STATE OF CONNECTICUT

DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION

Bureau of Natural Resources

Division of Forestry

FOREST MANAGEMENT PLAN
2018 through 2028

Natchaug State Forest

Eastford, Bigelow Brook, Westford, & West Ashford Blocks

3,470 Acres

Approvals:

Christopher Martin, Director — Date 3/19/18
Division of Forestry

William Hyatt, Bureau Chief — Date 3/23/18
Bureau of Natural Resources

Susan Whalen, Deputy Commissioner — Date April 2, 2018
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A. Executive Summary

Natchaug State Forest (NSF) includes over 13,200 acres in seven towns: Ashford, Brooklyn, Chaplin, Eastford, Hampton, Mansfield and Pomfret, all in Windham County except for Mansfield, which is in Tolland County. The northern blocks of Natchaug, the Eastford, Bigelow Brook, Westford, and West Ashford Blocks, comprise 3,470 acres in the towns of Pomfret, Eastford, Ashford and Mansfield. The majority of the land lies north of CT Route 44, and is part of a mostly forested area where State Forest is interspersed with private, Yale University, land trust and municipal land. Management objectives and harvesting will consider landscape-level habitat objectives and forest resource conditions across town and ownership boundaries.

The topography of the area is generally rolling hills mixed with moist lowland depressions with hardpan soils, creating a matrix of aquatic habitat ranging from expansive marshes to trout streams and intermittent drainages, along with moist, rich soils with excellent productive capacity. However, some sites have soils which been negatively affected by severe fires in the first half of the 20th century. Oak/hickory stands predominate, but there is a substantial amount of northern hardwood (sugar maple/white ash/yellow birch) on the productive soil sites, with hemlock and white pine mixed in.

Approximately 800 acres of silvicultural treatments are scheduled during the 10-year period. Half will focus on establishing new cohorts of forest regeneration through 1st and 2nd phase shelterwood harvests. This will work toward a long-term goal of increasing the percentage of young-forest habitat across Natchaug. The plan also recommends gating certain forest roads, cleaning illegally dumped trash and debris, eradicating invasive plants in specific areas and reclaiming valuable early-successional habitat. The plan also calls for designation of 262 acres of Old Forestland Management Sites to be left alone in perpetuity and allowed to develop without human influence (except for invasive removal and safety issues). Without investment in forest infrastructure and invasive plant eradication the ability to sustainably manage the forest in perpetuity will be compromised.

B. History

1) Reason for acquisition and funding sources

At the beginning of the 20th century mature forests were scarce in Connecticut. Agriculture had peaked in the mid-19th century and abandoned farms were reverting to forest. At this time the benefits of forest land and the virtues of managing forest resources were not widely known. Land had been historically abused through more than a century of intensive logging and agriculture. Large areas of regenerating forest were repeatedly clear-cut to produce charcoal for the industrial revolution. An expanding network of rail lines sparked widespread forest fires which threatened the landscape. In 1900, using concepts imported from Germany, the first graduate forestry school in the country was founded at Yale University. Around the same time the Connecticut Forest and Park Commission was founded with the mission of educating and engaging private landowners about good forestry using a recently acquired state forest resource for demonstration. In October of 1912 Walter Owen Filley became the 5th Connecticut State Forester. It was under the tenure of Mr. Filley that the State began acquisitions of what was then known as the “Eastford Forest”. By July of 1921 Mr. Filley had acquired roughly 2,200 acres of what would later be known as Natchaug State Forest.

2) Development of the Resource

In pre-settlement history the Natchaug area was a portion of the hunting grounds of the Wabbaquasset Indians, a subject tribe of the Mohegans. Bigelow Brook and the Still River unite at Phoenixville in Eastford to form the Natchaug River. The word Natchaug is Mohegan for "the land between the rivers". Early management by natives consisted of dispersed agriculture and setting forest fire to stimulate shrub growth, improve wildlife habitat and protect against invading tribes. Originally purchased by settlers from the Indians as one large tract in the late 1600's, the land was subsequently broken up into relatively small farm holdings and much of it was cleared during the next century. Agricultural communities prospered between 1760 and 1810. Then Midwest settlement and the introduction of increased productivity farm machinery made farming the small rocky fields uneconomical and the landscape began reverting to forest as fields and pastures were abandoned.

In 1800 the Boston Turnpike Company completed construction of a postal road linking Hartford and Boston. The turnpike was called Middle Post Road and was followed by manufacturing-related economic growth along its route. Mills sprang up in Ashford and Eastford as they were now connected to distant markets. By 1854 the Hartford, Providence and Fishkill rail line had been completed ten miles south of the turnpike. The railroad soon replaced the Middle Post Road as the main route of commerce through northeastern Connecticut. Again isolated from markets, the area experienced an economic downturn as businesses and farms moved to more productive areas. The remaining forest and land reverting to forest after agricultural abandonment was worked intensively in the production of charcoal, in wide demand to fuel the industrial revolution. This is evident by the numerous charcoal mounds visible in the forest today. The process of clearcutting every thirty years left an abundance of dry fuels throughout the forest. The late 1800's and early 1900's saw an increase in wildfire frequency and intensity. Large intense fires burned in 1870, 1903, 1915, 1922, 1926 and 1932.

There were very few land transactions in the area between 1860 and 1900. The early 1900's found the region substantially forested after agricultural abandonment. It soon became economically feasible for portable saw mill owners to buy and cut second growth timber from the reforested areas. The onset of the 20th century also brought the Chestnut Blight, a fungus introduced from Europe which killed all mature American chestnut in Connecticut by 1920. At this time the forest was harvested to salvage dead American chestnut.

The State began acquisition of the "Eastford Forest" in 1917 with the purchase of 586 acres from Mr. Filley (no relation to the State Forester). The forest had two age-classes, a 0-20-year-old sapling cohort that succeeded the chestnut salvage, and 40-60-year-old pole/small sawtimber which had been part of the same age-class as the chestnut, not yet merchantable at the time of chestnut salvage. Many older and larger trees blew down in the widespread disturbance of the 1938 hurricane.

Disturbance history is evident throughout these blocks. The Eastford Block, for example, has historically experienced a succession of widespread forest fires which significantly impacted the species composition and timber quality. Three of the large-scale fires previously mentioned impacted portions of the Eastford Block. These fires were large-scale and exhibited erratic behavior, jumping over Route 44 from what is now the

Beaver Brook Block of Natchaug into the Eastford Block. These areas are now characterized by a predominance of scarlet oak which are likely significantly older than they appear. Digging in the soil north of Route 44 has in places yielded the charcoal remnants of a very hot succession of forest fires. The growing stock in these areas may be hollow, have damaged root systems and have a higher wind-throw potential than unburned areas. These fires burned so hot that impacts to the soil's nutrient capacity are thought to be severe, resulting in a site with a reduced capacity for growing quality trees.

The Civilian Conservation Corps (CCC) established Camp Fernow in the Beaver Brook Block of Natchaug in 1933. The CCC built new roads, upgraded existing cart paths, created fire ponds, planted softwood stands and thinned hardwood pole stands for firewood. The camp was operational from 1933–1941.

In 2004 the Connecticut DEP developed a Statewide Forest Resource Plan to serve as a baseline for planning future activities and gauging progress within the forest community of Connecticut. The plan represents a great reference for all parties interested in forest management and forest uses throughout our state. The plan was last updated in 2015, and is currently in the process of being revised for 2020. The most recent version can be viewed here.

3) Changes since the last management plan

Since the composition of the last management plan for these blocks in the early 1980's, 1,805 acres have received silvicultural treatments. All but 171 acres of these harvests entailed thinning in overstocked stands. The additional 171 acres of treatment focused on one regeneration harvest in the Westford Block. Overall changes to the vegetative condition of this area have been relatively limited in the last ten-year period.

4) Rotations and cutting cycles used

A 100-year rotation will be applied to all stands managed on an even-aged basis. Stands to be managed on an even-aged basis are generally under Oak – Hickory, Oak – Pine, and Softwood management units. A total of approximately 2,089 acres will be subject to an even-aged management approach. The 240-acres of northern hardwood growing stock captured in the Beech – Birch – Maple cover group will be managed on an uneven-aged basis, along with an additional 101-acres of uneven-aged forest categorized under different cover groups. Uneven-aged management areas will use a cutting cycle of 25 years.

C. Acres and Access

1) Acres

The Eastford, Bigelow Brook, Westford and West Ashford Blocks contain 3,470 acres. 2,430 acres have the potential to be silviculturally managed.

Active	2,430 acres
Inaccessible	236 acres
Inoperable	430 acres
Wildlife	36 acres
Old Forestland Management Sites	262 acres
Recreation	76 acres
Total	3,470 acres

To facilitate management planning across large acreages, forest stands are grouped into one of six categories based on the forest condition and management objectives.

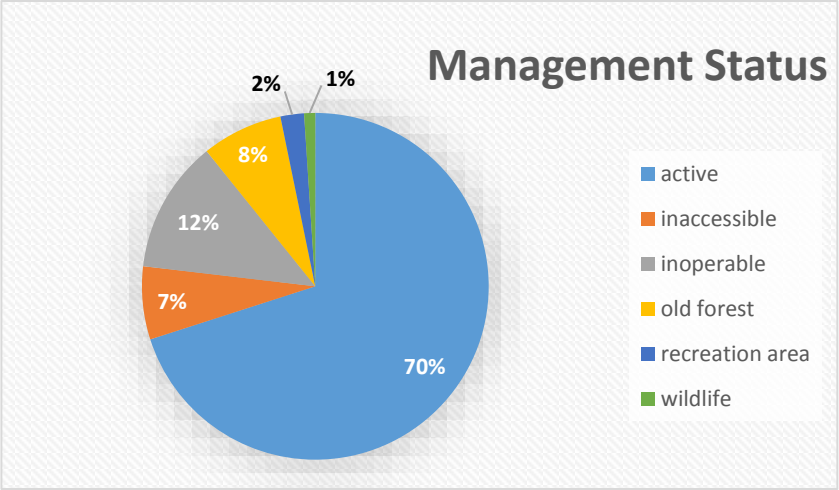
- "Active" forestland refers to an area which is currently or has the ability to be actively managed for forest products or wildlife habitat.
- "Inaccessible" denotes an area which is, because of steep, excessively rocky terrain or wetland features, unable to be physically accessed by equipment for forest management activities.
- "Inoperable" areas may be accessible but are not actively managed due to limiting physical site features such as water resources, wetlands or steep slopes.
- "Wildlife" refers to areas where the management activities are carried out by the Wildlife Division. These areas are typically fields, waterfowl impoundments, waterbodies or maintained upland openings which require periodic mowing or burning.
- "Old forestland management sites" are areas intended to be left alone as long-term forest reserves. They may be areas distinct in terms of forest structure or composition. They may be biologically old stands, where the influence of harvesting or human manipulation has been limited and natural processes are the main force driving forest succession.
- "Recreation" indicates an area where outdoor recreation is the primary management objective. These areas may have authorized trails, picnic areas, or cultural sites. The acreage attributed to each management status is detailed above.

2) Present Access

Administrative access to these blocks of Natchaug is generally good and available from town or Connecticut Department of Transportation (DOT) roads. Due to the remote nature of these areas and the matrix of private lands they occur within, public access to the forest is rather limited and is usually only available where authorized trails cross public roads. Main administrative access routes are available from Route 44, Firetower Road, Chase Hill Road (Pomfret), Old Colony Road, Ashford Road, Westford Road (Eastford), North Road, Horse Hill Road, Moon Road, Eastford Road, Kozey Road, Iron Mine Lane, Perry Hill Road, Krapf Road and CT Route 74 (Ashford). There are additional forest roads of varying accessibility. They are used for forest management access, fire protection and low-impact outdoor recreation. Forest roads are maintained by the Division of State Parks (DOP). Due to limited staffing, these secondary roads receive few improvements in recent years and most of the maintenance is reactive to serious storms. The DOP has historically invested resources in forest roads, bridges and culverts.

3) Inaccessible Areas

There are 236 acres of land which are inaccessible for management. Much of the northern extent of NSF supports a matrix of aquatic habitat ranging from expansive marshes to trout streams and intermittent drainages. The pattern that these water features create across the landscape results in land areas which are largely inaccessible by trucks or logging equipment. Additionally, there are isolated areas in these blocks in which steep, excessively rocky terrain limits the potential for active forest management. Due to the nature of the ground conditions inaccessible areas cannot be easily accessed through new road construction or existing road upgrades.



4) Rights of Way

Stand 4-4a on the west side of Krapf Road in Ashford in the West Ashford Block is a 50'-wide strip of fee-owned land which was intended to provide access to a rear piece of property for a planned housing development. However, the property was eventually purchased by the State and added to the Forest. Pursuant to their rights in a document titled "Easement, Warranty Deed, and Subordination Agreement", recorded in the Ashford Land Records at Volume 107, page 301 on September 22, 1995, the owners of an abutting house lot on Krapf Road have constructed their driveway partly on this strip of land.

A substantial part of the Westford Block is on the north side of Iron Mine Lane in Ashford. Iron Mine Lane was discontinued by the Town of Ashford in 1910. An Appellate Court decision, Rudewicz v. Gagne, 22 Conn. App. 285 (1990), which involved Iron Mine Lane and access to it from Horse Hill Road, places access to the Forest via Iron Mine Lane from Horse Hill Road in doubt. The court held that Conn. Gen. Stat. Sec. 13a-55,

which was enacted in 1959 and provides that "property owners bounding a discontinued or abandoned highway, or a highway any portion of which has been discontinued or abandoned, shall have a right-of-way over such discontinued or abandoned highway to the nearest or most accessible highway…," should not be applied retroactively. The State's right to access Iron Mine Lane from Horse Hill Road by virtue of having acquired an easement by adverse use of the roadway by the State and its predecessors in title remains an open question.

5) Boundary Conditions

This area of NSF has approximately 43 miles of boundary lines to be maintained by the Division of Forestry on an 8-10 year rotation. They were re-marked in 2011-2013. Several boundary issues including missing lines and minor encroachments were resolved while completing the boundary marking.

Total Management Unit Area	3,470 acres
Administrative / Operational Restrictions	1,284 acres
Uneven-aged Forest	341 acres
Actively Managed Even-Aged Forest	2,089 acres
Fields	11 acres
Ponds, Marshes, & Swamps	426 acres
Acres of Stands Accessible by DOT Roads	1,596
Acres of Stands Accessible by Forest Roads	1,392
Miles of Public Vehicle Access Roads	0.55
Miles of Gated Access Roads / Number of Gates	1.28 / 2
Miles of Blocked Forest Roads	1.27

6) Known Boundary Problems

Several boundary problems were addressed during the most recent boundary marking. Boundary issues were resolved for the following parcels; Eastford 107, & 52. Bigelow Brook 61, 98, & 74 a, b, c. There is at least one known boundary line issue concerning Eastford parcel 41. The southeast corner is not identified, likely due to impacts from the relocation of CT Route 44 and the addition of a private driveway to the east. DEEP Forestry (DoF) will work with the surveyor to relocate or reset the missing pin.

D. Special Use Areas

1) Lakes & Ponds

The topography of these blocks can be generally characterized as rolling hill slopes interspersed with moist lowland depressions. The topographic relief rarely exceeds 100' between ridge-top and valley. As a result, the area has little open water of any significance. There are two ponds called Phoenixville Park Ponds: #1 (3 acres) and #2 (1.5 acres) in the Old Colony Road - East tract, which have open water habitat. The Wildlife Division (WD) has installed wood duck nesting boxes in the ponds. The northern end of Pond #2 transitions to a marsh with emergent woody vegetation. Currently beaver activity in the pond has seasonally flooded the northern access road and a portion of the historic Boston – Hartford turnpike. The WD is responsible for the management of beaver populations across the state. Trapping activities will be conducted during the

regulated trapping season and occur as deemed necessary to resolve any problems. For more information see the following publication: "Beavers in Connecticut: Their Natural History and Management".

2) Rivers, Streams & Watersheds

The entire NSF is located within the Thames River Basin. On a regional scale 3,226 acres of the area falls within the watershed for the Natchaug River. Two hundred and forty four (244) acres of the Eastford Block fall into the regional watershed of the Quinebaug River. On a local scale there are five sub-region watersheds which contain tracts of Natchaug State Forest. The land area east of Firetower Road drains into Mashmoquet Brook. The land between Firetower Road and Old Colony Road feeds the Still River. Old Colony Road to North Road drains into Bigelow Brook. Between Moon Road and a discontinued town road which bisects the West Ashford Block is the sub-region watershed for the Mount Hope River. The western two-thirds of the West Ashford Block drains into Squaw Hollow Brook.

Forest Block	**Watershed Region**	**Watershed Sub-Region**	**Drainages**
Eastford Block	Natchaug River Quinebaug River	Mashmoquet Brook Still River	Lyon Brook Elliott's Brook Norton Brook Haven's Ledge Brook
Bigelow Brook Block	Natchaug River	Bigelow Brook Still River	Crann Brook Bigelow Brook Walker Brook Sibley Brook Branch Brook
Westford Block	Natchaug River	Mount Hope River	East Branch - Mount Hope River North Chism Brook South Chism Brook
West Ashford Block	Natchaug River	Mount Hope River Squaw Hollow Brook	Basset Brook Knowlton Brook Lipps Brook Squaw Hollow Brook Lowry Brook

It is the policy of the DEEP Inland Fisheries Division (IFD) that riparian corridors are protected with an undisturbed 100 ft. wide riparian buffer zone on perennial streams and a 50 ft. no equipment buffer on intermittent drainages. A riparian wetland buffer is one of the most natural mitigation measures to protect the water quality and fisheries resources of a watercourse. This policy and supporting documentation can be viewed on the DEEP website at: Riparian Policy and Riparian Position Statement.

The DOF will coordinate with the Inland Fisheries Division and utilize variable-width buffer strips whenever possible. The Division will protect seasonal and perennial drainages from impacts associated with forest operations. Division foresters will assess appropriate buffer widths based on the specific drainage, local topography and slope, the current fisheries resource, the planned silviculture, and the harvesting equipment to be used. Any modification of the DEEP Fisheries policy will be with the approval of the Senior Fisheries Habitat Biologist.

The DOF will, where appropriate, utilize seasonal harvest restrictions in sensitive areas containing steep slopes, wet, or highly erodible soils. Forest Operation Plans will limit stream crossings to a minimum and ensure Best-Management Practices for maintenance of water quality are met in the design and implementation of stream crossings. Direct stream crossings will only be allowed on hard, rocky stream bottoms during zero-flow conditions. Log bridges should be constructed over streams that have either steep approaches or soft stream bottoms. Temporary bridges should be removed upon harvest completion.

The IFD will review any forest road maintenance projects that involve replacement of culverts as a result of unexpected wash-outs from erosion. These culvert replacements are covered by a general wetlands permit issued to the Parks and Support Services Divisions. These projects would be assessed by the IFD to ensure fish passage needs are met.

CT BMP's for water quality while harvesting forest products.

An interactive map detailing fish community resource information for specific waterways can be found at: CT DEEP Fish Community Data

3) Cultural Sites

The area of NSF has historically been utilized by native populations, early settlers and commercial industry. After the opening of the Boston-Hartford Turnpike in 1800 the area experienced a manufacturing and mill boom facilitated by abundant natural resources and access to markets. In 1845 the Town of Ashford (named for its abundance of ash timber) had two cotton mills, two woolen mills, two coach and wagon works, two chair and cabinet companies, three tanneries, one comb factory, one hosiery factory, one carpet manufacturer, six saw mills, four shingle mills, five grain mills, boot and shoe shops, a brick yard, one wood working plant and one metal working plant. The forests produced 21,800 bushels of charcoal, 1,175 cords of wood and 1,300 pounds of maple sugar, and the mills sawed 388,000 board feet of timber. But the completion of the railroad through Willimantic several miles to the south soon limited the manufacturing potential of the area, and the late 1800's saw farms revert to forest and previously booming business migrate elsewhere.

The Boston-Hartford Turnpike was constructed from 1797-1800 and began as a postal route linking Boston and Hartford. A second route departed the road one mile east of Ashford and connected the Boston - Hartford road to Providence. The turnpike bisects two parcels of State Forest land. The road is still easily identified as it was once crowned and impressively ditched on both sides. The road is lined with old sugar

maple trees and granite mile markers denoting mileage distance to "HC" or Hartford Courthouse. Historic accounts describe "a continuous line of vehicles as far as the eye could see". The Middle Post Road is of underappreciated cultural interest in the area. The road corridor facilitated the economic growth of northeastern Connecticut. The turnpike will be treated like a historic landmark and all forestry activities will treat the road with the same Standard Operating Procedures as are required for authorized DEEP trails.

An often overlooked cultural thumbprint on our forest landscape was left by the charcoal industry. The production of charcoal from wood products fueled the iron smelting process, and in turn, the industrial revolution. Throughout the 19th century forests were repeatedly clear-cut. The wood was burned slowly onsite in large piles. Logs would eventually smolder and yield charcoal. The men who cut the wood and tended charcoal mounds were known as colliers. They lived in small huts in the forest for extended periods of time. They worked a small geographic area, tending up to three charcoal mounds at a time. The circular remnants of these mounds can be identified in the forest today. Nearby small chimney structures can sometimes be found, the only remaining evidence of collier's huts. Where present, these cultural artifacts will be preserved and protected from harvesting impacts.

4) Recreation & Scenic Areas

The forest provides widespread opportunities for hunting, fishing, trapping and wildlife viewing. See Connecticut's Hunting and Trapping Guide and Anglers Guide for licensing requirements, season dates and other regulations. Each tract of these Natchaug Blocks, aside from the 48-acre parcel in Mansfield, is open to public hunting by zones in season.

Additional use comes from passive, non-motorized outdoor recreation. There is a 6.7-mile segment of the Blue-Blazed Hiking Trail system which bisects the West Ashford, Westford and Bigelow Brook Blocks. These components of the Natchaug and Nipmuck trails are managed by the Connecticut Forest and Park Association (CFPA) and maintained by volunteer CFPA Trail Managers. The trails are accessed off Routes 74 and 44, and Perry Hill, Moon and Eastford Roads. The DOF may temporarily close affected trails during forest operations. Public notifications may be posted on the CFPA website.

There exists in places a network of forest roads suitable for administrative access, forest fire protection and hiking or walking. ATV and motorcycle use is not permitted in Natchaug State Forest. Enforcement is very difficult and is the responsibility of all of the neighbors of the forest along with the DEEP Environmental Conservation Police. The result of this illegal use is the degradation of forest roads and trails and the added cost of improvements to limit impacts to water quality.

In the Westford Block there is a series of cascading waterfalls located directly off the Blue-Blazed Trail. Pixie Falls occurs at the convergence of several distinct forest stands and unique wetland features. Draining between two marshes in the middle of the Westford Block, the adjacent forest stands have been categorized as part of a 205-acre "old forestland management site". Water quality, aesthetics and recreational appeal are the management objectives in this area which will be an interior forest reserve in perpetuity.

The only tract of NSF in Mansfield is a 48-acre parcel south of Route 44. The parcel has a recreational lease with the Town of Mansfield and is bisected by a ½ mile hiking trail. The Town is responsible for the upkeep and maintenance of the trail. These 48 acres have been designated for recreational use, and active forest management activities other than boundary maintenance and invasive species controls will not occur. Hunting is not permitted on this tract.

5) Critical Habitat

A review of the State's Natural Diversity Database identified 10 listed animal species and one rare natural community occurrence in the northern blocks of Natchaug. Forest operation plans developed during the life of this management plan will consider impacts to State-listed species. Forestry projects will be subject to site-specific review by the NDDB program where NDDB blobs overlap proposed harvest areas. See attached 'Special Features Map' for more information regarding listed-species observations.

6) Natural Areas

There are no designated natural areas within these four forest blocks.

7) Old Forestland Management Sites

This plan establishes 262 acres of old forest sites in the Westford and West Ashford Blocks. The Westford Block will have 205 acres of old forest designation bisecting the block in a corridor oriented northeast to southwest. The area is largely interior forest and has supported forest cover since agricultural abandonment in the late 19th century. Complex drainage patterns prevail, as the area contains three expansive marshes and four major drainages flowing between them. Adjacent uplands support multi-aged forest cover and a diversity of species. Both the East Branch of the Mount Hope River and North Chism Brook bisect the old forest area and serve as its eastern boundary near its the southern extent. The area supports a range of habitat types from poorer upland xeric growing sites to more productive moist northern hardwood stands and red maple lowlands. Pixie Falls, a series of cascading waterfalls adjacent to the Nipmuck Trail, occurs close to the geographic center of the old forestland site. The area also includes steep inoperable terrain, portions of the Blue-Blazed Hiking Trail System, exposed ledge features, glacial erratics, northern hardwood stands and dense areas of mountain laurel. The area designated as "old forest" in the West Ashford Block is 51 acres. It too supports a portion of the CFPA-maintained Blue-Blazed Trail, multi-aged hemlock-hardwood composition, a sugar maple stand, steep slopes, dense mountain laurel and a portion of Knowlton Brook, a tributary of the Mount Hope River.

8) Research Areas

Research activities are ongoing on State land and carried out by numerous individuals, educational institutions, and government agencies. Scientific collector's permits are issued by the DEEP Wildlife Division after multi-disciplinary review by the Agency including comment from DEEP Forestry. New permits will be issued on an annual basis. Some of the past and ongoing research at Natchaug State Forest is detailed below.

The Connecticut Agricultural Experiment Station (CAES) maintains a series of Long-Term Forest Monitoring plots on State Lands throughout Connecticut. The northern blocks of Natchaug have one such "Blue-Ribbon Plot" monitored on 10-year intervals to better-quantify forest vegetation changes, individual tree growth

rates and forest stand development. There are an additional five plots located in different blocks of the Goodwin-Natchaug State Forest complex. CAES is responsible for the inventory of such plots. Forest management activities will not occur within or close to forest monitoring plots so as to avoid influencing vegetative change. Special use permits for theses plots are managed by the Parks Division and renewed as necessary. The DOF encourages the use of state forestland for this purpose and benefits from the research that has been published as a result of this partnership.

E. Resource Management Concerns

1) Trails and Signs

There is a 6.7-mile segment of Blue-Blazed Hiking Trail system which bisects the West Ashford, Westford and Bigelow Brook Blocks. These components of the Natchaug and Nipmuck trails are managed by the Connecticut Forest and Park Association (CFPA) and maintained by volunteer CFPA Trail Managers.

2) Wetlands

There are roughly 426 acres of forested wetlands and marshland in these blocks. The rolling hills which characterize this area drain to moist depressions with hardpan soils. Drainages meander through the glacial valleys and sporadically surface to create expansive wetlands. Much of the aquatic resource is represented by expansive marshes, beaver meadows, and the perennial and intermittent drainages which bisect the uplands with a general north-south orientation.

Significant forested wetland and marshland features occur in each of the four blocks and encompass approximately 426 acres. In the 1950's-1960's the State Wildlife Division created wetland impoundments to benefit waterfowl and other wetland-dependent wildlife by damming brooks and installing water control structures that allow water levels to be manipulated. The WD is responsible for the maintenance of these areas and has installed wood duck nesting boxes. The WD has inventoried these waterfowl impoundments to determine priority management needs. Two impoundments, known as Westford Marshes #1 (1.5-acres) and #2 (3-acres), are located in the Westford Block. Another natural marsh in the West Ashford Block supports an active Great Blue Heron rookery. The DOF will apply the best available science in working near or adjacent to this area. That may include limiting management activities altogether or planning forest operations for the winter season when the birds will have likely migrated south or to the coast. The marsh and wetland resources of NSF have been historically managed to influence habitat features for migratory waterfowl. The DOF will coordinate with the WD regarding any forest management influences to waterfowl habitat.

3) Unauthorized Illegal Activity

Illegal off-road vehicle and ATV use are issues of concern in these blocks. Due to the isolated nature of these areas patrol and enforcement of off-road vehicle-use policies is a difficult task. Illegally-ridden ATVs and motorcycles gradually rut forest roads and trails. Over time erosion control structures become degraded and there is an increased potential for soil erosion under extreme weather conditions. The DOF will prioritize areas to install or improve forest gates to limit access to trails and curb a small percentage of this unauthorized illegal use of our public lands.

An important issue in all State Forests deals with the illegal dumping of trash and debris. Due to the remote nature of many State Forest parcels, individuals commonly dump trash and debris along isolated forest roads. Enforcing illegal dumping policies is a difficult task and the culprits are seldom caught or ticketed. Disposing of illegally dumped materials often falls on DEEP Parks & Support Services Divisions. One such dumping location has been identified and will be cleaned-up by DEEP personnel. Unfortunately, the adjacent roadway falls under municipal jurisdiction and gating or otherwise blocking the road doesn't appear to be an option at this time.

F. Wildlife Habitat

1) Investment in Habitat Improvement

Please see Connecticut's Wildlife Action Plan (WAP). The WAP identifies fish and wildlife species of greatest conservation need and their affiliated habitats. The strategy also identifies the priority research needs and conservation actions needed to address problems facing these species and habitats.

Forestry, wildlife and fisheries management often have complementary objectives on State forestlands. Wildlife abundance and distribution can be influenced by manipulating the structure and composition of the forest habitat. In order to provide a full range of habitat benefits for the widest array of species, the DOF will attempt to create a diversified age-class distribution across the forest landscape. Achieving a sustainable age-class diversity will maintain sufficient area of young-forest comprised of seedling/sapling growth, adolescent forests supporting trees smaller than 12" DBH, and maturing forests dominated by sawtimber sized trees over 12" DBH. Early-successional forests typically provide an increased diversity of insect communities (Lepidoptera – moths & butterflies) which, along with availability of ground-level nesting sites, influence songbird abundance and diversity. Pole-sized, or middle-aged forest stands provide cover for wildlife and middle-canopy nesting opportunities in addition to ensuring an aggradation of growing stock into sawtimber size classes. These stands replace sawtimber growing stock which is harvested to increase proportions of young forest. Lastly, although late-successional forest stands have not been documented to be critical habitat for any specific species, late seral stage forests are beneficial for ecosystem resilience and provide habitat for forest interior species such as pileated woodpecker, fisher and black bear. Maintaining the State Forest in this diversified vegetative condition will provide habitat opportunities for the widest array of species while supporting forest sustainability through succession – the predictable, orderly replacement of age-classes of vegetation on a site over time.

Young forest habitat is currently deficient in the northern blocks of Natchaug State Forest. This condition is a result of forest succession and the lack of recent forest management, or other disturbances throughout these blocks. As a result of this deficiency, wildlife populations which depend on the stem density and forest structure of early successional habitat have declined in this area. Additionally, declining forest interior birds like cerulean warbler who nest in the interior forest will utilize forest openings for foraging. Forest sustainability is also compromised as there are fewer young stands to replace older forests which change due to harvesting or natural disturbance. The DOF will address this deficiency through forestry treatments designed to regenerate new age-classes of growth which will have the opportunity to one day assume

dominance in the stand. Perpetuating new age classes of trees should not reduce habitat utilization by forest interior species as long as two conditions are met. 1) The cutting pattern will retain well-spaced large diameter dominant trees, and 2) the cutting scale does not greatly exceed 25-acres in areas of interior forest bird compatibility. Due to the condition of the forest stands and a general lack of desirable forest regeneration throughout the blocks, there is very little true early-successional habitat creation proposed as part of this plan.

In the West Ashford Block, Compartment 4, Stands 3, 3a, and 3b, there are 17 acres of shrub-sapling habitat in an area planned to be a housing development in the 1980's. After the development was abandoned, the land was sold to the State and it reverted to shrub-sapling habitat. The area is heavily-populated with invasive species and is an important area for control before the non-native plants seed-in more area of the block. The WD will coordinate the use of its equipment to mow the stands to mechanically treat the invasive species and reclaim the area as young forest habitat. Once the invasive species have been eradicated, the DOF could consider maintaining the opening with prescribed fire, or allowing it to revert to successively older age-classes through succession.

Despite the well-documented early-successional habitat deficiency, Natchaug State Forest is a substantial component of the heavily forested landscape in rural northeast Connecticut. Portions of the Forest support 'core forest' habitat defined as continuous unbroken forest that is at least 300-feet from other land uses including residences, farm land, and paved roads. Similarly, many of the species identified in the Natural Diversity Database review are sensitive to significant disturbance and utilize interior forest habitat. These species will be benefitted by the selection system and thinning silviculture called-for in the plan. These treatments maintain somewhat continuous canopy cover interspersed with small openings which allow for structural diversity. These treatments generally result in increased age-class diversity and the development of uneven-aged attributes. Nearby even-aged management may also benefit these forest interior species when; 1) well-spaced large diameter trees are retained above a basal area of 40 sq. ft. / acre, and 2) the scale of heavy cutting does not exceed 25-acres in areas of interior forest bird compatibility.

Two fields in the Bigelow Brook area just north of Route 44 have historically been in agricultural production. For many years a local farmer was allowed to grow hay and corn in the fields under an agricultural license agreement administered by the WD. The fields were recently taken out of production to establish permanent cover for wildlife. The fields are periodically mowed by Wildlife or Parks Divisions to control the establishment of woody plants.

2) Existing Diversity Situation

The wildlife habitat diversity of these northern Forest Blocks would be benefitted by the creation of more early successional forest habitat. Currently only 1% of the area is in seedling/sapling size-classes. In order to provide ample amounts of wildlife habitat seedling/sapling stands should total at least 10%. Currently 63% of the landscape is sawtimber or sawtimber-pole. Through the silviculture workplan the DOF will begin to shift the forest resource toward a condition supporting higher proportions of early-successional habitat. Limiting the ability of the DOF to quickly create young forest habitat is the lack of desirable advanced regeneration in the stands to be managed. Due to long intervals between harvests and decades without an assigned forester

opportunities to regenerate or release desirable species have largely been missed. Thus the silvicultural work to be accomplished under this plan is largely focused on establishing desirable advanced regeneration rather than releasing desirable cohorts of advanced regeneration.

3) Landscape Context

The subject blocks of Natchaug State Forest provide north – south habitat connectivity between the Beaver Brook Block of Natchaug, (south of Rte. 44) and other private conservation land (Yale-Meyers Forest, Nature Conservancy, Wolf Den Land Trust) north of Rte. 44. This connectivity enables both the seasonal and long-term movement of wildlife populations across suitable forest habitat. The corridor allows for the migration of genetic material between geographically isolated populations, and aides in the general mobility of species with large home ranges. The connectivity also enables dispersal of wildlife populations from existing habitat into new habitats created through forestry activities. The subject blocks alone are isolated tracts somewhat removed from the largest block of the forest. However, combined within the larger matrix of conserved private land, these areas represent an important habitat connection between expansive State lands to the south and expansive State lands to the north.

4) Wildlife Based Recreation

The northern blocks of Natchaug State Forest are open to public hunting and fishing in season. The area is also popular with bird-watchers, naturalists, and herpetologists. Wildlife-based recreation has trickle-down economic benefits across a regional scale. It is also important to note that license sales, and proceeds from hunting and fishing equipment benefit state and federal wildlife and conservation funding through legislation like The Pittman-Robertson Act (Federal Aid In Wildlife Restoration Act), The Dingell-Johnson Act (Federal Aid In Sport Fish Restoration Act), and The Federal Duck Stamp.

G. Vegetative Condition

2,049 acres, or 59%, of the area in these four blocks is Oak–Hickory forest. All but 74 acres of this Oak–Hickory composition is in sawtimber size-classes. In order to pursue more balanced structural composition the DOF must recruit and perpetuate a higher proportion of early-successional forest habitat consisting of desirable species. Management of this acreage will pursue this goal by employing even-aged management. Shelterwood system silviculture is the primary means to establish and perpetuate new cohorts of desirable even-aged vegetation.

Size-Class	DBH Range
Seedling	<= 1”
Sapling	1.0 <= 4.9”
Pole	5.0” <= 11.9”
Small Sawtimber	12.0” <= 13.9”
Medium Sawtimber	14.0” <= 16.9”
Large Sawtimber	17.0” and larger

1) Forest size classes by forest type (total forest)

Type	Seedling - Sapling	Pole Timber	Saw Timber	All Size	Other	Total
Oak – Hickory	25	50	1,974	0	0	2,049
Oak – Pine	0	5	523	62	0	590
Elm – Ash – Red Maple	9	137	216	0	0	362
Beech – Birch - Maple	0	0	135	112	0	247
White Pine	0	0	108	42	0	150
Other (non-forest)	0	0	0		71	71
Exotic Softwoods	0	1	0	0	0	1
Total Acres	34	193	2,956	216	71	
					Total	3,470

2) Forest type, size class and condition class on areas to be managed (excludes uneven-aged)

Oak – Hickory Management Unit

Size Class	Adequately Stocked	Overstocked - Thin	Regenerate – Low AGS
Seedling-Sapling	9	0	0
Pole Timber	50	0	0
Saw Timber	1,540	394	580
Total	1,599	394	580
Scheduled to Operate		37	413

Acreage numbers do not total to amounts in Table 1 above. Stands identified as adequately stocked may be prescribed thinning or regeneration treatments based on age-class distribution goals.

Oak – Hickory Forest

Oak-Hickory stands will be managed on an even-aged basis with the main objective of regenerating younger age-classes of desirable vegetation. Oaks have been in decline in Connecticut at a rate of 5% per decade since the hurricane of 1938. Intolerant of shade, oaks compete best in full sun conditions created by large-scale canopy disturbance. Due to oak's inability to grow in its own shade, perpetuating oaks on State Lands requires a combination of regeneration and release treatments aimed at establishing oaks under the partial shade of their parent trees before removing the forest overstory and allowing a new oak stand to develop in full sunlight. Achieving this objective is imperative on State Lands as the culmination of even-aged management is seldom employed on private lands in Connecticut, aside from some institutional, industrial, and water company land. This is supported by in-state data from the forest practitioner community. Despite a reported average of 12-14% regeneration harvesting, FIA data estimates levels of seedling/sapling habitat have remained steady at roughly 3%. This suggests that most of the regeneration harvesting on the landscape never culminates in a young-forest supporting species which are intolerant of shade. Generally, lack of natural disturbance, high-grade harvesting practices, the diminution of forest fire, and high deer

densities have all contributed to oak decline and the replacement of oaks by more shade-tolerant and fire-sensitive black birch and red maple.

Northern Hardwood Management Unit (includes uneven-aged)

Size Class	Adequately Stocked	Overstocked - Thin	Regenerate – Low AGS
Seedling-Sapling	0	0	0
Pole Timber	0	0	0
Saw Timber	72	58	0
All Aged	83	0	112
Total	155	58	112
Scheduled to Operate	114	32	63

Northern Hardwood Forest

Physical site features within these blocks result in forest succession trending towards Northern Hardwood vegetation on the better sites. Moist, well-drained mesic sites tend to support sugar maple, white ash and yellow birch composition. More poorly drained stands tend to have increased red maple competition. Where silvliculture is apt to perpetuate northern hardwood composition, an uneven-aged management approach should be considered. Harvest planning in these stands will use Q-factor measurements to assess surpluses and deficiencies in the growing stock and aim to leave a more-balanced distribution of age-classes in the residual forest.

Softwood Hardwood Management Unit (excludes uneven-aged)

Size Class	Adequately Stocked	Overstocked - Thin	Regenerate – Low AGS
Seedling-Sapling	0	0	0
Pole Timber	5	0	0
Saw Timber	346	236	253
Total	351	236	253
Scheduled to Operate	13	0	34

Softwood – Hardwood Forest Types

The northern-most blocks of Natchaug have a diversity of growing stock markedly different than State Lands to the south. With steep slopes, shallow soils, and proximity to major drainages, the forest has a higher proportion of eastern hemlock than is typical in Connecticut. These physical site factors combined with an active disturbance history result in areas supporting mixed-wood composition of Oak – Hemlock. We can hypothesize as to the route of this difference. Many of the lands encompassed in these blocks were actively farmed until the later 1800's. At this time fields reverted to forest. Forty to fifty years of growth resulted in a majority of pole-timber shading the growing site and influencing the regeneration of shade-tolerant trees like Hemlock. With established hemlock in the forest understory the hurricane of 1938 blew-down much of the aggrading hardwood growing stock and released this established Hemlock regeneration present in the

understory. Hemlock was perpetuated in full sun conditions while a new cohort of oak species and other hardwoods occupied the site and eventually came to out-compete the slower-growing hemlock. We can now observe ridge locations supporting roughly 50% oak species and 50% hemlock. Additionally, the moist conditions influenced by the abundance of streams and marshes have introduced northern hardwood growing stock on the better sites. Pure sugar maple – yellow birch stands occur on the moist, well-drained lowlands while sugar maple is replaced by red maple on the poorly drained sites. Land-use and disturbance history again impact vegetative distribution where a pure oak overstory is paired with a sugar maple understory. The oak was apt to become established post-hurricane as a result of the increased sunlight, even when it occurred on wetter sites. In these stands the established oak is a function of disturbance history, while the sugar maple composition is an indicator of natural community type – the compositional direction of an area given its inherent physical site features, principally the soil.

Past management treated these oak – hemlock areas with thinning. Due to the partial shade conditions created by these light harvests, black birch has regenerated in the small openings created. Future management efforts in mixed-wood stands will employ an Irregular Shelterwood, or Group-Selection harvest approach. The treatments designed to expand upon the openings created through previous harvests mimic an uneven-aged approach referred to as expanding gap shelterwood.

Softwood Management Unit

Size Class	Adequately Stocked	Overstocked - Thin	Regenerate – Low AGS
Seedling-Sapling	0	0	0
Pole Timber	0	1	0
Saw Timber	87	53	20
Total	87	54	20
Scheduled to Operate	12	0	0

Softwood Forest Types

Areas of pure softwood composition total over 150 acres of Northern Natchaug. The conifer cover is made up of predominantly pure hemlock stands, pure eastern white pine stands and mixed hemlock and pine stands. These are mostly natural conifer stands, many of which occur along Bigelow Brook. Only 29 acres are white pine plantation. Active forest management within the softwood forest types will focus on the pure white pine and mixed white pine – hemlock stands. Pure hemlock forest is unlikely to be actively managed due to the low potential for silvicultural benefit, the riparian nature of many such stands and the climate and disease factors currently stressing hemlock forests.

Opportunities to create areas of pole-sized softwoods that would specifically benefit sharp-shinned hawks, a state-listed endangered species, will be considered and discussed with WD staff as individual cutting plans are developed.

Area Based Approach

The DOF attempts to effectively balance the proportion of the total forest in each size-class to ensure timely graduation from one size class into the next. In order to provide habitat suitable for the array of wildlife species which occur, the forest must be maintained in a condition which provides for a diverse suite of habitat needs. This means maintaining young forest, aggrading forest, middle-aged forest and old forest.

The table below details the current forest age-class distribution against an acceptable range of ideal desired future conditions:

	Current Condition	**Desired Future Condition**
Seedling/Sapling	1%	5-15%
Pole	6%	25-35%
Sawtimber	93%	55-65%

Based on this comparison of current size-class distribution versus a desired future condition it is apparent that there is a surplus of sawtimber-sized stands and significant deficiencies in the amount of young-forest habitat across the landscape. This is a result of land-use history. The majority of the forest grew after a widespread stand-replacing disturbance, the hurricane of 1938. Therefore it stands to reason that much of Connecticut's forest is at minimum approaching 80 or so years old. Maintaining such a high percentage of forest land in a maturing condition is unsustainable, and fails to provide habitat for the array of species dependent on young forest habitat. In order to shift the proportion of forest growing stock to younger size classes the DOF will focus on recruiting and perpetuating desirable young forest cover using shelterwood system silviculture where appropriate. In overstocked stands, uneven-aged forest, and in areas which do not support adequate advanced regeneration, thinnings and selection harvests will focus on adjusting spacing and restoring vigor.

- In this plan 448 acres will be treated with even-aged regeneration harvests.
- First-Phase and Second-Phase Shelterwoods are prescribed for 406 acres.
- There will be 42 acres of Irregular Shelterwood.
- Thinnings will occur on 146 acres.
- Uneven-aged silviculture (single-tree and small-group selection) will occur on 181 acres.
- An additional 28 acres of timber stand improvement and roughly 40 acres of invasive species management will occur as funds and staffing permit.

3) Forest Health

Understory vegetation will require an aggressive management approach through the life of this plan. An integrated management strategy must be utilized to control the establishment and spread of invasive species within the forest. For decades invasive species have gone un-managed and have now established a strong foot-hold across certain parts of Natchaug. The DOF should work collaboratively with adjacent landowners and employ a combined mechanical and chemical control approach to reduce occurrences of invasive species within the forest. Forests interspersed with private forestland, Yale University and Land Trust holdings

should consider collaborative work to attain federally available group funding for invasive control. Working collaboratively with our neighbors would increase the amount of work which can be accomplished on the ground and benefit everyone's forest resource cumulatively.

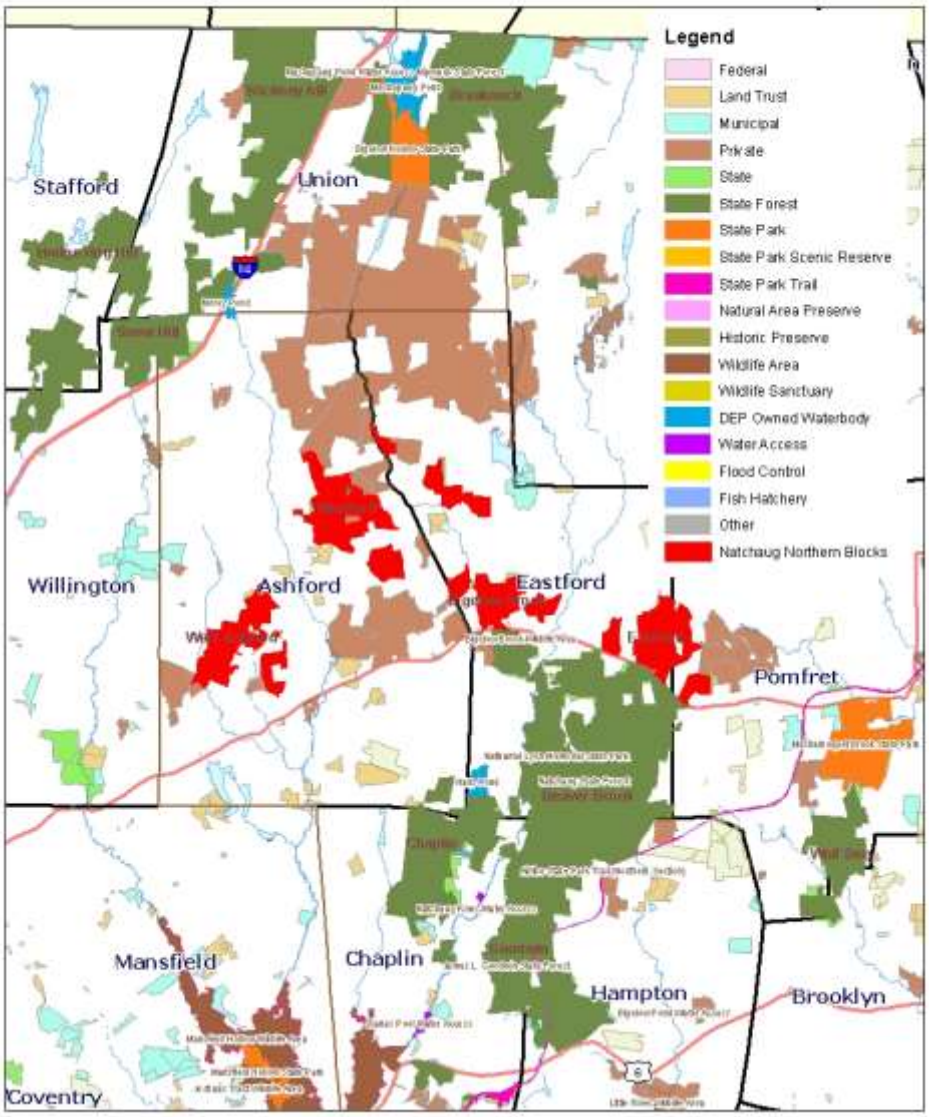
Currently the presence of invasive plants limits silvicultural potential in certain stands. In addition to affecting tree regeneration, invasive species have effectively reduced the proportion of native mast-producing shrub species. Understory shrubs such as blueberry, hazelnut, shadbush, spicebush and viburnum have declined as natural forest succession occurs and the forest matures. Field edges, stands near boundaries adjacent to residential development and along town roads are populated with non-native invasive plants. Japanese knotweed, Japanese barberry, multi-flora rose, autumn olive, bittersweet and honeysuckle can come to dominate the forest understory to the exclusion of native trees and shrubs.

H. Landscape Context

The areas of Natchaug State Forest north of Route 44 fall within a diverse forest ownership landscape. Less contiguous than lands in the Beaver Brook Block to the south, these State Forest parcels occur interspersed with private, University, non-profit and municipal lands. Large forest landowners in these areas are well advised to adopt a landscape-level approach considering the role their individual resource plays in the larger forest matrix. Understanding how each property fits in to the landscape context may help guide management objectives so resource benefits are maximized across larger areas. Currently Yale University is trying to ensure landscape-level management continuity by advising private landowners in the preparation of forest management plans. Through this "Quiet Corner Initiative" Yale School of Forestry and Environmental Studies land managers and students are trying to foster management cohesiveness on a regional landscape scale. The DOF will collaborate with Yale University staff to ensure as much as reasonably possible that State management objectives are congruent with the landscape scale management planning approach adopted by many neighboring landowners.

These blocks of Natchaug occur within the private land interface between two large blocks of conserved forest land: the Natchaug and James L. Goodwin State Forest complex to the south (10,000 acres) and the Yale-Myers, Nipmuck State Forest and Bigelow Hollow State Park landscape to the north (20,000 acres). Considering the municipal and non-profit land holdings extending through the Quiet Corner and into Massachusetts it would be reasonable to estimate that these blocks of Natchaug occur close to the southern-center of a 50,000 acre working forest. These 3,470 acres of Natchaug State Forest play an important role in providing forest habitat connectivity and landscape continuity in northeastern Connecticut.

Natchaug State Forest - Landscape Context



I. Specific Acquisition Desires

1) Acquisition of a ten-acre inholding west of Moon Road and north of Horse Hill Road in Ashford (Assessor's Map Parcel 18-B-4) would straighten a boundary line and provide better access to part of the Westford Block.

J. Public Involvement

1) Draft copies of this management plan were delivered to the Conservation Commissions in the towns of Pomfret, Eastford and Ashford in 2013 and again in 2017. The comments that were received have been included in Appendix E. The DOF will be available to answer additional questions regarding the contents of the management plan, forest management objectives and the implementation of silviculture and can be reached at 860-424-3630.

K. Adaptive Management

1) Forest management occurs on a dynamic landscape and somewhat unpredictable landscape. Management actions are often affected by outside variables which cannot be controlled, yet influence resource conditions. The management approach may need to be responsively and reasonably changed as environmental change and resource needs warrant. Some of these changes may be associated with biological factors such as insect or disease population outbreaks. Increased unauthorized motorized recreation which erodes trails and roads may require action unforeseen during the composition of this plan. Additionally, unforeseen disturbances such as windstorms or heavy precipitation events may affect resource conditions and work requirements. The Division of Forestry and our colleagues in Parks, Wildlife, Fisheries, and Agency Support Services, evaluate circumstances as they change, and use an adaptive-management philosophy which gives us the ability to respond accordingly. Best professional judgment will be used to address unforeseen circumstances should they arise during the tenure of this forest management plan.

L. 10 Year Goals

1) Maintain and improve forest ecosystem health to maximize stand growth rates, improve wildlife productivity, increase diversity and protect against insect and disease outbreaks.
2) Use silvicultural treatments to regulate the proportion of forest size-classes to achieve a desired future condition with a higher proportion of early-successional forest habitat.
3) Establish Old Forestland Management Area totaling at least 200 acres.
4) Increase proportion of significant or critical early-successional wildlife habitat.
5) Improve access to forest blocks by maintaining or upgrading deteriorating segments of forest roads.
6) Deter unauthorized illegal vehicle use by establishing or renovating gates on forest roads.

M. Work Plans

Block	Compartment	Stand	Treatment	Acres	Lead	Year
West Ashford	2	4	1st Shelterwood	28	Forestry	2018
Westford	10 & 11	10-1, 10-2, 11-3	Thinning	45	Forestry	2018
Westford	1	1	Thinning	27	Forestry	2019
Westford	1	2	Group Selection	53	Forestry	2019
West Ashford	3 & 7	3-7, 4-5	TSI	28	Forestry	2020
Bigelow Brook	8	1a, 2	Invasive Control	33 (subset)	Forestry	2020
West Ashford	4	3, 3a, 3b	Fecon Mow / Invasive	17	Wildlife	2020
Bigelow Brook	2	1, 1a, 1b	Invasive Control	166 (subset)	Forestry	2020
West Ashford	3	8	Selection	15	Forestry	2021
West Ashford	3 & 4	3-9, 4-9	1st Shelterwood	62	Forestry	2021
Bigelow Brook	14	5	Invasive Control	44 (subset)	Forestry	2021
Bigelow Brook	8	1b	Selection	45	Forestry	2022
Bigelow Brook	2	1a	Selection	21	Forestry	2022

Bigelow Brook	2	1b	2nd Shelterwood	100	Forestry	2022
West Ashford	5	1, 1a, 4	1st Shelterwood	120	Forestry	2023
Bigelow Brook	8	1, 1a, 2	1st Shelterwood	48	Forestry	2024
Bigelow Brook	13	7	Irregular Shelterwood	25	Forestry	2025
Bigelow Brook	13	11	Selection	18	Forestry	2025
Bigelow Brook	14	1	Thinning	7	Forestry	2026
Bigelow Brook	14	5	1st Shelterwood	44	Forestry	2026

Maintenance Workplan

- **Road maintenance** – Existing forest roads are maintained by DEEP State Parks Division, and the Division of Engineering and Field Support Services. Existing culverts should be inspected and cleaned out regularly. When the culverts become clogged, water can flood the road causing erosion, and deterioration of the road bed. Due to a backlog of deferred maintenance it is likely that some culverts are currently not functional, and drainage needs to be re-established. Leaves should be blown away from the edges of the road twice annually (spring and fall) so fewer leaves accumulate in the drainage ditches. Similarly, roadside tree work should be followed by clean-up activities to remove branches, leaves, twigs, and brush from the roadside, reducing the likelihood of such material ending up in the drainage ditches. Engineering and Field Support Services Division staff grade forest roads on an annual basis. – **State Parks Division / Engineering and Field Support Services Division**
  Road maintenance projects will be undertaken to facilitate active forest management. These projects may involve spreading stone, grading to crown, and restoring drainage ditches. Specific locations and material volumes will be estimated at the time of Forest Operations or Project Plan development. These proposed road improvement projects will be discussed with Engineering and Field Support Services Supervisor – **Division of Forestry**
- **Road Construction, Gates & Signs** – Installation of three gates is proposed to deter unauthorized off-road vehicle use in Bigelow Brook, Westford, and West Ashford Blocks.
  - In Bigelow Brook Block a gate is recommended on a forest road which goes west from Ashford Road in the Town of Eastford. The road is .70 miles long and ends at Bigelow Brook. There is currently evidence of off-road vehicle use and dumping of old tires and debris.
  - Establish a gate south of Perry Hill Road in the West Ashford Block. This is the location where the Blue-Blazed Trail crosses Perry Hill Road. There is some evidence of truck and jeep traffic traveling south on this forest road toward the former Krapf Road development.
  - Gate an old town road which departs Iron Mine Lane to the north. The first 650 feet of the road can be used to access adjacent private land to the east. A gate should be established to deter unauthorized vehicle-use along this road which is an authorized segment of the Blue-Blazed Hiking Trail System. Deterring unauthorized activity and off-road vehicle use will benefit the forest resource. **– Parks Division / Agency Support Services**
- **Stream Improvements** – In stream habitat alteration will be the responsibility of the DEEP **Inland Fisheries Division**.
- **Cultural Site Maintenance** – The DEEP **Parks Division** will be asked to cap an open well on Iron Mine Lane.

- **Recreation or Scenic Site Work** – as needed. **DEEP Parks Division**
- **Improvement of Critical Habitat –** There will not be any manipulation of habitats deemed 'critical' by the DEEP Natural Diversity Database unless specified by the CT Wildlife Division or Natural Diversity Database Review Team.
- **Trail Maintenance** – Maintenance of the Blue-Blazed Hiking Trail System is the responsibility of **CFPA** and its volunteer Trail Managers.
- **Upland Wildlife Opening Work** – **The Wildlife Division** will be consulted concerning the maintenance of early successional shrub habitat off of Krapf Road in the West Ashford Block.
- **Wildlife Habitat Improvement** – The **Division of Forestry** has planned significant invasive species work throughout these northern blocks of Natchaug State Forest. This work will rely on a mix of mechanical, chemical and biological treatments. The **Wildlife Division** will be consulted concerning specific projects.
- **Wildlife Population Controls – DEEP Wildlife Division**
- **Forest Stand Thinning** – See Silviculture Workplan – **Division of Forestry**
- **Forest Stand Conversion or Regeneration** – See Silviculture Workplan – **Division of Forestry**
- **Forest Product Sales** – See Silviculture Workplan – **Division of Forestry**
- **Burning, Mechanical, Chemical Work** – Invasive species eradication projects will employ a mix of mechanical, chemical, and biological (shade) controls to reduce the proportion of invasive species. – **Division of Forestry / DEEP Wildlife Division**
- **Planting –** None.
- **Forest Stand Rotational Cutting** – See Silviculture workplan. **Division of Forestry**
- **Pre-Fire Suppression Work** – Work may begin to establish control lines around the former Krapf Road Development so the Division can eventually maintain the early-successional habitat with prescribed fire. – **Division of Forestry**

N. Mapping

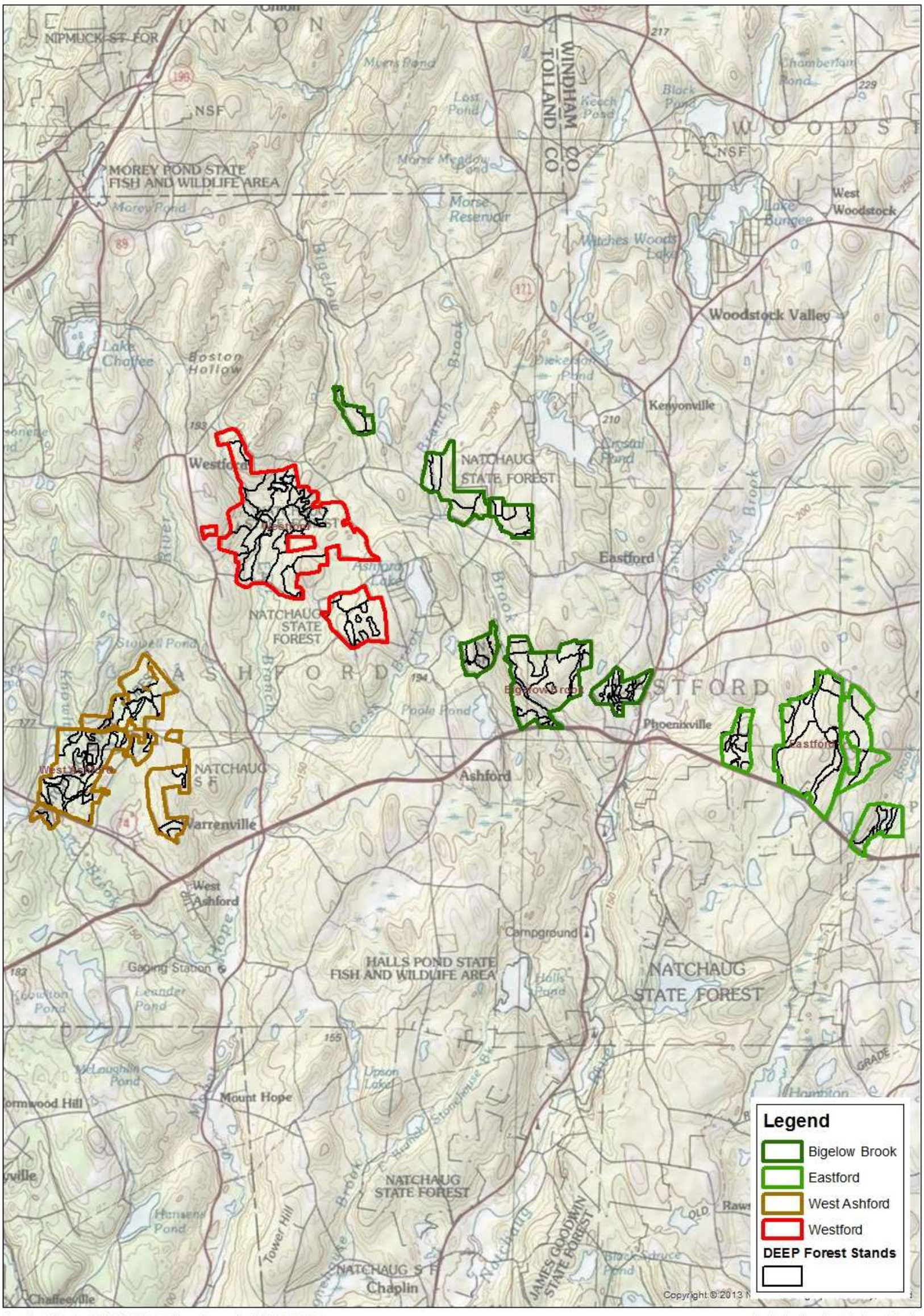
Map A - Topographic Natchaug State Forest
Eastford, Westford, West Ashford & Bigelow Brook Blocks
Ashford, Eastford, Pomfret & Mansfield Connecticut
3,470 Acres

February, 2017

Map Scale: (1 : 60,000)

0 0.5 1 2 Miles

N W E S



Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

Map B - Base Natchaug State Forest
Eastford, Westford, West Ashford & Bigelow Brook Blocks
Ashford, Eastford, Pomfret & Mansfield Connecticut
3,470 Acres

February, 2017

Map Scale: 1 : 60,000

0 0.75 1.5 3 Miles

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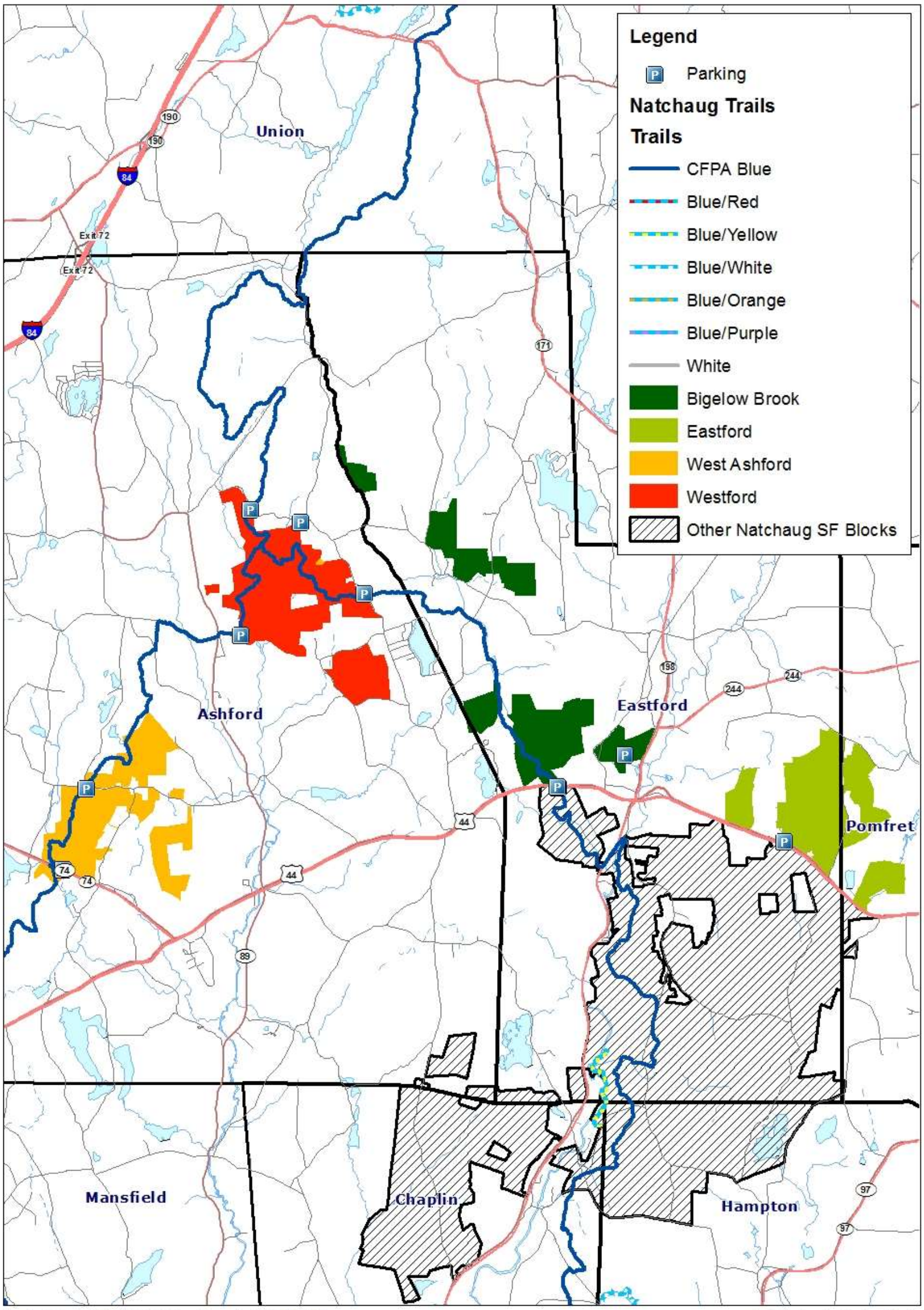

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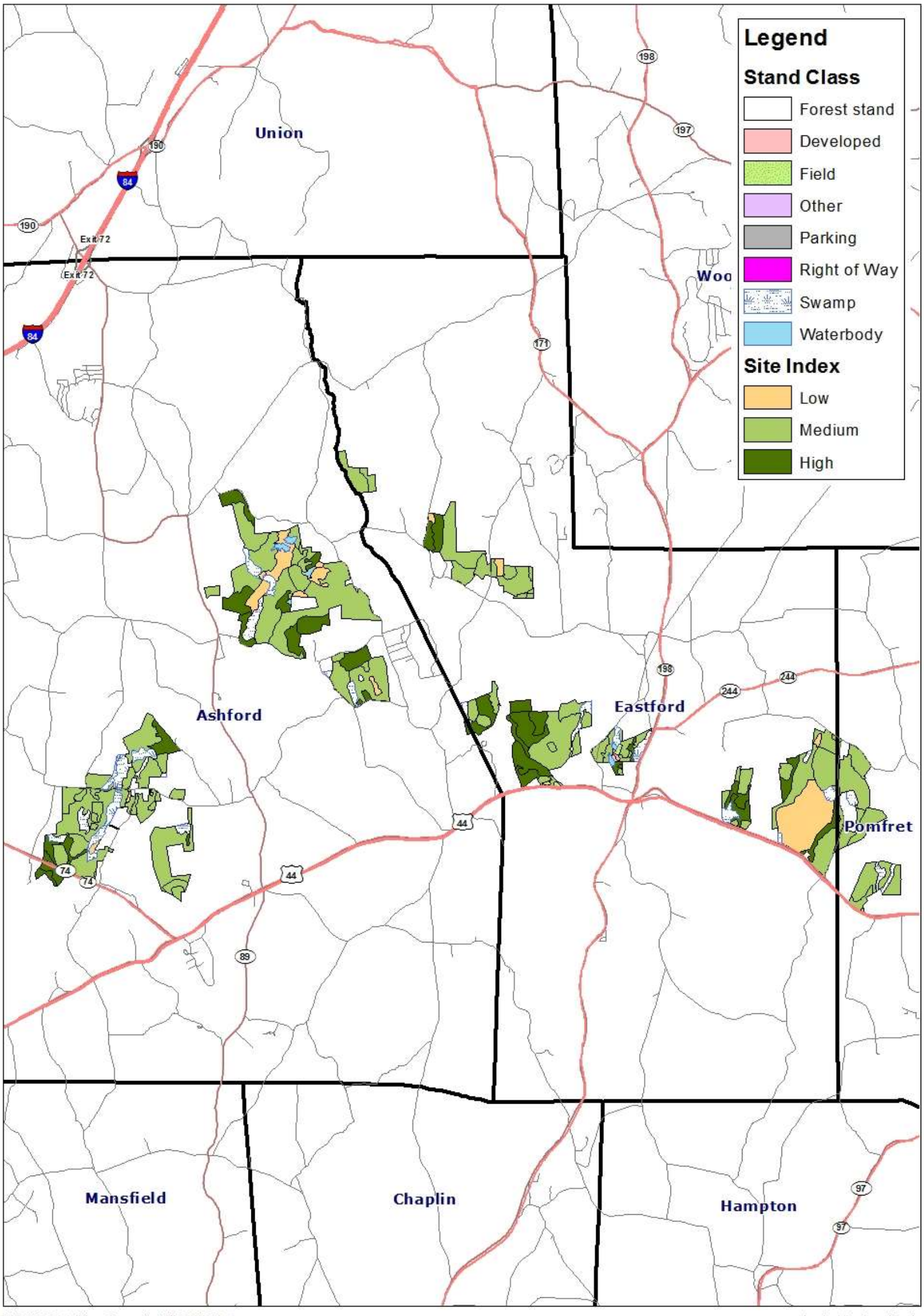
Projection: Lambert Conformal Conic

Map C - Site Quality Natchaug State Forest
Eastford, Westford, West Ashford & Bigelow Brook Blocks
Ashford, Eastford, Pomfret & Mansfield, Connecticut
3,470 Acres

February, 2017

Map Scale: 1 : 60,000

0 0.5 1 2 Miles



NAD 1983 State Plane Connecticut FIPS 0600 Feet

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Map D - Forest Type & Size Class Natchaug State Forest
Eastford, Westford, West Ashford & Bigelow Brook Blocks
Ashford, Eastford, Pomfret & Mansfield, Connecticut
3,470 Acres

February, 2017

Map Scale: 1 : 60,000

0 0.5 1 2 Miles

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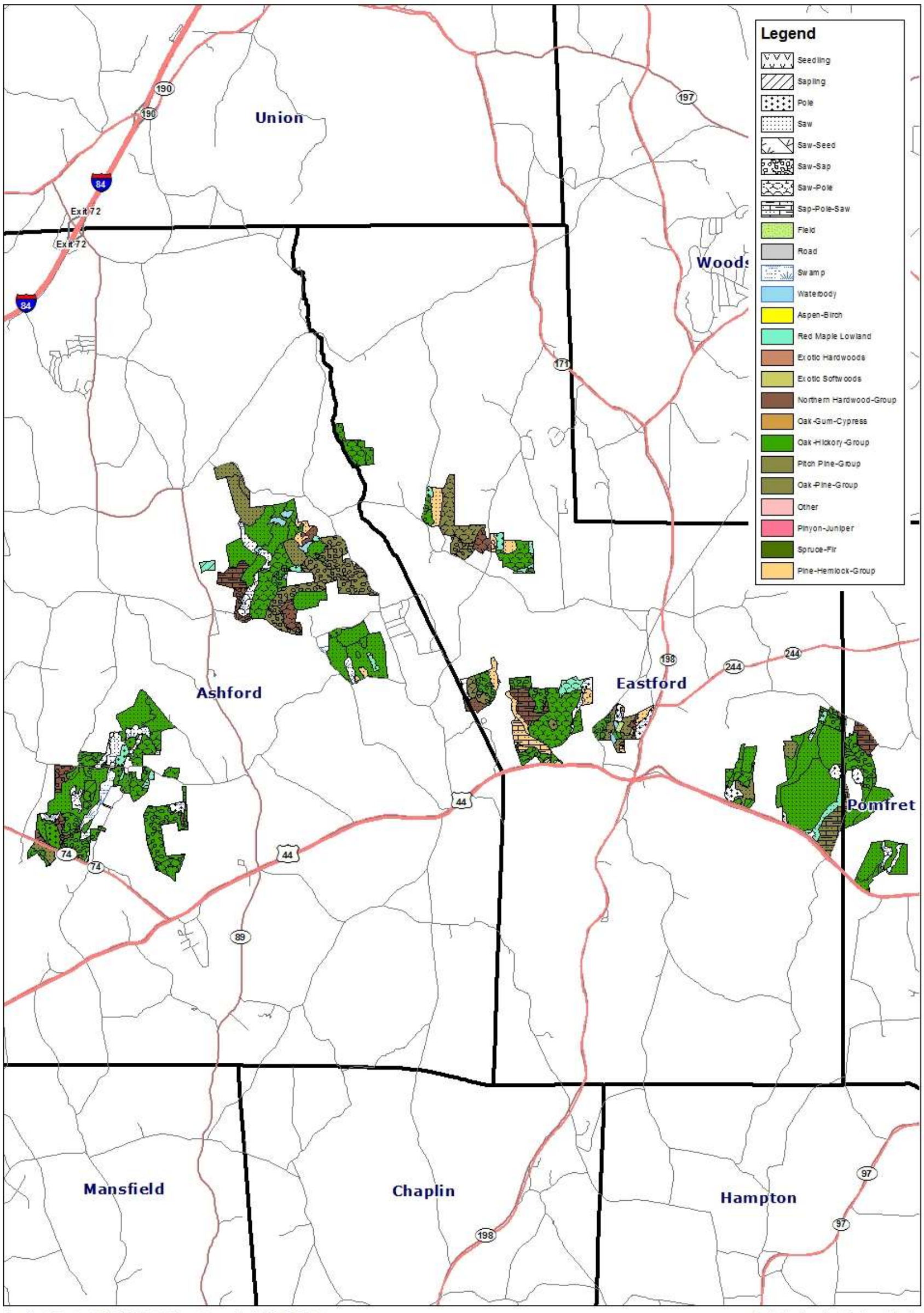


Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

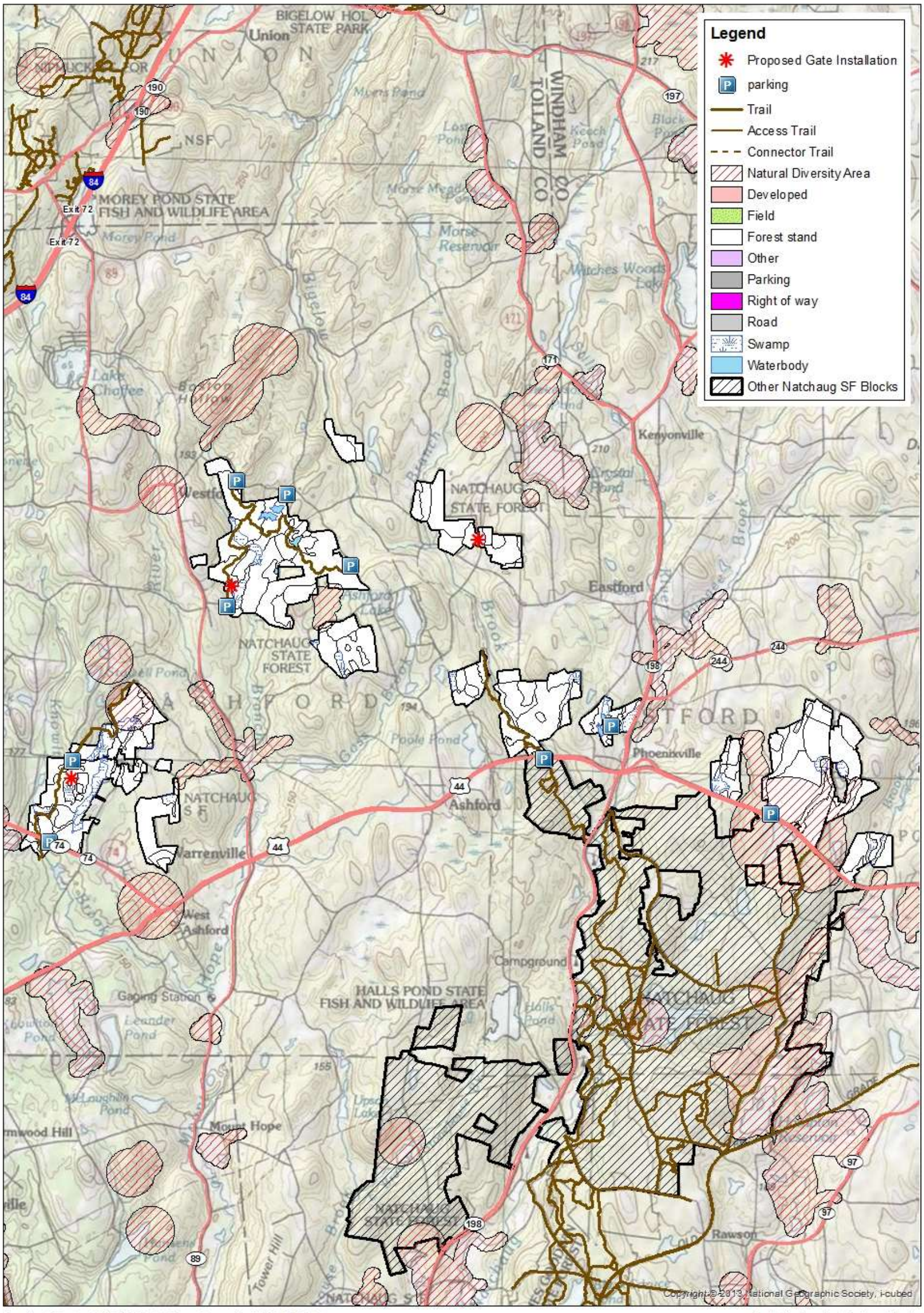
Map E - Special Features Natchaug State Forest
Eastford, Westford, West Ashford & Bigelow Brook Blocks
Ashford, Eastford, Pomfret & Mansfield, Connecticut
3,470 Acres

February, 2017

Map Scale: 1 : 60,000

0 0.5 1 2 Miles

N W E S



Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

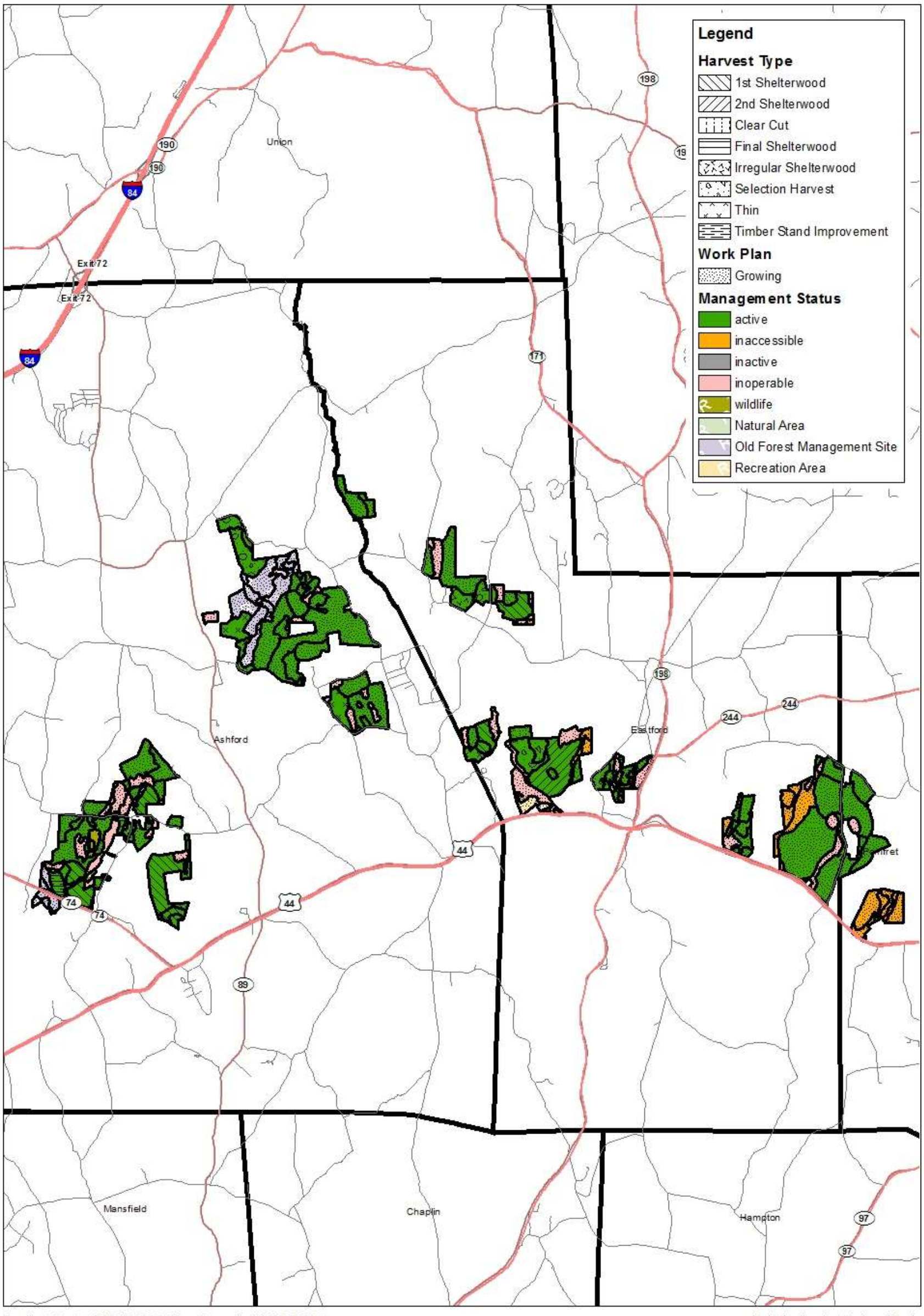
Projection: Lambert Conformal Conic

Map F - Work Plan Natchaug State Forest
Eastford, Westford, West Ashford & Bigelow Brook Blocks
Ashford, Eastford, Pomfret & Mansfield, Connecticut
3,470 Acres

February, 2017

Map Scale: 1: 60,000

0 0.5 1 2 Miles



Coordinate System: NAD 1983 State Plane Connecticut FIPS 0600 Feet

Projection: Lambert Conformal Conic

O. Appendix A. - Reference

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P. Appendix B. – Photo Documentation

Figure 1 – Bigelow Brook is the most significant fisheries resource in the northern blocks of Natchaug State Forest.

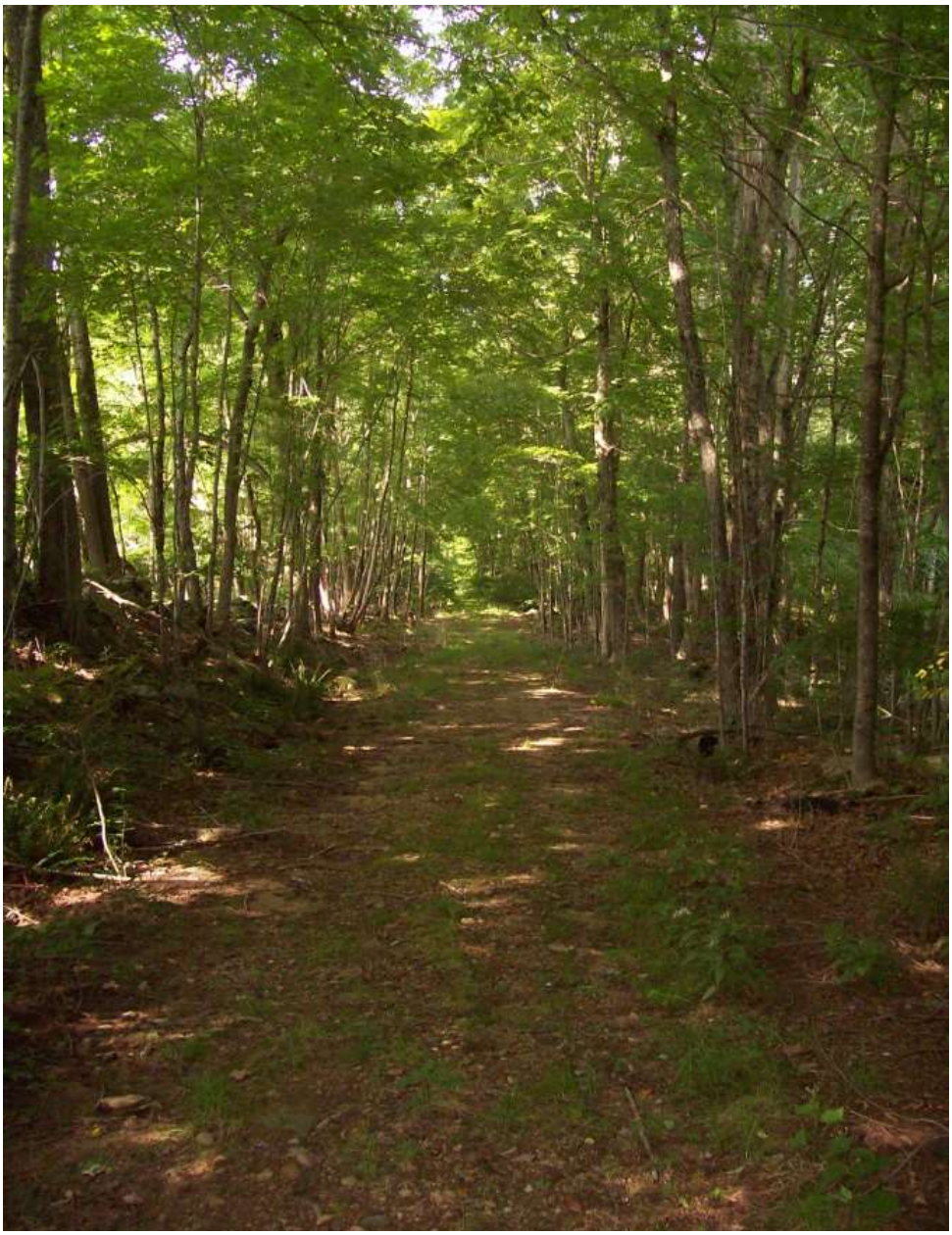

Figure 2 – A view of Hartford-Boston Turnpike as it crosses The Bigelow Brook Block. Stone bridge-footings can still be identified at river crossings.

Figure 3 – CT Blue-Blazed Trail as it parallels Bigelow Brook north of Rte. 44.

Figure 4 – CAES Blue-Ribbon Research Plot located in c1s6 of the West Ashford Block of Natchaug State Forest.

Figure 5 – Illegal dumping adjacent to a discontinued Town Road in the Westford Block of Natchaug State Forest.

Figure 6 – Developing early-successional shrub habitat in Bigelow-Brook Block. Notice two Autumn Olive shrubs invading the site.

Figure 7 – Japanese barberry colonizing a moist site forest understory directly adjacent to State Forest Land in Eastford, CT.

Q. Appendix C. - Definitions

This glossary contains a list of commonly used forestry terms.

- **acre** A unit of measure describing surface area. One acre contains 43,560 square feet. A football field (without the end zones) is 45,000 square feet -- slightly larger than an acre. The inside of a professional baseball diamond is about 1/4 of an acre.
- **advance regeneration** Young trees that have become established naturally in a forest before regeneration methods are applied. In other words, the regeneration is present in advance of any treatment.
- **age class** The trees in a stand that became established at, or about, the same time. The range of tree ages in a single age class is usually less than 20 percent of the expected age of that class.
- **basal area** The area of the cross section of a tree's stem at 4 1/2 feet above ground, or breast height, in square feet. Basal area of a forest stand is the sum of the basal areas of the individual trees in the stand. It is usually reported in square feet of BA per acre and is used as a measure of stand stocking, stand density, and stand volume.
- **board-foot volume** The amount of wood products expressed as the number of boards 1 foot wide by 1 foot long and 1 inch thick that are sawn from logs.
- **biological diversity** The variety and abundance of species, their genetic composition, and the communities, ecosystems, and landscapes in which they occur. Also, the variety of ecological structures and functions at any one of these levels.
- **Best Management Practices** Procedures and treatments that lessen soil erosion, sedimentation, stream warming, movement of nutrients, and visual quality during or following activities that alter the land.
- **buffer strip** An area of land that is left relatively undisturbed to lessen impacts of treatments next to it. Common examples include visual buffers used to screen the view from roads, and stream side buffers used to protect water quality.
- **canopy** The continuous cover of branches and foliage formed collectively by the crowns of trees.
- **Clearcutting** An even-aged silvicultural technique involving the removal of all stems in the stand. Strip cutting is a form of clearcutting.
- **crop tree** Any tree selected to provide a specific benefit such as mast, dens, veneer, or sawtimber. Crop trees are usually selected when they are young.
- **cutting cycle** The planned interval between treatments in forest stands.
- **damaging agent** Any one of various factors that injure trees. They include some insects, diseases, wildlife, abiotic factors, and human activities.
- **dbh** Diameter at breast height; the diameter of the trunk of a tree measured at 41/2 feet above ground level. It is measured on the uphill side of the tree.
- **den tree** A living tree that has holes in the trunk, or stem, from broken branches and decay, or hollow trunks; a cavity tree.
- **even-aged stand** A stand containing trees in the main canopy that are within 20 years of being the same age. Even-aged stands sometimes are designated by ageclass (10-year-old stand, 40-year-old stand) or broad size-class: seedling stand (most trees are <1 inch dbh); sapling stand (trees 1-4 inches dbh); poletimber stand (trees

5-10 inches dbh); and sawtimber stand (trees > 10 inches dbh).

- **even-aged system** A planned sequence of treatments designed to maintain and regenerate a stand with one age class.
- **forest condition** Generally, the current characteristics of forested land including but not limited to cover type, age arrangement, stand density, understory density, canopy density, and forest health.
- **forest cover type** A category of forests based on the kind of trees growing there, particularly the composition of tree species. Forest cover types are often referred to as forest types, cover types, stand types, or types.
- **group selection** An uneven-aged silvicultural technique involving the removal of trees in groups usually 1/10 to 2/3 acre in size, but sometimes up to 1 to 2 acres on large properties. Group selection can be applied in combination with single-tree selection between groups.
- **horizontal diversity** The degree of complexity of the arrangement of plant and animal communities, and other habitats across a large area of land.
- **inactive forest –** Management category designated for forests on marginal growing sites often with dense mountain laurel in the understory. May be activated if beneficial to biodiversity.
- **interior species** Species found only or primarily away from the perimeter of a landscape element. Species commonly requiring or associated with interior habitat conditions.
- **intermediate cuttings** Silvicultural cuttings applied in the culture of even-aged stands and are normally noncommercial (no products sold) or commercial thinnings (timber sold), designed to favor certain species, sizes, and qualities of trees by removal of competitors. Thinnings designed to grown quality timber commonly maintain a closed canopy; however, low-density thinning (50-70% residual crown cover) can be used to hasten diameter growth and stimulate understory development for wildlife purposes. At rotation age, the stand in considered to be mature and a regeneration cutting is applied to produce a new stand.
- **intermediate treatment** Any treatment or "tending" designed to enhance growth, quality, vigor, and composition of the stand after seedlings are established and before mature trees are regenerated. For example, thinning is an intermediate treatment.
- **mast tree** A tree that produces nutlike fruits such as acorns, beechnuts, hickory nuts, seeds of certain pines, cherries, apples, samaras. Hard mast includes acorns, beechnuts, and hickory nuts. Soft mast includes cherries, apples, and samaras (on maple and ash trees).
- **matrix** The matrix is the dominant landscape element on a landscape in which smaller differentiated elements (patches) are embedded. It is commonly highly connected throughout the landscape.
- **native plant** A species that naturally occurs in a given location where its requirement for light, warmth, moisture, shelter, and nutrients are met.
- **non-commercial treatment** Any activity that does not produce at least enough value to cover the direct costs of that treatments.

- **overtopped** A condition or position where a tree's crown is completely covered by the crowns of one or more of its neighboring trees. An overtopped tree's crown is entirely below the general level of the canopy and does not receive any direct sunlight either from above or from the sides.
- **patch** A patch is a relatively homogeneous area that differs in some way from its surroundings (e.g., woodlot in a corn field, conifer plantation in a mixed-deciduous forest).
- **plantation** A forest stand in which most trees are planted or established from seed sown by people. Typically, planted trees are in rows, with equal spacing between each tree in a row and between rows.
- **pole** A tree, usually young, that is larger than 4 inches dbh and smaller than 8 to 11 inches dbh.
- **prescribed burn** The application of fire in forested or other areas, usually under specific conditions of weather and fuel moisture, to control vegetation for silvicultural purposes or to reduce hazards.
- **regeneration** The seedlings and/or saplings in a new forest stand or age class. Natural regeneration originated from seeds, sprouts, or root suckers.
- **Regeneration method** A cutting method by which a new age class is created. These methods include clearcutting, seed tree, shelterwood, single-tree selection, and group selection; also called reproduction method.
- **Regeneration cuttings** Silvicultural cuttings designed to naturally regenerate the stand by providing for seedling (or vegetative stems) establishment or development, or both. Two even-aged techniques; clearcutting and shelterwood, and two unevenaged techniques; single-tree selection and group selection.
- **rotation** The planned interval of time between treatments that regenerate a stand.
- **runoff** Surface streamflow leaving a watershed. Sources of runoff are precipitation falling in the channel, overland flow (rare in forested areas), and subsurface water exiting from soils and bedrock. In this Guide, runoff is synonymous with streamflow.
- **sapling** A tree, usually young, that is larger than a seedling but smaller than a polesized tree. Size varies by region, but a sapling is usually taller than 6 feet and between 1 and 4 inches in dbh..
- **sawtimber** Trees greater than 11” in diameter
- **sedimentation** The accumulation of organic and mineral soil particles and rocks in streams and water bodies due to erosion. Sedimentation often accompanies flooding. The application of Best Management Practices will usually protect against sedimentation during and after treatments.
- **seed tree** A tree that produces seed. Seed trees are usually mature and high in quality.
- **seedling** A tree grown from a seed. Usually the term is restricted to trees smaller than saplings, or less than 6 feet tall or smaller than 1 inch dbh.
- **shade intolerance** The relative inability of a plant to become established and grow in the shade.
- **shade tolerance** The relative capacity of a plant to become established and grow in the shade.

- **shelterwood** An even-aged silvicultural technique involving the removal of the understory and lower crown canopy trees to allow the new stand to regenerate under shade. Subsequent removal of the overstory in one or several cuts.
- **silvicultural system** A planned process whereby a stand is tended, and reestablished. The system's name is based on the number of age classes (for example even-aged or two-aged), and/or the regeneration method used (for example, shelterwood, crop-tree, or selection).
- **silvicultural treatment** A process or action that can be applied in a controlled manor according to the requirements of a prescription or plan to a forest community to improve real or potential benefits.
- **silviculture** The art, science, and practice of establishing, tending, and reproducing forest stands with desired characteristics.
- **single-tree selection** An uneven-aged silvicultural technique involving the removal of trees singly or in groups of 2 or 3, which maintains a continuous canopy and an uneven-aged or uneven-sized mixture.
- **site** The combination of biotic, climatic, topographic, and soil conditions of an area; the environment at a location.
- **snag** A standing dead tree without branches, or the standing portion of a broken-off tree. Snags may provide feeding and/or nesting sites for wildlife.
- **softwoods** A term describing both the wood and the trees themselves that in most cases have needles or scale-like leaves (the conifers); gymnosperms.
- **species composition** The collection of plant species found in an area. Composition is expressed as a cover type, or a percentage of either the total number, the density, or volume of all species in that area.
- **stand** An area of trees of a certain species composition (cover type), age class or size class distribution and condition (quality, vigor, risk), usually growing on a fairly homogeneous site. The trees are sufficiently uniform in spacing, condition, age arrangement and/or forest type to be distinguished from neighboring stands. The conditions of the site are relatively uniform, including soil properties, water drainage, slope, exposure to weather, and productivity. Stands of 5 acres and larger commonly are recognized, though minimum stand size depends upon size of ownership and intensity of management.
- **stand composition** The collection of plants, particularly trees, that are found in a stand.
- **stand condition** The number, size, species, quality, and vigor of trees in a forest stand.
- **stand density** A quantitative measure of the proportion of area in a stand actually occupied by trees. This is an absolute measure rather than a relative measure, or percentage.
- **stand structure** The arrangement of trees of different sizes and ages in a stand.
- **succession** A gradual and continuous replacement of one kind of plant and animal community by a more complex community. The environment is modified by the life activities of the plants and animals present thereby making it unfavorable for themselves. They are gradually replaced by a different group of plants and animals

better adapted to the new environment.

- **thinning** The removal of some trees to improve and enhance the vigor and growth of other trees. Thinning enhances forest health and allows you to recover any excess of potential mortality.
- **understory** The small trees, shrubs, and other vegetation growing beneath the canopy of forest trees and above the herbaceous plants on the forest floor.
- **uneven-aged stand** A stand with trees in three or more distinct age classes, either intermixed or in small groups, growing on a uniform site; a stand containing trees of several 20-year age-classes. These stands generally contain trees of many sizes (seedling through sawtimber) due to the range in age as well as differences in growth rate among species.
- **vertical diversity** The extent to which plants are layered within an area. The degree of layering is determined by three factors: 1. the arrangement of different growth forms (trees, shrubs, vines, herbs, mosses and lichens); 2. the distribution of different tree and shrub species having different heights and crown characteristics; and 3. the number of trees of different ages.

R. Appendix D. Staff Project Review

To be reviewed by: Assistant Commissioner ( ) Parks & Rec. ( ) Planning & Development ( ) Property Management ( ) Division Services ( ) Law Enforcement ( ) Wildlife ( )

DISTRICT 1	DISTRICT 2
Discipline: Agency Support Services To all, The plan looks fine to me. I cannot commit to the requested assistance at this time. Please check back with me closer to the start date. Thanks Eric Ott Initials: Date:	Discipline: Agency Support Services Good morning Dan. I have reviewed the Natchaug SF 10 year plan and my comments (mostly from the road maintenance perspective) are listed below. Existing forest roads are maintained by Parks **and** E&FSS (Division of Engineering and Field Support Service) staff. In the road maintenance section it should be stated that the existing culverts should be cleaned out and inspected **regularly**. When the culvert are clogged the drainage backs up, floods and deteriorates the road. There are currently some culverts that are collapsed and some culverts that are completely silted in. It is likely at this point some of the existing drainage needs to be re-established. The leaves should be blown off the edges of the road (spring and fall) so "less" of them end up in the drainage ditches. When tree work is done on the edges of the road or when weather takes down trees …. trees, branches and brush should be moved back into the forest, away from the edges of the roads and drainage.

	E&FSS typically grades these roads on an annual basis. Certain sections should be prioritized and project(s) developed to add gravel. E&FSS also assists with the mowing of the two fields just north of Rt 44 – to control the establishment of woody plants. Please contact me if you have any questions. Thank you for the opportunity to review this plan. Thanks –Deb Initials: Date:
Discipline: Parks Looks good to me no problems , Scott Initials: Date:	Discipline: Discipline: Park and Forest Supervisor The Plan looks very good Dan, no comments Initials: Matt Quinn Date:10/10/17
Discipline: CFPA Initials: Date:	Discipline: CFPA Hi Dan, Sorry it has taken so long to review the Plan. It seems like there have been so many recently—you must be busy!! I have some minor comments: - Our trail volunteers are called “CFPA Trail Managers”. Not a big thing… -The Nipmuck Marathon is run through these blocks of the Forest. I also don’t know if that is worth noting/ including. - I support the language you use for the ATV abuse. I wish there was more that could be done on this front in general.

	- The official name of the trail system is "Blue-Blazed Hiking Trail System". Thanks for the opportunity to review…and sorry again for the delay. Clare Clare Cain, Trails Stewardship Director Connecticut Forest & Park Association Initials: Date:
Discipline: Wildlife Initials: Date:	Discipline: Wildlife Hi Dan, I am not sure where things are at at this point with the Natchaug North plan, but I want to go over some comments received from Shannon Kearney to see if they can be addressed. I am hoping the final plan has not yet been sent to Hartford for signature. I have a meeting in Groton today at 11, but hope to be back in the office by 3. Tomorrow I have a meeting in East Hartford from 10-12, and then plan to be in the office in the afternoon. Hoping we can talk sometime during those two times or another day this week when you are free. Thanks, Ann Ann M. Kilpatrick District Wildlife Biologist

	Eastern District Headquarters Wildlife Division Initials: Date:

Connecticut Department of ENERGY & ENVIRONMENTAL PROTECTION

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January 13, 2017

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NDDB DETERMINATION NUMBER: 201614687

Project: 10-year management plan, Natchaug State Forest, Northern Blocks north of Rte 44 in Pomfret, Eastford, Ashford, and Mansfield, CT

I have reviewed Natural Diversity Data Base (NDDB) maps and files regarding this project. According to our records, there are State-listed species (RCSA Sec. 26-306) documented within the proposed project area.

General recommendations for wildlife and plant species are grouped below by Taxa, Relevant Contact, and Habitat Group. Research recommendations are given for your information and potential collaboration with partners. An excel table is available with this information if that format would assist with your planning. Please contact me if you would like information in this form.

The species that have been documented in this area are mostly mature forest species that benefit from unfragmented forest blocks, and the forest blocks should continue to be managed with this in mind. There may specific vegetation and structural components from which each of the species may benefit and they are explained below. Additionally, in areas around the West Ashford block, in general avoid pesticide use to protect sensitive invertebrate species and food supplies for aerial insectivores.

Birds

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Mature Forest Cerulean warbler- *Setophaga cerulean:* SC

Cerulean warblers are found in mature hardwood forests with well-spaced, large diameter trees and open understory, such as wet bottomlands and dry slopes. They are insectivores, foraging in and

around deciduous trees. Breeding habitat is thought to include canopy gaps and internal forest edges (trails and narrow roads, right-of-ways, small harvest edges), although there is some question as to whether or not they nest strictly in continuous unbroken forest, in association with canopy gaps in otherwise continuous forest, or whether they use closed canopy forest, canopy gaps and edges as available.

This species is in decline due to habitat loss, and maintaining older, structurally diverse forest may be important to this species. In actively managed forests, small scale harvests (10-25 acres) can mimic natural disturbances and enhance habitat for this species. Shelterwood cuts, group selection cuts (uneven-aged) or modified uneven-aged regeneration are the preferred harvest types. Large white oaks, hickories and sugar maples should be retained and the residual basal area should be no less than 40 square feet per acre ((40-90 square feet per acre is optimal).

When conducting forest management to avoid impact on breeding individuals: Do not begin to cut, clear, or remove trees between May 1-July 30.

Research Recommendation: Monitoring before and after prescribed cutting recommendations

Northern saw-whet owl- *Aegolius acadicus:* SC

Winter roost sites for this species are patches of conifers located in close proximity to open areas, such as marshes or agricultural fields, that they forage in. Incorporating silvicultural practices that maintain high densities of trees with nesting cavities of minimum diameters of 30.5 cm may benefit this species. Conserving patches of conifers adjacent to open fields and marshes may benefit the needs of this bird during the harsh winter months.

Sharp-shinned hawk- *Accipiter striatus:* E

The Sharp-shinned Hawk's preferred nesting habitat is in dense coniferous stands in large tracts of undisturbed forest. In particular, young, dense, even-aged conifer stands with overarching canopies. Habitat managment that will create young white pine, hemlock or pine/oak forests would benefit this species.

Research Recommendation: Documentation of nesting in forests specifically managed for sharpshinned hawk

Wood Thrush- *Hylocichla mustelina:* GCN- Most Important

Interior forest areas throughout these forest blocks have the potential to support wood thrush populations. Management that includes retaining mid-story cover (0-5'layer) for nesting will benefit this species. Maintain or create well-stocked uneven-aged, sawtimber hardwood stands with >80% canopy cover and moist leave litter. When performing cuts, avoid disturbance and dessication of leaf litter and soil conditions.

Invertebrates

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Barrens

Frosted Elfin- Callophrys irus: T

Habitat: open habitats on sandy or gravelly soils

Larval host plant: wild blue lupine (Lupinus perennis) and wild indigo (Baptisia tinctoria). Encourage inventory in appropriate habitats. Populations of frosted elfin (Callophrys irus) are declining nationally. This butterfly is associated with the plant species wild blue lupine (Lupinus perennis) and wild indigo (Baptisia tinctoria). Activities that impact the host plants will negatively impact this butterfly. Creation of areas with open sandy or gravelly habitat in this area will benefit this species.

Open woodlands, shrub swamps with highbush blueberry Henry's Elfin-*Callophrys henrici:* SC

Encourage inventory in appropriate habitats. Habitat: Open woodlands, shrub swamps with highbush blueberry. Host plants include introduced buckthorns (Rhamnus spp.), holly (Ilex spp.), particularly the American holly (I. opaca), and redbud (Cercis canadensis). Winterberry (Ilex verticillata) is also a suspected host plant. Henry's elfin butterfly has only been found in recent years in a few locations in Connecticut though its host plant (Frangula sp.) is increasing rapidly. Any managment that increases the growing conditions for these host plants will benefit this species.

Rivers

Brook Floater-Alasmidonta varicose: E

Habitat: Small to medium-sized rivers, usually in gravel and cobble substrates in swift current. Host fish include longnose dace (Rhinichthys cataractae), blacknose dace (Rhinichthys atratulus), slimy sculpin

(Cottus cognatus), golden shiner (Notemigonus crysoleucas), pumpkinseed sunfish (Lepomis gibbosus), yellow perch (Perca flavescens), and tessellated darter (Etheostoma olmstedi). DEEP Wildlife Division considers all streams with populations of brook floaters to be conservation priorities.

- Minimizing permanent habitat conversion and development as well as non-point source pollution in the watershed may protect brook floater populations.
- If any waterbodies, like a brook, will actually be manipulated, the Wildlife Division recommends:

1. That no vegetation be removed from the stream banks adjacent to the mussel habitat since land clearing activities will affect the mussels.
2. There can be no erosion or siltation discharged into the brook that can bury and kill these mussels.
3. There can be no polluted runoff such as chemicals or fertilizer discharged into the brook, resulting from this project that can contaminate the water.

Mammals

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Mature Forest, Wetlands Little brown bat-*Myotis lucifugus:* E

Protection and management of old stands of forest may be the best way to encourage little brown bats to use an area. Forestry management practices that reduce clutter, such as thinning, within the forest and increase edge habitat can encourage little brown bats to forage and roost. Linear corridors are important for bat commuting, and forests may be managed such that suitable foraging habitat is connected by corridors; this may include managing edge habitat along roads, logging trails and riparian corridors. Special consideration should be given to preserving natural roosting resources (safety permitting) including snags, trees with cavities, cracks or crevices, trees with exfoliating bark (e.g. shagbark hickory), coniferous trees (e.g. tamarack, hemlock, white pine). Minimize erosion and maintaining clean and open water resources free of siltation.

Wetlands Southern bog lemming-*Synaptomys cooperi:* SC

Encourage inventory to locate current populations. Southern bog lemmings are closely associated with wetlands such as bogs, fens, hardwood swamps with hummocks, and wet meadows. These lemmings live, tunnel and burrow deep in decomposing leaf mold. They feed on leaves, stems, and seeds of grasses and sedges, fungi, moss, bark, ground pine and occasionally insects. If standard protocols for protection of wetlands are followed and maintained during the course of the project, potential impacts to these species will be reduced. Avoid impacts to the habitat and to food sources.

Research Recommendation: Inventory and Documentation of occurrence

Plants

Natural community

Acidic Atlantic white cedar basin swamp- Natural community

Existing Atlantic white cedar should be preserved, while selectively harvesting (or girdling) competing hardwoods to think the canopy and increase light availablity at ground level.

Amphibians

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Mature Forest Northern spring salamander-*Gyrinophilus porphyriticus:* T

This species requires cold, clean, well-oxygenated springs, brooks or seepage areas. Their favored habitat is heavily forested steep rocky ravines. Any activities that decreased the forest canopy would increase the water temperature, and this species definitely requires cold water. If there are drainages in this area that are well-oxygenated and heavily forested, they may be suitable habitat for this species and reduced canopy should be avoided.

Turtles

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Rivers with adjacent uplands

Wood turtle-Glyptemys insculpta: SC

Individuals of this species are riverine and riparian obligates, overwintering and mating in clear, cold, primarily sand-gravel and rock bottomed streams and foraging in riparian zones, fields and upland forests during the late spring and summer. They hibernate in the banks of the river in submerged tree roots. Their summer habitat focuses within 90m (300ft of rivers) and they regularly travel 300m (0.2 mile) from rivers during this time. During summer they seek out early successional habitat: pastures, old fields, woodlands, powerline cuts and railroad beds bordering or adjacent to streams and rivers. Their habitat in Connecticut is already severely threatened by fragmentation of riverine, instream, riparian, and upland habitats, but is exacerbated by heavy adult mortality from machinery, cars, and collection. This is compounded by the species late maturity, low reproductive potential, and high nest and hatchling depredation rates.

- Instream work should not occur during species dormant period (Nov 1- April 1) • Conduct upland work during the species dormant period (Nov 1- April 1).
- If upland forestry operations must occur outside of dormant period:
    - The work crew must be made aware of the species description and possible presence
    - The immediate area to be harvested each day should be searched for turtles before starting work using mechanical equipment o Any turtles found during the

harvest should be moved out of the way. This animal is protected by law and should never be taken off site.

- Work conducted during early morning and evening hours should occur with special care not to harm basking individuals.

- Discontinue logging roads after operation are complete so they do not provide new access points to sensitive stream habitat or provide increased vehicle or recreational traffic in general area.
- Forestry cuts may provide habitat enhancement opportunity through creation and maintenance of early successional habitat for this species.

Research Recommendation: Population assessment for viability

Woodlands

Eastern Box Turtle-Terrapene carolina carolina: SC

In Connecticut, this terrestrial turtle inhabits a variety of habitats, including woodlands, field edges, thickets, marshes, bogs, and stream banks. Typically, however, box turtles are found in well-drained forest bottomlands and a matrix of open deciduous forests, early successional habitat, fields, gravel pits, and or powerlines.

This species is very sensitive to adult mortality because of late maturity (10 years old) and long life span (50-100years). Maintaining forested habitat is essential for the conservation of Eastern Box Turtles. The impacts of timber harvesting are recognized as having significantly fewer lasting effects as compared to other permanent changes in land use, such as residential and commercial development. However, certain precautions should be taken during timber harvesting in order to maintain the long-term viability of Eastern Box Turtle populations within forested areas. The primary concern about forestry practices within Eastern Box Turtle habitat is the direct mortality of adults due to crushing by motorized vehicles during harvesting and scarification. This could occur at any time during the Eastern Box Turtle activity season since they are primarily terrestrial and it could even occur during the winter since the turtles overwinter in upland forests, usually within a few inches of the soil surface. Habitat alterations that are of concern include suppression of plant growth from wood chips since these turtles forage on the forest floor. Disturbance of fallen trees and removal of snags that serve as future sources of large woody debris are also concerns, because these turtles will overwinter beneath fallen trees, often in the pit created by the root mound. Also, fallen trees are used for cover during the active season.

If you conduct harvests when the species is active (April1-Nov 1) it will allow the animal to move out of harm's way and minimize mortality to hibernating individuals. Additionally, the following recommendations will further minimize potential impacts:

- The logging crew be made aware of the species description and possible presence
- The immediate area to be harvested each day should be searched for turtles before starting work
- Any turtles found during the harvest should be moved out of the way, just outside of the work area. This animal is protected by law and should never be taken off site.
- Work conducted during the early morning and evening hours should occur with special care not to harm basking or foraging individuals

Where feasible, maintain these microhabitat characteristics for this species:

- If wood is chipped, chips shall be removed from the site or left in piles in an area disturbed by other harvest activities, preferably at the landing.
- Where feasible, leave two snags/acre to provide source of large woody debris for future overwintering sites and cooler microhabitat refuges.
- Where feasible, avoid disturbing fallen logs or snags that will serve as future sources of woody debris.
- Avoid disturbing pits from tipped root mounds which can serve as overwintering locations.

General recommendations for forest management that benefit this species include:

- Discontinue logging roads after operation are complete so they do not provide new access points to sensitive stream habitat or provide increased vehicle or recreational traffic in general area.
- On sites where options exist, favor site preparation techniques that minimize soil disturbance and compaction.
- Where feasible, seek to minimize impacts to the forest floor.
- Give special consideration to unique habitat features within the forest such as ephemeral wetlands, springs, seepages, and rock outcrops.
- Maintain a patchwork of harvest practices in this area to meet the different life stages of this species. Including both mature forest and forest openings. If the only available sun-exposed ground is along roadsides, road mortality may occur as females seek nesting grounds and individuals bask.

Research Recommendation: Encourage inventory to locate hibernacula for avoidance. These areas could then be flagged for avoidance during winter harvest operations.

Below is a table summarizing the occurrence records for above mentioned species in your area. Our occurrence information is not a census and the species actual occurrence may not be limited to these areas. You should consider management in appropriate habitat types outside of these occurrences for these species.

Block	Species	Latin	Rank	Location
Eastford	Acidic Atlantic white cedar basin swamp		Natural community	[redacted]
	Henry's Elphin	*Callophrys henrici*	SC	[redacted]
West Ashford	Frosted Elphin	*Callophrys irus*	T	[redacted]
West Ashford	Cerulean warbler	*Setophaga cerulea*	SC	[redacted]
Westford	Little brown bat	*Myotis lucifugus*	E	[redacted]
	Brook Floater	*Alasmidonta varicosa*	E	[redacted]
	Wood turtle	*Glyptemys insculpta*	SC	[redacted]
	Southern bog lemming	*Synaptomys cooperi*	SC	[redacted]
	Acidic Atlantic white cedar basin swamp		Natural community	[redacted]
Westford **All**	Eastern Box Turtle	*Terrapene carolina carolina*	SC	[redacted]

	Northern saw-whet owl	*Aegolius acadicus*	SC	[redacted]
All	Sharpshinned hawk	*Accipiter striatus*	E	[redacted]
All	Wood Thrush	*Hylocichla mustelina*	GCN- Most Important	[redacted]
	Northern spring salamander	*Gyrinophilus porphyriticus*	T	[redacted]

This is determination is valid for two years. Please submit an updated NDDB Request for Review if the scope of the proposed work changes or if work has not begun by **January 13, 2019.**

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Bureau of Natural Resources and cooperating units of DEEP, independent conservation groups, and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the NDDB should not be substituted for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated in the NDDB as it becomes available.

Please contact me if you have any questions (shannon.kearney@ct.gov). Thank you for consulting with the Natural Diversity Data Base and continuing to work with us to protect State-listed species.

Sincerely,

/s/ Shannon B. Kearney

Wildlife Biologist

Cc: Ann Kilpatrick

Nelson DeBarros

Laura Saucier

Brian Hess

Jenny Dickson

S. Appendix E. Public Comment

*Hi Daniel, Thank you for an excellent management plan. The Ashford Conservation Commission reviewed the plan and was impressed with the scope and detail. The inclusion of working in collaboration with Yale University and Land Trust organizations to eradicate invasive species is noteworthy. Also planning to prioritize limiting access to trails to decrease the impact of illegal off-road activity and ATV use is much in line with issues of concern for our Commission. In Ashford on the 72+acre Langhammer Property,the largest town-owned open space property,ATV activity has been a concern.

We hope that you will have the personnel to implement this plan. We are aware of the question of the temporary foresters being eliminated and supported changing that decision both individually and as a member of the Windham County Conservation Consortium (WCCC).

Our Ashford Plan of Conservation and Development supports the Natchaug State Forest Management Plan. We see this plan as a great model for forest management. We look forward to continued communication with DEEP Division of Forestry in the future. Ashford has an abundance of forest land including Yale Forest and several Joshua's trust properties in addition to the Langhammer Open space Property mentioned above. We will benefit immensely from the goals outlined in this Plan.

One suggestion is to notify all area land use commissions of the existence of this Forest Management Plan when the draft is completed to help coordinate effective use of this document.

Thank you.

Sincerely,
Loretta Wrobel, chair
Ashford Conservation Commission

*This comment was received in 2013 during circulation of an initial draft.

**The plan was circulated to the Town‘s again in 2017. No additional comments were received by DEEP.

T. Appendix F. Distribution

Town Conservation Commissions
DEEP District Staff
DEEP Hartford Forestry