

RESOURCE DEMANDS ON THE UNIT

Society's demand for natural resources continues to increase. In the United States, consumption of wood, water and non renewable mineral resources surpasses consumption in both industrialized and developing countries. Furthermore, there is heightened awareness about old growth forests, endangered plant and animal species and the ecological implications of a consumer society. Legislation such as the Endangered Species Act and National Environmental Policy Act (NEPA) have had a lasting effect on both resource management and public perception of land stewardship. The utilitarian value of such resources as trees for timber and fur bearing animals for pelts is coupled with the esthetic, recreational and spiritual values that people associate with the non human world. Public lands have emerged as important places for contesting the multiple values embedded in natural resources. Demand for natural resources and the potential conflict over how best to sustain them is expected to increase.

A. Timber Resources

Hardwood, red pine and Norway spruce sawtimber, spruce pulpwood and hardwood cordwood are the primary timber resources available from State lands. Much of the information on demand for timber resources that follows is based on the Stumpage Price Report published by the Department semi-annually. Comparisons were made between Reports published in July, 1996 and January, 2001.

The price paid for **hardwood** sawtimber stumpage has increased over the ten year period ending in January, 2006. Based on reports from buyers in the nine county region, there has been a 53% increase in the price paid for four hardwood species common on State land. Within 25 miles of the Tioughnioga Unit are three manufacturing facilities producing approximately 15 million board feet of sawn hardwood lumber annually. The following table lists the most common price paid per thousand board feet (Doyle log scale).

Species	1996 (\$)	2006 (\$)	% change
White ash	370	250	-32
Sugar maple	490	910	+85
Black cherry	690	1,270	+84
Red maple	150	260	+73

Unlike hardwood timber, the supply of red pine and Norway spruce stumpage is concentrated on State lands and subsequently DEC has an important role in the regional softwood timber and pulpwood market. Based on the stumpage report, the price for red pine sawtimber has increased 33% from \$60 to \$80 per thousand board feet while prices for utility pole stock has increased 100% from \$60 to \$120 per thousand. Utility poles, pressure treated lumber and stock for pre-fabricated log homes are the primary uses for red pine timber. Demand for pine pulpwood is weak. Future demand for red pine timber will be constrained by efforts to control the movement of the pine shoot beetle. The USDA Animal and Plant Health Inspection Service has established a federal quarantine on red pine throughout much of New York, including Madison County, resulting in restrictions on the shipment of pine logs outside of the State.

During the ten year reporting period, there has been a substantial increase in the supply of Norway spruce sawtimber stumpage from State land. Although stumpage is typically purchased by local firms, the majority of logs are transported to Canadian mills for processing. The stumpage report indicates that prices for spruce sawtimber have increased 100% from \$60 to \$120 per thousand board feet during the ten year reporting period. As stands of plantation spruce continue to mature and treatments are conducted to maintain optimal stocking levels, the supply of spruce sawtimber is expected to increase. Conversely, the supply of small diameter (<10" dbh) spruce that is currently utilized for pulpwood is expected to decline. With increasing reliance on imported pulp and the volatility within New York's paper industry, future demand for spruce and hardwood pulp is uncertain. In January 2001, a spokesman for Lyons Fall Pulp and Paper Company, users of hardwood pulpwood, announced that "After many months of study and analysis of the prospects for returning the company to profitability we have come to the conclusion that the combination of a depressed market for our products and increased cost of operation make closure and liquidation the only reasonable economic decision". (NL, Vol.49, No.8). In March, 2001 Deferiet Pulp and Paper Company announced that it too would be closing its New York mill, thus eliminating an important market for spruce pulpwood from central New York.

There is limited demand for hardwood cordwood and most of this stumpage is sold within the local firewood market. The 2000 census reports that 236 households within the four townships within which the Unit is located rely on firewood as a primary home heating fuel. Prices have remained stable during the ten year reporting period and actual requests through DEC's home firewood program in southwestern Madison County have increased slightly. Prices for home heating oil have increased dramatically since 1999, and this could have a direct impact on demand for firewood. Furthermore, a wood-fired power plant located at Colgate University is a potential market for low grade logs and other chip stock.

In January, 2000 all State forests in New York were independently certified by the National Wildlife Federation/SmartWood using criteria established by the Forest Stewardship Council. This certification indicates that State forests are managed for long

term ecological, social and economic benefits.

While still an evolving process, ultimately this “green certification” label will give consumers the option of purchasing wood products that have been certified and tracked through a chain of custody as originating from lands that are committed to sustainable forestry.

Some of the management practices that promote sustainable forestry that are incorporated into this plan include: retaining coarse woody debris, harvest restrictions on steep slopes and along riparian corridors, protecting areas with significant cultural or historic resources and rare plants and following best management practices during timber harvesting. This management plan includes goals and objectives consistent with sustainable forestry criteria established by the Forest Stewardship Council.

B. Mineral Resources

Since 1969, four natural gas wells were drilled on private land within the Towns of Georgetown, DeRuyter and Nelson. All wells were dry and subsequently have been plugged. Four gas fields have been discovered in other parts of Madison County including the Sangerfield Field in the Town of Brookfield, the Hamilton Field in the Towns of Madison and Hamilton and the Lebanon Field and Bradley Brook Field in the Towns of Lebanon and Eaton. The Bradley Brook Field was discovered in 1999 and produces gas from the Silurian age Herkimer and Oneida formations at a depth of 3,000 feet.

Natural gas production in New York State has increased substantially as a result of new exploration and development, reaching 36.02 billion cubic feet in 2003. Madison County production has also grown, to 254.7 million cubic feet, primarily due to new wells in the Bradley Brook Field. Many deeper formations in New York are under-explored and may be exploration targets in coming years. With natural gas increasingly becoming the fuel of choice for both residential heating and electrical utilities, demand in New York and nationally is expected to rise. This will likely stimulate future exploration activity in Madison County and elsewhere.

C. Wildlife Resources

Two broad types of wildlife demands can be identified for the Tioughnioga Unit; namely consumptive uses (i.e. hunting, trapping and scientific collection) and non-consumptive use (wildlife observation and research, for example). Societal views and traditions exert considerable influence on our management decisions and, therefore, what wildlife species will benefit most from our current and future management.

In 2001, 4.6 million residents and non-residents fished, hunted or watched wildlife in New York State. Of the total number of participants, 1.6 million fished, 714 thousand

hunted and 3.4 million participated in wildlife watching activities including observing, feeding and photographing wildlife. Together, residents and non-residents spent a total of \$3.5 billion on wildlife recreation including \$808 million on trip-related expenditures, \$1.9 billion on equipment purchases and \$807 million on licenses, contributions, land ownership, leasing and other items and services. Comparisons between 1991 and 2001 wildlife recreation data in New York State reveals that participation in hunting declined 4% from 742 thousand to 714 thousand, participation in fishing declined 16% from 1.8 million to 1.6 million and participation in wildlife watching activities declined 18% from 4.2 million to 3.4 million. While participation in hunting, fishing and wildlife viewing has declined since 1991, total expenditure on wildlife recreation by state residents has remained unchanged (USDOJ, 2001).

In New York State, the demand for hunting, as measured by license sales, has declined 14% since 1985. This decline appears to be greatest among the increasing urban and suburban populations, while hunting participation in the predominantly rural regions of the State has been less affected. While license sales reveal declining participation, hunting on State lands is still a popular activity and offers much freer access than private land in the face of regional land use changes and posting or other private land access issues. As work and family demands have continued to reduce time devoted to hunting, there seems to have been a general shift to more concentrated hunting effort for only a few game species. Based on license sales and hunter surveys, most hunters use their time afield to pursue deer or turkeys.

Most wildlife viewers wish to see a diversity of species during a viewing trip. Some may venture out in hopes of spotting a particular species. Other individuals may only wish to know that a species or a diversity of species exists on public land even though they may never visit the area. An overwhelming majority (89%) of New York State residents who participated in wildlife viewing in 2001 engaged in this activity within one mile of their home. Many are backyard birders who maintain feeders, plant vegetation to encourage wildlife and tally their observations. Survey results indicate that there are 2.8 million "birders" in New York State and expenditures on wildlife viewing equipment such as binoculars and special clothing amounted to \$504 million (USDOJ, 2001).

Trapping has declined as a result of fluctuating markets for pelts and a societal shift away from this traditional activity and the use of fur that it produces. In response, populations of fur bearing animals such as beavers have increased. Trapping helps control populations of beaver, one of the wildlife species that can become a nuisance in some situations. Approximately 25-30% of the 1143 calls received by regional Wildlife Bureau staff in 2003 pertained to nuisance wildlife situations. The Wildlife Management Area differs from the State forest components of the Unit in that it was purchased for wildlife management. Much of the funding for the Bureau of Wildlife, the entity responsible for the Wildlife Management Area, is derived from the purchase of sporting licences and related equipment. Therefore, much of the direction for this area has been guided by game species needs. However, game management also benefits non-game

species. Foresters, responsible for the management of State forests, have traditionally managed for the production of trees and healthy forest ecosystems. This philosophy has most benefitted interior forest wildlife. This Unit Management Plan attempts to better integrate the best aspects of these two management approaches for the benefit of all wildlife native to the area.

Parcelization and residential occupancy has restricted access onto private lands and it is speculated that increased "posting" of private properties has shifted some activities, including hunting, to State land. While there may be no net increase in regional hunting pressure, the distribution of these activities appears to be changing. State lands provide hunting opportunities for those unable to purchase or access private land.

There is a demand for research on public lands in order to gain a better understanding of wildlife ecology that will help us to manage populations, and how these populations are influenced by societal demands.

D. Fishery Resources

There is some limited angling opportunity on the Unit. The greatest angling pressure undoubtedly occurs at Stony Pond during the period when camping is allowed there. In addition, the headwater of Limestone Creek is located on Tioughnioga WMA and is used by trout fishers.

Similarly to hunting, a regional angler survey conducted in 1988 and again in 1996 revealed a 24% decline in fishing within the nine county region of DEC Region 7. However, this decline has not been as pronounced as that for hunting because angler numbers (and, subsequently, fishing license sales) have always exceeded hunter numbers.

E. Recreational Resources

Interest in a broad range of outdoor recreational activities exists for the Unit including camping, boating, cross country skiing, hiking, hunting, biking or simply observing the non-human world. Changing demographics has led to a shift in State land use resulting in both increased demand for recreational facilities and the potential for conflict between user groups. In addition to the traditional uses of hunting, fishing and camping/hiking, people today visit State lands to snowmobile, mountain bike, ride horses, cross country ski, and to engage in other recreational pursuits. Based on anecdotal evidence, some of the uses that appear to be growing in interest are archeology, photography and birding.

Discussion at the public meeting held in Erieville on April 5, 2000 focused on recreational issues. The 62 participants represented a broad range of recreational uses on State land including horseback riding, hiking, snowmobiling, hunting, camping, photography, cross country skiing, trapping, birdwatching, canoeing/kayaking, ATV

trails, target shooting, wildlife observation, fishing and horse drawn carriage riding. In response to a questionnaire distributed at the session, 65% of respondents used State land for non motorized recreation while 10% engaged in snowmobiling and 15% in hunting, trapping or fishing. The remaining 10% of respondents indicated that logging or firewood cutting were their primary activities on State land. In response to a question regarding future use, 71% indicated satisfaction with existing conditions and wanted to ensure that diverse recreational opportunities continued to be available. Twenty three percent of respondents favored increasing development of such facilities as horse stalls, potable water sites, lean-tos and recreational trails. Six percent indicated that a higher degree of preservation is preferred and that logging, motorized access and developed facilities should be restricted in the future.

A free permit system regulates camping at Stoney Pond and registration figures since 1998 reveal that an average of 787 people use the 14 sites each summer season. Furthermore, an overwhelming majority (88%) of campers live within 25 miles of Stoney Pond suggesting that this facility is primarily a local recreational resource. Information from cross-country skiing registration at Stoney Pond indicates that use of the trail system has remained relatively unchanged since 1988 with approximately 1,100 users each winter. As with camping, cross-country trail use is by a local population. A 0.4 mile segment of a snowmobile corridor trail maintained by the Snow Valley Riders with an Adopt-A-Natural Resource agreement passes through the forest on Green Road and use is heavy throughout the winter season. Since 1995, there has been a 49% increase in snowmobile registration in Madison County, suggesting that demand for facilities will probably continue to grow.

Hiking on the Unit is popular both as a club event and as an individual activity. Many people visit State land for exercise and relaxation and often utilize the network of foot trails for long distance hiking or for a short walk to access particular sites. The Central New York Chapter of the North Country Trail Association has established three miles of the Madison County Link Trail within the Wildlife Management Area and works in partnership with DEC to promote trail stewardship and public education. The thirty mile Link Trail is a project to connect the Old Erie Canal Towpath in Canastota with the Finger Lakes Trail in Chenango County. The north-south link provides hikers with opportunities for accessing a long distance trail network and to experience some of the County's natural and cultural resources. Furthermore, the Link Trail is part of the larger North Country National Scenic Trail which extends through seven States between North Dakota and New York. The Onondaga Chapter of the Adirondack Mountain Club is another regional hiking club that has expressed interest in foot trail development within the Unit. The 2003 SCORP (State Comprehensive Outdoor Recreation Plan) indicates that demand for hiking is expected to increase slightly until 2010 and that the availability of facilities in Madison County is adequate.

Madison County agricultural statistics reveal an increase in the number of resident horses and ponies between 1987 and 1997 and both Morrisville and Cazenovia Colleges have equine programs. The Cazenovia Area Equine Association is a local

advocacy group formed to influence land use decisions in favor of equine activities. The Association has expressed interest in establishing a designated horse trail through the Unit.

Non-permitted ATV use on the Unit appears to be increasing and with a 40% increase in vehicle registration within Madison County, this trend is predicted to continue. An expressed demand for trails is apparent from the non-permitted use.

MANAGEMENT CONSTRAINTS ON THE UNIT

A. Physical Constraints

- Steep slopes
- Geologic properties
- Soil characteristics
- Density and placement of recreational trails
- Potential insect and disease infestations
- Limited access
- Presence of cultural resources
- Presence of county, town and State roads
- Electrical transmission and telephone lines
- Deeded rights-of-way
- Buried telecommunication lines
- Natural gas collection and distribution lines
- Concurrent use agreements
- Lack of contiguous arrangement of State land

B. Administrative Constraints

- Budget and staffing considerations
- Availability of Operations and Corrections work crews
- Fluctuations in wood markets
- Lack of demand for some wood products

C. Societal Influences

There are differing public opinions on the management practices and uses of State forests and wildlife management areas. All opinions are considered, but the degree to which they can be satisfied will vary.

D. Departmental Rules, Regulations and Laws

Appendix XIII lists the Department's rules, regulations and laws governing management activities on the Unit.

Appendix XIV illustrates comparisons and contrasts of the Environmental Conservation Law governing wildlife management areas and State forests.

The most obvious differences occur between rules governing swimming and camping. Swimming is prohibited on wildlife management areas. Swimming is permitted on State forests unless signed against such use.

E. Local Laws

Appendix IV lists the local laws and zoning ordinances plus the highway regulations and seasonal restrictions involved in the four towns of Madison County covering this management plan.

VISION STATEMENT

We recognize that the Tioughnioga Unit provides important environmental values within the changing rural landscape of Central New York. Our mission is to maintain ecological patterns and processes that support, sustain and enhance biological diversity and to provide opportunities for people to fulfill a basic human need for contact and experience with the natural world.

GOALS AND OBJECTIVES

It is the goal of the Department to manage State lands for multiple uses to serve the needs of the People of New York. This management will be carried out, not only to ensure the biological improvement and protection of the Unit, but also to optimize the many benefits to the public that these lands provide. This strategy considers both the social and environmental conditions within the larger landscape of which the Unit is inextricably linked, as well as the broader cultural context which defines human relations with nature. Management will be pursued to advance biological diversity, protect the Unit's cultural and natural resources, cultivate an ethic for sustainable land use and ultimately to optimize the range of public benefits that this Unit provides.

Management will respond to human values and will continually seek to engage people in a dialogue about the future of State lands. While participatory planning provides managers with information necessary for decision-making, it also allows different people to define their common interest in State lands. Open discussion between individuals and groups with divergent expectations for State land use will uncover common ground and often identify a potential conflict before it escalates to an unmanageable level. Meaningful participation however is contingent on an informed public, and fostering dialogue will require a program of raising public awareness about natural and cultural history, ecology and sustainable land management. Interaction and shared learning between citizens and managers will be a key factor for achieving our primary goal of serving the needs of the People of New York.

Conserving Biodiversity on the Tioughnioga Unit

The Tioughnioga Unit Management Plan provides a framework for maintaining ecological patterns and processes that support, sustain and enhance biological diversity on State lands in southwestern Madison County. Conceptually, the plan is based on the work of Hunter (1990, 1997 & 1999) and Franklin (1987, 1989 & 1992) who have advanced ecological forestry for the purpose of maintaining biodiversity in managed forests.

A key feature of ecological forestry is the concept of disturbance regimes and how natural episodes such as fire, wind and flooding can be emulated in silvicultural systems to conserve biodiversity. Hunter argues that maintaining a full range of landscape conditions offers the best assurance against losses of biodiversity. This is analogous to the “**coarse filter approach**” in that conserving diverse ecosystems and landscapes supports habitats for the vast majority of species. “With an effective coarse filter strategy in place, the more costly and information intensive **fine-filter management** can be focused on for species of special concern” (Seymour & Hunter, 1999).

Many wildlife species can be broadly classified into grass, shrub or forest dwelling. Other species thrive where two or more habitats converge. While some species can thrive in relatively small areas of a given habitat, other area sensitive species need considerable expanses. Furthermore, some species have very specific needs for all or some phase of life, i.e., hollow trees for nesting or vernal ponds for breeding. Managing for biodiversity requires the maintenance of sizeable areas of all cover types (coarse filter) and is enhanced with an eye on the distribution of these covers and knowledge of special habitat features required by species of special concern (fine filter).

Unit management planning allows for the deliberate sequencing and distribution of planned disturbances for controlling landscape characteristics. It provides both a framework for applying ecological forestry and strategies for conserving biodiversity. Following Franklin (1987), management objectives for the Tioughnioga Unit were developed to support habitat conditions necessary for a diversity of species. The Tioughnioga Plan includes specific management objectives for protecting, creating or maintaining early successional habitats (grass and shrub land), riparian and wetland areas, even and uneven-aged stands, late successional forests and **natural areas**. In developing management objectives, Unit characteristics such as historic land use, size and distribution of existing cover types, and riparian connectivity were considered in relation to ecological conditions within the larger private landscape. Management actions (planned disturbances) such as mowing, burning, clear-cutting and selection harvests are intended to create and ultimately maintain a full range of landscape conditions suitable for a diversity of species. The amount and distribution of habitat types across the landscape have been planned with consideration of the needs of species and the value of habitat connectivity. Connectivity allows for the movement of

species, material and energy through a landscape (Noss & Cooperrider, 1994). Habitat connectivity has important effects on the persistence and abundance of species in that the spatial arrangement of habitats affects the location, foraging dynamics and persistence of organisms (Spies & Turner, 1999).

The massive clearing of pre-colonial forests by European settlers gave way to substantial reforestation as marginal farmlands were abandoned during the late 19th and throughout the 20th century. Today much of the landscape is relatively young forest and much of what isn't forested is heavily influenced by human occupation or agriculture. Lacking in this mix, or holding only a temporary place, are early successional habitats such that "the status and trends of early successional forest and associated wildlife species have emerged as a concern within the eastern United States" (Trani et al. 2001). Many of the Neotropical migrant birds with declining population trends are classified as early successional species (Lorimer, 2001) and most birds associated with open habitats have declined since at least 1950 (Hunter et al 2001). Some grassland dependent bird species which have been confirmed (see Appendix VII) as occurring on or near the Unit are: eastern meadowlark, eastern kingbird, bobolink, and savannah sparrow. The vesper sparrow, a species of special concern, is noted as a probable breeder. Some shrub land dependent bird species which have been confirmed (see Appendix VII) as occurring on or near the Unit are; alder flycatcher, indigo bunting, blue winged warbler, yellow warbler, chestnut sided warbler, common yellow throat, gray catbird and house wren. The fact that early successional habitats, unless disturbed, will evolve into forest and that private landowners often have little incentive to maintain them creates the need for land managers to focus efforts on these habitats. Hunter et al. (2001) argued that allowing "nature to take it's course" can not be relied on to restore early successional habitats. This plan outlines a course to ensure early successional areas are well represented on the Unit.

In addition to merely ensuring the presence of a diversity of cover types within the Unit, attention must also be directed to the size of habitat types and their distribution. This is particularly important for area sensitive species. In the larger scale, trends in land ownership raise concerns for many species. Lands are becoming increasingly **parcelized**, with the private landscape characterized by small ownership (<50 acres) and dispersed decision-making. In Madison County, where parcelization has increased at a rate of 18% since 1988, State lands have emerged as relatively large properties under single ownership (Madison County Real Property Tax Rolls, 2000). These blocks of State land provide opportunities to manage for habitat conditions not likely to occur on private lands, and to focus attention on the needs of area sensitive species.

The parcelization of land and the development that frequently follows has reduced and fragmented habitats and poses a threat to many species. Even with the general rebound in forest cover, the needs of all forest species are not necessarily being met. Forest fragmentation and the subsequent isolation of habitat types has been stated to be the greatest threat to regional biodiversity (Noss & Cooperrider, 1994). In eastern

North America, residential development in rural landscapes has resulted in forest fragmentation and loss of habitat for species that depend on interior forest conditions for survival (Friesen et al., 1995). Forest interior Neotropical migratory birds such as warblers, vireos and flycatchers are vulnerable to forest fragmentation and their populations have declined as a result of decreasing interior forest habitats (Askin et al., 1990, Gavin, 1991).

The rose breasted grosbeak, yellow throated vireo, American redstart, ovenbird, indigo bunting, scarlet tanager and twelve additional Neotropical migrants are confirmed breeders on the Tioughnioga Unit (see Appendix VII). These species depend on interior forest conditions for nesting success and are vulnerable to parasitism, nest predation and other impacts associated with edge habitats (Temple & Carey, 1988). Paton (1994) describes edge habitats as openings in forest canopies with diameters that are at least three times the height of adjacent trees, which in mature northern hardwood forests would be an area of approximately one acre. Askin (1995) argues that population declines of Neotropical migrants in the eastern United States are correlated with increasing amounts of forest edge due to predatory species that occupy these habitats. In landscapes dominated by edge habitats, Neotropical migrants are vulnerable to small mammalian predators such as racoons and feral cats and egg-snatching birds such as the blue jay and American crow (Patton, 1994). Brown headed cowbirds occupy edge habitats and are associated with declining reproductive success of Neotropical migrants due to nest predation (Hahn & Hatffield, 1994; Saunders et al., 1991; Robinson et al., 1995). Cowbirds and other nest predators are most active within 200 meters of edge habitats, so interior forest conditions are optimal for nesting Neotropical migrants (Askin, 1995).

The silvicultural objective for managing uneven-aged stands is to establish and maintain continuous forest canopy representing different age classes of shade tolerant species. Stand structure is maintained using the single tree selection system which allows for a continuous forest canopy and consistency of ecological conditions over long periods of time (Nyland, 1998). Canopy openings are limited to the space occupied by individual trees and are created to control stand structure by releasing advanced regeneration. While canopy openings are a condition of uneven-aged stands, they are not of a size sufficient to introduce edge habitats. Furthermore, the duration of open conditions is limited to the relatively short amount of time necessary for advanced regeneration to reoccupy the upper canopy. Access into uneven-aged stands is established through a dispersed network of temporary skid lanes that do not impact canopy conditions. Unlike constructed roadways, skid trails do not require a hardened surface nor do they create disturbances that impact upper canopy conditions. Log landings necessary for timber harvest operations will create canopy openings; however, both existing and proposed landings are located contiguous with roadways and other edge habitats outside of areas being managed for interior conditions.

Together with riparian corridors and natural areas, uneven-aged stands on the Tioughnioga Unit will be managed to create continuous blocks of closed canopy habitat

suitable for forest interior nesting Neotropical migratory birds and other forest dwelling species.

The amount, size and distribution of various habitats all contribute to the value and quality of an area for wildlife. The large blocks of State land in the Tioughnioga Unit provide opportunities for creating a full range of habitat types, including those addressing the needs of area sensitive species. The designation and distribution of grass and shrub land, uneven-aged stands, natural areas and riparian forests within the Unit are designed to meet needs of a wide array of species, with specific attention directed at the needs of early successional as well as forest interior species.

Through deliberate distribution of habitat types, the Tioughnioga plan provides a long term strategy for creating and maintaining landscape conditions suitable for conserving biodiversity

I. Land Management Goal

The land management goal is to establish and maintain conditions that promote biological diversity. Management actions and objectives are set recognizing the landscape in which the State lands are located and with a vision toward what the future holds for this broader landscape. In order to provide for biodiversity, forest and wildlife managers must manage the lands to create and maintain cover types that private landowners may have little incentive or are unable to maintain. These management actions will result in a diverse and healthy ecosystem that, in turn, will provide for biological diversity. The management activities and resultant habitats will serve as examples for other individuals or organizations with an interest in managing their lands to promote biodiversity.

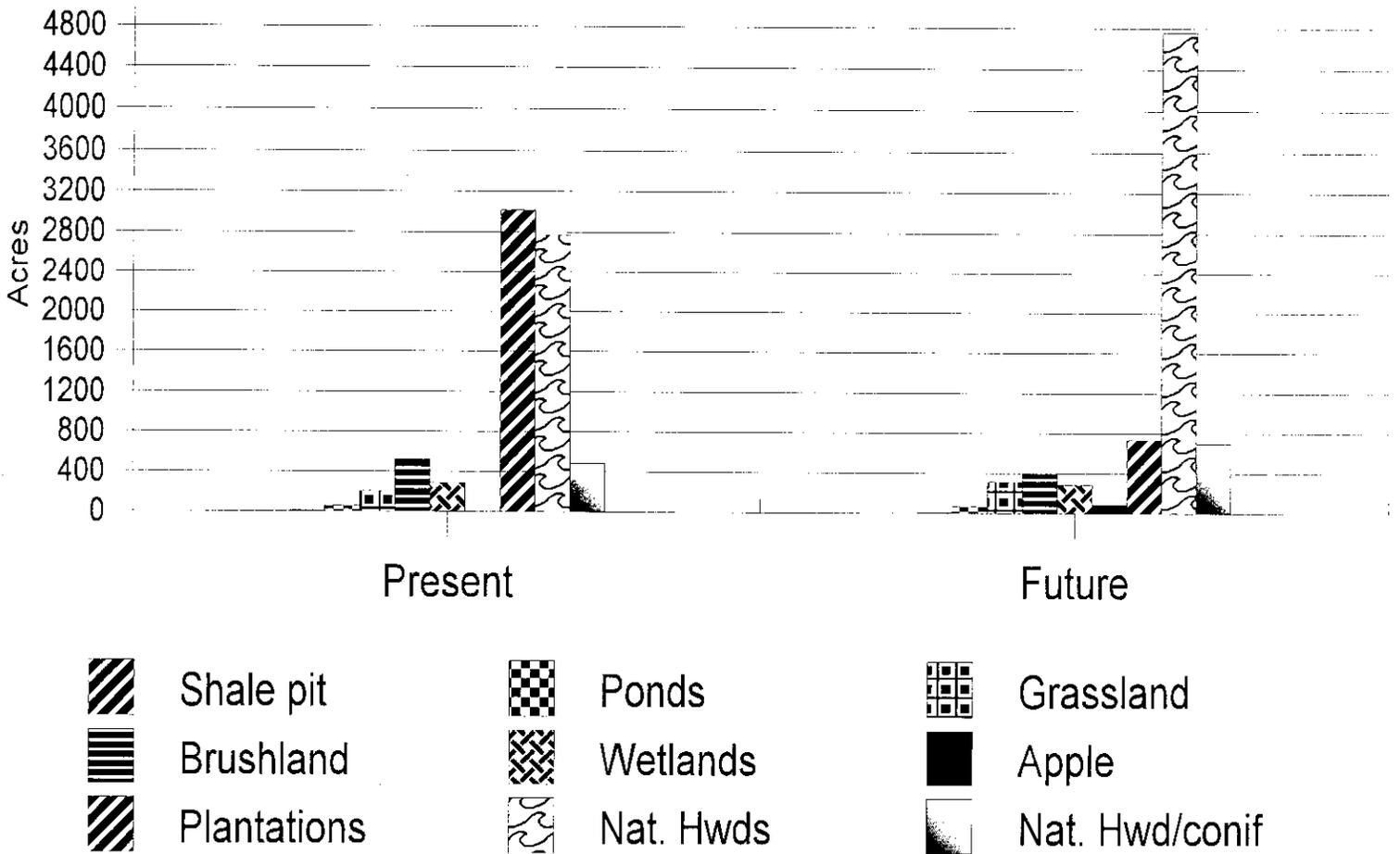
To support this goal, a number of specific management objectives have been defined including programs for maintaining grass and other open land conditions, protecting wetlands and riparian habitats, perpetuating conifer species and establishing a full range of forest development stages characteristic of the northern hardwood forest. Silvicultural treatments, such as timber harvesting and release cuttings will be the primary tools used for establishing diverse forest conditions as described later in the plan. Habitat management practices such as mowing, prescribed burns and clear cuts will be used to create or maintain early successional stage habitats. The following objectives and their supporting statements are the measurable steps for achieving the land management goal.

The following chart and graph display the present and objective ecotype distribution.

Present and Objective Ecotype Distribution

Land Classification	Present Acres	%	Objective Acres In 2050	%
shale pit	7	<1	7	<1
ponds	77	1	77	1
grassland	204	3	259	4
shrubland	521	7	583	8
wetlands	277	4	277	4
apple trees	10	<1	255	3
plantations	2978	40	777	10
natural hardwood	2764	37	4345	59
mixed natural hardwood & natural conifers	486	7	744	10
roads	82	1	82	1
TOTAL	7406	100	7406	100

Toughnioga Unit Ecotype Comparisons



A. Ecosystem Objectives for Early Succession Stages

- 1. Maintain 259 acres in a grassland condition**
- 2. Maintain 583 acres in a shrubland condition**
- 3. Maintain 255 acres of apple trees**

Open land ecosystems are occupied by grasses, herbaceous plants, shrubs and other woody vegetation. Open lands provide primary habitat for some small mammals and insects. Here species such as deer, turkeys and rabbits can find forage, seeds or berries. Other species, especially songbirds, use open lands seasonally for nesting grounds, brood cover, courtship and food. Currently there are 204 acres of grassland in the Unit and this will be expanded to 259 acres by the year 2050. In the process of forest succession, most land would become forested if left on its own. Grassland habitat is vital for a wide range of animal species. Besides providing nesting habitat for species such as bobolink and meadowlark, grasslands are where deer and bear come to graze, turkeys and ruffed grouse bring their broods to feed on insects, and hawks and owls hunt for mice and other rodents.

These grasslands are usually under ten acres in size and generally do not support species that require extensive grasslands i.e. Henslow sparrow. Open lands provide edges where ecosystems meet and overlap. These edges form a transition zone called ecotones. Some animal species such as bluebirds and song sparrows require the special habitat conditions that the transition zone provides. Grasslands will be maintained by mowing or prescribed burning. Creation of new grassland involves mechanical treatment of the land, the placement of lime and fertilizer, and proper seed mixture application. In addition, open land ecosystems will receive a regular treatment of lime and fertilizer to enhance grasses. Mowing will take place after July 15 to avoid breeding activity and before August 15 to prevent the development of weed species.

Shrubland, another important open land habitat, will replace some of the current softwood plantations. Maintenance will be reviewed on a five-year cycle and mowed or burned when necessary to prevent plant succession from advancing.

Apples are an important food resource for a wide range of wildlife species. Fruit of the various species of apples are consumed by small and large mammals, most birds and even reptiles and amphibians.

“Releasing” apple trees involves removing overtopping vegetation from an area of approximately 700 square feet around each tree. This allows the released apple tree to receive full sunlight, thus prolonging its life and fruit and bud producing potential. This practice should be repeated at ten year intervals.

B. Ecosystem Objectives for Aquatic, Riparian and Wetland Areas.

- 1. Protect the water quality of 11.8 miles of Class C streams**
- 2. Maintain 77 acres of ponds**
- 3. Protect 277 acres of forested and open wetlands**
- 4. Protect 374 acres of riparian zones**

Wetlands, ponds and stream channels are extremely complex ecosystems that provide many environmental, biological and recreational benefits. Throughout the Unit these resources will be protected to ensure that such benefits as clean water for human consumption, wildlife habitat, storm water control, and recreational opportunities will be sustained. Management activities such as silvicultural treatments, wildlife habitat enhancement and the development of recreational facilities must be carefully designed and undertaken to avoid impacts to designated wetlands and within a 100' wide riparian buffer on each side of streams, creeks and associated tributaries. Priority must be given to resource protection for all management activities proposed for these areas. Restricting intensive management will protect wetland vegetation, improve fisheries, limit soil disturbance and enhance overall watershed quality.

Stoney Pond and Little Stoney Pond on Madison RA# 13 and a number of impoundments on the Tioughnioga Wildlife Management Area will require periodic maintenance to ensure that both recreational opportunities and habitat conditions are sustained. Maintenance will include annual cleaning of drop boxes, dike mowing and cleaning debris from trickle tubes and spillways.

C. Forest Ecosystem Objectives

- 1. Manage 2,221 acres of natural hardwood and mixed natural hardwood/ conifer types on a 100 year rotation length using 20 year cutting intervals using the even-aged management system.**

Perpetuating a full range of species and habitats that are characteristic of the northern hardwood forest will require the application of silvicultural systems. The even-aged management system favors the establishment of shade intolerant species such as white ash and black cherry. Since much of the Unit is second growth forest, even-aged stands have emerged following agricultural abandonment and natural reforestation. This system will be applied to establish a series of distinct even-aged stands, each representing one of five different stages of forest development, from saplings to mature trees. Intermediate treatments will favor shade intolerant species i.e. white ash and black cherry and promote overall stand vigor. Adequate advanced regeneration will be established using the shelterwood or seed tree method prior to the final harvest cut.

2. Manage 58 acres of natural hardwoods, principally aspen and associated species, using a short rotation even-aged system.

Short rotation even-aged management is the preferred method for regenerating robust stands of aspens and associated tree species. Clearcuts ranging in size from 1 to 10 acres and the subsequent regeneration provides ideal habitat for woodcock and ruffed grouse. The late Gordon Gullion, a recognized authority on the ruffed grouse, has stated that the aspen species are an essential component of high quality grouse habitat. At every stage of development, aspen support healthy grouse populations. Stands of aspen less than 3-5 years old provide excellent habitat for broods of grouse. The thick vegetation provides excellent cover from avian predators and a multitude of insects are fed upon heavily by the young birds. As aspen trees mature, grouse feed on the tender buds and spring flowers, called catkins.

Maintaining these different stages of aspen development requires periodic clearcutting to stimulate regrowth through stump and root sprouting. Maximum sprouting is obtained when all aspen in a stand are cut. Best results are found when the cutting is done during the dormant season. Grouse cuts will be made throughout the Unit, especially where aspen stands occur adjacent to apple trees, grassland or shrub areas.

To promote ideal habitat conditions, clearcuts will be scheduled on a staggered 60 year rotation to ensure a full range of stand development stages across the Unit. Furthermore, logs and other coarse woody debris will not be removed from the site after clearcutting.

3. Manage 63 acres of mixed natural hardwoods and plantation white pine using the long rotation even-aged system.

White pine is a native conifer that has had an important role in the natural and cultural history of the northeastern forest. As both a reforestation and naturally occurring species, white pine is common throughout the Unit and the larger landscape. An eastern white pine growing within the nearby Nelson Swamp Unique Area is estimated to be 450 years old. Records indicate that it is the oldest living tree of its species and perhaps the oldest tree in central New York. On the Tioughnioga Unit, where individual trees or small groves of remnant old growth white pine exist, they will not be cut but retained as biological legacies. In other stands, application of even-aged management will favor retention of existing pine until rotation age, while reforestation and natural regeneration will promote long term perpetuation of this conifer type. Management will follow the even-aged system on a 150 year rotation using 30 year cutting intervals. The final conversion cut, however, will retain approximately 10-40 square feet of **basal area** per acre of white pine to allow these trees to reach biological maturity. Depending on the diameter of the residual trees, this figure will represent retention of 25-50 trees per acre.

4. Manage 496 acres as conifer cover type using the even-aged system.

In addition to white pine, there are several naturally-occurring and plantation species that make up the Unit's conifer cover type. Eastern hemlock, red pine, Norway spruce, balsam fir and jack pine are common species that provide both visual contrast to the dominant deciduous forest type and habitat for conifer dependent wildlife. These species are important in that they not only occupy a large acreage on the Unit but represent a significant amount of the total conifer cover within the larger landscape. Reforestation is an important legacy of State land history and these efforts have resulted in relatively high concentrations of conifer species on State forests, wildlife management areas and other public lands throughout New York State. While critics have dismissed plantations as biological deserts, at the landscape level, these stands contribute important conifer cover for migratory birds and raptors, deer winter yards and a food source for red squirrels and other small mammals. In addition to providing habitat, managed plantations have emerged as characteristic features of State lands; they provide people with a distinct sense of place and a living legacy for interpreting New York's conservation history.

Of the multiple species that were utilized in early reforestation efforts, Norway spruce has proved to be most tolerant of a wide range of soil types. Where other species have failed, spruce continues to dominate many of the original planting sites. Furthermore, Norway spruce has naturally regenerated within existing plantations following intermediate thinning. Norway spruce plantations will be managed with natural hardwoods using the even-aged system on a 120 year rotation with 20 year cutting intervals. Treatments will favor mixed stand conditions with natural regeneration and reforestation planned to ensure perpetuation of this cover type.

5. Reforest 56 acres.

Reforestation will ensure long term perpetuation of a conifer component and the continued existence of the plantation cover type within the Unit. White pine, white spruce, Norway spruce and other conifer species will be used in reforestation efforts. Reforestation will occur after the removal of a plantation overstory.

Plantations provide ecological, economic and social values. The original purpose for establishing plantations was to restore depleted, eroded soils and to function as a nurse crop for natural species. As a result of sixty or more years of occupancy, the soils under plantations today are much improved over the landscape in which they were planted. The restoration process is still going on and will continue if these lands are maintained as plantations. Natural species have regenerated under these plantations following intermediate thinnings. In many circumstances, the natural regeneration is of desirable species and conversion of the plantation to natural stands is the appropriate course of action. In other circumstances, the regeneration is of less desirable species, which makes it prudent to replant these sites to conifers. In either case, the soil

restoration process will continue, whether it be plantation or a naturally regenerated forest following the plantation. In addition, plantations will continue to protect the watershed and prevent soil erosion, while contributing to wildlife species and flora diversity.

It is a common misconception that plantations are ecological deserts and have no significant biological values. During the first 20-30 years, plantations are open, with trees between 2 and 25 feet in height, and are associated with a variety of vegetative species that have seeded in naturally. This is the principal age class (early succession) which most inventories indicate is lacking in sufficient quantity across the landscape.

Certain wildlife species are drawn to plantations. Rabbits use plantations in early stages of stand development for food and cover. Red squirrels collect cones and predators use plantations to hunt small mammals. Deer use the softwood cover for protection against weather and as winter areas, much as they do natural softwood. The golden crown kinglet is native to the Adirondack region and has expanded its range across most of the State following the development of spruce plantations. Numerous other species of birds, including smaller raptors and neo-tropical migrants, utilize the unique structure of softwood plantations for breeding, nesting and hunting.

Plantations are taking the place of the natural softwood component which is not present in the quantities it once was. Maintaining a segment of conifer plantation is one way to maintain a softwood component on State forests. Current literature indicates that 20-25% of the landscape in the northeast should have a conifer component. Currently, State forests have slightly more than that (about 33%) in plantations, but they only represent about 1% of the total forested area in New York. The total area in conifer cover in New York State, according to the latest U. S. Forest Service inventory data, is only about 16% of the total timberland acreage, or less than 10% of the total land area. This State currently has a deficit of softwood cover types, a deficit that plantations can help fill. Furthermore, this current deficit is expected to increase dramatically as the spread of the Hemlock Woolly Adelgid, which kills hemlock, impacts many naturally occurring stands. It is vitally important to anticipate this potentially catastrophic condition by maintaining, and where appropriate expanding, the establishment of pine and spruce plantations.

Natural stands are not being converted to plantations. Plantations occur on old farmland, which most of our State forests were; and we will continue to maintain a portion of the past agricultural landscape in softwood plantations. Replanting occurs when natural regeneration under existing plantations is not present or undesirable, or when we acquire open land through new acquisitions.

Plantations have provided important contributions to the forest product community by making available a resource not readily found on privately owned lands. Plantations on State forests have generated as much as \$5,000/acre in income to New York State after 60 years of growth, as well as income from intermediate thinnings. This income

comes significantly earlier than that from natural stands. It is possible to grow two complete rotations of softwood in the same amount of time that one rotation is grown in some natural stands. Plantations can also grow much higher volumes per acre than natural stands, which helps compensate for the lower value/unit volume.

Plantations on State forests represent an important portion of our softwood resource. Certain industries in New York have developed markets which depend on the availability of these resources.

When people see extensive areas of plantations, mixed in with natural forests, they identify that with State forests. They also link these areas with our Civilian Conservation Corps (CCC) heritage. Heavy concentrations of plantations are generally not found on private lands.

Plantations provide attractive open forests where the public goes to enjoy outdoor recreational pursuits and solitude. They are popular places for cross-country skiers, hikers and others who want to experience a high canopy with heavy crown cover and a relatively open understory. Tall straight stems with a dense canopy gives one the impression of being in a cathedral.

In closing, State forests are sought out by many people for their wide variety of values and uses. Plantations contribute significantly to these values in many ways. Although in the future, plantations acreage on State forests will diminish, they still create important values that should be maintained.

6. Manage 2,181 acres of natural hardwoods and mixed natural hardwoods/ natural conifers using uneven-aged system.

The uneven-aged system establishes and maintains multiple age classes within each stand, from saplings to mature trees. This system favors shade tolerant species such as sugar maple, eastern hemlock and American beech and creates vertical layering of the tree canopy with each layer providing a distinct habitat niche. Regeneration and the control of stand structure is accomplished using the individual tree selection system with periodic treatments favoring the most vigorous shade tolerant species in all age classes. Unlike the even-aged system, uneven-aged management perpetuates a high canopy and favors the interior habitat conditions required by some species. This system will grow trees to ages of 120 years with 20 year cutting intervals.

7. Manage 344 acres of natural hardwoods and mixed natural hardwoods/ natural conifers using experimental uneven-aged management.

Forest ecosystems are extremely complex assemblages of plants and animals which function more chaotically than according to a predictable pattern of development. How ecosystems might evolve over the next year, decade and century is increasingly

uncertain. Add to this the human dimension with changing perceptions of nature and demand for natural resources and the task of ecosystem management becomes even more complex. The experimental uneven-aged system will be applied to approach a multiple age class stand structure, but treatments will occur at 50 year intervals, to achieve these objectives. The concept of rotation age will be abandoned for one that considers a tree's biological maturity instead of market criteria. The purpose of the experimental uneven-aged system is to observe stand development and compare conditions to those stands treated under conventional uneven-aged management.

8. Manage 200 acres as natural areas / late successional forests.

These areas will not be considered for active commercial forest management or salvage and generally allowed to develop naturally into a late successional forest state. Intervention will be considered to protect forest health (e.g. fire or invasive plant or animal invasive species), to enhance structural or species diversity, to protect, restore or enhance significant habitats or to exploit or create regeneration opportunities for desired plant species. Road construction and facility development will be avoided within natural areas. The management objective within natural areas is to allow forest ecosystems to evolve to old growth characteristics. With time, the structure and function of natural areas will differ from actively managed stands and will ultimately support species that are dependent on relatively undisturbed conditions. Natural areas also provide people with experiences that contrast dramatically with familiar built environments and provide relief from the rigid confines of every day life.

9. Protect historic cultural resources.

Historic cultural resources are structures and other features in the landscape that provide evidence of past relationships between people and nature. These resources contain information about historic settlement patterns and how people used the land. Public management and protection of cultural resources will ensure that future generations have access to information about the past for appreciation and scientific study. Management will be directed toward long term protection of historic sites and raising public awareness about the Unit's cultural history.

Cultural resources within the Unit, such as farmsteads, mills and cemeteries will be protected to ensure that the integrity of these sites are not compromised and that the association between various site features is not diminished. For example, the relationship between stone walls, cellar holes, garden plot and orchard provides evidence of a functioning farmstead that ultimately reveals information about cultural practices. Activities that disrupt this integration decrease the accuracy of site interpretation and lessen our ability to understand the past.

Cultural resources will be protected by prohibiting site disturbance during silvicultural treatments, road construction and facilities development. Stone structures will not be

dismantled and access for harvesting equipment will be restricted to existing gateways. Where feasible, hedgerows, shade and fruit trees, garden shrubs and other non-invasive ornamental plants will not be harvested and efforts will be made to conserve this vegetation through release cutting and other silvicultural and horticultural practices. Cultural sites and associated structures will be inventoried and conservation strategies developed to ensure long term protection.

Any archeological research to be conducted within the Unit will be accomplished under appropriate permit. Research permits will be issued only after consultation with the New York State Museum and the State Historic Preservation Officer.

10. Protect the rich sloping fen.

A rich sloping fen is a small, gently sloping, minerotrophic wetland, with shallow peat deposits, that occurs in shallow depression on a slope composed of calcareous glacial deposits. There is a rich sloping fen located on the Tioughnioga Wildlife Management Area. Potential threats to the fen include invasion of non-native plants spreading from the AT&T cable right-of-way and alteration of natural hydrology resulting from Right-of-Way (ROW) maintenance and harvesting in adjacent forest stands.

The rich sloping fen will be protected by establishing a 500' buffer around the fen where timber harvesting is prohibited. A program for controlling invasive plants will be established to promote species native to the fen. Planting white pine and eastern hemlock will establish a screen between the fen and ROW to reduce the spread of invasive species. Furthermore, that portion of the ROW adjacent to the fen will be maintained by mowing rather than using herbicides to prevent accidental runoff (NYSDEC, 1998).

11. Promote biological diversity by providing a variety of habitat structures.

Forest Habitats

Dead, dying and down trees provide habitat for animals, serve as nursery sites for germination and store nutrients that can be recycled through forest ecosystems. Long considered a waste in traditional forest management, snags, cavity trees and coarse woody debris are increasingly being recognized as contributing to ecological processes that promote biodiversity. Standing dead trees or snags are critical for many bird species that rely on these structures for establishing cavity nests and to forage for wood boring insects. Once excavated, these cavities are utilized by secondary nesters, bats, rodents and other small mammals to meet their habitat requirements. Downed logs are used by both vertebrates and invertebrates for cover, foraging sites, and, in the case of ruffed grouse, as drumming sites for attracting mates. The moist environment below logs is especially important for the survival of some species of reptiles and amphibians. Logs in streams provide cover for fish and increase the ecological complexity of aquatic

habitats. Coarse woody debris is not only beneficial to wildlife but the moist, nutrient-rich humus that forms during decomposition is critical for regenerating such native species as hemlock and yellow birch. Many nutrients, such as phosphorus, nitrogen and sulphur, are released as coarse woody debris decays and materials in advanced stages of decay are excellent sites for the formation of soil mycorrhizae.

Management for snags and cavity trees will involve retention of at least eight trees per acre. This practice will be followed during all silvicultural treatments including clear cuts and stand conversions. To ensure an adequate quantity of coarse woody debris the following practices will not be permitted: utilization below an 8" top diameter during commercial sawtimber treatments, utilization of culls and whole tree harvesting.

Downed wood naturally occurs when limbs break, trees are blown over or snags fall. Additional downed wood will be provided as follows:

1. Tops of felled trees following sawtimber harvests will not be sold for firewood, except along travel corridors.
2. Designated cull trees will be left in the woods during harvesting.
3. Minimum utilization limits will not be enforced.
4. Whole tree harvesting will not be permitted.

Ten to forty square feet of basal area/acre in live overstory trees during the final regeneration cut will be retained in some even-aged management stands. This range of basal area per acre can be visualized as a scattering of live trees left throughout the treated acres. The number of residual trees can range from as few as 10 to as many as 60 trees per acre, depending on tree sizes. Leaving live overstory trees, also called **green tree retention**, provides structural and habitat diversity while also moderating the microclimate for seedling establishment and animal movement. Retention trees may become snags, contain or develop cavities, survive the entire rotation length of the new stand, or be cut during intermediate treatment of the new stand. This practice will be applied where management objectives allow.

Open Land Habitats

Open land is an important component of any healthy, diverse ecosystem. The future existence of grassland and shrubland-dependent wildlife species in New York is at greater risk than that of forest-dwelling neotropical migrant birds. In recognition of this, the Tioughnioga Unit Management Plan is allocating up to 25% of the area to be maintained as shrubland and grassland. This will consist of approximately 10-15% of the area as shrubland and 5-10% as grassland. Specifically, 125-450 acres of grassland and 500-1000 acres of shrubland will be created and/ or maintained.