CHAPTER 2
ECOSYSTEM MANAGEMENT

ECOSYSTEM MANAGEMENT

An ecosystem based management strategy will holistically integrate principles of landscape ecology and multiple use management to promote biological diversity, while enhancing the overall health and resiliency of State Forests. In recognition of the fact that forests are dynamic systems, constantly being shaped by the forces of nature, DEC will also apply adaptive management techniques and advanced technology to react to insect and disease epidemics, wind and ice storms.

Ecosystem management is a process that considers the total environment, including all living and non-living components. It requires skillful use of ecological, economic, social, political and managerial and leadership principles to sustain or restore ecosystem integrity, as well as desired forest uses, products, values and services over the long term. Ecosystem management recognizes that people and their social and economic needs are an integral part of ecological systems. (USBLM 1994)

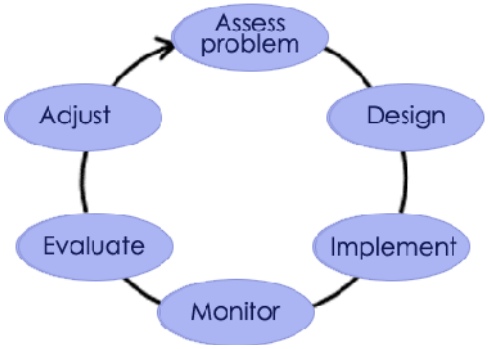
As the ecosystem management concept is applied through the actions recommended in this plan, DEC will strive to strike a balance between human needs and ecosystem health. To achieve this, the plan recommends actions that promote biodiversity at the landscape level, as well as healthy, productive, sustainable forest ecosystems.

Emphasis will be placed on enhancement of carbon sequestration, the protection of rare, endangered and threatened species, and the perpetuation of unique natural communities. The primary focus of management will be to provide a wide diversity of habitats that naturally occur in New York. However, when at-risk species and communities are present, actions will be taken to protect those specific populations or communities.

Ecosystem management – One of the simplest definitions of ecosystem management points out the complexity of understanding and managing an ecosystem. That definition is in the form of a slogan on a United States Forest Service poster promoting ecosystem management. The slogan simply defines ecosystem management as "Considering All Things." This approach asks that management decisions consider all living things from soil micro-organisms to large mammals, including their complex interrelationships and habitat requirements; all non-living components of the ecosystem, including physical, natural, and geological components; and all social, cultural, and economic factors as well.

Adaptive management

- Helps science managers maintain FLEXIBILTY in decisions, knowing that uncertainties exist and they need latitude to change direction
- Will improve UNDERSTANDING of ecological systems to achieve management objectives
- Is about taking ACTION to improve progress towards desired outcomes. (U.S. Department of the Interior 2007)



ECOSYSTEM MANAGEMENT

The cornerstone of ecosystem management is promotion of ecosystem integrity, including a biologically diverse landscape. To accomplish this goal, diversity must be viewed and enhanced on a large scale, which requires us to assess conditions on a statewide and ecoregional scale. Ecosystem integrity cannot be sustained or enhanced without considering land use and cover type diversity beyond the State Forests. For example, important landscape features such as grasslands and forests need to be present in relatively large blocks and be connected to one another by hedgerows, riparian zones, or wetlands to be completely functional. These connections allow animals to move from one habitat to another, as needed when populations fluctuate.

Landscape ecology - "the study of the distribution and abundance of elements within landscapes, the origins of these elements, and their impacts on organisms and processes... [This approach] promotes stability of natural systems, diversity and structural heterogeneity to improve resistance and recovery from disturbances." (Landscape Ecology 2005)

Multiple-use management seeks to simultaneously provide many of the following resource values: fish and wildlife, wood products, recreation, aesthetics, grazing, watershed protection, and historic or scientific values.

BIODIVERSITY

Biodiversity is the variety and abundance of living things, their habitats, and their interdependence in a given area or "landscape." It is by definition greater when many species of plants and animals are present in the landscape. It is further enhanced if each respective population has a wide range of genetic variability and ages. Having many different habitats also contributes to greater biodiversity. Peer reviewed scientific studies strongly suggest that diverse ecosystems are more resilient to environmental stresses, human impacts, and attacks by insects and disease.

This small portion of landscape has many necessary structural elements including hedgerows, riparian zones and forest corridors; however grasslands and large blocks of forest are not present

Diversity within a given unit can be broadly measured and interpreted by assessing the variety of species and the range of land cover types and forest development stages present. A very important attribute of diversity is scale. It must be recognized that some components of diversity must be present in large enough blocks to effectively accommodate and develop their full potential and value to the greater landscape and ecological systems.

INTRODUCTION TO LANDSCAPE ASSESSMENT

What is a Landscape?

The term landscape often conveys different meanings for different people. For the purposes of this assessment, the term is used from a Landscape Ecologist's point of view. Landscape Ecologists use the term "landscape" to refer to the view that one can see from an airplane or a mountain on a clear day; a mixture of land uses and patterns over tens of miles that is consistently repeated (Perlman and Midler 2005). In much of New York State, the landscape can be described as a patchwork quilt. Each patch is a different size, and most of the patches represent forest or fields, which are often connected by streams, rivers, valleys and hedgerows. Outside of the intensely developed urban, suburban and village areas of the state, the landscape is made of repeating patches of forests, hayfields, croplands and water bodies. Within and near developed areas, the patches of fields and forests change in nature and become more fragmented and smaller in size. Large urban areas occupy hundreds of square miles that appear from a plane as a mixture of green and grey patterns; the green – areas dominated by vegetation - is often called green infrastructure and the grey - the buildings, roads and highways - is often called grey infrastructure.

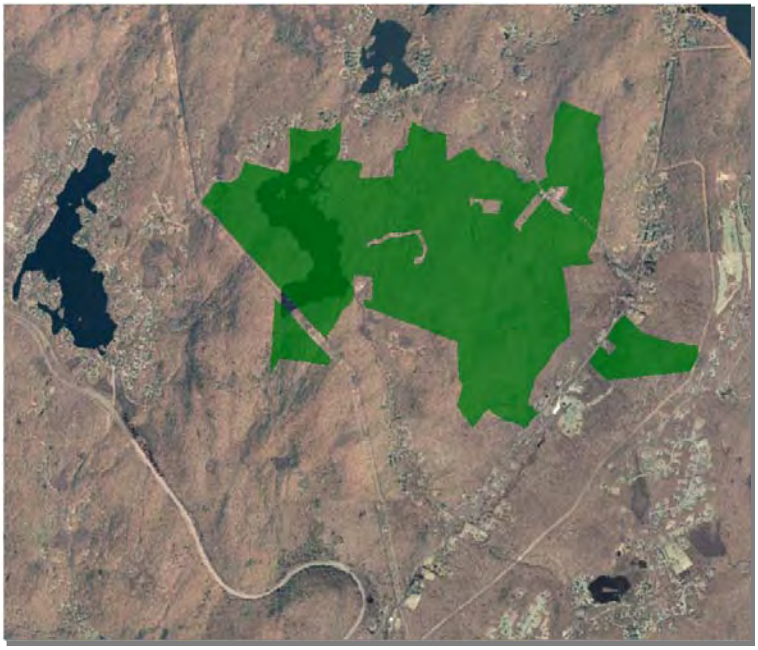
Managing at a Landscape Level

Today's public land managers must consider how the lands they manage fit into and ultimately impact the "bigger picture" or landscape. Ongoing research by universities and conservation organizations and agencies shows that ecosystem health is strongly related to biological diversity. Biodiversity is the term used by conservation biologists to describe the entire diversity of life, encompassing all the species, genes and ecosystems on the Earth (Perlman and Midler 2005). Having a wide range of naturally occurring plant and animal species, land types, and ecosystems in a landscape increases biodiversity and ecosystem resiliency. Despite the great importance of species diversity, it is almost impossible to manage all lands on a species-by-species basis. An ecosystem management strategy requires

managers to consider the thousands of forest-dependent species from soil micro-organisms to larger mammals, fungi to trees and insects to humans. The most effective and attainable strategy is to manage for a wide diversity of habitat types and "communities" of varying ages and structural diversity, with the goal of having ideal conditions available on the landscape for each and every species. Sustainable landscapes, in turn, must also be connected to different land types by natural habitat features at many different scales and have core blocks of minimally fragmented habitat. Managing at the landscape level requires a thorough assessment of the natural and present diversity of the landscape, an understanding of the patterns and processes affecting these dynamic, ever-changing systems, and applying this information to decision-making processes on State Forests.

What can State Forests contribute to the Landscape?

New York's State Forest lands serve as large blocks of open space on the landscape outside of New York's Adirondack and Catskill Forest Preserve that won't be subdivided, developed or converted to grey infrastructure. As the landscape changes over time, these green blocks and patches across the landscape will act as essential ecosystems supporting people, plants and animals, providing needed habitats and ecosystem services such as carbon sequestration, clean water and a sustainable supply of forest products. State Forests, due to their perpetual term of ownership, dedicated purposes and large contiguous acreage, are uniquely able to contribute habitat types and other components of biodiversity which are not normally found or sustained on privately held forest lands. State Forests will be managed, in the context of their surrounding landscape, to increase connectivity and biodiversity, and to enhance the resiliency and sustainability of the greater ecosystem.



Aerial view of California Hill State Forest in Putnam County

Addressing all the biodiversity gaps identified will not be possible, as State Forests represent a small portion of the overall landscape, a portion of the entire picture for biodiversity conservation, and must be managed for a variety of purposes. The size of each habitat component is often as important as the diversity of the components present. A good example is late successional forests. The large blocks of land in the Adirondack and Catskill Forest Preserve are better able to contribute late successional habitat, to the benefit of all its associated life

forms, than an equal acreage of late successional habitat dispersed across the state in smaller blocks. State Forests are, on the other hand, better able to provide those components of diversity that are created through active vegetation manipulation, given their dedication by law to forestry purposes. However, creating late successional habitats in other parts of the state is still a high priority, due to its relative absence on the landscape. Stands of late successional habitat can be grouped into large blocks where possible, instead of being scattered and small.

LANDSCAPE ASSESSMENT PROCESS

To apply principles of landscape ecology and enhance biodiversity, management decisions within State Forest boundaries must be made while considering their impact on the landscape surrounding the State Forest. If the surrounding landscape conditions are not taken into consideration, any efforts to promote biodiversity on a State Forest may not contribute to the diversity and ecological viability of the greater landscape surrounding it. To begin with, a landscape assessment must be conducted to illustrate and analyze landscape conditions.

Specifically, a landscape assessment does the following:

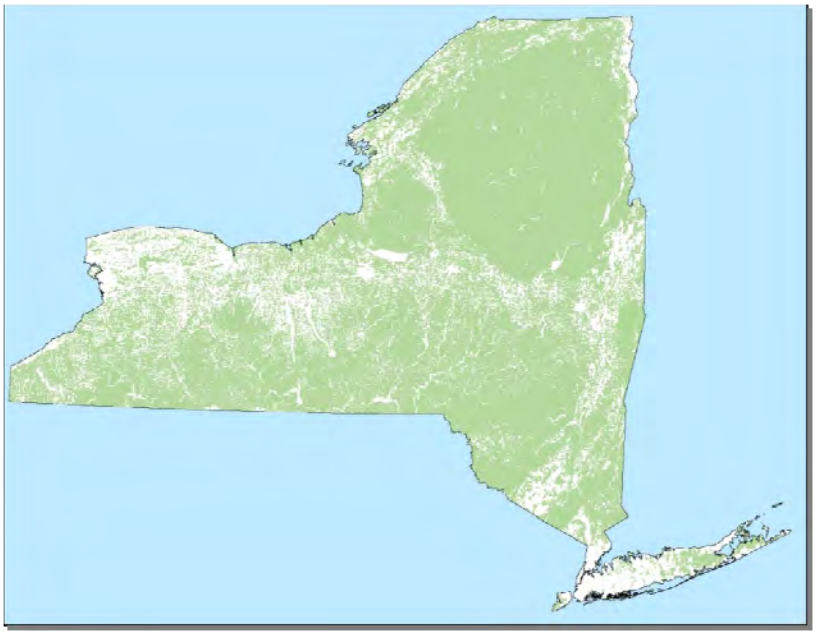
1. Describes the historical background.
2. Defines the existing conditions and ecological functions (i.e. the diversity of habitat types, forest structure and age, location within and relationship to the greater landscape).
3. Identifies natural and human-induced stressors that are exerting influence on natural systems, and the trends that are taking place as a result.
4. Identifies the missing or under-represented components of diversity and other ecological functions most appropriate for the site (gaps).

Landscape conditions must be assessed at multiple scales to fully understand conditions and identify opportunities to promote biodiversity. This chapter contains a statewide landscape assessment, including an assessment of the State Forest system, as well as ecoregional assessments. The planning-unit-level assessment will be conducted in each respective UMP.

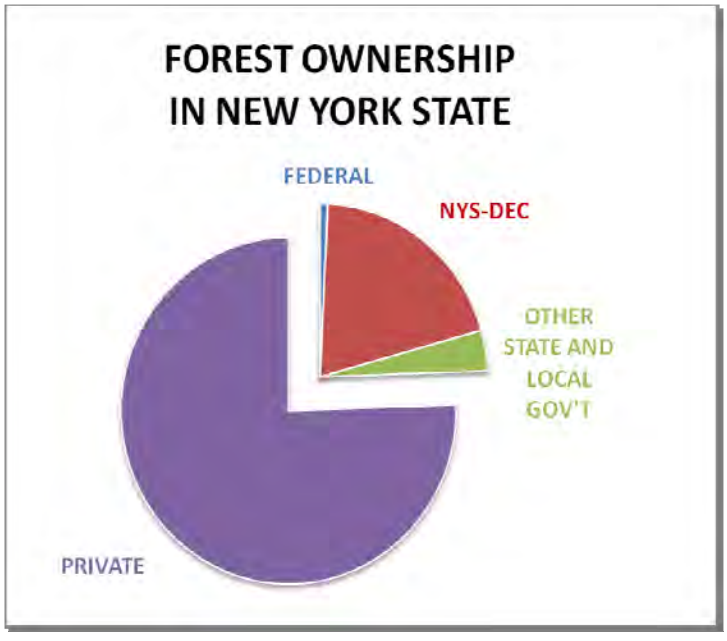
Source Data

To help assess the landscape within and surrounding the State Forest System, land cover data largely generated by satellite imagery from both the **2001 New York GAP Analysis Program (NYGAP)** and **National Land Cover Data (NLCD)** set was used (Multi-Resolution Land Characteristics Consortium (MRLC) 2008). Land cover from these resources was analyzed for the entire State and by (The) Nature Conservancy (TNC) ecoregions.

STATEWIDE LANDSCAPE ASSESSMENT



With an estimated population of 19,490,000 people, New York State covers an area of about 48,440 square miles, or about 31 million acres, with almost 19 million acres of forest cover. Interestingly, New York State has about one acre of forest land per person. Land cover from these resources was analyzed for the entire state and for each Nature Conservancy ecoregion. A map of the ecoregions can be found on *page 65*. According to the 2001 Gap Analysis of New York Final Report (Smith 2001), New York State's landscape is a combination of forest (63%) and cropland or old field/pasture (24%). The satellite image data for the 2001 study was acquired by the Landsat 5 Thematic Mapper during the spring and summer seasons between 1991 and 1993. Newer information collected in a similar fashion from a second generation of satellite imagery produced by the Multi-Resolution Land Characteristics (MRLC) Consortium in 2001 shows a slight change, with forests comprising 61 % of the state's landscape. The difference in forest cover percentage can likely be attributed to statistical variation and differing sampling techniques.



Of New York's approximately 19 million acres of forests, about 14 million acres (82%) are privately owned, and nearly 4 million acres (13%) are owned and managed by the State of New York as Forest Preserve, State Forests, Wildlife Management Areas and State Parks.

The 786,329 acres of State Forests addressed by this management plan represent 2.6% of the state's total land area, and about 4.0% of the state's total forest cover. State

STATEWIDE LANDSCAPE ASSESSMENT

Forests provide relatively large blocks of undeveloped land, and as such provide unique habitat and open space for people, plants and animals. Given the projected urbanization of the state, the importance of State Forests in New York State as protected open space, working demonstration forests, recreational areas and core wildlife habitats, along with the ecosystem services they provide, will undoubtedly continue to grow over time.

HABITAT ASSESSMENT

Early Successional Forest and Shrub Habitat

"Early successional habitat composed of young trees and shrubs, often occupying recently disturbed sites and areas such as abandoned farm fields, provides unique and important habitat for many wildlife species. Some of the tree and shrub species that colonize abandoned agricultural land and disturbed sites include grey birch, dogwood, aspen species, cherry, willow, and alder." (Natural Heritage Elements - Species Level 2003-04). Species that benefit from the presence of early successional habitat include chestnut-sided warbler, golden-winged warbler, yellow warbler, yellow-breasted chat, field sparrow, ruffed grouse, cottontail rabbit, snowshoe hare, woodcock, white-tail deer, and red and gray foxes.

Early successional habitat and many associated species can be found where land has been recently disturbed - Photo credit USDA-NRCS

Historical Background: Based on records from pre-settlement land surveyors, researchers have estimated that between 2 and 6% of the pre-settlement northern hardwood forest was in young forest cover (Lorimer and White 2003). Coastal areas, valleys and transitional hardwood sites in New York's southern tier likely had higher percentages of young forest – typically less than 15%. An even higher amount of early successional habitat is estimated to have been present in coastal areas (including the shores of the Great Lakes and the Atlantic). Due to more frequent disturbances in these areas from hurricanes and greater incidence of burning by Native Americans, especially in coastal oak and pitch pine forest types, 31% of this area is estimated to have been in early successional stages.

To highlight another specific geographic region, consider New York State Museum bulletin no. 484 entitled "Late Eighteenth Century Vegetation of Central and Western New York State on the Basis of Original Land Survey Records," published in 1992. The study was completed using Military Tract survey records from the 1790s to describe the vegetation present at that time in the central Finger Lakes region of New York. In summary, the study concluded that more than

97% of the region was forested prior to widespread European settlement (Marks, Cardescu and Seischab 1992). The remaining 3% of the landscape were openings created by windfall, beaver meadows or Native American settlements.

Existing Conditions: Analysis of the landscape using satellite-generated land cover from NYGAP and the later National Land Cover Database (NLCD) shows that early successional habitat cover types presently occupy between 2% and 6% of each ecoregion. Statewide, the NYGAP Report estimated about 2% of the state is in early successional cover. The NLCD (which includes emergent herbaceous wetlands) places the statewide average at about 5%. According to the NLCD, between 1 and 3% of State Forests are presently covered by early successional habitat.

Nelson Swamp Unique Area in Madison County currently contains significant early successional cover

Trends: To assess trends in the age of New York's forests (both public and privately owned), the U.S. Forest Service, Forest Inventory Data was consulted. A comparison of the 1980 and 1993 USFS Forest Service Forest Inventory Statistics of forest land outside the Forest Preserve illustrates a dramatic trend: in 1980, 30% of forest land was classified as "seedling/sapling" (which roughly approximates early successional habitat). In 1993 this habitat type dropped almost by a half to 16% of forest land in the state (outside the Forest Preserve). The most recent US Forest Service statistics are online at: http://fiatools.fs.fed.us/fido/standardrpt.html. This survey covered the period from 2003 to 2008, sampled all forest lands in New York State (including the Forest Preserve), and defined the forest by age classes instead of size classes. Under this metric, early successional habitat is best represented by forests ranging from zero to 19 years. Forests in this age range now represent 7% of the total forested acreage in New York State. While it is difficult to directly relate this to the 1980 and 1993 inventory data, it still suggests a continued decline in early successional habitat.

Early successional cover may continue to decrease as time progresses unless steps are taken to deliberately create, enhance and sustain new habitat, particularly on publicly managed lands and private lands such as rod and gun clubs, which are commonly managed to create diverse wildlife habitat. Early successional habitat is especially important in that it supports a high diversity of birds, mammals and reptiles (Perlman and Midler 2005). In fact, New York State's Comprehensive Wildlife Conservation Strategy recognizes the value of this land cover type and identifies early successional birds as a "greatest conservation need" species group. There is no consensus within the scientific community as to what is the optimal percentage of the

landscape occupied by early successional cover. Many bird and mammal species dependent on early successional habitat are declining in population, and would benefit from the creation and maintenance of this habitat type. Decisions concerning the management of this type of habitat must be made in consideration of both current and historic population levels of these species, and within the context of the amount of early successional habitat on other lands in the surrounding landscape.

Mid Successional Forest Habitat Assessment

Historical Background: Most of the forest across New York's landscape originated from heavy cutting and land clearing to establish farms during European settlement. In the late 1800s only 25% of New York State remained forested. Many of the lands cleared for farming proved to be of marginal quality and others failed as a result of poor farming practices depleting the soil. Farm failures peaked in the Great Depression, setting the stage for natural succession and the re-birth of forests.

Mid successional forest with a relatively open understory

Existing conditions: As a result of their similar past history, most of the state's forests are even-aged and are often less than 120 years old. The trees in these mid successional forests have grown larger than those found in early successional forests, but the vertical diversity that typifies late successional forests has not yet developed. Mid successional forests are therefore defined as forests that are pole-sized or larger, with relatively open understories. This "wave" of even-aged forest presents both challenges and opportunities to land managers.

Trends and stressors: While it is possible to classify these forests as middle aged, some of the tree species are reaching and exceeding their biological maturity, especially those classified as early successional and shade intolerant, like aspen, ash and birch. These trees will be more susceptible to insect and disease issues and will naturally be replaced by more shade tolerant species. Over the next 50 to 100 years this "wave" of middle aged forests will continue to mature and develop attributes associated with late successional forest habitats, except in cases where harvesting or natural disturbances "set the clock back" on succession.

Late Successional Forest Habitat Assessment

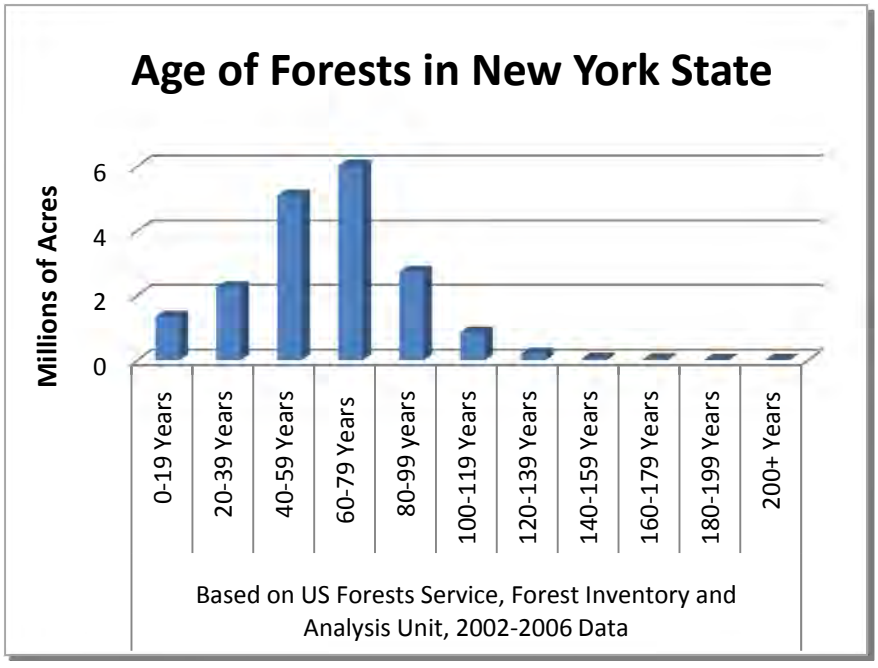
State Forests, parks and preserves provide significant blocks of both actively and minimally managed late successional forest cover. Late successional forest cover provides habitat for animals such as red backed, northern dusky, spotted and marble salamanders; black bear, fisher, bobcat, smokey shrew and northern flying squirrel; wood thrush, Louisiana water thrush,

black-throated blue warbler, ovenbird, hermit thrush, eastern wood pewee, golden-crowned kinglet, least flycatcher, Swanson's thrush, blue headed vireo, yellow bellied sapsucker, veery, red-eyed vireo, scarlet tanager and Cerulean warbler. It is also essential for a wide variety of lichens, mosses, vascular plants and soil micro-organisms.

Historical Background: Early settlement, land clearing for agricultural needs and industrialization of New York State removed much of the state's forest cover. Between 1700 and 1900, approximately 75% of New York's land area was deforested, when deforestation reached 85% or more for some counties (Caslick 1975). Large scale forest disturbance from European settlement and the rapid industrialization of the state that followed was probably the greatest event to impact New York's forest resource since the last glacier retreated and the landscape began to recover some 10,000 years ago. Thus, most of the state's late successional forest cover was lost in a very short period.

Existing Conditions: Today, the vast majority of New York's forests are less than 140 years of age and, by their very nature, often lack late successional habitat components such as large diameter dead standing trees (snags), large diameter deadwood on the ground (coarse woody debris) and large diameter biological legacy trees. Statewide, U.S. Forest Service inventory data show that less than 1% of the state's forest resource is greater than 140 years in age. Most forests and forest ecosystems simply haven't had the time to develop late successional habitat characteristics. As previously mentioned, about 14 million acres, representing about 76% of New York's forests, are owned privately and periodically harvested, often with limited technical assistance from professional foresters. New York's private lands are subject to pressures associated with land development, subdivision, rapid turnover in ownership and financial need.

New York State has more forest land in a "preserve" status (i.e., not permitted to be commercially harvested) than any other state in the Northeastern United States (including the States of CT, DE, ME, MD, MA, NH, NJ, OH, PA, RI, VA, VT and WV). These are lands which, over time have the potential to develop into late successional forests, barring large natural or human-caused disturbances. According to 2008 data from the US



Forest Service Forest Inventory and Analysis Unit, 5% of the Northeast's forests lands are reserved from harvesting. Over 18% of New York State's forests are in this category.

The Adirondack and Catskill Forest Preserve and the State Park System provide nearly 3.1 million acres of mostly forested open space that will continue to provide late successional habitat. The Adirondack and Catskill Forest Preserve are constitutionally protected from harvesting and New York State Parks are protected by policy from commercial tree cutting. Additionally, on the nearly 1 million acres of State Forests and Wildlife Management Areas some forests are managed in a manner that promotes the development of late successional habitat. Further, private land conservation trusts protect about 366,000 acres, which adds to the potential statewide late successional habitat land base (Aldrich and Wyerman 2005). Federal lands in New York add an additional 163,000 acres.

Trends: The great majority of properties within the forest preserve that underwent significant disturbance will continue to progress towards a late successional condition. A small percentage will likely undergo additional natural disturbance, but the amount of late successional habitat within the forest preserve will likely continue to increase. At some point, taking into account the eventual equilibrium between natural disturbance and forest succession, late successional forests in the forest preserve will comprise between 15 and 20 percent of the state's forest land. Forests owned by non-industrial private landowners will contribute to the statewide late successional forest cover on lands protected from harvesting by conservation easements held by land trusts. Portions of State Forest lands will be managed using uneven-aged management systems, allowing them to develop late successional characteristics. It is virtually impossible however, that late successional forests will ever make up as high a percentage of the landscape in other parts of the state as they eventually will within the Adirondack and Catskill blue lines.

Evergreen Forest Cover Habitat Assessment

Evergreen (non-deciduous conifer) forests are important because they moderate temperature extremes, help improve previously eroded and nutrient-depleted soils, and provide valuable winter cover. Mammals that require or benefit from evergreen cover include the red squirrel, fisher, snowshoe hare and white-tailed deer. Evergreen forests and mixed evergreen-hardwood forests provide high quality winter habitats for deer in areas that are prone to heavy snowfall. Non-deciduous conifers also provide habitat preferred by a suite of bird species which includes the magnolia warbler, Blackburnian warbler, pine warbler, yellow-rumped warbler, red-breasted nuthatch and black-throated green warbler. Mature tall conifers also provide nesting habitat for raptors such as the northern goshawk, broad-winged hawk and sharp-shinned hawk.

Historical background: Evergreen cover is an important habitat that has historically been heavily impacted by early colonization and European settlement. The early demand for eastern white pine for ship masts, eastern hemlock for barn siding and beams, and hemlock bark for leather tanning, coupled with the extensive cutting of evergreens for paper pulp during the late 19th and early 20th centuries significantly impacted the state's evergreen resource. Based on

satellite images from the NLCD, about 8% of New York State is covered by evergreen forest. Eastern white pine, eastern hemlock, red spruce, black spruce, northern white cedar and balsam fir are the chief native conifers found in the state.

Existing conditions: From a forest cover standpoint, the State Forest System is especially unique in that it provides a large conifer plantation and evergreen component which is significant on a statewide basis. Much of this component is comprised of plantations, which are largely a legacy of the massive tree planting campaign conducted by the Civilian Conservation Corps during the Great Depression. According to the NYGAP Report, New York State agencies, primarily the DEC, manage about 56% of the evergreen forests, but only 13% of deciduous and 22% of the mixed evergreen/deciduous forests. Both native and non-native evergreen conifers such as Austrian pine, eastern white pine, red pine, pitch pine, jack pine, Scotch pine, balsam fir, eastern hemlock, northern white cedar, Norway spruce, white spruce, and white spruce have historically been planted on State Forest lands. Of these species, Norway spruce, red pine and Scotch pine have arguably been the most successful, in terms of rate of growth and volume of biomass produced per acre.

Stressors and trends: A majority of State Forest plantations were established between 1930 and 1942. Those planted with shorter-lived species like Scotch pine, those planted in poor soils, and those established on sites to which they were not well suited, have passed their biological maturity and are now being harvested and converted to more natural mixed hardwood and mixed softwood/hardwood habitats. This is widely considered the second step of the restoration process for these formerly abused lands. As a result, the evergreen forest cover on State Forests and in the landscape will be dropping over time. Other plantations of longer-lived species like Norway spruce and white pine will remain in softwood cover for a much longer period of time, since it will take longer for these stands to reach the point at which they will be converted or re-generated.

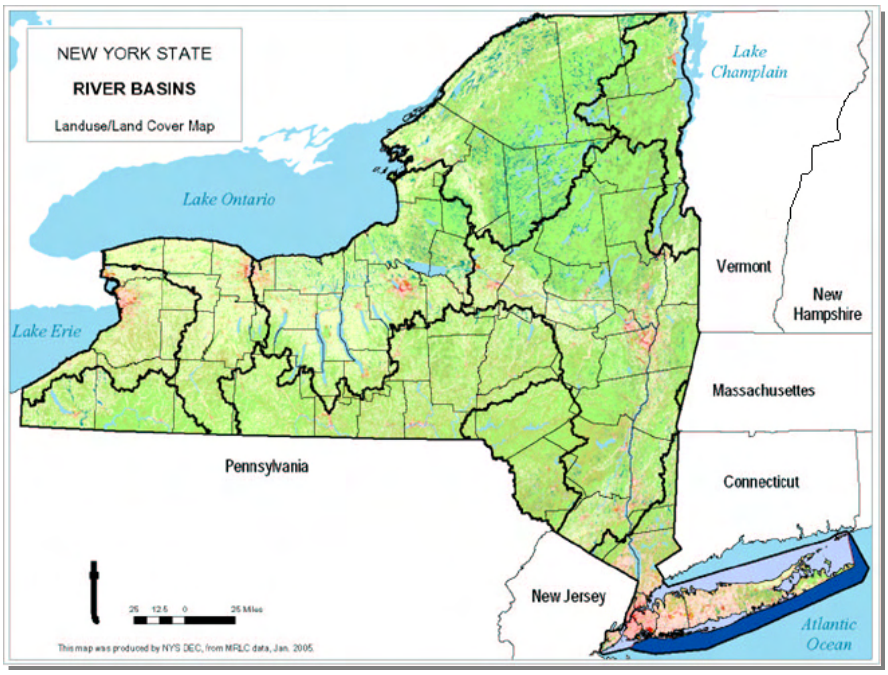
Insect and disease are more prevalent in over-mature plantations or those experiencing other stressors from not being properly thinned or being on poor or inappropriate sites. In the case of Scotch pine, a newly introduced wood wasp, S*irex noctillio*, has spread throughout most of the state and is causing significant mortality loss. Red pine plantations are experiencing a greater incidence of root rot fungi, causing general decline in some plantations. In the worst cases mortality spreads progressively through entire stands. These too will lead to a reduction in the evergreen conifer cover in the landscape.

Wetlands Habitat Assessment

Wetlands filter, clean and store rain and snowmelt, help reduce flooding, and provide

habitat for many forms of wildlife such as geese, ducks, frogs and salamanders. Outside of the Atlantic Coast, Great Lakes and Finger Lakes regions of New York, wetlands often occur in relatively small patches within upland habitats. As such, most local populations of wetland species are small and isolated and thus vulnerable to extinction (Moller and Rordam 1985), (Sjogren 1991). Recent research suggests that the present understanding of how wetland patches and the plants and animals that depend upon them interact across the landscape is limited (Gibbs 2000). The difference in size, shape and spacing patterns of wetlands varies considerably across the landscape and makes sustaining, enhancing and managing wetland habitats challenging.

Historical background: The NYGAP Report summarizes the estimated patterns of long-term changes in different community types across New York State. Based on the work of Noss, Laroe and Scott (1985) and Reschke (1993), about 60% of New York State's wetlands were lost between the 1780s and 1980s.



Intact wetlands provide improved water quality downstream

Current trends: State wetland regulations and policies have significantly slowed wetland loss, but gradual development continues to impact and fragment smaller wetland habitats that fall below the state wetland regulation size threshold. DEC is working with organizations like the Upper Susquehanna Watershed Coalition to create and improve wetlands and habitats on State Forest lands.

Grassland habitat on Long Pond State Forest, Chenango County

Grassland, pine barrens, tidal wetlands and other unique habitat assessment

Historical background: Modern civilizations have long established themselves near water for agricultural, industrial and commercial purposes. As such, early development of New York initially

took place along and near the Atlantic Coast, Staten Island, Long Island and the lower Hudson River Valley. As human population rapidly expanded in these areas, habitats and communities unique to New York State such as freshwater tidal wetland swamps, Coastal plain white cedar swamps, Serpentine barrens, Long Island Coastal heathland, Hempstead Plains grassland and Long Island pine barrens were significantly impacted.

Table 2.1, obtained from the NYGAP Report, lists the estimated patterns and historic changes in different habitat and community types. The authors of the NYGAP report state that "though generally poorly documented, the post-settlement changes in some plant communities most dramatically affected have been those that occupied relatively small land areas in the first place, or plant communities occurring in areas with the longest histories of settlement and development, like Long Island." In addition, "major changes in the species composition of hardwood forests have occurred and continue to occur."

Table 2.1 – Estimated Patterns of Long Term Habitat/Community Type Loss in New York State (Adopted from the 2001 NY GAP Analysis Report)

Habitat / Community Type	Estimated Long Term Loss
Long Island coastal heathland	More than 90% loss since the mid 1800s
Hempstead Plains grassland	More than 99% loss
Long Island pine barrens	60-68% loss
Serpentine barrens, maritime heathland and pitch pine barrens	More than 90% probable loss
Coastal plain Atlantic white cedar swamp, maritime oak-holly forest, maritime red cedar forest, marl fen, marl pond shore and oak openings.	More than 90% probable loss
Alvar grassland, calcareous pavement barrens, coastal plain poor fens, dwarf pine ridges, inland Atlantic white cedar swamp, freshwater tidal swamp, inland salt marsh, mountain spruce-fir forest, patterned peat land, perched peat land, perched bog , pitch pine-pine-blueberry peat swamp, rich sloping fens and riverside ice meadow.	Around 70-90% probable loss
Allegheny oak forest, alpine krummholz, Great Lakes dunes, ice cave talus communities, perched swamp white oak swamp, rich shrub fen and sandstone pavement barrens .	Less than 50% probable loss
Coastal plain ponds and pond shores	Around 50-70% loss
Brackish intertidal mudflats, brackish intertidal shores and coastal streams	Around 50-70% loss

ASSESSMENT OF HUMAN IMPACTS ON THE FORESTS OF NEW YORK (STRESSORS AND TRENDS)

Most decision making on State Forests will consider the functional role role each forest can play with respect to the greater landscape and the state as a whole. This may include opportunities to enhance biodiversity in the landscape by creating and maintaining a wide variety of habitats

with varied structural diversity or opportunities to enhance core forest within a matrix forest block by maintaining forest integrity. DEC will also consider strategies to mitigate the harmful impacts of human activities and to protect rare and endangered species, threatened species, and unique natural communities that exist on State Forests and unique sites capable of supporting rare and endangered species.

Black cherry hardwood forests are becoming less common in New York due to harvesting pressure

Impacts of harvesting

The current rate of harvesting on a statewide basis, on all forest lands, is well below the rate of growth, allowing forests to mature. The 2008 Forest Service Inventory of all New York forests available for harvest showed that average net growth exceeded overall harvesting by a 2.5 to 1 ratio. As forests mature, the species composition will naturally change from being dominated by shade-intolerant trees to being dominated by shade-tolerant species.

Data collected by DEC indicate that higher value species such as sugar maple, black cherry and red oak comprise a larger percentage of timber harvested in New York than lower valued species such as beech, basswood and ash. This is likely a result not only of market demands, but of the availability of each species in the landscape. As a result, species such as red maple and American beech, which are not as valuable financially, have become more plentiful in the forest. Red maple has replaced sugar maple as the leading tree species in the state. Since many life forms including fungi, mosses, insects, and birds depend on specific tree species and their respective ecosystems, the changing composition of trees across the landscape is of concern.

Methods of harvest also have the ability to affect species composition in a forest. Many oak species need exposed mineral soil to become established as a major component in a forest. In Western New York, some of the stands dominated by red oak owe their existence to heavy harvests in the late 1800s. At that time harvesting practices were very disruptive to the soil and the market for all species and sizes of trees led to many clear cuts, favoring oak seedling establishment. Railroads also had an effect on oak dominance. Wildfires were commonly started by sparks from wood- and coal-fired locomotives in the 1800s. These fires could get hot enough to burn away the organic layer of the soil and expose mineral soil, creating conditions that favored the development of oak forests. Oak species are especially relevant from an ecosystem sustainability and health standpoint because many species depend on acorns as an important food source. Harvesting methods have changed, and wildfires are now very uncommon. As a result, the dominance of oak is declining in some areas of the state.

Harvesting methods over a long timeframe can affect the quality of the forest's genetic quality or gene pool. Harvests on private lands in New York State are often conducted using diameter limit cuts, which remove all of the trees on a property larger than a selected size. In some cases, private land harvests focus only on the highest valued trees, leaving behind poorly formed or defective trees. In the most extreme cases, all of the economically valuable trees are removed from a property, leaving behind the poorest and least valued trees. The repeated application of these practices over several harvest cycles will have significant effects on the remaining tree gene pool, future forest composition and forest productivity. On State Forests, where economic goals are balanced with ecological objectives, most harvests incorporate the removal of diseased and defective trees, and those of low ecological value. Taking the lead from "Mother Nature," harvests mimic natural selection and attempt to enhance the gene pool.

Impacts of Introduced Insects, Diseases and Invasive Plants on New York's Forests

The introduction of non-native, invasive species and diseases has historically had a huge impact on New York's forests and has caused the virtual extirpation of some species. Unfortunately, introductions are occurring at an accelerated rate with consequences yet to be realized.

This issue is covered more fully in the Forest Health section on page 277 of this plan.

Impact of Urbanization and Development

Based on past trends, researchers predict that urban expansion will likely increase in the coming decades in New York State (Nowak and Walton 2005). For instance, the amount of urban land in the U.S. is projected to increase from 3.1% in 2000 to 8.1% by the year 2050. If this were to occur, about 151,506 square miles of the land in the U.S. would be converted to urban land, which is an area larger than the state of Montana. In New York State, Nowak and Walton predict that between 1,930 and 2,900 square miles of forest (between 5 and 10 percent) will be lost to urban sprawl by the year 2050. Continued urban sprawl threatens forest sustainability by increasing the risk for exotic pest infestations, by placing greater recreational demands on the remaining forest, and by increasing fragmentation of forest ecosystems and habitats. State Forests, particularly those in close proximity to urban areas, will receive growing pressures and demands, especially for recreational services.

In the long term, suburban sprawl will continue to drive the subdivision and fragmentation of privately held forest cover habitats that connect publicly managed open space. Based on these trends, New York's future forest ecosystems will be less connected across the landscape and will have a higher proportion of stand-alone (isolated) forest, shrub and agricultural patches. Gradually, losses of connections between habitat patches will impact future plant and animal populations. Isolated patches will reduce the movement of plant and animal species and stress ecosystems. Therefore, keeping patches of open space connected by naturally vegetated corridors along such features as wetlands, hedgerows, streams and rivers is an important key to

future forest ecosystem sustainability. Fragmentation of existing landscape connections by large scale electric utility, natural gas pipelines and major highways is also of concern. Large blocks of core forest also play a role by providing 'source' populations of plants and animals that can repopulate these smaller patches after disturbance events.

Climate Change Impacts

The earth's climate has always been in a state of change, which has created the very world that exists today. Fossils in the sedimentary rock record show that the Earth has witnessed at least five large-scale mass extinction events, all thought to be correlated with rapid climate change. Since the last Ice Age, the state has gradually become warmer and species have migrated northward (Pielou 1991). More recently, however, average annual temperature has risen, which most scientists attribute to the burning of fossil fuels and global carbon dioxide emissions. The Union of Concerned Scientists has stated that "if global warming emissions continue to grow unabated, we can expect dramatic changes in climate over the course of this century" (Union of Concerned Scientists 2006).

In a 2007 report entitled Confronting Climate Change in the U.S. Northeast, scientists point out that "average temperatures across the Northeast have risen more than 1.5 degrees Fahrenheit since 1970, with winters warming most rapidly - 4 degrees Fahrenheit between 1970 and 2000." If current global emissions of the greenhouse gases carbon dioxide and methane continue, seasonal average temperatures across the state are projected to rise between 8 to 12 degrees Fahrenheit above historic levels. The character of the Northeast's forests may change dramatically over the coming century, as suitable habitat for most of the region's tree species shifts northward. This shift may be as much as 500 miles by the late 21st century if greenhouse emissions continue to climb unchecked, and as much as 350 miles if steps are taken to reduce global greenhouse gas emissions (Frumhoff 2007).

According to the report, this rapid temperature rise would almost undoubtedly trigger an unprecedented change in forest species composition, especially near the upper forest type limits. For example, northern hardwood forests with a large sugar maple component currently on the fringe of the transitional oak-forest type would likely be stressed and significantly changed. Forest ecosystems that require cool and moist conditions such as spruce-fir forests that cover the higher elevations of Adirondacks would change and diminish in scope. Throughout the state, populations of tree species such as eastern white pine and eastern hemlock, and the ecosystems that depend upon them, could significantly shrink.

In fact, some scientists believe that suitable habitat for eastern hemlock could shrink by as much as 50 percent if greenhouse gas emissions continue to rise rapidly over the next century. Eastern hemlock is often called a keystone species because it is a species that strongly influences the functioning of an entire ecosystem. Hemlock provides cover and habitat for species such as turkey, deer and brook trout. 96 bird species and 47 mammal species are known to be associated with the hemlock type in the northeastern United States (Yamasaki,

DeGraff and Lanier 1999). Ruffed grouse, yellow-bellied sapsucker, great horned owl, northern goshawk, red squirrel, black-throated green warbler, Blackburnian warbler, pine siskin, evening grosbeak, winter wren and red-breasted nuthatch have all been associated with hemlock habitat. Given these facts, it seems almost certain that tree species which require relatively cool and moist conditions such as sugar maple, yellow birch, eastern white pine and eastern hemlock will be replaced with those that tolerate warmer conditions, such as red maple, northern red oak and tulip poplar.

STATEWIDE GAPS

The assessment on the following pages identifies major forest related habitat gaps that exist at the statewide landscape level. In essence, biodiversity would be enhanced in New York State by:

- Developing late successional, early successional, and evergreen forest cover habitats in order to promote habitat diversity (The state currently has an abundance of middle aged forests that have grown and aged on former agricultural land).
- Maintaining forests on a wide variety of landforms to ensure the proper environmental conditions exist for all species as the climate continues to change and other stressors appear in the landscape.
- Maintaining and enhancing habitat connectivity. Keeping existing patches of these habitats physically connected over the coming centuries will be a significant challenge. Connectivity is also needed to allow species to adapt to climate change. A number of research projects in New York State have used computer modeling to define and identify corridors based on potential to provide connectivity. These “least cost path” (LCP) corridors connect naturally forested and minimally developed areas. Protection and enhancement of LCP corridors will require extensive and consistent cooperation, collaboration, communication, leadership, vision and financial support at state and local levels.
- As development and subdivision of privately held forests continues in New York, large contiguous blocks of unbroken forest are becoming more scarce. New York State can be proud of its conservation record in the protection of the Adirondack and Catskill Forest Preserve. However, there are other parts of the state containing different ecosystems and forest types that should be protected from permanent conversion to non-forest uses. NYNHP has identified priority areas where large blocks of forests exist and can be further augmented. These areas are referred to as matrix forests.
- Preserving open space. The New York State 2009 Open Space Conservation Plan, a collaborative effort between DEC, the Office of Parks, Recreation and Historic Preservation, the Department of State and potentially affected stakeholders and organizations, outlines strategies to keep important habitats connected across the New York landscape. In fact, the plan frequently references the need to enhance greenways

and connectivity for recreation, protection of water quality, to meet ecological goals, and address climate change. The projects are too numerous to list here, but the following quote from the 2009 Open Space Plan illustrates this concept well:

ADDITIONAL RESOURCES

New York's 2009 Open Space Conservation Plan – www.dec.ny.gov/lands/47990.html

"Protection of sufficient variety of habitat and migration corridors, including managed, and wild, and riparian areas, to ensure the long-term existence of the native plant and animal species in the Region by providing connectivity among suitable habitat allowing species to migrate when climate or other external forces degrade their existing range."

- Employing management strategies to mitigate human impacts, impacts of deer, impacts of invasive species and to protect and enhance rare and endangered species and unique natural communities.

ASSESSMENT OF THE STATE FOREST SYSTEM

The diversity of the ecosystem will also be considered at the level of the many lands that make up the State Forest system. Table 2.7 illustrates the composition of New York's State Forests.

Table 2.7 – New York GAP Cover Type (2001), Summary: Lands Managed by the Bureau of State Land Management

LAND COVER	NUMBER OF FEATURES	ESTIMATED ACRES	PERCENTAGE
Forest Matrix			
Evergreen-northern hardwood	9,820	283,983	36.7
Sugar maple mesic	12,280	204,812	26.5
Oak	3,432	64,346	8.3
Successional hardwoods	6,892	64,336	8.3
Evergreen Plantation	1,432	33,419	4.3
Spruce-fir	1,055	15,131	2.0
Deciduous wetland	1,476	14,229	1.8
Pitch pine-oak	126	8,970	1.2
Evergreen Wetland	795	7,354	1.0
Appalachian oak-pine	519	4,567	0.6

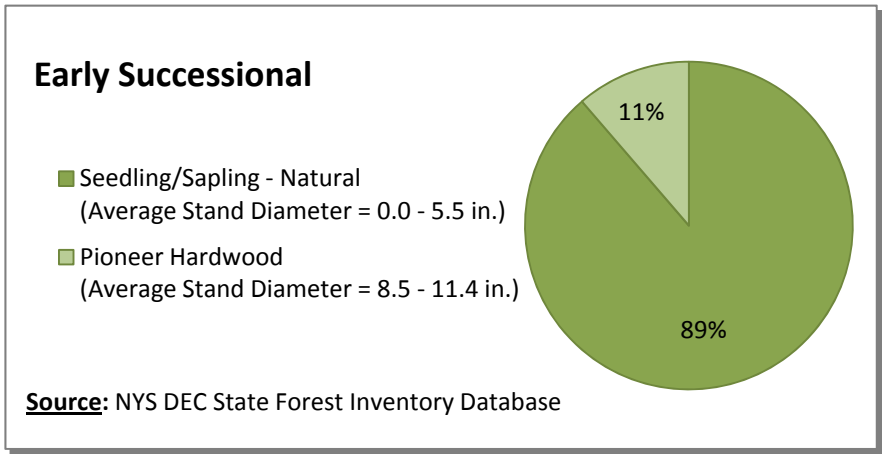
Table 2.7, cont. – New York GAP Cover Type (2001), Summary: Lands Managed by the Bureau of State Land Management			
LAND COVER	**NUMBER OF FEATURES**	**ESTIMATED ACRES**	**PERCENTAGE**
Sub-total	***37,827***	***701,147***	***90.7***
Early Successional Shrub Matrix			
Successional shrub	734	3,829	0.5
Shrub swamp	383	2,100	0.3
Sub-total	***1,117***	***5,929***	***0.8***
Water Resources Matrix			
Open water	3,698	21,246	2.7
Mixed wetland	1,075	9,692	1.3
Emergent marsh/open fen/wet meadow	390	2,518	0.3
Dwarf shrub bog	1	0	0.0
Sub-total	***5,164***	***33,456***	***4.3***
Agricultural Matrix			
Cropland	3,126	15,340	2.0
Old field/pasture	1,359	7,909	1.0
Orchard/vineyard	1	50	0.0
Sub-total	***4,486***	***22,299***	***3.0***
Developed Open Space Matrix			
Suburban	12	7	0.0
Golf course/park/lawn	5	2	0.0
Sub-total	***17***	***9***	***0.0***
Grey Infrastructure Matrix			
Roads	479	655	0.1
Urban	105	641	0.1

Table 2.7, cont. – New York GAP Cover Type (2001), Summary: Lands Managed by the Bureau of State Land Management			
LAND COVER	**NUMBER OF FEATURES**	**ESTIMATED ACRES**	**PERCENTAGE**
Sub-total	***584***	***1,296***	***0.2***
Other			
Sand flats/slope	6	32	0.0
Barren	21	12	0.0
Clouds and Shadows	387	8,757	1.2
Sub-total	***414***	***8,801***	***1.2***
Total	**49,609**	**773,937**	**100.0**

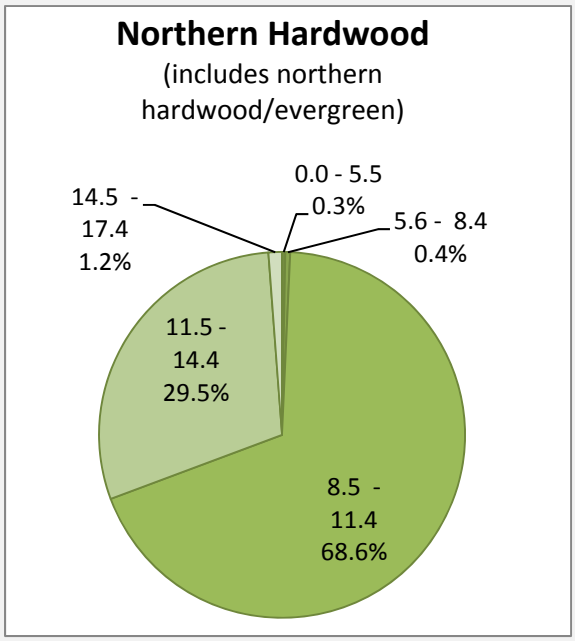
Notes: Satellite sensors have limitations in distinguishing between evergreen plantations and natural evergreens as well as differentiating fields, pasture and cropland. State land acreage based on the current polygon data in the DEC's MHDB.

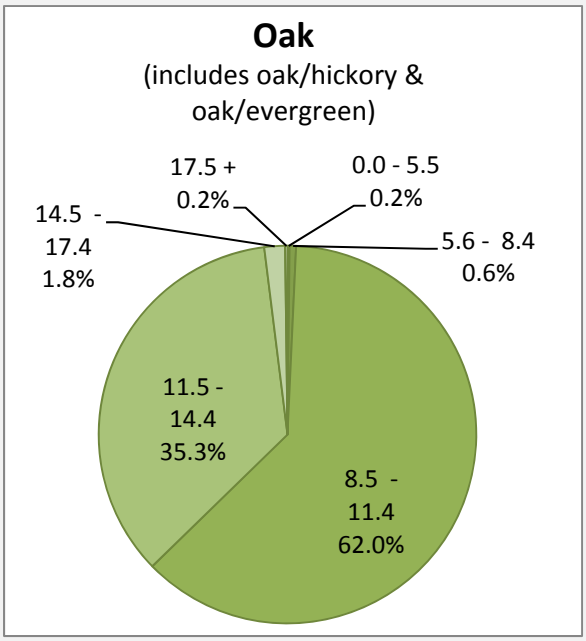
State Forest Size Classes

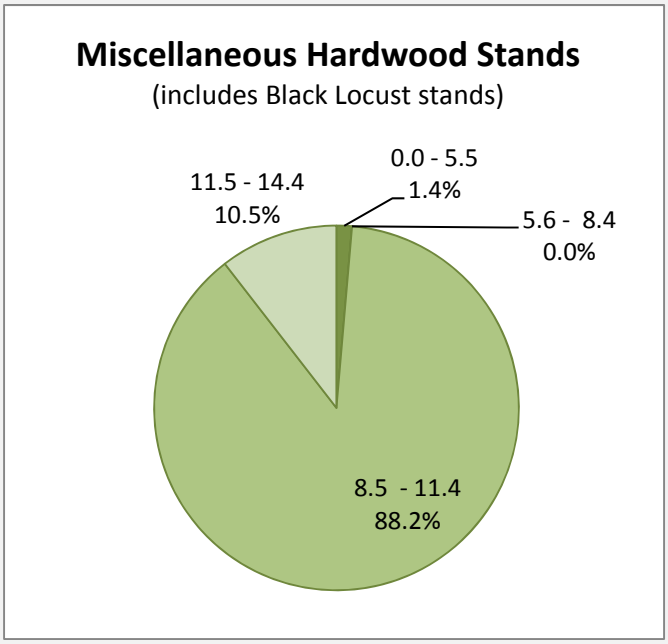
The following charts display the percentage of acreage found in various size classes in early successional, natural hardwood, natural conifer and plantation stands on State Forests. The vast majority of stands have an average stand diameter between 8.5 and 14.4 inches. This data was collected from DEC's State Forest Inventory database. Approximately 30% of the data was collected under updated inventory protocols, within the years 2006 to 2010. The remaining data was collected between 1978 and 2005 using less standardized techniques. Data was collected by separating stands according to "forest type", sorting each forest type into size classes by average stand diameter, totaling the acreage for each size class within each forest type, and calculating the percentage composed of each size class.



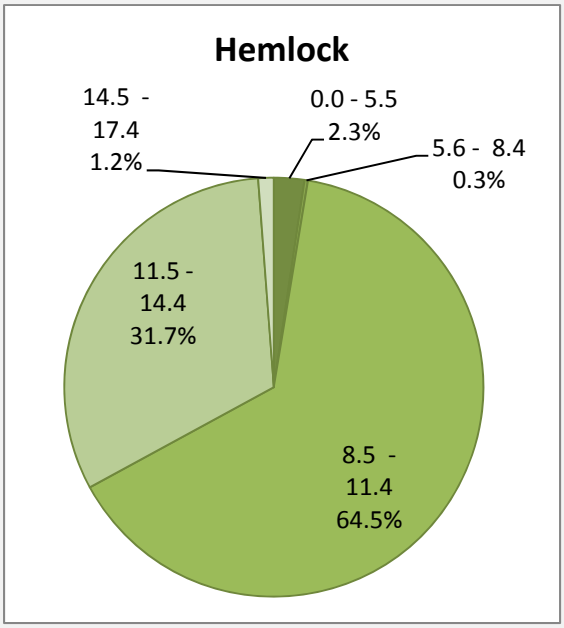
Size Classification of Natural Hardwoods – Percentage of stands in each size class, by SFID forest type. Stand size is characterized by mean stand diameter in inches. **Source:** NYS DEC State Forest Inventory Database

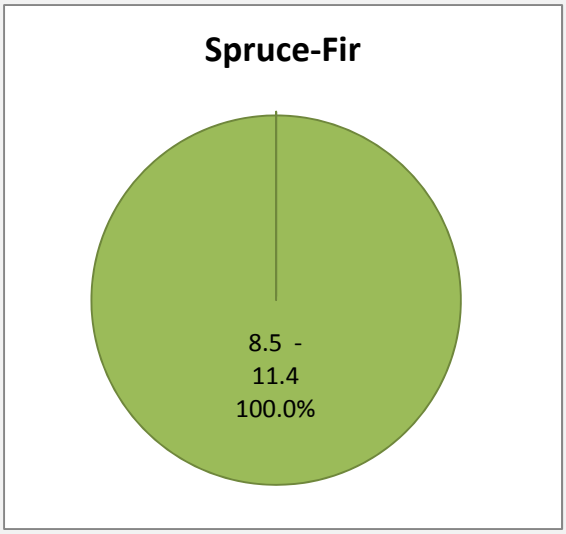


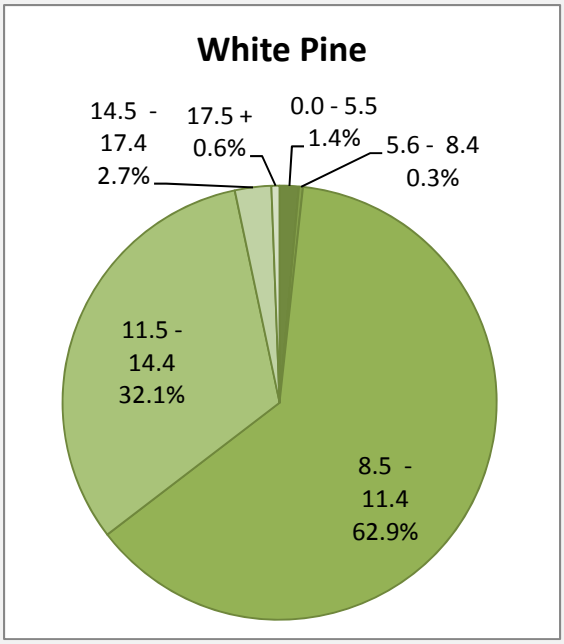


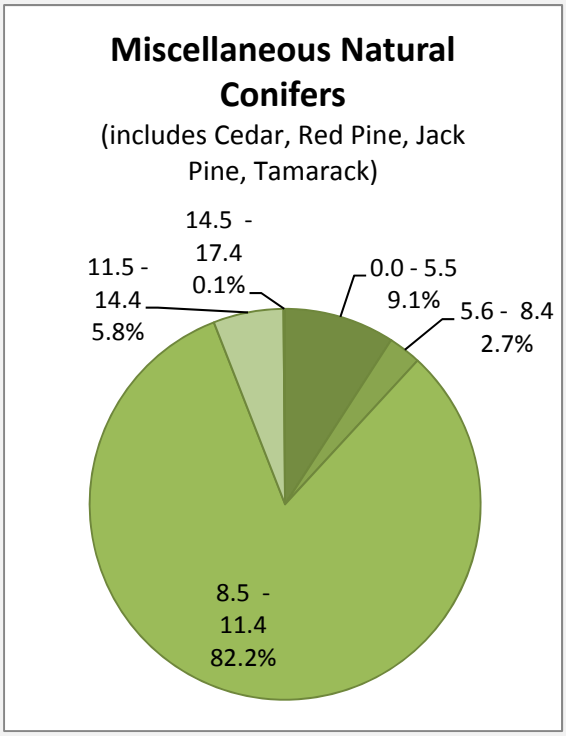


Size Classification of Natural Conifers – Percentage of stands in each size class, by SFID forest type. Stand size is characterized by mean stand diameter (inches). **Source:** NYS DEC State Forest Inventory Database



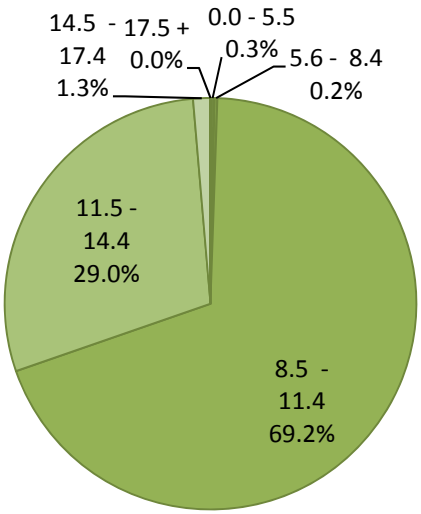




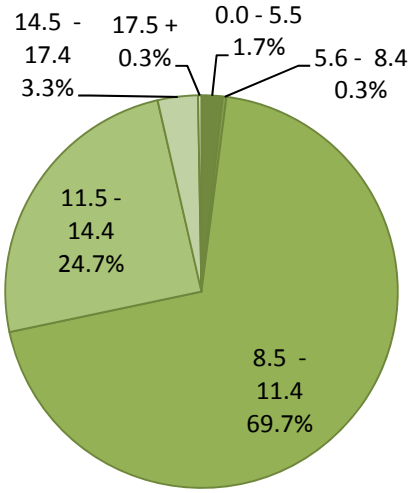


Size Classification of Plantations – Percentage of stands in each size class, by SFID forest type. Stand size is characterized by mean stand diameter (inches). **Source:** NYS DEC State Forest Inventory Database

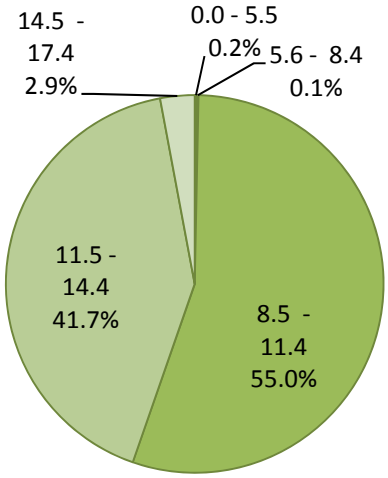
Plantation Pine
(includes White Pine, Scotch Pine and Red Pine)



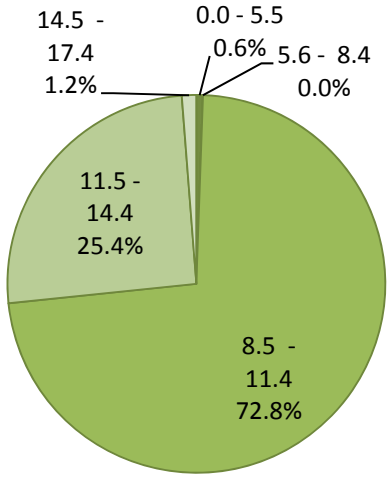
Plantation Spruce and Fir
(includes Norway Spruce, White Spruce, Douglas Fir and Balsam Fir)



Mixed Plantation
(includes pine, spruce and larch in mixed plantation stands)



Plantation Larch
(includes European and Japanese larch)



ECOREGIONAL LANDSCAPE ASSESSMENT

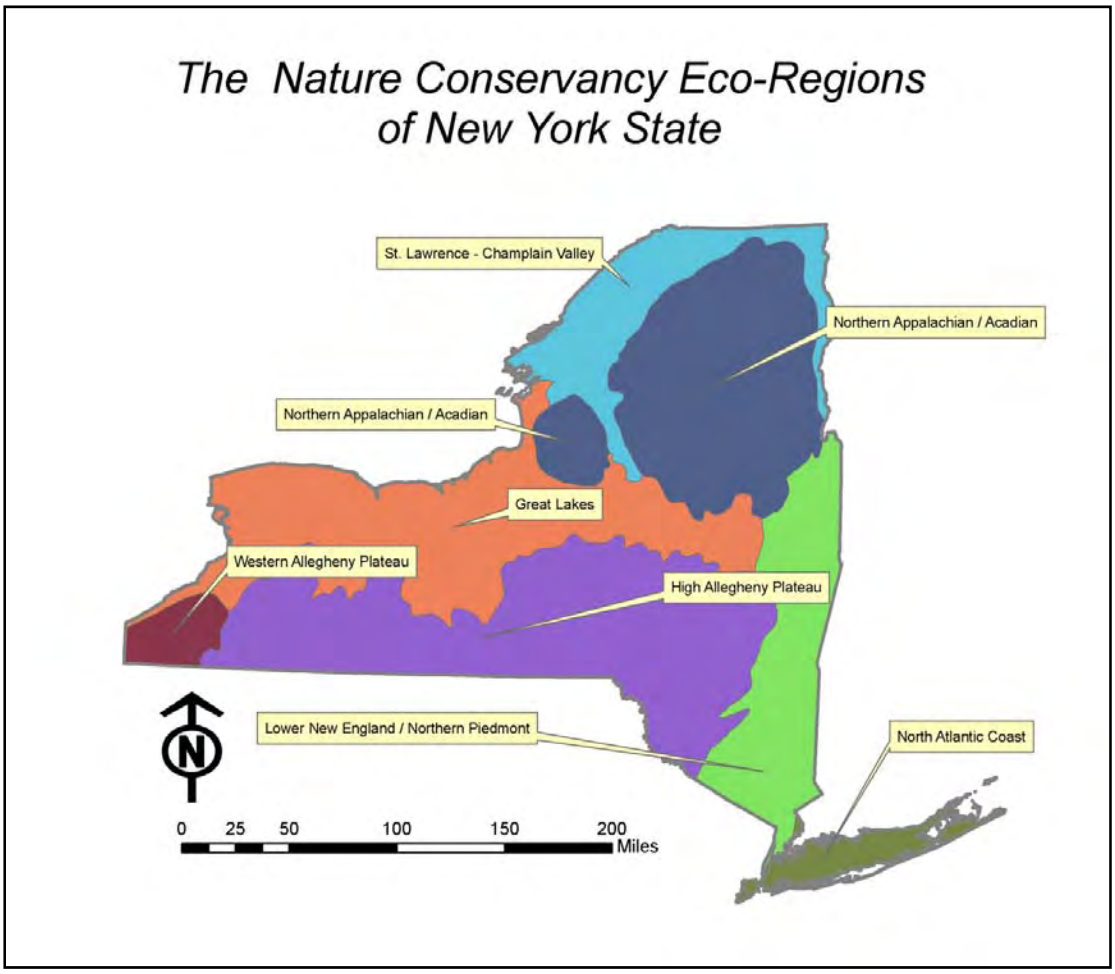
This segment of the assessment will take a closer look at the landscape based on "ecoregions" as defined by The Nature Conservancy. Ecoregions are areas of ecological homogeneity, which are defined by similarities in soil, physiography, climate, hydrology, geology and vegetation. The following ecoregional analysis was completed using the resources of the NY GAP, the National Land Cover Types website, the U.S. Forest Service, the State University of New York College of Environmental Science and Forestry, the Multi-Resolution Land Characteristics Consortium (MRLC), and analysis of DEC GIS data layers with ArcGIS v. 9.3.

ECOREGIONS IN NEW YORK STATE

This section will present an analysis of the landscape conditions on each of the seven Ecoregions in New York State, as defined by The Nature Conservancy.

ADDITIONAL RESOURCES

New York's Ecoregions – a full page map of Ecoregions and State Forests http://www.dec.ny.gov/docs/lands_forests_pdf/nyecoregions.pdf



ECOREGIONAL LANDSCAPE ASSESSMENT

Table 2.2 – TNC Ecoregions of New York State (NYS)			
Ecoregion	**Acres**	**Percentage**	
		State	**SFS***
St. Lawrence/Champlain Valley (SL-CV)	2,845,196	9	12
Northern Appalachian/Acadian (NAP)	6,684,854	22	22
Great Lakes (GL)	7,393,893	24	6
Western Allegheny Plateau (WAP)	743,861	2	2
New York High Allegheny Plateau (HAP)	8,709,864	28	53
Lower New England/Northern Piedmont (LNE-NP)	3,796,070	12	4
North Atlantic Coast (NAC)	945,667	3	1
Totals	**31,119,405**	**100**	**100**

** Percentage of State Forest System (SFS) in each respective ecoregion.*

The following summaries are based on The Nature Conservancy's assessments, and describe the present character of New York's ecoregions.

St. Lawrence - Champlain Valley Ecoregion

The St. Lawrence – Champlain Valley (SL-CV) Ecoregion includes vast stretches of fertile land, rich woodlands, vibrant wetlands, dramatic cliffs, one of the continent's largest rivers, the St. Lawrence, and the continent's sixth largest lake, Lake Champlain (Thompson 2002). The ecoregion hosts a number of endemic species as well as more widespread species at the edges of their ranges. It provides critical habitat for migratory birds, breeding grassland birds, and wintering raptors.

Because of its fertile soils, relatively mild climate, and stunning scenery, the ecoregion has been used by humans for at least 10,000 years, and very heavily for the last 300. Some of the species that once occurred in the ecoregion have been extirpated, either throughout the east or in the ecoregion alone. Others are in decline or otherwise vulnerable. The upland and wetland natural communities of the region have been reduced in many cases to small, isolated fragments that harbor exotic species and have lost much of their integrity. The lakes, ponds, rivers, and streams that define this ecoregion are compromised by pollution and damming. Conservation of this region's biological diversity will be a challenge.

Several key threats to the biological diversity of the ecoregion were identified. These threats include water flow manipulation, landscape fragmentation, invasive exotic species, intensive agriculture, intensive forestry, a weak conservation ethic in the human population overall, and pollution of all kinds. Abating these threats will require creative approaches and hard work. Restoration of ecological systems and their component species will be vital to success in conserving both the uplands and the aquatic features of the ecoregion. Influencing public policy in the areas of water management, agriculture, forestry, and transportation will be crucial.

Deep and committed partnerships in all these endeavors will be more important than ever to be successful in achieving the goals for the SL-CV.

Northern Appalachian – Acadian Ecoregion

The Northern Appalachian – Acadian (NAP) Ecoregion extends over large ecological gradients from the boreal forest to the north and deciduous forest to the south (The Nature Conservancy n.d.). The Gaspé Peninsula and higher elevations support taiga elements. At lower elevations and latitudes, there is a gradual shift toward higher proportions of northern hardwood mixed-wood species which marks the transition into the Acadian forest. It also supports local endemic species, as well as rare, disjunct, and peripheral populations of arctic, alpine, Alleghenian and coastal plain species that are more common elsewhere. In New York, the primary portion of the NAP Ecoregion consists of the Adirondack Forest Preserve and Tug Hill Plateau.

The forest is a heterogeneous landscape containing varying proportions of upland hardwood and spruce-fir types. It is characterized by long-lived, shade-tolerant conifer and deciduous species, such as red spruce, balsam fir, yellow birch, sugar maple, red oak, red maple, and American beech, while red and eastern white pine and eastern hemlock occur to a lesser but significant degree.

There has been a historical shift away from the uneven-aged and multi-generational “old growth” forest toward even-aged and early successional forest types due to human activities. This mirrors the historical trends toward mechanization and industrialization within the forest resource sector over the past century and shift from harvesting large dimension lumber to smaller dimension pulpwood.

For vertebrate diversity, the NAP ecoregion is among the 20 richest ecoregions in the continental United States and Canada, and is the second-richest ecoregion within the temperate broadleaf and mixed forest types. The forests also contain 14 species of confers, more than any other ecoregion within this major habitat type, with the exception of the Southern Appalachian-Blue Ridge Forests and the Southeastern Mixed Forest.

Characteristic mammals include moose, black bear, red fox, snowshoe hare, porcupine, fisher, beaver, bobcat, lynx, marten, muskrat, and raccoon, although some of these species are less common in the southern parts of the ecoregion. White-tailed deer have expanded northward in the ecoregion, displacing (or replacing) the woodland caribou from the northern realms where the latter were extirpated in the late 1800s by hunting. Coyotes have recently replaced wolves, which were eradicated from this ecoregion in historical times, along with the eastern cougar.

A diversity of aquatic, wetland, riparian, and coastal ecosystems are interspersed between forest and woodland habitats, including floodplains, marshes, estuaries, bogs, fens and peatlands. The ecoregion has many fast-flowing, cold water rocky rivers with highly fluctuating water levels that support rare species and assemblages.

ECOREGIONAL LANDSCAPE ASSESSMENT

Great Lakes Ecoregion

The Great Lakes (GL) Ecoregion encompasses 234,000 square miles in parts of eight Midwestern states and one Canadian province (The Nature Conservancy, Great Lakes Ecoregional Planning Team 1999). The ecoregion extends from northeastern Minnesota across to north central New York, and south to northern Indiana and Ohio. The entire landscape was glaciated during the last Ice Age, and is characterized by level lake plains, level to gently rolling lowlands, and hillier upland areas. Elevation across the ecoregion ranges from 300 to over 2,000 feet. Michigan's Porcupine and Huron Mountains and Minnesota's North Shore are some of the areas with higher elevations, while the southern shores of Lakes Michigan, Erie and Ontario have lower elevations and less relief.

In New York, the Great Lakes Ecoregion represents the watersheds of the Finger Lakes, Lake Ontario and Lake Erie, including the Mohawk River Valley. Historically, the northern part of the ecoregion was dominated by northern hardwood forests, pine forests, and spruce-fir forests. The vast majority of these forests was cut over by 1910, and is now in second growth; some areas are even in third growth. Much of the Great Lakes Ecoregion in New York was dominated by tallgrass prairies and savannas, with some beech-maple and other hardwood forests mixed in. This area has been almost completely converted to agricultural and urban or residential uses. The primary disturbance events that helped to shape these ecosystems were fire, blow-downs, and insect and disease outbreaks in the forested parts of the ecoregion, and fire in the grasslands and savannas.

Western Allegheny Plateau Ecoregion

The Western Allegheny Plateau (WAP) Ecoregion has its most northerly tip beginning in the southwestern nose of New York and runs south through western Pennsylvania and West Virginia and eastern Ohio. It includes a small portion of its southern tip just entering northeastern Kentucky.

The WAP ecoregion consists mainly of the upper Allegheny River Basin, or the watershed of the upper reaches of the Allegheny River within both New York and Pennsylvania. The New York portion of the WAP includes approximately 743,325 acres and has an approximate population of 110,000 residents (2000 Census).

This portion of the WAP supports the most diverse fish assemblages in New York State and also harbors a variety of mussels, including several rare species like the endangered clubshell mussel and the wavy-rayed lampmussel. This northwestern portion of the Allegheny River Basin also contains portions of the only unglaciated (Wisconsinan) section of New York, which is reflected in the rich plant and amphibian life found here.

The natural resources of the WAP are generally in good to excellent condition. Although agricultural pursuits, residential uses, and light industrial development pressures have long since removed forests from the fertile flat valleys, the region remains ecologically sound and

aquatic systems that have diverse fish assemblages and several species of rare freshwater mussels.

High Allegheny Plateau Ecoregion

The High Allegheny Plateau (HAP) Ecoregion is located along the southern tier of New York and the northern tier of Pennsylvania (Zaremba and Anderson et. al. 2003). It includes a small portion of New Jersey. Well known features in HAP include the Catskills, The Shawangunks, The Kittatinny Ridge, The Poconos, Allegany State Park, Allegheny National Forest, and a large mass of Pennsylvania state-owned land.

The HAP ecoregion is defined by high elevation features at the northern end of the Appalachian Plateau. Most of the ecoregion is above 1200 feet. The general land form of the area is mid-elevation hills separated by numerous narrow stream-cut valleys.

One of the main features of the ecoregion is an abundance of rivers and streams. The Delaware, Susquehanna, and Allegheny Rivers and their many tributaries cover the entire ecoregion. The Delaware River drains into Delaware Bay; the Susquehanna flows into the Chesapeake Bay; the Allegheny flows into the Ohio and eventually into the Mississippi. These three different drainages contribute to the high overall aquatic diversity in the ecoregion.

The northern and eastern portions of the ecoregion were glaciated; the southwest portion was not. Many northern species and communities reach their southern limit in HAP, while many southern species extend into the ecoregion but not beyond. Species and communities associated with glaciated landforms occur in the north and east; biodiversity associated with older substrate and deeper erosional soils occurs in the southwest.

Another prominent feature of the ecoregion is its currently low population density, although major population centers are nearby. There are 1.7 million people living in the 16.9 million acres of HAP (2000 census data). The largest city is Binghamton, New York at 47,000. Only 250,000 people in HAP live in cities over 10,000. The overall population trend in HAP indicates that people are moving out of the ecoregion with the notable exception of the areas within reach of New York City by major highways.

There are large and significant managed areas in HAP, including three large intact forested areas: the Catskills, the Allegheny National Forest/Allegany State Park complex, and the Pennsylvania state land in central PA.

Lower New England – Northern Piedmont Ecoregion

The Lower New England – Northern Piedmont (LNE-NP) Ecoregion includes portions of 12 states and the District of Columbia (Barbour et al. 2000). The Lower New England ecoregion extends from southern Maine and New Hampshire with their formerly glaciated, low mountain and lake studded landscape through the limestone valleys of western Massachusetts and Connecticut, Vermont

and eastern New York. Rhode Island, eastern Massachusetts and Connecticut are distinctive in that the communities are more fire adapted including pitch pine and oak dominated forests on glacially deposited sandy till that forms a broad plain with many ponds. In New York, the LNE-NP Ecoregion consists primarily of the Hudson Valley region, from below Lake George, south to New York City.

Large portions of the Appalachian Mountains lie within the ecoregion including the Palisades in New York and New Jersey, the Taconics and the Berkshires in Massachusetts, New York, Vermont, and Connecticut, and the widely strewn Monadnocks of southern New Hampshire. Large rivers originating in the Appalachians cut across the Atlantic slope lowlands generally from north or west to east emptying into the Atlantic Ocean. The Potomac, Susquehanna, Delaware, Hudson, Housatonic, Connecticut, Merrimack, and Saco Rivers provide a diversity of high- and low-energy aquatic habitats. The natural character of the ecoregion in New York is perhaps best seen currently within existing protected lands, primarily state-held, found in Palisades Park in New York and New Jersey.

The LNE-NP ecoregion remains one of the most highly populated in the country with many cities including Nashua and Manchester, NH, Springfield and Worcester, MA, Hartford, CT, Albany, NY and New York City, Baltimore, MD, York and Lancaster, PA, and Washington, D.C. Added to these metropolis areas are the suburbs for the cities of Boston, Providence, RI, New Haven, CT, New York, and Philadelphia. The great forest expanses are now being increasingly fragmented by first and second home development. While the mountainous areas of the ecoregion are lightly settled, the valleys have long been developed for agriculture, and both are rapidly succumbing to development pressures.

North Atlantic Coast Ecoregion

The North Atlantic Coast (NAC) Ecoregion represents a 13 million acre area forming a narrow coastal strip covering parts of nine states (M. e. Anderson 2006). It has a straight line distance of 475 miles but encompasses almost 5,000 miles of irregular shoreline habitat. Rocky shores, sandy beaches and tidal marshes are all characteristic. Once mostly wooded, it is now primarily residential.

This ecoregion consists of glaciated irregular plain composed of sandy till and modified by coastal processes in New Jersey, Delaware, New York, Rhode Island, Connecticut, Massachusetts, New Hampshire, Maine and a tiny piece of Pennsylvania. Kames, kettle holes, drumlins and reworked terminal moraines are typical features. Entirely below 600 ft., the region boasts extensive marine and estuarine habitats including salt marshes, beach dune and barrier island systems, fresh and brackish tidal marshes. Inland forest types include coastal pine-oak forests, and oak-beech-holly forest.

New York represents 952,372 acres or just fewer than 13% of the NAC ecoregion. Most of these acres include the entire area of Long Island. Of these acres, 33% are in their natural state, 10%

are in agricultural development, and 58% are in urban, industrial, commercial or residential development.

HABITAT ASSESSMENT OF FOREST LAND AT AN ECOREGIONAL LEVEL

Present Conditions: The present conditions of each of the seven TNC defined Ecoregions are presented in the Table 2.3:

Table 2.3 – National Land Cover Database (NLCD) Summary 2001 from the Multi-Resolution Land Characteristics Consortium (MRLC)

LAND COVER	ECOREGIONS														ENTIRE STATE	
	SL-CV St. Lawrence/ Champlain Valley		**NAP** Northern Appalachian/ Acadian		**GL** Great Lakes		**WAP** Western Allegheny Plateau		**HAP** New York High Allegheny Plateau		**LN-NP** Lower New England/ Northern Piedmont		**NAC** North Atlantic Coast			
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Deciduous Forest	875,608	30.8	3,218,690	48.1	1,539,261	20.8	335,375	45.1	4,093,324	47.0	1,321,869	34.8	109,537	11.6	11,493,666	36.9
Pasture/Hay	493,191	17.3	95,350	1.4	1,720,859	23.3	121,349	16.3	1,321,454	15.2	549,501	14.5	27,087	2.9	4,328,792	13.9
Cultivated Crops	198,229	7.0	44,230	0.7	1,424,790	19.3	102,658	13.8	603,624	6.9	248,866	6.6	27,579	2.9	2,649,976	8.5
Evergreen Forest	251,588	8.8	1,309,952	19.6	221,248	3.0	29,922	4.0	591,826	6.8	186,920	4.9	45,178	4.8	2,636,634	8.5
Woody Wetlands	380,176	13.4	762,347	11.4	590,541	8.0	35,768	4.8	253,798	2.9	350,613	9.2	20,573	2.2	2,393,816	7.7
Mixed Forest	73,156	2.6	613,926	9.2	317,985	4.3	18,689	2.5	1,058,257	12.2	235,895	6.2	20,843	2.2	2,338,751	7.5
Developed, Open Space	83,125	2.9	85,505	1.3	453,374	6.1	29,970	4.0	310,609	3.6	359,870	9.5	183,867	19.5	1,506,320	4.8
Open Water	200,862	7.1	293,962	4.4	267,601	3.6	15,608	2.1	91,564	1.1	130,085	3.4	10,262	1.1	1,009,944	3.2
Shrub/Scrub	114,856	4.0	160,737	2.4	349,117	4.7	24,848	3.3	186,258	2.1	84,171	2.2	9,220	1.0	929,207	3.0
Developed, Low Intensity	38,555	1.4	13,051	0.2	244,070	3.3	6,986	0.9	68,885	0.8	162,106	4.3	170,832	18.1	704,485	2.3
Developed, Medium Intensity	11,373	0.4	2,552	0.0	90,195	1.2	2,091	0.3	21,641	0.2	89,319	2.4	166,947	17.7	384,118	1.2
Grassland/Herbaceous	88,279	3.1	36,468	0.5	75,101	1.0	15,918	2.1	72,418	0.8	9,017	0.2	6,818	0.7	304,019	1.0
Emergent Herbaceous Wetlands	29,173	1.0	41,917	0.6	44,431	0.6	3,730	0.5	19,066	0.2	17,215	0.5	34,953	3.7	190,485	0.6
Developed, High Intensity	3,296	0.1	516	0.0	37,062	0.5	378	0.1	5,126	0.1	44,012	1.2	95,240	10.1	185,630	0.6
Barren Land (Rock/Sand/Clay)	3,028	0.1	5,623	0.1	17,196	0.2	495	0.1	11,559	0.1	6,200	0.2	14,343	1.5	58,444	0.2
SUM	**2,844,495**	**100**	**6,684,826**	**100**	**7,392,831**	**100**	**743,785**	**100**	**8,709,409**	**100**	**3,795,659**	**100**	**943,279**	**100**	**31,114,290**	**100**

ECOREGIONAL TRENDS

To further put the challenge of managing the state's landscape and habitats into perspective, a spreadsheet has been developed that allows the user to conduct scenario-based planning based on each major land use type. Table 2.4 (above) shows the result of this scenario-based planning. Each ecoregion was separately evaluated based on the current land cover and overall trends in the landscape. Also, despite the above-mentioned needs of various land cover and habitat types, realistic assumptions were applied in developing Table 2.4. These assumptions are as follows:

First, it was assumed that at best, the acres of wetland and grassland types in each ecoregion will remain stable, and in some instances slightly decrease.

Second, it was assumed that 1 to 8% of the landscape would be lost to development over the next 20 years, depending on the existing level of development in each ecoregion, demographic trends and land use development trends in the literature. Currently, about 9% of New York State is considered developed; of this about 5% of this is considered *developed* open space. Based on the assumptions made by ecoregion, an additional 2% or an estimated 683,355 acres of habitat would be lost to development or significantly altered in the next twenty years. As previously mentioned, U.S. Forest Service researchers Nowak and Walton estimate that New York State will lose between 5 and 10% of its forest by the year 2050, or between one and two million acres (an area equal to or greater than the State Forest and Wildlife Management Area system combined) (Nowak and Walton 2005). Thus, the total habitat loss portrayed in Table 2.4 falls within the range predicted by Nowak and Walton, but the habitat and land cover loss comes more from lands currently classified as pasture/hay and cultivated crops and less from forest cover.

Third, it was assumed that managed state lands present the best opportunities to manage evergreen habitats on a large scale. Evergreen habitats are arguably needed, but require significant resources to deliberately maintain and create. Slight habitat shifts on a percentage basis can translate to significant acreage. Based on the assumptions previously discussed, creating about 1% of new evergreen land cover/habitat at the state level would require 371,722 acres of tree planting or natural regeneration over a 20 year period. Using an 8' X 8' spacing, this equates to about 253 million tree seedlings, or about 13 million seedlings per year over a twenty year period. To slightly increase the amount of early successional habitat statewide by about three quarters of a percent, 228,222 acres of habitat would have to be created, or about 11,400 acres a year.

ADDITIONAL RESOURCES

National Land Cover Website – data used in this analysis can be found at www.mrlc.gov/nlcd.php

ECOREGIONAL LANDSCAPE ASSESSMENT

Table 2.4 – 20 Year Forecast of Habitat Trends (*Predicted Change in Acreage by Land Cover Types)*

LAND COVER	ECOREGIONS							ENTIRE STATE	
	SL-CV St. Lawrence/ Champlain Valley	NAP Northern Appalachian/Acadian	GL Great Lakes	WAP Western Allegheny Plateau	HAP New York High Allegheny Plateau	LNE-NP Lower New England/ Northern Piedmont	NAC North Atlantic Coast	Change in Acres	Percent Change
Forests									
Deciduous Forest	17,563	143,777	146,304	10,485	-8,611	-12,367	-44,451	252,702	0.81%
Evergreen Forest	-9,806	-173,532	-36,427	-3,890	-8,296	-16,115	-7,447	-255,512	-0.82%
Woody Wetlands	986	6,408	885	-66	-1,225	9,975	179	17,142	0.06%
Mixed Forest	-30,489	-12,292	-93	-11,251	73,966	-65,090	-11,410	-56,659	-0.18%
Agriculture									
Pasture/Hay	-66,517	-28,502	-316,221	-9,781	-189,231	-37,087	-8,221	-655,560	-2.11%
Cultivated Crops	-27,559	-10,806	-94,080	-13,404	-124,607	-59,083	-8,713	-338,252	-1.09%
Early Successional, Grasslands and Wetlands									
Shrub/Scrub	13,146	39,808	20,525	7,135	75,024	67,655	4,929	228,222	0.73%
Grassland/ Herbaceous	-2,944	-3,044	72,756	-1,042	14,676	2,370	2,615	85,386	0.27%
Emergent Herbaceous Wetlands	-728	-1,808	-74	-11	-1,647	1,763	-52	-2,557	-0.01%
Developed									
Developed, Open Space	19,277	14,767	71,517	3,500	37,767	19,696	23,654	190,179	0.61%
Developed, Low Intensity	18,335	7,003	51,643	4,171	18,209	27,677	17,824	144,862	0.47%
Developed, Medium Intensity	39,828	4,133	42,876	1,628	65,453	24,551	21,709	200,177	0.64%
Developed, High Intensity	25,149	6,169	36,866	1,110	38,421	31,901	8,521	148,137	0.48%
Open									
Open Water	1,097	170	-1,459	11	4,239	-1,033	114	3,141	0.01%
Barren Land (Rock/Sand/Clay)	2,661	7,747	4,982	11,406	5,860	5,187	749	38,592	0.12%

ECOREGIONAL HABITAT GAPS

The following narrative addresses conditions and gaps at an ecoregional level.

Grassland
On a historic basis, grasslands have not been distributed evenly across the state. There are specific areas of the state where grasslands naturally occur, such as the Great Lakes, North Atlantic Coast and St. Lawrence / Champlain Valley ecoregions. In these areas, active agriculture and development have over the last century reduced the abundance of naturally occurring grasslands. On State Forests in these ecoregions, existing rare grassland communities will be protected and will contribute to ecoregional habitat. However, forests will not be cleared to create grassland habitat.

Early Successional Shrub
The amount of early successional shrub cover in New York State varies greatly between ecoregions, both presently and historiucally. This habitat gap is discussed in great detail in the statewide landscape assessment on *page 46* above. Goals established in this plan for the conversion of plantations, along with natural disturbances and abandonment of agricultural lands outside State Forests will create a steady supply of new early successional habitat. In many ecoregions, this will provide a level somewhere between pre-settlement and mid-20th century levels. DEC also recognizes recreational demands from hunters and bird watchers for early successional habitat and its associated species, which have been declining from the mid-20th century's historically high levels. (These demands and needs will be accommodated in UMP planning along with consideration of other multiple use goals).

In the Great Lakes, North Atlantic Coast and St. Lawrence / Champlain Valley ecoregions, land development and current agricultural land uses have reduced the quantity of high-quality, naturally occurring early successional shrub/scrub cover to below pre-settlement levels. In these three eco-regions, this natural community type is considered a biodiversity gap. State Forest management and future acquisition in these ecoregions will consider and address this gap in the UMP planning process as appropriate. This will focus on developing or maintaining early successional habitat on areas where it has naturally occurred

Mid Successional
The past history of land clearing in New York State is relatively consistent across all Ecoregions with approximately 50% of all forests being between 40 and 140 years old and in a mid successional stage. This habitat type is more than adequately represented across the state.

Late Successional
Late successional cover types with trees greater than 140 years of age will be most prevalent on blocks of publicly owned lands 500 acres or greater in size. This habitat type will gradually increase from the current coverage of 1% and will become more prevalent as time progresses.

ECOREGIONAL LANDSCAPE ASSESSMENT

This plan establishes strategies for the establishment, maintenance and enhancement of forest matrix blocks to be implemented in future UMPs to address this gap. This habitat type is sufficiently represented in the Northern Appalachian/Acadian ecoregion and the eastern portion of the High Allegheny Plateau (although there may be locations within these ecoregions where State Forest UMPs can address fragmentation of this habitat type).

Evergreen
Based on the landscape analysis, evergreen forest is most lacking in the Great Lakes, Lower New England/Lower Piedmont, North Atlantic Coast and Western Allegheny Plateau. Mixed forest, a mixture of hardwoods and evergreens, is also lacking in these regions. Stressors such as climate change, the hemlock woolly adelgid (an introduced invasive insect that kills hemlock) and the gradual loss of maturing evergreen forests on State Forests will gradually reduce the evergreen land cover in the remaining ecoregions. Evergreen cover is important to wildlife and attempts should be made to conserve, enhance and sustain it when possible.

Deciduous Forest
Deciduous forest cover outside of the most developed ecoregions will remain relatively stable with slight decreases in prevalence over time. Deciduous forest cover is needed, especially to help conserve, protect and enhance habitat connectivity in the North Atlantic Coast and Great Lakes ecoregions, areas where forests are less dominant because of development, subdivision and continued agricultural land use.

Wooded Wetlands
Wooded wetlands are also needed in several ecoregions including the New York High Allegheny Plateau, Western Allegheny Plateau and particularly those with greater development such as the North Atlantic Coast and Lower New England/Lower Piedmont ecoregions. Depending on the perspective one takes, and based on the extensive loss of wetland habitat in the past, more wetlands would be desirable in every part of the state, but the ability to create or restore them on a large enough scale is very limited.

Emergent Herbaceous Wetlands
Emergent Herbaceous Wetlands are needed or potentially needed in all ecoregions.

LAND COVER GAPS

Beyond the process of assessing gaps in habitat types, land management decisions will also take into account the relative abundance or scarcity of forest cover types in each ecoregion as illustrated in Table 2.6 (next page).

Table 2.6 – New York GAP Percentage Land Cover by TNC Ecoregion and Statewide

LAND COVER	ECOREGIONS							STATE WIDE
	SL-CV St. Lawrence/ Champlain Valley	NAP Northern Appalachian/Acadian	GL Great Lakes	WAP Western Allegheny Plateau	HAP New York High Allegheny Plateau	LNE-NP Lower New England/ Northern Piedmont	NAC North Atlantic Coast	
Forest Matrix								
Sugar maple mesic	13.2	39.6	15.7	6.1	29.3	30.3	0.2	25.5
Evergreen-northern hardwood	9.0	26.4	7.9	14.4	19.3	12.5	0.0	15.7
Successional hardwoods	16.1	1.9	11.3	32.3	7.8	0.3	2.2	7.7
Oak	0.1	0.0	0.8	2.5	9.9	22.6	5.8	6.0
Appalachian oak-pine	0.0	0.0	0.1	0.0	0.7	3.8	0.1	0.7
Evergreen plantation	0.3	0.2	0.3	0.3	0.8	0.2	0.0	0.4
Pitch pine-oak	0.0	0.0	0.0	0.0	0.3	0.1	17.9	0.6
Deciduous wetland	6.0	0.6	2.3	0.2	0.6	2.3	0.1	1.7
Evergreen wetland	0.5	3.7	0.1	0.0	0.1	0.0	0.0	0.9
Spruce-fir	1.0	15.9	0.0	0.0	0.0	0.0	0.0	3.6
Sub-total	***46.2***	***88.3***	***38.5***	***55.8***	***68.8***	***72.1***	***26.3***	***62.8***
Agricultural Matrix								
Cropland	19.1	2.0	37.0	33.0	19.7	10.6	6.0	18.8
Old field/pasture	18.7	0.8	7.3	4.8	4.1	1.4	7.3	5.3
Orchard/vineyard	0.0	0.0	0.5	0.1	0.0	0.2	0.0	0.2
Sub-total	***37.8***	***2.8***	***44.8***	***37.9***	***23.8***	***12.2***	***13.3***	***24.3***
Early Successional Shrub Matrix								
Successional shrub	0.5	0.2	2.9	0.4	1.3	0.1	1.7	1.2
Shrub swamp	0.6	1.1	0.5	0.3	0.2	0.2	0.1	0.5
Salt shrub/maritime shrub land	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
Sub-total	***1.1***	***1.3***	***3.4***	***0.7***	***1.5***	***0.3***	***2.2***	***1.7***

ECOREGIONAL LANDSCAPE ASSESSMENT

Table 2.6 – New York GAP Percentage Land Cover by TNC Ecoregion and Statewide

LAND COVER	ECOREGIONS							STATE WIDE
	SL-CV St. Lawrence/ Champlain Valley	NAP Northern Appalachian/Acadian	GL Great Lakes	WAP Western Allegheny Plateau	HAP New York High Allegheny Plateau	LNE-NP Lower New England/ Northern Piedmont	NAC North Atlantic Coast	
Grey Infrastructure Matrix								
Roads	0.7	0.3	1.1	0.4	0.7	1.4	1.2	0.8
Urban	0.7	0.1	4.0	0.9	0.6	7.2	46.7	3.5
Sub-total	***1.4***	***0.4***	***5.1***	***1.3***	***1.3***	***8.6***	***47.9***	***4.3***
Developed Open Space Matrix								
Suburban residential	0.0	0.0	0.1	0.0	0.1	0.5	0.9	0.1
Golf course/park/lawn	0.1	0.0	0.2	0.1	0.1	0.1	0.4	0.1
Sub-total	***0.1***	***0.0***	***0.3***	***0.1***	***0.2***	***0.6***	***1.3***	***0.2***
Water Resources Matrix								
Open water	8.8	6.6	6.6	4.1	3.5	5.8	3.2	5.2
Mixed wetland	0.5	0.1	0.4	0.1	0.3	0.0	0.0	0.3
Salt marsh	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.1
Emergent marsh/open fen/wet meadow	0.6	0.3	0.6	0.0	0.3	0.4	0.2	0.4
Dwarf shrub bog (less than 1% statewide)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sub-total	***9.9***	***7.0***	***7.6***	***4.2***	***4.1***	***6.2***	***5.5***	***6.0***
Other								
Sand flats/slope	0.1	0.0	0.1	0.0	0.0	0.0	1.5	0.1
Barren	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.1
Clouds and Shadows	3.4	0.2	0.1	0.0	0.3	0.0	0.3	0.5
Sub-total	***3.5***	***0.2***	***0.2***	***0.0***	***0.3***	***0.0***	***3.5***	***0.7***
Total	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***

Please note: Figures have been rounded to the nearest 10th of a percentage point.

IMPACTS OF HUMANS ON AN ECOREGIONAL LEVEL (STRESSORS AND TRENDS)

Urbanization and Fragmentation

Overall, the highest habitat needs are in the areas with the greatest population and land development. The North Atlantic Coast, the Lower New England/Lower Piedmont, and the Great Lakes ecoregions have the highest levels of development. Excluding the National Land Cover Database category of *developed open space*, an estimated 46%, 8% and 5% of these ecoregions, respectively are developed. Forest loss due to development will likely be greatest in these three ecoregions.

ACTIVE FOREST MANAGEMENT

Ecosystem management can be achieved through actively managing the forest using various strategies to meet landscape gaps and other desired outcomes, while applying protective measures to mitigate impacts. Foresters employ active management strategies, including various silvicultural systems and integrated pest management which in some cases involves pesticide and herbicide application. Protective measures include designation of matrix forest blocks and connectivity corridors at a landscape level, natural and protection areas at the forest level, buffers around those areas and various forms of green tree retention.

The decision as to which strategy is used must be based on multiple goals and objectives, some of which may be in conflict with one another. No single goal or objective can take precedence over all others all of the time. Local public opinion may indicate that certain habitats are desired by some for wildlife observation or hunting, while other constituents may express interest in maintaining certain aesthetic qualities. Fiscal responsibility also requires that the economic return, or lack thereof, produced by a certain management strategy be considered in the decision making process. And, looming over all of these is the goal of maintaining a high level of biodiversity. This is the classic land manager's dilemma; not all goals can be achieved on every acre of land.

SILVICULTURE

"Silviculture" is defined as "the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis." (Helms 1998). When actively managing forest ecosystems to promote biodiversity and produce forest products, foresters use two silvicultural systems which mimic natural disturbance patterns and help promote biodiversity. The two systems are referred to as even-aged and uneven-aged management.

Openings in the forest create room for new pioneer trees that need full sunlight, like the white pines that stand in this photo.

The Establishment of an Even-Aged Forest

Each tree species that grows in New York has a set of conditions under which it grows best. Many trees prefer exposed soils (leaf litter and organic matter removed) and full sun on the forest floor to regenerate. These types of trees are generally called either pioneer trees (the first trees to establish themselves on a disturbed site) or shade-intolerant trees (trees preferring full sun to regenerate a site). Some examples of these trees found in

ACTIVE FOREST MANAGEMENT

New York include pin cherry, black cherry, aspens, red oak and white pine. Many pioneer trees, like pin cherry and most aspens, grow fast and are relatively short-lived, surviving on average between 35 and 65 years. Others, like red oak and white pine, may live for 120 to 350 years.

Large scale disturbances can create conditions of exposed soils and full sunlight reaching the forest floor. Natural disturbances include forest fires (killing the existing forest and burning the leaf litter and exposing the soils), severe weather events that knock down the forest from either strong winds or heavy ice and snow (killing the existing forest and exposing soils from uprooted trees), and major insect or disease outbreaks that may kill off the forest. Human disturbances that can create similar conditions include large scale farming (and abandonment of farm fields), establishment or re-establishment of tree plantations, and other active forest management activities.

Soon after the disturbance, the "new" forest of shade-intolerant pioneer trees begins to establish itself within a short amount of time (anywhere from one to 20 years following the disturbance). The shade-intolerant trees are not the only beneficiaries of this disturbance. Many plants and wildlife prefer early successional forest and the many shade-intolerant pioneer trees for their mast (fruit, such as acorns from oaks). The trees of this newly established forest are considered by foresters to be about the same age, or *even-aged*.

As the forest matures, the trees compete with each other for limited resources (sunlight, nutrients from the soil, and water). Some trees will be out-competed and die while others dominate the site. One day a new disturbance may come and destroy this maturing forest and start the process over again - continuing the cycle of an even-aged forest.

Even-Aged Silvicultural Systems

As discussed earlier, many shade-intolerant trees have ecological values as mast producers and may also have significant value as timber. Foresters can apply different management techniques that mimic disturbances to perpetuate an even-aged forest. These harvest techniques, like the natural events they attempt to mimic, tend to be very intense and can be drastic in appearance. Although many may not like the appearance, when these harvesting techniques are applied correctly, the forest quickly rebounds and many plants and animals benefit from the new habitat type.

These trees have fallen due to heavy winds; this natural disturbance can be imitated by a shelterwood cut.

Foresters have three options (silvicultural systems) to choose from when establishing an even-age structure in a forest:

- **Clearcutting** (one harvest)
- **Seed Tree** (two harvests)
- **Shelterwood** (two or more harvests)

All three even-aged silvicultural systems remove the entire* mature forest and allow new forest to establish (regenerate) either naturally or by planting when there is insufficient seed after the cut. For this reason, these harvests are called *regeneration cuts*. As the new forest grows, foresters may decide to conduct intermediate thinnings to weed out unwanted trees and other competing vegetation. These intermediate thinnings are called *tending cuts*.

* DEC practices **tree retention** in all silvicultural systems. *To learn more about forest and tree retention, refer to page 85.*

The Life Cycle of an Uneven-Aged Forest

Uneven-aged forests tend to be very different from even-aged forests in that, as the name implies, they will have a distribution of trees ranging from young seedlings to old, mature trees and everything in between. A forest with this variation of **age classes** will look very different from the uniform nature of an even-aged forest. Typically, an uneven-aged forest will have three or more age classes.

Uneven aged management creates minimal openings in the forest canopy, layers of vegetation and a moist forest floor, among other conditions

Uneven-aged forests are, in many instances, indicative of a forest free from significant natural or man-made disturbances over many years—possibly hundreds of years. As you can imagine, this lack of disturbance also tends to attract an entirely different host of trees, plants and animals. Where trees of even-aged forests may be faster growing and shade-intolerant; trees of uneven-aged forests are more **shade-tolerant** (can regenerate and grow in the shade of other trees) and tend to be slower growing. Some examples in New York are sugar maple, American beech, yellow birch and eastern hemlock.

Just as in an even-aged forest, individual trees compete for limited resources (sunlight, nutrients from the soil, and water) as an uneven-aged forest matures. Once again, some trees will be out-competed or grow old and die, while others will dominate the site and fill in gaps

created from the dead. If, after many years (again, possibly 100 years or more), the forest is not significantly disturbed, shade-tolerant trees will begin to emerge as the dominant species. The multiple age classes that develop in uneven aged stands create a diverse **vertical structure** that offers a visual impression that is distinctly different than that which is seen in even aged stands. Since there are few younger trees to impede one's view in an even aged forest, it is possible to see quite a distance into the woods. In contrast, a mature uneven-aged forest has large, mature trees well distributed throughout, and younger trees of various ages with **crowns** (leaves and branches) at different levels down to the forest floor where ground vegetation of shade-tolerant plants and tree seedlings intermingle. Foresters commonly call the vertical structure in an uneven-aged forest the "green wall" due to the appearance of this forest from the side (say, from a forest opening or road) which can appear thick and impenetrable with vegetation from top to bottom.

Uneven-Aged Silvicultural Systems

While even-aged silvicultural systems are preferred when meeting early successional and mid-successional habitat needs, uneven-aged silvicultural systems are preferred over even-aged methods when trying to address the need for large blocks of late successional habitat. As discussed earlier, treatments for even-aged forests usually include one to four tending cuts with a final regeneration cut when the forest matures. For uneven-aged management, foresters enter the stand at regular intervals to conduct both tending and regeneration cuts at the same time. The intervals may be as short as 15 years and as long as 50 years or more.

These techniques are gradual and occur in many steps as the forest begins to establish uneven-aged characteristics. During each entry into the stand the forester will designate either clumps of trees (group selection), individual trees (single tree selection) or a combination to thin saplings and pole-sized trees (tending) and harvesting a few of the mature trees to allow for new trees to grow (regenerating). Foresters have two options (silvicultural systems) to choose from when maintaining the uneven-age structure in a forest:

- **Group Selection:** Trees are removed in an area commonly spanning about twice the height of surrounding mature trees and new age classes are established in small groups within that area. Smaller openings provide microenvironments suitable for shade-tolerant regeneration and larger openings provide conditions suitable for more shade-intolerant regeneration. The management unit or stand in which regeneration, growth and yield are regulated consists of an aggregation of groups. (Helms 1998)
- **Single Tree Selection:** Individual trees of all size classes are removed more or less uniformly throughout the stand, to promote growth of remaining trees and to provide space for regeneration (Helms 1998).

More than 75% of state forests are comprised of even-aged stands as a result of European settlement and historical clearing of forests for agriculture. Today, much of these forests are mature and ready to be either regenerated – maintaining their even-age structure - or slowly

managed to develop uneven-age characteristics. Converting to uneven-aged structure occurs by applying single tree and group selection silviculture to the management of the forest. The process of conversion typically takes well over 100 years. Success with any conversion of even-aged stands depends upon freedom from intense herbivory, lack of interference by undesirable woody or herbaceous plants, and protection against destructive agents like fire and drought (R. D. Nyland 2003). UMPs should consider recommending stands to be converted to an uneven-aged structure where forest conditions are suitable and other objectives are not compromised. Stands that are good candidates for long term uneven-aged management are typically located on productive ground that is capable of growing shade tolerant, long-lived tree species - chiefly sugar maple, American beech, and eastern hemlock.

Applying the strategy of converting even- to uneven-aged in certain forest types will lead to minimizing openings two acres or larger within these stands and thereby helping to establish and retain a relatively continuous and semi-permanent closed forest canopy condition. Landscapes with continuous closed forests canopies that are 500 acres or greater in size are environmentally significant, as they provide effective wildlife travel corridors between adjacent habitats on public and private lands.

Bear tracks; black bear is one of many species that prefer large blocks of continuous closed forests

A well developed uneven-aged forest may be characterized by larger diameter trees, greater amounts of coarse woody material on the forest floor, and greater numbers of living or dead hollow trees. In many ways, uneven-aged silviculture mimics the natural process by which older trees grow to maturity, die, and are gradually replaced by young seedlings and saplings.

PROTECTIVE MEASURES (FOREST MATRIX BLOCKS, CONNECTIVITY, RETENTION AND BUFFERS)

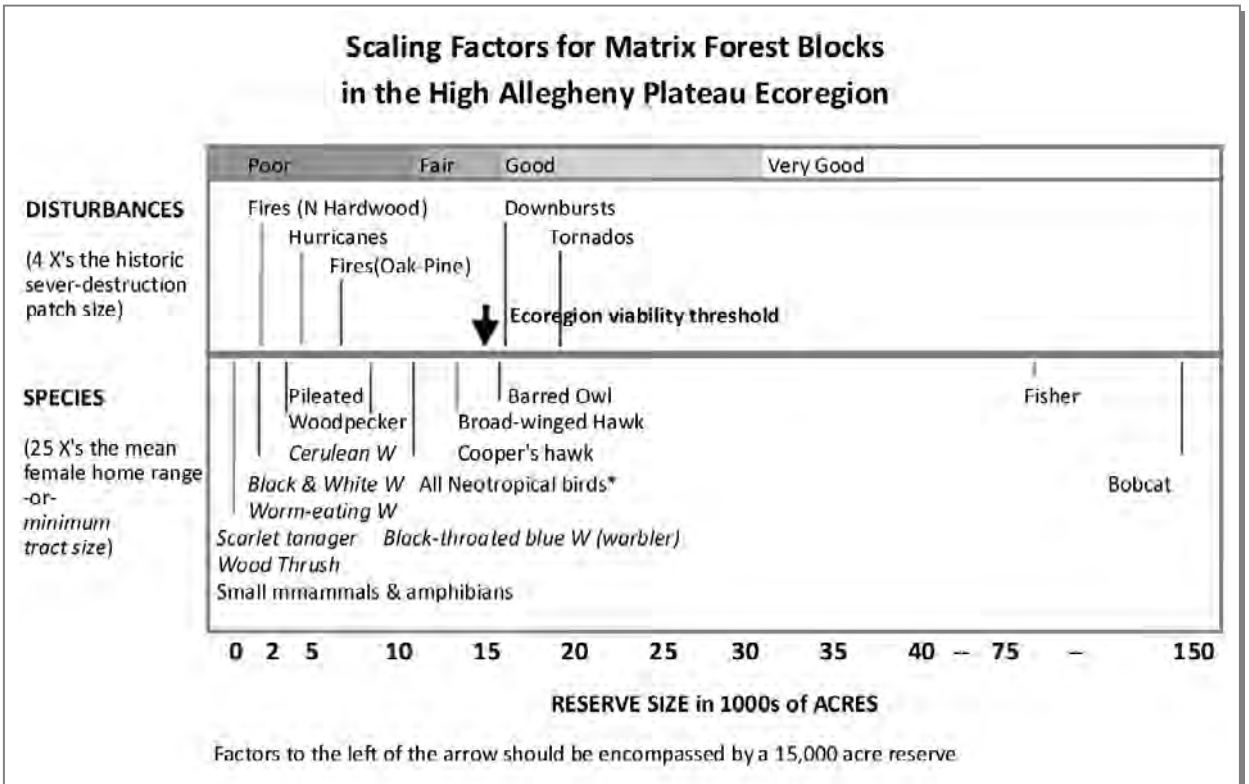
In the course of practicing active management, it is important to identify areas on the land that are reserved from management activity or where activity is conducted in such a manner as to provide direct protection of wildlife, biodiversity, successional features and water quality.

Forest Matrix Blocks

The identification of large, unfragmented forested areas, also called matrix forest blocks, is an important component of biodiversity conservation and forest ecosystem protection. Changes in both land use and climate will stimulate the alteration of movement patterns and range shifts for many species as they respond to changes in habitat availability and configuration along with changes in temperature, precipitation and the distribution of other species. Research that combines data from natural, dynamic disturbance processes (e.g., fires, tornados, downbursts,

icestorms, etc.) with the habitat needs of forest dwelling species in the Northeast U.S. has generated suggestions for how large forest blocks need to be in order to provide adequate space for maintaining viable populations of a number of species (Fig. 1). The two principal factors used to assess and recommend an appropriate size for proposed conservation areas of forested ecosystems, within a given ecoregion, are the home range of wide-ranging animal species and historical patch sizes that result from natural disturbance events within the landscape. Based on these assessments, a set of priority matrix forest blocks have been identified within the four following terrestrial ecoregions within New York.

- St. Lawrence/Champlain Valley (SL-CV) (Thompson 2002)
- Northern Appalachian/Acadian (NAP) (The Nature Conservancy n.d.)
- New York High Allegheny Plateau (HAP) (Zaremba and Anderson et. al. 2003)
- Lower New England/Northern Piedmont (LNE-NP) (Barbour et al. 2000)



***Neotropical species richness point based on** (Robbins, Dawson and Dowell 1989)**,** (Askins and Philbrick 1987)

This chart is excerpted with permission from (Anderson and Bernstein, Planning methods for ecoregional targets: Matrix-forming ecosystems 2003). Note: fisher and bobcat are included in the figure for context; they were not considered to be interior-forest-requiring species.

In this figure, disturbance is defined as four times the patch size of the most severely disturbed patch based on historic data. Home range estimate is based on area needed to accommodate a viable population of each species. In the High Allegheny Ecoregion, the minimum size for forested conservation areas (large vertical down arrow) was set at approximately 15,000 acres. (Adapted from (Groves, et al. 2002)and (M. G. Anderson, Viability and spatial assessment of ecological communities in the Northern Appalachian ecoregion 1999).

A total of 223,801 acres of State Forest fall within 49 of New York's 107 identified matrix forest blocks. This includes acreage on 117 state forests in 30 of the state's 84 UMPs. An analysis will be conducted to determine those areas that present the best opportunities to maintain and enhance the ecological function of these forest blocks.

During the Unit Management Planning process, maintaining or enhancing matrix forest blocks must be balanced against the entire array of goals, objectives and demands that are placed on a particular State Forest. Where matrix forest block maintenance and enhancement is chosen as a priority for a given property, management actions and decisions should emphasize closed canopy and interior forest conditions. More specifically, the following should be considered:

- Minimize or avoid management actions that create large and persistent artificial openings in the forest canopy or abrupt transitions from closed to open canopy area known as "edges." Examples of such actions include building of roads (of a size and extent comparable to PFARs), forest openings from 0.25 to 1 acre or larger (depending upon the forest type) or high densities of even-aged management actions (Roe and Ruesink undated), or the siting of oil and gas wells and their related infrastructure.
- Manage closed canopy areas to increase the amount of forest area supporting both late successional forests and their characteristics by incorporating harvest rotations beyond economic maturity. Specific practices employed might include: increased basal area and density of large diameter trees (in size classes >18" and >27.5" dbh); standing dead trees (snags) and coarse woody debris with dbh of >11.8"; the formation of natural canopy gaps, a well developed vertical structure of tree layers and continuous canopy area of 80% cover or higher (Goodell and Faber-Langendoen 2007) (Keeton 2006).
- Progressively convert embedded pine or spruce plantations within matrix forest blocks to natural forest types, allowing the compatible introduction of larger areas of seedling – sapling aged natural forest cover.
- Refrain from salvaging damaged stands or trees following natural disturbance events. Large and small patches of standing dead or down trees facilitate the development of late successional structural characteristics including higher densities of standing and down course woody debris, a desirable feature of interior forest habitat (Foster and Orwig 2006).

These management options should be viewed as the 'ideal' means of managing matrix forest blocks. Recognizing the extremely wide array of users and stakeholders involved, management choices may need to be made that do not serve the forest block as well as they could, but serve it better than others. For example, if a stand within the forest block is scheduled for harvest, and truck access is needed to implement the harvest, the choice might be made to construct a haul road, instead of a public forest access road (PFAR). Since haul roads are narrower than PFARs, the effect of the haul road on the forest canopy would be less than that of a PFAR.

ACTIVE FOREST MANAGEMENT

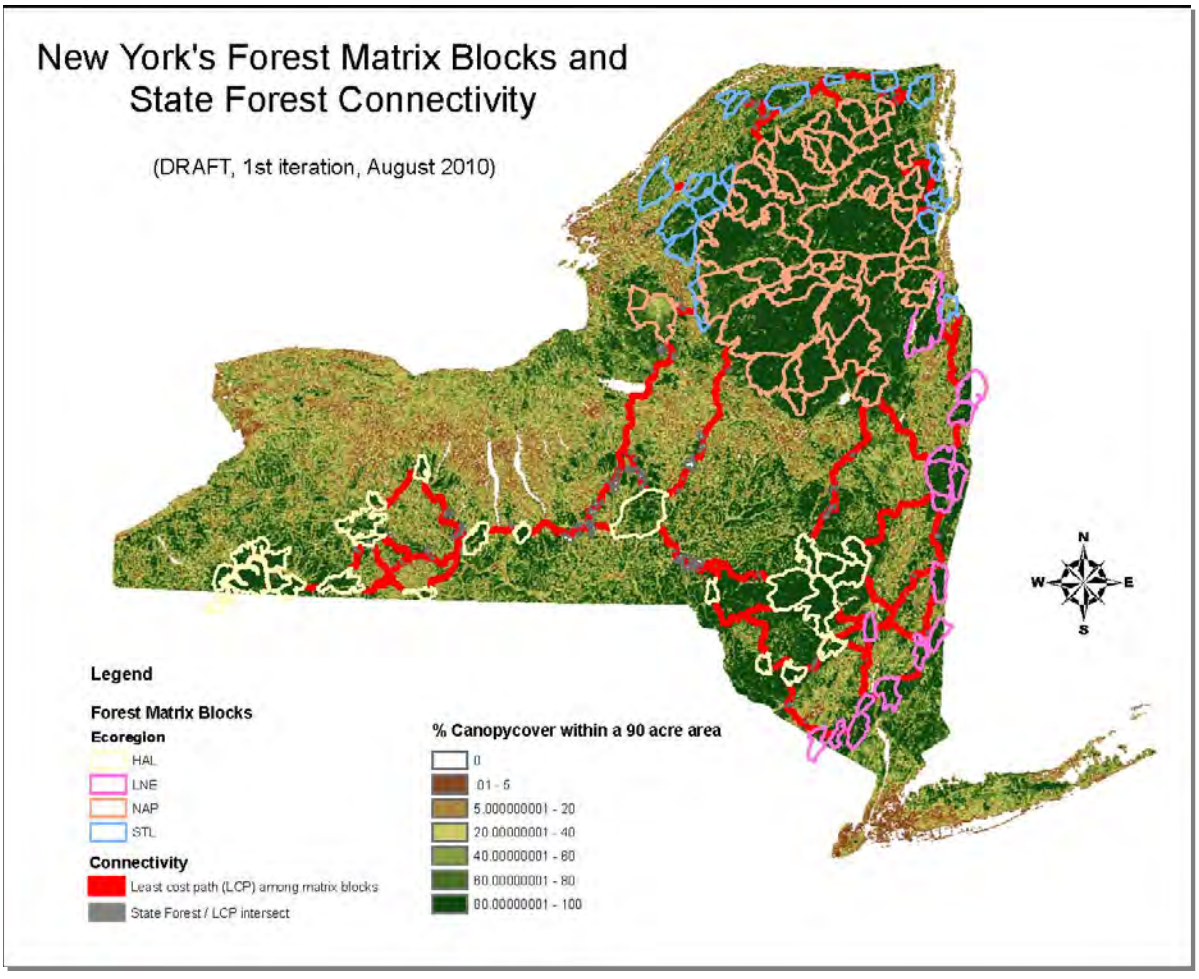
Forest Landscape Connectivity

Securing connections between major forested landscapes and their imbedded matrix forest blocks is important for the maintenance of viable populations of species, especially wide-ranging and highly mobile species, and ecological processes such as dispersal and pollination over the long term. Identifying, maintaining, and enhancing these connections represents a critical adaptation strategy if species are to shift their ranges in response to climate change and other landscape changes. Various nonprofit, state, and federally funded connectivity modeling efforts have been completed or are underway around New York State (e.g., (Quinby, et al. 1999), (Schlesinger and Howard 2010)). These projects target the identification of linkages between the large forested landscapes within New York and the broader region of eastern North America, including southern Canada and the Appalachian region to the northeast and south. As a part of this effort, least cost path (LCP) corridors between identified matrix forest blocks have been predicted.

ADDITIONAL RESOURCES

Forest Matrix Blocks and Connectivity Map (full size) –

http://www.dec.ny.gov/docs/lands_forests_pdf/sfconnectivity.pdf



An LCP corridor represents the most favorable dispersal path for forest species based on a combination of percent natural forest cover in a defined area, barriers to movement, and distance traveled. Thus, as species that live in forests generally prefer to travel through a landscape with less human development (i.e., fewer impediments to transit) as well as in a relatively direct line, the predicted routes depict a balance of these sometimes opposing needs.

Based on connectivity modeling for LCP corridors between matrix forest blocks found in New York, there are over 80 State Forests intersected by a predicted LCP corridor or less than a mile from a LCP. Lands that are bisected by or within one mile of an LCP, including State Forests, should be managed to create, maintain and enhance their forest cover characteristics that are most beneficial to the priority species that may use them.

Management Considerations:
Looking statewide at LCPs, it is obvious that the greatest restrictions to species movement along these corridors are paved and gravel public highways, agricultural fields and permanent fragmentation created by subdivisions and development. DEC and not-for-profit partners in land conservation should adopt strategies to provide greater forest continuity along LCPs through the acquisition of conservation easements along with fee purchases.

The connectivity analysis depicted in this section uses graph theory to assess connections and their relevance in conservation planning, as put forth by Dean Urban and colleagues (e.g. (Urban and Keitt 2001), (Minor and Urban 2007), (Minor and Urban, A graph-theory framework for evaluating landscape connectivity and conservation planning 2008)). The methods used here are an extension of those developed by Ben Best (see (Urban, et al. 2009) & www.nicholas.duke.edu/geospatial/software). Here, NYNHP staff used the percentage of natural land cover derived from the land use dataset developed by the NOAA Coastal Change Analysis Program (CCAP: www.csc.noaa.gov) to represent the resistance to travel for forest species. Thus, for each location on the ground (GRID cell) they calculated the percentage of natural land within 300 meters in any direction and scored those cells with more natural land as places where forest dwelling animals would be more likely to travel. The connectivity analysis then takes this scoring into account and finds the 'least cost path' between each forest block based on distance and the preference to travel through areas with natural land cover. A similar application using an earlier version of same software was completed at a coarser scale for the entire northeast by (Goetz, Jantz and Jantz 2009).

In comparison, State Forests do not provide significant limiting factors to species movement along LCPs, however the quality of these corridors on State Forests can still be enhanced. Many of the management strategies and goals in this plan will increase the quality of LCPs on State Forests as these lands continue to be restored to more natural conditions. The implementation of the new policy for management of plantations will, over time, convert many planted softwood monotypes to more natural hardwood forests. New standards for the retention of

snags, den and legacy trees along with Special Management Zone buffer requirements along streams wetlands and vernal pools will also enhance connectivity in LCPs.
UMPs for State Forests bisected by LCPs will also consider adaptive management to provide enhanced connectivity including the following strategies:

- Favoring uneven aged management over even aged management.
- Where even aged management will be employed, final harvests can be conducted with smaller patch sizes and cuts within a stand spread out over a longer time period.
- Enhancing the level of snag, cavity and legacy tree retention as guided by Retention Standards.
- Design any new roads to limit canopy gaps. Where feasible and in line with other goals, build roads to Haul road standards instead of PFAR standards.
- Limit use of fencing and incorporate best practices for facilitating successful species movement across roads (e.g. improved culvert design).
- Cease mowing of PFARs shoulders, allowing them to grow back into a wooded canopy.
- In non-forested areas, maintain or restore linkages between these continuous forest canopy areas via the retention or restoration of contiguous natural cover.
- Where possible, emphasize forest canopy conditions preferred by highly mobile species.

Forest and Tree Retention

Forest retention is a strategy for conserving biodiversity in stands managed for timber production. Retention and recruitment of snags, cavity trees, coarse woody debris (CWD) and other features will advance the structural and compositional complexity necessary for conserving biodiversity and maintaining long term ecosystem productivity. The purpose of this chapter is to provide guidance on the quantity and distribution of live and dead trees to be retained during stand treatments and through at least the next rotation.

Foresters have long recognized the importance of “wildlife trees” - snags, cavity trees, retained live trees and coarse woody debris as necessary components of a healthy, diverse forest. Retention of live and dead trees to enhance or provide wildlife habitat has been the subject of much research going back decades (Evans and Conner 1979) (DeGraff and Shigo, Managing Cavity Trees for Wildlife in the Northeast 1985) (Tubbs, et al. 1987).

DeGraff and Yamasaki documented over 50 wildlife species dependent upon cavity trees for feeding, roosting, or nesting/denning sites (DeGraff, Yamasaki, et al. 1992). In addition to vertebrate wildlife species, numerous invertebrate species such as wasps, spiders and honeybees depend upon cavities for habitat. Providing an abundance of trees suitable to maintain cavity nesting bird populations maintains avian species diversity while also directly benefitting the forest. Most cavity nesting birds are insectivorous. Researchers have demonstrated the increased growth of forests when insectivorous birds are present to control populations of leaf eating insects (Marquis and Whelan 1994).

This cavity tree may provide a home for many species, from insects to birds or small mammals

DeGraff and Yamasaki also document 39 wildlife species (esp. small mammals and amphibians) that use dead and down woody material for foraging or shelter and 65 species that use overstory inclusions (pockets of hardwood trees within conifer stands or groups of conifers within hardwood areas) for feeding, nesting or winter shelter (DeGraff, Yamasaki, et al. 1992). The retention of dead and down trees also provides habitat for many invertebrates, vascular plants, lichens, fungi, mosses and microorganisms. Coarse woody debris and fine woody material are also essential for nutrient cycling and provide a seedbed for the establishment of some tree species (Harmon, et al. 1986). Much of New York's State Forests are gradually recovering from the complete loss of dead wood material as a result of agricultural clearing. On many of these areas, there is still a lack of any large coarse woody debris (logs) even up to 70 years after reforestation.

In the 1990s, scientists incorporated the retention of "wildlife trees" into the larger concept of biological legacies. Biological legacies are defined as: "the organisms, or a biologically derived structure or pattern inherited from a previous ecosystem – note biological legacies often include large trees, snags, and down logs left after harvesting…" (Helms 1998). Biological legacies also include other ecological features that are vulnerable to timber harvesting such as vernal pools, small forest wetlands and patches of rare or unusual plant species. In addition to the obvious function of providing habitat for wildlife species as described above, biological legacies are valued for their "lifeboating" function after a period of heavy disturbance. Examples of such function include:

- Perpetuating plant species that would otherwise be lost as a result of the disturbance.
- Perpetuating living organisms by providing nutrients, habitat and modifying microclimatic conditions.
- Providing habitat for recolonizing species by structurally enriching the new stand and providing protective cover in the disturbed area (Franklin, Mitchell and Palik 2007).

The function of "lifeboating" is most pertinent after a large disturbance such as an even-aged regeneration harvest. Lifeboating is believed to be most effective at protecting those species with limited dispersal capabilities such as herbaceous plants, lichens, mosses, invertebrates and

terrestrial amphibians. Bellemare et al. documents the difficulty many forest herbs have at recolonizing secondary forests, many decades after the sites have been reforested, and that such herbs are often present on sites that escaped the extermination effects of forest clearing and plowing such as bedrock outcrops, rocky slopes and along hedgerows. Sites such as these would be examples of desirable locations for retention (Bellemare, Motzkin and Foster 2002).

If biological legacies are to be deliberately left, they must first be recognized and incorporated into harvest prescriptions. This practice is known as the variable retention harvest system and is defined as: "an approach to harvesting based on the retention of structural elements or biological legacies (trees, snags, logs, etc.) from the harvested stand into the new stand to achieve various ecological objectives. Major variables are types, densities and spatial arrangements of retained structures." (Helms 1998) (Franklin, Mitchell and Palik 2007). Variable retention harvests can be incorporated into traditional regeneration harvest systems (clearcut, seed tree, shelterwood or selection) to enable managers to protect a wider array of site characteristics for conservation of biodiversity while still establishing conditions for desirable tree regeneration. This practices or components are collectively referred to as reserves.

There is also recognition that traditional silviculture has the potential to reduce or largely eliminate cavity and snag trees, as well as coarse woody debris. Kenefic and Nyland reported that managers need to deliberately incorporate cavity tree retention as part of their marking strategy to maintain cavity trees in stands where the focus of management is on growing high-value trees (Kenefic and Nyland 2007).

As mentioned above, retention components provide benefits to a majority of the life forms dependent upon forests. These benefits include important habitat attributes, cover, shelter and nesting sites, nutrient recycling for soils, and general support for life forms at the foundation of the food chain. Unfortunately, some of these same attributes, especially fine woody debris (downed treetops) are viewed negatively by many human forest visitors who prefer a park-like, open landscape and the ease of walking and hunting in an "uncluttered" forest. The positive benefits of retention outweigh the human-related impacts, which are often satisfied or mitigated through education and a better understanding of the forest system.

Retention of dead and decaying trees is also important for aquatic species, as these trees eventually fall and can provide important habitat in streams. Large woody debris (LWD) provides important trout habitat in streams.

There are limited economic impacts associated with practicing retention in State Forest timber sales. In some cases, the retention of saleable trees translates to loss of income, however the ecological value of the retained trees takes precedence.

ADDITIONAL RESOURCES

Program Policy: Retention on State Forests

http://www.dec.ny.gov/docs/lands_forests_pdf/sfretentionpolicy.pdf

Retention Standards

The Bureau of State Land Management has developed standards for retention on State Forests and proposed a program policy to that end. In the development of these standards, existing research results and similar standards or guidelines of other states were reviewed including those of Wisconsin, Michigan, Pennsylvania, Minnesota, New Hampshire and Maine. While the requirements inevitably vary somewhat among states, there is broad consensus on the need for such standards to assist managers in maintaining diverse, healthy and productive forests.

Special Management Zones

DEC Special Management Zone (SMZ) Guidelines (Buffer Guidelines) provide continuous over-story shading of riparian areas and adjacent waters, by retaining sufficient tree cover to maintain acceptable aquatic habitat and protect riparian areas from soil compaction and other impacts. DEC's buffer guidelines also maintain corridors for movement and migration of all wildlife species, both terrestrial and aquatic. Buffers are required within SMZs extending from wetland boundaries, high-water marks on perennial and intermittent streams, vernal pool depression, spring seeps, ponds and lakes, recreational trails, campsites and other land features requiring special consideration. These guidelines are discussed in the soil and water protection section of this plan; DEC's special management zones are summarized in the table on *page 110*.

Upland/aquatic habitat on Texas Hollow State Forest in Schuyler County, typical of an area where Special Management Zones are applied

ADDITIONAL RESOURCES

Rules for Establishment of Special Management Zones on State Forests – June 2008, establishes the Bureau of State Land Management's buffer guidelines and can be found at http://www.dec.ny.gov/docs/lands_forests_pdf/sfsmzbuffers.pdf

ACTIVE MANAGEMENT GUIDELINES (SALVAGE, CLEARCUTTING AND PESTICIDE/HERBICIDE USE)

There are some tools used in State Forest management which are important and essential for reaching ecosystem management goals but which must be used carefully and judiciously. The following provides limitations and guidance for use of these tools to prevent and mitigate potential impacts.

Salvage

Extreme weather or outbreaks of insect activity can cause significant damage to State Forests. Salvage of severely damaged forest stands has traditionally been a very high priority for DEC.

ACTIVE FOREST MANAGEMENT

Natural disasters, including windstorms, ice storms, and insect infestations routinely impact State Forests. In recent history, the 1995 blowdown and 1998 ice storm created a major impact on State Forests in northern New York. More recently, a major outbreak of the forest tent caterpillar has caused significant defoliation in Central New York from Lake Erie to the Massachusetts border, roughly between 2000 and 2010. The 1998 ice storm alone impacted over 100,000 acres of State Forests in Jefferson, St. Lawrence, Clinton and Franklin counties. Approximately 4,500 acres of the most severely impacted areas were salvaged under 247 separate timber sales, netting $1.8 million.

There are several reasons to prioritize salvage over other management activities. At the time the damage occurs, there is a narrow window of time in which salvageable timber can be retrieved before succumbing to natural decay. Such timber has been grown and tended on State Forests, usually for decades. The value of this investment in time and labor as well as the monetary value of the timber itself is of great importance to the State of New York and to local businesses and communities that rely on timber harvesting. In addition, damaged stands can become a danger to neighboring forests and landowners. These stands may harbor and support forest insect and disease outbreaks. They also contain significant fuel loads that, especially in softwood stands, can be a wildfire hazard.

There are also numerous reasons not to salvage dead or dying trees. The economic importance of salvage must be balanced with these other important concerns. DEC must consider the ecological value of dead and dying trees. These trees will return nutrients to forest soils and provide biodiversity and structural diversity that is needed by a variety of forest-dependent life forms. (Foster and Orwig 2006) In addition, the value of conducting salvage must be balanced against the value of other scheduled harvests, the importance of maintaining a regular harvesting schedule, and the availability of staff and other resources.

The decision of whether or not to salvage must be made on a case by case basis, considering all these factors. At a minimum, the economic value of salvaged timber must be greater than the revenue lost by deferring other scheduled harvests, and harvests scheduled in approved UMPs must not be delayed more than five years.

Clearcutting

Clearcutting in particular is sometimes cited as an activity that State Forest users would prefer not to see. Most often, the reasons behind such dislike for the practice are based on aesthetics. Despite the visual appearance of a new clearcut, there are few other options that will accomplish certain goals as effectively. Timber production can be most effectively maximized by using even-aged management systems, of which clearcutting is one type. Native shade intolerant species such as black cherry and red oak reproduce best under conditions of full sunlight. It is highly desirable that the presence of these trees be maintained in the New York landscape. Also, there are myriad animal species that depend on young stands of seedlings and

saplings. Clearcutting is an effective means of creating such habitat, so that these animals remain a part of our ecosystems. As the photos at right illustrate, this habitat is present for approximately 20 years following a clearcut before forested habitat begins to reestablish itself.

A clearcut stand immediately after harvest

Staff conversations with members of the public often reveal that opposition to clearcutting stems from an incomplete knowledge of the reasons for using even-aged management systems, and the benefits derived from them. When they learn of these benefits, their opposition commonly changes to acceptance of the practice. Following a clearcut, stands may be replanted with selected tree species or, if sufficient regeneration or seed stock is present, allowed to develop into natural forest cover. The photos at right, collected from various clearcut stands in Delaware and Schoharie counties, represent the successional progress of reforestation that typically occurs following a clearcut that is not replanted, but allowed to develop into a natural forest stand.

A naturally regenerated clearcut stand, five years after harvest

The Division of Lands and Forests is developing policy which will address the visual and ecological impacts of clearcutting, and set guidelines for use of the practice on State Forests. This policy will build upon mitigations that are currently in place on State Forests and additional proposed policies discussed in this plan. All clearcutting on State Forests incorporates SMZ's (discussed above) which buffer and protect water resources and associated wildlife. In addition, the proposed retention policy (discussed above) establishes guidelines for ensuring that timber harvesting, including clearcutting, works around and does

A naturally regenerated clearcut stand, 19 years after harvest

not remove features on the land that provide the structural and compositional complexity necessary for conserving biodiversity and maintaining long term ecosystem productivity. In addition, the plantation section of this plan establishes guidelines for the management of plantations, including use of clearcutting. The plantation policy sets the stage for the gradual conversion of most plantations to more natural forest cover. (*refer to page 273*).

ADDITIONAL RESOURCES

Program Policy: Clearcutting on State Forests – Establishes the Bureau of State Land Management's practices for the use of clearcutting and other forest regeneration methods. Available at http://www.dec.ny.gov/docs/lands_forests_pdf/clearcuttingpol.pdf

Pesticide/Herbicide Use

Foresters apply principles of Integrated Pest Management (IPM), the science of silviculture and best management practices as the preferred methods of promoting forest health and providing for forest regeneration. However, in limited cases it is necessary to use pesticides to accomplish broader management objectives. Pesticides may be necessary to control invasive species, to protect rare and endangered plants from competition, or to control vegetation interfering with forest regeneration. Pesticides are used only as a last resort, where other "minimum tools" are not effective. For further discussion of invasive species and control of interfering vegetation, including IPM, and the "minimum tool" approach, *refer to the Forest Health section on page 285 of this plan.*

Pesticides are currently used effectively in limited situations on State Forests. Specific pesticides are carefully chosen, after researching their chemical components for their ability to bio-degrade in the environment, their resistance to leaching into the ground water and their effectiveness in controlling the target pest with minimal impact to other flora and fauna. Only those pesticides approved for use in New York State are considered. Additionally, no chemical not approved by the Forest Stewardship Council and Sustainable Forestry Initiative's forest certification standards is allowed. The latest research and in some cases partners such as TNC and the SUNY ESF are consulted to determine the best control methods. All applications are made under the direct supervision of a New York State Certified Pesticide Applicator using the most conservative application methods.

Among the herbicides that are used for vegetation management on State Forests, the following are the most frequently used:

- **Glyphosate** (trade names Accord, Garlon 4, Roundup, Rodeo and others) - Glyphosate is a non-selective herbicide registered for use on many food and non-food crops as well as non-crop areas where vegetation control is desired. It absorbs strongly to soil and is not expected to move vertically below the six inch soil layer. Residues are expected to be immobile in soil. Glyphosate is readily degraded by soil microbes into AMPA, a

compound that degrades to carbon dioxide. Glyphosate and AMPA are not likely to move to ground water due to their strong absorptive characteristics. Glyphosate does have the potential to contaminate surface waters; this risk is limited by application restrictions during wet or rainy conditions. (See "State Forest Pesticide Application Guidelines" below.) The US EPA has determined that the effects of Glyphosate on birds, mammals, fish and invertebrates are minimal.

- **Imazapyr** (trade name Arsenal) – Imazapyr is a non-selective herbicide registered for use on many food and non-food crops as well as non-crop areas where vegetation control is desired. Amazapyr is an anionic, organic acid that is non-volatile and is both persistent and mobile in soil. Photosynthesis is the only identified mechanism for imazapyr degradation in the environment. The US EPA concluded that risks to human health, dietary risks, residential post-application exposures and aggregate risks are below the EPA level of concern. However, there are no risks of concern to terrestrial birds, mammals, and bees, or to aquatic invertebrates and fish. However, there are ecological risks of concern associated with the use of Imazapyr for non-target terrestrial plants and aquatic vascular plants, and potential risks to federally listed threatened and endangered species which include aquatic vascular plants, terrestrial and semi-aquatic monocots and dicots that cannot be precluded at this time. Imazapyr use at the labeled rates on non-crop areas when applied as a spray or as a granular to forestry areas present risks to non-target plants located adjacent to treated areas. Risk of inadvertent introduction to surface waters via runoff is reduced by application restrictions during wet or rainy conditions. Risk of inadvertent introduction to surface waters or contact with non-target vegetation is reduced by application restrictions which minimize spray drift. (See "State Forest Pesticide Application Guidelines" below.)
- **Triclopyr** (trade name Vegetation Manager Triclopyr 3SL) – Based on EPA data, Triclopyr can be used in compliance with label requirements without posing unreasonable risks to people or the environment. Triclopyr is a selective herbicide registered for use on non-crop areas, rice and in forestry use for the control of broad-leafed weeds and woody plants. Triclopyr acid is somewhat persistent and is mobile. The predominant degradation pathway for triclopyr in water is photodegradation. The predominant degradation pathway in soil is microbial degradation to the major degradate TCP, which is both persistent and mobile. Based upon current data, EPA has determined that triclopyr is non-toxic to slightly toxic to birds and estuarine/marine invertebrates and practically non-toxic to mammals, insects, fish and freshwater invertebrates.

The term "pesticides" refers to both herbicides and insecticides. The New York State Department of Environmental Conservation is the agency in New York State designated to regulate pesticides. The Division of Solid & Hazardous Materials regulates pesticide applications in New York State and is responsible for compliance assistance, public outreach activities and enforcement of state pesticide laws, Article 33 and parts of Article 15 of the Environmental Conservation Law, and regulations, Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York Parts 320-329.

Under Sections 33-0301 and -0303 of the Environmental Conservation Law (ECL), the DEC has jurisdiction in all matters pertaining to the distribution, sale, use and transportation of pesticides. DEC also regulates the registration, commercial use, purchase and custom application of pesticides.

For compliance and enforcement purposes, DEC promulgates regulations pursuant to state laws, and issues policies as a part of compliance assistance.

Use of Pesticides to Control Insects on State Forests

There have not been any instances over the past decade where pesticides have been used on State Forests to control insect populations. IPM is applied to limit the need for pesticide use, including the promotion of health and biodiversity to maintain a resilient forest. Natural population cycles have been permitted to occur even though moderate to heavy defoliations sometimes cause significant tree mortality. However, the use of pesticides will not be ruled out, as the future will bring introductions of non-native invasive pests which could cause significant, wide-spread and permanent disruptions to forest ecology. The opportunity to control a new introduction before it has the ability to alter the ecosystem might, after careful consideration, warrant the use of a pesticide. While this option will not be considered lightly, it is wise to keep it available for limited use, when no other options are feasible. Any future use will conform to the guidelines established in this section, including SEQR analysis thresholds for pesticide application.

Use of Herbicides to Control Plants on State Forests

Examples of situations where herbicides may be used on State Forests when all other options are not viable, effective or economically feasible include protection of rare and endangered species, controlling exotic invasive plants, habitat restoration and ensuring adequate forest regeneration.

Controlling exotic invasive plants

Herbicides are sometimes used on State Forests to control non-native invasive plants. Targeted exotic plants include but are not limited to Japanese knotweed, mile-a-minute weed, honeysuckle, ailanthus, non-native Phragmites, pale and black swallow-wort, giant hogweed, multi-flora rose, oriental bittersweet, kudzu and autumn olive. The goal is to control small introductions prior to their ability to colonize an area and disrupt natural processes. Herbicides are only used in situations where other options such as mechanical control (usually hand-pulling individual plants out of the ground) have been proven to be ineffective. Historically, an average of less than twenty acres of invasive species control is conducted annually on State Forests.

Rare and endangered species protection

Herbicides are also used in limited situations to protect rare and endangered species. An example is the hart's tongue fern, federally listed as threatened. This is one of only a few plants listed in the Endangered Species Act. According to New York's Natural Heritage Program, 90% of the heart's tongue fern global populations are located in New York and a significant number of these populations are being seriously impacted by invasive plants. On a steep, rocky limestone bedrock site managed by DEC in Onondaga County, the Bureau is working with TNC and the State University of New York College of Environmental Sciences and Forestry (SUNY ESF) to save a rapidly declining population of Hart's tongue fern from being out-competed by the exotic, invasive vine called pale swallow-wort. Hand pulling swallow-wort is not an option at this site due to the thin soils and roots intertwined hart's tongue fern plants. After a thorough literature search and consultations with TNC and SUNY ESF the decision was made that the only viable option is to apply herbicide using a cut-stem application method. Using the cut-stem application method the applicator directly applies a drop of herbicide to each cut stem of pale swallow-wort, significantly reducing the amount of chemical used and the area treated, while protecting the ferns.

Habitat Improvement and Control of Interfering Vegetation

The remaining instance of herbicide use relates to forested areas which cannot be adequately regenerated due to interfering vegetation. The Bureau performs silvicultural treatments on approximately 8,000 acres annually. One of the basic tenets of silviculture is to ensure forests have adequate regeneration (seedling growth). In most cases, favorable conditions are created on the forest floor to stimulate seedling growth through either natural regeneration or by planting. Efforts to establish regeneration in a forest are incorporated into all active forest management activities. In cases where these efforts are unsuccessful, it may be necessary to judiciously use herbicides to reduce the abundance of interfering vegetation to create favorable conditions for the establishment of regeneration or to provide proper conditions for planting tree seedlings.

Herbicide use is limited to a few state approved herbicides that are effective at controlling interfering vegetation and have minimal short and long-term negative impacts on the environment when applied by a New York State Certified Pesticide Applicator according to the label instructions. Using herbicides to control interfering vegetation can have targeted results if the herbicide is applied to individual plants either by stem injection or foliar application. Broadcast spraying from the ground (either by backpack sprayer or tank sprayer attached to a vehicle) may be more appropriate in specific applications where larger areas need treatment in a more cost effective and efficient manner. When correctly and appropriately used, herbicide applications can be more cost efficient and effective at controlling interfering vegetation compared to other options. Herbicide is used only after all other options are considered. With this approach, herbicides are typically used in less than 4% of silvicultural treatments annually (between 300 and 350 acres a year). Herbicide use is further reduced by the application

methods employed – typically hand application, specifically applied where and when possible only on the interfering vegetation.

State Forest Pesticide Application Guidelines

Use of pesticides/herbicides shall comply with label directions and restrictions, including but not limited to: proper mixing, storage and disposal, personal safety equipment, application methods and rates, and minimizing effects on non-target vegetation and wildlife. No chemical not approved for use in New York State and no chemical not approved by the Forest Stewardship Council and Sustainable Forestry Initiative's forest certification standards will be used. The general public will be restricted from areas where herbicide is being applied. Overall impact will be minimized by using application methods that minimize the amount of herbicide being applied to the lowest level feasible. When practical, methods such as individual plant or tree stem injection, basal stem applications, cut stump treatment or backpack/machine spraying will be employed.

Specifications

Pesticide application will be conducted according to conditions described in a Pesticide or Herbicide Application Plan written for each specific instance of application. Such application plans will include, at minimum, the following information:

- location map;
- acreage of application;
- method and timing of application;
- name, registration number and sample label of herbicide/pesticide to be used;
- public notification procedures;
- post-application procedures.

To ensure protection of water resources and improve the effectiveness of foliar applications, pesticide spraying shall only take place when foliage is dry. Pesticide spraying shall not take place when rainfall is expected within 12 hours after application or during times when winds are gusty or exceed 10 miles per hour. The pesticide spraying shall be done in a manner, such that drifted pesticide does not impact adjacent areas or private land. No pesticide application may take place when the Palmer Drought Index drops below negative two (-2).

Pesticide application to control interfering vegetation will occur within the dates and times according the product label and as further described in the Pesticide Application Plan. A second application the following year may be required if the contractor does not meet the success rate standard specified in the Notice of Sale and Pesticide Application Plan. Equipment used in the application of pesticide or otherwise contaminated with pesticide shall not be used to draw water. Water mixed into pesticides will be brought to the site and will not be drawn from any water body adjacent to or located on State Forests.

Notices of pesticide application will be posted at the entrance to the treated area and on the State Forest boundary line adjacent to the treated area.

Pesticides will not be applied within defined protection buffers along water bodies or within the boundaries of designated wetlands, seeps, springs and vernal pools as described in the "DEC Division of Lands and Forests Management Rules for Establishment of Special Management Zones on State Forests" version June 2008 or later.

A New York State Certified Applicator will apply the pesticides following label instructions and safety precautions. This will minimize impact to both the environment and the public. Application personnel will be equipped with safety equipment as described on the label of the pesticide product being used.

"AFM" OBJECTIVES, ACTIONS AND SEQR ANALYSIS

Active Forest Management (AFM) Objective I – DEC will practice active forest management, applying sound silvicultural practices, including the use of timber harvesting and limited use of pesticides to reach statewide, ecoregional and unit-level ecosystem management goals.

AFM Action 1 – Develop and propose a clearcutting policy to provide guidance to regional staff, to be adopted by 2012. Conduct all clearcutting according to guidelines established in this plan unless superseded by policy.

AFM Objective II –Timber sales will be used to enhance forest health and the diversity of species, habitats and structure and thereby improve the resiliency of ecological systems and forest sustainability. Harvests will be planned in such a way as to develop a wider range of forest successional stages. To accomplish this objective, UMPs will contain harvesting plans and schedules. Occasionally unplanned salvage cuts may be necessary.

AFM Action 2 (also FP 2) – Re-establish a statewide system of permanent sample plots on State Forests to ensure sustainability and to quantify long-term carbon storage and forest growth, mortality and removals (harvests) and other forest characteristics, following the same protocol and methodology as used to develop the forest statistics for New York's forests by the US Forest Service Forest Inventory and Analysis Unit. Plots are to be established by 2013.

AFM Action 3 – Approach SUNY ESF to develop climate change adaptation strategies, using State Forests as a living laboratory and model. Strategies could include studies with varied planting stock and species redistribution (assisted migration).

AFM Objective III – Opportunities will be identified in all new UMPs to address ecoregional gaps, creating missing habitat types and diversity components to maintain and enhance

landscape-level biodiversity. While there is not enough acreage within each unit to fill all landscape gaps, each UMP will address the gaps each State Forest is best suited to fill.

AFM Objective IV – Adaptive management strategies will be considered to provide enhanced connectivity on State Forests bisected by LCPs. Also, management actions and decisions that emphasize closed canopy and interior forest conditions to maintain and enhance pre-identified matrix forest blocks will be considered within each respective UMP.

> **AFM Action 4 (also SM 5)** –Conduct training for forestry staff on the enhancement of forest matrix blocks and connectivity by 2013.

AFM Objective V – Forest and tree retention will be applied to preserve biodiversity in stands managed for timber on State Forests.

> **AFM Action 5** – Adopt proposed Program Policy "ONR-DLF-2 Retention on State Forests" to provide guidance to regional staff by 2011.

Active Forest Management (AFM) SEQR Alternatives Analysis and Thresholds

Following the **no-action alternative**, DEC will continue to employ the same silvicultural tools that have been proven effective to reach the desired conditions established in this plan and in UMPs. These tools emulate natural disturbances and processes to reach desired future conditions. However, we must recognize that this plan establishes many new landscape ecology and ecosystem management approaches that have not been consistently applied throughout the State Forest system. Using established tools to reach these new goals has been selected as the **preferred alternative** on acreage identified in UMPs as open to active management. This preferred alternative includes the application of protective measures, including uniform application of retention standards on areas of State Forests which are open to active forest management. Under this policy, other areas will be set aside to protect sensitive sites, rare and endangered species or to meet other ecological goals.

The alternative of removing all State Forests from active management has not been selected due to the following:

- State Forests are legislatively dedicated to the production of forest products
- Active management is used as a tool to promote forest health and biodiversity
- Timber harvests support local economies and offset the cost of administering and maintaining State Forests
- Timber sale contracts include requirements for the development and upkeep of forest access roads, parking lots and some multi-use trails.

The alternative of precluding pesticide use has not been selected because, there are instances in which small outbreaks of invasive species cannot be controlled by other methods and must be eradicated to prevent disastrous consequences. There are also

instances in which ecological and silvicultural goals cannot be realized without the use of pesticides.

SEQR analysis of the direct impacts of timber harvesting are also addressed in the Forest Products section of this plan.

SEQR Analysis Threshold
The use of any active forest management on acreage occupied by protected species ranked S1, S2, G1, G2 or G3 will first require site-specific environmental review under SEQRA. In addition, additional environmental review will be required for any projects that would cause the following impacts:

- substantial soil movement or change in soil condition;
- significant increased runoff or siltation of surface waters;
- significant change in the quantity or quality of ground water.

In consideration of the potential impacts of clearcutting on water quality, water temperatures, soil erosion and aesthetics60
, any clearcut of a contiguous area 40 acres or larger will require additional site-specific environmental review under SEQRA.

The use of pesticides to control invasive species or interfering vegetation on State Forests shall conform to Pesticide Application Guidelines delineated above. Compliance with these guidelines will avoid and minimize potential impacts resulting from pesticide application to the maximum extent practicable and no further SEQRA review will be conducted for pesticide application to State Forests as discussed in this chapter.

However, any pesticide application described below will require additional site-specific environmental review under SEQRA.

- aerial spraying (application by airplane or helicopter)
- applications adjacent to rare and endangered plants ranked S1, S2, G1, G2 or G3
- applications exceeding 40 acres

All selection harvesting (uneven aged management) conducted in accordance with this plan will not require additional SEQR analysis.

CHAPTER 3
RESOURCE PROTECTION

SOIL AND WATER PROTECTION

SOIL PROTECTION AND ECOLOGY

The Importance of Forest Soils

"Aldo Leopold suggests that the first rule of intelligent tinkering is to save all the pieces. We would recast this idea and say that the first rule of intelligent forest management is to take care of the soil. Taking care of the soil requires many important insights into the chemistry, physics and biology of soils, which together comprise soil ecology." (Fisher and Binkley 2000).

Soils provide the foundation, both figuratively and literally, of forested ecosystems. They support an immense number of microorganisms, fungi, mosses, insects, herpetofauna and small mammals which form the base of the food chain. They filter and store water and also provide and recycle nutrients essential for all plant life. "More than 99% of the diversity of life in forest ecosystems resides in soils, where amazingly small, numerous and important organisms make the rest of the ecosystem (such as trees and mammals) possible." (Fisher and Binkley 2000). The value of forest soils extends well past the boundaries of the forest, not only in providing high quality water, but also as important "sinks" for the sequestration of carbon.

Impacts on soil affect wildlife, starting at the base of the food chain

Unfortunately, soils are vulnerable to human impacts. State Forests are a testimony to this fact as past agricultural practices, prior to state ownership, depleted soils on these lands of nutrients and organic materials as well as impairing their structure. In some cases, soils were even lost to unchecked erosion. While reforestation efforts of the 1930s and 1940s have contributed to a replenishment of the soils and carbon stocks, the process is still far from complete. High quality forest soils are the product of thousands of years of development, a process for which there are no shortcuts.

Filtration is the process of absorbing and filtering rainwater and runoff. It is highly dependent on combined vegetative cover, humus and soil type.

Compaction of forest soils reduces aeration; which reduces their ability to absorb and filter water, support healthy root systems and support the full range of life forms dependent on healthy, well-aerated soils.

Erosion is the removal of vegetation, organic matter and soil, leaving the remaining soil prone to further damage. Erosion is caused by runoff, which occurs wherever the volume of water exceeds the ground's capacity for filtration. It increases exponentially as a function of increased water velocity.

Soil Management

Sustainable forest management dictates the protection of forest soils. Human activity can potentially have negative impacts on soils and the many life forms

resident in soil ecosystems. Management activities must be modified to limit these impacts. DEC staff will strive to minimize and mitigate soil impacts, erosion and compaction, to the fullest extent practical during the process of planning, working and contracting on State Forests.

To reduce impacts, including erosion and compaction, DEC:

- Designs and constructs recreational trails, roads and access trails to minimize running slope, which in turn minimizes the velocity of water that travels over them;
- Minimizes the overall impact of its activities by directing heavy use, such as recreational use, toward formal trail systems and designated campsites, which are designed to accommodate such use— heavy-duty harvesting equipment will often be limited to designated skid trails and restricted from areas where impacts would be excessive;

While this photo was not taken on State Forest lands, it illustrates that erosion problems can compound quickly when major storm events occur over exposed

- Closes poorly designed or badly damaged facilities and restores and maintains existing facilities to prevent damage from occurring;
- Applies best management practices (BMPs) and bureau guidelines.

Not all soils are created equal. Some are able to withstand heavier use than others. Impacts can be minimized by concentrating a particular use in soils which are better able to support that use. Another strategy is to avoid impacting some soils altogether. Where the filtration value of soil is highest, on the edge of streams, wetlands, vernal pools and spring seeps, a buffer zone will be created around water features and heavy equipment will be excluded, except at carefully selected and designed crossings.

Nutrient Depletion

Intensive management of forests, like intensive management of agricultural land, has the potential of depleting nutrients from the soil. This is more of a risk with plantations in the southern United States, where a “crop rotation” ending in a clearcut could happen every 20 to 25 years. At the present rate on State Forests in New York, less than 1/100th of the total area is cut every year, with the vast majority of those harvests being intermediate thinnings. This is far from being intense enough to deplete soils, as shown by the fact that State Forest soils are actually much richer on average in 2010, than they were when the state first acquired these

lands. Still, the demand for forest products, as a biomass fuel source for combustion, or as a raw material for the production of cellulosic ethanol, stands to increase significantly.

The Bureau of State Land Management has proactively developed policies on forest and tree retention *(refer to page 85)* and plantation management *(refer to page 263)* which establish standards and procedures to protect forest soils from nutrient depletion and protect the ecological goals outlined in this plan. Buffer guidelines (discussed below in the context of water quality) also help prevent nutrient depletion.

WATER ECOLOGY

The important role forests play in producing high quality fresh water cannot be overstated. Forests serve as nature's water filters and regulate water flow by storing rainfall and releasing it into streams at a more even rate. Water is essential for almost all terrestrial life forms, as well organisms that spend at least part of their life cycle in water, or are aquatic-based, like some insects and salamanders. As with soils, the state's waters support an immense variety of organisms which serve as the foundation for the food chain and the core of biodiversity.

Water quality—the ecological health of streams, ponds, lakes and wetlands—is directly and inextricably intertwined with soil protection. DEC's actions to protect soils and terrestrial vegetation directly and indirectly protect water quality by: maintaining the filtering capacity of soil; reducing soil erosion to protect stream habitat from sedimentation; stabilizing water chemistry; controlling water temperatures; buffering high water events to reduce damage from flooding; and storing water between rain events.

Water Quality Classifications

All waters of the state are provided a class and standard designation based on the *best usage* (for drinking, fishing, etc.) of each water or waterway segment. The following list shows waterway classifications and mileage found on State Forest lands.

- 145 miles of Class AA or A, assigned to waters used as a source of drinking water.
- 50 miles of Class B, indicating a best usage for swimming and other contact recreation, but not for drinking water.
- 1,449 miles of Class C, for waters supporting fish propagation and survival.
- 134 miles of Class D, for waters supporting fish survival, but not propagation.

East Branch Fish Creek State Forest in the Tug Hill Plateau, Lewis County

SOIL and WATER PROTECTION

Waters with classifications A, B, and C may also have a standard of (T), indicating that they may support a trout population, or (TS), indicating that it may support trout spawning (TS). Special requirements apply to sustain waters that support these valuable and sensitive fisheries. Small ponds and lakes with a surface area of 10 acres or less, located within the course of a stream, are considered to be part of a stream and are subject to regulation under the stream protection category of the Protection of Waters regulations.

Certain waters of the state are protected on the basis of their classification. Streams, or small water bodies located in the course of a stream, designated as C(T) or higher (i.e., C(TS), B or A) are collectively referred to as "protected streams," and are subject to the stream protection provisions of the Protection of Waters regulations. Special protective measures are used when protected waters are crossed, or have the potential to be impacted in the course of conducting management activities. When harvesting, for instance, portable temporary bridges are required in many cases to protect streams and their banks from damage and sedimentation. Additional protective measures are discussed on DEC's public website at www.dec.ny.gov/permits/49060.html and www.dec.ny.gov/permits/49066.html.

State Forests are included in DEC's Routine Statewide Monitoring Program which is responsible for the monitoring of the waters of the state to allow for the determination of the overall quality of waters, trends in water quality, and identification of water quality problems and issues. The program includes lake assessments, stream biomonitoring and rotating integrated basin studies. More information is found at www.dec.ny.gov/chemical/23848.html.

BEST MANAGEMENT PRACTICES AND GUIDELINES

To protect soils and water quality, the following BMPs and guidelines are being, and will continue to be, used in all projects undertaken on State Forest lands. The BMPs, in particular, describe appropriate actions that should be taken with very few exceptions.

Soil and Water Guidelines

- Apply **DEC Special Management Zone (SMZ) Guidelines**, which provide continuous over-story shading of riparian areas and adjacent waters, by retaining sufficient tree cover to maintain acceptable aquatic habitat and protect riparian areas from soil compaction and other impacts. DEC's buffer guidelines also maintain corridors for movement and migration of all wildlife species, both terrestrial and aquatic. Buffers are required within SMZs extending from wetland boundaries, high-water marks on

ADDITIONAL RESOURCES

Rules for Establishment of Special Management Zones on State Forests – June 2008, establishes the Bureau of State Land Management's buffer guidelines and can be found at http://www.dec.ny.gov/docs/lands_forests_pdf/sfsmzbuffers.pdf

perennial and intermittent streams, vernal pool depression, spring seeps, ponds and lakes, recreational trails, campsites and other land features requiring special consideration. DEC's special management zones are summarized in the table below.

General BMPs
(Refer to page 157 for additional construction guidelines.)

- Limit the size of improvements to the minimum necessary to meet the intended use.
- Minimize tree cutting associated with construction projects.
- Minimize the use of equipment in streams.
- Locate improvements to minimize cut and fill.
- Locate improvements away from streams, wetlands, and unstable slopes.
- Plan projects to avoid hydric and highly erodible soils. Where these soils must be traversed consider: construction in dry periods, seasonal closure, use limitations or the use of gravel and fabric.
- Use properly placed drainage devices such as water bars and broad-based dips.
- Locate trails to minimize grade.
- Use bridges instead of culverts or fords whenever possible.
- Design stream crossings (fords) where there are low, stable banks, a firm stream bottom and gentle approach slopes.
- Construct stream crossings perpendicular to the stream flow.
- Limit stream crossing construction to periods of low or normal flow.
- Avoid disrupting or preventing movement of fish and other aquatic species.
- Stabilize bridge approaches with aggregate or other suitable material.
- Use soil stabilization practices on exposed soil around construction areas, especially bridges, immediately after construction.
- Construct stream crossings which maintain a continuous natural streambed by using bridges, "D" shaped culverts, or oversize round culverts placed deep enough to provide this attribute.
- Restrict the size and type of equipment used, in order to minimize adverse impacts.

ADDITIONAL RESOURCES

Recommendations for Stream Crossings can be found online at www.dec.ny.gov/permits/49060.html and www.dec.ny.gov/permits/49066.html

SOIL and WATER PROTECTION

Recreation BMPs

(Refer to page 209 for additional recreation guidelines.)

Trails BMPs

- Wherever possible and appropriate, lay out trails on existing old roads or clear or partially cleared areas;
- Where stream bank stabilizing structures are needed, use natural materials such as rock or wooden timbers;
- Construct new trails on low or moderate side slopes to facilitate effective drainage;
- Avoid flat topography where ponding could develop and drainage could be problematic should the trail surface erode or become compacted to a level below the surrounding area.

Trailheads and Parking Areas BMPs

- Locate parking lots on flat, stable, well-drained sites;
- Use gravel or other appropriate materials to avoid runoff and erosion problems;
- Limit construction to periods of low or normal rainfall;
- Limit the size of the parking lot to the minimum necessary to address the intended use.

Lean-tos and Campsites BMPs

- Use drainage structures on trails leading to lean-to sites and campsites, to prevent water flowing into them;
- Locate lean-tos and campsites on flat, stable, well-drained sites that are properly buffered from streams, wetlands and waterbodies;
- Limit construction to periods of low or normal rainfall.

Timber Harvesting Guidelines

(Refer to page 251 for related information.)

Timber Harvests are conducted under a contract developed by DEC. Special terms and conditions are included in contracts to limit impacts on soil and water resources. A bond is required in any contract written for over $500, to ensure compliance with all requirements.

ADDITIONAL RESOURCES

New York State Forestry, Best Management Practices for Water Quality, BMP Field Guide – 2007. Developed by the Division of Lands and Forests.
www.dec.ny.gov/lands/37845.html

Rutting Guidelines for Timber Harvests and TRPs on State Forests – May 2008, developed by the Bureau of State Land Management.
http://www.dec.ny.gov/docs/lands_forests_pdf/ruttingguidelines.pdf

- Harvesting is often prohibited in spring and in periods when soils are saturated and unable to support harvesting activities.
- Skid trails are located by DEC to avoid sensitive soils and limit impacts on water resources.
- Contractors are required to have oil spill containment devices.
- Soils and water quality are protected during harvesting and construction operations by implementing best management practices as outlined in DEC's "BMP Field Guide" and "Rutting Guidelines for Timber Harvests, 2009."

Oil and Gas Exploration and Development – Surface Impacts Guidelines
(Refer to page 232 for further detail.)

The Division of Lands and Forests is responsible for managing surface impacts from oil and gas exploration and development on State Forests. These activities are regulated under a temporary revocable permit, which includes special terms and conditions required by DEC to reduce overall impacts and include mitigation measures. A bond is always required to insure all terms are satisfied.

The regulation of subsurface impacts related to oil and gas development and protection of underground aquifers is the responsibility of DEC's Division of Mineral Resources and is not discussed in this plan. The minerals section of this plan does contain information regarding these management responsibilities.

The following guidance documents have been developed to limit impacts on soil and water resources on State Forests;

- Guidelines for Seismic Testing on DEC Administered state Lands
- DRAFT Guidelines for Pipeline Construction on DEC Administered State Lands

ADDITIONAL RESOURCES

Guidelines for Seismic Testing

http://www.dec.ny.gov/docs/lands_forests_pdf/sfseismic.pdf

DRAFT Guidelines for Pipeline Construction on DEC Administered State Lands

http://www.dec.ny.gov/docs/lands_forests_pdf/sfpipelines.pdf

"SW" OBJECTIVES, ACTIONS AND SEQR ANALYSIS

Soil and Water (SW) Objective I – Soil and water quality will be protected by preventing erosion, compaction and nutrient depletion. Protection of soil and water quality is one of the highest management priorities and is the foundation of sustainable management.

SOIL and WATER PROTECTION

SW Action 1 - Increase monitoring of BMP effectiveness by sampling management sites on a periodic basis after construction of erosion control structures to assess sedimentation and water quality. This monitoring system will be implemented by the end of 2015.

SW Action 2 (also SM 5) - Provide training to Bureau of State Land Management (BSLM) and Division of Operations staff in modern application of BMPs at least every five years.

SW Objective II –All SMZs and highly-erodible soils will be identified and mapped in UMPs

SW SEQR Alternatives Analysis and Thresholds

The **no-action alternative**, or in other words, continuing with current management approaches, has been selected as the **preferred alternative**. The above-mentioned BMPs and other soil and water protection mitigations being implemented on State Forests adequately protect soil and water resources. However, there are some exceptions where impacts may occur. This may be due to such issues as illegal ATV use, which requires greater education and enforcement activity and the lack of adequate funding for maintenance. To address these obstacles, DEC will rely more heavily on timber sale-related work and AANR partners to maintain existing infrastructure.

The alternative of not implementing the above mitigations will not be adopted. This alternative is not acceptable, considering the severe impacts to soil and water that can occur with management activities and public use.

SEQR Analysis Threshold: Soil and water protection strategies established in this section will avoid and minimize potential impacts to the maximum extent practicable and no further SEQRA review will be conducted.

AT-RISK SPECIES AND NATURAL COMMUNITIES

When air, land, water, plants and animals support each other in a healthy environmental system, all species, including humans, flourish. Alone among the animals, humans have the power to throw the system out of balance and to damage key elements in the web of life beyond repair. But the same knowledge and technology that make humans uniquely destructive also give us the ability to prevent damage to the environment and to care for the environmental support system on which human survival depends. State Forests will be managed with an ecosystem management approach which includes a focus on the overall health of the "system" and on the individual species and communities (elements) within the ecosystem.

Hart's Tongue Fern (A*splenium scolopendrium)* is one of many species that are actively protected on State Forests. *Photo credit: Doug Schmid*

This plan addresses At-Risk Species and Natural Communities with a strategy to:

- "Keep Common Species Common" by enhancing landscape level biodiversity and providing a wide variety of naturally occurring forest based habitat.
- Protect and in some cases manage known occurrences of endangered plants, wildlife and natural communities using the Natural Heritage Database and conservation guides along with assistance from DEC experts in the Division of Lands and Forests and the Division of Fish, Wildlife and Marine Resources.
- Consider other "at-risk species" whose population levels may presently be adequate but are at risk of becoming imperiled due new incidences of disease or other stressors.

The bog turtle *(Clemmys muhlenbergii)*, endangered in New York, is one of the smallest turtles in North America. *Photo credit: Jesse W. Jaycox*

DEC's Endangered Species Program is designed to identify and protect imperiled species and communities. There are several levels of classification that rank the scarcity or vulnerability of species, established by federal and state governments. Under Federal and New York State law, species and natural may be classified as "Threatened," "Endangered," "Special Concern," "Rare," or "Exploitably Vulnerable." Upon classification, these species are granted a

commensurate level of protection under the law. Legal protections do vary, with greater legal protections for wildlife than for plants or natural communities. There are also many species of invertebrates, insects and smaller micro-organisms that are biologically rare and imperiled, but have not gone through the review process necessary for state listing. All of the above listed and unlisted elements are referred to as "At-Risk Species and Communities" (ARS&C) in this plan.

On State Forests, DEC foresters are able to actively promote habitat for the enhancement of ARS&C. In addition, DEC's management role on State Forests requires that the presence of ARS&C are investigated and appropriate protections or management actions are in place. This investigation occurs both through the UMP process and associated inventory of the State Forest resources, as well as before undertaking specific management activities in sensitive sites. Protections include reserving areas from management activity or mitigating impacts of activity.

It is important to note that DEC has the responsibility to protect all fish and wildlife, including those considered at-risk throughout the state, including on private lands as fish and wildlife are all considered property of the state. However, the protection of ARS&C plant species and natural communities is a responsibility that falls primarily with the owner of the land where on these elements occur as these are considered the property of the landowner. Therefore, State Forests present a tremendous opportunity where DEC can actively engage in the protection of RTE plants and natural communities, along with fish and wildlife species found on these public lands.

CLASSIFICATION SYSTEM

On State Forests, DEC will employ the ranking system described below, developed by the New York Natural Heritage Program (NYNHP), which is a joint program supported by DEC and The Nature Conservancy. (More information on this program can be found at www.dec.ny.gov/animals/29338.html.) The rankings compile multiple layers of regulation and protections along with the program's research into one useful system.

Each element in New York State has been assigned a global and state rank that reflects their scarcity or vulnerability. These ranks carry no legal weight. The global rank reflects the rarity of the element throughout the world and the state rank reflects the rarity within New York State.

Global Rank

G1 - Critically imperiled globally because of extreme rarity (5 or fewer occurrences), or very few remaining acres, or miles of stream) or especially vulnerable to extinction because of some factor of its biology.

G2 - Imperiled globally because of rarity (6 - 20 occurrences, or few remaining acres, or miles of stream) or very vulnerable to extinction throughout its range because of other factors.

G3 - Either rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g. a physiographic region), or vulnerable to extinction throughout its range because of other factors.

G4 - Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 - Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH - Historically known, with the expectation that it might be rediscovered.

GX - Species believed to be extinct.

NYS Rank

S1 - Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream, or some factor of its biology making it especially vulnerable in New York State.

S2 - Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State.

S3 - Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.

S4 - Apparently secure in New York State.

S5 - Demonstrably secure in New York State.

SH - Historically known from New York State, but not seen in the past 15 years.

SX - Apparently extirpated from New York State.

SZ - Present in New York State only as a transient migrant.

***SxB** and **SxN**, where Sx is one of the codes above, are used for migratory animals, and refer to the rarity within New York State of the breeding (B) populations and the non-breeding populations (N), respectively, of the species.*

Ecological Communities

In 1990, NYNHP published Ecological Communities of New York State, an all-inclusive classification of natural and human-influenced communities, using the ranking system outlined above (Reschke 1990). This classification system is now the primary source for natural community classification in New York and a fundamental reference for natural community classifications in the northeastern United States and southeastern Canada. This classification system is used in many decision-making processes on State Forests, guiding the establishment, maintenance and protection of natural systems.

ENDANGERED SPECIES LAW

Federal Law

One of the results of the environmental movement of the 1960s and 70s was the enactment of the Endangered Species Act of 1973. The Act was designed to prevent the extinction of plants and animals, addressing problems of both exploitation and habitat destruction. The Act defines an endangered species as any species of animal or plant that is in danger of extinction over all or a significant portion of its range. A threatened species is defined as one that is likely to become endangered. The Act regulates the "taking" of endangered and threatened plants on federal land or when they are affected by federal actions or the use of federal funds.

AT-RISK SPECIES and NATURAL COMMUNITIES

A particularly important section of the Act promotes the conservation of habitats of endangered and threatened species. The Act authorized the acquisition of land for the protection of habitats of these species and directs federal agencies to ensure that their activities or those authorized or funded by them do not jeopardize the continued existence of endangered and threatened species.

The Act prescribes strict procedural guidelines for determination of status and listing of species. These provide that species be listed only after extensive input and review by biologists, the states and the general public. This procedure ensures that only species in need of protection are listed, and it provides baseline data from which further population monitoring may proceed.

Presently, 11 New York rare plants are on the federal endangered and threatened list:

Endangered Plants
Agalinis acuta - Sandplain Gerardia - presently known from Long Island
Schwalbea americana - Chaffseed - historically known from the Albany Pine Bush
Scirpus ancistrochaetus - Northeastern Bulrush - historically known from Washington County

Threatened Plants
Aconitum noveboracense - Northern Monk's-hood - presently known from the Catskills
Amaranthus pumilus - Seabeach Amaranth - presently known from Long Island
Asplenium scolopendrium var. *americanum* - Hart's Tongue Fern - presently known from Central New York
Helonias bullata - Swamp Pink - historically known from Staten Island
Isotria medeoloides - Small Whorled Pogonia - historically known from Central and Eastern New York and Long Island
Platanthera leucophaea - Prairie Fringed Orchid - historically known from Central New York
Rhodiola integrifolia ssp. leedyi - Leedy's Roseroot - presently known from the Finger Lakes region
Oligoneuron houghtonii - Houghton's Goldenrod - presently known from Western New York

In addition, the following animal species that are known to occur, have been known to occur in the past or could potentially occur on or near State Forests, are on the federal endangered and threatened list.

Endangered Animals

Molluscs:	*Alasmidonta heterodon* - Dwarf Wedgemussel
	Lampsilis abrupta - Pink Mucket
	Pleurobema clava - Clubshell
	Potamilus capax - Fat Pocketbook
Insects:	*Nicrophorus americanus* - American Burying Beetle (extirpated from NYS)

	Lycaeides melissa samuelis - Karner Blue Butterfly
Fishes:	*Acipenser brevirostrum* - Shortnose Sturgeon
Birds:	*Charadrius melodus* - Piping Plover *Numenius borealis* - Eskimo Curlew (extirpated from NYS) *Sterna dougallii* - Roseate Tern
Mammals:	*Myotis sodalist* - Indiana Bat *Canis lupus* - Gray Wolf (extirpated from NYS) *Felis concolor* - Cougar (extirpated from NYS)

Threatened Animals

Molluscs:	*Novisuccinea chittenangoensis* - Chittenango Ovate Amber Snail
Insects:	*Cicindela dorsalis* - Northeastern Beach Tiger Beetle (extirpated from NYS)
Reptiles:	*Clemmys muhlenbergii* - Bog Turtle
Mammals:	*Lynx canadensis* – Canada Lynx (extirpated from NYS)

State Laws and Regulations

Plant Rarity and the Law

Various laws, regulations and policies protect rare plants. Probably the most surprising aspect of rare plant protection is that, unlike animals, plants are the property of the landowner whether that might be an individual, corporation, or government agency. This means that the protection of rare plants is under control of the landowner unless, in some cases, a government-regulated action is affecting them. Then the government entity regulating the action may require that protection efforts take place to preserve the rare plants and their habitat. As a large landowner, as well as the agency which promulgated many of the above mentioned legal requirements, the DEC has a responsibility to make every effort to fulfill the intent of those requirements.

At-risk plants in New York State are protected under New York State Environmental Conservation Law section 9-1503 and under regulations in 6NYCRR Part 193. Part (f) of the regulation reads as follows: "It is a violation for any person, anywhere in the state to pick, pluck, sever, remove, damage by the application of herbicides or defoliants, or carry away, without the consent of the owner, any protected plant. Each protected plant so picked, plucked, severed, removed, damaged or carried away shall constitute a separate violation." Violators of the regulation are subject to fines of $25 per plant illegally taken. This regulation contains lists of protected plants under four different categories (rare, threatened, endangered and exploitably vulnerable) based on their scarcity in New York State. The DEC Protected Plant Program and Part 193 Regulations can be viewed on the DEC website at: www.dec.ny.gov/regs/15522.html

Accordingly, the DEC long ago adopted regulations to protect rare and endangered plants on state lands. Specifically, 6 NYCRR 190.8(g) makes it illegal for anyone to “deface, remove,

destroy or otherwise injure in any manner whatsoever any tree, flower, shrub, fern, fungi or other plant organisms, moss or other plant, rock, soil, fossil or mineral" on state lands.

Wildlife Rarity and the Law

Regulations related to fish and wildlife protection have been in existence even longer than for plants. Current Environmental Conservation Law Chapter 11 contains protections for game and non-game fish and wildlife species with related regulations found in 6NYCRR Chapter I, Sub-chapters A-J. Endangered and threatened species of fish and wildlife are located within those regulations in Part 182 which is available online at: www.dec.ny.gov/regs/3932.html.

ADDITIONAL RESOURCES

New York State's Endangered, Threatened and Special Concern Wildlife Species List – Available at: www.dec.ny.gov/animals/7494.html

NEW YORK NATURAL HERITAGE PROGRAM

The Nature Conservancy established the New York Natural Heritage Program (NYNHP) in 1985 as a contract unit within the DEC. NYNHP's mission is to facilitate conservation of rare animals, rare plants, and natural ecosystems, which are commonly referred to as "natural communities." They accomplish this mission by working collaboratively with partners inside and outside New York to support stewardship of New York's rare plants, rare animals, and significant natural communities, and to reduce the threat of invasive species to native ecosystems.

This limestone woodland (rank: S2) is one of many rare natural communities present on State Forests

Capturing Many Different Levels of Biodiversity

A "coarse filter/fine filter" approach can be used to identify and prioritize the protection of rare species and significant ecological communities. Ecological communities represent a "coarse filter," an aggregate of biodiversity at a larger scale than the species level. Their identification and documentation encompasses whole assemblages of plant and animal species, both common and rare. The conservation of good examples of natural communities ensures the protection of most of the species that make up the biological diversity of the state.

However, because rare animals and plants often have narrow or unusual habitat requirements, they may fall through the coarse filter, not being captured within protected communities. Identifying and documenting viable populations of each of these rare species serves as the "fine filter" for protecting the state's biological diversity. This coarse filter/fine filter approach to a natural resources inventory is an efficient way to account for the most sensitive animals, plants, and communities in an area.

Ranking: Putting Biodiversity into Context

NYNHP's lists of rare species and natural communities are based on a variety of sources including museum collections, scientific literature, information from state and local government agencies, regional and local experts, and data from neighboring states.

Each natural community and rare species is assigned a rank based on its rarity and vulnerability. Like all state Natural Heritage Programs, NYNHP's ranking system assesses rarity at two geographic scales: global and state. The global rank reflects the rarity of a species or community throughout its range, whereas the state rank indicates its rarity within New York. These ranks are usually based on the range of the species or community, the number of occurrences, the viability of the occurrences, and the vulnerability of the species or community around the globe or across the state. As new data become available, the ranks may be revised to reflect the most current information. Sub-specific taxa are also assigned a taxon rank which indicates the subspecies' rank throughout its range.

Individual occurrences of rare plants, imperiled animals, and natural communities are ranked according to their quality, or perceived viability, based on factors including size, condition, and landscape context. All occurrences are assigned a quality rank of A-F, H, or X.

Species occurrence ranks are based on historical evidence of presence and/or on current population data. They are determined by evaluating the population's size, condition, and reproductive health, plus ecological processes needed to maintain the population and total landscape condition. Each of these factors is compared against specifications gathered from other populations throughout the species' global range. A final occurrence rank is calculated from this comparative review. Generally, an A-ranked occurrence is considered to represent one of the largest, most viable populations within a natural landscape.

Significant natural communities are also assigned ranks based on quality and are evaluated within the context of the known or hypothesized distribution of that particular community. Several ecological and spatial factors must be considered when determining the occurrence rank of a community. These include the occurrence size, maturity, evidence and degree of unnatural disturbance, continued existence of important ecological processes, overall landscape context, and existing and potential threats. A-ranked community occurrences are among the largest and highest quality of their type. These community occurrences are large enough to provide reasonable assurance of long-term viability of component ecological processes. They are essentially undisturbed by humans or have nearly recovered from past

human disturbance, and typically exhibit little or no unnatural fragmentation. Exotic or particularly invasive native species are usually absent from high-quality community occurrences, or if present, are observed at very low levels.

STATE LANDS ASSESSMENT PROJECT

The State Lands Assessment Project is an ambitious effort by the NYNHP to assess State Forests for rare species and significant natural communities. The State Forest Assessment, a partnership between the Division of Lands & Forests and NYNHP, began in 2004 and was completed for New York State Forests in 2009.

The overall objectives of the project were to conduct a detailed examination of approximately 723,000 acres of State Forests managed by DEC's Division of Lands & Forests for rare species and significant natural communities (i.e., occurrences of rare natural communities, and the state's best examples of common natural communities) to (a) develop tools for state land managers that will help conserve rare species and significant natural communities on State Forests and (b) improve human understanding of New York's biodiversity, which will enhance informed conservation outside of State Forests.

The State Forest Assessment Project included detailed rare species and significant natural community surveys, targeted observation point data collection at non-significant community occurrences, delineation of all significant natural communities within each State Forest, and preparation of in-depth reports for each property. The assessment project updated element occurrence data in DEC's GIS database, and created region-specific biodiversity reports and conservation guides for many rare, threatened and endangered species and natural communities on State Forests.

The final report, including tables, maps, conservation guides, and detailed element occurrence records is housed for internal DEC and NYNHP use and is delivered on a server located in the Albany DEC office and is available to forestry staff when planning management activities. Conservation guides for the species and natural communities documented over the course of this project are also available on the web at http://guides.nynhp.org.

At the completion of the State Lands Assessment Project in 2009, a total of 393 rare species and significant natural community occurrences (hereafter referred to as element occurrences) were documented on 137 State Forests. These records were distributed among State Forests as follows:

- 98 rare plant populations,
- 141 rare animal populations, and
- 154 natural communities

NEXT STEPS

As discussed earlier in this plan, State Forest management will strive to enhance habitat level diversity using an ecosystem management approach. The primary focus of management will be to provide a wide diversity of habitats that naturally occur in New York. This approach will help keep common species common. When species and communities ranked S1, S2, S2-3, G-1, G-2 or G2-3 are present, actions will be taken to protect those specific populations or communities. This may involve taking action to enhance habitat, or may entail preventing actions that would degrade habitat. DEC Foresters who manage State Forests will be provided educational opportunities, technologically advanced tools like GIS and GPS, and access to expert advice from DFWMR, USFWS, and NHP staff to improve their ability to recognize, manage and protect rare species and forest communities with exceptional values. DEC Foresters use the following resources to make broad-scale ecological and social assessments: this Strategic Plan for State Forest Management, the State Lands Assessment Project – Biodiversity Inventory of (Regional) State Forests, DEC's Comprehensive Wildlife Conservation Strategy and the NYS Open Space Conservation Plan.

DEC DFWMR have developed the New York State Comprehensive Wildlife Conservation Strategy (CWCS) which is a valuable tool for managing at risk wildlife species on State Forests. The CWCS identifies "Species of Greatest Conservation Need" (SGCN) in New York State. This designation takes into account species abundance and downward trends in population levels. Management of State Forests will consider at-risk species which, without intervention, might become imperiled. A list of SGCN that rely on forested habitat has been prepared by DFW&MR and is available on the DEC website. This list will be consulted, along with DFW&MR biologists when developing UMPs.

DEC Lands and Forests GIS staff and staff from NYNHP have deployed a new data layer in GIS for use by L&F Foresters. This data layer is based on predictive models (the EDMs) for targeted rare plant and animal species developed as part of the State Land Assessment Project to make the 'Predicted Richness Overlays' (PROs) available to Foresters in addition to the element occurrences presently being used. With this new tool an additional layer of protection has been created. In addition to protecting known occurrences of rare plants and animals or high quality natural communities, DEC Foresters are now able to look for new or unknown occurrences in areas where the PROs indicate areas where the elements might be present. The PROs data layer is consulted prior to any timber sale contract, oil and gas lease, or construction project.

DEC foresters use predictive models to focus efforts to discover and protect at-risk species and communities

AT-RISK SPECIES and NATURAL COMMUNITIES

Bureau staff will address ARS&C concerns within the context of each individual UMP, which includes public input and review. While a majority of management actions focus on habitat-level diversity, protection of rare, threatened and endangered species will take priority over other management concerns. DEC Foresters will reference NYNHP conservation guides and will confer with Natural Heritage Program staff along with college and university experts to apply appropriate management strategies. It is important to recognize that in some cases active management is required or desirable to protect or enhance ARS&C.

ADDITIONAL RESOURCES

'Predicted Richness Overlays' (PROs) – DEC data layer used by foresters to identify new or unknown occurrences

Conservation Guides for species and natural communities documented by TNC's Natural Heritage Program project are available on the web at guides.nynhp.org. Additional info is available at www.dec.ny.gov/animals/29338.html.

Comprehensive Wildlife Conservation Strategy (CWCS) - completed by the Division of Fish, Wildlife and Marine Resources (DFWMR) of NYSDEC in September of 2005 to address the wildlife species in greatest need of conservation in the state. The CWCS utilizes the best available data on the status of fish and wildlife species to define a vision and establish a strategy for state wildlife conservation and funding. www.dec.ny.gov/animals/9404.html

List of SGCN that Rely on Forested Habitat - www.dec.ny.gov/docs/lands_forests_pdf/sfcwcsforest.pdf

Land Classification

DEC developed a land classification for those portions of State Forests which have known high conservation values that DEC feels should take precedence over all other land use and management decisions. Areas identified as having exceptional values may, in certain circumstances, be managed using harvesting as a tool to reach management goals, but all management activities must maintain or enhance the high conservation values present. DEC consults with NYNHP, university scientists, and other concerned citizens and topical experts to develop and define these classifications. Currently, DEC has identified two land classifications that are considered to have high conservation values on State Forests and address ARS&C:

1. Biologically Diverse Forest - Forest areas that are in or contain rare, threatened or endangered ecosystems.
2. Special Treatment Area - Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, and refugia).

Land Classification Ranking

DEC recognizes that State Lands have many unique or special designations and are being managed to maintain or enhance these unique features. As a result, some areas may be part of more than one land classification. Therefore, it is necessary to rank all classifications against

each other to help land managers incorporate management decisions based on the highest priority for the forest. However, if a situation arises where a management decision protects the values of a higher ranking forest attribute but may have a known or unknown negative impact on the values of a lower ranking attribute within the same forest, no management actions will take place until further analysis can be accomplished to verify impacts and assure the protection of all unique forest values. Ranking from highest to lowest priority is: 1) Biologically Diverse Forest; 2) Special Treatment Area; 3) Cultural Heritage Forest; 4) Watershed (either above a *primary source aquifer* or supplying public water to municipalities greater than 5,000 people).

"AR" OBJECTIVES, ACTIONS AND SEQR ANALYSIS

At-Risk Species and Communities (AR) Objective I – Where any ARS&C ranked S1, S2, S2-3, G1, G2 or G2-3 is present, management activity will be conducted for the protection of these elements as a high priority compared to other management goals.

AR Action 1 –Conduct up-to-date training for forestry staff on the identification and protection of at-risk species and communities, including use of PROs, by 2011.

AR Objective II – UMPs will identify the presence of ARS&C and will present appropriate management actions to protect these elements, conduct habitat restoration, or otherwise promote the recovery of declining species, including use of timber harvest contracts as a mechanism for accomplishing proactive species restoration work.

AR Action 2 – Maintain and contribute additional data to the existing Master Habitat Database on ArcGIS which identifies all known occurrences of rare, threatened and endangered species and important natural communities in conjunction with the New York Natural Heritage Program.

AR Objective III – All new UMPs will be developed using the Comprehensive Wildlife Conservation Strategy and DFWMR staff to consider protection and management of Species of Greatest Conservation Need.

AR SEQR Alternatives Analysis and Thresholds

The **no-action alternative**, or in other words, continuing with current management approaches, has been selected as the **preferred alternative**. Use of data collected by the State Lands Assessment Project, including newly-identified occurrences of at-risk species and communities, the PROs layers, and TNC management guides provide important protections and management tools. DEC will continue to provide educational opportunities for land managers in the identification and management for RTE elements.

AT-RISK SPECIES and NATURAL COMMUNITIES

The alternative of not implementing the actions above will not be adopted. This alternative is not acceptable, considering the impacts timber harvesting, construction projects and minerals development can have on at-risk species and communities.

SEQR Analysis Threshold: Endangered species and natural community protection strategies established in this section will avoid and minimize potential impacts to the maximum extent practicable and no further SEQRA review will be conducted.

VISUAL RESOURCES AND AESTHETICS

"A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise." -Aldo Leopold

Foresters manage many diverse aspects of a forest. Some aspects of forest management are easy to observe and measure while others are more subjective and may not be measured easily. The visual resource aspect of forest management and the associated benefits to people fall into the latter category.

A natural floral arrangement on Cameron State Forest in Steuben County

"Many amenity values defy simple qualification. Their worth depends upon subjective factors that many people can only describe in terms of feelings and emotional benefit. Foresters cannot often translate this worth into tangible measures that have a marketable value. Instead, they can only rank the alternatives by user preference, without defining how much people would pay for different kinds of experiences, or gain by having them. On the other hand, people can often quite readily tell when some management activity destroyed or lessened an intangible value, or what areas do not provide quality experiences of some inexplicable kind." (R. Nyland, Silviculture Concepts and Applications 1996).

"In the last three decades, environmental legislation has mandated that recreation (and related aesthetic and ecological) values be considered more fully in forest management decisions. For these reasons, recreational resources can be as important to the land manager as the more tangible values of wood and water and forage." (Avery and Burkhart 1994).


A hardwood stand, following a timber harvest, with regeneration (newly seeded trees) and woody debris

When it comes to aesthetics, people hold different opinions. What may be aesthetically pleasing to some, may not be to others. Often, ecologically responsible management may not exhibit the most aesthetically pleasing results. State Forest management practices such as silvicultural and wildlife decisions take many considerations into account. Even so, the visual impact of some of these practices may not be kindly greeted by many people. While it is

VISUAL RESOURCES and AESTHETICS

important for State Forest managers to consider the visual effects of their management actions in terms of recreation and public perception, the ecological health of State Forests must be paramount.

While this plantation provides an aesthetically pleasing "park-like" setting, it lacks many attributes necessary for ecological health and integrity. *Photo credit: Melody Wolcott*

A stereotypical example of this concept may be seen in the public's perception of and positive reaction to a park-like setting, one that exhibits large evenly spaced trees with mowed grass or a thick bed of pine needles beneath them. While this image may be desirable to many, it does not necessarily represent much diversity from an ecological perspective. The forest manager must consider the forest's value to wildlife, through habitat and food and protective cover requirements. The manager must consider the next generation of trees or vegetation to inhabit the site and the manager must consider the area's susceptibility to erosion or environmental impacts. Frankly, both healthy, well-managed forests and most old growth forests may not look very inviting at all. Even this natural, uninviting look, however, may provide a core subconscious wild lands appeal to the viewer, who even though they may not wish to wander through the area and have a picnic, can still appreciate the appearance of disorder and its benefit at an ecological level.

VISUAL RESOURCES ON STATE FORESTS

History

Historic management of State Forests in New York has focused on timber management while also considering recreation, watershed protection and wildlife management. Many magnificent natural features, unique areas, historic structures, and wildlife habitats can be found in New York's State Forests. Management decisions regarding these many natural features have included development of hiking trails, creating access to water bodies and unique areas, construction of scenic public forest access roads, development of scenic vistas, creation and maintenance of forest openings, mowing of field areas to encourage various forms of wildlife, preservation of historic structures and carefully planned harvest operations.

Over the years, the general appearance of many State Forests has undergone quite a dramatic change. A significant amount of State Forest land came into state ownership as old farm areas with abandoned fields and pastures. A majority of these areas were replanted and have grown into mature and dense forests. As these forests matured and were harvested or tended, forest management practices focused on minimizing the visual impacts of management practices. The

removal of most of the diseased, defective and over-mature trees left a park-like setting in some places, which may be perceived by the untrained eye as a forest that has developed without any disturbance.

Stone wall on Stoney Pond State Forest in Madison County

Current Conditions

Current aesthetic qualities and considerations of State Forests cover a broad spectrum. Seemingly greater importance has been placed on scenic areas in recent years, recognizing the uniqueness of certain areas and preserving or creating opportunities for the public to enjoy them. New York's State Forest land base is expanding. When available properties are deemed desirable and funding is in place to purchase such properties, they are slowly added to the State Forest inventory. Many of these new properties have significant unique attributes which make excellent additions to New York's public land. Recent acquisitions and existing State Forests provide many opportunities for the public to recognize and enjoy the many visual resources at their doorstep.

A gravestone on State Forest land

Some of the interesting aspects of many State Forests are historic structures or remains. Throughout most State Forests, remnants of old farms or other settlements are visible through stone walls, foundation holes, wells, chimneys, root cellars, gravestones, stone culverts, bridge abutments, etc. The origins of many of these structures date back many years and tell an interesting story of the history of the area. These structures add a unique aesthetic quality to the areas they occupy and should be protected from any management activities that would disturb them. Any historic structures that exhibit imminent safety concerns for the public should be dealt with immediately and documented in the UMP when it is written.

See *Historic and Cultural Resources on page 139 for further detail.*

Trends

Large, unbroken tracts of forest and natural areas on private lands (farms, game reserves, etc.), which have served as public recreation areas in the past, are decreasing in number and size. As this trend continues in New York, the public will have fewer opportunities to recreate on such lands. DEC recognizes the valuable visual resources found on state lands and will maintain opportunities for the public to enjoy these unique and wonderful aspects of State Forests. As

policies bring about the increased use of mitigation measures to reduce the visual disruptions associated with timber harvesting, silvicultural activities will become less noticeable.

AESTHETIC STANDARDS AND GUIDANCE

Timber Management

Various forms of timber management can have differing effects on visual resources. Foresters can use vegetative buffering, irregular edges, and other techniques to alter the visual effect harvest areas may have on the public. Creative application of Forest Retention Standards can provide aesthetic benefits to timber harvests in addition to reaching ecological goals. Informational kiosks and signs may also be placed near harvests to educate the public about the reasons for, and benefits of, the visible operation.

Prescribed burning, as with clearcutting, may be essential to managing some types of ecosystems; however, these practices may result in an appearance that is offensive or shocking to the general public. Special consideration must be given to aesthetic resources when planning prescribed burns or clearcuts.

Betty Brook Road leads to a recently harvested area on Burnt-Rossman State Forest in Schoharie County

Current standards in regard to timber harvesting are referenced in the DEC Timber Management Handbook chapter 200 and include:

203.4 – Log Landings – Where possible, log landings should be concealed from the view of major travel corridors (state, county or heavily used town highways). They should be put behind a hill or other land form that hides them from main public roads. If this is not possible, they should be set back in the woods as far as practical with the long axis of the landing area. Entrances from the road should be kept narrow, as equipment allows, reducing the visibility from the roadside. At all times, the landing should be hardened with gravel so it can be maintained throughout the harvest to avoid the creation of ruts and mud holes (as outlined in the rutting guidelines). All woody debris should be either buried or dragged back into the forest and spread thinly, avoiding all damage to the residual stand.

204.1 – Softwoods – It shall be mandatory that the tops of all felled conifer trees be lopped to a 3” diameter in compliance with the Sale of Products Agreement.

204.2 – Hardwoods – It shall be mandatory in compliance with the Sale of Products Agreement that the tops of all deciduous trees be lopped so that no branches over 2” in diameter extend over four feet from the ground under the following conditions:

a. For a distance of 100 feet from the ditch lines of any state, county or town roads, or truck trail traversing the harvested area where no uncut strip is left for a screen.
b. For a minimal distance of 25 feet on both sides of any marked hiking trail, marked snowmobile trail, or marked horse trail traversing the harvested area unless an uncut strip is left for a screen.

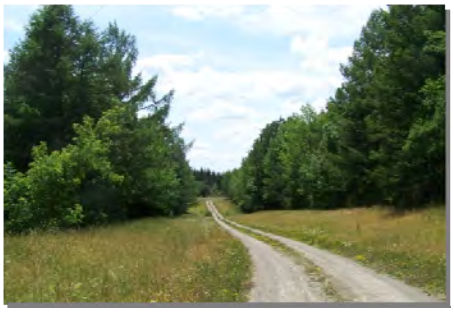
205 – Brush Removal Standards – All debris caused by any harvesting operation including brush, slash, logs, or any other inflammable material, shall not be allowed to remain on or within twenty feet of the right-of-way of any public highway.

206 – Aesthetics Standards – Adherence to the practices within this plan concerning stream protection, road and landing design, and top lopping will add much to render the aesthetics of a harvested area acceptable to the public. However, there are other considerations which would benefit the aesthetics of an area which shall be practiced. These are as follows:

1. Use of uncut strips to screen clearcut areas, shelterwood cuts or other heavy cuts.
2. Directional felling of trees so tops fall away from roads and trails.
3. Removal of trash, such as lunch papers, oil cans and miscellaneous junk during and after the harvest operations.
4. Removal of hanging trees and severely damaged trees.
5. Removal of all logging debris from along roadsides and ditches for a distance of 20 feet.
6. Cutting lightly near well traveled roads.
7. Keeping skidders back in the woods and off road rights-of-way.

The Timber Management Handbook is more than 30 years old and in need of revision. As part of the review and modification of this document, these standards will be updated and included in the final Strategic Plan for State Forest Management, and will supersede the Timber Management Handbook. Additional management practices that should be considered for aesthetic purposes include: new road construction; use of gates and signage; vegetation used to stabilize landings, skid trails and disturbed areas; vegetative variety; prescribed burning; and making appropriate vegetative choices around scenic areas.

Roads



Mount Washington State Forest in Steuben County

During new road construction, designing a road that travels directly from point A to point B may be the most efficient design, however, if the route can be altered to expose a unique hidden natural feature, the land manager should take that into consideration. Opportunities to develop access to scenic vistas and aesthetically pleasing areas have a value that should be given appropriate weight as managers make decisions.

VISUAL RESOURCES and AESTHETICS

Gates

Gates have been routinely used on State Forests in New York to prevent unwanted use of motor vehicles. Gates, while effective and sometimes necessary for maintaining administrative use, may appear unsightly. Where appropriate, the land manager should consider use of natural barriers such as large boulders or logs in place of unsightly gates in aesthetically sensitive areas.

Gates can be unattractive

Natural barriers may be preferable

Signs

Signs used on state lands have maintained a consistent and pleasing appearance over the years. Sign designs remain noticeable and informative and unobtrusive. Signs should continue to follow this format to maintain a consistent look to State Forests. Some warning signs may appropriately consist of brighter colors where it is necessary to grab the attention of the public for safety concerns. Signs are also helpful to inform the public of the reasons why the land manager has made certain management decisions in an area. An educational sign describing why a specific management area may look a little out of the ordinary can be educational and helpful in putting the public's mind at ease.

An example of sign pollution

Yet signage can be overdone and become an unsightly addition to an otherwise scenic area. In such cases, managers will install kiosks at areas to replace numerous individual signs avoiding "sign pollution."

Birdseye Hollow State Forest Auto Tour

'Reforestration Project" sign explaining a clearcut forest regeneration project in DEC Region 4

Soil Stabilization

Log landings and areas of disturbed soil on State Forests have traditionally been stabilized with grass seed mixes. In areas where the public comes into frequent view with disturbed soil areas, or in additional areas deemed appropriate, the land manager may vary the stabilization plantings by adding a native wildflower component to the stabilization mix. Care should be taken to ensure the seed mixture is free of unwanted and invasive seeds. DFWMR may be consulted to help determine which additional vegetation could increase benefits to wildlife while enhancing the aesthetic quality of the area.

Aesthetics and biodiversity go hand in hand. Restoring landing areas with a variety of vegetative cover can improve habitat diversity

Maintaining a vegetative variety over the forest landscape is aesthetically important at the ecosystem level as well. Aesthetically, maintaining vegetative variety helps to avoid visual impacts from a potential catastrophic event.

Recreation

Recreational facilities managed on State Forests include: structures, parking facilities, campsites and trails. As with signs, the DEC has maintained a consistent and pleasing appearance of its many structures. Outhouses, parking lot bollards, equestrian structures, picnic tables and other wooden structures typically exhibit similar designs from one working unit to another and are protected with the same brown stain. This dark brown color helps the structures blend into their surroundings and has come to be one of the ways the public can

VISUAL RESOURCES and AESTHETICS

Accessible fishing pier and observation deck on Green Pond, Bonaparte's Cave State Forest in Lewis County, built using primarily natural materials

more easily recognize state facilities. Fireplaces or fire rings are found at some day use areas on State Forests or at the occasional campsite and typically have a consistent natural or unobtrusive design of stone, concrete or steel.

Stone fireplace

State facilities should maintain a natural appearance where possible while accounting for accessibility. Natural materials such as wood or stone should be used in construction to help create a visually appealing finished structure that tends to blend in to the surroundings and not stand out.

Parking Lots

Parking lot design allows convenient access to facilities, provides for efficient flow of traffic, and offers a form of control by limiting the number of recreational users in an area to a level that will not degrade the resource. Aesthetic considerations in parking lot design should include vegetative manipulation in or around the parking area, scenic view opportunities from the parking area, and the general appearance of the parking area from the surrounding area.

This parking lot provides a scenic view of the valley, however, it may be larger than needed for intended use and has a large visual impact from above

Design of a parking lot can have a negative effect on the aesthetics of a nearby area. For example, removal of trees and construction of a large open parking area directly below a scenic overlook, as opposed to creating a masked parking area that allows access to the same overlook but remains hidden from the view.

Campsites

Designated primitive campsites on State Forests and areas typically used for camping should be monitored to ensure they are not getting overused and degrading the resource. Proper consideration in locating campsites will help ensure the area holds up to use and avoids the undesirable appearance of an over-used site. The visibility of a campsite is another

consideration. Is the campsite obscured from view of nearby trails or roads, so it does not detract from the view of other users of the resource?

Trails

Recreational trails are another important component of many State Forests. Snowmobile, horse, ATV access routes for people with disabilities, mountain bike, hiking, and accessible trails are some of the trails commonly found on State Forests. Trails can me marked to allow or prohibit certain types of use. In some situations, multiple use may be appropriate and in others trail use should be restricted to a single type of recreational activity.

Construction of new trails should take aesthetics into consideration. Does the trail bring the recreational user to some scenic destination or does it provide an aesthetically pleasing experience along the entire length or portions of the trail? If not, could it? Does the trail have variety? Is it irregular in nature and does it allow the user more of a personal experience as opposed to long straight stretches where, even when spaced out, users remain in view of one another? Will trail construction in certain areas detract from the view of that area from afar?

Trails must be signed properly. The manager must have direct oversight of the signs used along trails and in the frequency of trail markers. Some trails are improperly over marked with trail markers, which can detract from the trail's appearance. Proper trail site determination and construction will also help ensure that its aesthetics are not destroyed from overuse or erosion.

In applying retention standards to harvesting near recreation trails, foresters will consider leaving legacy trees and other green tree retention within sight of those trails for aesthetic enhancement, when the opportunity exists and long-term safety considerations do not preclude it.

An oil well in DEC Region 9

Additional Structures

Other structures on State Forests may impact the visual resources of a unit. Additional structures need to be considered on a unit by unit basis. Gas and oil wells, communication towers, and utility lines all can have a large visual impact on an area. These structures may

not be appropriate in certain locations on State Forests. Foresters assess the visual resources of the unit and any potential impact an additional structure will have on these resources. If structures already in existence have a significant negative impact on the visual resources of the unit, they should be moved to an appropriate location. If structures cannot be moved, the land manager should concentrate efforts on vegetation management to screen them and minimize the negative visual impacts the structures have on the unit and the surrounding area.

Scenic Vistas

Scenic vistas on State Forests may become compromised by vegetation that grows on or around them. If it is deemed appropriate to create or maintain a vista, the land manager should plant a native species of tree or other vegetation that will not threaten to block the scenic vista in the future.

Zoar Valley Multiple Use Area in Erie County

Managers of State Forests that exhibit multiple scenic vistas or other interesting attributes may wish to document those attributes in the form of a map or informational table in the UMP for that area. Documentation will aid in the management of the vista and may provide information for the public. To aid in management of the vista, the documentation should include photos and information such as the location of the vista, maintenance requirements, etc. Information that may be used by the public should also include the location of the vista and perhaps a brief description or history of the area. A map showing all of the major scenic attributes of a unit may be a valuable resource for the public.

Scenic vista on Cameron State Forest in Steuben County

Potential Alternatives and Related Impacts

If State Forests were managed with no consideration for aesthetics, public perceptions and the failure of those State Forests to provide the emotional, subconscious necessities for a pleasing

natural experience would likely result in numerous complaints to DEC. Aesthetic considerations must, however, be weighed carefully against ecological goals, and the diversity and quality of important biological forest communities and habitats must also be considered.

"VR" OBJECTIVES, ACTIONS AND SEQR ANALYSIS

Visual Resources (VR) Objective I – State forests will be managed such that the overall quality of visual resources is maintained or improved.

VR Action 1 – Develop guidance for visual impact assessment and mitigation around timber harvests, mineral extraction sites and infrastructure. Guidance to be developed by 2013 and will include an updated Timber Management Handbook.

VR Action 2 (also AFM 1, AFM 5, PM1) – Incorporate visual resource protection into final DEC policies for retention, plantation management and clearcutting.

VR Objective II – Natural materials such as wood and stone will be used for observation and fishing deck structures, and barriers such as large boulders, in areas that experience greater amounts of recreational use and where administrative access is not frequently needed or anticipated. To be addressed on a site-by-site basis in UMPs.

VR Objective III – In case of new construction, roads and trails will be laid out to highlight unique natural features of the land and develop access to scenic vistas. UMPs will address.

VR Objective IV – Kiosks will be developed where appropriate to provide educational material and reduce sign pollution. To be implemented within UMPs.

VR SEQR Alternatives Analysis and Thresholds

The **no-action alternative**, or in other words, continuing with current management approaches, has not been selected. As mentioned in this section, policy revisions are needed to ensure the protection of visual resources.

The **preferred alternative** is to implement the new plantation management, retention and clearcutting policies and update the timber management handbook, which all address visual impacts related to active management practices. In addition, the recommendations in this plan related to soils, recreation, scenic vistas and other infrastructure will be implemented under this alternative.

SEQR Analysis Threshold: Visual resource protection strategies established in this section and elsewhere in this plan will avoid and minimize potential impacts to the maximum extent practicable and no further SEQRA review will be conducted. However this plan has identified specific thresholds for some management activities, such as clearcutting and oil and gas development, that could otherwise cause significant visual impacts.

HISTORIC AND CULTURAL RESOURCES

The term "cultural resources" encompasses a number of categories of human created resources. The term used in state and federal law for these resources is historic properties. Historic properties include buildings, structures, objects and districts listed or eligible for listing in the State and National Registers of Historic Places. These can include standing structures, ruins, archaeological sites and other related resources. Such resources form the historical record and legacy of New York State. They tie us to and inform us of history and culture and are an important part of community identity and sense of place.

Leonard Hill Fire Tower on Leonard Hill State Forest in Schoharie County

DEC is required by the New York State Historic Preservation Act (SHPA) (PRHPL Article 14) and SEQRA (ECL Article 8) to include such historic and cultural resources in the range of environmental values that are managed on public lands. SHPA and State Education Law (EDN Section 233) are the legal mechanisms affecting the management of historic properties on state land.

SHPA does a number of things. First it authorizes a comprehensive statewide inventory of such properties. Second it directs state agencies to behave as stewards of the resources under their care, custody and control. SHPA also sets up a process by which agencies are required to identify and avoid or mitigate impacts to historic properties from the actions they permit, fund or undertake directly.


CCC Tool and Engineering Building on Winona State Forest in Jefferson County

On lands managed by DEC's Division of Lands and Forests, the number of standing structures is generally limited, due to the nature of past and current land use. Often those that remain are structures that relate to DEC's land management activities such as fire towers, ranger cabins and related resources. Fire towers as a class of resources have been the subject of considerable public interest over the last decades.

The majority of surviving fire towers have been found eligible for inclusion in the State and National Registers of Historic Places and a number have been formally listed in the Registers since

HISTORIC and CULTURAL RESOURCES

2001. Whether formally listed in one of the registers or merely found eligible, DEC must treat these resources appropriately, requiring that special procedures be followed should it be necessary to remove or otherwise affect them.

Former Civilian Conservation Corps (CCC) camp on McDonough State Forest in Chenango County

Archaeological sites are, simply put, any location where materials (artifacts, ecofacts) or modifications to the landscape reveal evidence of past human activity. Human occupation of New York State extends as far back as immediate post-glacial times, perhaps as early as 15,000 years ago. Evidence of the human past includes a wide range of resources ranging from pre-contact Native American camps and villages to Euro-American homesteads, cemeteries and graves as well as mills and other industrial sites. Such sites can be entirely subsurface or can contain above ground remains such as foundation walls or earthwork features. All of these types of resources are known to exist within the State Forest system.

The New York State Office of Parks, Recreation and Historic Preservation (OPRHP) and the New York State Museum are charged by law with creating and maintaining a comprehensive inventory of archaeological resources, including those on public lands. Other state agencies are charged with helping to develop this inventory by providing information on archaeological resources on their lands to OPRHP and the State Museum. Other agencies are also charged with acting as stewards of the archaeological resources under their care, custody and control.

Sawmill foundation in Cattaraugus County

A cursory examination of the inventory reveals several hundred identified archaeological resources as being present on DEC managed lands. Many of these were recorded prior to state ownership as DEC has never had the funds budgeted to undertake a systematic inventory. Were a systematic inventory to take place, it is likely that many new archaeological sites would be added.

The quality of site inventory information varies a great deal in all respects. Very little systematic archaeological surveying has been undertaken in New York State, especially on

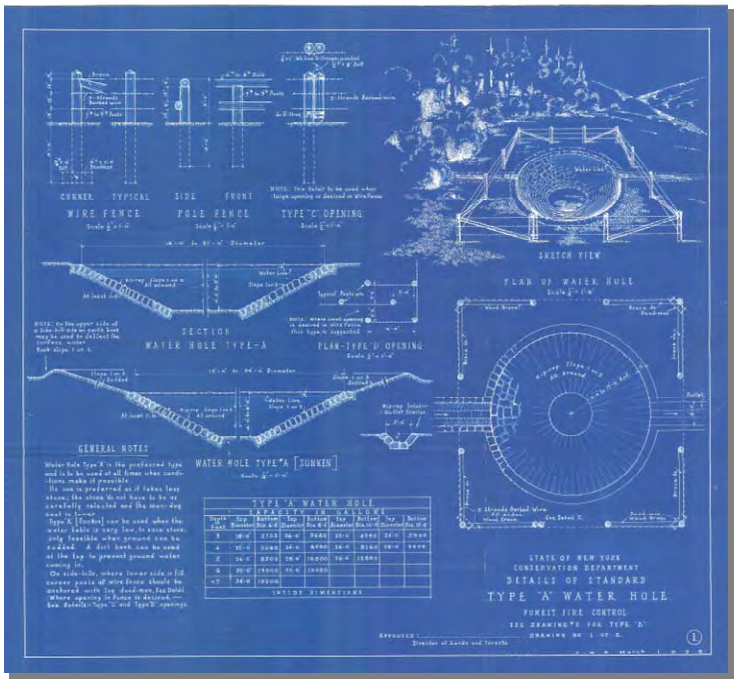
state land. Therefore, all current inventories must be considered incomplete. Even fewer sites have been investigated to any degree that would permit their significance to be evaluated. Many reported site locations result from 19th century antiquarian information and artifact collector reports that have not been field verified. Often very little is known about the age, function or size of these sites. This means that reported site locations shown on inventory maps can be unreliable or encompass a large area.

As a part of the inventory effort associated with the development of UMPs, DEC arranges for a search of the archaeological site inventories maintained by the State Museum and OPRHP in order to identify known archaeological resources that might be located within or near a State Forest unit. This is done for two reasons: to determine if any known sites might be affected by actions proposed within the unit, and to assist in understanding and characterizing past human use and occupation within the unit. Archaeological site information is maintained as a part of the DEC's resource inventory for a given unit and is discussed in general in the UMP. To prevent damage to sites, specific site locations are not published in plans or otherwise made public as required by PRHPL Article 14.07.

HISTORIC AND ARCHAEOLOGICAL SITE PROTECTION

The historic and archaeological sites located on State Forests as well as additional unrecorded sites that may exist are protected by the provisions of the New York State Historic Preservation Act (SHPA - Article 14 PRHPL), Article 9 of Environmental Conservation Law, 6NYCRR Section 190.8 (g) and Section 233 of Education Law. Unauthorized excavation and removal of materials from any of these sites is prohibited by Article 9 of Environmental Conservation Law and Section 233 of Education Law. In some cases additional protection may be afforded these resources by the federal Archaeological Resources Protection Act (ARPA).

State Forests can be made available for research on known archaeological sites, as well as unrecorded sites that may be suspected to exist on the property. Such research requires permits which can be issued only after consultation with the New York State Museum and OPRHP.



CCC firefighting reservoir design

HISTORIC and CULTURAL RESOURCES

HISTORIC PROPERTY MANAGEMENT AND PROTECTION GUIDELINES

Resource Inventory

DEC will continue to provide its forestry staff with training opportunities to enhance their ability to identify and protect historic and cultural resources on the lands they manage. While conducting forest inventory or timber management tasks, they will note the presence of possible artifacts for future investigation, and will shelter or protect these features from management activities until that investigation has been completed. All known and suspected historic and cultural resources will be discussed in all new UMPs and added to a GIS database.

When new cultural and historic sites are identified, their presence will be shared with OPRHP and NYSM using inventory forms developed for this purpose. DEC will explore an enhanced partnership with NYSM to develop and initiate a long-term State Forest archeological inventory project as funding and staffing permit.

Resource Protection

Timber harvesting, well site construction and recreational activities that would impact historic properties should be avoided. Haul roads, skid trails, landings, trailheads and parking areas should not be located in the vicinity of historic resources that might be damaged by such activities. A *do-no-harm* approach should be applied where possible artifacts are identified, until such time as a full archeological review can be conducted to establish the true nature of the find.

Cultural resources should be managed to preserve the integrity of individual sites such that the association between site features is not diminished. For example, the relationship between foundations, stone walls, garden plots and old orchards provides evidence about a functioning farmstead. Activities that disrupt this integration decrease the accuracy of site interpretation and lessen the ability to learn about the past.

Where necessary, place protective conditions on sales contracts that prohibit harvesting activities that would impact historic properties, or direct harvesting activities in such a way as to protect historic properties. Should disturbances be necessary, the contract or Temporary Revocable Permit (TRP) can require that the structures be returned to their pre-impact condition.

Protections will be put in place such that stone walls and other structures will not be dismantled and efforts will be made to accommodate access using existing gateways. Hedgerows, shade and fruit trees, garden shrubs and other ornamental plants associated with cultural sites will be excluded from harvesting, and efforts will be made to sustain non-invasive vegetation through thinning and pruning. Hedgerows will be maintained, though hazard trees may need to be removed.

"HC" OBJECTIVES, ACTIONS AND SEQR ANALYSIS

Historic and Cultural Resources (HC) Objective I –Historic and cultural resources will be preserved and protected wherever they occur on State Forests.

> **HC Action 1** – Develop standard operating procedures for managing historic and cultural resources, including old homesteads, water wells and stone walls by 2013.

HC Objective II –Historic and cultural resources on State Forests will be identified and addressed during development of UMPs. Inventory forms will be completed and submitted to OPRHP and NYSM and resources will be added to DEC's state land assets GIS layer as they are identified.

HC Objective III –Historic and cultural resources on State Forests will be inventoried at a statewide level.

> **HC Action 2** – Initiate a systematic and comprehensive archaeological inventory of State Forests in partnership with the New York State Museum to be completed by 2020.

HC SEQR Alternatives Analysis and Thresholds

The **no-action alternative**, or in other words, continuing with current management approaches has been selected as the **preferred alternative**. This means that protective measures will be applied where known historic and cultural resources occur. In addition, resources will be inventoried as staffing and other resources allow.

The alternative of not implementing the above mentioned protections has not been selected because it would neglect DEC's responsibility as a landowner.

SEQR Analysis Threshold: Historic and cultural resource protection strategies established in this section will avoid and minimize potential impacts to the maximum extent practicable and no further SEQRA review will be conducted.

CHAPTER 4
REAL PROPERTY AND INFRASTRUCTURE

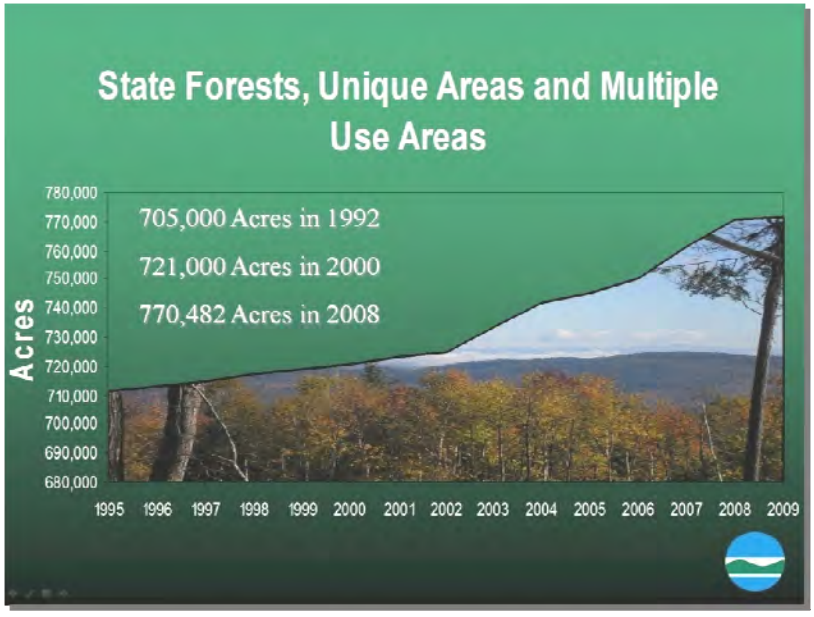
LAND ACQUISITION

Acquisitions in fee and conservation easements have been utilized by New York State to conserve land for more than a century. These lands have created the State Forest Preserve, reforested marginal farmland, created state parks, and have protected sensitive natural habitats for threatened and endangered species.

New York's State Forests, to be managed separately from the State's Forest Preserve, were established by The State Reforestation Law of 1929 and the Hewitt Amendment of 1931. Today, these laws are authorized under Article 9, Title 5 of the Environmental Conservation Law (ECL). Both laws set forth legislation that authorized the former Conservation Department to acquire land by gift or purchase for reforestation areas. Land Acquisition Bond Issues in 1960, 1962, 1970, 1972, 1986 and 1996 as well as today's Open Space Conservation program funded by the Environmental Protection Fund have strengthened the public commitment to acquire, protect and preserve these valuable areas.

In 1990, the state legislature passed ECL Article 49, Title 2 to ensure citizen input into state land acquisition decisions made by DEC and the Office of Parks, Recreation and Historic Preservation (OPRHP). Nine Regional Advisory Committees were established to assist DEC & OPRHP in identifying areas in which land acquisition is a high priority for conservation purposes. Through a formal public review and natural resource evaluation process, projects are required to be listed in a state land acquisition plan, now formally known as the New York State Open Space Conservation Plan (Plan). As one of the principles of the State's Open Space Conservation Program, the Plan recognizes fee acquisition from willing sellers as one of a variety of tools to be utilized for conserving land.

Shortly following, in 1993, the New York State Environmental Protection Fund (EPF) was created to provide funding for open space conservation and land acquisition. Purchases of land in areas identified in the Plan are eligible for funding from the EPF, and other state, federal and local funding sources for acquisition purposes, with "State Forest, Wildlife Management Area & Unique Area Protection" identified as a statewide



priority project. Projects listed in the State's Open Space Conservation Plan are required to be reviewed every three (3) years.

Profile of a Successful Acquisition

In June of 2010, the City of Rochester's lands surrounding Hemlock and Canadice Lakes, totaling about 6,684 acres in Livingston and Ontario Counties, were acquired by DEC, and re-named the **Hemlock-Canadice State Forest**.

View of Canadice Lake, on Hemlock-Canadice State Forest, in Ontario County

Hemlock and Canadice Lakes have provided drinking water for the City of Rochester and adjacent communities for more than 100 years. The City began drawing water from the lakes in order to put an end to cholera outbreaks. To protect water quality, the City acquired much of the watershed property around the lakes. However, much of the property being acquired in the early 1900's was in agricultural use. Therefore, in 1902, an aggressive tree-planting program began in order to provide the desired forest cover. During the next 29 years, 3.7 million conifer seedlings were planted on 3,000 acres. The remaining acres naturally re-grew to trees without needing to be planted. Few traces remain of the land's former uses except for stone walls.

With the addition of a water filtration plant in the 1980's, the protection provided by natural forest cover was no longer a high priority in comparison with other financial concerns. Hemlock and Canadice Lakes were identified as a "high priority" on the state's Open Space Conservation Program since its inception in 1992 - state acquisition would remove the pressure on the City to sell off the buffer lands for development. Today, the lakes, with their steep forested shorelines guarding the deep clear water, show visitors a glimpse of the past when all the Finger Lakes were wild lakes. While protecting water quality continues as the most important function of this property, the lands will be managed for multiple benefits as described in this plan.

POLICY

Under the state's Open Space Conservation program, available acquisition funds for State Forest protection would be placed on fee acquisition of parcels that are either: a) in-holdings, i.e., parcels with at least three sides bordered by existing State Forest; b) improve access to an

existing State Forest; c) are scenically important; d) contain threatened or endangered species; or e) are of exceptional historical or cultural importance. Priority will be placed on the elimination of "in-holdings" and the consolidation of State Forest parcels in order to lessen management demands and fiscal expenses by significantly reducing boundary line maintenance, improving operational access, and by providing additional protective buffers from non-compatible or potentially non-compatible adjoining land use.

Procedure

ADDITIONAL RESOURCES

New York's 2009 Open Space Conservation Plan – www.dec.ny.gov/lands/47990.html

In order for land to be acquired for State Forest protection, as described in the Open Space Conservation Plan, a proposed parcel will be evaluated to determine: a) the impact of the location of the parcel on its ability to achieve the project's objective; b) the compatibility of the parcel with other state environmental plans and other regional and/or local environmental plans; c) the multiple benefits afforded by the proposed parcel; d) the availability of alternative or additional funding for purchase of the parcel; e) post acquisition management needs and the availability of post acquisition management support; f) the extent to which a parcel encompasses agricultural lands; and g) the fiscal and economic benefits and burdens resulting from acquiring the proposed parcel, including those on state agencies, the local government and the local economy (2009 New York State Open Space Conservation Plan).

The Commissioner of DEC will then consider: a) the extent to which the parcel's location contributes to the geographical balance and availability of the State's diversity of resources, as well as the fair distribution of the available monies across the State; the availability of the project for acquisition by purchase, gift or partial; b) the suitability and practicality of a conservation easement, or other less than fee acquisition strategies, as required by ECL Section 49-0203(2); c) the cost of the project in relation to its resource value; d) the social, cultural and educational values, benefits, and potential of the project; and e) the comments from the Regional Open Space Advisory Committees.

Once the Commissioner decides whether to proceed with the acquisition of certain parcels, he/she will establish priorities for approved projects and will individually propose the projects for funding through the EPF, which are listed in the capital project budget prepared each fiscal year. Priority projects listed in the final budget are then approved or denied by the Governor and State Legislature.

As stressed by the Regional Advisory Committees, it is important for DEC to critically evaluate the feasibility of managing additional public lands and its incurring expenses beyond the initial acquisition costs. The Committees recommend that: 1) a percentage of the land acquisition portion of the EPF be allocated annually for stewardship activities; 2) user fees should not be

collected since they potentially discourage economically disadvantaged people from enjoying these areas, reducing attendance on these lands; and 3) the state should compensate municipal taxing units for property tax on all public lands (including easements) to offset the potential impacts to a local municipality's tax base resulting from the removal of property from the municipalities' tax base.

Implementation

Following approval by the Governor and the state legislature, and in accordance with the state Open Space Conservation Plan, DEC's Bureau of Real Property performs all aspects of the land and conservation easement acquisition process from appraisals and boundary surveys through negotiations and contracts. Legal assistance is provided to the Bureau from DEC's Office of General Counsel and the State Attorney General Office's Real Property Bureau.

Applicable Laws

- State Reforestation Law of 1929
- Hewitt Amendment of 1931
- ECL Art. 9 Title 5 - Reforestation Areas
- ECL Art. 49 Title 2 - State Land Acquisition
- ECL Art. 54 Title 3 - Open Space Land Conservation Projects

FUTURE NEEDS FOR LAND ACQUISITION

Identify Priority Connectivity Parcels

Connectivity between private and public forest patches across the landscape will become increasingly important for biodiversity and ecosystem health as time progresses. State Forest Management Unit Plans should refer to New York State Open Space Plan for guidance and ideas on how to keep the State Forest System connected to other public and private lands. DEC's cooperative forest landowner outreach program can help private landowners learn how their lands fit into the bigger ecosystem picture. An incentive system similar to the 480-a tax law program or conservation easements will be needed provide long term contributions to connectivity from privately held lands.

Connective corridors identified in the Landscape Assessment section of this plan should be referenced in each UMP as being important assets at the landscape level, worthy of protection through tools such as conservation easements or direct purchase.

Meet Demand for Open Space and Watershed Protection

Consider new acquisitions of state forest lands in areas of the state that have not traditionally been served by State Forests but are underserved by open space and recreational benefits or

are in need of watershed protection. Any proposed acquisition will be listed in the Open Space Plan.

List Priority State Forest Parcels specifically in the NYS Open Space Plan

Identify, list and map priority acquisition parcels as specific projects by unit and/or eco-region in the New York State Open Space Plan.

"LA" OBJECTIVES, ACTIONS AND SEQR ANALYSIS

Land Acquisition (LA) Objective I – Acquisition of in-holdings and adjoining properties that would reduce management costs and benefit resource protection and public access goals will be prioritized with potential acquisitions listed in UMPs.

LA Objective II – Acquisition of the mineral estate will be prioritized wherever it is split from a State Forest tract with potential acquisitions listed in UMPs.

LA Objective III – Acquisition of properties within identified matrix forest blocks and LCP corridors will be prioritized with potential acquisitions listed in UMPs.

LA Action 1 – Work with regional advisory committees to add matrix forest blocks and LCP connectivity as priorities for State Forest acquisition in the NYS Open Space Plan.

LA Objective IV—Acquisition of forested lands in underserved areas of the state.

LA Objective V – Acquisition of forested lands in areas that are in need of watershed protection.

LA SEQR Alternatives Analysis and Thresholds

SEQR analysis for the action of land acquisition by New York State for addition to the State Forest system has been addressed in the 2009 New York State Open Space Conservation Plan and Generic Environmental Impact Statements (GEIS).

BOUNDARY LINE MAINTENANCE

Background
DEC has under its jurisdiction nearly 5 million acres of land and easements, among which are included State Forests, Forest Preserve and others lands managed through the Division of Lands & Forests. Although limited at times by fiscal constraints, the state has a firm commitment and responsibility to protect and manage these resources. State Forests alone have 6,520 miles of boundary lines. That's roughly equivalent to the distance from New York State to the southern tip of South America.

Given current staffing levels and the rate at which boundary line markings deteriorate, it will take about 120 years to catch up with the backlog of needed surveys at the rate they are currently being completed. Unfortunately, this backlog will result in additional encroachment issues demanding an even greater level of staff involvement to solve.

Policy
DEC places great emphasis on stewardship, with boundary line maintenance being an important and necessary element. It is DEC's responsibility to make all state forest boundaries readily identifiable to the public. Well marked boundary lines enable the public to more fully use state land, while reducing unintentional trespass. Additional resources are needed to meet stewardship responsibilities.

PROCEDURE

In an effort to make state boundaries readily identifiable, it is important to keep markings consistent throughout the state and through the various program areas and in line with surveying norms and standards. These standards include the practices of painting and blazing trees along the boundary lines as well as establishing monuments at property corners. Blazing involves the cutting or removal of small patches of a tree's bark by a licensed land surveyor. These blazes are then painted with yellow paint to enhance visual identification of the actual boundary line.

Boundary lines to be maintained will include all lines where existing evidence of paint and blazes can be readily found. All other lines must be verified or established by DEC's Bureau of Real Property before maintenance can take place. Ideally, it is the goal of the Real Property Supervisor to see that all new state land boundaries are surveyed, monumented, blazed and mapped, so they may be maintained.

A seven- to ten-year maintenance cycle for forest lands should be implemented to insure that state boundaries remain clearly marked. In certain situations, boundary lines such as those in wetlands and lands in heavily populated areas may require more frequent maintenance as

BOUNDARY LINE MAINTENANCE

dictated by local conditions. Regular maintenance can reduce the need for costly resurveys, illegal occupancies and encroachments.

Implementation

Generally, Forest Rangers implemented the boundary maintenance program until the mid-1990s when they assumed a greater law enforcement role. Today, boundary maintenance duties vary greatly from region to region, where functions are shared and overlap between DEC's bureaus of State Land Management and Real Property, and its Division of Operations. Each region knows its needs and resources, and can best set up a customized program for implementing a suitable boundary maintenance program while staying within the 7- to 10-year rotation cycle.

Generally, an annual maintenance schedule or request is set up by either the Division of Operations or the Bureau of State Land Management. Actual maintenance (painting and signing) is carried out by seasonal trail crews from the Division of Operations with the assistance of either the Bureau of State Land Management or Bureau of Real Property. Again, how each region manages its boundary maintenance duties depends on its available resources and growing demands on its staff.

When boundary lines are questioned, blazes or corners are missing, or other discrepancies are found, the Bureau of Real Property must be notified to re-establish the boundaries. However, the Bureau of Real Property has suffered the same fate as the rest of the Division of Lands and Forests, with staffing losses and increased responsibilities, and has not had sufficient resources to address the backlog of survey requests. It is estimated that more than 2,300 miles of boundary line need to be established or re-established on State Forests, representing a backlog exceeding 100 years at current levels of staffing and funding. This has led to a number of encroachment issues with adjoining neighbors.

As UMPs are developed, DEC will inventory, monitor, and schedule boundary line maintenance, noting encroachments and areas of special need and attention.

IMPACTS OF BOUNDARY LINE MAINTENANCE

Blazing trees can have a minor and temporary impact on a tree's health. Most blazes are 3-4 inches square, depending on tree size. The size and depth of a standard blaze is intended to minimize long term effects. While it is recognized that the visual impact of painted trees can be viewed negatively by some, it is a cost-effective and necessary practice with no viable alternatives.

APPLICABLE LAWS

Applicable Laws relating to destruction of boundary markers, trespass and timber theft are:

- Education Law Section 7209, Subdivision 9 established by Chapter 730, Laws of 2005.
  Sets penalties for the damaging of monuments and/or boundary markers.
- Environmental Conservation Law (ECL) 9-0303
  Restricts the use of state lands including trees and timber – no cutting, removing, etc.
- ECL 9-1501
  No person shall cut, pull or dig up and remove trees on the lands of another without consent of the owner.
- ECL 71-0703 Penalties
  Establishes fines and civil penalties for violating provisions of Article 9.
- Real Property Actions and Proceedings Law, Section 861
  Consequences for cutting, removing, injuring or destroying trees or timber, and damaging lands.
- Article 145 – Penal Law – Criminal Mischief
  Establishes penalties for intentionally damaging the property of another person.
- ECL 71-0712 Timber theft and trespass education training
  Establishes training programs for courts, district attorneys and law enforcement agencies for control and prosecution of timber theft and trespass.

"BL" OBJECTIVES, ACTIONS AND SEQR ANALYSIS

Boundary Line Maintenance (BL) Objective I – Illegal use of State Forests will be minimized through the regular maintenance of boundary lines.

BL Action 1 – Ensure that all State Forest boundary lines are surveyed by 2025.

BL Objective II – Boundary line maintenance will be inventoried and scheduled during UMP development, while noting encroachments and areas of special needs and attention.

BL SEQR Alternatives Analysis and Thresholds

The **no-action alternative**, or in other words, continuing with current management approaches, has been selected as the **preferred alternative**.

The alternative of not identifying (painting and marking) boundary lines has not been selected. Even though marked boundary lines have some negative visual impacts, they are necessary for the purpose of resource protection and land management.

SEQR Analysis Threshold: Boundary line management approaches established in this section will avoid and minimize potential impacts to the maximum extent practicable and no further SEQRA review will be conducted.

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State Forests are managed with a minimal amount of improvements to accommodate rustic, forest based recreational opportunities while providing for resource protection; public health and safety; and access for individuals of all ability levels. Minimal development is in harmony with the open space and ecological goals of these lands, which are of increasing importance, as the surrounding landscape continues to be subdivided and in some cases developed. Intensive recreational use and supporting facilities such as athletic fields, playgrounds, man-made beaches, bath houses and developed campgrounds (with running water and bathroom facilities) are beyond the scope and budget of the Division of Lands and Forests.

Infrastructure development must consider DEC's ability to provide long term maintenance to meet sustainability mandates. This is the case with all infrastructure development by DEC or AANR partners. It is always easier to build new infrastructure than to maintain it. Without careful attention, the level of infrastructure development on a State Forest could potentially reach a level that is disproportionate with multiple uses, ecological goals and DEC's ability to maintain health, safety and facility quality or which displaces other uses. For example, trail systems, when developed with the help of AANR agreements, have shown the potential to incrementally expand beyond expectations or sustainable levels. It is important at the outset of AANR construction activity, to determine and agree to the appropriate bounds of potential development. In most cases, development of new infrastructure will be considered as part of a UMP to consider the above factors and provide opportunities for public input.

GENERAL INFRASTRUCTURE GUIDELINES

ALL infrastructure projects planned or built on State Forests will be developed in accordance with Best Management Practices (BMPs), including the following:

Use BMPs for the protection of soil and water resources
(Refer to page 110.)

Avoid areas where habitats of threatened and endangered species are known to exist.
(Refer to page 115.)

Consider aesthetic impacts, including use of natural materials to blend structures into the surroundings and wooded buffers to screen structures from view of public roads.
(Refer to page 127.)

Apply universal design to incorporate accessibility for people with disabilities;
(Refer to page 173.)

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Reduce or eliminate the introduction and spread of invasive species by pressure washing equipment between jobs and re-vegetating areas of exposed soil along roadsides using native plants. *(Refer to page 277.)*

ROADS

A public forest access road

Early needs for State Forest access roads were for tree planting and forest fire protection, since over one half of the acquired acreage was in grassland or light brush. Early access was primarily via old town roads and former farm lanes. Where these were not sufficient, new roads were constructed by the Civilian Conservation Corps (CCC). In the days of the CCC, labor was not expensive. Large crews of men built roads and trails using limited machinery and mainly hand labor. Some of the roads were built extra wide to serve as fire breaks to protect the newly established plantations. Although there were few heavy trucks used at that time, the CCC roads were generally built to a high standard and many still exist today. Decades later, as the plantations and natural forests matured, access to stands was needed for timber stand improvement thinning. New roads were built as needed to do this work. Some of these projects involved and were funded by sales of forest products, which included mostly firewood, pulp and Christmas trees.

Present Situation

Over the past 20 years recreational use of State Forests has expanded dramatically with new uses like mountain biking and geo-caching added to the list of activities enjoyed on these lands, increasing the need for State Forest access. In addition, as State Forests have matured, management has included additional harvesting activities. These harvests are conducted to enhance forest health, promote biodiversity and to provide jobs and economic stimulus for the local economies. Department standards for road maintenance have also increased commensurately with an increased focus on resource protection and higher standards for harvesting operations as established in DEC Rutting Guidelines and strict Timber Sale contract terms. In addition, ecological impacts, such as forest fragmentation, resulting from road development are considered.

Two types of DEC administered Roads can now be found on State Forests, Public Forest Access Roads and Haul Roads.

- **Public Forest Access Roads (PFARs)** are permanent, unpaved roads which may be designed for all-weather use depending upon their location, surfacing and drainage.

These roads were previously referred to as “truck trails”. They provide primary access for administration and unless restricted by a sign, regulation or law, these roads serve as trails for hiking, cross country skiing, snowmobiling, horseback riding, carriage riding and motor vehicles registered for use on public highways. There are 563 miles of PFAR statewide.

- **Haul Roads** are permanent, unpaved roads which are not designed for all weather travel, but may have hardened or improved surfaces with artificial drainage. They are constructed according to best management practices primarily for the removal of forest products, providing limited access within the State Forest by log trucks and other heavy equipment. These roads may or may not be open for public motor vehicle use, depending on management priorities and objectives.

A haul road on Pochuck Mountain State Forest in Orange County

Legal Status

In limited cases, access to state land requires the use of roads with uncertain or unresolved legal status. Examples include: former town roads that are now maintained by DEC as Public Forest Access Roads but have an initial section passing through private land before reaching state land; town roads that were abandoned improperly by the Town (without regard to Chapter 203 of the Laws of 1976); town roads that receive little or no maintenance by the Town; and DEC Public Forest Access Roads that also serve as the only access to private parcels. These issues will be researched on a case-by-case basis, as part of the UMP process.

Funding

While the demand for better roads has increased, money available to provide them has not. DEC Division of Operations maintenance staff are hard pressed just to maintain existing roads. Reduced timber sale activity due to L&F staff losses has translated into less maintenance being conducted by timber harvests. It is hoped these constraints will be addressed as New York State’s economy improves.

Trends

Towns are also being heavily impacted by shrinking budgets and continue to abandon or stop maintenance on roads used to access state land, or post roads against use by heavy trucks. The demand for forest access continues to increase. As some of DEC’s constituents age, roads are increasingly important for providing access for hunting, fishing, and trapping. Existing roads and trails will need to be upgraded to a higher standard that will be safer and easier to maintain. New access roads will be needed to replace those that are not up to standards or that cannot

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be fixed at a reasonable cost. Some roads were built in a poor location and will need to be rebuilt using up-to-date standards. Roads should be moved out of riparian areas where possible and the old road bed should be restored to a natural condition. However most new road construction and major upgrades of existing forest roads must be done as sale-related work to the extent possible. Maintenance and improvement work on existing forest roads done by DEC Operations will continue to lag behind. Many access roads on State lands need new culverts and gravel. These issues will be discussed in more detail in individual UMPs.

Potential Impacts of Road Establishment and Use

Properly constructed and maintained roads actually mitigate impacts by concentrating and redirecting uses to the least sensitive areas and by properly preparing those areas to support such use. However, there are aspects of road establishment and use which have the potential for negative environmental and ecological impacts. These impacts, along with mitigation measures, are listed here:

- Road construction can create forest fragmentation in the form of edge effect, bringing in predatory species when they are unwanted. They can also create barriers for some species of amphibians, reptiles, and stream based aquatic species. These impacts can be mitigated by maintaining narrow road corridors instead of providing wide mowed shoulders. This is not possible in all cases. Heavily used roads must have good sight distances to prevent accidents and need to be “daylighted” to maintain a hard dry surface (to prevent erosion). Heavily used roads are usually those which serve popular recreational destinations or which are “through roads” which provide connectivity with other public road systems.
- Roads can provide a vector for the establishment and spread of invasive species like garlic mustard or chervil. This can be mitigated by using the guidelines established under the invasive species section of this plan.
- Roads can negatively impact aesthetics. This can be mitigated by design considerations like meandering the road course. An added benefit of this approach is the tendency for people to travel slower on a curvy road.
- Roads can increase public use of an area. While this is preferable in many locations there are instances where lower public use would decrease the impacts on sensitive areas. This will be addressed at the UMP level.

Road construction on Turkey Point State Forest in Ulster County

Road Management Guidelines

Permanent access may be established for public use, forest management and silvicultural operations, forest protection, and emergency

management. Stand procedure regarding forest roads shall be as follows:

1. All roads will be planned, designed and constructed in a sound manner to avoid or minimize unnecessary degradation of natural resources, providing the service needed and at a justifiable cost, with minimal negative impacts to the environment. The Best Management Practices outlined in Chapter 3 will be incorporated into all road planning, design and construction.
2. Roads will be operated in accordance with Vehicle and Traffic Laws, Public Highway Laws and 6 NYCRR Part 190.

ADDITIONAL RESOURCES

DEC Unpaved Forest Road Handbook – August 19, 2008. Available at http://www.dec.ny.gov/docs/lands_forests_pdf/sfunpavedroad.pdf

New York State Forestry; Best Management Practices for Water Quality BMP Field Guide – 2007. Contains additional information to guide planning, design and construction activities. Available at www.dec.ny.gov/lands/37845.html

Rutting Guidelines for Timber Harvests and TRPs on State Forests – May 2008. Developed by DEC Bureau of State Land Management. Also available at http://www.dec.ny.gov/docs/lands_forests_pdf/ruttingguidelines.pdf

USDA Forest Service Handbook for Eastern Timber Harvesting – Provides additional road building guidance

POINTS OF ACCESS

Rock barrier on Morrow Mountain State Forest in Madison County

Points of access, where roads and trails border State Forest lands, provide valuable locations for providing information and orienting visitors. Visitors receive their first impression of the area from the nature and condition of the trailhead/parking facility. For highway travelers, trailheads and/or parking areas are often the only indication that they are passing through public lands. Access points also provide trailhead registration data that can be utilized in quantifying the public's use of a particular area, and for providing crucial information that may assist in search and rescue operations. Parking lots enhance public safety at popular areas, as the shoulders of rural town roads are seldom adequate to

accommodate parked cars. Environmental impacts of access points are similar to the impacts of roads.

Point of Access Guidelines

- Locate parking lots roadside. While aesthetic goals would be enhanced by screening parking lots from the road, this is not an acceptable solution in most cases due to security issues and the goal to reduce forest fragmentation.
- Use natural material barriers such as logs and boulders whenever practical.
- Provide combined signage to provide necessary information along with a trail register where needed, following the signage guidelines below.

DIRECTIONAL AND INFORMATIONAL SIGNS

DEC produces and posts a variety of signs that provide information about regulations, recommendations, directions and distances to destinations, and resource conditions. These signs are posted at trailheads as well as interior locations.

Designated trails on state forests are identified with trail markers. State forests with designated trail systems may have brochures and maps at the trailheads. The brochures typically describe appropriate trail activities and trail etiquette and give a brief description of the history and features of the state forest. Most state forests have at least one 48" x 25" identification sign at or near a main entrance location. This large sign lists the name of the forest and acreage. Smaller 8" x 11" “State Forest” signs are also placed along roadsides and property lines. These signs identify the area as state forest land.

Signs restricting or prohibiting certain activities are posted at key locations, however the present information available to the public about rules and regulations is often inadequate. A few state forests have kiosks* that provide additional information. Signs are occasionally placed on state forests to describe natural features or forestry activities. Self-guided interpretive trail systems are present on some State Forests. Several have a self-guided interpretive auto tour that describes the history, natural features and forestry practices of the state forest area.

Signage Guidelines

To maintain a consistent and recognizable appearance, the dimensions, materials, colors, and wording of DEC signs will be standardized. To ensure the public’s ability to locate the State Forest lands and facilities easily, the following guidelines will apply to the design and erection of signs:

- All roadside directional signs, trailhead identification signs and interior guide boards will be made of wood and will be brown with yellow lettering.

- Informational “posters” may be made of metal or plastic and generally will be brown with yellow lettering, although other unobtrusive color combinations may be used, such as yellow or white with dark green lettering, or white with black lettering. Posters or signs intended to draw attention to obstacles or hazardous conditions may be red and white.
- Lettering clearly indicating the unit name and classification; ex. “Witch’s Hole State Forest”, will be given in all roadside directional signs and trailhead identification signs.
- Standard boundary signs will be posted every 400 feet along all highways that pass through or adjacent to State Forest lands and at other strategic locations, such as points on trails where they pass from private onto state lands.
- Managers will use the smallest number of signs necessary to accomplish an informational or regulatory objective.
- Signs will be clustered on a single sign post or bulletin board placed where they are most likely to be seen by visitors.
- As a general rule, informational signs will be posted on the periphery of a unit rather than in the interior.
- Signs will be constructed of rustic materials and will be limited in number.
- Only signs that conform to DEC rules and regulations and policy will be placed.

TRAILS

Bent Rim Trail, Rock City State Forest, Cattaraugus County

A wide variety of trails can be found on State Forests to accommodate the needs of a wide variety of recreational activities. Over 2,400 miles of multiple use, single use and dual use trails are provided with the goal of having something for everyone. While it is impossible to accommodate every recreational use on each property, every attempt is made to locate trails in areas where the demand is greatest and to design trails to serve the needs of each recreational use. Some trails serve multiple uses while others may be designed and limited to only one recreational use. The development of formal trails must also rely on the availability of volunteer organizations are able to assist with trail maintenance under Adopt a Natural Resource Agreements. There are over 110 active AANR agreements between DEC and local volunteers, clubs and organizations, which are crucially needed to maintain recreational trails on State Forests. Where possible, trails are developed and maintained in partnership with local governments, organizations, and residents.

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State Forest trails can be linked with nearby communities and trail systems through trail connections where feasible, appropriate, and supported by local governments, residents, and landowners. Priority is given to trail linkages that tie into existing public transportation, reduce the need for new structures and improvements within the unit, support local economic development plans, and foster the development of interpretive and educational programs.

Trail Infrastructure Guidelines

- Sufficient parking will be provided at the trailhead to accommodate anticipated use and in accordance with that area's resource capacity to withstand use.
- Trails will be clearly marked, and well maintained.

Foot Trail Construction:

Where it is not possible or appropriate to construct using the most current ADAAG available at the time of construction, the following technical specifications will be used.

- Trail width: 3 ft
- Trail tread width: 2 ft
- Trail clearance: 9 ft
- Trail tread surface: Trail surface will be native soils where trail is on moderately well- to well-drained ground. Those portions of trail on poorly drained ground will have a hardened surface or improved trail drainage to prevent muddy conditions.
- If a section of a trail must cross a small area of wet or soft soil that section will be hardened, or bog bridging (puncheons) will be installed.
- Trail signs: Trail markers will be placed such that they are inter-visible
- Some trails will be laid out on existing roads, skid trails or other partially cleared areas
- Erosion control measures shall be installed on slopes where expected use has potential for significant erosion
- Erosion control measures shall consist of water bars, broad based dips and water diversion ditches

Cross-country Ski Loop Trail Construction:

- Trail width: 4 ft for ungroomed trails; 6 ft for groomed trails
- Trail tread width: 2 ft for ungroomed trails; 6 ft for groomed trails
- Trail height: 12 ft
- Trail length: 5 to 10 miles
- Slope: 3 to 25%
- Cross slope: 0 to 5% for groomed trails
- Minimum acreage needed: 500 acres of contiguous upland acreage
- Trail signs: trail markers will be placed at appropriate distances
- Trails will avoid wet areas
- Wherever possible, trails will be laid out on existing roads, skid trails or other partially cleared areas

Horseback Riding Trail Construction:

- Type of trail: loop trail
- Trail width: 6 ft
- Trail tread width: 4 ft
- Trail height: 12 ft
- Trail length: 5 to 15 miles
- Slope: 3 to 25%
- Cross slope: 0 to 5%
- Minimum acreage needed: 1,500 acres of contiguous upland acreage needed for a trail system that is contained within a given State Forest
- Trail signs: Trail signs will be placed at appropriate distances
- Refer to "Construction and Maintenance of Horse Trails in Arkansas State Parks" for guidelines on location of road crossings and signs at intersections
- Trails shall be built and maintained to standards sufficient to prevent or minimize erosion
- Water bars or broad-based dips will be installed as needed
- Trail tread on wet or soft soils will be hardened
- Streams will be crossed with culverts if possible
- Stone fords or bridges will be used as a last resort
- If it is necessary to use a bridge, it will be designed or approved by DEC operation engineers.

Mountain Bike Trail Construction*:

- Identify control points (i.e. wetlands, rock outcrops, scenic vistas)
- Avoiding sensitive areas, such as wetlands and wherever water collects, steep slopes, and unique habitats
- Use existing roadways where possible, on grades that do not exceed 10%
- Clear new single-track trail tread two to three feet wide with a maximum width of four feet, with the assumption that a narrower track will develop as the edges of the trail re-vegetate.

The Golden Hill Bike Trail in Cattaraugus County

- Trail corridor can be cleared 5-8 feet wide based on expected vegetation re-growth, speed of users and frequency of use. Care should be taken to avoid opening the canopy to minimize fragmentation and the establishment of invasive species.
- Frequent grade reversals and drainage dips will allow for water management.
- Texture the tread by leaving natural features, such as small rocks and logs, in the trail to help control speed.
- Remove vegetation at the root level, not at ground level.
- Keep routes close to the contour & avoid fall lines where water is likely to flow downhill.

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- On side slopes, follow the contour, cutting full benches to construct the tread (out-sloping at 5% to remove water from the trail), and re-vegetating back slopes.
- Design trails with an open and flowing route, with broad sweeping turns. Avoid long straight stretches and acute sharp angle turns.
- Cross streams at 90 degree angles, preferably across rock, gravel, culverts or bridges.
- Install bridges where steep banks prevent normal stream crossings.
- Plan trails for beginner/intermediate riders by maintaining overall grades of 10% or less.
- Monitor and inspect all trails annually; addressing water problems immediately.

*These standards have been adapted from both DEC and International Mountain Bicycling Association recommendations.

Snowmobile Trail Construction:

- Type of trail: Corridor or loop trails
- Trail width, trail tread width and trail clearance
- Refer to NYS Snowmobile Trail Manual based on the class of trail
- Trail length: Minimum of 50 miles; shorter for loop trail
- Slope: 3 to 25%
- Cross Slope: 0 to 2%
- Minimum acreage needed: 5,000 acres of contiguous upland acreage for loop trails
- Trail signs: Will be in accordance with the NYS Snowmobile Trail Signing Manual
- Speed Limit: 25 mph on public forest access roads
- Other uses allowed: Sections of snowmobile trails may be part of multipurpose trail systems
- Other: Grooming of trails by snowmobile clubs will be allowed through the Adopt-A-Natural Resource Program or a temporary revocable permit
- Trails will be located to minimize unnecessary cut and fill
- Trails will avoid wet areas
- Wherever possible, trails will be laid out on existing roads, skid trails or other partially cleared areas

Potential Impacts of Trail Establishment

Like roads, properly designed, constructed and maintained trails actually mitigate impacts by concentrating use along an appropriate corridor. The most significant impact associated with trails is the potential for erosion. This impact will be mitigated by the thorough application of BMPs for soil and water protection. Trails may create a small-scale edge effect which does not impair the ecological function of the forest. Additional trail related infrastructure, such as parking lots, staging areas, manure pits and watering stations have the potential to add to these impacts and must be properly located.

The level of trail use and number of multiple uses is very closely associated with the amount of maintenance needed and potential environmental impacts. Therefore, the discussion of impacts and mitigations related to trail use is located in the Recreation section of this plan. (*refer to page 187*)

FACILITIES AND STRUCTURES

Various facilities and structures can be found on State Forests, however the overwhelming majority of lands are unfragmented and undeveloped. The primary consideration for DEC staff, before undertaking new facility construction or the maintenance of existing facilities is the need to minimize forest fragmentation and development. Facilities and structures are first developed in areas already fragmented. Facilities may be developed in unfragmented areas if they have a small footprint of impact (ex. campsites) or a relatively short duration of impact (ex. gas wells). Intensive use recreational facilities such as playgrounds, athletic fields and other broad areas of turf require significant resources for maintenance. These facilities can often be found at municipal parks and other areas. No new facilities of this type will be developed on State Forests.

Recreational Facility Construction Guidelines

Campsite, Privy & Lean-to Construction and Maintenance:

- Any technical specifications will be in compliance with the ADAAG
- Located away from streams, wetlands and unstable slopes whenever possible
- Located on flat, stable, well drained sites
- Constructed during periods of limited rainfall whenever possible

Fishing Pier Construction:

- Any technical specifications will be in compliance with ADAAG, including edge protection, accessible railings, clear floor space and access route from parking lot
- Bureau of Fisheries shall be consulted to ensure that the pier is placed in a location that is likely to provide a positive fishing experience
- If applicable, vertical slots should be placed at regular intervals in the pier railing to provide easy access to caught fish, particularly for seated anglers
- Location of fishing piers will comply with Article 15 and Article 24
- Approach will be on dry ground, where possible
- Unnecessary cut and fill will be minimized
- Location of pilings will be done to minimize disturbance to aquatic vegetation
- Access points will be located and stabilized to minimize shore erosion and sedimentation

Towers and Wind Turbines

The placement of new communications towers (for purposes other than DEC administrative use), wind turbines or other utilities should be avoided and for ecological purposes would be more appropriately placed on private lands which have already been fragmented. For example, there are vast areas of agricultural lands throughout the state whose owners would surely appreciate the income provided by leasing for windmills, and where agricultural use could carry on unimpeded by the presence of windmills. State Forests are not an appropriate setting for industrial-scale wind farms that would require permanent clearing of land. State Forests are

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more appropriately used for providing unfragmented habitat blocks along with smaller-scale openings created for forest management activity or oil and gas production.

Wind turbines established on adjacent properties have the potential to impact their neighbors' lands. For this reason, many towns have established property boundary line setbacks to buffer neighbors. These same ordinances often provide options for the neighbor to waive this setback. It shall be DEC's policy not to grant waivers from setback provisions where these local ordinances apply, in recognition of the recreational and ecological importance of State Forests.

Utility Corridors

Much of the legislation authorizing acquisition of State Forest lands has specifically prohibited DEC from entering into any long term leases or selling any real property rights, including utility rights of ways. This demonstrates the intent to minimize development or fragmentation of these lands. There are currently some power lines in use across State Forest lands established prior to state acquisition or, in a limited number of cases, established without DEC approval or proper authority while the land was in state ownership. It is not reasonable to require the immediate removal of utilities previously established without proper authority, especially when the majority were established decades ago. However, it is DEC's intent to address these utilities on a case-by-case basis to secure proper compensation for the state and/or establish a legal basis for their continued use. Generally speaking, DEC will resist the establishment of new utility ROWs to limit future fragmentation of the forest. An exception may be made for future oil and gas exploration and development which has been specifically authorized by the NYS Legislature.

"INF" OBJECTIVES, ACTIONS AND SEQR ANALYSIS

Infrastructure (INF) Objective I –Basic infrastructure will be provided and maintained, including public forest access roads, access trails, haul roads, and parking areas, and associated appurtenances.

INF Action 1 - Update *Unpaved Forest Road Handbook* to include the application of new technology. Complete update by 2015.

INF Action 2 – Develop a standard process for assessing State Forest infrastructure to assign maintenance schedule priorities and budgets.

INF Action 3 – Increase the amount of money to DEC Operations for the upgrade and maintenance of roads and trails.

INF Objective II – Opportunities for infrastructure upgrades, replacement or relocation out of riparian areas will be identified at the unit level.

INF Objective III – Issues of uncertain legal status or jurisdiction along roads will be resolved via UMP development to decrease the number of future encroachments and lawsuits.

INF Action 4 - Complete surveys of all roads and create maps showing the legal status of all access roads as issues are raised during UMP development.

INF Action 5 – Enlist the aid of Real Property and/or Legal Affairs to resolve uncertain status of existing encroachments, rights of way, etc.

INF Objective IV – Prevent over-development of State Forests at a unit level by ensuring the sustainability of road, trail and utility corridor systems and avoiding the installation of facilities with running water.

INF Action 6 – Develop guidance for road, trail and utility corridor development, with the express intent of limiting forest fragmentation. Guidance to be developed by 2013.

INF SEQR Alternatives Analysis and Thresholds

The **no-action alternative**, or in other words, continuing with current management approaches, has been selected as the **preferred alternative**. State Forests will continue to be managed to provide rustic recreational opportunities with a limited amount of supporting infrastructure. In most cases, new infrastructure development will be undertaken to concentrate use and mitigate impacts that would otherwise occur on an undeveloped surface. Most projects involving development of new infrastructure will be addressed in a UMP, or a similar formal public process.

The alternative of not developing new infrastructure has not been chosen, considering public demands, increased public use and the need to mitigate related impacts.

The alternative of building highly developed recreational areas for intensive use has not been selected. This would create a long term change in the nature of land use on State Forests and displace traditional recreational and forest-resource related uses.

SEQR Analysis Threshold: Compliance with the guidelines and strategies of this section will avoid and minimize potential impacts resulting from infrastructure development. Any development of facilities with potable water supplies, septic system supported restrooms, camping areas with more than 10 sites or development in excess of other limits established in this plan will require additional site-specific environmental review under SEQRA.