". In July 2019 the septic system servicing the wash house failed; portable toilets were brought in and reservations suspended. The facilities were not opened in 2020 due to the CoVid-19 pandemic.

The bathroom building (BBR99) adjacent to the Oaks Unit are scheduled for renovation. Once this bathroom renovation is complete, the Maples Unit will be rehabilitated by Division staff to bring the total of 16 cabins (total 84 persons) available for rental.

The future redevelopment of the site has not been determined, however, potential strategies include;

- Renovate Pines/Ledges units similar to Oaks/Maples. No improvements to administration buildings.
- DPR renovate and rent administration buildings and/or pines/ledges unit to groups for corporate outings, family reunions, camps.
- RFP solicited for a 3rd party operator to lease facilities to include renovate and manage administration buildings and Pines/Ledges.
- Upgrade Oaks/Maple units to offer primitive winter camping (snowmobile/ATV or ski/snow shoe).
- Offer winter camping with amenities (drive to the site, heat, electricity, etc) in existing units and/or other buildings

Catamount Pond Camping Area

This site was formerly the family picnic area. After the red pine sanitation harvest in 2013, the area was not reopened to the public. The equestrian community seeking the opportunity to camp with their horses, proposed opening Hayes Field to primitive camping, however, once introduced to the facilities at the picnic area the plan changed.

In the spring of 2019, Trails Bureau staff began the site work to layout the campground roads and sites. Construction of the campground was suspended in 2020 due to the CoVid-19 pandemic. Work remaining includes building the roads and campsite, installing water stations and site amenities.

The campground will offer 8 campsites for equestrian use. There is potential to add an additional loop if the program is successful. An evaluation of need and visitor experience should be conducted prior to design and construction of additional loops.

11.6 ENTERPRISE OPERATIONS

The Division of Parks and Recreation has a statewide retail program administered by the Division of Parks and Recreation Retail Operations Supervisor. The retail program works with vendors to supply each location with product to sell. Park Managers and their staff order supplies and sell the items. The retail operations budget provides funding for staffing, however, the staff are hired and supervised locally.

Bear Brook State Park retail revenue has grown with a 67% increase in profit over the last five years (FY14-FY18). There is the potential to increase retail profits by expanding the existing stores and develop a retail location at Bear Hill Pond and future Visitor Center.

Catamount Pond
Catamount Pond Beach Store is located in the lower level of the Violette Pavilion on Catamount Pond. This store sells beach snacks and souvenirs and rents boats. Currently there are 6 canoes in the fleet. This store is open from Memorial Day weekend until Labor Day Weekend. This store has seen an increase in gross sales and has the potential to increase sales when the Catamount Pond Camping area is open for camping.

Beaver Pond Campground
This store is located in the Beaver Pond Campground office and is open from first Friday in May until the last Sunday in October. The campground store sells camping supplies, snacks and souvenirs and rents boats.

Bear Hill Pond Campground
As redevelopment plans for the site progress, include retail with a focus on camping supplies and firewood sales. The retail space should be self-supporting within the campground management framework.

11.7 RECREATIONAL DAY USE ASSESSMENT

Recreational day use is the non-camping use of the park by visitors. Fees are collected for the use of the park recreational facilities including trail use mid-May through October. The Park has two collection sites, Catamount Pond and Podunk Road. Fees are collected per person for general recreation and there are set fees for use of pavilions. Historically the day-use focus was at the Catamount Pond area and the use of the beach and picnic facilities. With the growth of mountain biking, day use operations has expanded to include trail use. There is no accurate count of the number of people who use the park, however, approximately 20,000 persons pay the user fees per year.

Table 11.5 Park Visitors 2014-2018

Year	*Paid*	*Prepaid*	*Complimentary Use*	*Total Visitation*
2014	12,763	3,177	1,397	17,337
2015	14,284	2,336	2,098	18,718
2016	16829	4,382	2,659	23,870
2017	13,078	2,478	2,699	18,255
2018	14,643	3,857	2,420	20,920

11.8 WATER RECREATION

Boating
The small ponds at the park are best suited to cartop boats (canoes, kayaks) and there are no boat launches in the park. The Department of Environmental Services provide educational information and monitoring for invasive species through their Lakes Management and Protection Program. The Division rents boats to day use visitors and campers at Catamount Pond and Beaver Pond. Visitors may bring their own boats.

Swimming
Recreational swimming is permitted within the designated swim lines at Beaver Pond and Catamount Pond. The water quality at the swimming areas is monitored by the Department of Environmental Services, Beach Inspection Program. The park does not staff lifeguards at the Beaver Pond and Bear Hill Pond swimming areas and the beaches are signed to call 911 in case of emergency.

11.9 TRAILS

Bear Brook State Park has an extensive network of multiple use trails that provide year round recreation across much of the property. The trail system and its use must be coordinated with the recreation and natural resource management goals for the property and location. The existing trail system consists of old woods roads, recreational trails built by the Civilian Conservation Corps, and other trails built more recently by the volunteer efforts of user groups. Proposed changes of trail management, groomed trail network or new trail uses require review by the department lands team and may be referred to the state lands team for review.

The condition of trails varies through the Park, but many trails are in need of basic maintenance. Volunteers are doing most trail work needed in the park. The New England Mountain Bike Association (NEMBA) and the Derry Trail Riders are the most active non-motorized trail volunteer groups. The Southern New Hampshire Snow Slickers are the most active motorized trail volunteer group.

The Division of Parks and Recreation is responsive to changes in recreational equipment and uses, but this often requires extensive evaluation and review, and it is not always possible to accommodate every use on all trails. While many trails are suitable for most types of recreation, this plan provides recommended trail uses to guide visitors to the areas best suited for their sport.

Non-motorized trail use includes hiking, horseback riding and mountain biking and in the winter snowshoeing, fat-tire bicycling, Nordic skiing and mushing. Mountain bikers and horses are allowed on all designated trails, unless the trail is specifically closed to that use. Winter motorized use by snowmobiles and ATVs is permitted on designated trails.

There are two designated trailhead parking areas specifically for the park's trail system. A large parking lot off the Deerfield Road, near the Catamount Pond area, is designated for snowmobilers in the winter. This parking lot is available in the summer by special use. The Podunk Road parking lot is designated for non-motorized trail users in the winter and general trail use in the summer. The park staff plow the designated winter parking lots. Non-motorized trail users also park at the Catamount Pond parking area and at pull-offs along Campground and Podunk Roads.

Trails at Bear Brook are marked in a variety of ways, including trail signs, blazes and wooden markers. Various factors contribute to making the trail system difficult to navigate for the casual user, including:

- Size of the property.
- Lack of destination and descriptions for all user groups.

- Poor trail signage and inconsistent marking.
- Unsigned intersections.
- No centralized visitor services center to get trail information.
- Scale of map does not adequately portray distances; there is a need for sub-maps with greater detail.

Trail Management

The park's trail system does not have a point of contact who coordinates work across the user groups and seasons. The land managers including park staff and foresters review annual work plans of the non-motorized volunteer groups; however, they are not coordinated with other user groups. The snowmobile club proposes projects through the Trails Bureau and receives funding through the Grant-In-Aid program.

User Conflict

The trail system at Bear Brook State Park is a multiple use trail system that supports varying levels of proficiency within each user group. Conflict between and within user groups can center on speed, noise, etiquette, crowding, etc. There is no "quick fix" to managing user conflict however; recreation managers can develop systems to address conflict by;

- Fostering communication and facilitating positive user interaction through leadership.
- Building a robust trail community and to encouraging trail user interaction and cooperation.
- Educating trail users on trail sharing practices and etiquette.

User Etiquette

Trail etiquette is a tool to inform other users to act in a courteous way on recreational trails.

General Guidelines for all users:

- Be courteous of all other users regardless of their sport, speed or skill level.
- Keep pets under control.
- Enjoy and respect wildlife; do not disturb.
- Stay to the right and pass on the left when safe and appropriate.
- Train yourself and your animals.
- Be polite and a good steward of your recreational use; educate others.
- Travel at a safe and reasonable speed.
- Faster users yield the right of way to slower users.
- All users yield to horses and mushers.
- Users should be single file when in groups and approaching other users.
- Stay on trail, avoid trail widening when trail is wet/muddy and stay off trails during mud season.

General Guidelines for all users encountering equestrians and mushers:

- When passing a horse or musher from behind, call out that you want to pass, and proceed slowly and safely.
- Speak in a calm tone to alert horse and rider and musher of your presence.

- Ask the rider and musher to advise you on passing and always proceed slowly around horses and dogs.
- Motorized vehicles should stop and wait for rider and musher to advise what to do next.

Trails for People and Wildlife

The objective of the Fish and Game Department's "*Trails for People and Wildlife"* mapping tool is to help land managers manage existing and new trails with wildlife in mind. Trail use can have impacts on wildlife including reduced abundance, reproduction, and survival.

Bear Brook State Park contains 60+ miles of woods roads and trails whose corridor of influence affects more than 4,400 acres of wildlife habitat. Given the numerous special habitat areas and rare species within the park, there are very few low impact areas for wildlife.

Key principles that can be followed to reduce impacts to wildlife by trail use are;

- Avoid special habitat areas such as wetlands (including seasonal vernal pools) and shrublands that are essential to several species of greatest conservation need.
- Route trails away from wet areas to reduce disturbance to waterfowl, wetland birds, amphibians and turtles. Adjoining upland areas are also important travel corridors for these animals as well as for a variety of mammals.
- Route trails along habitat edges. Although habitat edges are also important for wildlife, impacts of trails will be greater if placed in the middle of a field that may be home to bobolinks, or a patch of young forest that may be home to songbirds, such as prairie warblers, whose populations have been declining for decades.
- Avoid steep slopes that are important areas for bobcats and rare small-footed bats to raise their young.
- Avoid known locations of rare species. Bear Brook State Park is home to several rare wildlife including some of the rarest in the state that have been designated as state-listed.
- Consider a trail's corridor of influence, that is the distance off trail that wildlife can be disturbed. The distance is quite significant; up to 400 feet for mammals; 150 feet for birds; and 60 feet for reptiles and amphibians.

Trail Uses

The following are permitted trail uses and information about each use. Winter trail users are encouraged to stay off groomed trails during warm conditions when surfaces are soft and prone to damage such as "post holing and rutting.

Off-Trail Pedestrian Use

Dispersed pedestrian use of the property is any use not associated with or confined to a particular trail or road, and is allowed anywhere on the property except areas posted against public use for safety or natural resource protection. Accepted off trail pedestrian uses include bushwhacking to hunt, trap, fish, picnic, cross-country ski, snowshoe, observe nature, or enjoy open space. Mountain biking or motorized off-highway vehicle use is not permitted.

Hiking: Hiking opportunities range from destination hikes such as Catamount Hill, hikes to wildlife viewing areas or just a walk in the woods. Parking is allowed in the Podunk and Catamount Pond parking lots and along Campground Road and Podunk Road to access the trails in the southern part of the park (see Map 11.1).

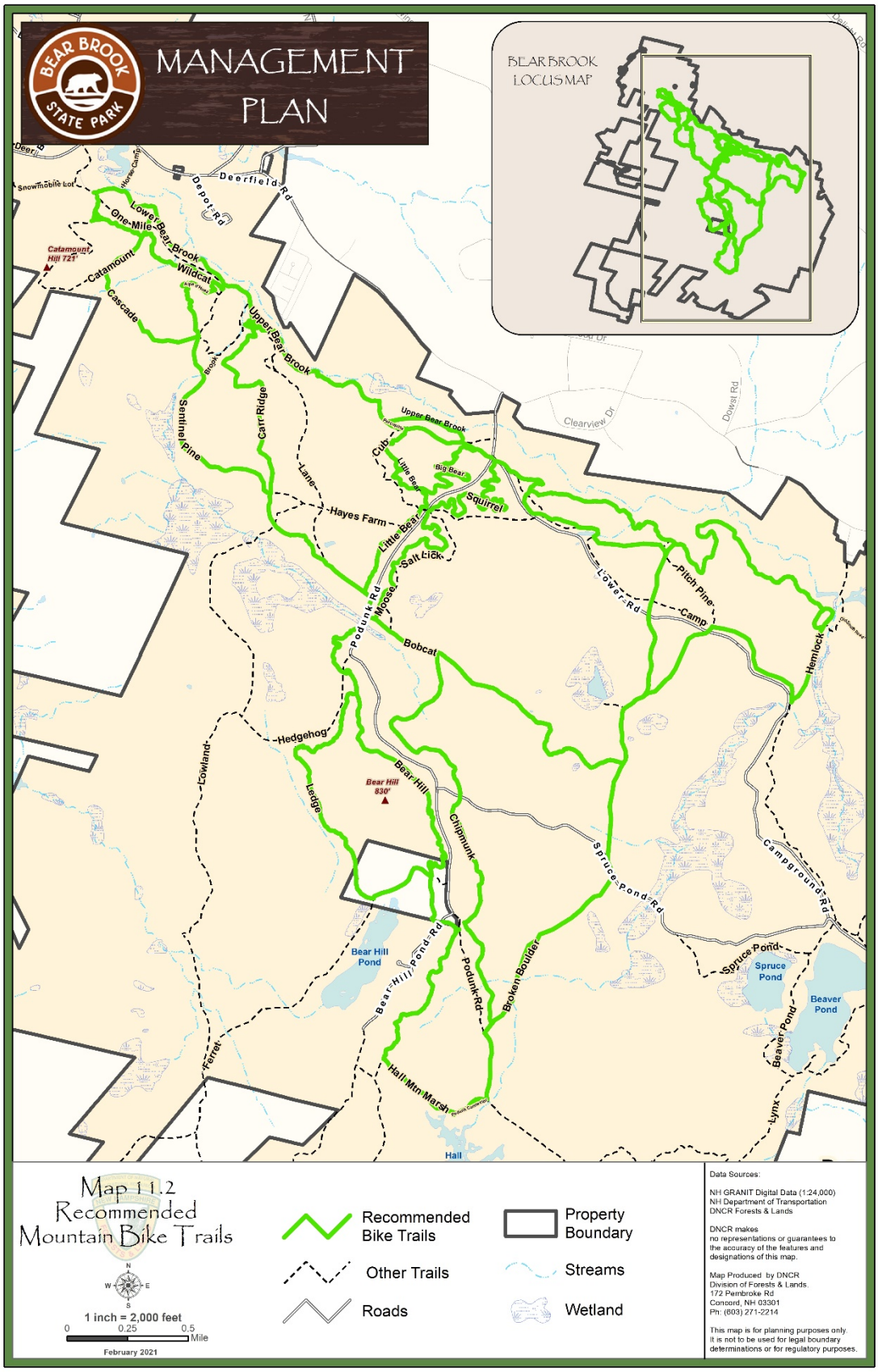
Bicycling: Bicycling is allowed on designated trails and roads in the park, off-trail/road cycling is prohibited. A designated network of winter groomed mountain bicycle trails is allowed as approved in the club's Annual Operating Plan. Maps of groomed trails and recommended loops shall be submitted in the Annual Operating Plan (see Map 11.2 and Map 11.4).

Equine: Saddle riding is the predominant equine use at the park, however, carriages are allowed on open park roads. Parking for vehicles with trailers is designated at Hayes Field. A mounting ramp is available at Hayes Field. Once the Podunk Road gate is closed for the winter season, trailers are permitted to park in the Podunk Road parking lot. Maps of recommended loops shall be submitted in the Annual Operating Plan (see Map 11.3).

Winter Pedestrian Use: Winter pedestrian activities include walking, snowshoeing, and Nordic skiing. Winter pedestrian trails are typically ungroomed but users may also utilize groomed snowmobile or mountain bike trails. Winter grooming of trails is permitted by annual operating plans submitted by a sponsoring organization, currently there are no proposals to groom. The Podunk Road and Catamount Pond parking areas are maintained for winter parking access.

Mushing: Mushing is an activity that occurs on snow, however, dog teams train in the fall using OHRVs as "sleds" on the park roads (per RSA 216-F:2) and must obtain permission from the Trails Bureau each year. Mushers may use the park trail network in winter, however, they usually utilize the groomed snowmobile network. During fall training mushers are permitted to park in the Bear Hill Pond area and Hayes Field. Mushers park at the Podunk Road parking area in winter.

Snowmobiling/Winter OHRV Use: There are 25 miles of groomed trails in the park, and 6 miles of ungroomed trail. Corridor #15, a major north-south snowmobile trail passes through the property. There is a 50" maximum vehicle width restriction on the trails. The Southern New Hampshire Snow Slickers is the club that grooms the trail network in the park and conducts trail maintenance. A winter OHRV map will be submitted annually to the park manager so it can be coordinated with pedestrian winter activities and groomed mountain bike trails (see Map 11.4).


BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEAR BROOK LOCUS MAP
Deerfield Rd
Depot Rd
Snowmobile Lot
Lower Bear Brook
One-Mile
Catamount
Catamount Hill 721'
Wildcat
Cascade
Upper Bear Brook
Sentinel Pine
Carr Ridge
Lane
Hayes Farm
Little Bear
Salt Lick
Moose
Podunk Rd
Bobcat
Hedgehog
Lowland
Ledge
Bear Hill 830'
Chipmunk
Bear Hill Pond
Bear Hill Pond Rd
Ferret
Hall Mtn Marsh
Broken Boulder
Spruce Pond Rd
Spruce Pond
Campground Rd
Beaver Pond
Lynx
Hall
Upper Bear Brook
Cub
Little Bear
Big Bear
Squirrel
Clearview Dr
Dorset Rd
Lower Rd
Camp
Pitch Pine
Hemlock
Map 11.2
Recommended
Mountain Bike Trails
1 inch = 2,000 feet
0 0.25 0.5 Mile
February 2021
Recommended Bike Trails
Other Trails
Roads
Property Boundary
Streams
Wetland
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
DNCR Forests & Lands
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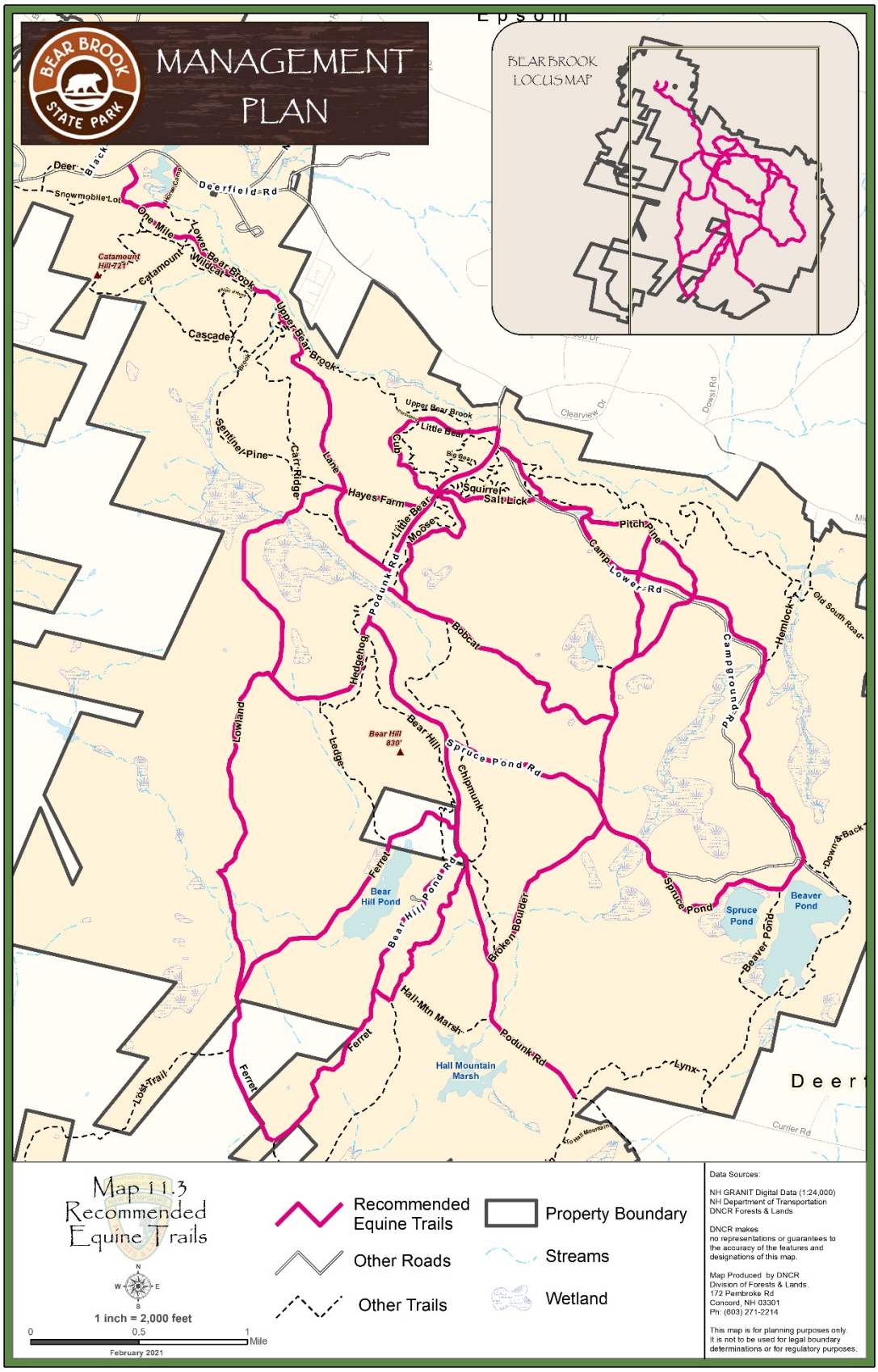
BEAR BROOK STATE PARK
MANAGEMENT PLAN
BEAR BROOK LOCUS MAP
Deerfield Rd
Snowmobile Lot
One Mile
Lower Bear Brook
Catamount
Wildcat
Catamount Hill 721'
Cascade
Upper Bear Brook
Sentinel Pine
Carr Ridge
Lane
Hayes Farm
Little Bear
Cub
Big Bear
Squirrel
Salt Lick
Pitch Pine
Camp Lower Rd
Moose
Podunk Rd
Bobcat
Hedgehog
Lowland
Ledge
Bear Hill
Bear Hill 830'
Spruce Pond Rd
Chipmunk
Campground Rd
Hemlock
Old South Road
Down & Back
Ferret
Bear Hill Pond
Bear Hill Pond Rd
Broken Boulder
Spruce Pond
Beaver Pond
Half-Mtn Marsh
Hall Mountain Marsh
Podunk Rd
Lynx
Loop Trail
Clearview Dr
Dowst Rd
Currier Rd
Map 11.3
Recommended Equine Trails
1 inch = 2,000 feet
0 0.5 1 Mile
February 2021
Recommended Equine Trails
Other Roads
Other Trails
Property Boundary
Streams
Wetland
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
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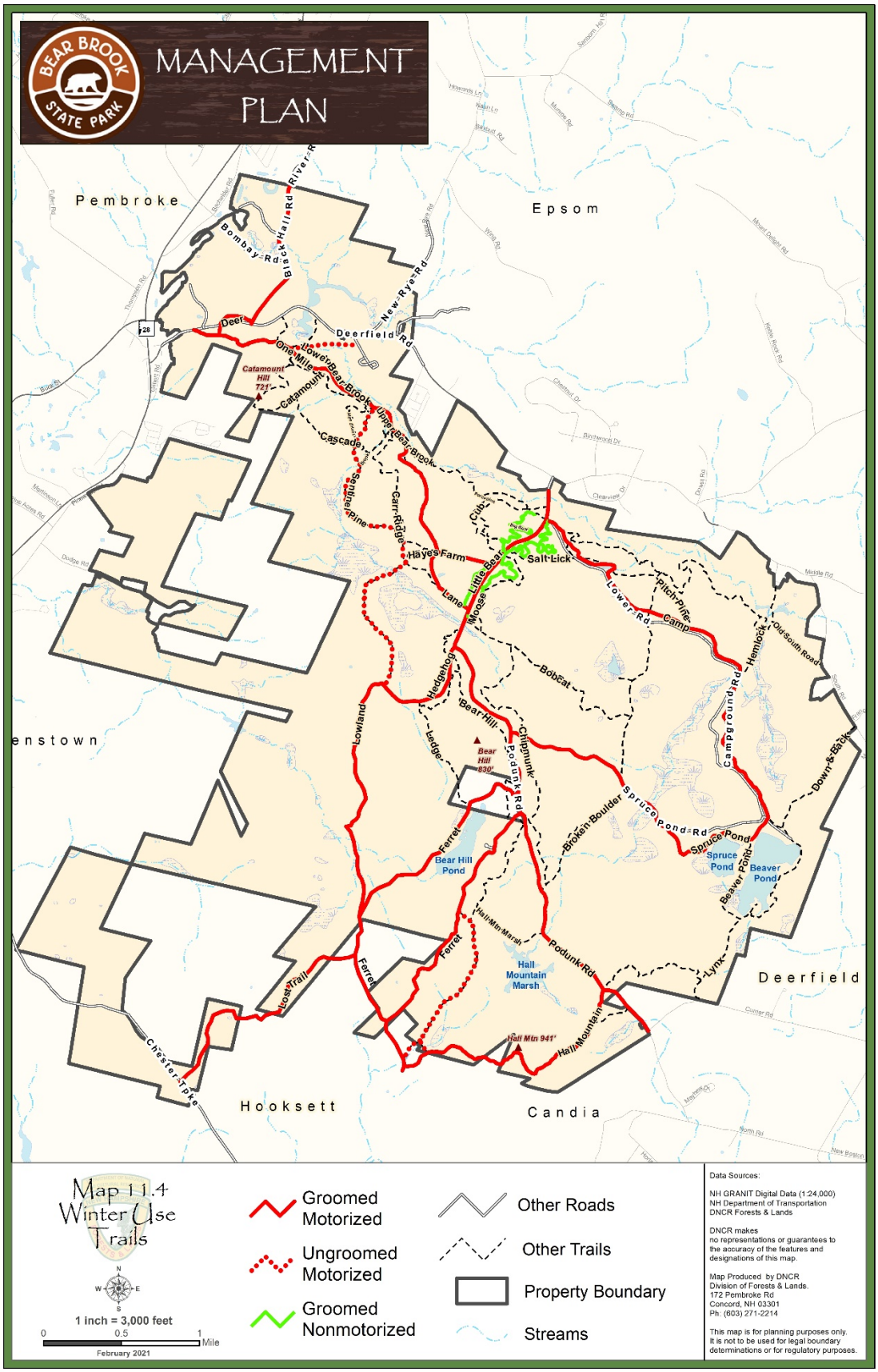
BEAR BROOK STATE PARK
MANAGEMENT PLAN
Pembroke
Epsom
Deerfield
Hooksett
Candia
enstown
Bombay Rd
Black Hall Rd
River Rd
New Rye Rd
Deerfield Rd
Deer
One Mile
Lower Bear Brook
Catamount
Catamount Hill 721'
Upper Bear Brook
Cascade
Sanborn Pine
Carr Ridge
Hayes Farm Lane
Little Bear
Moose
Club
Salt Lick
Lower Rd
Pitch Pine
Camp
Hemlock
Old South Road
Campground Rd
Down & Back
Bobcat
Hedgehog
Bear Hill
Ledge
Bear Hill 830'
Chipmunk
Podunk Rd
Lowland
Broken Boulder
Spruce Pond Rd
Spruce Pond
Beaver Pond
Bear Hill Pond
Ferret
Hall Mtn Marsh
Hall Mountain Marsh
Podunk Rd
Lynx
Lost Trail
Ferret
Hall Mtn 941'
Hall Mountain
Chester Turnpike
Map 11.4
Winter Use Trails
1 inch = 3,000 feet
0 0.5 1 Mile
February 2021
Groomed Motorized
Ungroomed Motorized
Groomed Nonmotorized
Other Roads
Other Trails
Property Boundary
Streams
Data Sources:
NH GRANIT Digital Data (1:24,000)
NH Department of Transportation
DNCR Forests & Lands
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Trail Descriptions and Trail Use Recommendations
The park has approximately 60 miles of multiple use trails available year round. The trail system is located in Criteria 1, 2 and 3 areas. The Department is not proposing any new trails in this plan and will focus on maintaining existing trails and relocating trails for environmental or conservation reasons.

In the list of official trails below, the department has provided recommendations to guide visitors to trails that are most suitable to each permitted use. Trails were not rated by difficulty levels; users should evaluate their own individual skills, knowledge, and current trail conditions when using the trails. Prohibited uses are also noted.

Several existing trails were named or renamed as part of this plan and are denoted by an *. The North and South Lost Trails have been decommissioned as they are seldom used, have fallen into disrepair, and weave on and off several private landownerships. Trail coordinates provided below are keyed to Map 11.1 at the beginning of this chapter.

Official Trail List
Alp d'Huez Trail (7E)
Length: .5 mile Trail Type: Narrow trail, single user width.
Recommended Use Type: Mountain Bike
Description: This is a double back loop trail and it starts off Sentinel Pine near One Mile trail and travels uphill to the intersection with Sentinel Pine and Cascade Trails.

Bear Brook Lower Trail (6E)
Length: .6 mile Trail Type: Narrow trail, single user width
Recommended Use Type: Pedestrian/Mountain Bicycle
Description: Trail follows Bear Brook. Access is from Pavilion Trail to the west and One Mile Trail to the east.

Bear Brook Upper Trail (8F)
Length: 1.2 mile Trail Type: Narrow trail, single user width.
Recommended Use Type: Pedestrian/Mountain Bicycle
Description: Trail follows Bear Brook. Access is from One-Mile Trail to the west and Little Bear to the east.

Bear Hill Trail (12G)
Length: 2 mile Trail Type: Narrow trail, single user width.
Recommended Use Type: Pedestrian/Equine/Mountain Bicycle
Description: The trail starts at Hayes Field and parallels Podunk Road and connects to Bear Hill Road.

Beaver Pond Trail (15L)
Length: 2 mile Trail Type: Narrow trail, single user width.
Recommended Use Type: Pedestrian
Prohibited: Equine
Description: Mile and half loop that starts and returns in the Beaver Pond campground.

Big Bear Trail (9H)
Length: .8 mile Trail Type: Narrow trail, single user width.
Recommended Use Type: Pedestrian
Description: Trail begins at parking lot near junction of Campground and Podunk roads then heads south with many switch backs and ends at junction with Little Bear. Paired with the northern section of Little Bear, creates loop from Podunk Rd parking lot.

Bobcat Trail (11G)
Length: 1.4 miles Trail Type: Wider trail, two user width
Recommended Use Type: Pedestrian/Equine/Mountain Bicycling
Description: Bobcat Trail intersects with Podunk Road linking to the trails on the west side of the park and linking to the east with Chipmunk Trail and Broken Boulder Trail.

Broken Boulder Trail (14J)
Length: 2.3 miles Trail Type: Wider trail, portions on unimproved road
Recommended Use Type: Pedestrian/Mountain Bike/Equine
Description: This trail is divided by Spruce Pond Road and links to Podunk Road to the south and to the north, Campground (Lower) Road and Camp trail ending at Pitch Pine.

Camp Trail (10I)
Length: 3.0 miles Trail Type: Unimproved road
Recommended Use Type: Pedestrian/Equine/Mountain Biking/Snowmobile
Description: Trail starts on the northern side of the Campground Road and terminates at Beaver Pond Campground. Part of the groomed snowmobile trail network.

Carr Ridge Trail (10F)
Length: 1.2 miles Trail Type: Narrow trail, single user width.
Recommended Use Type: Pedestrian/Mountain Biking
Description: This narrow trail is best suited for pedestrian use. Mountain bikers will find it a technical ride and it is recommended to be a downhill return.

Cascade Trail (7E)
Length: 1.0 mile Trail Type: Narrow trail, single user width.
Recommended Use Type: Pedestrian
Description: Cascade Trail links Catamount Trail and One Mile Trail, intersects with Sentinel Pine, Alp d'Huez and Carr Ridge Trails. Not recommended for mountain bicycles or equine use.

Catamount Trail (7E)
Length: 1.3 miles Trail Type: Narrow trail, single user width.
Recommended Use Type: Pedestrian
Description: This trail provides access to one of the best viewpoints in the park. The trail intersects with One Mile Trail.

Chester Turnpike (19C)
Length: 3.4 miles Trail Type: Unimproved road
Recommended Use Type: Pedestrian/Equine/Mountain Bike/Snowmobile
Description: Class 6 road located in the southern end of the park, intersects with Lost Trail (gated).

Chipmunk Trail (12H)
Length: 2.1 miles Trail Type: Narrow trail, single user width
Recommended Use Type: Pedestrian/Mountain Bike
Description: Trail parallels Podunk Road on the east from the Bobcat Trail south to the Broken Boulder Trail near its southern terminus.

Corridor 15
Description: This groomed snowmobile corridor trail utilizes several portions of trails in the park. The corridor trail begins in Derry and traverses the state ending in West Ossipee. Portions of trails used include, Lost Trail, Ferret, Bear Hill Pond Road, Podunk Road, Lane Trail, One Mile Trail and Snowmobile Lot Trail.

Cub Trail (H9)*
Length: .5 miles Trail Type: Narrow trail, single user width
Recommended Use Type: Pedestrian/Equine
Description: Alternative to Little Bear, begins at the junction of Little Bear and Porcupine.

Deer Trail (D6)*
Length: .3 miles Trail Type: Wider trail, two-user width
Recommended Use Type: Pedestrian/Equine/Mountain Bike/Snowmobile
Description: Leaves snowmobile parking lot and heads north, crosses Deerfield Rd then heads east and ends at Black Hall Road behind the orange gate.

Dodge Road (10B)
Length: .6 miles Trail Type: Unimproved road
Recommended Use Type: Pedestrian/Equine/Mountain Bike
Description: Class 6 road located in the western section of the park, intersects with Lost Trail.

Down and Back Trail (13M)
Length: .90 miles Trail Type: Wider trail, two-user width
Recommended Use Type: Pedestrian/Mountain Biking
Description: Trail starts in the campground and goes through recently logged area ends at South Road.

Ferret Trail (14H)
Length: 3.6 miles Trail Type: Unimproved road
Recommended Use Type: Mountain Bike/Pedestrian
Description: Trails goes around Bear Hill Pond, its northern terminus off Podunk Road and it ends near the Bear Hill Camp. Portion of the trail is a groomed snowmobile trail network, Corridor 15.

Hall Mountain Trail (18J)
Length: 3.7 miles Trail Type: Wider trail, two-user width
Recommended Use Type: Pedestrian/Snowmobile
Description: The trail begins near the southern end of Podunk Road travels southwest over the summit of Hall Mountain and then heads north back to Podunk Road. Part of the groomed snowmobile trail network

Hall Mountain Marsh Trail (17I)
Length: 1.5 miles Trail Type: Narrow trail, single user width
Recommended Use Type: Pedestrian/Snowmobile
Description: Trail leaves Hall Mountain Trail and travels south east and travels by Hall Mountain Marsh and ends near southern end of Podunk Road. Part of the groomed snowmobile trail network.

Hayes Farm Trail (10G)
Length: 1 mile Trail Type: Unimproved road
Recommended Use Type: Pedestrian
Description: Scenic, gently graded woods roads connects Podunk Road with the Lost and Lowland Trails and gives viewing access to Hayes Marsh.

Hedgehog Trail (11G)
Length: .7 miles Trail Type: Unimproved road
Recommended Use Type: Pedestrian/Equine/Snowmobile
Description: Departs Podunk Rd, south of Hayes Field, connects to Ledge and Lowland trails. Part of the snowmobile trail network.

Hemlock Trail (11L)
Length: 2.6 miles Trail Type: Narrow trail, single user width
Recommended Use Type: Mountain Bike/Pedestrian
Description: Eastern terminus begins at Pitch Pine and ends at Campground Trail.

Horse Camp Trail (E6)*
Length: .1 miles Trail Type: Wider trail, two-user width
Recommended Use Type: Pedestrian/Equine
Description: Starts at Deerfield Road, opposite from horse camping area, connects to Lower Bear Brook.

Lane Trail (11G)
Length: 1.0 mile Trail Type: Unimproved road
Recommended Use Type: Pedestrian/Equine/Mountain Biking/Snowmobile
Description: Northern terminus starts where One Mile Trail ends and ends in Hayes Field. Snowmobile groomed trail, Corridor 15.

Ledge Trail (13G)
Length: 1.2 mile Trail Type: Narrow trail, single user width
Recommended Use Type: Pedestrian/Mountain Bike
Description: Northern terminus is off the Bear Hill Trail and travels parallel to Hedgehog trail and the swings east toward Bear Hill, trail ends at intersection with Ferret Trail.

Little Bear Trail (11G)
Length: 1.3 miles Trail Type: Narrow trail, single user width
Recommended Use Type: Mountain Bike/Pedestrian/Equine
Description: This trail leads from Hayes Filed to the parking lot off Podunk Road by the junction with Campground Road.

Lost Trail (18D)* - Formerly Lost Trail Extension, Lost Trail North and South decommissioned
Length: 2 miles Trail Type: Wider trail, two-user width
Recommended Use Type: Pedestrian/Equine/Snowmobile
Description: Connects Chester Turnpike with Ferret Trail. Groomed as part of Corridor 15 of the snowmobile trail network.

Lowland Trail (12F)
Length: 1.8 miles Trail Type: Wider trail, two-user width
Recommended Use Type: Pedestrian/Equine/Snowmobile
Description: Connects Hayes Farm Road and Lost Trail. Part of the groomed snowmobile trail network.

Lynx Trail (17K)
Length: 1.2 Trail Type: Wider trail, two-user width
Recommended Use Type: Pedestrian
Description: Connects Beaver Pond Trail and Podunk Road.

Moose Trail (11G)
Length: .8 Trail Type: Narrow trail, singer user width
Recommended Use Type: Mountain Biking
Description: Single track trail that runs parallel to the east of Podunk Road from Salt Lick to Bobcat Trail.

One Mile Trail (6E)
Length: 1.0 mile Trail Type: Unimproved road
Recommended Use Type: Pedestrian/Mountain Biking/Equine/Snowmobile
Description: Starts near main tollbooth on south side of Deerfield Road and heads southeast and ends after one mile where Lane Trail begins. Snowmobile groomed trail, Corridor 15.

Old South Road (11M)
Length: .5 Trail Type: Unimproved road
Recommended Use Type: Pedestrian/Mountain Biking/Equine
Description: Connects Camp Trail and South Road at northern park boundary.

Pitch Pine Trail (10J)
Length: 2.1 miles Trail Type: Wider trail, two-user width, narrows in places
Recommended Use Type: Pedestrian/Mountain Bike
Description: Connects Podunk Road parking lot to Broken Boulder, has many trail intersections

Porcupine (H9)*
Length: .1 miles Trail Type: Wider trail, two-user width
Recommended Use Type: Pedestrian/Equine/Mountain Bike
Description: Short connector trail between Little Bear and Bear Brook Trail

Salt Lick Trail (10I)
Length: 1.3 miles Trail Type: Unimproved trail
Recommended Use Type: Pedestrian/Mountain Biking/Equine
Description: Connects Podunk Road and Campground Road

Sentinel Pine Trail (7F)
Length: 1.4 miles Trail Type: Trail varies in width
Recommended Use Type: Pedestrian/Mountain Bike/Snowmobile
Description: Connects One Mile Trail to Hayes Farm Trail. Ungroomed snowmobile trail.

Snowmobile Lot Trail (6D)
Length: Trail Type: Unimproved road
Recommended Use Type: Snowmobile
Description: Primarily used by snowmobiles to connect to One Mile Trail.

Spruce Pond Trail (15K)
Length: 1 mile Trail Type: Wider trail, two-user width
Recommended Use Type: Pedestrian/Snowmobile
Description: Connects Beaver Pond campground to Spruce Pond Road, bypassing Spruce Pond Camp.

Squirrel Trail (10I)
Length: 1 mile Trail Type: Narrow trail, single user width
Recommended Use Type: Mountain Biking
Description: Leaves at junction of Campground and Podunk Road and heads south trail is single track with many switch backs, end at intersection with Salt Lick, Podunk and Moose Trails.

Wild Cat (E6)*
Length: .7 miles Trail Type: Narrow trail, single user width
Recommended Use Type: Pedestrian/Mountain Bike
Description: Connects Alp D'Huez with Catamount, paralleling One Mile.

11.10 PROGRAMMATIC AREAS MANAGED IN COLLABORATION WITH THE FISH AND GAME DEPARTMENT

The Fish and Game Department manages the wildlife resources in the park. In addition, the department manages two education programmatic areas Archery Pond Area which includes the Archery Range and the Game Refuge by memorandum of agreement.

Hunting, Fishing and Trapping
Hunting, fishing and trapping at Bear Brook State Park is allowed and regulated by state statutes and DNCR and New Hampshire Fish and Game Department rules. The New Hampshire Fish and Game Department has an ongoing stocking program for both trout and ring necked pheasants. To facilitate hunting in the southern part of the park, the Podunk and Campground Road gates shall remain open until December 15th, unless winter conditions make it unsuitable for wheeled vehicle use sooner.

The Game Refuge
Unique to other state reservations, a game refuge has been established by RSA 212:13. Hunting within the refuge has been limited to archery hunting for white tail deer since 1947 by RSA 212:14. New Hampshire Fish and Game Department rules set hunting seasons, the park is located in Wildlife Management Unit, WMU L.

Archery Range and Course
To promote safety and training of archers, the Public Affairs Division of the New Hampshire Fish and Game Department manages the archery program at the park. Fish and Game staff maintain the targets and shooting lanes. Vehicle access to the archery range parking area is permitted without cost via Campground Road when it is open to the general public.

Archery Pond
The Facilities and Lands Division of the New Hampshire Fish and Game Department manages the Archery Pond fishing site. Fish and Game staff maintain the fishing structures, the dam and mows the area. Park staff maintain the pit toilets, parking lots, and picnic tables. The area has two ponds, one which is restricted to children 12 and under. The pond is managed as fly fishing only and provides universal access to anglers. Vehicle access to the pond parking area is permitted without cost via Campground Road when it is open to the general public.

Persons using the Archery Pond fishing access and Archery course are granted complimentary admission to these facilities per the terms of the memorandum of agreement when the facility was originally constructed.

11.11 RECOMMENDATIONS

Park Operations

- Ensure fees are appropriate and collected for services provided when services are provided (pit toilets, plowing).
- Install iron rangers at all locations to collect service fees and donations where needed.
- New tollbooth for beach parking area to relieve congestion at Catamount tollbooth area.

- Redesign Podunk Road gateway to correctly align tollbooth and ease vehicle traffic through the area.
- Provide adequate road signage to direct visitors to primary public use facilities.
- Evaluate existing facilities for suitability for a visitor contact/park administration/store building.
- Continue to partner with the SCA NH Corps or other similar partners to provide park specific nature programming.
- Develop an interpretive program for the CCC Museum.
- Work with the New Hampshire Snowmobile Museum Association to coordinate regular hours of operation.
- Develop interpretive signage to identify the CCC buildings in the Depot Area and their original functions.
- Continue to work with the Fish and Game Department about management of species of concern within the park.

Camping

Beaver Pond Campground (14L)

- Assess current campsites for maintenance needs. Combine/reorganize existing sites where needed.
- Begin a program of revegetation between campsites.
- Develop a campsite rest and restoration plan at Beaver Pond Campground to restore all sites over a 20 year period, including the development of 25 new campsites to maintain revenue levels while resting sites.
- Add additional campsites within the limits of infrastructure capacity and visitor experience.
- Add tent platforms/shelters to lessen soil impact and contain campsite "creep".
- Establish a group camping area for youth and adults.
- Capture additional value to campsites by adding water and power to sites.
- Increase the number of designated accessible sites at Beaver Pond Campground from two to five per recommendations in the USDA Forest Service *Accessibility Guidebook for Outdoor Recreation and Trails*.

Bear Hill Pond Area (15H)

- Dedicate facility management and maintenance staff to manage complex.
- Redevelop cabins for three to four season use.

Catamount Pond Area (6E)

- Continue campground construction with the goal to open in 2022.
- Construct Horse Camp Trail to link the campground to Bear Brook Trail and replace bridge.

Enterprise Operations

- Expand the number and type of watercraft for rent at both the Catamount Pond and Beaver Pond areas.
- Purchase and install a generator to prevent retail product spoilage at the Catamount Pond store.
- Evaluate retail options for the Podunk Road area in conjunction with visitor services.

Water Recreation

- Include boat rental locations and cartop boat put-in sites on the park map.

Trails

- Update maps by season for public distribution, include destinations by user group.
- Create sub-maps to provide greater detail in areas.
- Work with New Hampshire Fish and Game Department to identify trails that may be relocated to avoid significant wildlife habitat.
  - Continue to monitor sensitive trail sections to assess the need for trail relocation or seasonal closures as intensity increases.
  - Work with NH Fish and Game Department reroute sections of Bobcat Trail adjacent to the wetlands and vernal pools to protect turtle hibercula.
- Implement uniform trail marking, and adequately mark existing trails by installing signs with trail names and reassurance markers along trails.
- Establish a seasonal trails crew to work with volunteers and do routine trails maintenance and signing.
- Implement an "Adopt a Trail" program.
- Set up a trails advisory group of primary trail user groups to coordinate work.
- Communicate winter operations plan on social media and websites including gate and parking lot status.
- Install and maintain information kiosks at parking lots and trail junctions include E911 addresses on kiosks. Provide links to web resources at the kiosks.
- Secure landowner permission of trails that cross private property and link to the park trail network. Remove trails from the map and gate trails at boundary.
- Identify parking areas along Podunk Road and Campground Road for destination hikes, especially for pedestrians.
- Designate a winter non-motorized parking area at Catamount Pond Area to allow access to the One-Mile trail.
- Close out Lost North and South Lost Trail by removing water crossing structures, gating the property boundaries, and signing as closed.
- Close out all un-official trails, bypasses between trails, and take enforcement action when possible.
- Manage trail user conflicts to protect safety and experience of visitors.
- Ensure Trail design and intensity is appropriate for the type of use.

Programmatic areas managed in collaboration with the Fish and Game Department

- Update Archery Pond MOA to reflect management Fish and Game's management responsibilities at the site by agency and program. Including the following
  - New Hampshire Fish and Game shall consult with NH Division of Forests & Lands on forest resource management within the area.
  - NH Fish and Game shall sign Pitch Pine Trail, which bisects the Archery Course, alerting both users to each other.
  - Consult with Division of NH Parks and Recreation on kiosk signage
- Promote wildlife viewing at Hayes marsh and mark the trail from Hayes field parking area.

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