STATE OF CONNECTICUT

DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION

Bureau of Natural Resources

Division of Forestry

FOREST MANAGEMENT PLAN
2012 through 2022

James L. Goodwin State Forest

Approvals:

8-1-12

Christopher Martin, Director Date
Division of Forestry

8/1/12

WilliamHyatt, Bureau Chief Date
Bureau of Natural Resources

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A. History

In 1913, James Lippincott Goodwin, a recent graduate of the Yale School of Forestry, purchased 28-acres of abandoned agricultural land in the town of Hampton, Connecticut. This initial acquisition planted the seedling that eventually grew into Pine Acres Farm, and subsequently, the James L. Goodwin State Forest.

It was James Goodwin's life ambition to own and manage a forest according to the best management techniques of the time. Over subsequent years additional acreage was acquired. Abandoned fields were planted to conifers, and existing hardwood stands were thinned. Resource protection increased as new roads were constructed, existing roads were improved with gravel, and fire ponds were established. Early resource management on the farm ranged from timber and wildlife improvements, to Christmas trees, a dairy farm, orchards, and other agricultural commodities to support the ongoing war effort, and keep farm workers busy during the summer months. The early tending of softwood plantations yielded posts, poles, pilings and Christmas trees. Hardwood stands were judiciously thinned to produce thousands of board-feet of lumber and many cords of firewood.

The Hurricane of 1938 had a drastic impact on Pine Acres Farm. For the previous 25 years Mr. Goodwin had gone to considerable effort, and great personal expense, to establish forest plantations and improve the composition of hardwood stands on Pine Acres. Much of this work was undermined in a matter of one fall afternoon. Mr. Goodwin later described 50 acres of older red and white pine blow-down as "a tangled mass of trunks and branches." Forest records show it took the young men of the Civilian Conservation Corps 4,208 hours to clear six miles of forest road. This hurricane salvage eventually yielded over 500,000 board-feet of lumber, nearly 3 miles of posts and roughly 1300 cords of firewood. It took four years to partially salvage the wind-thrown timber on Pine Acres before rot rendered the rest unusable. This volume was only a small fraction of the total hurricane impact to Pine Acres Farm. Wind-thrown evidence of the 1938 hurricane can still be identified in some forest stands to this day.

James L. Goodwin is widely considered to be the father of the Connecticut Tree Farm program. Goodwin was the first certified tree farmer in the state as he managed the Great Pond Forest (Tree Farm #1) and Pine Acres Farm (Tree Farm #13). (Note: A thorough history of stewardship activities carried out on Pine Acres Farm from 1914-1951 may be obtained by reading A History of Pine Acres Farm by James L. Goodwin.)

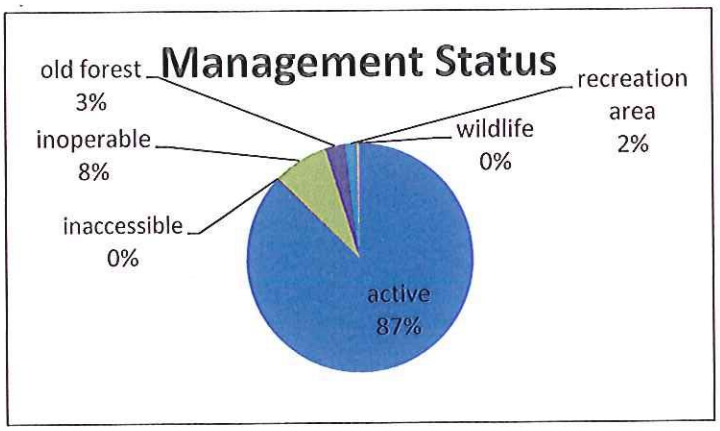
On September 4th, 1964 James L. Goodwin presented Pine Acres Farm to the people of Connecticut as the James L. Goodwin State Forest. The terms of this gift set aside the farmhouse and an additional 83 acres of forestland as the James L. Goodwin Conservation Center. The mission of the Center is to carry out his vision of sound forestry and conservation practices through educational programs. The initial 28-acre acquisition, purchased in 1913, encompasses the land surrounding the James L. Goodwin Conservation and Education Center. Up until 1993 the Center was under the direct oversight of the Division of Forestry; it is now part of the CT DEEP Division of State Parks and Public Outreach. The remaining 1,765 acres is under the primary management of the Division of Forestry. The Conservation Center land is managed by Connecticut Forest & Park Association (CFPA) in a manner intended to reflect sound private-forestland stewardship. Forest

conditions and management recommendations for these 83 acres are described in a separate plan. Forest management and habitat improvement activities carried out by the State of Connecticut between acquisition in 1964 and the present, are detailed later in the plan.

B. Acres and Access

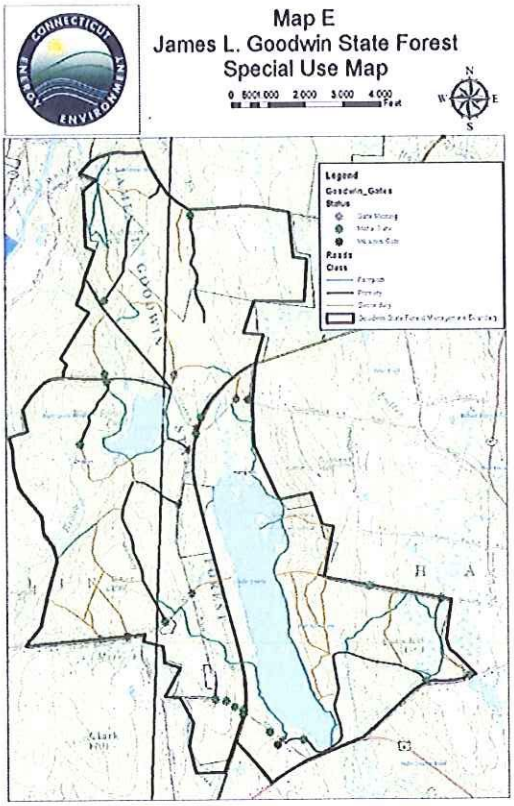
The James L. Goodwin State Forest is comprised of 1,765 contiguous acres in the towns of Hampton and Chaplin, in Windham County, CT. In order to better-facilitate management planning, 324-acres of Natchaug State Forest south of Station / Morey Rd, and east of Marcy Rd is included in this management plan. This brings the total acreage under the scope of this management plan to 2,089 acres. The boundary between the James L. Goodwin State Forest and the Natchaug State Forest is largely an administrative distinction as the contiguous Natchaug acreage is managed as a component of Goodwin. Removing acreage attributed to ponds, wetlands, cultural centers and restricted management areas, the actively manageable acreage of the Forest is closer to 1,542 acres. All subsequent calculations are relative to this 'suitable timber-base' acreage.

For management purposes, the forest has been evaluated and categorized into groups affected by current physical conditions, policy, or management principles. The chart to the right illustrates the forest as it exists today. The category labeled Active is forestland that is actively managed for its resources. Old Forest is a contiguous block of land, interior to the forest that has been set aside to allow for the natural processes of stand development to occur without the influence of active forest management. Inoperable lands contain physical features such as steep slopes, excessively rocky terrain, or wetlands that prevent active management for resource protection or operator safety. Inaccessible areas are "landlocked" stands that cannot be accessed due to the deterioration of forest roads orinoperable conditions (i.e. wetlands).



Management Status by Acreage Table

Active	1542 acres
Inaccessible	2 acres
Inoperable	150 acres
Old Forestland	60 acres
Recreation	30 acres
Wildlife	0 acres



There are three separate 'road class' distinctions which make up the 20+ miles of passable roads in the Forest. Primary roads tend to be in relatively good condition; they have been improved with gravel, graded, crowned, ditched, and they are blocked with steel, vandal-proof gates. These roads typically provide access for fire protection, homeowner firewood sales, and commercial forest product harvests.

Secondary roads may need improvements and typically cannot support access for log, or fire trucks. There may be encroaching brush, or areas of poor drainage, but these roads can be utilized in the skidding of forest products during a timber sale, or otherwise improved to provide access for multi-axel trucks. Lastly, trails are typically considered natural materials footpaths. These paths are open to foot traffic, horses and mountain bikes. Trail upgrades have been limited to boardwalks or bridges, and generally contain no gravel. Hauling or skidding forest products is prohibited on these footpaths. Any necessary trail crossings for the purpose of forest management will be established at right (90 degree) angles. These crossings will be limited. Potential gouging of trail surface will be mitigated through pre-harvest establishment of bridges or crossing structures. Trails will be temporarily closed to pedestrian traffic during timber harvesting activities. These stipulations are set forth in the Division of Forestry, State Lands Management – Standard Operating Procedures (SOP).

Deed restrictions established by Mr. Goodwin prior to gifting the property to the state currently prohibit public hunting on the 1,765 acres of the Forest. Additionally, forest management actions on the 83 acres deeded as The Goodwin Conservation Center are subject to planning from the Goodwin Conservation Center director. For management planning purposes the Conservation Center should be considered a cultural center. (See page 6).

Forest Accessibility by Road & Trail Type

Forest Road Type	Distance (Miles)
Primary Gravel Access Road	7.63
Secondary Access Road	6.07
Natural Materials Trails	7.15
Total	**20.86**

Acres & Access Table

Total Management Unit Acres	2,089 acres
Goodwin State Forest Acreage	1,765 acres
Total Administrative Operational Restrictions	547 acres
Fields (5)	59 acres
Pond & Wetland Acreage	396 acres (246 Ponds, 150 Wetlands)
Actively Managed Acreage	1,542 acres
Acres of Stands Accessible from DOT roads	1,922 acres
Acres of Stands Accessible from Forest roads	167 acres
Miles of Public Vehicle Access roads	0 mi
Miles of Gated Access Roads & Number of Gates	(10.3 mi, 21 Gates)
Miles of Blocked Forest Roads	0 mi

C. Special Use Areas

There are numerous notable Special Use Areas which receive heavy seasonal use by sportsmen, recreationalists, researchers and wildlife enthusiasts;

- Lakes and Ponds: All ponds are a water source for DEEP Forest Fire Control.
  - Pine Acres Pond – The primary use of the 196-acre pond is wildlife habitat. The pond represents a habitat resource for migratory waterfowl. Pine Acres Pond has a watershed of 1,055 acres of primarily forestland. The Pond also supports populations of largemouth bass, yellow perch, brown bullhead and sunfish. Pine Acres is mainly used for wildlife observation and study. In July 2011 a new migratory bird observation platform was constructed on Governors' Island. The platform was constructed by "The Friends of Goodwin State Forest." Locally grown and processed wood products were provided by the Division of Forestry. Boating access for kayaks and canoes is available in the southwest corner of the lake. There is a second observation deck adjacent to the boat launch on the Goodwin Conservation Center which was constructed in 2011 through a collaborative effort between the Wildlife Division and Agency Support Services.
  - Black Spruce Marsh – Migratory waterfowl habitat is the primary use of Black Spruce Marsh. The 30-acre marsh was constructed with Wildlife funding and managed for wetland habitat. Coordination with the Wildlife and Parks Divisions is required to reduce the water level of this pond. Limiting the depth of Black Spruce Marsh is a means of establishing more herbaceous emergent vegetation to support breeding migratory waterfowl. Controlling Beaver populations is essential to accomplishing wildlife goals for this area. The marsh additionally supports brown bullhead and golden shiner.
  - Brown Hill Marsh – This 19-acre marsh is primarily oriented towards wildlife habitat and associated research. Coordination with the Wildlife and Parks Divisions is required to reduce the water level of this marsh. Limiting the depth of Brown Hill Pond should be evaluated as a means of establishing more herbaceous emergent vegetation to attract migratory waterfowl. The Wildlife Division will monitor for Beaver activity which would limit our ability to meet these goals. The pond also supports fishable populations of brown bullhead and golden shiner.

CT DEEP Fishing Information can be found here.
Boating Information is accessible here.

- Streams and Rivers
  - The U.S. Geological Survey 7.5 minute topographic map for the Hampton, Connecticut Quadrangle shows six perennial drainages occurring on the Goodwin State Forest (see Appendix 'C')

  - Two of the drainages are inputs to the Pine Acres Pond, one from the north and the other from the east. One represents the output from Pine Acres Pond to Cedar Swamp Brook, a tributary of the Little River located just south of Rte. 6. Two drainages are outputs associated with Black Spruce Pond one being the pond outlet which flows into Turner Brook, exiting the forest to the west. The other, while not a direct output of the pond, is located within three hundred feet of the pond at approximately the same surface elevation and is most likely hydrologically linked by groundwater level. Whitman Brook is the sixth perennial drainage. This brook originates as red maple lowland in Compartment 32 Stand 3. Flowing to the north and west this drainage crosses the Natchaug Blue Trail supporting a series of minor cascades as it exits the forest and crosses Marcy Rd. before entering the Natchaug River.

  - It is the policy of the Inland Fisheries Division (IFD) that riparian corridors be 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 watercourses. This policy and supportive documentation can be viewed on the DEEP website at: http://www.ct.gov/dep/lib/dep/fishing/restoration/riparianpolicy.pdf and http://www.ct.gov/dep/lib/dep/fishing/restoration/riparianpositionstatement.pdf.

  - The Division of Forestry will utilize variable-width buffer strips whenever possible, and 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 silviculture planned, 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 Division of Forestry will, where appropriate, utilize seasonal harvest restrictions in sensitive areas containing steep slopes, wet, or highly erodible soils. Additionally, 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 DEEP Inland Fisheries Division 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 Fisheries Division to ensure fish passage needs.

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

- Cultural Sites
  - **James L. Goodwin Conservation Center** - The Goodwin State Forest supports, by deed, an 83 acre Conservation and Education Center which is operated by the Connecticut Forest & Park Association and CT DEEP Division of State Parks and Public Outreach. The programs carried out at the center and the management of the accompanying 83 acres are the responsibility of the Center's Director and professional forester. In season, the Center offers weekly educational outreach programs covering numerous topics from forest stewardship and tree identification, to mycology and mountain biking. These programs target a range of age groups including children and the elderly. More information can be uncovered by contacting The James L. Goodwin Conservation Center Director.
    - **Richard D. Haley Native Plant Wildlife Gardens** – The spacious grounds surrounding the Goodwin Conservation Center include 1.5 acres designated as the Richard D. Haley Native Plant Wildlife Gardens. In these well-maintained gardens visitors can see and learn about dozens of native trees, shrubs and perennials that offer food and cover value for a suite of wildlife species. This area is managed by 'Master Gardener' volunteers of 'The Friends of Goodwin State Forest'.
    - **Youth Group Camp Sites** - The Goodwin Conservation Center provides a campsite to youth groups such as scouts, home school groups, environmental clubs, and Envirothon teams. Eligible groups must meet specific requirements and complete an application to use the area. A Goodwin Youth Camping brochure details additional features of the site.
    - **Forest Stewardship Trail** – Recently established on the Goodwin Conservation Center land is a 2/3 mile-long forest stewardship trail. Indicated with a "Blue over Red" Blaze, this trail departs the Conservation Center from the northwest corner of the Richard D. Haley Native Wildlife Gardens and forms a loop which brings visitors through several managed forest areas. A brochure available in the garden gazebo explains the different types of forest stewardship activities visible from the trail. Numbered posts along the trail direct the visitor to corresponding text descriptions in the brochure.

  - **Governors' Island** – Governors' Island - Compartment 12 Stand 7 - represents a significant ecological and cultural resource to the people of Eastern Connecticut, and the users of the James L. Goodwin State Forest. This isolated island located in the north end of Pine Acres Pond has a diverse human and ecological history. In early colonial history this site was said to be one of the last Eastern Connecticut encampments of the Nipmuck Indians. Governors' Island received its name as it was later owned by Connecticut Governor John Cleveland, originally from Hampton. It is also recognized for its unique forest structure, and is regarded as a site exhibiting late-successional forest characteristics, structural characteristics under-represented on the Goodwin State Forest landscape.
    - **Wildlife Observation Deck** – During the summer of 2011 volunteers from 'The Friends of Goodwin State Forest' donated 328 hours of time in the design, planning and construction of a migratory bird observation deck. The deck is located on Governor's Island, Compartment 12, Stand 7, and makes a great stopping point for hikers.

- **Historic Sawmill Site** – In the fall of 1930 Mr. Goodwin installed a sawmill on Pine Acres Farm. Previously, all logs cut in forest operations on Pine Acres required a portable sawmill, or transportation to a custom mill 15 miles away. A small mill building was erected north of Potter Rd. just west of the present-day Air Line Trail. Goodwin operated a retail and wholesale sawmill here for 30 years.

- **Foundations** – There are numerous visible stone foundations located throughout the Forest. These foundations are often all the remaining evidence of historic farm sites and their associated outbuildings. These pieces of cultural evidence are valued components of this forest environment. Significant efforts will be taken to eliminate potential degradation of these features during forest operations. If a forest operation plan calls for the operation of heavy machinery in stands containing these cultural landmarks, the Division of Forestry will ensure their longevity by flagging foundation sites, establishing no-operation buffers, and monitoring equipment operation to ensure no impacts are made.

- **Charcoal Production** – A discussion of forest ecology in southern New England is incomplete without a mention of 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 for wood fiber. The men who cut wood and tended charcoal mounds were called Colliers. These individuals lived in huts in the forest for extended periods of time. They worked a small geographic area, tending up to three charcoal mounds. The circular remnants of these mounds can be readily identified in the forest today, often along with chimney structures, they are the only remaining evidence of this historic forest-use.

- **Christmas-Tree Plantation** – In its early history, Pine Acres Farm was quite a diversified operation. There was an active dairy component, livestock were raised, oats, rye, and grains were grown. Apple orchards were thriving. Goodwin also experimented with Christmas trees, planting 20,000 Norway spruce at 3'x3' spacing in 1921. Although the spacing proved too close for symmetrical growth, Goodwin continued with the production of Christmas trees. Trees from these plantations were also the first 'forest products' sold from Pine Acres Farm under Goodwin's oversight. The Christmas Tree plantation in Compartment 8, Stand 4 remained active as a demonstration area until 1997. The area comprised 14 acres and supported 75% white spruce, 15% douglas-fir, and 10% fraser fir, (per Sherwood R. Raymond). Deemed obsolete for the needs of the public, this area will continue to be periodically mowed by the Wildlife Division. Invasive plants will be controlled, and management priorities should favor allowing this area to revert to old-field, shrub habitat.

- **Orchard Hill** – In 1927 Mr. Goodwin purchased 185 acres located several miles north of Pine Acres Farm. He added to this acquisition in 1931 with the purchase of 143 additional acres. These parcels together formed the beginnings of the Orchard Hill Forest subdivision. Encompassing the northern boundary of Pine Acres Farm this tract initially supported a decrepit house and the foundation of a fallen barn. In 1932 Goodwin removed the house and constructed a stone fireplace, lean-to, and

picnic area. In subsequent years the open field portions of Orchard Hill were used for the production of apples, and other agriculture commodities. In 1936 Goodwin sold 18,000 Red Pine seedlings 4-6 feet high to The Bay State Nurseries of Framingham, Massachusetts. Evidence of the Winslow farm site can still be identified from the Blue-Trail near Orchard Hill.

- **Air Line Trail** – The current location of the Air Line Trail was once owned by the New York, New Haven, and Hartford Railroad Company. In 1924, sparks from a passing train ignited a forest fire which grew to 43 acres and burned in red & white pine plantations adjacent to the rail-bed. The following spring the damage was assessed and the land was prepared for re-planting. The railroad paid Mr. Goodwin $2,336 in damages incurred to the pine plantations. The railroad bed was renovated by the Connecticut National Guard in the 1990's. This corridor now falls under the jurisdiction of CT DEEP Division of Parks and Public Outreach and is managed for outdoor recreation uses including snowmobile traffic in the winter.

- **Historic Forest Roads** – Shortly after the acquisition of Pine Acres Farm in 1913 Mr. Goodwin began to improve the forest road system to facilitate access to remote stands and allow fire protection opportunities. In 1928 the farm purchased a stone crusher, steam boiler and engine from the Town of Tyringham, Massachusetts. Housed just west of the railroad, the machinery was used to convert old stone walls into crushed gravel for use on the forest road system. With every acquisition the forest road system grew more expansive. The availability of local inexpensive gravel benefited the establishment of sturdy forest roads which continue to support access for forest management, fire protection and non-motorized outdoor recreation. Gravel roads require regular maintenance of drainage control structures, eroded, and compacted areas.

- **Ropes Course** – Goodwin State Forest supports a ropes course which was established and maintained by Eastern Connecticut Educational Services Center (EASTCONN) under a memorandum of understanding with The Division of Forestry in 2008. This area was established to provide leadership and team-building opportunities to students. The ropes course is located in Compartment 8 Stand 3. The management status for this stand has been assigned to 'Recreation'. No removal of forest products or significant alteration of vegetative condition will occur within the 10-year scope of this management plan.

- Recreational and Scenic Areas
  - **Pine Acres Pond** – In 1933, after witnessing the habitat alteration created by beavers which dammed Cedar Swamp Brook, Mr. Goodwin suggested creating a pond by constructing a dam at the south end of Cedar Swamp Brook, adjacent to the state highway. In the fall, work was started to construct a dam spanning the width of Pine Acres Pond (1,000 feet). The dam took two years to complete and was reinforced by a cement core for a distance of 400 feet along the state highway. Upon its completion the Farm was left with a very attractive 196 acre pond with an average depth of 4-5 feet. The water level of Pine Acres Pond is now controlled by the DEEP Wildlife Division. The pond is primarily used for wildlife observation, wildlife habitat, and fishing.

- There are approximately 20 miles of maintained **roads and hiking trails** through the Goodwin State Forest. These roads and trails are generally open to non-motorized, multiple-use outdoor recreation. Management of the trail system is a collaborative effort between the CT DEEP Parks Division, CFPA, and 'The Friends of Goodwin State Forest' volunteer group. The Blue-Blazed Natchaug Trail crosses through Goodwin State Forest for a total distance of 4.2 miles. Any additional trail modifications will need to be reviewed by DEEP Parks, Forestry, Wildlife, Fisheries and The Friends of Goodwin State Forest Trails Committee.

- There is one **scenic vista** in the State Forest accessible off the Natchaug Trail. This section of trail climbs to the top of Orchard Hill – Compartment 27 Stand 1 –providing views of the Natchaug River Valley and the Town of Chaplin visible to the southwest.

- **Natchaug Trail** – The Forest supports a 4.2 mile segment of the Natchaug Trail. This trail is an important component of the CT Blue-Blazed Trail system. Primarily located in Windham County, the trail begins in the Forest, continuing north through the Natchaug State Forest before joining the Nipmuck Trail in Eastford, CT. The trail is maintained by the CFPA for non-motorized outdoor recreation. Most of the traffic on the Natchaug Trail is related to hiking and backpacking, however, sections may also be suitable for cross-country skiing, bird watching, horseback riding, and geocaching.

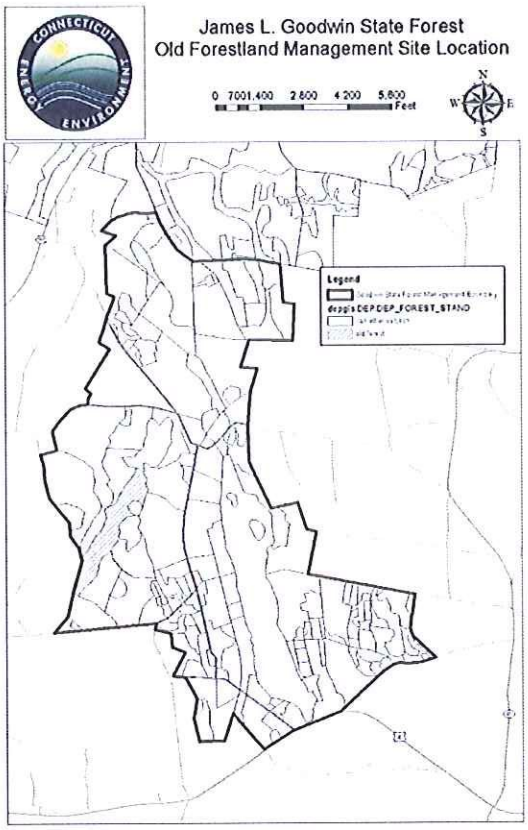
- **Letterboxing** - In 2003, to honor the Centennial of the State Forest system, the Division of Forestry established a series of letterboxes throughout the State Forests. In letterboxing, you visit interesting locations and collect unique stamps to mark your visit. The letterbox in the forest is maintained by the Division of Forestry.

  Information can be found at: **Trails Map**

- Critical Habitat
  - A review of the State Natural Diversity Database indicates the presence of two state-listed plants, Pale green orchid (Special Concern) and Swamp lousewort (Threatened), in close proximity to Goodwin State Forest. A remnant stand of Atlantic white cedar, an uncommon natural community in Connecticut, is present at the north end of Pine Acres Pond. Multiple observations of Wood Turtles (Special Concern) (link to fact sheet) also have been recorded within Goodwin State Forest.

- Natural Areas
  - There are currently no State-designated Natural Areas within the James L. Goodwin State Forest.

- Old-Forestland Management Sites
  - There is one Old Forestland Management site to be established by this management plan; Compartment 19, Stand 1. This is a mixed upland-hardwood stand exhibiting a multi-aged (uneven-aged) structure. This biologically diverse site is oriented on a southwest-facing slope supporting predominately Woodbridge fine sandy loam soils. A forest type map produced in 1927 clearly shows this stand originating sometime in the mid-1800's. The 54-acre stand appears to have supported forest cover for more than 150 years with numerous biological legacy trees which have largely survived widespread stand-replacing disturbances (like the Hurricane of 1938). This partial disturbance history and the absence of human activity, have acted to establish a matrix of small groups supporting vegetation diverse in both species composition and age-class distribution. Apparent in this stand are red oak legacy trees, two age classes of sugar maple, specimen-sized yellow poplar, senescent hemlock, large diameter yellow birch, basswood snags, and very large tip-up mounds. Small-scale canopy-gap replacement is driving forest succession in this stand. Despite being relatively protected from blow-down, wind-throw events still occur on a periodic basis with minor disturbance from 2011's storm Irene. Coarse woody material is present, tip-up mounds are obvious, the stand is unaffected by invasive species, the area is only open to non-motorized traffic, and it is devoid of bisecting trails. This stand borders Turner Brook, the outlet from Black Spruce Pond. Maintaining multi-aged forest structure will adequately protect water quality in Turner Brook. Signage will be established on a loop trail now known as "The Valley of The Giants Trail" – these educational materials will be evident to hikers and inform forest users of the benefits and attributes of late-successional forest stands.



- Research Areas
  - The Connecticut Agriculture Experiment Station (CAES) has on-going, long-term Blue-Ribbon forest monitoring plots established in Goodwin State Forest. Two fixed-radius plots have been established and are intermittently re-measured to assess forest health, growth rates, compositional change, and response to management. The plots are located within Compartment 17 and represent some of the most long-term forest research plots in Connecticut.
  - CAES has also spearheaded American Chestnut research in Compartment 10 Stand 5. Following a final shelterwood harvest in 2007 CAES planted approximately 300 American Chestnut seedlings to gauge survivorship and potential genetic resistance to Chestnut Blight. In the first 4 years height growth has been promising, and survivorship is good. This research is on-going.

D. Extensive Areas of Concern

- **Trails & Signs** – Please refer back to section C. of this management plan – "Cultural Sites" and "Recreational and Seasonal Areas" for more information regarding specific trails within the Forest. The following narrative was produced as part of an annual trails report produced by CFPA volunteers.

  Rehabilitation of the Goodwin Forest trail system and several significant trail improvement projects were completed in 2011. A total of 10.7 miles of trail was blazed/re-blazed using the latest CFPA-recommended guidelines. The number of marked trails was increased from three (exclusive of the Natchaug Trail) to nine uniquely blazed trails creating numerous loop routes. A new forest map reflecting these changes was created in cooperation with the CT DEEP. A Trails Committee was established within the Friends of Goodwin State Forest group. The objectives of this committee are to develop ideas for trail system improvements, identify project leaders to implement those ideas and to establish a pool of support people to help accomplish the adopted projects. In its first year of operation, several projects were initiated and/or completed. Eight of the smaller, standard size, CFPA kiosks were fabricated and installed on 6x6 posts at key trail junctions throughout the forest. Currently, the basic forest map is posted but it will be replaced shortly by an informative, CFPA developed, poster containing both the map and other trail usage information. Additional educational materials also are being developed for future posting. Trailhead and numerous smaller forest signs were fabricated (letters routed in wood) and installed on posts and trees in the forest. Students from EcoHouse at UCONN helped to paint the signs (brown with yellow lettering) over the past winter. Approximately 60% of the planned signage is in place and is concentrated near the Forest Conservation Education Center. The remaining forest signs will be installed in more remote areas of the forest away from the Conservation Center.

- **Wetlands** - In addition to the three Ponds totaling 245 acres, there are an estimated 151 acres of wetlands; these areas may include, but are not limited to, vernal pools, woodland seeps, potholes, forested wetlands (red maple swamps) and fire protection ponds. Wetlands are critically important landscape features due to the role they play in water filtration, pollutant mitigation, storm-water collection, wildlife habitat, and groundwater protection. Management actions occurring adjacent to these areas will meet or exceed current BMP's (Best Management Practices) for the protection of water quality on logging jobs in CT. Forest Management operations will not require the skidding of logs or other forest products within close proximity to wetlands, or across man-made structures established to control water levels associated with the three ponds. These areas should be treated as water quality protection zones. Efforts will be made in individual forest operation plans to eliminate the potential for impact to these areas.

Description	Acres
Pine Acres Pond	196
Black Spruce Marsh	30
Brown Hill Marsh	19
Forested Wetlands	151
Total Acreage	**396**

E. Wildlife Habitat

- The James L. Goodwin State Forest supports a diversity of forest types and size classes which benefit numerous species of Wildlife. It is the goal of the Division of Forestry to recruit and perpetuate habitat types which will support species on the decline, while maintaining a mix of values beneficial to a suite of species. Early-successional, (young forest) areas need to be increased to support species on the decline in Connecticut such as American woodcock, chestnut-sided warbler, and New England cotton-tail. Simultaneously, softwood cover should be perpetuated to support Goodwin's legacy and provide cover values for turkey, raptors, and other species. Wetland habitat requires protection to support Eastern box turtle. And, while there is no known wildlife species that is totally dependent on biologically mature forest, it is ideal to have this late seral stage forest for overall ecosystem health.

- Based on its location near the periphery of a larger contiguous forested tract, the James L. Goodwin State Forest should be managed to achieve early-successional forest habitat objectives. It is well documented that young-forest habitat has been on the decline for decades in Connecticut. Eliminating natural disturbance regimes, supporting high densities of white-tailed deer, "light-touch" harvesting practices, and successional trends have resulted in the widespread maturation of our forest environments. This trend is significantly impacting wildlife populations; notably, small mammal, and bird species which depend on young-forest habitat for their foraging and breeding success. From an early-successional, shrubland-bird standpoint more-than 25% forest canopy results in a significant reduction in species-richness. Without actively creating early-successional habitat our forests will succeed beyond a condition suitable for many wildlife species of concern.

- Maintenance of water levels in the three man-made ponds fall under the jurisdiction of the Parks Division in coordination with the Wildlife Division. These areas will receive consideration from Wildlife regarding the reduction of water levels to a point where the ponds could support herbaceous emergent vegetation and attract higher numbers of migratory waterfowl. Pine Acres Pond may be suitable as a stopping point for migratory waterfowl during their seasonal migrations. Black Spruce, and Brown Hill Marsh, due to their inherently lower water levels, should be evaluated as potential breeding ground for migratory waterfowl given reduced water levels and stimulated herbaceous emergent vegetation growth. The Wildlife Division will monitor the three ponds for

beaver activity and evaluate the potential habitat and public safety impacts associated with increased water levels as a result of damming.

- There are three grasslands maintained using prescribed fire on an annual basis. These areas are Compartment 2 Stand 4, Compartment 3 Stand 3, and Compartment 4 Stand 9. These areas will continue to be burned by the Division of Forestry as staffing and resource conditions allow. Maintaining these areas as an herbaceous plant and grassland community will support early-successional wildlife species dependent upon maintained, non-woody, upland openings. These grasslands east of Pine Acres Pond were established through an NRCS WHIP Grant.

- The Goodwin State Forest is currently not-open to public hunting and trapping. This desire was expressed via deed restriction when the property was gifted to the State of Connecticut by James L. Goodwin. This no-hunting clause was a reflection of the 1960's era of wildlife restoration. Populations have now recovered. We now understand that fully eliminating hunting pressure leads to populations which grow well past their environmental carrying capacity. Observational data from the winter of 2010-2011 has shown groups of 6-15 deer congregating, and traveling together through the forest. It is believed that there is a locally significant seasonal migration showing congregations of deer traveling in large groups onto the Goodwin State Forest. Deer are using the forest as a refuge.

- It is suspected that deer densities at the current level are having some impact on forest regeneration. Desirable advanced regeneration is currently scarce and in need of intervention to ensure tree seedlings are perpetuated into successively larger size-classes. Recent final and irregular shelterwood harvests in the Forest have yielded inadequate numbers of acceptable species despite adequate timing of harvests with seed years. The Division of Forestry will utilize seasonal technicians to conduct regeneration surveys on select forest stands. These data will suggest whether deer densities at the current level are having a "detrimental effect on the natural ecosysytem" thus introducing the potential to cite CGS 26-3 and recommend controlling the white-tailed deer herd. The Wildlife Division will also conduct a deer population impact study in 2012-2013 in order to better-document the extent of the problem.

- Please see the Connecticut Comprehensive Wildlife Conservation Strategy

F. Vegetative Condition

Forty Years of Division of Forestry Management within Goodwin State Forest

The first forest management plan written by The State of CT Foresters for the James L. Goodwin State Forest was composed in 1973. Since that time there have been two additional management plans prepared for the years 1983-1993 and 1997-2007. As a result of different harvests taking place stands can have multiple age classes represented in them. The table below explains age-class criteria. The multiple size-class designations such as sawtimber-sapling (saw-sap), sawtimber-seedling (saw-seed), and sapling-poletimber (sap-pole), indicate stands with both size classes represented in the inventory as a result of past management. The sawtimber component can represent any trees 11" and larger.

Size-Class	DBH Range
Seedling	<= 1"
Sapling	1.0 <= 4.9"
Pole	5.0" <= 10.9"
Small Sawtimber	11.0" <= 13.9"
Medium Sawtimber	14.0" <= 16.9"
Large Sawtimber	17.0" and larger

Between 1983 and the composition of the last management plan in 1997, 43% of the manageable acreage, or 675 acres were operated. Thirty-six percent of this operated acreage, (243 acres) was focused on establishing regeneration with initial shelterwood harvests. Final shelterwood and overstory removal harvests accounted for 8% (54 acres) of the work. Intermediate thinnings represented 28% of the silviculture and focused mainly on mixed hardwood stands. Additionally, improvement cutting and pre-commercial thinning was accomplished on 3% of the area. Natural disturbance also had an impact as salvage of Hurricane Gloria blow-down occurred across 6% of the acreage, and insect salvage accounted for 11%. Most of this salvage was due to red pine scale and red pine adelgid (54 acres). Gypsy moth damage accounted for 22 acres.

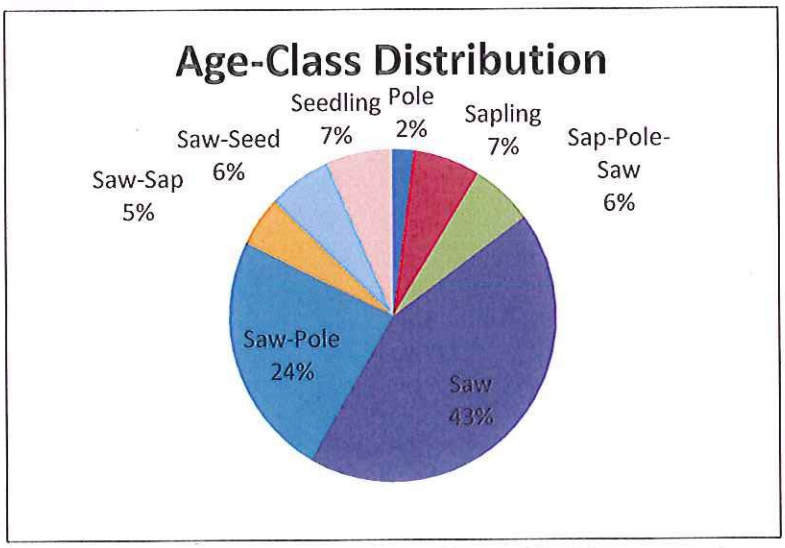
Since 1997 when the last forest management plan was written by DEEP foresters, 331 acres, or 21% of the manageable forest has received silvicultural treatment. Slightly over one third of the work, or 114 acres, were focused on final shelterwood harvests or clearcuts to salvage and sanitize insect infested red pine. Establishing advanced regeneration was a goal on 170 acres, across 51% of the treatment acreage; this was accomplished through initiating first phase shelterwood system silviculture in maturing sawtimber stands. Included in this category were 25 acres treated to salvage hemlock timber as a result of a Hemlock Wooly Adelgid infestation introduced into Connecticut by Hurricane Gloria. The remaining 47 acres or 14% of the treatment area was focused on completing intermediate thinnings in overstocked stands.

In the last 30 year period roughly 590 acres, or 38% of the manageable acreage within the Forest has been treated with even-aged silviculture aimed at establishing or releasing advanced regeneration. An additional 311 acres, or 21% of the actively managed forest were treated with intermediate thinnings.

Current Forest Condition / Silviculture

The majority of the managed acreage of the James L. Goodwin State Forest is to be maintained as an even-aged system perpetuated through applications of shelterwood system silviculture. The target rotation age is 100 years, with a planned 20 year cutting cycle in stands managed with uneven-aged silviculture.

There is an opportunity, or an obligation to perpetuate species of the oak genus within the Forest. Oak forests have been on the decline at a rate of 5% per decade in Connecticut since 1938. Forest succession, lack of forest fire, high-grade harvesting practices, and high deer densities have been the catalysts behind this decline. Oaks excel in importance due to their value as a food source for wildlife, their relationship with overall forest insect and bird biodiversity, their value as high-quality forest products, and their inability to grow in shade and naturally sustain themselves. These early-successional communities are intolerant of shade, it is then a combination of regeneration and release treatments which favor oak establishment and stand development. The importance of securing these communities on State Forest Lands is critical as the appropriate silviculture is seldom accomplished on private lands.



Stands in the State Forest were prioritized for silvicultural treatments based on three factors; their ratio of unacceptable growing stock (UGS) to acceptable growing stock (AGS), the relative soil site-index quality, and the presence or absence of desirable oak regeneration. The Division of Forestry will target the regeneration of stands with levels of acceptable growing stock at or below the C-level, as determined by the appropriate stocking guide. There must be sufficient numbers of advanced regeneration of oak species to support silvicultural treatment to release desirable seedlings. The Division will aim to establish and graduate desirable regeneration with shelterwood system silviculture.

Inventory data collected during 2011 illustrates an actively managed forest condition supporting 46% or roughly 714 acres in a predominately sawtimber size-class. An additional 24% of the active forest acreage is currently in a sawtimber-pole size-class. Another 13% of the actively managed landscape is comprised of sawtimber-sapling, and sawtimber-seedling age classes. Together these conditions amount to roughly 1,250 acres or about 81% of the actively managed forest landscape. Comparing these area measurements to an ideal sustainable age-class distribution which allows for higher proportions of under-represented young forest habitat, is represented in the following table.

Forest stand data illustrate a current forest condition heavily weighted to the sawtimber size classes, and Oak-Hickory composition. Analysis suggests the sawtimber size-class is exceeding habitat suitability measurements by upwards of 35%. The Division of Forestry will begin to shift this sawtimber surplus by focusing removals on sawtimber-seedling, and sawtimber-sapling stands in which we can release desirable advanced regeneration with irregular and final shelterwood harvests. These removals will begin to shift the size-class distribution to include higher proportions of under-represented early-successional forest habitat. Additionally, the Division will recruit new age classes of desirable species by establishing and promoting advanced regeneration of shade-intolerant species using first-phase shelterwood silviculture. Over the following three-to -five management plan cycles the Division of Forestry will aim to sustainably balance the proportion of different size-classes to better-meet the desired future condition outlined below.

Current Forest Size-Class Distribution vs. Desired Future Condition

Forest Size Class	Present Condition	Desired Future Condition
Sawtimber	81%	40%
Pole	5%	15%
Sapling	7%	25%
Seeding	7%	20%

Using an area-based approach to sustainability the Division of Forestry will operate approximately 320 acres of actively managed forest via even-aged regeneration treatments (excludes intermediate thinnings) within the life of this 10-year management plan. The result of this work will be a forest exhibiting a more balanced distribution of old forest and young forest habitat. The operational breakdown should be as follows;

- Establish and perpetuate advanced regeneration on 212 acres using a combination of first phase, and second phase-shelterwood system silviculture.
- Release desirable advanced regeneration via final shelterwood, irregular shelterwood harvests and overstory removals on roughly 106 acres.
- Perform intermediate thinnings within softwood plantations and overstocked hardwood stands. These thinnings will occur 'from below' they will improve stand vigor and health by removing low-quality, suppressed, undesirable trees while increasing increment growth on residual crop-trees. Intermediate thinnings will total roughly 100 acres and focus on softwood plantations.

Forest Cover Group by Size Class

Forest Type	Sapling	Pole	Saw-timber	Saw – Pole - Sap	Saw - Pole	Saw - Sap	Saw-Seed	Seed	Totals
Northern Hardwood	0	0	0	27	0	0	0	0	**27**
Elm – Ash – Red Maple	0	17	59	0	64	0	0	0	**140**
Oak - Pine	0	0	24	0	17	0	0	0	**41**
Oak - Hickory	102	16	569	84	380	81	110	118	**1460**
Softwood	12	4	130	0	11	13	5	0	**175**
Totals	**114**	**37**	**782**	**111**	**472**	**94**	**115**	**118**	**1,843**

Mixed Hardwood Forest Types

Size Class	Satisfactory	Needs Thinning	Needs Regeneration	Needs Release
Seedling-Sapling	237	0	0	0
Pole	37	0	0	0
Sawtimber	718	0	471	164
Scheduled to Operate	0	**0**	**212**	**106**

Softwood Plantations

Size Class	Satisfactory	Needs Thinning	Needs Regeneration
Seedling-Sapling	10	0	0
Pole	0	0	0
Sawtimber	45	120	0
Totals	**55**	**120**	**0**
Scheduled to Operate	**0**	**100**	**0**

Understory Concerns

For decades, populations of invasive plant species have gone without management and have now established a strong foot-hold in the Forest. 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. Given the Forest's main objectives of education, outreach, and demonstration, the Division of Forestry must employ mechanical and chemical controls to reduce occurrences of invasive species within the forest. Revenues from timber harvests in the Goodwin Forest are deposited into a fund established with PA 11-192 and can be utilized on the Forest to control invasive species and demonstrate control techniques through educational information and workshops. Currently the presence of invasive plants limit our silvicultural potential in certain stands. If the Division of Forestry aims to increase our management productivity, a proactive approach must be utilized in the control of invasive species.

Invasive species management projects will initially be two-pronged; strategies will focus on eradicating individuals and species which have yet to develop a widespread foothold throughout the forest. Specifically, eradicating Cork-Tree occurrences will be essential prior to their seed dispersal and inevitable colonization of new areas. This is an example of an invasive species battle we can win. Further, it will become necessary to control the spread of Japanese Barberry in priority areas around the forest. These removals will occur within stands, and adjacent to stands which have silvicultural operations planned. Reducing the population of invasive species will limit their potential spread into adjacent stands after silvicultural treatment.

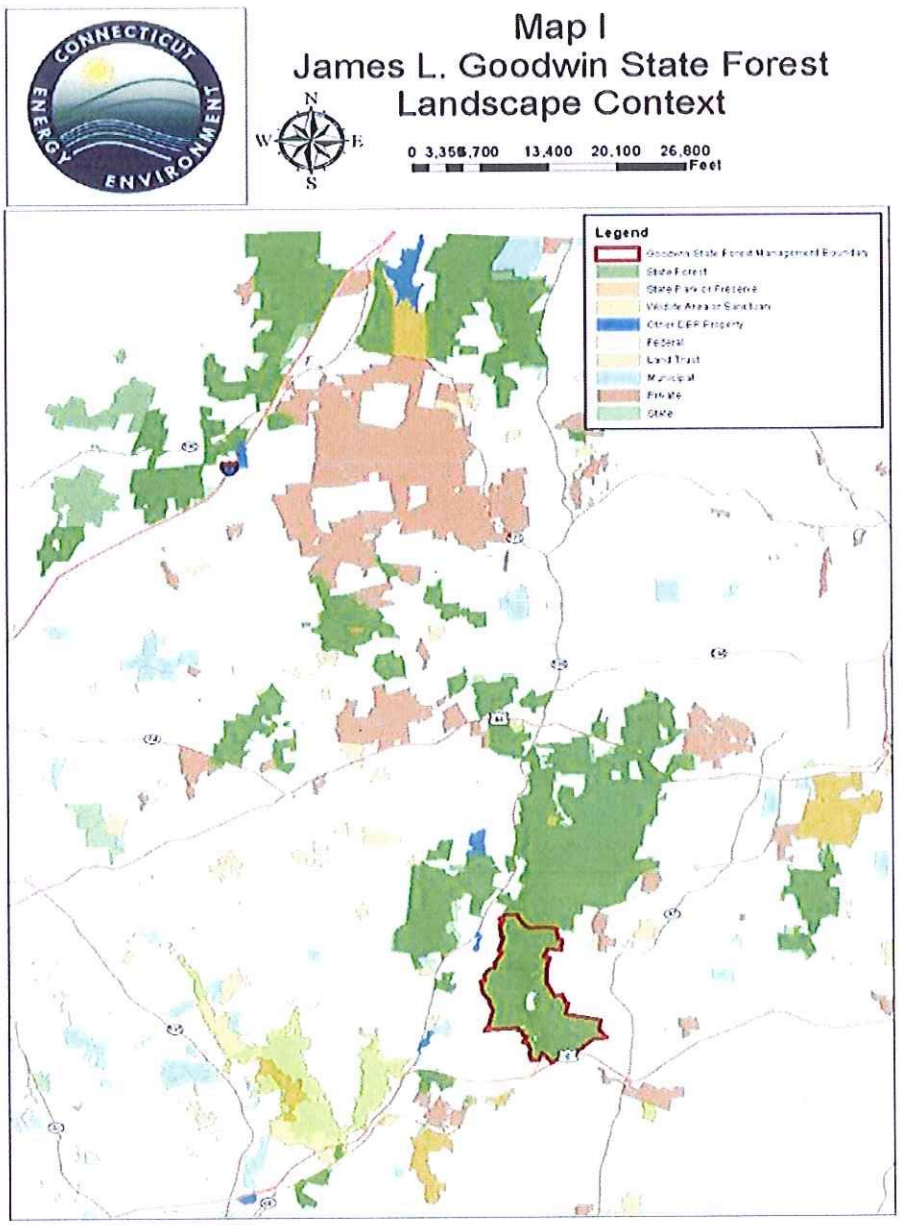
Invasive species control measures must be accomplished through treatments which are species-specific, well-timed, and professionally applied. The appropriate control measure will vary based upon the individual species, and season of application. Cork-Tree occurrences must be controlled in the fall via mechanical cutting and cut-stump herbicide application. Japanese Barberry control will employ a suite of techniques ranging from hand-pulling, to low-density foliar herbicide in the spring, prescribed fire, and cut-stump fall herbicide treatments. The appropriate method of control will be evaluated based on the species composition, and size of the plants to be eradicated, and the density of the infestation. Specific details associated with these proposals will be cited in project plans and contracts will be established with consultants.

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 honey suckle come to dominate the understory to the exclusion of native shrubs wherever sunlight penetrates to the forest floor along stand edges.

Healthy turkey and deer populations affect acorn mast crops which are eaten before germination or consumed as browse once above the winter snow depth. Small natural canopy gaps or light silvicultural treatments favor the growth of black birch, beech and red maple. Citing the Forest Regeneration Handbook released by the Connecticut Agricultural Experiment Station, oak forests have been declining at a rate of 5% every decade since the hurricane of 1938. If this trend continues, the oak forests that our native wildlife communities rely on for food will be replaced by birch, maple and beech, and the ecological, economic and aesthetic values that are associated with oak forests will be lost.

G. Landscape Context

Within the surrounding landscape, the Goodwin State Forest should be managed to achieve early-successional forest habitat objectives. This is determined based on our role within the surrounding landscape and concepts of matrix land management. Goodwin State Forest represents the southern extent of a largely contiguous block of conserved forestland which encompasses Natchaug State Forest, the Yale-Meyers Forest, Bigelow Hollow State Park, the Nipmuck State Forest, Mashmoquet Brook State Park, Mansfield Hollow State Park, and thousands of acres of private conservation land established by The Last Green Valley, and Joshua's Land Trust. The position of the State Forest within this block suggests it plays an important role on the southern periphery of a large forest block. Generally, the wide-scale forest ecosystem is enhanced with variable age-classes of even-aged forest on the perimeter, and a minimally disturbed interior forest at the core.



H. Specific Acquisition Desires

At the time of this writing there is a 50-acre property that abuts the Goodwin State Forest east of compartment 12 stand 4. The absentee landowner can be contacted by The Division of Forestry with a letter and Prospective Land Acquisition Application after approval of this plan based on funding availability.

I. Public Involvement

A draft of this management plan has been presented to Conservation Commissions in the towns of Chaplin and Hampton, The Windham County Consortium of Conservation Commissions, and The Friends of Goodwin State Forest. A power point presentation was given to each group, and questions were answered regarding the management plan, forest management objectives, and the implementation of silviculture. These comments are attached in a general appendix. Frequent naturalist walks offer opportunities for interested parties to participate, and learn about forest management within the James L. Goodwin State Forest.

J. Adaptive Management

The Division of Forestry understands the nature of forest management as it occurs as part of a dynamic landscape. Management actions are often affected by outside variables which influence the outcome of resource decisions. The Division of Forestry reserves the right to reasonably change our management approach as environmental change and resource needs warrant. Some of these changes may be associated with biological factors such as insect and disease, or population outbreaks. Increased unauthorized motorized recreation which erodes trails and roads may require action unforeseen during the composition of this plan. Additionally, environmental conditions such as hurricanes or record-breaking precipitation may additionally affect resource condition and work requirements. The Division of Forestry and our colleagues in Parks, Wildlife, Fisheries, and Agency Support, evaluate circumstances and use an adaptive-management philosophy and additionally reserve the right to address unforeseen circumstances should they arise during the tenure of this forest management plan.

K. Ten Year Goals

1. Further the education and demonstration mission of Goodwin State Forest by making siviculture and active forest management transparent to the public.
2. Maintain and improve forest ecosystem health and vigor to maximize stand growth rates, balance age-classes, improve wildlife productivity, increase diversity, and protect against insect and disease outbreaks.
3. Sustain the historic forest condition by performing intermediate thinning treatments to improve timber quality in overstocked pine and spruce plantations.
4. Employ an adaptive management philosophy which allows for changes to the management plan timeline due to; unexpected management results, stand damage from insects, disease, natural disturbance, & biological factors; seed availability, soil moisture.

5. Establish forestry-based recreation opportunities focused on integrating GPS technology with unique specimen trees of Goodwin State Forest. Much-like geo-caching, participants will use GPS to navigate themselves to 'specimen trees' exhibiting large diameters, and exemplifying traits of the particular species. This will be an opportunity to integrate forestry education with GPS technology while allowing users to experience off-the-beaten-path forest-based recreation. Compass required.
6. Reduce the distribution and frequency of invasive plants by applying a mixture of mechanical and chemical treatments to truncate growth, limit seed dispersal, and reduce understory competition.
7. Improve forest access roads and install gates.

L. Work Plans

2012

- Compartment 27 Stand 1 – 30 acres establish regeneration. – **Division of Forestry**
- Compartment 30 Stand 1 – 52 acres release regeneration. – **Division of Forestry**
- Compartment 30 Stand 2 – 10 acres invasive species treatment. – **Division of Forestry**
- Control Cork-Tree in Compartment 2 – Cut & Stump-Treat – **Division of Forestry**
- Install erosion control measures on 'The Red Trail' – to Governor's Island – **Division of Forestry, Parks Division / Friends of GSF.**
- Address flooding of causeway to Governors Island – **Parks Division,** Labor – **Friends of GSF.**
- Purchase gravel to improve Black Spruce Pond Road. Install erosion control structures to maintain road upgrades. – **Division of Forestry, Agency Support Services / Friends of GSF**
- Improve Brown Hill Pond Road access point – **Division of Forestry / Agency Support Services.**
- Remove metal gate from 'old route 6 east' and re-install on a north-bound secondary road which departs from the junction of Nutmeg Lane & Middle Road. – **Agency Support Services**
- Establish 'specimen trees of Goodwin State Forest' tour. – **Division of Forestry / Friends of GSF**
- Coordinate with Parks Division to actively control water levels of Pine Acres Pond, Black Spruce, and Brown Hill Marsh. – **Wildlife Division**
- Monitor for beaver activity in Pine Acres Pond, Black Spruce Marsh, and Brown Hill Marsh. Utilize necessary control measures to meet Wildlife goals associated with water levels. – **Wildlife Division**

2013

-Compartment 2 Stand 3 – 6 acres hazard mitigation – **Division of Forestry / Parks Division**
-Compartment 27 Stand 2 – 9 acres intermediate thinning – **Division of Forestry**
-Compartment 3 – 6 acres invasive species treatment – **Division of Forestry**
-Establish signage on 'The Valley of The Giants Trail' – **Division of Forestry / Friends of GSF**
-Install / upgrade two wooden gates on Cedar Swamp Road – Chaplin. – **Parks Division**
-Establish rip-rap footpath over poorly-drained section of the Valley of the Giants Trail. – **Division of Forestry / Agency Support Services**
- Continue mowing activities to maintain early-successional shrub habitat in former Christmas Tree Plantations. – **Wildlife Division**

- Monitor for and control invasive species in maintained fields under wildlife jurisdiction. – **Wildlife Division**
- Coordinate with Parks Division to actively control water levels of Pine Acres Pond, Black Spruce, and Brown Hill Marsh. – **Wildlife Division**
- Monitor for beaver activity in Pine Acres Pond, Black Spruce Marsh, and Brown Hill Marsh. Utilize necessary control measures to meet Wildlife goals associated with water levels. – **Wildlife Division**

2014

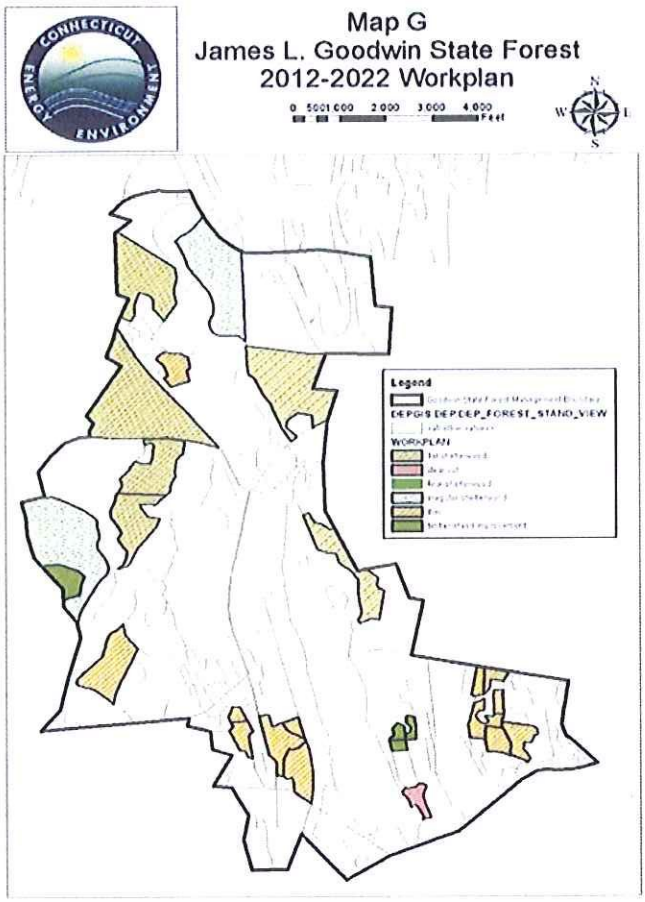
-Compartment 32 Stand 1 – 54 acres release regeneration – **Division of Forestry**
-Compartment 2 Stand 7, Compartment 4 Stands 1,2,7, Compartment 5 Stand 5 – 28 acres intermediate thinning. – **Division of Forestry**
- Coordinate with Parks Division to actively control water levels of Pine Acres Pond, Black Spruce, and Brown Hill Marsh. – **Wildlife Division**
- Monitor for beaver activity in Pine Acres Pond, Black Spruce Marsh, and Brown Hill Marsh. Utilize necessary control measures to meet Wildlife goals associated with water levels. – **Wildlife Division**
- Contribute to White-Tailed Deer population survey and advise on potential management. - **Wildlife Division**

2015

-Compartment 12 Stand 3 – 25 acres establish regeneration. – **Division of Forestry**
-Compartment 10 Stands 2,3,4 – 37 acres intermediate thinning. – **Division of Forestry**
- Establish 'Blue Trail' signage detailing compartment 10, 23, & 24 silviculture. – **Division of Forestry / Friends of GSF**
-Establish 'Red-over-White Trail' silviculture signage. – **Division of Forestry / Friends of GSF**
- Coordinate with Parks Division to actively control water levels of Pine Acres Pond, Black Spruce, and Brown Hill Marsh. – **Wildlife Division**
- Monitor for beaver activity in Pine Acres Pond, Black Spruce Marsh, and Brown Hill Marsh. Utilize necessary control measures to meet Wildlife goals associated with water levels. – **Wildlife Division**
- Coordinate with the Division of Forestry to continue utilizing prescribed fire as a management tool to maintain upland openings. – **Wildlife Division**

2016

-Compartment 29 Stand 1 – 50 acres establish regeneration – **Division of Forestry**
-Compartment 16 Stand 1 – 25 acres intermediate thinning – **Division of Forestry**
- Coordinate with Parks Division to actively control water levels of Pine Acres Pond, Black Spruce, and Brown Hill Marsh. – **Wildlife Division**
- Monitor for beaver activity in Pine Acres Pond, Black Spruce Marsh, and Brown Hill Marsh. Utilize necessary control measures to meet Wildlife goals associated with water levels. – **Wildlife Division**



2017

-Compartment 24 Stand 1 – 26 acres thinning – **Division of Forestry**
-Compartment 23 Stand 1 – 24 acres thinning – **Division of Forestry**
-Compartment 9 Stands 4 & 8 – 9 acres intermediate thinning – **Division of Forestry**
- Coordinate with Parks Division to actively control water levels of Pine Acres Pond, Black Spruce, and Brown Hill Marsh. – **Wildlife Division**
- Monitor for beaver activity in Pine Acres Pond, Black Spruce Marsh, and Brown Hill Marsh. Utilize necessary control measures to meet Wildlife goals associated with water levels. – **Wildlife Division**

2018

-Compartment 28 Stand 1 – 76 acres establish regeneration – **Division of Forestry**
- Continue mowing activities to maintain early-successional shrub habitat in former Christmas Tree Plantations. – **Wildlife Division**
- Monitor for and control invasive species in maintained fields under wildlife jurisdiction. – **Wildlife Division**
- Coordinate with Parks Division to actively control water levels of Pine Acres Pond, Black Spruce, and Brown Hill Marsh. – **Wildlife Division**
- Monitor for beaver activity in Pine Acres Pond, Black Spruce Marsh, and Brown Hill Marsh. Utilize necessary control measures to meet Wildlife goals associated with water levels. – **Wildlife Division**

2019

-Mark State Forest Boundary – **Division of Forestry**
- Coordinate with Parks Division to actively control water levels of Pine Acres Pond, Black Spruce, and Brown Hill Marsh. – **Wildlife Division**
- Monitor for beaver activity in Pine Acres Pond, Black Spruce Marsh, and Brown Hill Marsh. Utilize necessary control measures to meet Wildlife goals associated with water levels. – **Wildlife Division**

2020

-Inventory James L. Goodwin State Forest – **Division of Forestry**
- Coordinate with Parks Division to actively control water levels of Pine Acres Pond, Black Spruce, and Brown Hill Marsh. – **Wildlife Division**
- Monitor for beaver activity in Pine Acres Pond, Black Spruce Marsh, and Brown Hill Marsh. Utilize necessary control measures to meet Wildlife goals associated with water levels. – **Wildlife Division**

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N. Acknowledgements

The Division of Forestry would like to take an opportunity to acknowledge the individuals who have been instrumental in the preparation of this ten-year forest management plan. Representatives from the Connecticut Department of Energy & Environmental Protection, and Connecticut Forest & Park Association have contributed their time and expertise on a number of levels;

Thanks to Ed McGuire for his assistance with forest inventory, and silvicultural planning. Thanks to Dick Raymond and Kevin Grady for their extensive local knowledge of the James L. Goodwin State Forest and its extensive management history. Thanks to all contributing representatives of the Wildlife Division, Parks Division, Fisheries Division, Agency Support Services, and Public Education and Outreach for their cooperation, comment, and technical assistance. Thanks to, Steve Broderick, for his guidance, comment, and encouragement throughout the process. A special thanks to 'The Friends of Goodwin State Forest' for their unwavering interest, constructive project ideas, and insightful comments. The Division of Forestry is grateful to have such active and well-informed volunteer support.

All DEEP Divisions identified in the 10-year work plan as well as The Friends of Goodwin State Forest, have reviewed, approved, and committed to the successful implementation of this resource management plan.

O. Appendix

Daniel Evans
DEEP Forestry
209 Hebron Road
Marlborough, CT 06447
(860) 770-0061
daniel.evans@ct.gov

Subject: NDDB Request #201106881
Management Plan, Goodwin State Forest
Hampton, Chaplin, CT

Dear Daniel Evans,

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided. According to our records, multiple State-listed species (RCSA Sec. 26-306) have been documented within or near your proposed project area.

The following plant species have been documented immediately to the north of Goodwin State Forest and may also occur within its boundaries:

Pale green orchid (*Platanthera flava* var. *herbiola*)

Protection Status: State Special Concern

Habitat: Swamps and low woods. Blooms June- September.

Swamp lousewort (*Pedicularis lanceolata*)

Protection Status: State Threatened

Habitat: Moist fields, swamp edges, wet ground, wet meadows, open swamps, stream edges.

Blooms in August- September.

As illustrated in the map you provided, an *acidic atlantic white cedar basin swamp* has also been identified to the northeast of Governors Island in Pine Acres Lake.

A forest management plan that protects the remaining Atlantic white cedar (*Chamaecyparis thyoides*) and encourages future cedar recruitment might serve to accomplish two desirable goals. Increasing the density of white cedar might help to (1) restore a locally uncommon habitat and (2) increase the availability of food for Hessell's hairstreak (*Callophrys hesseli*), a State Endangered butterfly.

In addition to the plant species and communities mentioned above, multiple records of **Wood turtles (*Glyptemys insculpta*)** exist within this segment of Goodwin State Forest. Wood turtles are species of State Special Concern and they require riparian habitats bordered by floodplain, woodland or meadows. They hibernate in the banks of the river in submerged tree roots. Their summer habitat includes pastures, old fields, woodlands, powerline cuts and railroad beds bordering or adjacent to streams and rivers. This species has been negatively impacted by the loss of suitable habitat. For more information regarding wood turtles, please contact Elaine Hinsch (elaine.hinsch@ct.gov; 860-424-3011).

Natural Diversity Data Base information includes all information regarding critical biologic resources available to us at the time of the request. This information is a compilation of data collected over the years by the CT Department of Energy and Environmental Protection Bureau of Natural Resources and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site specific field investigations. Consultations with the Data Base 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 into the Data Base as it becomes available. If the proposed work has not been initiated within 12 months of this review, contact the NDDB for an updated review.

Please contact me if you have any questions (nelson.debarros@ct.gov; 860-424-3585). Thank you for consulting the Natural Diversity Data Base and continuing to work with us to protect State-listed species.

Sincerely,

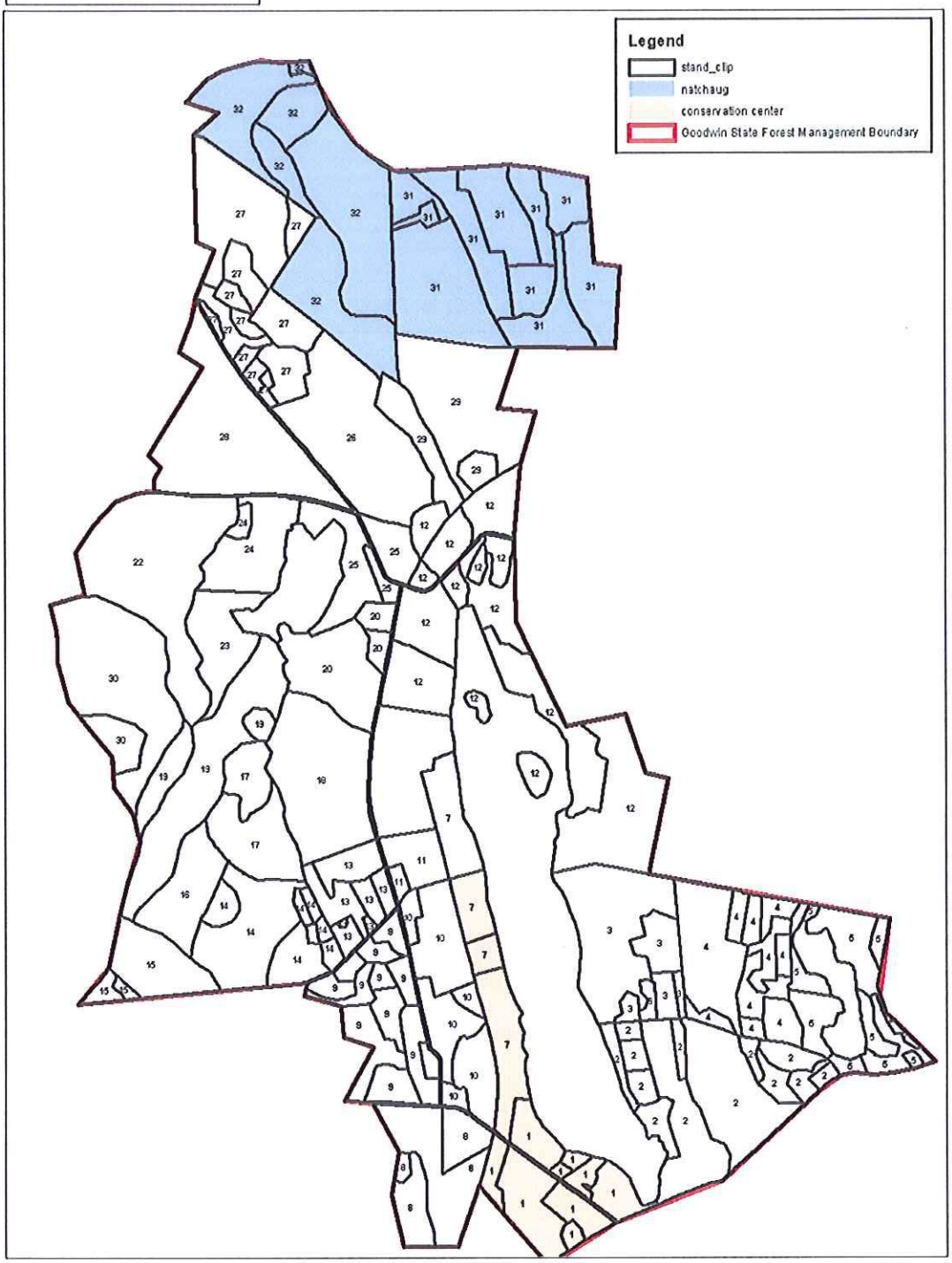
Nelson B. DeBarros

Botanist/Ecologist

Map A
James L. Goodwin State Forest
Forest Stand Map

N
W E
S

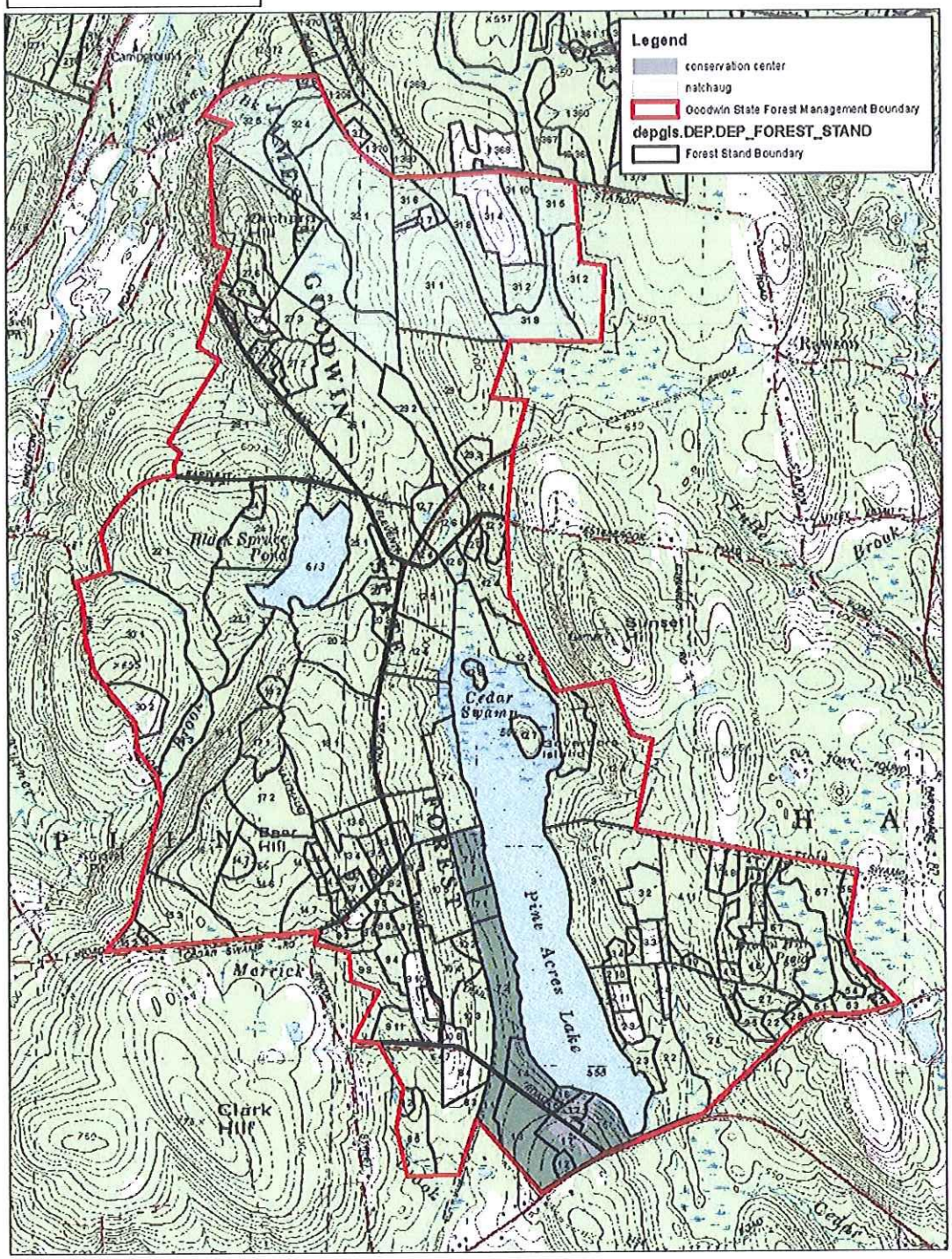
0 5001,000 2,000 3,000 4,000
Feet



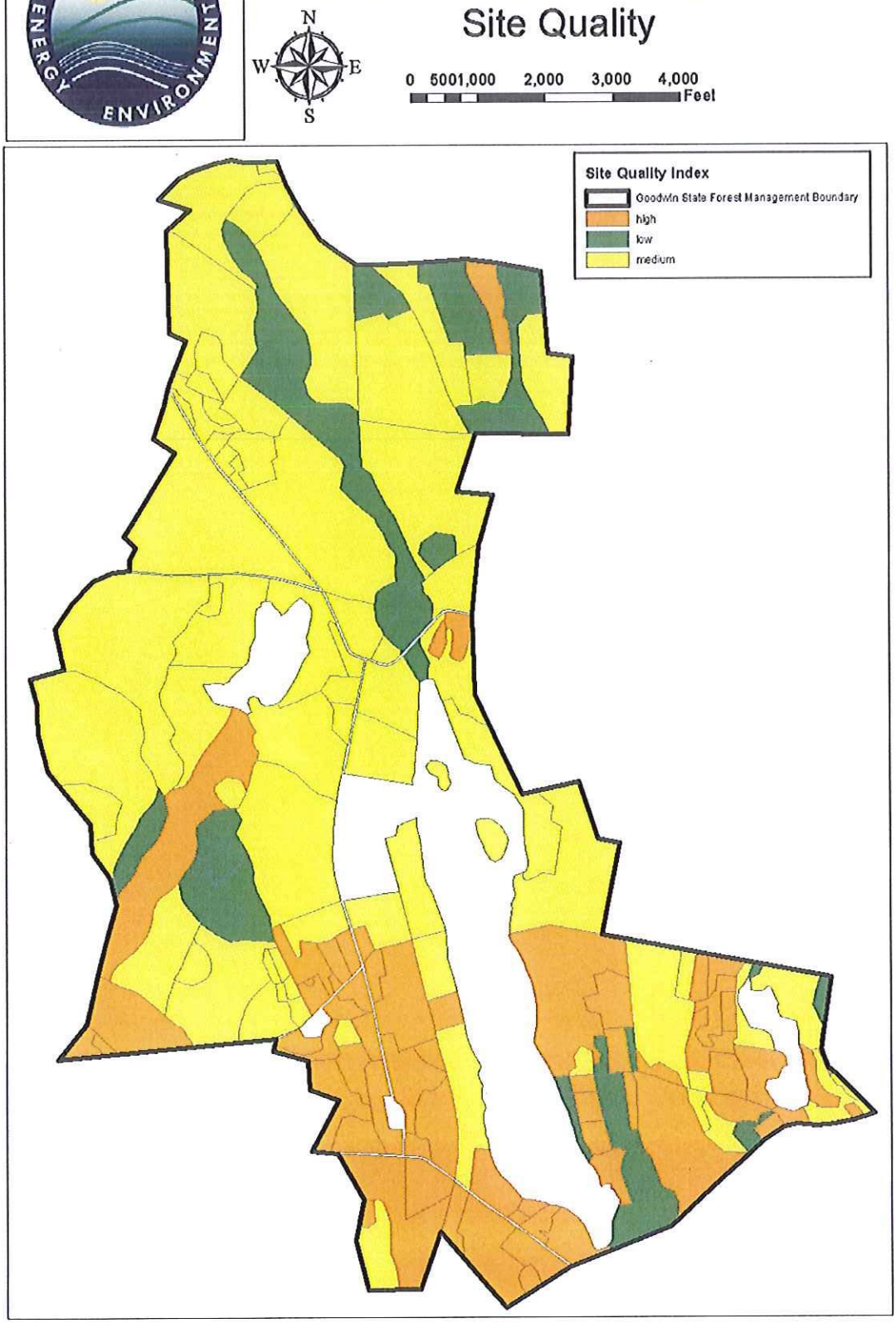
Map B
James L. Goodwin State Forest
Forest Stand Map

N
W E
S

0 5501,100 2,200 3,300 4,400
Feet



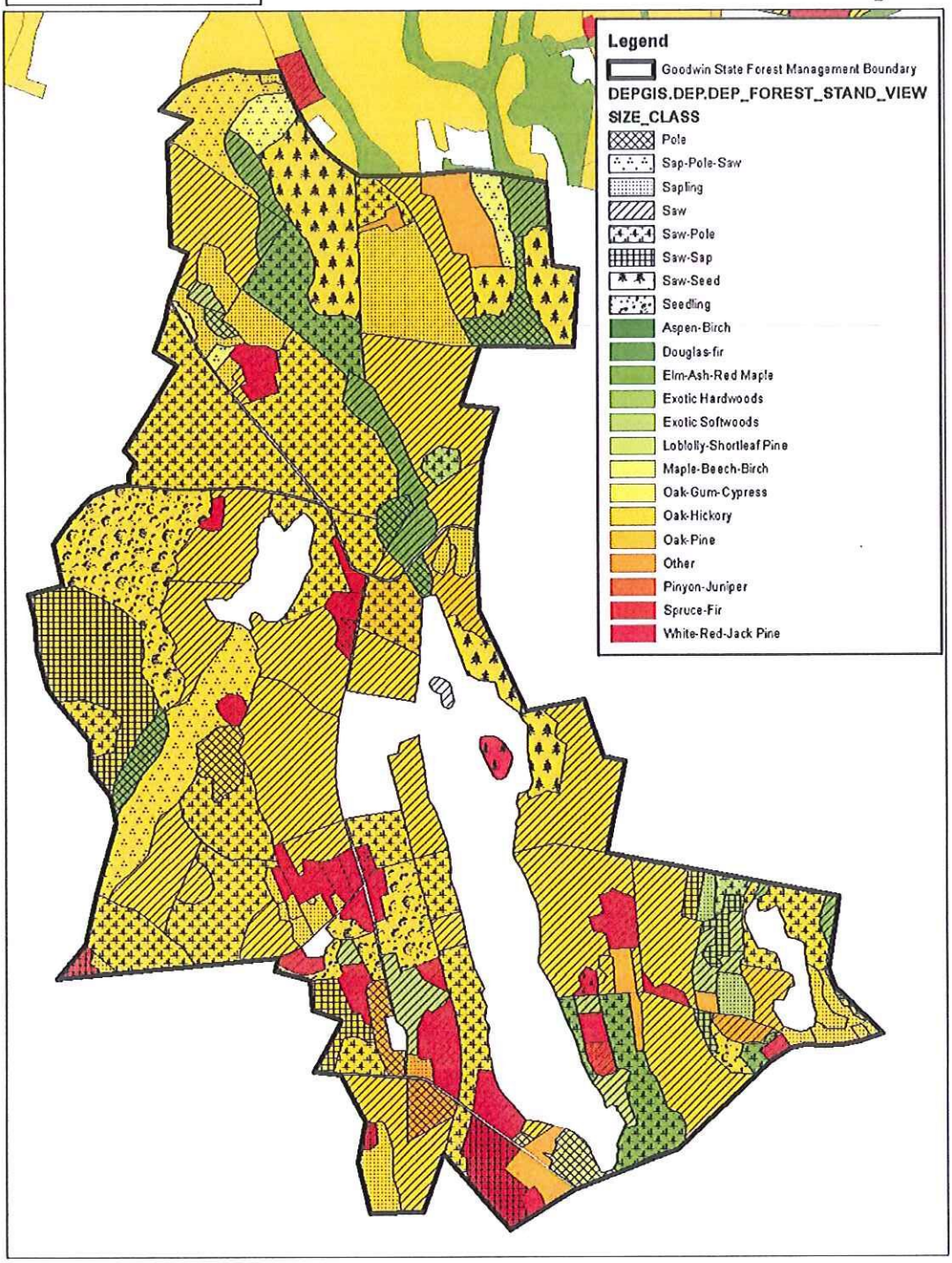
Map C
James L. Goodwin State Forest
Site Quality



Map D
James L. Goodwin State Forest
Cover Type by Size Class

0 5001,000 2,000 3,000 4,000 Feet

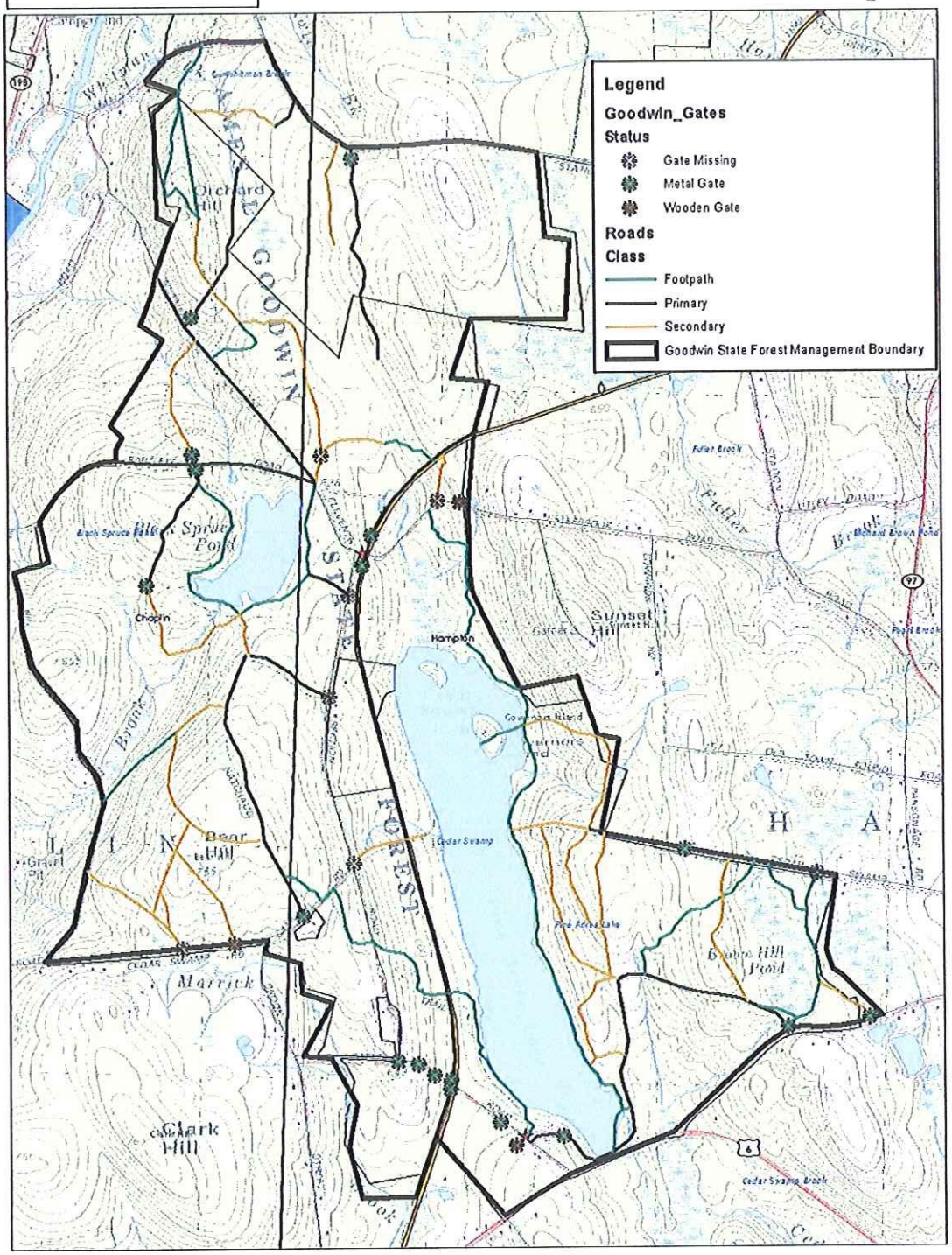
N W E S



Map E
James L. Goodwin State Forest
Special Use Map

0 5001,000 2,000 3,000 4,000 Feet

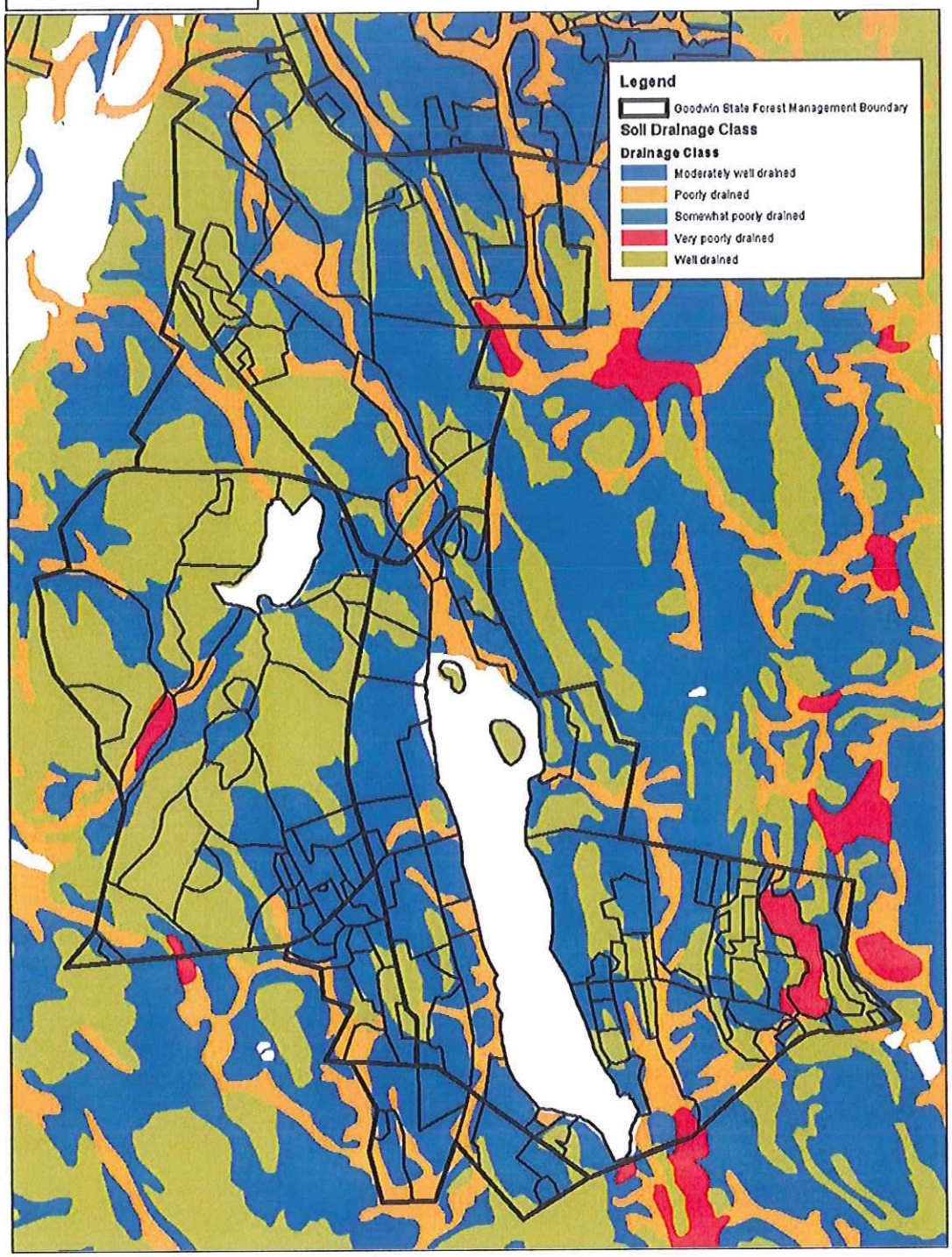
N W E S



Map F
James L. Goodwin State Forest
Soil Drainage Class

N W E S

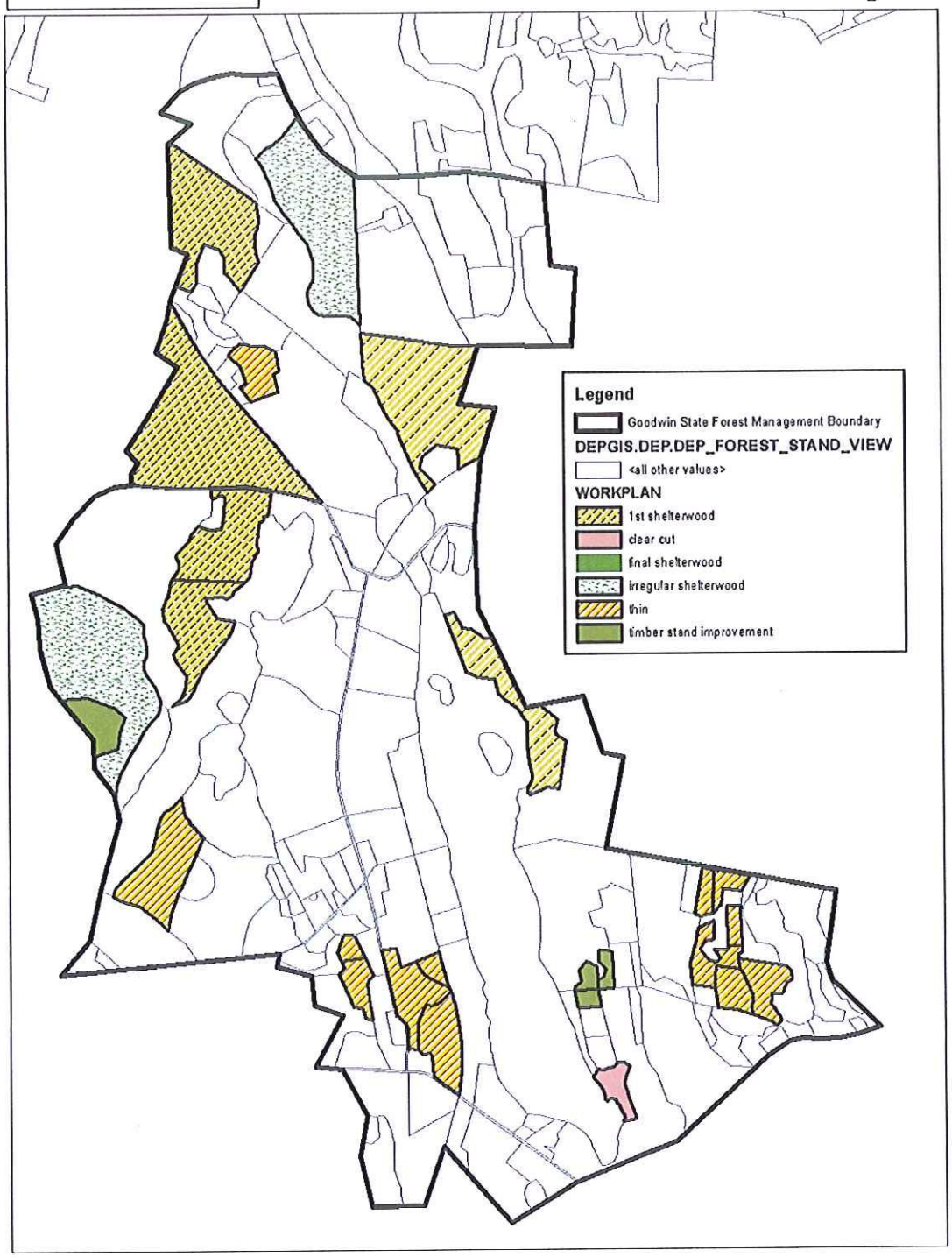
0 500 1,000 2,000 3,000 4,000 Feet



Map G
James L. Goodwin State Forest
2012-2022 Workplan

0 5001,000 2,000 3,000 4,000
Feet

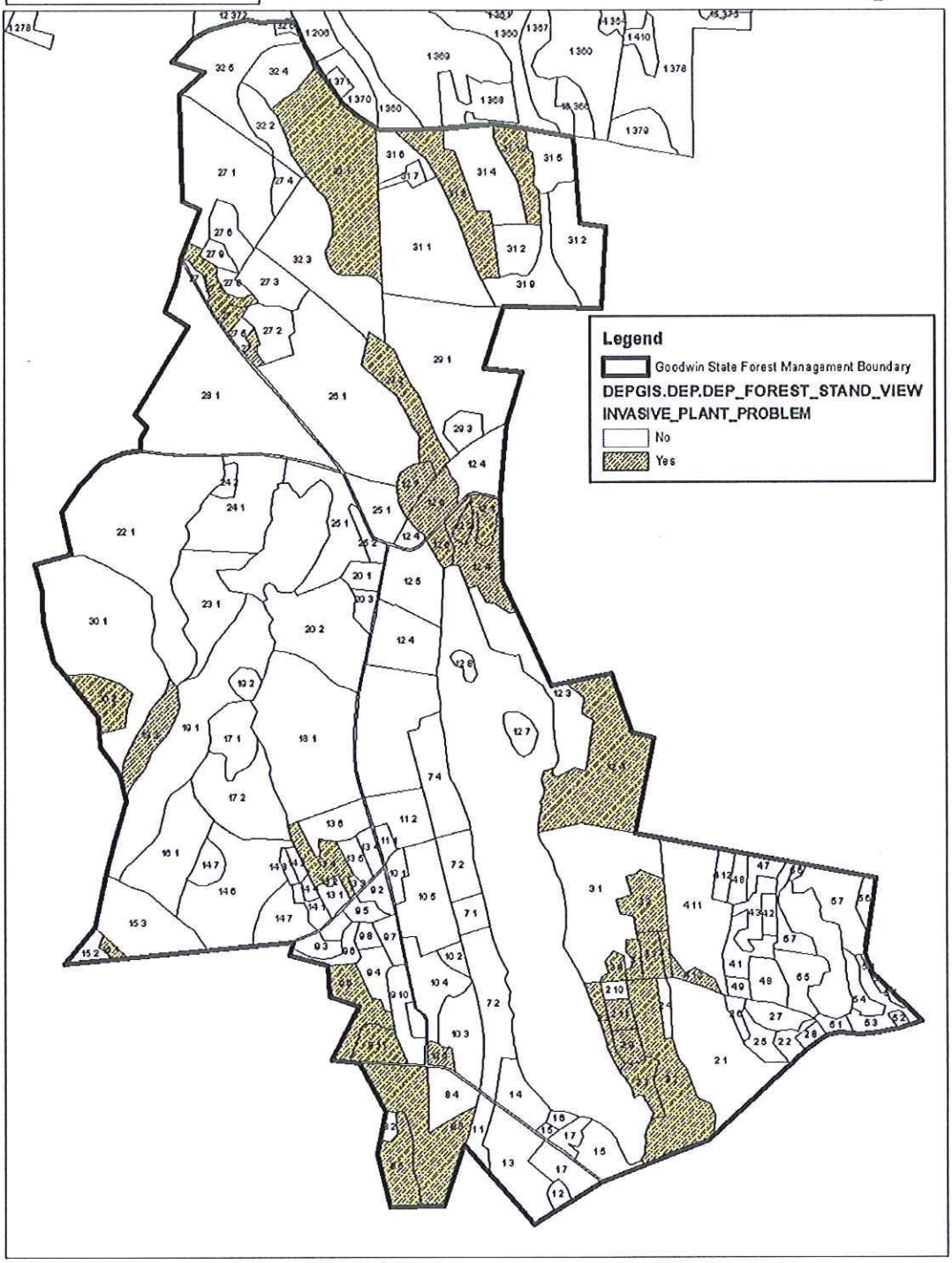
N
W E
S



Map H
James L. Goodwin State Forest
Invasive Plant Distribution

0 5001,000 2,000 3,000 4,000 Feet

N
W E
S



P. Comment

2/1/2012

Daniel,
Your plan looks great. Thanks for the tour yesterday.
Could you please add the following comment to the Goodwin Management Plan Review:

Any trail modifications will need to be reviewed by DEEP Parks, Forestry, Wildlife, Fisheries and The Friends of Goodwin State Forest Trails Committee.
Thanks,
Lori Lindquist
Park Supervisor
Mashamoquet Brook State Park Unit
860-928-6121

From: Starr Sayres [mailto:saystarr@snet.net]
Sent: Fri 1/20/2012 9:27 PM
To: Steve Broderick
Subject: Re: Goodwin State Forest Management Plan

Hi Steve,

Many congratulations! I'm sure you must be very pleased to now have a long range plan with which to direct your efforts. Short of reading the full plan, sometime, it would be of interest to to me see a summary of what has been proposed. I am imagining that other of your supporters might also be interested.

All the best to you,

Starr

On Jan 20, 2012, at 12:02 PM, Steve Broderick wrote:

Dear Friend of Goodwin,

I'm pleased to tell you that the Connecticut DEEP Division of Forestry has developed a new, 10-year detailed plan for the management of the Goodwin State Forest. This planning effort was overdue as a result of low staffing. We are delighted that the Forestry Division was able to get this accomplished despite very difficult circumstances. We look forward to seeing the plan implemented in the years ahead, and working with the Forestry Division to teach people about the forest management occurring out on the ground.

If any members of the Friends of Goodwin would like to see this plan and have a chance to comment, just send me an e-mail and I will e-mail you a copy. The Forestry Division would like to have comments by the end of January if possible.

Thanks for all you do. All the best,

Steve

Steve Broderick, Connecticut Forest & Park Association
Forester & Program Director
Goodwin Forest Conservation Education Center
Connecticut Department of Energy & Environmental Protection
23 Potter Road
Hampton, CT 06247
(860) 455-9534
(860) 455-9857 (F)
sbroderick@ctwoodlands.org
www.ct.gov/dep/Goodwin
www.ctwoodlands.org

Scott Matthies
177 Ridge Road
Chaplin, CT 06235
scottmatthies@charter.net

January 12, 2012
Re: Goodwin Forest 10 year Management Plan

Daniel Evans
State Lands Forester
Bureau of Natural Resources
Forestry Division

Dear Dan,

I am a member of the Chaplin Conservation Commission and Chairman of the Chaplin Inland Wetlands and Watercourses Commission. I am writing in support of the 10 year Management Plan for the Goodwin State Forest dated 12/28/2011 and agree with the nine Ten Year Goals as stated in the plan. I would like to reinforce or modify certain aspects of the plan:

- I strongly support utilizing variable width buffer strips to protect seasonal and perennial watercourses and wetlands from impacts associated with forestry operations as stated in the plan as this will help maintain water quality.
- I strongly support establishment of no-operation buffers to eliminate potential degradation of historical stone foundations located throughout the forest.
- As regards the Old Forest Management Site on the north facing, not south facing as stated in the plan, slope in Compartment 19 Stand 1: I highly recommend a no cutting policy and let nature take its course and in the distant future there will likely be a very unique forest stand. I've seen photographs of Tulip Poplars 13 feet in diameter from the early 1900's in eastern Kentucky. Today those trees don't exist and never will unless acreage is set aside. What would Connecticut's forests produce? Let these marketable mature trees continue to stand and see what results. A suitable acreage should be set aside to make this experiment viable. This stand

is a good candidate as it has shown to be able to survive without significant blow downs from hurricanes.

- Research- I support the research planned including the study on the American Chestnut in Compartment 10 Stand 5.
- I support the prescribed burns to maintain grasslands and recommend doing research with prescribed burns to control invasives, i.e. Japanese Barberry.
- I support the control of deer populations through hunting by citing CGS 26-3.
- As regards the silviculture plan, I would support, in addition to promoting a multi-age forest, promotion of increasing species diversity including trees which may not have a marketable value, but do increase overall biodiversity. Some forest stands should be managed without considering the economic value to be gained.
- I support the educational program which would provide GPS coordinates to "Specimen Trees" .
- I support the ongoing efforts to gate off access roads in hopes of reducing vehicular use and dumping of trash.
- Revenue from timber sales should go back into maintaining the state forest system rather than into the General Fund.

Sincerely,
Scott Matthies

Daniel,
The plan looks great. I would appreciate meeting with someone and seeing what needs to be done in 2012 regarding the eroison control and the causeway flooding on the Red trail going to Governors Island and also the 6 acre overstory removal in 2013 that parks will be assisting with.
Thank you,
Lori Lindquist
Park Supervisor
Mashamoquet Brook State Park Unit
860-928-6121

Hi Dan,

I have no further comments. Happy New Year !

Brian D. Murphy, Senior Fisheries Habitat Biologist
Connecticut Department of Energy and Environmental Protection
Inland Fisheries Division
Habitat Conservation and Enhancement Program
209 Hebron Road
Marlborough, CT 06447
Phone:860-295-9523
Fax: 860-344-2941
brian.murphy@ct.gov

Dan,

Great job with the plan. Very comprehensive, and it flows well. I know you are looking for some comments so here we go; take them or leave them....

It was still a little unclear to me how the additional acreage of Natchaug SF fit in with the Goodwin Plan. Are the management goals and objectives for Natchaug the same as Goodwin, will there be some cutting in Natchaug during this planning period? (this may be nit-picky it was something I was getting hung up on). I didn't see any distinctions between the areas, perhaps it's not necessary.

The maps. As an FYI I try and display the map feature as best as I can in a limited space. I think it would clean up the image if you deleted the title logo and legend etc and used the space to display the map. You can always add info with a caption if needed. I understand that by posting a complete map, you have an accurate figure that can be referenced but somewhere you have to weigh the view-ability against the writing formalities.... Just my opinion.

I like pictures to give the pages some life, don't know if you want to add some or not. I guess it's a personal choice.

Nice job explaining your plan to create the desirable stand conditions and so forth. Good luck fighting the invasives!

If I don't see you today, have an good Christmas and I'll see you next week.

Will

William Hochholzer
Forester 1
Department of Energy and Environmental Protection
Division of Forestry
209 Hebron Avenue
Marlborough, CT 06447

860-295-9523 ext 125

Dan -

Just a note to say thanks for the excellent job you did today presenting your draft plan to the Friends et al. The plan is well constructed and thought out, and your presentation was articulate and organized. This will go a long way towards effective cooperation between the Friends and the Division as we work together to implement the plan and educate the public in the process.

thanks again.

Best,

Steve

Steve Broderick, Connecticut Forest & Park Association
Forester & Program Director
Goodwin Forest Conservation Education Center

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(860) 455-9857 (F)
sbroderick@ctwoodlands.org
www.ct.gov/dep/Goodwin
www.ctwoodlands.org

Dan –
Thank you for the invitation. I do have another meeting at that time, but will confirm.

I will review the entire plan and provide my comments. For clarification the Goodwin Forest Conservation Education Center is operated by CT DEEP Division of State Parks and Public Outreach (we no longer have an "I&E Unit"). We contract with CT Forest and Park Association and have had a wonderful partnership with CFPA for a number of years and we hope that continues. We are in the process of amending our agreement with them for another 3 years.

Juan Sanchez is currently the naturalist and a seasonal employee. It would probably be best if you just have them contact the Center for more information.

Thanks for all your work on this. I will be in touch.

Sincerely,
Diane

Diane Chisnall Joy, Assistant Director
Division of State Parks & Public Outreach
Bureau of Outdoor Recreation
CT Department of Energy & Environmental Protection
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Hartford, CT 06106
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diane.joy@ct.gov
www.ct.gov/dep
www.NoChildLeftInside.org
www.facebook.com/CTStateParks

Hi Dan – Thanks for the opportunity to take a look at this plan. It looks good and I'm pleased to see that there is hope to utilize revenue from timber sale to invest in road system improvements. As always, Agency Support makes every attempt to assist all divisions in meeting their goals, and I'd look forward to working with the Forestry Division making improvements to the Goodwin State Forest. Mike

Hi Dan,

Can you provide us with a stand/compartment map for Goodwin? It would be very helpful in our review of the draft plan.

Thanks,

Ann

From: Huang, Min
Sent: Tuesday, November 15, 2011 4:22 PM
To: Kilpatrick, Ann; Dickson, Jenny; Kilpatrick, Howard; Rothbart, Paul; Wilson, Judy
Subject: RE: Goodwin State Forest Plan

Can we get a stand/compartment map that indicates where they are proposing to do work?

From: Kilpatrick, Ann
Sent: Tuesday, November 15, 2011 2:41 PM
To: Dickson, Jenny; Huang, Min; Kilpatrick, Howard; Rothbart, Paul; Wilson, Judy
Subject: FW: Goodwin State Forest Plan

Hi All,

Forestry (Dan Evans is a durational Forestry Technician that works out of the Eastern District Headquarters) is looking for our input on a new forest management plan for Goodwin State Forest (see below and attached). Here is our opportunity to discuss and provide input on any wildlife and habitat management issues and opportunities that we'd like to see addressed over the next 10 years.

If possible, please reply to all with any comments you may have by no later than December 9. If we feel we need to get together to discuss things further before meeting with Forestry, I will try to set up a time to get together.

Thanks,

Ann

Hi Dan,

Plan looks good, thanks much for sending along the requested map. The Inland Fisheries Division will continue to provide specific guidance during reviews of individual timber harvest plans within the Goodwin State Forest; however, the following technical guidance is provided to ensure the utilization and implementation of best management practices for all harvest operations. This includes:

1) Utilizing buffer strips along watercourses. It is the policy of the Inland Fisheries Division (IFD) that riparian corridors be protected with an undisturbed 100 ft. wide riparian buffer zone. A riparian wetland buffer is one of the most natural mitigation measures to protect the water quality and fisheries resources of watercourses. This policy and supportive documentation can be viewed on the DEEP website at: http://www.ct.gov/dep/lib/dep/fishing/restoration/riparianpolicy.pdf and http://www.ct.gov/dep/lib/dep/fishing/restoration/riparianpositionstatement.pdf.

2) Utilizing seasonal harvest restrictions in sensitive areas that contain steep slopes, wet and highly erodible soils.

3) Avoiding stream crossings if possible. Direct stream crossings should 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.

4) IFD would like to review any forest road maintenance projects that involve replacement of culverts. We review culvert replacement projects for fish passage needs. Stream crossing guidance can be found on the DEEP website:
http://www.ct.gov/dep/lib/dep/fishing/restoration/streamcrossingguidelines.pdf

- Minor edit, I've deleted the word introduced in the sentence for Pine Acres Lake description,

Pine Acres Pond – The Primary use of the 196 acre pond is sport fishing. The pond supports ~~introduced~~ populations of largemouth bass, yellow perch, brown bullhead, and sunfish.

Let me know if you have any questions.

Regards,
Brian D. Murphy, Senior Fisheries Habitat Biologist
Connecticut Department of Energy and Environmental Protection
Inland Fisheries Division
Habitat Conservation and Enhancement Program
209 Hebron Road
Marlborough, CT 06447
Phone:860-295-9523
Fax: 860-344-2941
brian.murphy@ct.gov

Q. Glossary

This glossary contains a list of commonly used forestry terms.

- **abiotic factors** The non-living components that make-up or interact with a community or ecosystem.
- **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.
- **aesthetics** The science or study of beauty, as well as the theory or understanding of the perception of the environment by all the senses.
- **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.
- **association** A naturally occurring collection of plants and animals with similar needs for sunlight, warmth, moisture, shelter, and nutrients growing together. They function together to cycle energy, nutrients, and water; also called a community.
- **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 area's 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.
- **biotic factors** The living components of a community or ecosystem.
- **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.
- **Clean Water Act** A Federal Law passed in 1972 and since amended, designating forests and silvicultural activities such as logging as nonpoint sources of water pollution. To comply with the Act, most states have established Best Management Practices to control erosion and sedimentation, stream warming, and movement of nutrients into forest streams.

- **clearcutting** An even-aged silvicultural technique involving the removal of all stems in the stand. Strip cutting is a form of clearcutting.
- **commercial treatment** Any activity producing forest products that have at least enough value to cover the direct costs of the activity.
- **conifer** Trees, mostly evergreens, bearing cones and needle-shaped or scale-like leaves.
- **corridors** Corridors are usually linear patches or connections between similar patches, that differ from the elements on either side. Corridors can function as habitat for some species (especially species that live in edge habitats), serve as conduits or routes of movement between patches, or act as barriers to movement across the matrix.
- **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.
- **crown** The part of a tree or woody plant bearing living branches and foliage.
- **cubic-foot volume** The amount of wood products expressed as the number of cubes 1 foot wide by 1 foot long and 1 foot high that are in a log or stem.
- **cumulative effects** An effect initiated by an event that was tied in time or space to other events (e.g., one straw broke the proverbial camel's back, but only because many straws had already been piled on). Cumulative events can be additive (e.g., straws on the camel's back) or compounded (involving more than one process). For example, increased frequencies of high flood events, debris torrents, and dam-break floods can adversely affect aquatic habitats and bury low-gradient stream reaches in debris. The occurrence of such events are not only due to severe storm conditions but to the effects of land management activities such as timber harvesting practices, road density, construction and maintenance standards, and conversion of land cover from forests to other land uses.
- **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 4-1/2 feet above ground level. It is measured on the uphill side of the tree.
- **dead and down material** Any dead branches, tree trunks, or stumps that are on the ground.
- **den tree** A living tree that has holes in the trunk, or stem, from broken branches and decay, or hollow trunks; a cavity tree.
- **diameter class** An interval of sizes of trees or logs; or the trees and logs themselves that fall into such an interval.
- **dieback** The death of branch tips and loss of foliage in the upper and outer areas of tree crowns. Trees usually recover in several years by producing new branches. Various damaging agents can cause tree crowns to die back.
- **disease** Any departure from the normal functioning of a plant caused by some type of persistent damaging agent.
- **drought** A period of dryness that is associated with low soil moisture and inability of plant roots to obtain adequate water for growth. Droughty conditions often predispose trees to other problems that also cause damage.

- **escape cover** The cover used to avoid a predator or other danger.
- **evapotranspiration** The conversion of water into water vapor which is then released into the air. The water can pass from plants (usually leaves) into the air or be evaporated from open water or the soil. Plants convert water to vapor to cool the surface of leaves.
- **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 age-class (10-year-old stand, 40-year-old stand) or broad size-class: seedling stand (most trees are <1 inch d.b.h.); sapling stand (trees 1-4 inches d.b.h.); poletimber stand (trees 5-10 inches d.b.h.); and sawtimber stand (trees > 10 inches d.b.h.).
- **even-aged system** A planned sequence of treatments designed to maintain and regenerate a stand with one age class.
- **felling** Cutting or uprooting standing trees, causing them to fall to the ground.
- **forest** A plant association characterized by trees and other woody vegetation, growing more or less closely together. Also, a group of stands under one ownership or manager. Forest management includes silviculture, and also involves activities such as road construction, fire protection, pest management, regulating the cut of timber products, maintenance of wildlife habitat conditions, inventory, boundary maintenance, and recreational and aesthetic planning.
- **forest benefit** Any of the things that you receive from a plant community dominated by trees that increase the community's value to you. These things may include beauty, solitude, biological diversity, habitats for species of special concern, water quality or quantity, wildlife, wood products, and income.
- **forest community** A naturally occurring collection of plants dominated by trees, and the animals associated with them, that have similar needs for sunlight, warmth, moisture, shelter, and nutrients growing together. They function together to cycle energy, nutrients, and water.
- **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.
- **forest developmental stage** The age, condition, and degree of maturity of a forest community. For example, even-aged stands develop from seedlings to saplings to poles to large diameter trees, and the community changes as the trees grow. Uneven-aged stands have at least three different developmental stages in each stand.
- **forest health** The condition of a community of trees in relation to past, present and potential effects of damaging insects, diseases, abiotic factors, wildlife and human activities.
- **forest opening** An area where trees have been or will be absent from the plant community.
- **fungi** Organisms that reproduce by spores, and are not able to produce their own food. Fungi obtain nutrients from other living or dead organisms.
- **geographic range** The area, or region, where a native species occurs naturally.
- **groundwater** Water found in unblocked pores and fractures in bedrock and other geologic material. Groundwater can occur in soils that are permanently saturated. Groundwater may be

held in place for long periods of time or move slowly down slope by gravity. Groundwater is usually obtained from wells and may contribute to streamflow by surfacing at lower elevations.

- **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.
- **growth loss** A reduction in expected height and/or diameter increase. Many factors influence tree growth including available growing space, water, nutrients, amount of shading, and effects from damaging agents.
- **hardwoods** Woody angiosperms, broadleaf trees, that are distinguished from softwoods (gymnosperms) by the presence of vessels in the wood and broad leaves; hardwood is the wood of broad-leaved trees.
- **herbaceous plants** Plants with non-woody stems that normally live only one growing season. Herbaceous perennials have persisting root systems or other underground structures such as bulbs. These plants can sprout stems each growing season for several years. In forest understories, these include wildflowers and ferns.
- **herbicide** Any chemical preparation used to kill or inhibit the growth of certain plants, particularly herbs, or their spores or seeds. This term generally includes arboricides which are specific for trees and other woody plants.
- **home range** The area in which an individual animal normally confines itself to obtain food and cover.
- **horizontal diversity** The degree of complexity of the arrangement of plant and animal communities, and other habitats across a large area of land.
- **hydrologic function** The ability of vegetation, soils, and bedrock to accept rain water and snowmelt and convert it to soil water, runoff, groundwater, or evaporation. The hydrologic function in well established forest communities is excellent and provides a maximum opportunity for storing moisture and minimal overland flow.
- **hydrology** The study of the movement and storage of water in the natural and disturbed environment. Also, the condition of the water resource at some specified point in time.
- **improvement cut** A cut in an uneven-aged stand, designed to upgrade the quality or species composition. No rotation age is specified for uneven-aged stands. Instead, a very general maximum tree size is chosen, and residual stands after cutting are defined by maximum tree size, stand density, and stand structure - diameter distribution, proportion of sawtimber, etc.
- **insect** Insects associated with forests are represented by numerous species, and have a wide range of ecological roles. Most insects do not damage trees, but some do. They eat leaves, suck sap, bore through bark and wood, and introduce microorganisms that cause diseases.
- **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 product** Any wood product recovered from intermediate treatments.
- **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.
- **landing** A cleared area in the woods where logs are gathered to load onto trucks for shipment to a processing plant. Usually, it is along a road.
- **landscape elements** The basic, relatively homogeneous ecological elements or units, whether they are of natural or human origin. Examples include forests, rivers, fields, roads, wetlands, hedgerows, lakes, and farmyards.
- **leaf litter** Fallen organic matter including recognizable leaves, needles, branches, bark, and stems, that accumulate on the forest floor. Leaf litter protects the underlying organic and mineral soils against the impacts of raindrops. It prevents erosion and promotes rapid infiltration of rain and snowmelt into the soils.
- **logging** The felling and removal of logs and other wood products from forest stands.
- **lop** Cutting branches of trees that are standing, felled, or fallen.
- **maintenance costs** Costs that are associated with owning and caring for a piece of land. They include taxes, and upkeep of other resources such as roads.
- **management unit** A group of forest stands managed as a unit to provide a single package of benefits.
- **mast tree** A tree that produces nutlike fruits such as acorns, beechnuts, hickory nuts, seeds of certain pines, cherries, apples, samaras. Hard mast include acorns, beechnuts, and hickory nuts. Soft mast include 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.
- **mature tree** A tree that has reached the age where its growth declines or decay begins to increase. Also, a tree is mature when the benefits begin to decline, as in its ability to produce mast or the value of its wood.
- **mortality** The death of trees. In forests, it is a normal process that occurs when trees are old, crowded, or when they have been severely damaged by some agent. Mortality of some trees offer benefits to remaining trees and to wildlife. However, extensive mortality in a forest interferes with its expected development and desired uses.
- **native plant** A species that naturally occurs in a given location where its requirement for light, warmth, moisture, shelter, and nutrients are met.
- **natural forces** The factors that influence the development of a forest, including the soil, climate, and damaging agents.
- **NED** A computerized decision support model developed by the US Forest Service for forest managers to provide assistance on integrated resource management. NED is a tool to incorporate wildlife habitats, visual and scenic qualities, wood production, water quality and quantity, and

ecological aspects in forest planning and development of silvicultural treatments. In early versions of the software, including NED/SIPS and NED-1, the NED acronym was rooted in the concept of a "Northeastern Decision Model". As the geographic scope as well as our set of collaborators expanded, the name has remained but with expanded applicability that includes the temperate forest zone of the eastern United States.

- **NED/SIPS** NED/SIPS was the initial product of the development of NED. The computer program, subtitled Stand Inventory Processor and Simulator (SIPS), provided an effective means of creating, managing, and analyzing forest inventory records at the stand level. Its user-friendly interface relieved the pain of entering and editing stand inventory data, and once data are entered, a host of analytical tools were available to help understand the data. A variety of reports could be generated describing the vegetation structure, timber value, and economics of the stand. The user could apply any of a set of standard treatments to the stand or design a customized cutting scheme, and utilize one of the four incorporated stand growth simulators to show what the stand may look like in the future. Major SIPS features included access to four growth and yield simulators using the same data file format (NE TWIGS, SILVAH, OAKSIM, and FIBER), overstory summary tables for common measures of stand characteristics (i.e. density, species composition, volume, etc.), and economic analyses of incomes and expenses over the planning horizon.
- **net present value** The gross value minus costs at one point in time, generally the present.
- **non-commercial treatment** Any activity that does not produce at least enough value to cover the direct costs of that treatments.
- **nonpoint source pollution** Pollution that stems from a source that is spread out over the land. Nonpoint sources include runoff from silvicultural treatments, agricultural activities, waste water management and some construction activities. The actual pollutants may vary considerably.
- **nutrient** Elements, and other chemical substances, that enhance biological activity. Nitrogen, phosphorus, potassium, and sulfur are some of the nutrients necessary for plants to grow.
- **old growth** A forest community that is very old, generally with several age classes older than 80 years.
- **outbreak** Unusually large populations of insects or diseases that cause damage. Outbreaks vary in size, frequency and duration depending on the particular insect or disease and environmental conditions.
- **overland flow** The portion of rain or snowmelt that flows over the surface until it reaches a stream channel. It is not absorbed by the soil. Overland flow in forests is rare unless leaf litter and organic horizons of the soil have been severely disturbed or mineral soils have been compacted.
- **overmature** A stage in a tree's life when it has declined in vigor and is no longer growing due to old age.
- **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).

- **peak water flow** The instantaneous maximum flow of water, often occurring as the result of an intense storm, snowmelt, or a combination of both.
- **pest suppression program** A collection of methods used by forest managers to control outbreaks of damaging insects and diseases. These methods usually involve aerial spraying of pesticides or biological materials to reduce pest populations and minimize damage to the forest resources.
- **photosynthesis** The formation of starches and other carbohydrates from carbon dioxide, water, and sunlight in cells containing chlorophyll, or green colored cells in plants.
- **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.
- **pollutant** A resource out of place.
- **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.
- **prescription** The specific instructions for controlled applications of silvicultural treatments based on information about the stands to which they apply.
- **quarantine regulation** Federal, state and local laws that restrict the movement of plants or their products that may contain or promote damaging insects and diseases. These restrictions are intended to limit the spread of pests outside their current range.
- **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 uneven-aged techniques; single-tree selection and group selection.
- **relative density** An index of crowding for forest stands, also called the tree-area ratio; a measure of the absolute stand density expressed as a ratio to the density of some reference level. The reference level is usually the stand density of a fully stocked stand for a particular species composition, site, and method of treatment.
- **residual spacing** The distance between trees that remain in the forest after a silvicultural treatment.
- **resting cover** The cover used when animals are roosting or sleeping.
- riparian area The area where the transition between streams, or other bodies of water, and forest vegetation occurs. Riparian areas usually have unique plants, animals, and soil characteristics. The boundaries of riparian areas are not always clearly defined. Riparian areas require special care to protect the quality and habitats of streams.

- **roost** To sit, rest, or sleep on a pole, tree, or protected place on the ground. Roosting is a term used mostly in reference to birds.
- **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 pole-sized tree. Size varies by region, but a sapling is usually taller than 6 feet and between 1 and 4 inches in dbh.
- **sawlog** A log suitable in size and quality to be milled in to lumber of any size. Usually sawlogs are at least 8 inches in diameter after the bark is removed.
- **sawtimber** Trees large enough to be cut into sawlogs.
- **scale** A reference to the relative size of things. Or, size in comparison with its environment, a human figure, or the landscape. The human scale, or the size of people, is a standard reference for the size of all things in our culture.
- **scenic quality** The positive and negative visual characteristics of the natural landscape.
- **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.
- **semi-woody plant** Plants with stems that reach nearly full size and become somewhat woody in one growing season; subshrubs. They commonly grow additional shoots but not additional layers of wood in following years. Such stems normally live only a few years, and are replaced by new stems growing from a persistent root system. These include brambles.
- **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 re-established. 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.
- **site conditions** The site conditions representative of a stand are sometimes designated by soil factors (parent material, texture, drainage, or soil series), or by direct measurements such as site index - the height of the dominant/codominant trees at a base age of usually 50 years.
- **skid trail** A path or minor road in the woods that is followed when skidding logs from the stump to the landing.
- **skidding** The act of moving felled logs from their stumps to a landing by dragging or sliding.
- **slash** Branches, twigs, and leaves of trees left on the ground after a treatment.
- **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.
- **soil properties** The combination of chemical and physical factors which influence the movement of moisture into, through, and out of soils. Examples include infiltration capacity, porosity, bulk density, soil depth, and water-holding capacity.
- **soil water** Water held between soil mineral and organic particles. This water is susceptible to evaporation, plant uptake, lateral flow into streams, and downward flow into groundwater.
- **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.
- **species diversity** The number of different plants and animals, and other life forms, coexisting in a community.
- **species richness** The number of different species present in an 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.
- **stewardship** The wise management and use of forest resources to ensure their health and productivity for the future with regard for generations to come.

- **stocking** A subjective indication of the number of trees present on a stand compared to the optimum number for your desired outcomes expressed as a percentage.
- **stream flow** Flowing surface water formed by a combination of precipitation intercepted by the stream channel, and moisture passing over or through soils and bedrock. Stream flow is generally confined to a well defined channel, except during flooding or in exceptionally flat topography.
- **stream warming** The heating of stream water by sunlight. The forest canopy covering streams can be managed to either protect against or encourage stream warming.
- **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.
- **sustainable** The indefinite and steady supply of something.
- **terrestrial** Of or pertaining to the land as distinct from air or water.
- **territory** A defended area in the home range of an animal, particularly during the breeding season.
- **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.
- **thinning interval** The period of time between successive thinning treatments, usually used in connection with even-aged stands.
- **threatened and endangered species** Plant or animal species with limited abundance and distribution and in danger of disappearing due to lack of suitable habitat and/or other factors.
- **travel cover** The cover that allows animals to move from one area to another without being detected.
- **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.
- **uneven-aged system** A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.
- **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.
- **virus** Microorganisms that are not able to produce their own food. They obtain nutrients from other living or dead organisms. The study of tree viruses is relatively new, but several have been identified. They infect leaves or roots, and may contribute to tree death.
- **visual and scenic qualities** A category of aesthetic factors associated with forests that includes qualities like big tree appearance, plants with special characteristics, permanent openings, and concern for the visual effects of disturbance and slash after treatments.

- **visual quality** The positive and negative visual characteristics of anything you see.
- **warm-water fish** Fish are tolerant of high water temperatures often found in larger bodies of water, such as rivers and lakes. An example is large-mouth bass.
- **water quality and quantity** A category of factors associated with forests that includes intensive protection of water quality, riparian areas, wetlands, and fisheries; and the amount of water that flows from the forest.
- **water yield** The distribution and total quantity of runoff, usually considered over some specified period of time. Water yield may be characterized by total volume of runoff and flow duration curves.
- **watershed** An area of land through which precipitation is redistributed into components of the hydrologic cycle, including evaporation, groundwater, and streamflow. A watershed is all the land giving rise to streamflow at a selected point in a stream channel; the area drained by a river or stream and its tributaries.
- **wetland** In the absence of a single, universally recognized definition, a wetland is a land/water ecosystem characterized by periodic inundation. The soils developed under the influence of saturation. It supports plants and animals adapted to these conditions.
- **wildlife cover** Hiding places that provide animals with protection from weather, predators, or other dangers. Specialized types of cover include breeding cover, escape cover, resting cover, and travel cover.
- **wildlife habitat** The combination of environmental factors, such as food, water, cover, and their spatial distribution that a given species needs to survive and reproduce in a given area. Each species has unique habitat requirements.
- **wildlife pest** Animals that cause excessive damage to trees by eating leaves, twigs, buds, bark, or roots.
- **woody debris** The larger woody branch and stem wood (greater than 1 inch in diameter) that has fallen either naturally or as a result of logging. Woody debris in water is an important layer for aquatic organisms and a source of shelter for fish.
- **woody plants** Plant species with persistent stems capable of growing an additional sheath, or layer, of wood and bark each year for the life of the plant. These include trees, shrubs, and woody vines (grapevines).