

STATE OF CONNECTICUT

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION



Bureau of Natural Resources Division of Forestry

FOREST RESOURCE MANAGEMENT PLAN

2012 through 2022

Cockaponset State Forest

Candlewood, Cedar Swamp, Killingworth, Maromas, Ruth Hill, Turkey Hill,
Westwoods and Winthrop Blocks

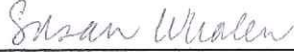
16,696 acres

Chester, Clinton, Deep River, Durham, Guilford, Haddam, Killingworth, Madison,
Middlefield, Middletown, and Westbrook

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Division of Forestry
12-26-12
Date


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A. Executive Summary

The Forest Management Plan is a guide that describes the forest resources and upcoming management activities of a particular forest area. It establishes goals and objectives that the Division of Forestry will strive to achieve and explains why much of the forest is being actively managed. The following brief description of the landscape and management approach is included to provide appropriate context.

Cockaponset State Forest is located in south-central Connecticut in eleven towns, eight of which border the western shore of the Connecticut River or the Long Island Sound. Most of the forest is within Middlesex County with a small amount located in the New Haven County. The forest is situated in the Essex, Deep River, Clinton, Guilford, Durham, Middletown, Middle Haddam and Haddam USGS Quadrangles.

- Second largest state forest (16,696 acres)
- Cornerstone of the forest landscape in south central Connecticut and the proposed Menunketesuck-Cockaponset Regional Greenway.
- The plan provides a landscape approach to forest management that takes into consideration the condition and management of adjoining private, municipal, land trust, and water company forests.
- A collaborative effort with Regional Planning Agency, UConn Extension Forester and DEEP Private Lands Forester to present a landscape approach of forest stewardship to local Conservation Commissions.
- Assessment - The forest analysis indicates that most of Cockaponset's individual forest stands are in a healthy condition.
- **Key Challenges**
 - Several disturbance dependent ecosystems and individual species (pitch pine, oak, aspen, New England Cottontail, etc) are not sustaining themselves under current natural conditions.
 - Aquatic environment being impacted by sediment produced from unmitigated stream crossings used by legal and illegal forest users.
 - Invasive plants are entrenched in a few forest stands and have a foothold in several other stands.
 - Public outreach to solicit public input into plan.
- **Opportunities**
 - A natural disturbance model of management that includes heavy harvests and occasionally prescribed burns on a relatively small portion of the forest during each management period could help halt the downward trajectory of some under-represented upland ecosystems and fauna populations.
 - Plan includes projects to reduce sediment loading in aquatic environment including road gating or blocking, bridge building, road upgrades and stream crossing improvements.
 - Plan provides an opportunity for public outreach that includes:
 - Informing towns that draft plan will be on Forestry's Web Site for public comment.
 - A list-serve of interested public to inform them of on-going forestry operations.

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Cockaponset S.F. Management Plan 2012-2022

- Presentations to Conservation Commissions of area towns of Forest Resource plan's goals and proposed bio-indicators and soliciting Commissions' input and any alternative indicators.
- **Vision** – The desired future condition is a forest with healthy, diverse, and sustainable ecosystems.
- **Goals**
 - To promote biological diversity. Efforts will concentrate on under-represented upland ecosystems and plant populations that are not adequately sustaining themselves under current conditions.
 - Maintain or improve aquatic system integrity.
 - To promote healthy and sustainable forests.
- **Indicators** (attributes monitored to determine whether the plan's goals are being met).
 - **Sustain oak forests** - Release 50 oak or hickory saplings per acre 5 years after regeneration harvests
 - **Sustain Pitch pine ecosystem** – Expand and release pitch pine regeneration after regeneration harvests.
 - **Provide Early Successional habitat** – Regenerate 10% of active and inactive forest
 - **Retain Late Successional (LS) structure** – Retain an average five large (>16" in diameter) legacy, den or rotten trees/acre. Retain snags, coarse woody materials and provide heterogeneity by creating variable sized gaps in the forest canopy and retain uncut patches in harvest areas.
 - **Provide for LS Forest** – Maintain 20% of forest for old forest values with passive management.
 - **Minimize Stream Sedimentation** – Gate more roads unsuitable for public vehicle traffic, stabilize more stream fords on woods roads, and have more bridges at stream crossings on trails at end of plan period.

B. Scope of the Plan

History - Cockaponset is reportedly named after a Native American chief who was buried in the Ponset section of Haddam. Pattaconk, the name of a brook and reservoir in the forest, also has Native American roots. It was the native name for a round hill in Chester that was shaped like a wigwam and where natives had a fortified village.

The Cockaponset Area was at the confluence of several Native American tribes. The Mattabesetts occupied the Middletown area, the Wangunks the Haddam area, The Hammonasetts in Madison, Clinton and Killingworth and the Menunkatucks in Guilford. The Guilford and Madison Areas was at one time the eastern extent of the territory of the Quinnipiacs, the English name for the “Eansketambaug” tribe which means the original people in the Algonquian language. After treaties with the English settlers, the Quinnipiacs had reservations on West Lake in Guilford and on the East River in Madison.



The land appears to have been originally used primarily as a source of wood and for pastures since European settlement. Trees with large low branches or stubs (picture left) indicate that the tree once grew out in the open probably when the land was pasture. Numerous stonewalls are indicative that part of the forest was cleared, at least in the vicinity of the walls, for agriculture. Cellar holes off Jackson and Gladwin (Haddam), Little City (Killingworth) and Opening Hill (Madison) Roads in the forest were probably once farm buildings surrounded by farmland. As agriculture declined and pastures were abandoned, the forest reclaimed the cleared land. The Cedar Swamp was divided into long, narrow parcels for settlers to have access to the Atlantic White Cedar, which was valued for its rot resistance lumber and fence posts. A sawmill and grist mill operated on Beaver Meadow Brook in the forest. The craft of making barrel hoops from shaved saplings, called Hoop poles, was practiced in an old settlement near Hoopole

Hill in Chester. Charcoal was produced from wood throughout much of the forest as witnessed by remnants of charcoal mounds and the chimneys of collier huts (picture left).

Quarries for flagstone and curbstones operated near Pine Ledge and for quartz in Haddam. A railroad spur was built to a quarry near Lost Lake in Guilford.

The state started purchasing land for a state forest in 1926. The original intent of the state forest system was to provide an example of good forest management and to provide the citizens of the state a source of the wood products. Cockaponset became the ninth state forest and is the State's second largest.

In the 1930's, the Civilian Conservation Corps operated Camp Filley (Haddam), Camp Hadley (Madison) and Camp Roosevelt (Killingworth, now part of Chatfield Hollow State Park). The

campers employed about two hundred young men each during the Great Depression to work on conservation projects including road building, tree planting, thinning and pruning forest plantations, cutting firewood, building recreation areas, and firefighting.

Fires have not been substantial since public ownership. One fire burned 245 acres of the Turkey Hill Natural Area and some of the surrounding forest in 1932. Most fires that have occurred since have been small. Other forest disturbances include the Chestnut blight, 1938 hurricane, gypsy moth defoliations, and the hemlock woolly adelgid infestation. They altered the forest and promoted a thick new generation of birch, beech, and maple. Forest fires have historically controlled the proliferation of these thinned bark species but fire is currently insignificant in the landscape. Hemlock woolly adelgid added some important complexity to the forest structure with the addition of snags, large down wood and created gaps in the canopy. Some hemlocks appear to have regained some of their vigor.

Landscape - Cockaponset is part of a forest landscape which is more or less bounded by the trap rock ridge east of Interstate 91, the Interstate 95 corridor, and Route 154. It crosses the I-95 corridor and almost touches Long Island Sound in Guilford. It crosses Route 154 in the Maromas section of Middletown and almost touches the Connecticut River. The forest and surrounding landscape is within the Southern New England Coastal Hills and Plain Section as delineated by the U.S. Forest Service's National Hierarchical Framework of Ecological Units. The landscape, which mostly contains low and some medium density housing, is fairly rugged with relatively continuous forest. Small housing developments, town centers, and denser development on the peripheries account for some forest fragmentation. Important farmland occurs in the valley east of the trap rock ridge in Middlefield, Durham, and North Guilford. The forest landscape in the vicinity of the state forest and the other largest land holdings has substantial amounts of valuable core forest. Core forest is defined, for the purposes of this plan, as continuous forest that is at least 300' from other land uses including residences, farm land and paved roads.

Most of the forest is within the proposed Menunketesuck – Cockaponset Regional Greenway which connects Long Island Sound at the mouth of the Menunketesuck River on the Clinton / Westbrook Boundary to the interior forests north to Haddam. The connection from the shore provides an important pathway to interior forests for migratory birds.

Ecosystem and Landscape level Management Overview - Substantial amount of the forest landscape (over 30,000 acres combined out of approximately 174,212 acres) is owned by the South Central Regional Water Authority, Connecticut Water Company, the Hammonasset Fish and Game Club, land trusts, the towns of Guilford, Madison and Middletown, Haddam Land Trust, State of Connecticut (Parks and Wildlife Management Areas) and Northeast Utilities. Many of these properties adjoin Cockaponset and effectively extend a protective buffer to the forest (and vice versa). When combined with Cockaponset, over 50,000 acres or 28% of the area of the 11 towns of the Cockaponset landscape (minus Haddam Neck) is owned by these large landowners.

In conjunction with the "*Community Engagement and Landscape-level Approaches to Forest Stewardship*" Grant being administered by UConn Cooperative Extension, these landowners and abutters to large landowners have been contacted to find out their management goals, forest

retention plans and management activities. From the large landowner query, it has been ascertained that only one other large landowner in the landscape is utilizing even-aged management or restoring a significant amount of early successional forests or young forest habitat. This is corroborated by the [US Forest Service 1998 Forest Inventory Analysis](#) (page 2) which indicates that young seedling/ sapling forests is severely underrepresented with it occupying only 5% of the state's forest (page 2). It is probable that there are fewer acres in young forest now (14 years after the inventory) as the trend is for young forest habitats to outgrow their usefulness quickly and are not adequately being replaced. This infers disturbance dependent ecosystems are probably not being adequately sustained in the landscape. Management of strategies on Cockaponset will take into account the trend and current condition of the rest of the landscape.

Forest management in Cockaponset State Forest emphasizes promoting upland ecosystems that are not sustaining themselves under current conditions. Native Americans had once helped sustain several disturbance dependent ecosystems for millennium with the relatively frequent and widespread application of fire ([Historic fire frequency map](#)). These ecosystems will be promoted



by providing similar disturbances that have historically sustained them as part of a natural disturbance model of management. Some ecologists view aboriginal management activities (including their use of fire) as part of the historic natural disturbance regime of an area. Since reintroducing widespread fire is not practical in this landscape, forest management will be tailored to sustain these ecosystems by tending the forest with judicious cutting of trees and limited application of controlled fire. Pitch pine ecosystems are prime example of ecosystems that have historically been perpetuated by fire and are not sustaining themselves under current conditions. It is estimated that 95% of Connecticut's pitch pine/scrub oak

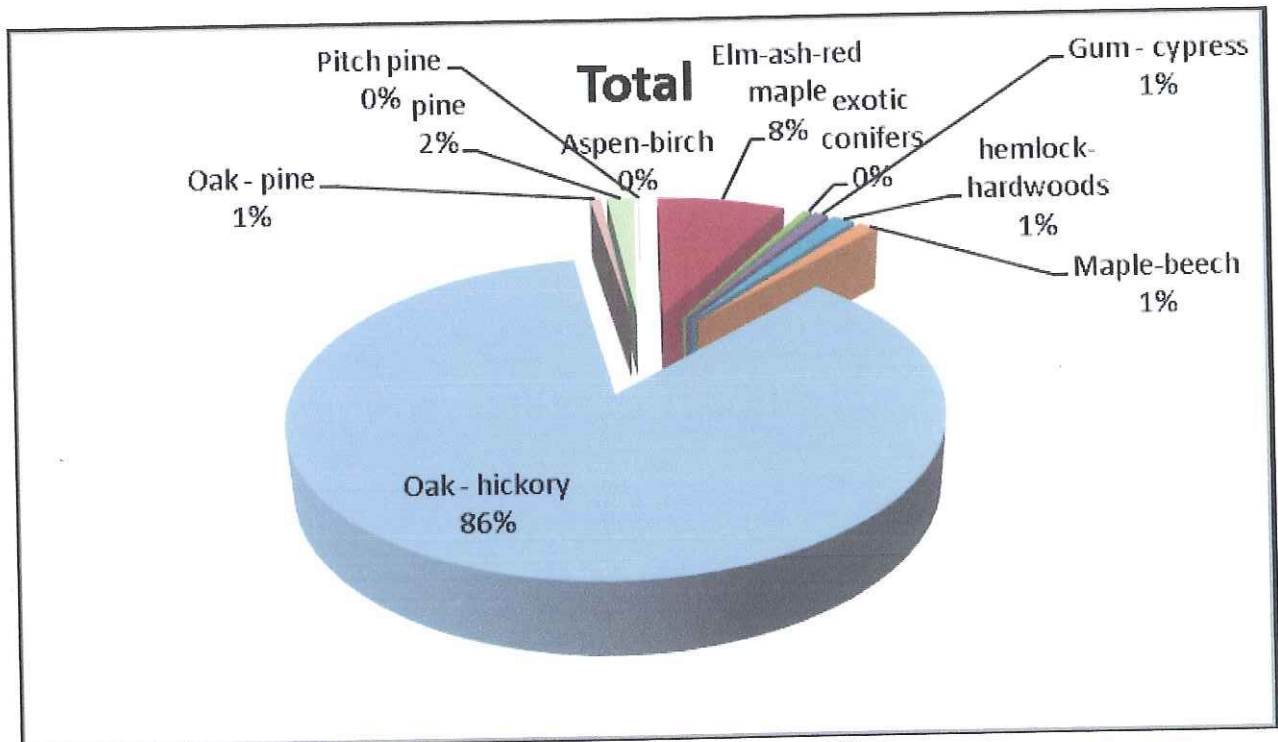
sand plains, one of Connecticut's 13 imperiled ecosystems, have been lost to development (Metzler, K.J. et al.) and the rest is threatened by succession. Pitch pine has only been sustained (see picture) in Cockaponset with prescribed burns and/or harvests that exposed mineral soil during a pine seed year to create a favorable seed bed for pitch pine germination.

C. Acres and Access

Acres -	Land Use Type
Forest	16,308
Field	36
Water	72
Open swamp	147
Power lines	113
Developed	19
Total	16,696

Forest Management Status

Active	8560
Natural area	81
Old forest	3229
Inaccessible	661
Inoperable	1786
Inactive	2103
Recreation	14
Wildlife*	262
Total	16,696

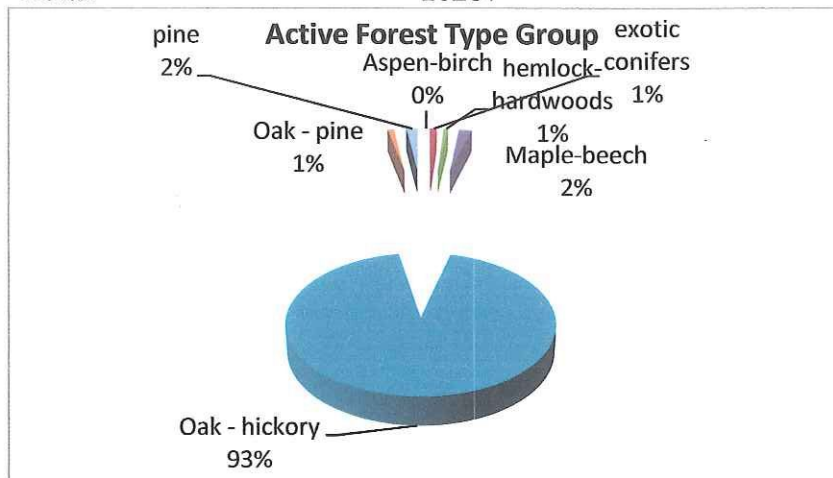


Percent of Each Forest Type Group Regardless of Management Status

* Consists mainly of flooded marshes, fields, and early successional habitat under power lines. The latter is not managed by the Wildlife Division

Cockaponset Forest Type Group (Active, Reserve, Old Forest, Inaccessable, Inoperable, & Inactive)

Aspen-birch	3
Elm-ash-red maple	1281
exotic conifers	88
Gum - cypress	145
hemlock-hardwoods	232
Maple-beech	200
Oak - hickory	13947
Oak - pine	114
pine	272
Pitch pine	5
Total	16287



Active Forest Type Group Acres

Aspen-birch	3
Exotic conifers	88
Hemlock-hardwoods	60
Maple-beech	175
Oak - hickory	7984
Oak - pine	90
Pine	160
Total	8560

D. Special Use Areas

Lakes, Ponds, & Streams – Pattaconk Reservoir is the only major pond within the forest that is owned by the state. Turkey Hill Reservoir is surrounded by the forest but owned by the Connecticut Water Company. The forest bounds Lost Lake (Guilford) and Shailer Pond (Chester and Deep River). Numerous beaver ponds have developed throughout the forest. Water Protection for fire access is available from Shailer Pond and Pattaconk Reservoir.

The forest is the headwaters of several streams including Pattaconk Brook, Dark Hollow Brook, Great Brook and Swain Johnson Brook. Part of the forest borders the Neck River, Menunketesuck River, Bunker Hill Brook, Sumner Brook, Pole Bridge Brook, Deep River and Beaver Meadow Brook.

Cultural Sites – The only known old farm structure sites are the house foundation and well, deep in the woods on the north side of Little City Road in Killingworth and cellar holes on Jackson Road and Gladwin Road in Haddam and Opening Hill Road in Madison. The foundations and chimneys in the CCC camps in Madison and Haddam are still evident. Numerous charcoal mound and chimneys from colliers' huts dot the forest. Remnants of a dam and mill site are found on Deep River and Beaver Meadow Brook. Pattaconk Reservoir probably was originally constructed to provide a summer water supply for powering mills downstream. Ice was reportedly harvested from the reservoir in the past.

Recreation – Pattaconk Reservoir Recreational Area with its unprotected swimming area and trail head is the main recreation site in the forest. Pattaconk Reservoir area also has four youth group camping lean-tos. There are 9.3 miles of Connecticut Forest and Park Association maintained blue blazed trails for hiking. There are numerous other trails. The Quinimay Trail, maintained by the Westbrook Bridle Conservancy, is a north south trail that traverses the heart of the forest from Westbrook to Haddam. The Cockaponset Enduro is the only sanctioned dirt bike event though it did not take place in 2011. The forest also provides hunting, fishing, and wildlife viewing activities.

Natural Areas - The forest contains the Turkey Hill Natural Area which is left in an unmanaged condition by legislative action in 1926. The Connecticut Agricultural Experimental Station (CAES) located in New Haven, established permanent research plots on these sites in 1926 and 1927 to study the relationship between soil type and forest composition. These plots have been inventoried every decade except the 1940's, and is established as one of the oldest and largest sets of permanent plots in eastern hardwood forest. No harvesting is permitted in the natural areas or within a two chain (132 feet) buffer strip of the research plots. Information regarding the changes tracked in these forest stands can be obtained by contacting the CAES by using the following link; <http://www.ct.gov/caes>.

Old Forestland Management Site – Almost 20% of the forest will be managed passively to allow late succession forests and their attributes to develop with limited intervention. When combined with areas with other limitations, almost half of Cockaponset Forest will not be designated for active management. Inactive designated areas, marginally worthwhile from a timber standpoint, may be activated if there is a benefit to the resources to do so.

Though there is no mechanism in place to ensure the perpetuity of Old Forest Management Site beyond the management plan period, the intent of Old Forestland Management Site concept and this plan is that foresters developing future plans will continue the same management status for those stands currently designated as Old Forest unless there are ecological reasons to discontinue it. Relatively large areas are designated as Old Forest. Most have some long lived species such as hemlock that could develop into large trees and subsequently large snags, down woody debris, and provide other old growth attributes.

Though forest fires are very infrequent, it will be encouraged that suppression tactics in Old Forestland Management sites include burning out to natural fire breaks. This should increase the area affected by fire and may increase ecological diversity. Firewood permits will be limited to cleaning down wood along public roads in Old Forest Management Site. Other cutting will be limited to forester or designee freeing up uncommon trees such as pitch pine.

Research Areas – In addition to the Turkey Hill Natural Area, CAES has forest health monitoring plots in Cedar Swamp and on Pine Ledge Road. CAES also is monitoring the vegetation response to Forestry's prescribed fires off Filley Road, Jericho Road, Cedar Lake Road, Truck Trail, and Route 80. The Wildlife Division has 6 bird survey plots in recently regenerated forest stands, and researchers associated with Yale University are monitoring a vernal pool response to day-lighting.

E. Extensive Areas of Concern

Unauthorized use of paths and trails by four wheelers and dirt bikes have created varying degrees of erosion with those under power-line right-of-ways usually exhibiting the worst condition. The historic ford on Cedar Swamp Road in Chester that bisects a small part of the Cedar Swamp splashes silt into the swamp when vehicles drive through it. The Town currently allows the State to close the sections of Cedar Swamp and Hoop Pole Hill Road that runs into the forest from the first of the year to the end of mud season.

Atlantic white cedar swamps, pitch pine ledge outcrops, and pitch pine sand plains areas are under-represented populations and ecosystems. Chester Cedar Swamp (the second largest Atlantic White Cedar Swamp in Connecticut) was designated a [National Natural Landmark](#) by the National Park Service in the early 1970's. Atlantic White Cedar Swamps and Pitch pine-Scrub oak Barrens are among thirteen of Connecticut's most imperiled ecosystems (Metzler, K.J. et al.). It is anticipated that Atlantic White Cedar will regenerate itself after the next severe hurricane. Except on the barest ledges, the few pockets of pitch pine are expected to decline without intervention. Forest management will target sustaining these populations.

Numerous locations of species of concern have been identified by Natural Diversity Database (Special Uses Map) including a population of Prickly pear.

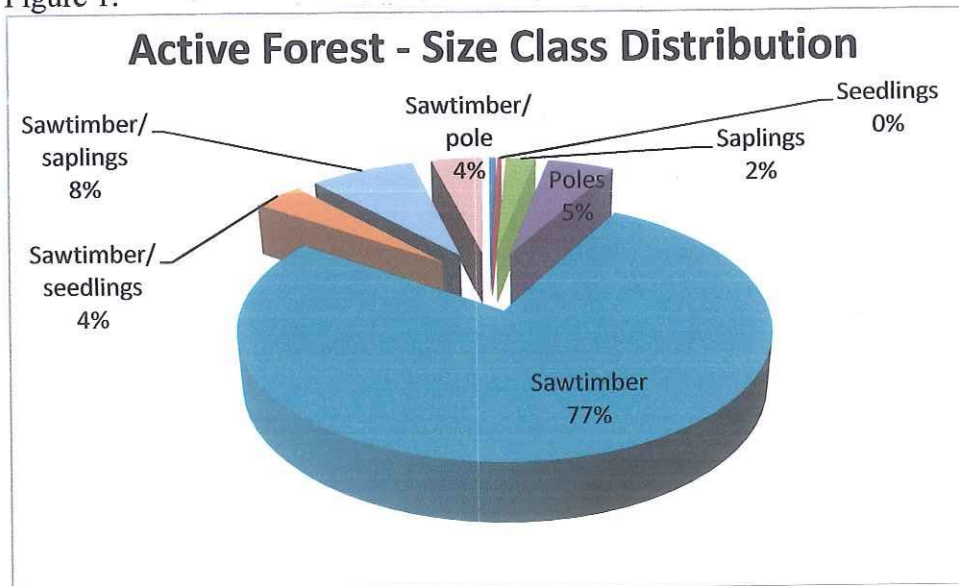
F. Wildlife Habitat

Aquatic Habitat – Most of the fisheries habitat in Cockaponset are ephemeral headwater streams. These first order ephemeral streams are an important component of the aquatic environment. Authorized and unauthorized recreational activities often impact these streams significantly where trails cross the stream. The stream crossings and gravel roads that have no erosion control consideration have the most potential to degrade aquatic environment by the addition of large amounts of sediment to streams. Forestry operations will avoid stream crossings if possible, cross when there is no flow, corduroy or bridge the crossing. Crossings will be blocked or temporary bridges will be left in place when permitted in order to keep recreational users out of the streams. Forestry operations will continue to require loggers to improve erosion control as needed on existing roads when they need to use them to access their acquired wood. The Park and Recreation Supervisor requires user groups to build bridges as a condition of their use of the forest trails that do not have all their stream crossings bridged. Forestry will support appropriate restoration projects proposed by the Fisheries Division. Forestry will pursue blocking or upgrading stream crossings open to public use on Swain Johnson Road in Haddam and Cedar Swamp Road in Chester as well as purchasing 3 gates (plus concrete) to be installed by the Park and Recreation Staff on Old County and Gladwin Roads to reduce sedimentation of the aquatic environments. Recent forestry projects to reduce sediment and erosion included the installment of gate in the Cedar Swamp Road and Hoop Pole Hill Road to reduce use during mud season and construction of erosion control structures on Pine Ledge Road.

Terrestrial Habitat– Fields, shrub-land, and young forest habitat (seedlings, saplings, sawtimber/ seedlings*, and sawtimber / saplings* forest stand size classes), are among the under-represented habitats in Cockaponset and the rest of the state. They have been identified in [CONNECTICUT’S COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY](#) as key habitat types. Part of Cockaponset is within the lower Connecticut River focus area for habitat restoration for the threatened New England Cottontail (see Appendix G) which along with numerous at risk shrubland birds utilizes dense shrubby young forest habitat. Fields, shrub-land, young forest habitat are not stable ecosystems as they eventually succeed over time to maturing forests without appropriate disturbance or, in the case of fields, mowing or burning. An influx of these important habitats is not occurring because of the lack of recently abandoned farmland, severe fires and clear-cuts that historically produced these short-lived habitats. Cockaponset’s forests are dominated by maturing sawtimber forest habitat (see Figure 1.) that owes its origins to the widespread fires, clear-cutting, and farm abandonment that occurred around a century ago.

**seedling or sapling stands with a minor older component*

Figure 1.



Forest management on Cockaponset will strive to help provide habitat for viable populations of all native animals, especially under-represented species. The most positive influence forest management can have on habitat is promoting an array of the different forest size class classes within the upland forest as different wildlife guilds utilize different forest size classes for their primary habitat. A continuum of the forest size classes will be provided by generally managing on a 100 year rotation regenerating at least 10% of the active forest during the Ten Year Management Plan. Promoting a forest landscape with 10 to 20% regenerating forests and permanent openings (power lines, brushy post-agriculture set aside acreage and scrub-shrub wetlands) should help optimize early successional species diversity ([Options for managing early successional forests](#) p. 9). The regeneration harvests will typically promote ecological complexity by retaining den trees and legacy trees as well as snags, coarse woody material and retention patches. A strategy of concentrating harvest areas (when possible) will provide for high quality young forest habitat while minimizing impact on interior forests.

The Wildlife Division has been actively maintaining Cockaponset's largest field (20 acres) located in Middletown. Parks has brushed hogged the capped landfill on Cedar Lake Road on the Chester/ Haddam town line. It is anticipated that these areas will be mowed at least twice in this plan period to maintain a diversity of habitat. The Wildlife Division has also been responsible for the maintenance and repair of eleven wildlife marsh/pond impoundments (Turkey Hill, Big and Little Spec Meadow, Shubert, Oxbow, Old County, Hackney Pond, Cedar, Webber Marsh, Cockaponset #1 and Cockaponset #2 Marsh).

G. Vegetative Condition

Forest Health Forest ecosystems have evolved with various native insects and pathogens whose impacts have become part of the natural disturbance regime. The imported Dutch elm disease, chestnut blight and hemlock woolly adelgid have added additional mortality over the years. The potential introduction of the exotic invasive [Asian Longhorned Beetle](#) could create substantial mortality with the death of the maple component of the forest. The introduction of [Emerald Ash Borer](#), another exotic invasive pest, would have less impact as it only affects ash which comprises a very minor component of the forest.

There are several sites in the forest with established populations of invasive species, which will become more problematic over time. The plants noted during the last inventory include [Tree of Heaven](#), [Japanese Barberry](#), [Multi-flora Rose](#), [Japanese Silt Grass](#), and [Oriental Bittersweet](#). The latter appears to be the most disruptive and have the most potential to grow exponentially, especially after the next class 3 or greater hurricane creates large and widespread canopy gaps throughout the forest. Invasive species threaten the health of the forest because they form monocultures and smother or preclude the regeneration of native species. This can drastically impact sustainability of the forest. They also provide poor bird habitat as they replace native understory vegetation that attracted a source of high protein (insects) for their offspring with plants that do not attract insects. The goal is to contain established invasive populations and eradicate new populations before they become entrenched.

Forest Sustainability Some of the last vestiges of shade intolerant trees such as aspen, gray birch, white birch, cherry, butternut, red cedar and pitch pine are dying from old age or shade from overtopping trees. Special efforts will be made on releasing and regenerating these species by creating favorable environmental conditions intimidating circumstances that would simulate historic disturbances and/ or controlled burns in the vicinity where remnants of under-represented tree species are found.

Even the dominant forest type group, oak – hickory, is not sustaining itself in the absence of intervening forest management. The combination of excessive deer browse and the absence of frequent fire have allowed a dense mid and understory canopy comprised of shade tolerant and fire sensitive birch, beech and maple. Browsed oak seedlings are unable to graduate through a dense beech, birch and maple mid and understory to the upper canopy. Without intervention, oak and hickory forests will likely be replaced by less ecologically valuable birch, beech and maple. Oaks are extremely valuable to wildlife for their acorn crop and they host the most Lepidoptera (moths and caterpillars) species that attract more abundant and diverse species of birds. Forest management on Cockaponset State Forest will strive to conserve under-represented forest tree species and forest types as well forest type groups which are not sustaining themselves without forest management.

The active forest will be managed on a 100 year rotation (area management with 10% of the active forest regenerated during the 10 year plan). The desired future condition after one rotation would have a size class distribution of approximately 20% seedling and saplings; 30% poles and 50% sawtimber on the active forest. The other half of the forest is expected to remain dominantly sawtimber until the next major hurricane or tornado.

Active Forest Type Group by Size Class (Current Acres)

Type Group > Size Class	Oak Hickory	Maple Beech Birch	Oak Pine	White pine	Exotic Softwoods	Hemlock hardwoods	Aspen birch	Total
Seedling/sapling	187	29	3	0	0	0	2	221
Sawtimber/seedling	284	5	26	1	0	0	0	316
Sawtimber/sapling	646	4	0	12	0	0	0	662
Pole	362	27	21	2	15	2	0	429
Sawtimber/ pole	302	0	9	10	0	1	0	322
Sawtimber	6203	110	30	135	73	57	0	6608
Total	7984	175	89	160	88	60	2	8558

H. Specific Acquisition Desires

Numerous parcels are land locked without public access (see Special Features map). Acquisition of adjoining land that would provide public access is a top priority. A second priority is properties that connect existing state forest. The Pataconk Rod and Gun Club property between Hoop Pole Hill Road and Pine Ledge Road in Chester is a prime example of the second priority though acquisition efforts were halted as the lead shot contamination site has not been remediated by the landowner.

I. Public Involvement

Public involvement in the Cockaponset Management Plan is based upon the [Montreal Process](#), which is the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. The United States is a signatory of the Montreal Process. Its view is that forest sustainability cannot be achieved without the support and understanding of its public. Key public involvement components of the Montreal Process include Criterion 7.1c. Provide opportunities for public participation in public policy and decision making and Criterion 7.2 a. Provide for public involvement activities and public education, awareness and extension programs and make available forest-related information.

Previous state-wide public involvement included the opportunity for various stakeholders groups to provide input into the state-wide Forest Resource Plan. Stakeholders were then invited to join The Forest Land Council. This group and the interested public participated in the roundtable-style Forest Forum, which provided input for the [Connecticut Forest Resource Assessment](#).

Local public involvement for the Cockaponset Forest Resource Management Plan included contacting town planners, conservation commissions (or wetland commission), or town executives and offering to present to them the plan's goals and seek input or comments on the proposed indicators (see K. Ten Year Goals below). The towns that were contacted were those in which there may be active forest management during the plan period. Such presentations were made by the end of 2011 to the Conservation or Inland Wetlands Commissions in the towns Chester, Clinton, Deep River, Durham, Guilford, Haddam, Killingworth, and Westbrook. No written input has been received to date from any of the commissions, though verbal response from the commissions was generally positive. The towns were notified when the Draft Management Plan was placed upon DEEP Forestry's web site so they can notify their citizens and have the opportunity to give comment. The plan was on the web from May-July 2012. The presentations for those towns in Middlesex County were done in conjunction with the Connecticut River Estuary Regional Planning Agency's Environmental Planner, DEEP Service Forester and UConn Extension Forester as part of the "*Community Engagement and Landscape-level Approaches to Forest Stewardship*" Grant.

J. Adaptive Management

The plan will be based on an adaptive management format as there are many variables and uncertainties that will affect outcomes. With the unknowns of climate change, outcomes are more uncertain so the flexibility of adaptive management is especially valuable. Outcomes of management actions will be monitored and provide feedback as to whether the plan is moving the forest toward the management goals. Adaptive management will allow changes in the plan if conditions change, there are undesirable outcomes, or new information becomes available. The adaptive management format follows the steps listed below:

- Problem assessment
- Designing a management plan and monitoring program (biodiversity indicators) that will provide reliable feedback about the effectiveness of the chosen action.
- Implementation of the plan
- Monitor indicators to determine how effectively actions are meeting management objectives
- Evaluate the outcomes and compare to stated "Desired future condition".
- Adjust implementation
- Repeat process for adjustments

K. Ten Year Goals

Goals of the Cockaponset Forest Management Plan

- 1) To promote biological diversity or viable populations of forest species of plants and animals native to the area. Efforts will concentrate on upland ecosystems and populations that are not adequately sustaining themselves under current conditions.
- 2) Maintain or improve aquatic system integrity.
- 3) To promote healthy and sustainable forests.

Bio- indicators (quantitative or qualitative biological variables which can be measured and provide reliable feedback about the effectiveness of reaching stated management goals.

Indicators are requisite for adaptive management). Appropriate indicators have practical characteristics as explained in Selecting Bio-indicators

- **Sustain oak forests-** Promote 50 free to grow oak or hickory saplings per acre 5 years after regeneration harvests. This will yield a new forest with a 50% oak/hickory component and sustain ecologically valuable oak forests that would eventually succeed to other hardwoods without intervention.
- **Sustain pitch pine ecosystem** – Promote pitch pine regeneration under existing parent trees and extending 200' past seed source to prevent it from being succeeded by more common forest ecosystems.
- **Provide Early Successional (ES) habitat** – Regenerate 10% of active to provide seedling or sawtimber/seedlings* size class by end of management period.
*Stands with a minor sawtimber component (generally < 10 trees/ac) that do not significantly inhibit ES habitat.
- **Retain Late Successional (LS) structure** – Retain an average five large (>16" in diameter) legacy, den or rotten trees/acre. Retain snags, coarse woody materials and provide heterogeneity by creating variable sized gaps and retention patches.
- **Provide for LS Forest** – Maintain 20% of forest for old forest values with passive management. Salvage or clean up of natural disturbances will not take place except where it is a public safety issue. Uncommon trees such as pitch pine may be promoted in these forests by felling but not harvesting a limited number of overtopping trees.
- **Minimize Stream Sedimentation** – Gate more roads unsuitable for public vehicle traffic, stabilize more stream fords on woods roads and have more bridges at stream crossings on trails at end of plan period.

L. Work Plan

Projects Plans

Old County and Gladwin Road Gate Project (Killingworth)
 Cedar Swamp Ford upgrade or blocking
 Swain Johnson Road and ford upgrade or blocking
 Bear Rock Invasive Control
 Plus future projects as needed

Regeneration Harvests Schedule for Management Plan

Note: More acreage has been scheduled for harvest than indicated in Ten Year goals as acres harvested is usually reduced due to wetlands, trails, structures, micro stands within the larger stand that are thinned or left un-harvested, and areas too close to roads and property boundaries. Other stands may be substituted for any listed below if they become more conducive to regenerate during the plan period.

Block	Compartment No.	Stand No.	Acreage
Candlewood	8	2	3
Candlewood	8	1	5
Candlewood	8	1	129
Candlewood	4	3	95
Candlewood	1	2	46
Candlewood	1	2	12
Candlewood	1	3	6
Candlewood	1	3	125
Turkey Hill	17	1	213
Turkey Hill	18	1	63
Cedar Swamp	2	7	22
Turkey Hill	12	3	24
Turkey Hill	7	2	26
Turkey Hill	8	2	8
Turkey Hill	8	2	3
Turkey Hill	49	9	5
Turkey Hill	49	1	54
Turkey Hill	40	1	47
Turkey Hill	40	4	45
Turkey Hill	40	3	21
Turkey Hill	40	1	8
Turkey Hill	8	12	28
Killingworth	1	9	11
Killingworth	1	13	29
Winthrop	12	2	12
Winthrop	26	1	43
Winthrop	16	2	74
Total			1157

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Thinning Schedule for Management Plan

BLOCK	Compartment No.	Stand No.	Acreage
Cedar Swamp	10	5	14
Killingworth	4	2	48
Killingworth	5	1	2
Killingworth	7	2	2
Killingworth	7	2	10
Killingworth	6	11	2
Candlewood	9	3	117
Turkey Hill	29	3	32
Cedar Swamp	7	2	21
Winthrop	21	7	12
Winthrop	21	7	7
Turkey Hill	14	1	1
Turkey Hill	8	8	2
Turkey Hill	8	8	1
Turkey Hill	35	3a	2
Turkey Hill	8	8	1
Turkey Hill	35	3a	1
Killingworth	10	1	29
Killingworth	1	12	10
Killingworth	1	7	9
Killingworth	1	8	2
Killingworth	1	7	10
Killingworth	6	2	14
Killingworth	6	2	8
Killingworth	7	2	11
Killingworth	7	2	15
Killingworth	8	2	6
Killingworth	8	1	4
Killingworth	8	2	14
Killingworth	8	2	2
Killingworth	8	2	1
Killingworth	8	1	46
Killingworth	11	2	2
Killingworth	3	5	70
Killingworth	3	4	49
Killingworth	3	6	133
Killingworth	4	5	7
Cedar Swamp	11	1	20
Killingworth	9	2	26

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Cedar Swamp	10	3	3
Total			766

Potential Additional Resource Needs:

Additional road improvement, invasive control, and property surveys as needed.

Appendix A - References

Meltzer, K.J. and D.L. Wagner. 1998. Thirteen of Connecticut's Most Imperiled Ecosystems

Appendix B - Definitions

This glossary contains a list of commonly used forestry terms.

- **acre** A unit of measure describing surface area. One acre contains 43,560 square feet. A football field (without the end zones) is 45,000 square feet -- slightly larger than an acre. The inside of a professional baseball diamond is about 1/4 of an acre.
- **advance regeneration** Young trees that have become established naturally in a forest before regeneration methods are applied. In other words, the regeneration is present in advance of any treatment.
- **age class** The trees in a stand that became established at, or about, the same time. The range of tree ages in a single age class is usually less than 20 percent of the expected age of that class.
- **basal area** The area of the cross section of a tree's stem at 4 1/2 feet above ground, or breast height, in square feet. Basal area of a forest stand is the sum of the basal 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.
- **best management practices** Procedures and treatments that lessen soil erosion, sedimentation, stream warming, movement of nutrients, and visual quality during or following activities that alter the land.
- **buffer strip** An area of land that is left relatively undisturbed to lessen impacts of treatments next to it. Common examples include visual buffers used to screen the view from roads, and stream side buffers used to protect water quality.
- **canopy** The continuous cover of branches and foliage formed collectively by the crowns of trees.
- **clearcutting** An even-aged silvicultural technique involving the removal of all stems in the stand. Strip cutting is a form of clearcutting.
- **crop tree** Any tree selected to provide a specific benefit such as mast, dens, veneer, or sawtimber. Crop trees are usually selected when they are young.
- **cutting cycle** The planned interval between treatments in forest stands.
- **damaging agent** Any one of various factors that injure trees. They include some insects, diseases, wildlife, abiotic factors, and human activities.
- **dbh** Diameter at breast height; the diameter of the trunk of a tree measured at 4 1/2 feet above ground level. It is measured on the uphill side of the tree.
- **den tree** A living tree that has holes in the trunk, or stem, from broken branches and decay, or hollow trunks; a cavity tree.

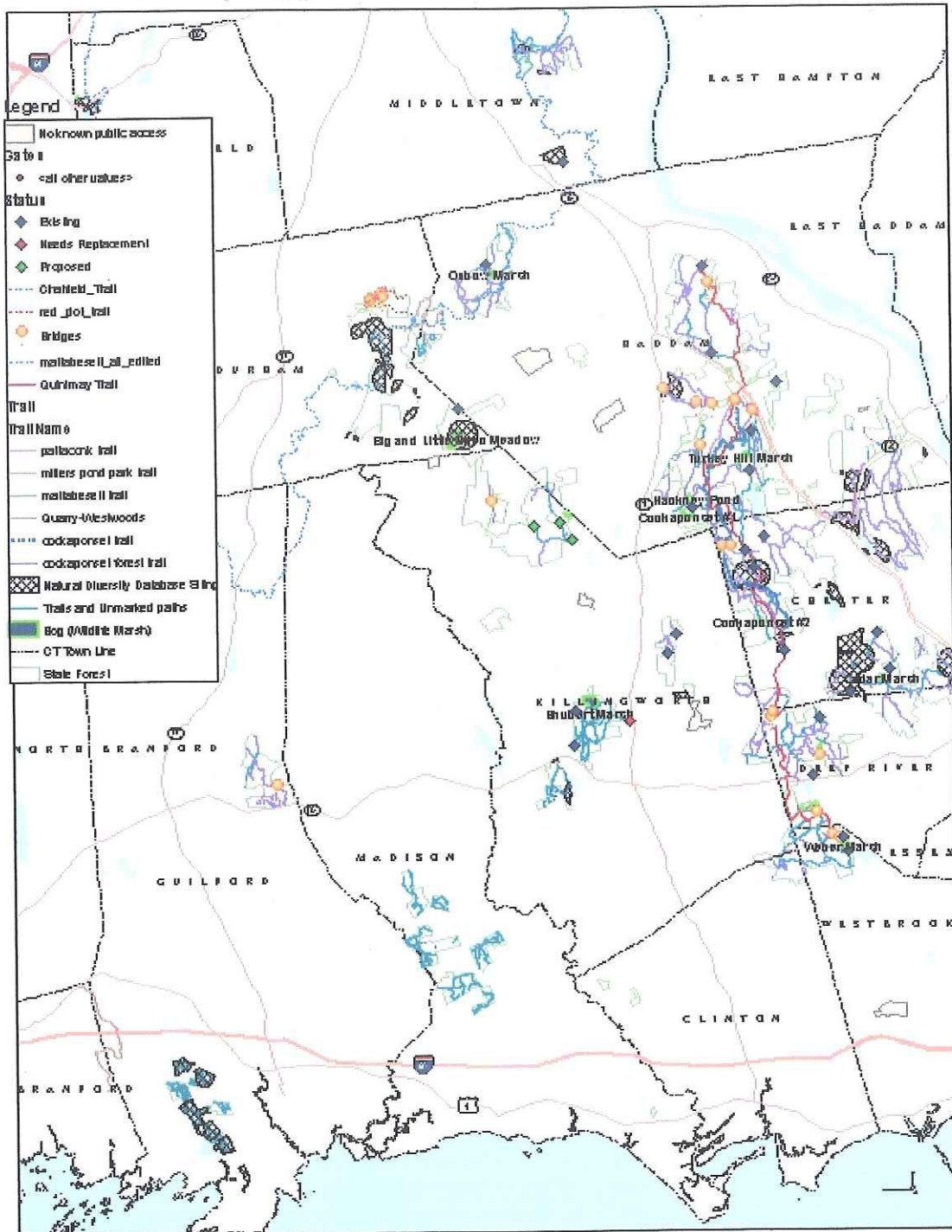
- **even-aged stand** A stand containing trees in the main canopy that are within 20 years of being the same age. Even-aged stands sometimes are designated by age-class (10-year-old stand, 40-year-old stand) or broad size-class: seedling stand (most trees are <1 inch dbh); sapling stand (trees 1-4 inches dbh); poletimber stand (trees 5-10 inches dbh); and sawtimber stand (trees > 10 inches dbh).
- **even-aged system** A planned sequence of treatments designed to maintain and regenerate a stand with one age class.
- **forest condition** Generally, the current characteristics of forested land including but not limited to cover type, age arrangement, stand density, understory density, canopy density, and forest health.
- **forest cover type** A category of forests based on the kind of trees growing there, particularly the composition of tree species. Forest cover types are often referred to as forest types, cover types, stand types, or types.
- **group selection** An uneven-aged silvicultural technique involving the removal of trees in groups usually 1/10 to 2/3 acre in size, but sometimes up to 1 to 2 acres on large properties. Group selection can be applied in combination with single-tree selection between groups.
- **horizontal diversity** The degree of complexity of the arrangement of plant and animal communities, and other habitats across a large area of land.
- **inactive forest** – Management category designated for forests on marginal growing sites often with dense mountain laurel in the understory. May be activated if beneficial to biodiversity.
- **interior species** Species found only or primarily away from the perimeter of a landscape element. Species commonly requiring or associated with interior habitat conditions.
- **intermediate cuttings** Silvicultural cuttings applied in the culture of even-aged stands 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 grow 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 is considered mature and a regeneration cutting is applied to produce a new stand.
- **intermediate treatment** Any treatment or "tending" designed to enhance growth, quality, vigor, and composition of the stand after seedlings are established and before mature trees are regenerated. For example, thinning is an intermediate treatment.
- **mast tree** A tree that produces nutlike fruits such as acorns, beechnuts, hickory nuts, seeds of certain pines, cherries, apples, samaras. Hard mast includes acorns, beechnuts, and hickory nuts. Soft mast includes cherries, apples, and samaras (on maple and ash trees).
- **matrix** The matrix is the dominant landscape element on a landscape in which smaller differentiated elements (patches) are embedded. It is commonly highly connected throughout the landscape.
- **native plant** A species that naturally occurs in a given location where its requirement for light, warmth, moisture, shelter, and nutrients are met.

- **non-commercial treatment** Any activity that does not produce at least enough value to cover the direct costs of that treatments.
- **overtopped** A condition or position where a tree's crown is completely covered by the crowns of one or more of its neighboring trees. An overtopped tree's crown is entirely below the general level of the canopy and does not receive any direct sunlight either from above or from the sides.
- **patch** A patch is a relatively homogeneous area that differs in some way from its surroundings (e.g., woodlot in a corn field, conifer plantation in a mixed-deciduous forest).
- **plantation** A forest stand in which most trees are planted or established from seed sown by people. Typically, planted trees are in rows, with equal spacing between each tree in a row and between rows.
- **pole** A tree, usually young, that is larger than 4 inches dbh and smaller than 8 to 11 inches dbh.
- **prescribed burn** The application of fire in forested or other areas, usually under specific conditions of weather and fuel moisture, to control vegetation for silvicultural purposes or to reduce hazards.
- **regeneration** The seedlings and/or saplings in a new forest stand or age class. Natural regeneration originated from seeds, sprouts, or root suckers.
- **Regeneration method** A cutting method by which a new age class is created. These methods include clearcutting, seed tree, shelterwood, single-tree selection, and group selection; also called reproduction method.
- **Regeneration cuttings** Silvicultural cuttings designed to naturally regenerate the stand by providing for seedling (or vegetative stems) establishment or development, or both. Two even-aged techniques; clearcutting and shelterwood, and two uneven-aged techniques; single-tree selection and group selection.
- **residual spacing** The distance between trees that remain in the forest after a silvicultural treatment.
- **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.
- **sawtimber** Trees greater than 11" in diameter
- **sedimentation** The accumulation of organic and mineral soil particles and rocks in streams and water bodies due to erosion. Sedimentation often accompanies flooding. The application of Best Management Practices will usually protect against sedimentation during and after treatments.
- **seed tree** A tree that produces seed. Seed trees are usually mature and high in quality.

- **seedling** A tree grown from a seed. Usually the term is restricted to trees smaller than saplings, or less than 6 feet tall or smaller than 1 inch dbh.
- **shade intolerance** The relative inability of a plant to become established and grow in the shade.
- **shade tolerance** The relative capacity of a plant to become established and grow in the shade.
- **shelterwood** An even-aged silvicultural technique involving the removal of the understory and lower crown canopy trees to allow the new stand to regenerate under shade. Subsequent removal of the overstory in one or several cuts.
- **silvicultural system** A planned process whereby a stand is tended, and 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.
- **snag** A standing dead tree without branches, or the standing portion of a broken-off tree. Snags may provide feeding and/or nesting sites for wildlife.
- **softwoods** A term describing both the wood and the trees themselves that in most cases have needles or scale-like leaves (the conifers); gymnosperms.
- **species composition** The collection of plant species found in an area. Composition is expressed as a cover type, or a percentage of either the total number, the density, or volume of all species in that area.
- **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.
- **succession** A gradual and continuous replacement of one kind of plant and animal community by a more complex community. The environment is modified by the life activities of the plants and animals present thereby making it unfavorable for themselves. They are gradually replaced by a different group of plants and animals better adapted to the new environment.
- **thinning** The removal of some trees to improve and enhance the vigor and growth of other trees. Thinning enhances forest health and allows you to recover any excess of potential mortality.
- **understory** The small trees, shrubs, and other vegetation growing beneath the canopy of forest trees and above the herbaceous plants on the forest floor.
- **uneven-aged stand** A stand with trees in three or more distinct age classes, either intermixed or in small groups, growing on a uniform site; a stand containing trees of several 20-year age-classes. These stands generally contain trees of many sizes (seedling through sawtimber) due to the range in age as well as differences in growth rate among species.
- **vertical diversity** The extent to which plants are layered within an area. The degree of layering is determined by three factors: 1. the arrangement of different growth forms (trees, shrubs, vines, herbs, mosses and lichens); 2. the distribution of different tree and shrub species having different heights and crown characteristics; and 3. the number of trees of different ages.

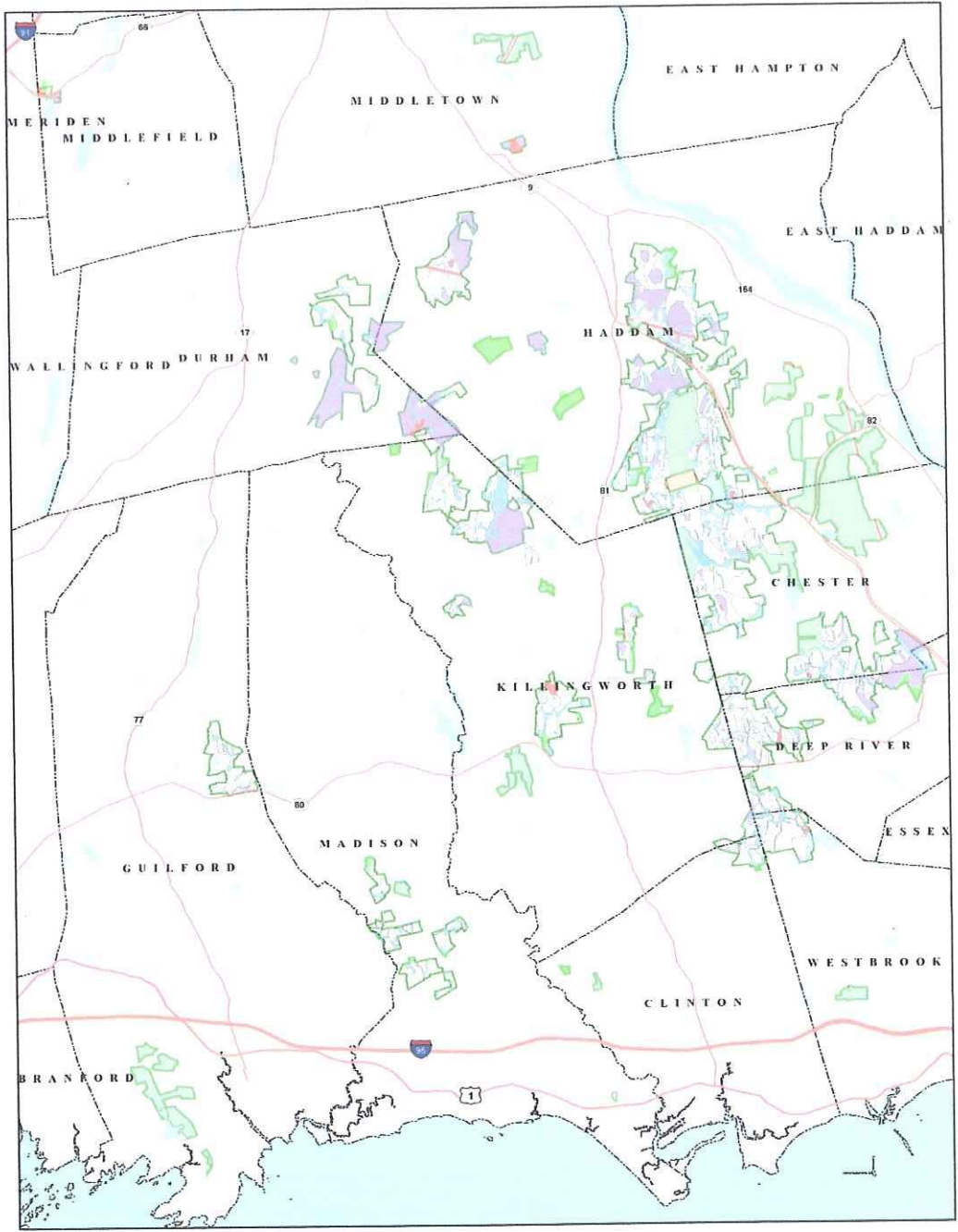
Map A. Special Features Overlay



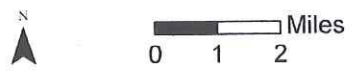
Cockaponset State Forest 2013 -2023 Management Plan Special Use Map



Map B. Forest Management Status Map

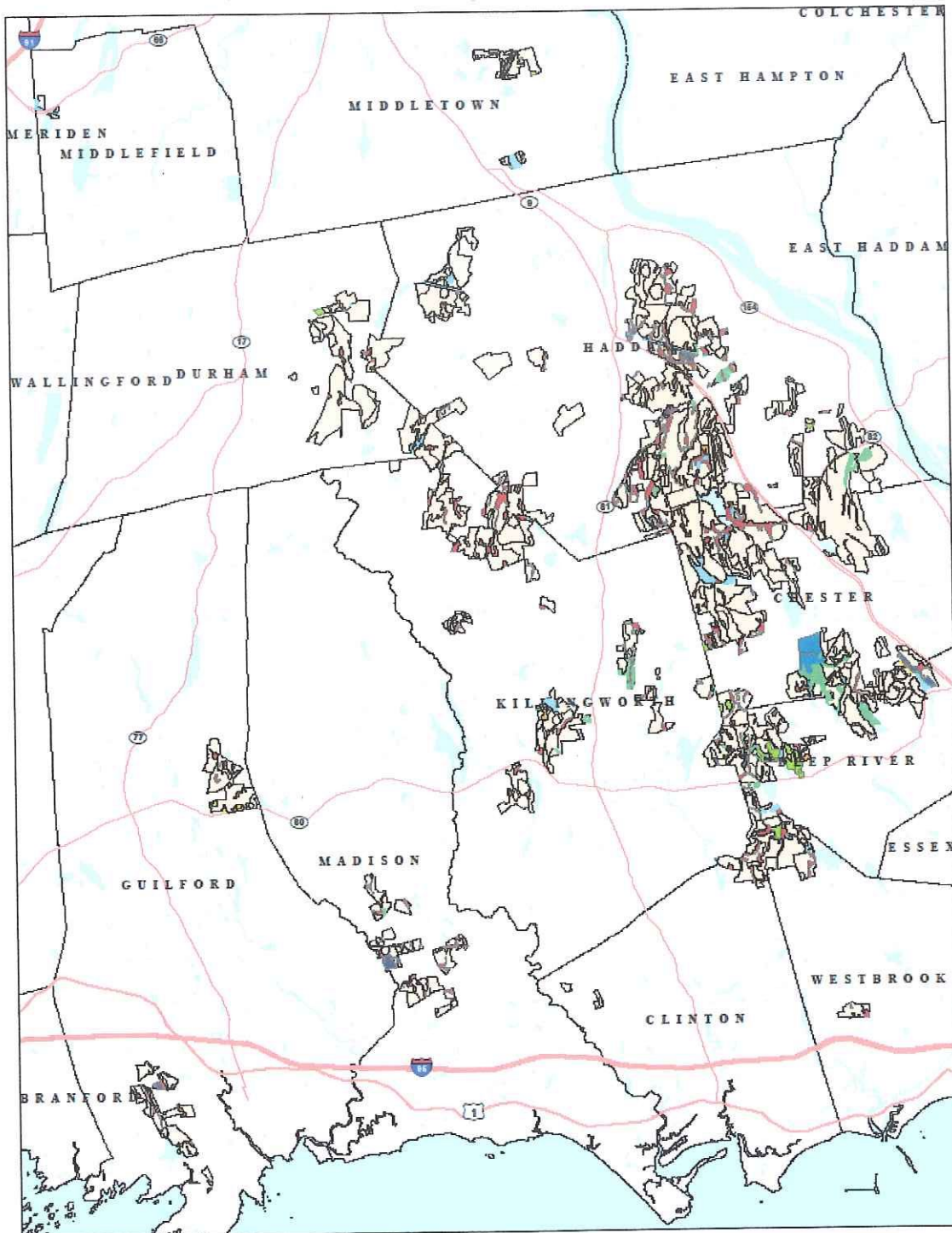


Cockaponset State Forest
 2013 -2023 Management Plan
 Management Status Map



- Legend**
 depgis.DEP_DEP_FOREST_STAND
 MGMT_STATUS
- Active
 - Natural Area
 - Old forest
 - Inaccessible
 - Inoperable
 - Inactive
 - Recreation Area
 - Wildlife
 - CT Town Line
 - State Forest

Map C. Forest Type Group



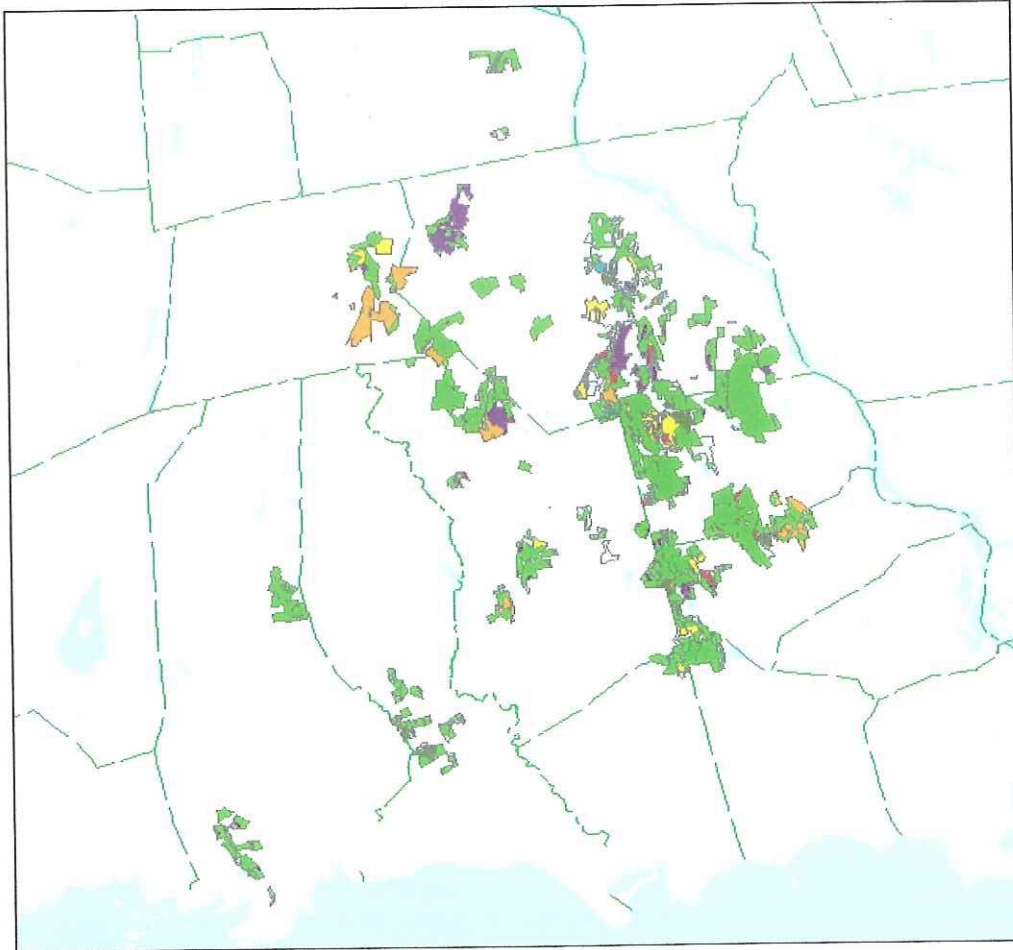
Cockaponset State Forest
 2013 -2023 Management Plan
 Forest Type Group Map



- Legend
 DEEP Forest Groups
 COVER_GROUP
- Null
 - Aspen-Birch
 - Elm-Ash-Red Maple
 - Exotic Hardwoods
 - Exotic Softwoods
 - Loblolly-Shortleaf Pine
 - Maple-Beech-Birch
 - Oak-Gum-Cypress
 - Oak-Hickory
 - Oak-Pine
 - Other

Map D. Size Class Distribution Map

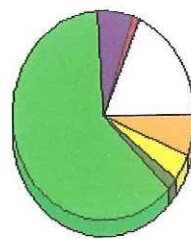
Size Class Distribution Cockaponset State Forest



Size Class

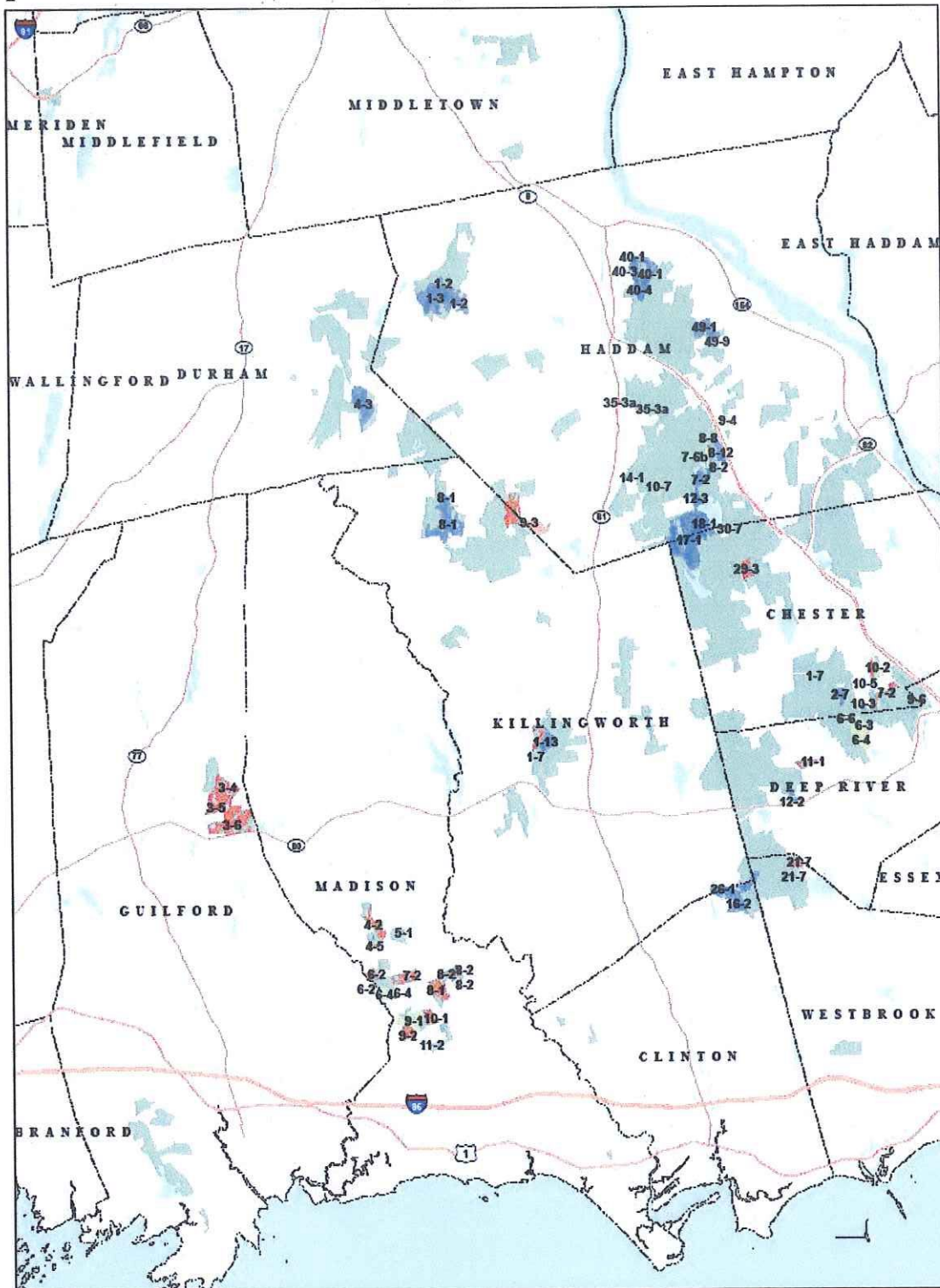
-  Inactive
-  Seedling
-  Sapling
-  Pole
-  Saw
-  Saw-Seed
-  Saw-Sap
-  Saw-Pole

Acreage Values Relative to Size Class in Cockaponset State Forest



Total Acres by Size Class
2,613,262
21,001
10,120
1,002,882
10,118,820
31,953
4,5568
1,000,022

Map E. Work Plan Overlay Map



Cockaponset State Forest 2013-2023 Management Plan Forest Work Plan Map

Legend

depgis.DEP.DEF_FOREST_STAND
 WORKPLAN

- Forest Stand Improvement
- Regeneration Harvest(s)
- Thinning
- CT Town Line
- State Forest



0 1 2 Miles

Map F. New England Cottontail Focus Map

