

FOREST MANAGEMENT PLAN

for

The Oaklands Town Forest

Exeter, New Hampshire

Prepared for:

The Exeter Conservation Commission
Exeter, New Hampshire

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INTRODUCTION

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for
The Oaklands Town Forest
Exeter, New Hampshire

ABSTRACT

Acquired in December of 1991, The Oaklands Town Forest property adds great new resource dimensions to the existing Exeter town forest parcel, the Henderson-Swasey Conservation Area. Though the Route 101 highway lies between these adjacent properties, a trail underpass will soon connect the two town forest tracts. The two properties represent a total of 422± acres of community-owned forestland which is, or will be, actively managed for public recreation, the growth and production of forest products, the enhancement of wildlife habitat, and the protection of the area's natural resources. As tangible examples of sound forest management practices, the town forests will promote the wise use of renewable forest resources in the community, and beyond.

This forest management plan was prepared the 231.8± acre Oaklands Town Forest (and is an accompanying study to the management plan written in June 1989 for the Henderson-Swasey Town Forest). The present study identifies the natural and physical features on the parcel, analyzes the forest's composition, and examines opportunities for public use and silvicultural management of the property.

The plan is based on an intensive woodland inventory and aerial photo analysis made in the summer of 1993. Forest management goals were defined in consultation with Peter Dow, Exeter Town Planner, who served as liaison with the Conservation Commission. The plan was then created, outlining a program to meet these goals through long-term management of The Oaklands.



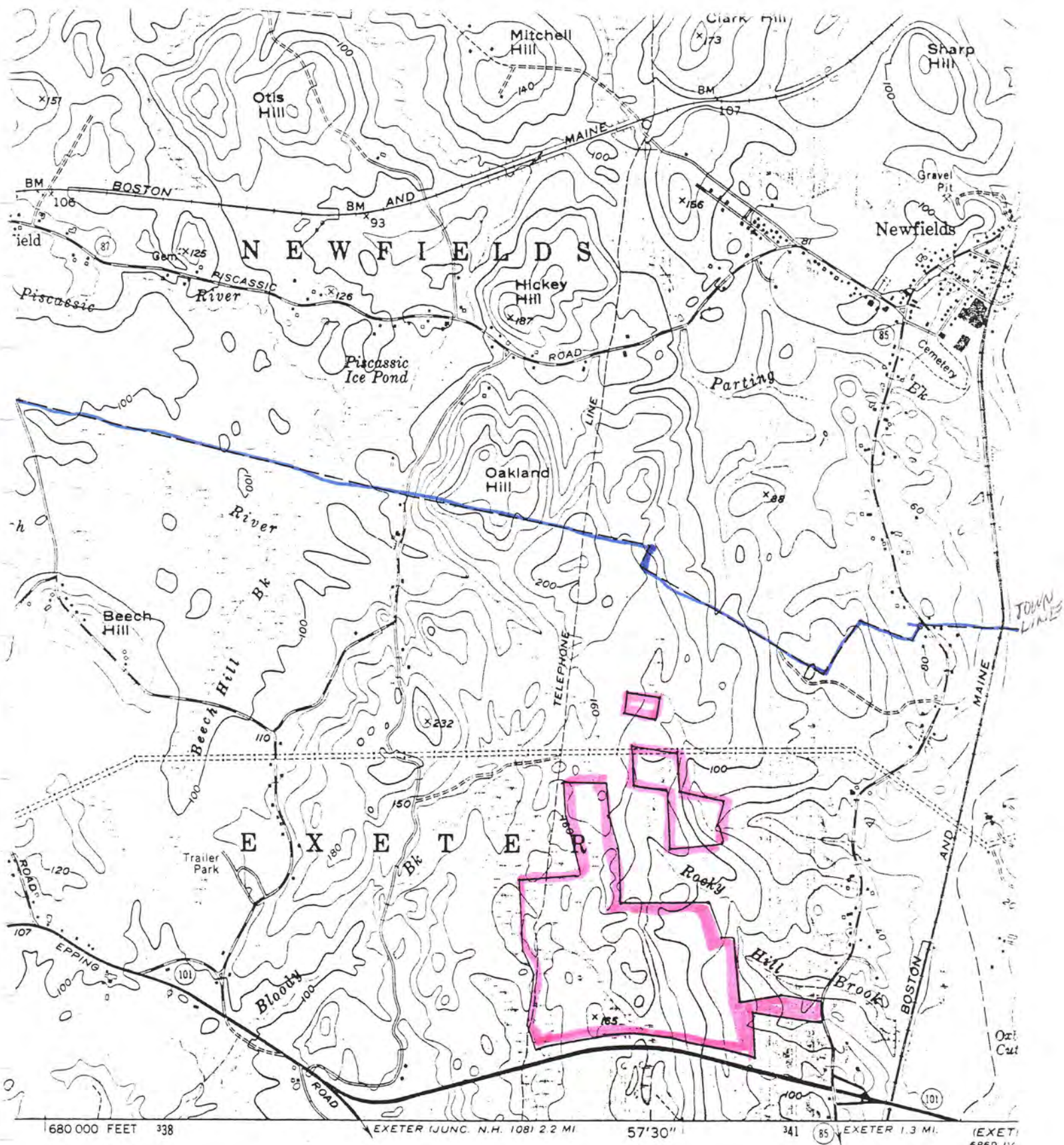
The plan includes maps and an assessment of the various woodland resources. Multiple-use recommendations are aimed at enhancing access for recreational use, while promoting silvicultural activity to improve forest growth and wildlife habitat. An implementation schedule and cost/revenue analysis are also included as essential elements of the planning process.

This project was performed in conjunction with Rockingham County Cooperative Extension and cost-share funding under the ASCS' program, SP-44. All parts of this study were researched and prepared by Charles A. Moreno; no part of the plan, or the plan's format, may be used or copied without the author's prior written consent.

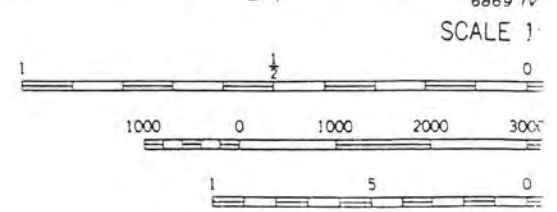
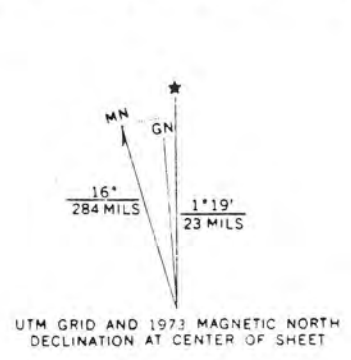


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FOREST MANAGEMENT OBJECTIVES

MISSION STATEMENT

The purpose of The Oaklands Town Forest is as follows: First, as forestland available for the public to enjoy recreationally and educationally; second, as open space preserved from development and managed for the benefit of wildlife; and, finally, as a tangible example of sound forest management practices, thereby promoting the wise use of renewable forest resources in the community, and beyond.

SUMMARY

GOAL/CATEGORY -----	Degree of Importance			
	High -----	Med -----	Low -----	None -----
Forest Productivity		x		
Woodland Access	x			
Timber Production				
Present Income		x		
Future Income		x		
Educational Use		x		
Public Recreation				
Light Uses	x			
Motorized				x
Forest Aesthetics		x		
Preserve Area		x		
Wildlife Habitat				
Improvement	x			
Wetlands Protection	x			
Forest Maintenance			x	



FOREST HISTORY

Natural History

The area known as "The Oaklands" has traditionally included much of the large forested area lying north of Exeter town center and west of the Squamscott River. Though the primeval forest was cleared long ago from this area, the forest on much of the property was probably allowed to grow back almost immediately. Unlike 90+% of the land in southern New Hampshire which was farmed, The Oaklands have probably always remained forested, and have undoubtedly served for long as a local source of firewood and timber.

The extreme rockiness, ledgy outcrops, and thin soils render much of The Oaklands unfit for even simple pasture. Historical evidence of forest-land use is found by an almost complete lack of stonewalls or fencing through the forest, whose presence usually attest to the land's differentiation into fields.

Of historical interest is the location of an old road in The Oaklands which was once the main travel path to the village of Newmarket. The exact location of the road has not been determined. However, traces of an old woods road in The Oaklands were found in the course of researching this study. This road travels by two abandoned hand-dug water holes, and was found to traverse a long distance through the forest. The possibility exists that this may be the old road.

Town Forest Acquisition

The 231.8± acre Oaklands Town Forest was consolidated from eleven parcels, primarily in 1990-91. It is the culmination of dedicated efforts by the Exeter Planning Department and the Exeter Conservation Commission.

Acquisition of property by the Town in The Oaklands area began in the early 1980's when Phillips Exeter Academy donated a landlocked, 16-acre



parcel to the Town. Then, in 1983, Lucy Dawson, former Chairperson of the Conservation Commission, arranged for the purchase of several scattered parcels in the area, at the time, all unsurveyed.

In the summer of 1990, the abutting owner to some of the scattered parcels the Town owned at this point owned, approached the Town about purchasing his land. The Town was not interested unless it could acquire substantial additional lands, to form a Town Forest, and in so doing, attract funding from the State's Land Conservation Investment Program (LCIP). LCIP was at the time in full swing, with funds available to towns for the purchase and/or to secure conservation easements on land, thus preventing development.

The efforts of Town Planner, Peter Dow, and Conservation Commission Chairperson, Jody Pellerin, then went into contacting other abutting landowners, negotiating terms of the sale of their lands, and applying for LCIP funds. By January of 1991, three additional landowners had agreed to sell lands to the Town, and the project, now encompassing over 200 acres, was approved for LCIP funding. Deed research, surveying, appraisals, and further negotiations followed. The successful closing for all the properties was completed in December 1991. In March 1992, The Oaklands Town Forest came into being by vote at Town Meeting.



PROPERTY PROFILE

ORGANIZATION of The Oaklands Town Forest

Organizing a tract of land into compartments and stands helps in achieving management goals. Through this approach, inventory data is more applicable and precise, specific silvicultural recommendations are made, access planned, and timber harvests logically executed.

COMPARTMENTS are management areas, or easily defined sections of land for which: (1) forest stocking and volume data are presented, and (2) a series of silvicultural treatments are planned, often as one operation, using similar access routes. For forest management purposes The Oaklands Town Forest will be divided into three compartments which correspond to access and the property's layout.

Management compartments are further subdivided into STANDS. A stand represents a forest type, or homogeneous forest area which are usually the result of a similar history of land use and harvesting. Though prescriptions vary between different stands, it is common for several stands within a property or compartment to be treated concurrently during a harvest, each to its own specifications. Ten stands were demarcated in The Oaklands Town Forest.

AREAS are described in several stands where pockets of the forest type differed slightly or prescriptions varied. Areas within stands are too small to statistically derive volume and stocking data.



LIST OF FOREST TYPES

- STAND A: Upland hardwoods (J3B), 67.2 acres
B: Upland hardwoods, low-stocking (J2/3C), 26.1 acres
C: Mixed hardwoods, young (M2B), 7.5 acres
D: Mixed hardwoods (M3B), 9.2 acres
E: Pine/hardwood (N2/3A/B), 18.1 acres
F: Hemlock/hardwood (H3A), 13.3 acres
G: Pine/hemlock/hardwood (T3/4A), 13.5 acres
H: Wetland hardwoods (Q3B/C), 26.3 acres
I: Recently harvested areas (M1A), 36.0 acres
J: Pine/hemlock/hardwood (T2A), 11.8 acres

FOREST TYPE CODESI. FOREST TYPE KEY

- A = Pine/Hemlock
H = Upland Hemlock/Hardwood
J = Upland Hardwoods
K = Hemlock
M = Mixed Hardwoods
N = Pine/Hardwood
O = Red Maple
Q = Wetland Hardwoods
R = Red Pine
T = Pine/Hemlock/Hardwood
V = Wetland Hemlock/Hardwood
W = White Pine

II. SILVICULTURAL STAGE

- 1 - Regenerating (Seedling - Sapling)
- 2 - Young Intermediate (Precommercial)
- 3 - Intermediate (Commercial)
- 4 - Mature (Regeneration Harvest Stage)
- 5 - Unevenaged (Various Ages)

III. STAND STOCKING

- A = Overstocked
B = Fully Stocked
C = Understocked



FOREST DATA ANALYSIS

INVENTORY METHODS

Over 217 acres of The Oaklands Town Forest were cruised using the variable-radius plot sampling technique. A total of 108 sample plots were inventoried, spaced on a 300' x 300' grid. A 20-factor prism was employed to establish sample trees.

The balance of the Town Forest, 14± acres, which include the former Stockbridge and Chamberlin parcels, were examined on a walk-through basis.

For cruised areas, Diameter at Breast Height (DBH) was measured to the nearest inch using a Biltmore Stick. Merchantible height was estimated in logs (16-foot sections), with softwood sawtimber measured to the nearest halflog and hardwood sawtimber measured to the nearest quarter log. Merchantible height for firewood was considered for straight stem sections only, that is, sections which are normally marketed as "grapple loads".

The minimum small-end diameters for determining the merchantible height of sawlog trees were as follows: hardwoods and hemlock - 10"; white pine - 8". Firewood was scaled to a 5" top diameter, on straight sections at least 18 feet in length.

At each plot, data was taken for total volume, and volume prescribed for harvest. Also recorded were tree species, basal area/acre, sawtimber grades, soil and site conditions, silvicultural stage, relative stocking, understory species, and recommended treatments.

Cruise error on a 90% confidence level was ±15.9% for the total sawtimber volume estimate. The precision of the sawtimber estimate was greatly improved by stratifying inventory data. Differing soil types and past logging activity on the property have resulted in variable forest type conditions. Stratification of the cruise data into 10 strata, corresponding to the forest types on the parcel, reduced the effects of this variability, therefore increasing precision levels.



TOTAL VOLUME AND VALUATION

The Oaklands Town Forest

<u>SPECIES</u>	<u>TOTAL VOLUME</u>	<u>PRICE/ MBF</u>	<u>TOTAL VALUE</u>
WP	215.9 MBF	\$ 85/MBF	\$ 18,352
RO	198.7	\$230	45,701
HM	61.1	\$ 30	1,833
Pal	19.8	\$ 25	495
BO	17.9	\$ 90	1,611
Bir	10.2	\$ 50	510
WA	5.6	\$ 90	504
WO	1.1	\$ 90	99
TOTALS	530.3± MBF		\$ 68,871
Firewood	2450 ± cords	@ \$ 8/Cord	\$ 19,600
GRAND TOTAL			\$ 88,471
ROUNDED			<u>\$ 88,500</u>

September 1993

Valuation is based on competitive market prices for stumpage in Rockingham County, New Hampshire, in the summer of 1993. Stumpage prices have been adjusted for overall timber grade and various logging factors, particularly, accessibility. Stumpage prices are constantly subject to change according to market trends.

Furthermore, stumpage prices may be lower than those quoted above depending on the terms of the sale, and if a partial or improvement harvest is made on the property, as recommended in this plan. The above valuation represents "liquidation value", for total timber volume.



TIMBER VOLUME TOTALS

(by Stand for Entire Parcel)

STAND	WP	HM	RO	WO/BO	Bir/WA	Pal	TOTAL	FWD
A	42.2	4.7	119.4	1.1/7.9	2.5/1.9	2.7	182.4	700
B	2.0	2.6	9.5			1.8	15.9	225
C	7.3						7.3	29
D	5.3	3.3	10.0		2.6/1.1		22.3	137
E	95.4	3.5	19.6	3.2	1.4		123.1	273
F		11.6	24.4		3.6	3.8	43.4	154
G	46.4	27.1	8.4	2.9			84.8	140
H	4.7		6.0		1.5	10.3	22.5	596
I	4.1			1.1	1.2	1.2	7.6	104
J	8.5	8.3	1.4	2.8			21.0	92
TOTALS	215.9	61.1	198.7	1.1/17.9	10.2/5.6	19.8	530.3	2450

* Total Sawtimber: 530,300 ± Board Feet

* Total Firewood: 2,450 ± Cords



TIMBER VOLUME PRESCRIBED FOR HARVEST: 1993 - 2003

by Stand

STAND	WP	HM	RO	WO/BO	Bir/WA	Pal	TOTAL	FWD
A	.6	1.7	20.6	1.1	1.4/ .2	.4	26.0	250
B		.5	1.9			.4	2.8	70
C	1.0						1.0	5
D			1.8		1.1/ .1		3.0	40
E	7.3	1.9	4.4	1.7	/ .2		16.6	50
F			5.0		1.5		5.4	40
G	11.0	4.1					15.1	35
H						2.0	2.0	50
I							0	0
J	3.3						3.3	40
TOTALS	23.2	8.2	33.7	/2.8	4.0/0.5	2.8	75.2	560

*Sawtimber recommended for harvest: 75,200 $\pm$ Board Feet (15 $\pm$ % of total)

*Firewood recommended for harvest: 560 $\pm$ Cords (23% of total)



VOLUME TABLE NOTES

A) TREE SPECIES KEY:

WP = White pine

HM = Hemlock

RO = Red oak

WO = White oak

BO = Black oak

Bir = Birch (white, black, and yellow)

RM = Red maple.

B) First seven columns are sawtimber estimates. Last columns, "FWD" = firewood volume. Chipwood is not estimated, as feasibility of a chipping operation is questionable.

C) All sawtimber figures in tables are by thousand board feet (MBF). One must multiply numbers by 1,000 to get board foot figures.

D) Firewood estimate is measured by cord units.

E) The statistical error around individual estimate entrees is relatively high. Total volume estimates are far more precise.

F) Prescribed harvest estimates are based on conventional logging yields. If chipping is implemented, firewood volumes generated will be 40±% lower than estimated for conventional logging. Chipwood will also be produced.



TREE SPECIES COMPOSITION

- For Entire Parcel -

Species -----	% of Basal Area -----	% of Timber Volume -----
Red oak	32.5%	37.5%
Red maple	17.5	3.5
White pine	11.7	40.7
Hemlock	9.0	11.5
Black birch	8.5	.6
Beech	5.1	.2
Black oak	5.1	3.4
White birch	4.8	1.3
White oak	1.9	.2
White ash	1.0	1.0
Popple	.6	
Yellow birch	.6	.1
Black cherry	.5	
Sugar maple	.5	
Gray birch	.2	
Black gum	.1	
Basswood	.1	
Others	.3	



MULTIPLE-USE PLAN

SILVICULTURE and FOREST PRODUCTIVITY

Ideally, one of the primary goals of silviculture is maximizing forest productivity. In the context of this plan, "forest productivity" refers to optimizing the long-term productivity of a forested area. In The Oaklands Town Forest, this concept is dramatically illustrated in the extensive areas stocked with poorly-growing hardwoods, where a few large, excellent-quality white pine are found. If it is possible to grow pines of this nature, logic dictates that conversion of the hardwood areas to a white pine forest would greatly improve the vigor and productivity of the areas. In the ideal situation, the goal of silvicultural treatment would be to have every acre of the forest achieve its productive capacity by growing the species or set of species most suited to the existing soils. In practice, this goal is modified by a number of factors.

Silviculture is the vehicle by which various multiple-use objectives are applied. Wildlife habitat improvement, recreational trail development, and forest aesthetic considerations, among others, are all directly influenced by the silvicultural treatment of the forest. Striking a balance with these various multiple-use objectives greatly modifies our ability to maximize forest productivity. For example, a productive monoculture of white pine in the Town Forest would negatively affect conditions for wildlife, while large clearcuts to establish pine would affect recreation and aesthetics.

In many sections of the Oaklands Town Forest, the thin, rock-strewn soils are too dry or nutrient-poor to adequately grow the variety of hardwood species found in more fertile soils. White pine normally outcompetes hardwoods in these marginal soils, and as alluded, is perhaps the most suitable species for these upland sites.

Red oak has also grown well, particularly in areas with sufficient



moisture. In addition to being the most common species on the property, substantial amounts of red oak sawtimber and veneer-quality trees stock the Town Forest. The problem with all oak species, including red oak, is the Gypsy Moth caterpillar. Xeric (dry) site conditions combine with a high oak component to make The Oaklands extremely susceptible and vulnerable to gypsy moth infestations. Repeated attacks have become a chronic problem for The Oaklands, resulting in lost growth, devaluation of sawtimber, and a significant amount of tree mortality.

It is for this reason that a long-term policy of reducing the proportion of oak in The Oaklands Town Forest is advocated. Increasing the amount of tree species unpalatable to gypsy moth, such as shagbark hickory, white ash, red and sugar maple will help buffer the effects of this insect pest. White pine, the most value species commercially, is gypsy moth resistant, in itself not attractive to the caterpillars. Though pine is often defoliated when in the presence of oaks, it usually makes a strong comeback after one lost growing season. The pine component, as discussed, will also make a crucial positive contribution to overall forest productivity.

The logistics of silvicultural treatment to improve the growth of healthy red oaks, while reducing the overall amount of oak in the forest, is complicated by the gypsy moth. Due to changes in its micro-habitat, a tree is stressed, usually slightly, after a forest thinning. For a healthy tree, this stress is quickly overcome by the positive growth response induced by the thinning. However, when a forest is totally defoliated by gypsy moth, grave stress is introduced to the trees. Thinning oak forests immediately before, during, or after the infestation simply aggravates stress conditions and further weakens the trees.

Though it is suggested that harvesting in The Oaklands be timed, if



possible, in between gypsy moth infestations (at least two years after), it is recognized that other management constraints and objectives dictate, to an extent, immediate harvesting. In the mixed hardwood/oak stands which are to be regenerated through conversion to a pine/hardwood mix, it is recommended that an even-aged silvicultural system be used. The shelter-wood technique is discouraged, except if the harvest can be properly timed between insect attacks. Instead, small patch cuts, up to 1/4 acre in size, are suggested, in a well-distributed array. Only trees which represent undesirable seed sources will be removed from the area between the patch cuts, thereby minimizing the potential for tree stress. Finally, patch cut areas should be planted with pine seedlings. Other hardwoods will fill-in on their own. Furthermore, it is recommended that thinning/improvement cuttings in vulnerable intermediate-aged hardwood areas be postponed.

A final factor, poor access, not only modifies, but hinders, the maximization of forest productivity in The Oaklands Town Forest. Increasing the amount of white pine in the forest requires pine planting, and at least partial removal of undesirable seed sources such as black birch and beech, which include many small diameter trees. Reforestation costs increase with poor access, therefore, site preparation and planting efforts should be focused in Compartment 1.

The exceptionally rocky terrain of The Oaklands presents challenging access to logging. Though internal woods roads may be developed to reduce skidding distances no further than 1800', the time and equipment-wear involved in maneuvering over and around rocks serve to easily "double" the skidding distance. Removal of only low-quality, low-value trees, as is usually the case in improvement harvests, is in all likelihood unfeasible for skids over 700' long. Sawtimber must be included in the harvest mix,



particularly for longer skids. (This is consistent with the recommendation for patch-cutting.)

Another access consideration is that use of whole-tree chipping as the mode of harvest operation is probably unfeasible, with the possible exception of Compartment #3. The Oaklands rocky terrain is unsuitable for tree shears as well as grapple skidders. Conventional logging is possible, except in wet or extremely rocky areas. This, however, creates problems for the economical removal of small diameter trees, especially undesirable species which are diseased and/or tend to proliferate when given enough light to regenerate. With conventional logging, it is not feasible to harvest many trees below 8" in diameter. Furthermore, the slash resulting from conventional logging may impede the reforestation work recommended for Compartment 1.

In conclusion, a great deal of complexity faces silvicultural decision-making on The Oaklands Town Forest in the effort to accomodate the various multiple-use objectives and overcome the difficulties posed by the site. The silvicultural package presented in this plan is modified in terms of maximizing forest productivity. A summary of its major points follows:

- 1) White pine is the most productive species for the majority of soils in the Town Forest, relative to growth and timber value.
- 2) Red oak is presently the major species on The Oaklands. It has important value as timber and for wildlife. However, along with other oak species, it is the favored food for gypsy moth.
- 3) The Oaklands are extremely susceptible to gypsy moth attacks, due to upland site conditions, and heavy stocking of oak.
- 4) Gypsy moth problems are chronic, resulting in reduced growth, devaluation of sawtimber, tree mortality, and generally unstable forest conditions.



- 5) Long-term silvicultural conversion from mixed hardwood/oak to a white pine/hardwood mix is desirable, because of: 1) Less susceptibility to gypsy moth; 2) Improvement in forest health; and 3) An increase in forest productivity.
- 6) Forest species mix conversion should include white pine, as well as, trees unattractive to gypsy moth.
- 7) Patch-cutting is recommended for regeneration/conversion areas, followed by planting of white pine seedlings. Light removal of undesirable seed sources is suggested for areas between patch cuts.
- 8) Thinning activity in oak stands should be postponed at least two years after the most recent gypsy moth attack.
- 9) Rocky terrain presents great difficulty to logging and skidding. Sawtimber must be included in the harvest of the less accessible areas, for the harvest to be economically feasible.
- 10) Conventional logging is possible, while whole-tree chipping is of questionable feasibility for forest operations.

Specific recommendations involving long-term silvicultural management and forest productivity are provided for each forest type in the "Forest Description and Recommendations" portion of this plan.

WOODLAND ACCESS

Poor woodland access is a major limiting factor to potential uses of the Oaklands Town Forest, and greatly influences the course of forest management planning and recommendations. The main body of the Town Forest is bounded south by a limited access highway, west by wetlands, and north and east by extensive private woodland holdings. The northerly Town Forest



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areas, represented as Compartment 3, are completely landlocked. External access possibilities to both areas of the property are few and difficult. Furthermore, the development of internal access to all areas is complicated by the property's extremely rocky terrain.

The development of both external and internal access is a crucial component to the future usage of this property, and will be a high forest management priority. The extent of access development will be tempered by economic considerations, however, because of the extremely difficult terrain encountered in The Oaklands, it appears certain that even basic access measures will exceed the returns currently generated from the sale of forest products.

A woods access system provides various benefits: Recreational use, fire protection, access for silvicultural activity, and the creation of edge and forage for wildlife. Three levels of access will be defined: Truck roads, skid trails, and foot paths. Recommendations for these access types will be discussed for the entire Town Forest.

The first level includes roads constructed or upgraded to handle on-road vehicles, particularly trucks and trailers used to market forest products. Though there are no roads of this description presently on the newly-created Town Forest, the construction of a 1000' truck road is imminent. This road will access Compartment 1, entering through the land corridor from Route 85. Plans for this road include the construction of a parking area by the Town, and an access apron onto Route 85 by the State Department of Transportation. The road will terminate with a cleared landing site just west of the corridor, providing logging access to an estimated 60± acres of the former Deene Estate property. The road, which includes several wetlands crossings, was designed in conjunction with the Soil Conservation Service.



In the next five years, a 2500' extension is recommended for this road, running in a northwesterly direction into the interior of the property. The extended truck road, totalling about 3500', will then serve as the access core for the Town Forest. In addition to improving recreational and fire protection access, this additional stretch of road will access an additional 60± acres of woodlands for silvicultural management, including the balance of Compartment 1. Construction of this road extension may be partially financed by an initial round of harvesting, with specific recommendations provided in the silvicultural section of this study. It is also strongly recommended that the Town immediately apply through the ASCS for SL-11 cost-share funds, which will defray some of the road's expense.

It is of some interest to mention here, that much of the obscured remains of an old road traversing The Oaklands--perhaps the former road which lead to Newmarket--has been located. This road snakes its way between the multitude of boulders and rocks in the Town Forest, very closely following the proposed route of the woods road extension. It is probably most expedient, and least expensive, to follow the course of this road for the road extension. However, bulldozing will destroy whatever historical value there may lie in this old road.

Truck road access to Compartment 2, is presently unfeasible for development. The forest in this area was severely harvested in recent years, leaving few merchantable trees, and a young regenerating stand. Commercial harvest of this stand will not be possible for 40± years, at which time truck road access can be developed, probably by extending the "core" access road. This road may be readily financed through revenues accumulated from the prescribed harvests on the property over the next 40 years.

Truck access through an adjacent parcel, the Chamberlin property, is most feasible for Compartment 3. The Chamberlin property already contains



an access road which comes within 400 feet of this landlocked compartment. Permission to use this access road for logging purposes, perhaps in exchange for sharing, or fully covering, road upgrading costs, must be negotiated. Road upgrading will be fairly expensive, but costs may be substantially defrayed by the use of the SL-11 woods road cost-sharing program, which is readily available for private landowners.

Please refer to the Physical Features Map for the approximate location of these roads.

The second level of woods access includes the narrower, rougher trails made by equipment during logging. It is recommended that trails which are later to serve as recreational paths be planned and laid-out prior to logging. These trails include: 1) A route between the parking area and the proposed Route 101 trail underpass (which will serve to connect the Oaklands with the Henderson-Swasey Town Forest); 2) A network of trail loops, primarily west of the core truck road; and 3) another connector trail east of the truck road which access trail(s) on the adjoining Chamberlin conservation easement property.

After logging, trails slated for recreational use can be upgraded by minor stumping, grading, grass seeding, and wetland crossing improvements. (Much of the grading work can be accomplished with a York rake.) Because of the costs associated with developing well-groomed trails, this work should proceed at a methodical pace easily covered by revenues from future woodland harvests. Present attention should focus on improvements to the trail which accesses the Route 101 underpass, insofar as the woodland budget allows.

Finally, footpaths are simple forest paths literally winding through the trees, with few, if any, trees cut to define the path. This will be the most feasible level of current access through areas which are



inaccessible to logging.

Trails and paths will be designed to run in loops of various sizes, along points of interest. Please refer to the Forestry Recommendations Map for a summary of proposed trails, with approximate locations.

TIMBER INCOME

From a financial standpoint, The Oaklands Town Forest is capable of producing periodic income from the harvest and sale of sawtimber, firewood, and other wood products. This income will be necessary to finance woods road construction, reforestation, and forest maintenance work.

In the spirit of long-term forest productivity while balancing the various goals of this forest, harvests will be of varying magnitude. The thinning/improvement cutting of young and intermediate-aged stands will be conservative in nature, as dictated by silviculture, realizing minimal current revenue. By contrast, the regeneration harvest of areas targeted for species conversion can produce substantial current return.

The initial harvest, scheduled for the winter of 1993-94, should gross \$7,500±, enough to cover the costs of the initial woods road (\$5,000), forestry costs related to the harvest operation, and most of the reforestation of patch cut areas. Follow-up harvests covering the interior areas of Compartment 1, and most of Compartment 3, should generate another \$10,000± of income. This is enough to cover all other management costs for the property, except the construction of the woods road extension.

A periodic gross income of \$10,000 - \$15,000 every 15± years, barring natural disaster such as fire or severe insect attacks, can be indefinitely sustained without decimating the forest or sacrificing forestry objectives. Silvicultural management of the forest is crucial for maintaining this level of income indefinitely, i.e., so that the forest is neither over- or



under-harvested, and to insure that productive forest regeneration is established. It is mainly for this reason that the stocking of white pine must be increased: Since white pine holds the greatest timber value potential in this forest, it is important to plan for the distant future by regenerating a productive timber supply now.

This periodic income should be sufficient to cover the costs of woods road construction and maintenance, trail layout and development, forestry services, post-harvest restoration work, reforestation, and boundary maintenance, with perhaps occasional revenue overruns. Once the initial investments in basic road access are made, over the long-run, the Oaklands Town Forest will be self-supporting, without cost to the Town of Exeter.

EDUCATIONAL USES

One of the foremost values of a town forest lies in its potential to serve educationally. A town forest provides a public location for school groups, townspeople, and others to observe and study nature, or forest management activities. But equally as important, a community forest can serve as a visible, "working" example of careful and conscientious resource management.

The Henderson-Swasey Town Forest is an easily accessible area for educational purposes. With improved access for The Oaklands, educational use of this property will also be possible. Touring may be both informal, for individuals visiting the parcels, or planned group-tours, including students, landowners, and other interested parties.

Passive demonstration of the various forest management practices recommended in this plan may be an educational theme of the trail network. "Passive demonstration" is intended to mean that trail markers or plaques



would not be used (they require maintenance). Instead, trail maps which illustrate the areas where various forest practices are taking place, might be made available either at the Exeter Town Hall or Town Forest parking area. Forest practices to be observed may include reforestation areas, improvement harvests, regeneration harvests, wildlife habitat improvement work, and proper stream crossings.

RECREATION

Public recreational use will be a high priority management objective for The Oaklands Town Forest. However, as opposed to the Henderson-Swasey Town Forest property, recreational opportunities will be more broad-based. A major distinction between the properties is the present lack of trails and internal access in The Oaklands property. As a result, hunting has been historically the principal recreational use of the new Town Forest. The Exeter Conservation Commission has decided to retain hunting as a permissible use of The Oaklands, in contrast to a no-hunting policy in the other Town Forest property.

After the parking area and trail network are developed, trail-related activities such as hiking, jogging, mountain biking, skiing, and horseback riding will be available to the public. Of special attraction will be the extensive trail system offered to recreationalists once the Route 101 trail underpass is completed and the two Town Forest properties are connected. Several miles of trail will be available, ultimately connecting to the center of Exeter.

Motorized use (dirt bikes, ATV's, and 4WD) of the property's trails should be strictly discouraged, because of associated litter, vandalism, and soil erosion problems.



A final note is that the trail system will pass through areas which are being actively managed silviculturally. Because of the nature of the existing forest, many areas will undergo long-term conversion and reforestation work, in some cases requiring fairly open harvests. Though these areas may be unappealing to the eye of some visitors, these conditions are temporary.

FOREST AESTHETICS

Forest aesthetics is a nebulous subject, as every individual has a different sense of what degree of orderliness or disturbance, whether naturally or man-caused, is acceptable. Since many of the recommended forestry practices will cause change in the current appearance of the forest, aesthetics and methods to mitigate these changes are further discussed.

Due to the difficult access and terrain in The Oaklands Town Forest, and the resulting lean economics of managing the property, aesthetics will not be as large a priority as in the Henderson-Swasey Town Forest. Monetary investment will generally not be made to improving aesthetics as on the other property, where, for example, extra expenditures were made to lay-out all skid roads in the preparation of a chipping harvest. Moreover, conventional logging will probably be the mode of operation, with slash (branches and brush) left as a result of the harvesting. Though a logger can be contracted to lay slash reasonably close to the ground (within 2 1/2 feet), meticulous removal of slash is not economically feasible.

Providing logging access to the area can be a source of considerable aesthetic impact. Woods roads and landings need clearing and stumping. Grading of road edges and burying of stumps will greatly improve aesthe-



tics, though incur extra cost.

Staging areas are generally messy workplaces. After the logging operation is complete, steps should be taken to dispose of woody debris. It is usually part of the logging operation for the contractor to push woody debris into a neat pile alongside the landing, and grade the area. Burying stumps and seeding with conservation mix grass, is beyond the scope of logging, but can have positive aesthetic effects.

Careful planning and execution of the logging operation is also critical. Trees for harvest should be marked by a forester. Trees of aesthetic interest, such as large trees or unusual species, should be retained, overriding other factors which may encourage their harvest, such as timber value. A corridor of large trees is recommended to be left along the edges of the woods road extension and the trail to the Route 101 underpass.

Since public use of the trail system resulting from the logging operation is to be encouraged, especially on the trail leading to the Route 101 underpass, post-harvest "fine-tuning" work may be advisable. This work will be beyond the scope of the logging operation, and will require volunteer work or some cost on the part of the town. Essentially, this includes: 1) Along trails, collecting or lopping slash which inevitably breaks off harvested trees; 2) Grading (and seeding) skid roads which are to become part of the trail system; and 3) Dressing-up the operation staging area as discussed above.

PRESERVE AREAS

Approximately 15% of The Oakland Town Forest is recommended for designation as permanent no-harvest areas. Distinction should be made here with areas not currently under treatment. Due to poor access and a forest which was severely harvested in recent years, much of Compartment 2 is presently not feasible for treatment. However, the sapling growth in



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this compartment will eventually reach commercial size, and be available for silvicultural treatment. By contrast, much of the area slated for "preserve" is already in a commercial state. These areas are to be withheld indefinitely from any further disturbance by man.

The recommended preserve areas are well-distributed throughout the property, and include wetlands as well as productive forest. The entire landlocked parcel north of the powerlines is suggested. Also included are 50' no-harvest corridors along the woods road extension, leading from the landing site, and the recreational trail to the Route 101 underpass. The location of the preserve areas is illustrated in the Forestry Recommendations Map.

There are multiple purposes for preserve areas: 1) They will eventually develop into old-growth habitat for wildlife, interspersed through the woodlot; old-growth types are presently scarce. 2) They will serve as future "baseline" stands to study and compare managed areas with. 3) They will serve as interesting and aesthetic areas for the public to visit. And 4) large trees in the preserve areas provide a living example of the property's growth potential, and thus, a goal to strive for--through forest management, growing trees as large in other areas of the property.

WILDLIFE

The Oaklands have long been considered outstanding wildlife habitat. Taken in context with the surrounding properties, The Oaklands area represents a contiguous block of nearly 1,500 undeveloped acres. The majority of this area is forested, though fieldland and proximity to the Squamscott River and its associated brackish-water marshes, provide valuable differentiation of wildlife habitat from a regional standpoint.



Perhaps the greatest asset to wildlife possessed by The Oaklands is its high concentration of oak forest. Other important features are:

- 1) The extensive meadows and wooded swamps, which contain cattails and fruit-bearing shrubs, especially high-bush blueberry;
- 2) Softwood pockets interspersed with hardwood areas;
- 3) Areas with sapling growth, along with the areas of well-developed forest (although little old-growth);
- 4) The bisecting powerline, which represents a large area of early-successional forest growth; and
- 5) The extremely rocky terrain, which provides denning opportunities for some wildlife.

A few common mammals in the Town Forest area are deer, fox, raccoon, and porcupine. Moose and black bear may be occasional visitors to the area. Birdlife includes hawks, owls, turkey, woodpeckers, and songbirds.

A generalist approach to wildlife management in The Oaklands Town Forest will be pursued, with the objective of benefitting the greatest number of species. This approach will be on two levels. First, habitat improvement measures will be incorporated into the silvicultural practices recommended in this plan. Examples include: Retaining cavity trees; maintaining a well-distributed selection of mast-producing trees (particularly large-crowned oak, beech, and hickory); creating small pockets of early successional vegetation where appropriate; and producing a supply of browse, especially from maple stumps.

On a more broad-based level, forest management on The Oaklands runs the gamut of silvicultural recommendations for the various stands: Even and unevenaged management, current regeneration areas, intermediate cuttings, and no-harvest preserve zones.



WETLANDS

The Oaklands Town Forest contain extensive palustrine (shallow-water) wetland environments. Wetland types include: several seasonal streams and rocky drainages, sedge meadows, and shrub swamps. No open-water wetlands were noted.

Planned logging activity includes close attention to minimizing the number of wetland crossing points. Where a stream must be crossed with logging equipment, the following techniques are available to mitigate impacts: 1) Logging in the winter or dry summer months; 2) Choosing a narrow crossing point, with well-defined banks, and a stoney bed, where possible; 3) Employing historically-used crossing points, as these are often stoned-in; and 4) Using proper stream fording techniques for logging, such as a log bridge, poled fords, or culverts. Wetlands protection will be a high forest management priority.

FOREST MAINTENANCE

Periodic harvesting in a forest provides a source of income to finance property maintenance. Boundary lines, for example, need occasional upkeep. On the Town Forest, some line are currently in need of location and demarcation. All boundaries are due for a coat of long-lasting paint. Blazing, though expensive, is best; blazed and painted lines last 20 to 30 years.

Another area of periodic work is road and trail maintenance. This includes an annual check and maintainance of culverts and gates, as well as trash disposal.

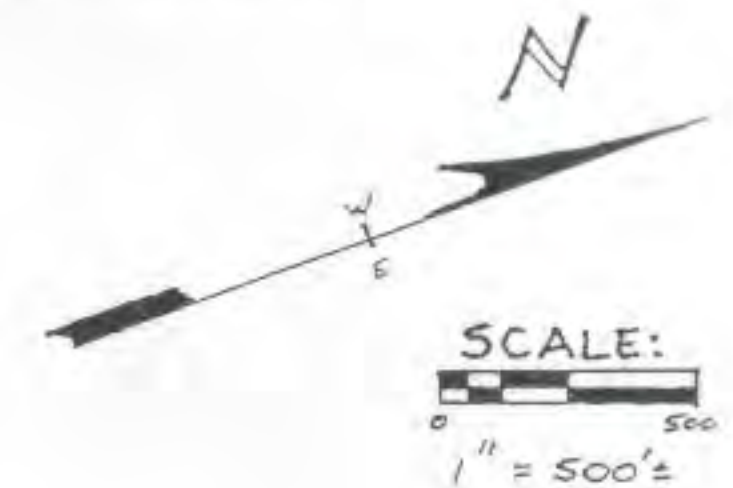
Finally, management planning, maps, and inventory data should be updated every 25± years.



FOREST DESCRIPTION
and
SILVICULTURAL RECOMMENDATIONS

FORESTRY RECOMMENDATIONS MAP

of the
THE OAKLANDS TOWN FOREST
EXETER, NEW HAMPSHIRE
231.8 ± ACRES



RECOMMENDATIONS KEY

No Treatment, Presently	H	Historic Point
Intermediate Treatments Regeneration Harvest/ Reforestation Practices	— — — —	Highway Trail Underpass
Unevenaged Management	— — — —	Existing Trail/Road-- Upgrade
Wildlife/Other Management	— — — —	Proposed Trail/Road
Preserve Area		Culvert
	(X)	Proposed Landing Site

Sources: Aerial Photos: #33015-374-998, ASCS (1974)
ASCS color slide (1989)
Forest Inventory: C. Moreno (8/93)

Map researched and drawn by:
CHARLES A. MORENO, Consulting Forester
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September 1993

FOREST TYPE: Upland Hardwoods

ACRES: 67.2±

STAND DESCRIPTION

STAND CHARACTERISTICS: Found almost exclusively in Compartment 1, this is the predominant forest type on the property. High concentrations of red and black oak, along with very low stocking of softwoods (pine and hemlock), are the distinguishing features of this stand.

An ample volume of oak sawtimber has developed in the stand, falling in the mid-range size of 14 - 18 inches DBH. Generally of above average quality, it is estimated that 18±% of the property's red oak sawtimber is veneer grade.

The stand is highly susceptible to gypsy moth infestations. In light of recent gypsy moth attacks which have visibly affected the growth and vigor of this stand, the future of this forest type is tenuous.

SITE DESCRIPTION: Well-drained soils. Extremely rocky terrain, with large glacial erratics strewn about. Rocks and boulders will impede logging.

STAND POTENTIAL: Though the fine quality oak in this stand demonstrates that it is capable of thriving in this site, the prospect of impending defoliations by the gypsy moth portend a gloomy, unstable future. Tree mortality and a weakened forest can be expected from this chronic problem.

Encouraging a broader spectrum of tree species, especially those well-suited to the site, but less attractive to gypsy moth, will help buffer the negative effects of this insect. Hickory, red maple, and white pine are recommended for the species conversion process, which must take place over the extended period of time of 40 to 50 years.

The scattered white pine in the stand will serve the important function of acting as a natural seed source for this desirable species. Accordingly, virtually no white pine should be harvested from the stand, with the exception of those which are diseased, until adequate amounts of pine regeneration have become established. From a financial standpoint, white pine represents substantial commercial value, and can compensate for losses in the red oak timber potential of the stand.

Generally, the course of regeneration in the less accessible (the westernmost pocket) or highly visible (along Route 101) areas of this stand should be left to natural seeding. By contrast, reforestation efforts, in addition to natural regeneration, are recommended for the more accessible, interior areas of the stand. This will help insure that adequate levels of white pine regeneration are achieved.

As a long-range goal, white pine should eventually represent 40±% of the stand's species composition. Red and white oak, along with shagbark hickory, all important mast producers for wildlife, should represent another 40% of the stocking. A variety of species should round-out the remaining 20% of the species mix.

TECHNICAL DATA

SPECIES: Primary - Red and black oak.
Secondary - Beech, red maple, black and white birch, hemlock, and white pine.



STAND AGE: 75± years SILVICULTURAL STAGE: Intermediate
TREE DIAMETERS: Mean - 9 inches
Range - 6 to 18 inches
STOCKING LEVEL: Well-stocked BASAL AREA: 105 Square Feet/Acre
FOREST REGENERATION: Beech, primarily.

=====

STAND PRESCRIPTIONS

FORESTRY OBJECTIVE(s): Long-term (40 - 50 years) species conversion, to species mix percentages specified above. Two approaches to be applied: A) For interior areas, with good access, initiate conversion process immediately; follow-up with reforestation practices. B) For less accessible areas, or in the vicinity of planned highway underpass, continue intermediate-stage cuttings, with objective of developing existing oak stand well into maturity. At that time, the conversion process can be initiated, relying on natural regeneration.

FAVORED SPECIES: White pine, shagbark hickory.

SILVICULTURAL TREATMENT:

1+ Years - Patch cutting, (group selection), of 25% of the "interior areas", for a total of 8.25 acres. Patch cuts should not exceed 1/4 acre in size, for aesthetic concerns. All trees in patch cut area should be removed, with the exception of pine and hickory. Slash removal, through chipping, is desirable, though perhaps unfeasible. Patches should be well-distributed.

Sanitation/Salvage cutting in forested areas between patch cuts. Removed diseased trees and poor seed trees, especially, black birch and some beech. Salvage white birch, hemlock, and oak which have recently succumbed from the gypsy moth attacks.

RESIDUAL BASAL AREA: 85 Square Feet/Acre

2+ Years - Plant 6600 white pine 3-0 bareroot seedlings at the rate of 800/acre, or approximately 150-200 trees per open patch. Planting may be random (vs. evenly spaced).

3 - 5 Years - Improvement harvest of less accessible/highway areas. Harvest should be conservative and timed 2 to 3 years after most recent gypsy moth attack.

10 -15 Years - Patch cut of another 25% of the "interior areas", with sanitation/salvage, and followed by a similar planting regimen.

15 -20 Years - Improvement cut/thinning, follow-up harvest in less accessible areas, with timing measures.

25± Years - Patch cut/planting along same regimen as before, now on all areas.



FOREST TYPE: Upland Hardwoods, low-stocking

ACRES: 26.1±

STAND DESCRIPTION

STAND CHARACTERISTICS: This forest type is found in some of the higher elevation areas of the property, where the underlying bedrock is particularly close to the ground's surface. Soils are thin and retain moisture poorly during the summer dry season. Site conditions are less than optimal for tree growth, which is reflected by low forest stocking and the stunting of tree heights. Both conditions are distinctive of this forest type.

As with Stand A, red and black oak are the most common species in the stand, however, red maple and black birch are also primary species. Sawtimber volumes are low, as is the overall quality of hardwood sawlogs, due to the unfavorable site conditions.

This area is also highly susceptible to gypsy moth. Increasing the diversity of species, including the introduction of more white pine, would benefit this stand for reasons similar to Stand A. Though direct reforestation efforts are recommended for the more accessible section of this stand (in Compartment 1), planting will be more limited because of the lower productivity potential of the soil.

SITE DESCRIPTION: Exposed ledge and very rocky. Rolling topography with slopes 0-15%. Small shrub swamp areas are interspersed throughout Compartment 1.

STAND POTENTIAL: Low potential for the growth of quality hardwood sawtimber. White pine growth would be moderately better. Chronic gypsy moth problems compound tree stress cause by poor site conditions. Oaks, as well as the scattered wetlands, have wildlife value.

=====

TECHNICAL DATA

SPECIES: Primary - Red and black oak, black birch, red maple.
Secondary - White pine and white oak.

STAND AGE: Variable

SILVICULTURAL STAGE: Unevenaged

TREE DIAMETERS: Mean - 8 inches
Range - 4 to 18 inches

STOCKING LEVEL: Understocked **BASAL AREA:** 60± Square Feet/Acre

FOREST REGENERATION: Red maple, black birch, beech. Some areas with white pine.

=====

STAND PRESCRIPTION

FORESTRY OBJECTIVE(s): Reduce susceptibility to gypsy moth; improve stand productivity. Species conversion work to be done in Compartment 1 area. Parcel north of powerlines recommended as a preserve area due to poor accessibility.



FAVORED SPECIES: White pine

SILVICULTURAL TREATMENT:

- 1+ Years - Patch cutting, (group selection), of 25% of Compartment 1 areas, for a total of 3.75± acres. Patch cuts should not exceed 1/4 acre in size, for aesthetic concerns. All trees in patch cut area should be removed, with the exception of pine and hickory. Slash removal, through chipping, is desirable, though perhaps unfeasible. Patches should be well-distributed.
Sanitation/Salvage cutting in forested areas between patch cuts. Removed diseased trees and poor seed trees, especially, black birch and some beech. Salvage white birch, hemlock, and oak which have recently succumbed from gypsy moth attacks.
- 2+ Years - Plant 1540 white pine 3-0 bareroot seedlings at the rate of 400/acre, or approximately 75-100 trees per open patch. Random planting.
- 3 - 5 Years - Improvement harvest of Compartment 3 area. Harvest conservatively, and time 2 to 3 years after most recent gypsy moth attack.
- 10 -15 Years - Patch cut of another 25% of the "interior areas", with sanitation/salvage, and followed by a similar planting regimen.
- 20 -25 Years - Improvement cut, follow-up harvest in Compartment 3, with timing measures.
- 25+ Years - Patch cut/planting in Compartment 1, with same regimen.



FOREST TYPE: Mixed Hardwoods, young

ACRES: 7.5±

STAND DESCRIPTION

STAND CHARACTERISTICS: This small stand dominates the land corridor which leads into the property from Newfields Road. The forest type was established as a result of a heavy pine harvest in the area 45± years ago. Characterized by sapling and pole-sized hardwood growth, a few large pines--residuals from this prior harvest--are found scattered in the stand.

The first phase of woods road construction will provide excellent access to this stand. The aesthetics of forest improvement work will be a major concern.

SITE DESCRIPTION: Silty soil near Newfields Road is prone to wetness, which limits treatment of this area to winter/summer. Area is fairly rock-free in comparison to the interior sections of the property.

STAND POTENTIAL: The young oak in this stand is growing vigorously and has good potential as sawtimber. High proportions of maple and other hardwoods lessen the effect of gypsy moth.

Logistically, the stand can be presently treated if a chipping operation is viable on the property, perhaps combining the harvest of this stand with work on the adjacent stands. Otherwise, treatment must be postponed 15 to 20 years, when the trees are large enough for conventional logging work.

=====

TECHNICAL DATA

SPECIES: Primary - Red oak, red maple, white birch.
Secondary - White pine, gray birch, others.

STAND AGE: 45± years **SILVICULTURAL STAGE:** Young intermediate

TREE DIAMETERS: Mean - 6 inches
Range - 2 to 10 inches

STOCKING LEVEL: Variable **BASAL AREA:** 60-90 Square Feet/Acre

=====

STAND PRESCRIPTION

FORESTRY OBJECTIVE(s): Develop into mature mixed hardwood stand, with valuable oak sawtimber, and aesthetic character as the "entrance" to the woodlot.

FAVORED SPECIES: Red oak, maple, white pine.

SILVICULTURAL TREATMENT:

1+ Years - Weeding & Thinning, through biomass harvest, if feasible.
"Weed-out" trees of undesirable species, while thinning to release the crowns of young red oak.

15 -20 Years - Improvement cut/thinning. Treatment will have same purpose as first year treatment, with difference that trees are now of commercial size.



FOREST TYPE: Mixed Hardwoods

ACRES: 9.2±

STAND DESCRIPTION

STAND CHARACTERISTICS: Bordered by Stand A, a strict demarcation is not found separating this stand. The change is gradual, though a distinct forest type is found. Birch, maple, and oak stock the stand in more or less equal proportions. In addition, pockets of these hardwoods intermixed with hemlock were noted.

Soil moisture is sufficient enough, despite extremely rocky conditions, to support fine quality hardwoods. However, mortality of white birch and red oak due to gypsy moth is appreciable, often the case on moister soils.

SITE DESCRIPTION: Extremely rocky. Subsurface drainage from surrounding stands results in somewhat moister soils.

STAND POTENTIAL: Has the site potential to grow good quality oak and ash, white birch, and sugar maple. However, extreme rocky conditions hinder the operability of the area for forest management purposes. Intensive management practices, such as chipping work or reforestation are precluded. Also, trees sensitive to gypsy moth are at risk.

=====

TECHNICAL DATA

SPECIES: Primary - Black & white birch, red maple, red oak.
Secondary - Hemlock, white pine, beech, white ash, sugar maple.

STAND AGE: 75± years SILVICULTURAL STAGE: Intermediate

TREE DIAMETERS: Mean - 10 inches
Range - 6 to 17 inches

STOCKING LEVEL: Well-stocked BASAL AREA: 115± Square Feet/Acre

FOREST REGENERATION/UNDERSTORY: Black birch, hemlock, and witch hazel.

=====

STAND PRESCRIPTION

FORESTRY OBJECTIVE(s): Maintain as a mixed stand of valuable hardwood species. Salvage trees at-risk due to gypsy moth. Stand will contain trail corridors slated as preserve areas; manage for aesthetics.

FAVORED SPECIES: White ash, sugar maple, red oak, white birch, white pine.

SILVICULTURAL TREATMENT:

- 1+ Years - Improvement cutting/Salvage. Remove diseased black birch and trees severely weakened by gypsy moth. Salvage recently killed trees, if still merchantable.
- 10 -15 Years - Improvement cut/Thinning. Follow-up treatment as before, thinning around desirable hardwoods.
- 25± Years - Shelterwood harvest or Patch cuts depending on impact of gypsy moth. Encourage regeneration of mixed stand.



FOREST TYPE: White Pine/Hardwood

ACRES: 18.1±

STAND DESCRIPTION

STAND CHARACTERISTICS: Situated on the same upland site as Stand A, and containing good quality red oak, this forest type differs in that white pine, in variable quantities, is a major component. The demarcation with the adjacent Stand A is somewhat obscured, however, it may be defined as the area where pine stocking begins to account for more than 10% of stand composition. Towards the interior of the stand, white pine approaches 50% of stand stocking.

Though gypsy moth have attacked the stand's oak, stand conditions are reasonably healthy. White pine averages mid-sawtimber size, and is of good quality.

SITE DESCRIPTION: Rocks are abundant on the well-drained soils of this stand. Soils are well-suited for the growth of pine. 0 - 20% slopes.

STAND POTENTIAL: The pine-oak proportions of much of the stand, ie., roughly 40% each, is the ideal sought in the species conversion of adjacent areas. Both the pine and oak hold value as sawtimber, while the effect of the gypsy moth appears less devastating. The amount of oak in the stand is sufficient to address wildlife needs.

Access must be improved, in the form of a woods road extension, to reach this stand.

=====

TECHNICAL DATA

SPECIES: Primary - White pine, red oak, red maple, black birch.
Secondary - White oak, hemlock.

STAND AGE: 75± years **SILVICULTURAL STAGE:** Intermediate

TREE DIAMETERS: Mean - 11 inches
Range - 6 to 18 inches

STOCKING LEVEL: Well-stocked **BASAL AREA:** 140 Square Feet/Acre

FOREST REGENERATION: White pine, black birch, hemlock; sparse in areas.

=====

STAND PRESCRIPTION

FORESTRY OBJECTIVE(s): Use white pine as a seed source while it develops into good-quality sawtimber. Increase levels of pine to 40% or 50+% of stocking in all areas of stand. Increase hardwood species diversity.

FAVORED SPECIES: White pine.



SILVICULTURAL TREATMENT:

- 3 - 5 Years - Improvement cut/Thinning. After road extension built. Focus on removal of poor quality hardwoods. Oaks severely affected by gypsy moth will be candidates for harvest. Maintain or increase proportion of pine.
RESIDUAL BASAL AREA: 100 Square Feet/Acre
- 12 -15 Years - Improvement cut/Thinning. Follow-up treatment, this time focusing on increasing pine stocking by retaining pine and removing reasonable amounts of other species.
- 25 -30 Years - Shelterwood Harvest, First Phase. On good pine cone year, remove about 30% of overstory, to favor pine regeneration.



FOREST TYPE: Hemlock/Hardwood

ACRES: 13.3±

STAND DESCRIPTION

STAND CHARACTERISTICS: This forest type exists as scattered pockets in Compartment 1, with one large area along the border with the Chamberlin property. The mix of hemlock and various hardwoods, containing little or no pine, distinguishes this forest type. The forest type is found near the vicinity of wetlands.

While hemlock sawtimber is of average quality, good red oak timber was also noted. Growing intermixed with hemlock is favorable to quality oak growth.

SITE DESCRIPTION: Rocky, especially near wetlands.

STAND POTENTIAL: In addition to serving as a good forest type for wildlife, this stand has red oak and hemlock sawtimber which is available for harvest. Unevenaged management is intended to promote hemlock, and other species, valuable to wildlife.

=====

TECHNICAL DATA

SPECIES: Primary - Hemlock, black & white birch, red oak, red maple.
Secondary - Yellow birch, white pine.

STAND AGE: 40 - 100± years SILVICULTURAL STAGE: Unevenaged

TREE DIAMETERS: Mean - 10 inches
Range - 2 to 18 inches

STOCKING LEVEL: Well-stocked BASAL AREA: 140 Square Feet/Acre

FOREST REGENERATION: Hemlock, with sparse areas.

=====

STAND PRESCRIPTION

FORESTRY OBJECTIVE(s): Manage to promote wildlife. Maintain unevenaged species mix. Harvest some oak and hemlock sawtimber, presently.

FAVORED SPECIES: Hemlock, red oak, others.

SILVICULTURAL TREATMENT:

3 - 5 Years - Individual Selection. Harvest proportionate number of trees of from entire diameter class range represented by the stand.

RESIDUAL BASAL AREA: 110 Square Feet/Acre

12 -15 Years - Individual Selection. Similar treatment, making small openings for hardwood regeneration.

25 -30 Years - Individual Selection. Similar treatment. Continue age-class differentiation.



FOREST TYPE: Pine/Hemlock/Hardwood

ACRES: 13.5±

STAND DESCRIPTION

STAND CHARACTERISTICS: This stand is represented by a number of scattered pockets, covering all three compartments. In addition to mixed hardwoods, both pine and hemlock are found in appreciable amounts (10%+).

Tree growth is good, as this forest type tends to occupy the moister sites adjacent to wetlands. Because of heavy stocking with larger trees, this is among the more scenic stands on the property.

Among the areas classified as this forest type, is a scenic two acre pocket of older growth trees near the northwest corner of Compartment 1. Containing large pine and hemlock, this pocket escaped the heavy harvesting which took place on the former Deene property 75± years ago. A recreational trail is recommended to traverse this suggested preserve area.

SITE DESCRIPTION: Not as rocky.

STAND POTENTIAL: Well-stocked with sawtimber, this stand has good potential to produce quality oak and pine in the areas being managed. The dense hemlock understory has value as cover for deer.

=====

TECHNICAL DATA

SPECIES: Primary - Hemlock, white pine, black birch, red oak.
Secondary - Red maple, white birch, beech.

STAND AGE: 75 to 100+ years **SILVICULTURAL STAGE:** Mid/late Intermediate

TREE DIAMETERS: Mean - 8 inches
Range - 2 to 18 inches

STOCKING LEVEL: Well-stocked **BASAL AREA:** 140 Square Feet/Acre

FOREST REGENERATION: Hemlock, black birch, white pine. Dense understory.

=====

STAND PRESCRIPTION

FORESTRY OBJECTIVE(s): Develop existing stand into good-quality, mature sawtimber. Maintain corridors of young/old hemlock for wildlife. Over time, hemlock will aggressively take-over the site. Constant provision should be made to insure the regeneration of pine, and some oak.

FAVORED SPECIES: White pine, red oak, hemlock (partially).

SILVICULTURAL TREATMENT:

- 3 - 5 Years - Improvement cut/Thinning. Remove poorer quality trees, while providing increased growing space to crop trees. Retain good stocking of white pine as a seed source. Reduce levels of hemlock, retaining "corridors".
RESIDUAL BASAL AREA: 110 Square Feet/Acre
- 12 -15 Years - Improvement cut/Thinning. Similar treatment, maintaining pine stocking and reducing hemlock levels.
- 25 -30 Years - Shelterwood Harvest, First Phase. On good pine cone year, remove about 35% of overstory, primarily hemlock.

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FOREST TYPE: Wetland Hardwoods

ACRES: 26.3±

STAND DESCRIPTION

STAND CHARACTERISTICS: This extensive stand type is identified as all the forested wetlands on the property. Red maple is the predominant species, though elm, black gum, yellow birch, ash, and in some areas, hemlock and spruce, are found. Tree stocking is variable, but mostly low. Highbush blueberry densely stocks open areas.

SITE DESCRIPTION: Poorly drained soils; some seasonal watercourses.

STAND POTENTIAL: Though the interior of these wetlands are inoperable, the edges are accessible to cable logging. A desirable goal, at least along these wetland edges, is wildlife habitat improvement. This is accomplished by periodically harvesting maple to create a supply of stump sprouts, while increasing the amount of shrubby vegetation

=====

TECHNICAL DATA

SPECIES: Primary - Red maple.
Secondary - Elm, black gum, hemlock.

STAND AGE: 75± years SILVICULTURAL SYSTEM: Coppice

TREE DIAMETERS: Mean - 10 inches
Range - 6 to 16 inches

STOCKING LEVEL: Variable BASAL AREA: 20-100 Square Feet/Acre

FOREST UNDERSTORY: Highbush blueberry, ferns and grasses.

=====

STAND PRESCRIPTION

FORESTRY OBJECTIVE(s): Due to access limitations, much of this stand is slated as preserve. Conditions for wildlife are to be enhanced in accessible areas.

FAVORED SPECIES: Red maple, hemlock, black gum, blueberry, and other species favorable to wildlife.

SILVICULTURAL TREATMENT:

- 3 - 5 Years - Harvest of maple cordwood, both individually and in groups along stand edges, where accessible, promoting stump sprouts, and therefore, coppice regeneration system.
- 12 -15 Years - Harvest of maple cordwood, promoting fresh stump sprouts.
- 25 -30 Years - Harvest of maple cordwood. Continue promoting development of a coppice stand.



FOREST TYPE: Recently Harvested Areas

ACRES: 36.0±

STAND DESCRIPTION

STAND CHARACTERISTICS: 75% of the former Jensen property lands, mostly comprising Compartment 2, were heavily harvested in the mid to late 1980's. Virtually all the merchantable sawtimber and cordwood were removed from this stand, with the exception of a few small pockets containing pine, hemlock, and hardwoods. In the extensive clearcut areas, sapling growth, primarily black birch, is becoming firmly established.

SITE DESCRIPTION: Exposed ledge, rocky. Interspersed wetlands.

STAND POTENTIAL: The remnants of the former stand are too scattered to be feasible for further harvest. Site preparation, reforestation, and/or measures to improve the species mix which is presently regenerating, are all unfeasible due to Compartment 2's poor access. Unfortunately, the regenerating species mix holds little value for wildlife or as future timber.

=====

TECHNICAL DATA

SPECIES

REGENERATING: Primary - Black birch.
Secondary - Beech, red maple, witch hazel, others.

STAND AGE: 5-10± years SILVICULTURAL STAGE: Regenerating

TREE DIAMETERS: Mean - 2 inches
Range - 1 to 18 inches

STOCKING LEVEL: Variable

=====

STAND PRESCRIPTION

FORESTRY OBJECTIVE(s): Allow current regeneration to develop into merchantable size, which will require 40± years. At that time, study silvicultural options of either continuing the development and improvement of the existing stand, or regenerating into a new stand. Road access must also be improved at the time the stand is treated.

SILVICULTURAL TREATMENT:

0-40 Years - No treatment.

40± Years - Study silvicultural options, as specified.

- Construction of access road.



FOREST TYPE: Pine/Hemlock/Hardwood, young

ACRES: 11.8±

STAND DESCRIPTION

STAND CHARACTERISTICS: Located entirely in Compartment 3, this promising stand contains a mix of pole-sized pine and hardwoods, with varying amounts of hemlock. White pine, especially, is of good quality.

SITE DESCRIPTION: Rocky, with exposed ledge. 0 to 15% slopes.

STAND POTENTIAL: White pine in this stand has the potential to develop into valuable sawtimber. It should respond well to thinning at this relatively early stage. Biomass harvesting is the preferable mode of operation in this stand.

=====

TECHNICAL DATA

SPECIES: Primary - White pine, red oak.
Secondary - Hemlock (abundant in pockets).

STAND AGE: 50 ± years SILVICULTURAL STAGE: Young intermediate

TREE DIAMETERS: Mean - 8 inches
Range - 5 to 14 inches

STOCKING LEVEL: Well-stocked BASAL AREA: 130 Square Feet/Acre

FOREST REGENERATION: White pine, hemlock, red maple. Sparse in areas.

=====

STAND PRESCRIPTION

FORESTRY OBJECTIVE(s): Encourage growth of high quality pine; increase proportion of pine to 50+% as stand develops.

FAVORED SPECIES: White pine; red oak, to a lesser extent.

SILVICULTURAL TREATMENT:

- 3 - 5 Years - Improvement cut/Thinning. After access improvements to road on abutting property. Release the crowns of well-formed pine to increase their growth. Remove poor quality hardwood.
RESIDUAL BASAL AREA: 100 Square Feet/Acre
- 12 -15 Years - Improvement cut/Thinning. Follow-up treatment, again releasing pine while upgrading stand quality. Also, if hemlock levels are increasing, harvest so that this species does not exceed 15% of stand's overall stocking.
- 30± Years - Improvement cut/Thinning. Similar treatment as above.

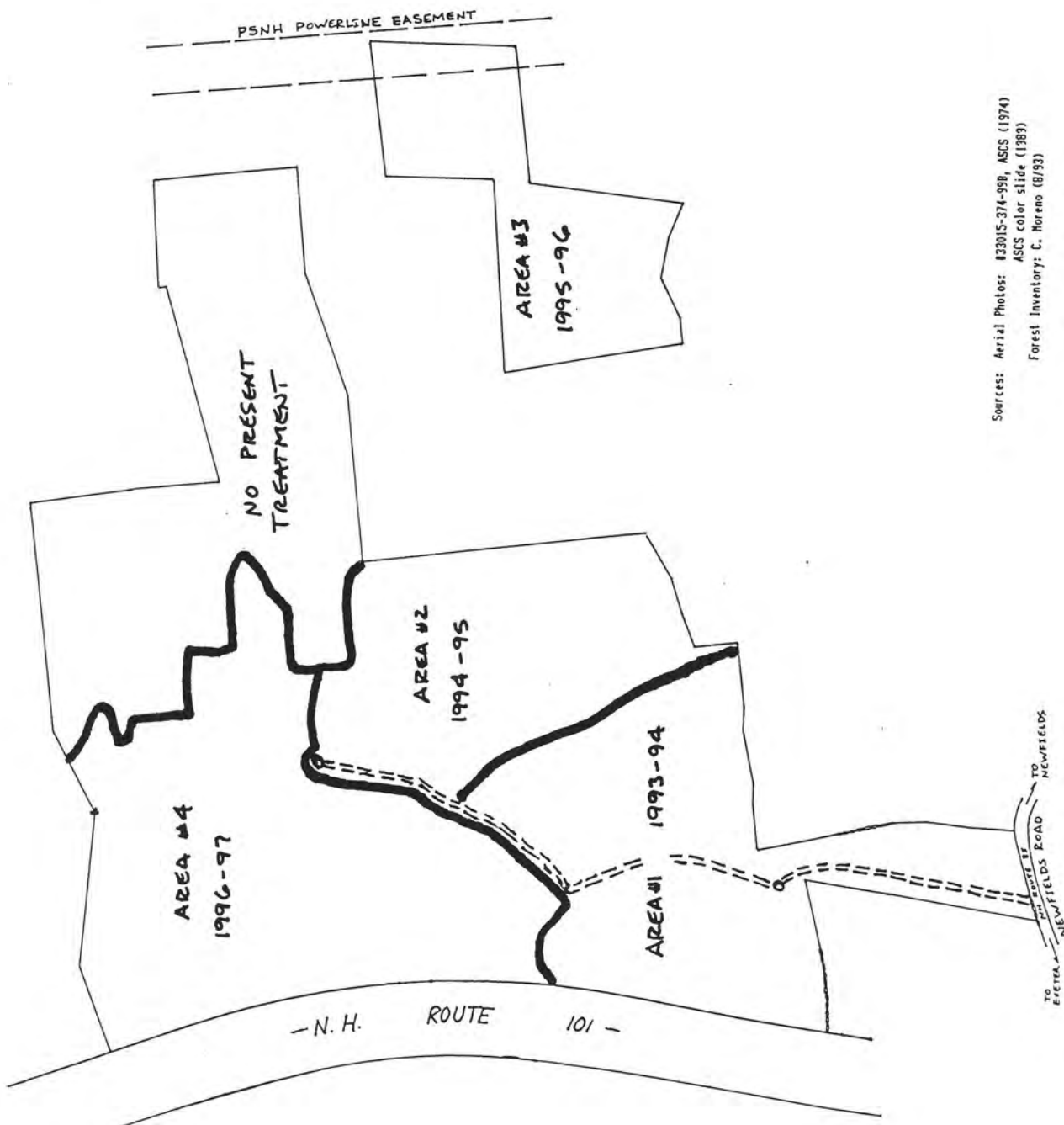
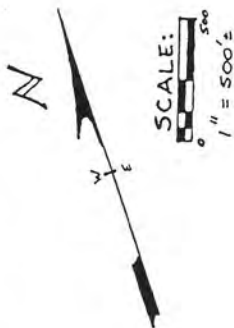


FOREST TREATMENT PLAN

HARVEST SCHEDULE MAP

of the

THE OAKLANDS TOWN FOREST
EXETER, NEW HAMPSHIRE
231.8 ± ACRES



Sources: Aerial Photos: #33015-374-998, ASCS (1974)
ASCS color slide (1989)
Forest Inventory: C. Moreno (8/93)

Map researched and drawn by:
CHARLES A. MORENO, Consulting Forester
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September 1993

FOREST OPERATIONS

A systematic approach in applying forestry recommendations is a key ingredient of successful forest management. In this section, all prescribed treatments are organized chronologically--based on cash flow, priority, access, and work completion for each compartment.

This schedule is intended to establish chronology for forestry practices rather than a strict timetable. A flexible timetable is necessary to accommodate the occurrence of good seed years, weather, markets, and the availability of reliable contractors. The goal of scheduling is to facilitate the accomplishment of the prescribed activities.

The following codes are used to signify the person or contractor doing a specific task:

C = Conservation Commission/Town Planner

F = Forester

L = Logging Contractor

R = Road Contractor

V = Volunteer

The cost/revenue analysis is based on projected net income and expenses from forest operations. Projections are "ballpark" figures, based on estimated amounts of forest products to be harvested and estimated forestry/logging/construction costs.

Target Completion Dates:

June 1, 1994 - Harvest Area #1

June 1, 1995 - Harvest Area #2

June 1, 1996 - Harvest Area #3

June 1, 1997 - Harvest Area #4



SCHEDULE OF FOREST TREATMENTS: 1993 - 1994

DATE	COMPT	TREATMENT	WHOM
-----	-----	-----	-----
1993			
Fall	1	-CLEARING/CONSTRUCTION, 1000' woods road	R
		-APPLY for woods road extension cost-share	C
Fall/ Winter	1	-PREPARATION, Harvest Area #1, 39 acres	F
		-LAYOUT woods road extension & trails	F
1994			
Winter	1	-HARVEST Area # 1	L
		-CLEAR woods road extension	L
		-CLEAR trails to highway underpass	L
		-ORDER 4,000 seedlings	F
Spring	1	-REFORESTATION, Area #1, 5 acres	F
Summer	1	-CONSTRUCTION, 2500' woods road	R
		-UPGRADE/SEED highway underpass trail	R & V
		-PREPARATION, Harvest Area #2, 33 acres	F
		-LAYOUT of recreational trail	F
Fall/ Winter	1	-HARVEST, Area #2	L
		-CLEAR recreational trail	L
1995			
Winter	All	-LOCATE, BLAZE & PAINT Property bounds	C & F
	1	-ORDER 1,600 seedlings	F
	3	-NEGOTIATE Chamberlin road access	C
Spring	1	-REFORESTATION, Area #2, 2 acres	F



SCHEDULE OF FOREST TREATMENTS: 1993 - 1994

DATE	COMPT	TREATMENT	WHOM
-----	-----	-----	-----
1995 - Cont.			
Summer	3	-Chamberlin road IMPROVEMENTS	R
		-PREPARATION, Harvest Area #3, 22 acres	F
		-LAYOUT of recreational trail	F
Fall/ Winter	3	-HARVEST, Area #3	L
		-CLEAR recreational trail	L
1996			
Spring	1	-PREPARATION, Harvest Area #4, 56 acres	F
		-LAYOUT of recreational trails	F
Summer/ Winter	1	-HARVEST, Area #4	L
		-CLEAR recreational trails	L
1997			
Winter	1	-ORDER 2,800 seedlings	F
Spring	1	-REFORESTATION, Area #4, 5.5 acres	F
		-Grass SEEDING of roads/landings	C/F
		-UPGRADE trail	V



COST/REVENUE ANALYSIS

PROJECT -----	ESTIMATED REVENUE -----	ESTIMATED EXPENSE -----
<u>1993</u>		
ROAD		
-Construction		\$5,000±
<u>1994</u>		
HARVEST #1		
-Forestry costs		\$1,800±
-Stumpage revenue	\$7,500±	
ROAD		
-Layout		\$ 200±
-Construction		\$10,000±
REFORESTATION		
-Stock & Planting		\$1,600±
TRAIL		
-Upgrade		\$ 500±
<u>1995</u>		
HARVEST #2		
-Forestry costs		\$ 900±
-Stumpage revenue	\$3,700±	
PROPERTY BOUNDS		
-Locate/blaze/paint		\$2,500±
REFORESTATION		
-Stock & Planting		\$ 700±
ROAD		
-Upgrade		\$1,000±
<u>1996</u>		
HARVEST #3		
-Forestry costs		\$ 600±
-Stumpage revenue	\$1,800±	
<u>1997</u>		
HARVEST #4		
-Forestry costs		\$1,700±
-Stumpage revenue	\$4,000±	
REFORESTATION		
-Stock & Planting		\$1,300±
ROADS & LANDINGS		
-Seed		\$ 200±
TOTALS	\$17,000	-\$28,000

FINAL PROJECTED BALANCE.....(-\$11,000±)



COST BREAKDOWN

Category	Cost
-----	-----
Roads	\$16,200±
Forestry	5,000±
Reforestation	3,600±
Property lines	2,500±
Trails	700±
-----	-----
TOTAL	\$28,000±

REVENUE SUMMARY

Harvest Area	Revenue
-----	-----
1	\$ 7,500±
2	\$ 3,700±
3	\$ 1,800±
4	\$ 4,000±
-----	-----
TOTAL	\$17,000±



APPENDICIES

APPENDIX A

SCIENTIFIC NAMES and ABBREVIATIONS for TREE SPECIES
FOUND in THE OAKLANDS TOWN FORESTSoftwoods

White Pine	WP	<u>Pinus strobus</u>
Pitch Pine	PP	<u>Pinus rigida</u>
Eastern Hemlock	HM	<u>Tsuga canadensis</u>
Red Spruce	SP	<u>Picea rubens</u>

Hardwoods

Northern Red Oak	RO	<u>Quercus rubra</u>
Black Oak	BO	<u>Quercus velutina</u>
White Oak	WO	<u>Quercus alba</u>
Scarlet Oak	SO	<u>Quercus coccinea</u>
American Beech	BE	<u>Fagus grandifolia</u>
Red (White) Maple	RM	<u>Acer rubrum</u>
Sugar (Rock) Maple	SM	<u>Acer saccharum</u>
White (Paper) Birch	WB	<u>Betula papyrifera</u>
Yellow Birch	YB	<u>Betula allegheniensis</u>
Black Birch	BB	<u>Betula lenta</u>
Gray Birch	GB	<u>Betula populifolia</u>
White Ash	WA	<u>Fraxinus americana</u>
Shagbark Hickory	SH	<u>Carya ovata</u>
American Basswood	BA	<u>Tilia americana</u>
Black Cherry	BC	<u>Prunus serotina</u>
American Elm	EL	<u>Ulmus americana</u>
Bigtooth Aspen (Popple)	PO	<u>Populus grandidentata</u>
Black Gum (Tupelo)	BG	<u>Nyssa sylvatica</u>



APPENDIX B

TREE INSECTS AND DISEASE INFORMATION

The gypsy moth, as discussed throughout this study, is an insect pest with major negative consequences for The Oaklands. The principle species group on the property are the oaks, composing roughly 40% of stocking, with some areas approaching 60-70%. Gypsy moth are especially attracted to oak stands on dry sites. The Oaklands are prime candidates to their continued attacks. Recent attacks since the early 1980's have been fairly devastating, demonstrated by overall growth loss, dieback and weakening of trees, as well as mortality of hemlock, white birch, and oak. From a silvicultural standpoint, reducing the proportion of oak in The Oaklands while retaining healthy, gypsy moth "resistant" trees, helps buffer the attacks.

The hemlock adelgid, an insect slowly spreading through southern New England, may pose a risk to the hemlock stocking on the property, if it reaches our area. Presently there is only moderate concern.

A few pathogens were observed affecting trees in the property. No disease is presently cause for alarm. Diseased trees should be removed in the course of harvesting, thereby salvaging any merchantable wood and reducing the possibility of spreading the disease.

Low incidence of white pine blister rust was noted. These trees usually die within 25 years infection, and should be identified and removed during the upcoming harvests.

Beech bark disease, a widespread disease, affects some of the middle-aged and older beech on the property. Heavy decay occurs over a period of fifteen to thirty years, after which the disease is usually fatal. Because beech regenerates prolifically, it is unlikely that the species will be decimated to critical levels.



Black birch on the property is often afflicted by Nectria cankers, a common disease of birch in our area, which is eventually fatal. Due to this disease, the regeneration of black birch is often not favored, as most trees become diseased by the time they reach small sawtimber size.

Other diseases of little concern because of low incidence are Strumella cankers in oak, Nectria in red maple, Hypoxylon cankers in popple, and Inonotus obliquus, (forming "cinder conks") in white and yellow birch.



APPENDIX C

FOREST MANAGEMENT RECORDS: 1993 -1998

Year	WP	Sawtimber Species Harvested			Fwd	Chips	Gross Revenue
		HM	RO	Other			
1993							
OTHER WORK ACCOMPLISHED:							
1994							
OTHER WORK ACCOMPLISHED:							
1995							
OTHER WORK ACCOMPLISHED:							
1996							
OTHER WORK ACCOMPLISHED:							
1997							
OTHER WORK ACCOMPLISHED:							
1998							
OTHER WORK ACCOMPLISHED:							
TOTALS							



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APPENDIX D

GLOSSARY

Basal Area	The number of square feet contained in the cross-section of a tree at breast height (4.5 feet from ground level).
BA/AC	<u>Basal Area per Acre</u> , given in square feet.
Biomass Operation	Whole-tree chipping.
Board Foot	A unit of volume measurement equal to the volume in a 1" x 12" x 12" block of wood.
Bole	A tree's trunk section.
Chips	Forest product produced from the chipping of poor-quality trees or treetops. Used primarily as fuel to produce steam for turbines which generate electricity.
Commercial	Merchantable or saleable timber.
Commercial Operation	A forest treatment where the harvested trees are marketable as timber, firewood, pulpwood, chips, or other forest product.
Conventional Logging	Traditional method of logging involving chainsaws for tree felling, and cable skidders or tractors to yard the trees.
Cord	Unit of volume measurement equal to the volume in a 4' x 8' x 4' space.
Crop Tree	Tree, which because of its species, growth, vigor, form, location, and/or market value is designated as a component of the final, mature stand of timber and is favored silviculturally through its lifetime.
Cull	A tree which is unmerchantable as sawtimber due to deformities or decay in its bole.
Cutting Cycle	The period of years or the timespan established between harvests.



DBH	<u>Diameter at Breast Height</u> , or the diameter of a tree at a level 4.5 feet above the ground.
Edge	The demarcation or zone where different natural habitats come together.
Even-aged	A forest stand where variation in tree age does not exceed 25 years, and no more than two age classes are present.
Intolerant	Tree species unable to withstand overstory shade when at a young age.
Mature Timber	A) <u>Financially</u> mature timber is timber which has reached its peak growth. B) <u>Economic</u> maturity is the stage where a tree's grade and value will deteriorate if left until the next harvest. C) <u>Biological</u> maturity is the stage where a tree is in imminent danger of death by the next harvest.
MBF	<u>Thousand</u> Board Feet.
Pole	A tree 4 to 10 inches in diameter (DBH).
Precommercial	Tree too young to be merchantable.
Precommercial Operation	A forest treatment, such as tree pruning or a weeding operation, which does not yield merchantable products.
Regeneration	Seedlings, or a new crop of trees.
Rotation	The time span allotted for a forest stand between its establishment and its maturity. Thereafter, the stand is regenerated.
Sapling	A tree 1 to 4 inches in diameter.
Sawtimber	Trees of sawlog size, or above 10 inches at DBH.
Scarification	Scraping of the soil's duff layer to expose the mineral seed bed to encourage regeneration.



Seedling	A young tree less than one inch in diameter.
Silviculture	The treatments applied to a forest to improve tree growth and value, and stimulate regeneration.
Site Index	A ratio between tree age and total height, used to express the productivity of an area.
Site Potential	The capacity of a given area of land to grow timber.
Stocking	The density of trees on a given area of land.
Stumpage	Standing timber.
Sustained Yield	A continuous and cyclic yield of forest products from a land area over many years (usually broken into cyclic cuts during the rotation span). Maintaining forestland productive.
Tolerant	Tree species able to withstand low-light conditions, especially shading from overstory trees above.
TSI	<u>Timber Stand Improvement</u> , refers to precommercial operations with trees, such as pruning, weeding and thinning.
Unevenaged	A forest stand characterized by a variety of age classes and tree age spread of over 25 years.
"Weed" Tree	Trees of undesirable species, form, or condition which are interfering with the growth of the crop trees.
Whole Tree Chipping	Harvest or logging operation involving the use of a tree shear to fell trees, as well as grapple skidders and a large stationary chipper. Well-suited for improvement cuttings of low-quality stands.

