Village of Fredonia

Watershed Properties

Forest Management Plan

2020-2034

FORECON INC.

FOREST MANAGEMENT PLAN

Watershed Properties
Spoden & Glasgow Tracts

2020 - 2034

346.3 & 43.1 Acres

Property Location:

Town of Pomfret
Chautauqua County, New York State

Prepared For:

Village of Fredonia
9-11 Church Street
PO Box 31
Fredonia, NY 14063

Prepared By:

FORECON, INC.
1890 E. Main Street
Falconer, New York 14733

Craig Vollmer, Chief Forester

Tab Index & Contents

Property Uses & Management Goals

Understanding the uses of a property and the management goals are the most crucial start to the management planning process and guide direction for management activities. Based on discussions with the owner, the property uses and goals for management are understood as follows:

Property Uses/Reasons for Ownership

- Village water supply
- Timber asset management

Management Goals

- Protect soil and water resources.
- Protect water supply.
- Maximize natural water filtration through the forest.
- Responsible stewardship of the forest resources.
- Sustainable management of the timber resource to improve its health and condition.
- Develop a periodic income stream from the sale of timber.

This report has been developed to characterize the timber resources of the property and outline recommendations for sustainable management within the bounds of these management goals.

Executive Summary

Ownership Information

Tract Name: Spoden and Glasgow

Owner Name: Village of Fredonia

Contact Person(s): Chris Surma – Water Filtration Plant Supervisor

Owner Address: 9-11 Church Street, P.O. Box 31, Fredonia, NY 14063

Owner Phone No.: (716) 679-2307

Owner Email Address: fredoniavillageclerk@netsync.net

Contact Person(s) Phone No.: Work: (716) 679-2310 Mobile: (716) 410-2141

Contact Person(s) Email Address: fredoniawtpco@outlook.com

Property Location: Spoden Road, Town of Pomfret, Chautauqua County, New York State
Glasgow Road, Town of Pomfret, Chautauqua County, New York State

Tax Parcel ID#: Glasgow – 181.00-2-1

Deed Book/Page:

Total Acreage of Property: Spoden – 346.3, Glasgow – 43.1

Total Management Stand Acreage: Spoden – 201.6, Glasgow – 18.5

Number of Management Stands: Spoden – 7, Glasgow - 1

Forecon Project File #: 16302

Property Description

Access:

Spoden

600 and 2,700 feet of frontage on Spoden Road.

600 feet of frontage on Darby Switch Road.

500 feet of frontage on both sides of the Water Plant Access Road Right-of-Way.

5,300 feet of frontage along the abandoned railroad bed.

Because of the parcel ownerships and terrain access to the bulk of the manageable forest on the Spoden Watershed is inaccessible without permission from adjacent owners.

Stand 2 is directly accessible by way of the frontage and spillway access road off Spoden Road.

Stand 4 is directly accessible by way of an old skid trail off of the Water Filtration Plan Access Road Right-of-Way.

Stands 8, 9, 11, 13, & 14 have no direct road frontage and are inaccessible internally because they are cut off by the reservoir, deep ravines, riparian wetlands, and main creek feeding the reservoir. These areas are only accessible by way of the abandoned railroad bed that forms the western boundary of the

property; access is from the south end of the railroad bed where it intersects with Glasgow Road. The railroad bed is owned by the Niagra Mohawk Power Corp., but according to records is managed by National Grid. The rail road bed was used by the Village in the past for harvesting. It should be noted that there is are a couple of spots along the rail road bed that are washed out from erosion and will need to be repaired for harvesting access.

Per records from 2009 the contact person for National Grid for obtaining authorization to use the rail road bed is Gary DeStefanis 315-749-6976.

The southern part of Stand 13 is cut off from access by a deep ravine. There is evidence that it was accessed in the past by way of the neighboring property, which is currently owned by Peter Jarzynka with an address of 115 Richfield Road, Williamsville, NY 14221.

Records show that Stand 6 and the east side of stand 10 (reservoir) were accessed in the past way of Spoden Road, but current tax records show that the strip of open land there is no longer owned by the Village and is now owned by Arthur Lepp with an address of 8944 Spoden Rd., Fredonia, NY 14063.

Internal access is provided by way of a network of existing skid trails.

Existing landing for harvest operations is located on Spoden Road and the abandoned rail road bed.

Glasgow

900 feet of frontage on Glasgow Road.

Internal access is provided by way of a network of existing skid trails and old abandoned gravel roads that were not maintained and are no longer accessible by vehicle.

Boundary Line Maintenance:

Spoden

Length: 4.5 miles (excludes frontage on public roads, but includes frontage along the rail road bed, which is approximately 1 mile in length)

Paint Color: red

Condition: poor

Glasgow

Length: 0.4 miles (excludes frontage on public roads and through wetlands)

Paint Color: red

Condition: poor

Last Maintenance: 1991 (records indicate painting was scheduled for 2000, but there is no record to indicate that it was performed)

Next Scheduled Maintenance: 2020

Boundary lines should be re-painted every +/- 10 years depending on condition.

Topographic Features Present:

Flat
Sloping
Steep
Rolling
Side Hill
Ravines
Gullies

Water Resources Present:

Fredonia Reservoir
Upper Cassadaga Lake
Major permanent stream
Minor permanent stream
Intermittent drainage
Pond
Open wetland/marsh
Riparian wetland
Vernal pools
Spring seeps
Protected Streams: yes
Protected Wetlands: yes

Special or Unique Features:

Fredonia reservoir, spill way, water filtration plant, abandoned railroad bed, power line, gas line, abandoned buildings (on Glasgow)

Rare, Threatened, or Endangered Species:

A search was conducted in the NY Natural Heritage records through the NYS DEC Environmental Resource Mapping application. Records indicate that there are no known significant natural communities present on the Spoden Tract. Records do indicate that the Spoden Tract falls in an area where there has been a finding of a rare plant or animal. This database indicates that the Spoden reservoir is central to the mapped area associated with the finding, but does not provide specific information about it or if the property itself is where the finding is located, but based on experience in most cases rare plants and animals in this area of NY are typically aquatic in nature and upland forest sites like those on the property that are to be managed for timber are rarely associated with such plants or animals, or are not impacted by forest management activities. In the specific case of the Spoden Reservoir, it would also not be surprising if this finding was in direct reference to bald eagle or heron activities and/or nesting sites along the reservoir or riparian wetland areas directly up stream. None were observed during the inventory, but the inventory had little direct contact with the area adjacent to these sites as they were excluded because they are not accessible for forest management. In any event, if such sites were discovered while implementing the plan, proper procedures would be followed to ensure their protection. Furthermore, the prescriptions laid out in the plan specifically call for unmanaged forest buffers along the reservoir and riparian wetlands up stream.

Management History/Plan Updates & Changes:

Original Plan: 1991

Last Update: 2006

Changes: Stand mapping/numbering has been revised. 2006 stand maps are included in the appendix for reference

History:

Spoden

Stand #	Last Inventory	Last Harvest	Harvest Type	Other Information
2	2019	none	--	
4	2019	1991	Thinning	
8	2019	2000	Thinning	
9	2019	1994	Thinning	
11	2019	1993, 1997	Thinning	
13	2019	1993	Thinning	
14	2019	1994	Thinning	

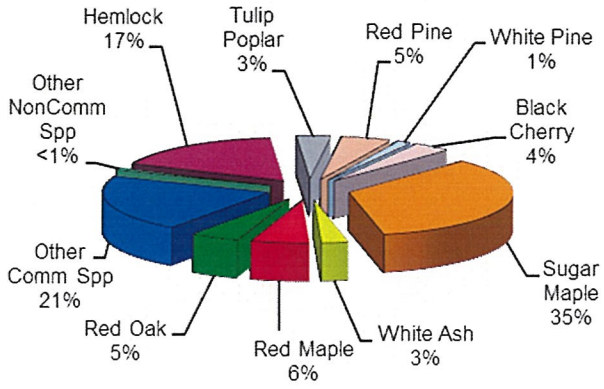
Glasgow

Stand #	Last Inventory	Last Harvest	Harvest Type	Other Information
1	2019	2007	Regeneration Release	

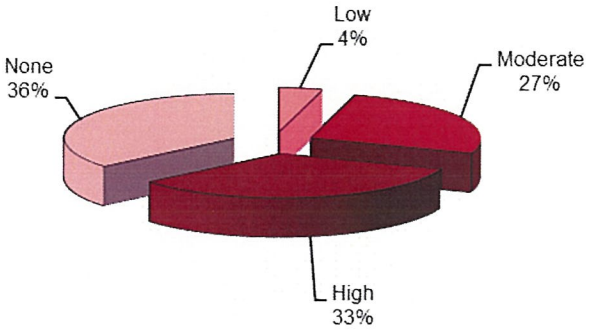
Tract Summary of Inventory Data – Spoden

All volumes and values are estimates based on a statistical sample. Volumes will vary plus or minus depending on sample size and are not guaranteed. Values are established from an opinion of fair market pricing by species for the entire ownership and are not guaranteed. These figures are not intended for use in advertising the sale of standing timber or real estate; Forecon, Inc. cannot guarantee any result if used in such a manner.

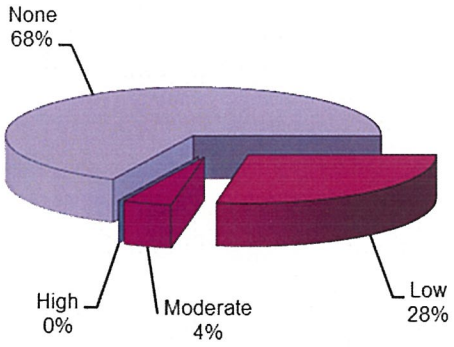
Species Comp (% Basal Area)



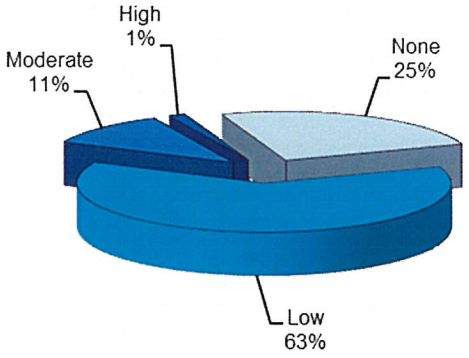
Deer Browse Intensity/Damage (% Plots)



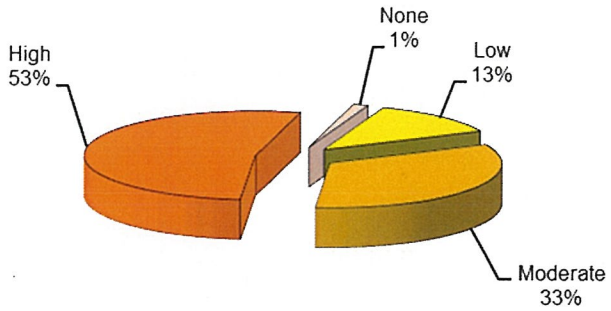
Density of Seedling Regen (% Plots)



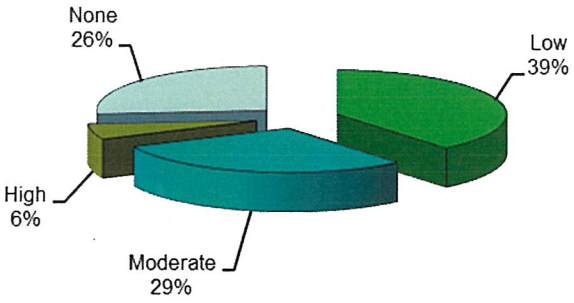
Density of Sapling Regen (% Plots)



Density of Woody Comp (% Plots)
Primary Types: Grapevine, Beech

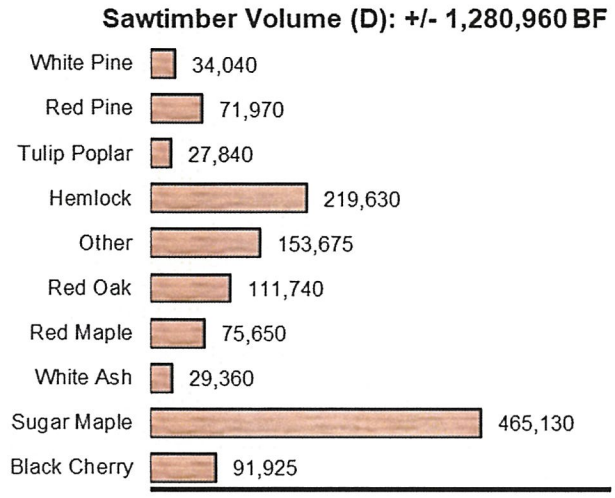


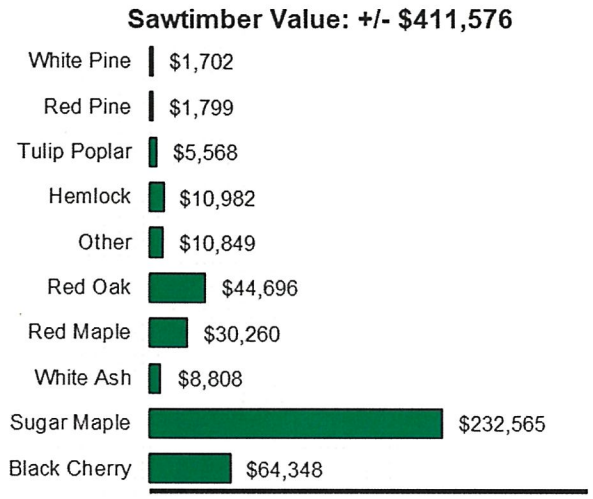
Density of Herbaceous Comp (% Plots)
Primary Types: Fern



Tract Summary of Volume & Value – Spoden & Glasgow

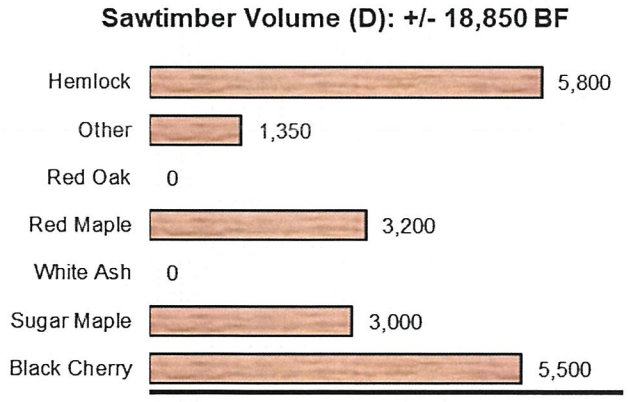
Spoden

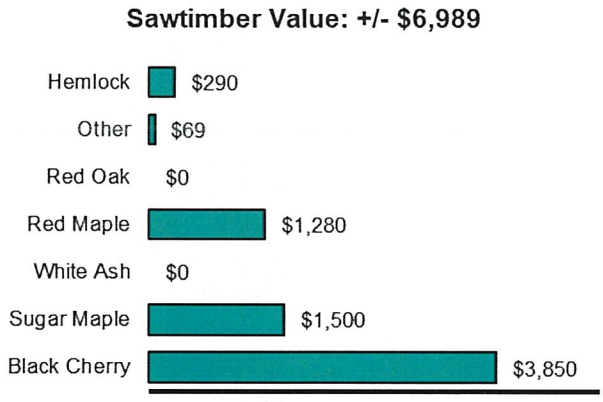




Total Sawtimber (Doyle):	1,280,960	Boardfeet	$411,576
Total Cordwood:	2,045	Cords	$6,135
Total Timber:			$417,711

Glasgow





Total Sawtimber (Doyle):	18,850	Boardfeet	$6,989
Total Cordwood:	205	Cords	$615
Total Timber:			$7,604

Note: This value represents the total estimated liquidation value of the entire sawtimber resource. This does not represent the yield value from harvesting. Because many of the stands are not ready for management, are under developed, immature, or are not ready for commercial harvesting, much the timber is not available yet and is for all intents and purposes held in reserve until ready. And whenever harvesting occurs, only a portion of the timber will be harvested at any one time and only in accordance with sustainable silvicultural practices. Management recommendations are intentionally conservative to improve the quality, health, and long-term value of the timber asset as a first priority, so the forest can be a productive source of revenue indefinitely.

Some of the timber volume may not be available at all. The inventory is based on per acre averages that are blown up across the acreage at the stand level, which are ultimately combined and totaled at the tract level. Across the property there are many micro-sites where harvesting will be limited or inaccessible all together due to extreme steep terrain, heavy erosion, sensitive soil, poorly drained wet soil, non-productive forest, etc.; while more easily worked around during management activities and harvest operations, these areas are difficult to reasonably map with any accuracy at this scale during the sampling/planning process. This is a common occurrence for a large ownership, but because they are difficult to isolate and withdraw from the acreage during the planning process, they are included in the acreage and thus considered in the volume estimates, even though that volume may be largely unavailable – despite being unquantified, this was not observed to be overly significant given the scale of the ownership.

General Overview - Spoden

The following overview is for the Spoden Tract only. Specific details for the Glasgow Tract can be found in the Commercial Stand Description and the Non-Commercial Stand Descriptions for that property.

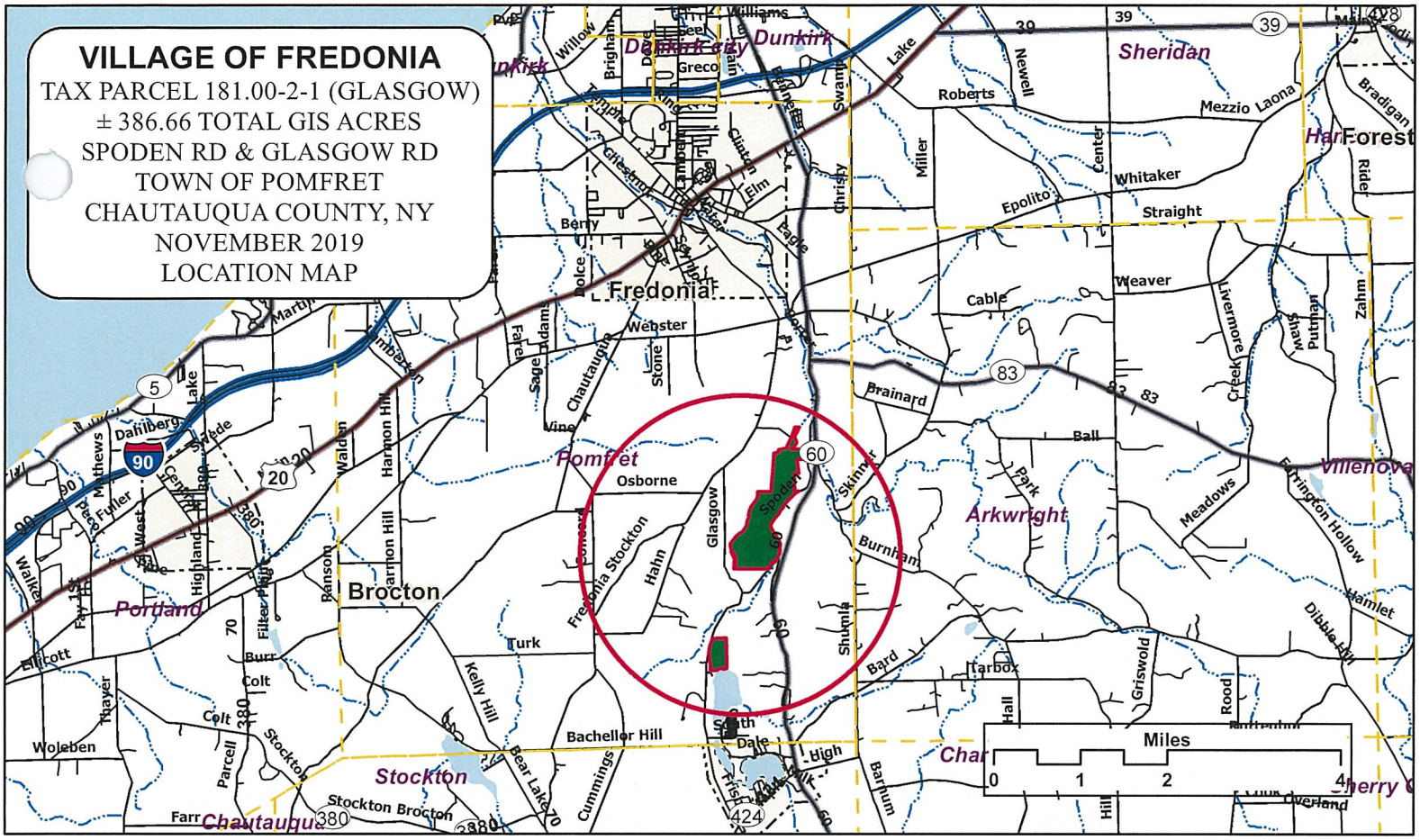
- The timber resource on the property is hardwood dominated, which are typically higher valued species. There is a decent amount of sawtimber volume and value. The hardwood timber is pretty decent in overall quality. Sugar maple is the dominant species and drives the timber value, accounting for nearly 56% of the total timber value on the property. Generally speaking this property has a valuable timber resource.
- Field observations suggest that the impacts from deer are fairly high. This is based on the observable signs of browsing and cannot account for what is unseen. It is suspected that browsing is, or has been, much higher yet than what is already observed, because where there are no seedlings, there is no deer browse to observe. Heavy browsing paves the way for other vegetation like fern, grass, and other woody competing tree and shrub species to become established that deer do not prefer to eat, which further inhibit desirable seedlings from becoming established (see also below). Without new seedling development at the right time and place, there will be no trees to replace those harvested or even those lost to natural causes. Furthermore, even under normal circumstances with the implementation of sound forest regeneration practices, the resulting regeneration quickly attracts deer especially in this area where the deer population is typically high. A large herd will likely overwhelm new seedling growth making any attempts to regenerate the forest through management a failure. The deer herd alone can be a major threat to the sustainability of the forest, with or without management. Controlling the deer herd will be important to the future management and productivity of the forest. More precise information on deer browsing is reported in each stand description found later in this report. More background information on this issue is discussed under the Forest Health and Condition Tab of this report.
- Competing woody vegetation is fairly high across the property – 86% of the sample plots were found with moderate or high stocking levels, composed primarily of beech, witch hazel, and grapevine. There is not, however, excessive growth of herbaceous competing vegetation on the forest floor – 35% of the sample plots were found with low to none stocking levels. Some stands may have fern problems that may need to be addressed. The stocking level of woody and herbaceous competition will prevent the germination, establishment, and survival of desirable tree seedlings and will directly threaten the sustainability of the forest unless controlled. The grapevine can inhibit regeneration, but is initially a concern for the damage and destruction it can cause to upper canopy trees. More precise information on woody and herbaceous competition is reported in each stand description found later in this report, which also include specific recommendations for the timing and control of it. More background information on this issue is discussed under the Forest Health and Condition Tab of this report.
- As a direct result of excessive deer impact and competing vegetation, seedling and sapling densities are low to none across the property – 4% of the sample plots were found with moderate or high seedling stocking levels, and 12% of the sample plots were found with moderate or high sapling stocking levels. There are very few, if any, desirable trees growing in the understory to replace the older and mature trees over head as they are harvested or perish of natural causes. In its current state, this property may not be capable of sustainably growing timber of desirable and valuable species, unless specific measures are taken at the appropriate time. More precise information on

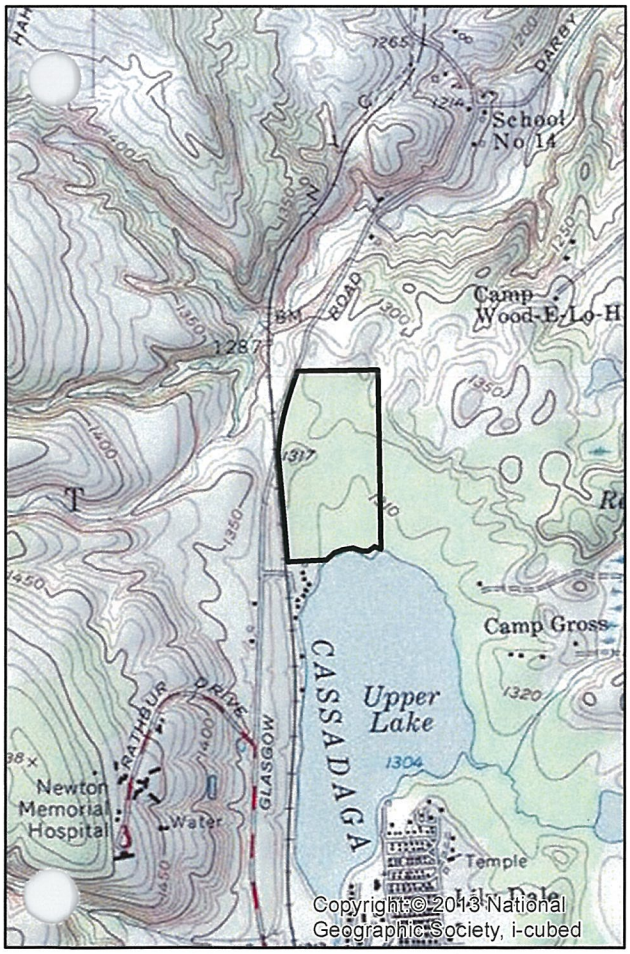
seedling and sapling stocking is reported in each stand description found later in this report, which also include specific recommendations for competing vegetation control.

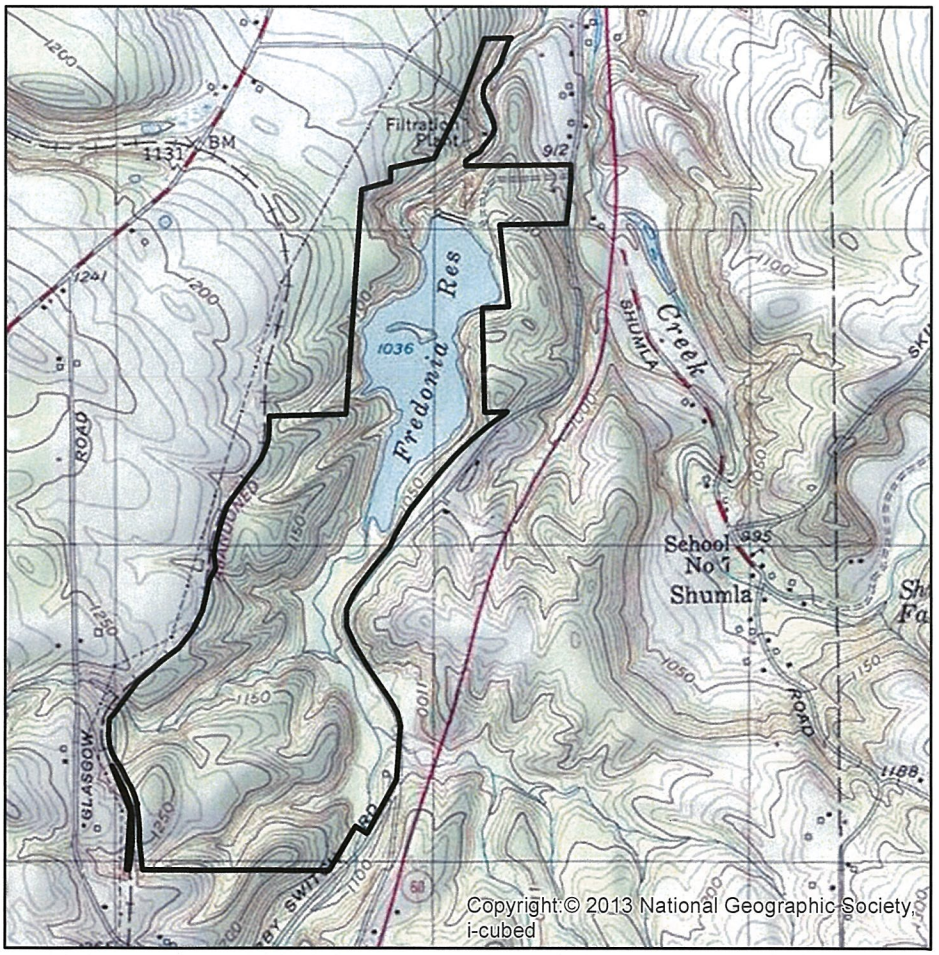
- This property is has the potential to be fairly productive for hardwood timber, but the timber is maturing. It will be very important for the next 20 years that every effort is made to reduce the proportion of unacceptable growing stock thereby improving the genetic make up of the forest; control woody and herbaceous competing vegetation, and control the deer herd; all of which sets the stage for regeneration harvesting which will likely be necessary for the series of harvests the follow those prescribed now and will be critical in beginning to establish a new forest crop. Without taking strategic steps now to set the stage for regeneration harvesting, any harvesting in the future could very well become timber mining where sawtimber trees are not replaced by young growing stock and the necessary seed trees could be too few to adequately regenerate the site. Harvesting needs to be generally conservative until regeneration becomes successfully established.

VILLAGE OF FREDONIA

TAX PARCEL 181.00-2-1 (GLASGOW)
± 386.66 TOTAL GIS ACRES
SPODEN RD & GLASGOW RD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
LOCATION MAP







Legend

Property Line

Projection: NAD83 zone 17 North

All mapping was prepared for forest management planning purposes using the best available information about the property from various sources and does not represent instrument survey accuracy. Acreages are estimated using geographic information system (GIS) technology and may not be consistent with acreages calculated by the county tax office or the ownership deed. This map is not a legal survey.

FORECON

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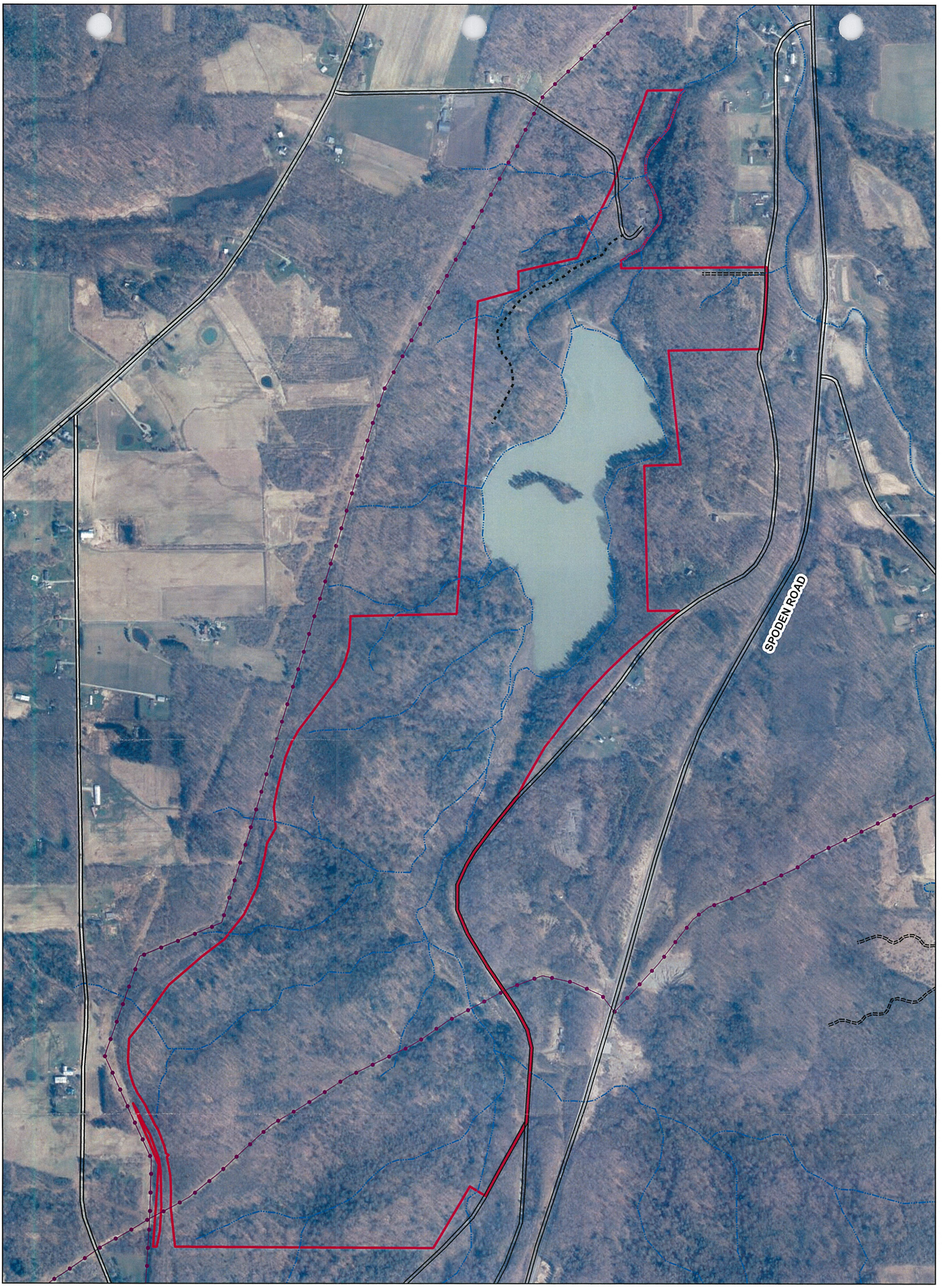

VILLAGE OF FREDONIA
SPODEN ROAD TRACT
346.3 ACRES
SPODEN ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
PROPERTY LOCATION MAP

Feet
0 330 660 1,320

N

Legend

- Property Line
- Stream
- Power/Gas Line
- Paved Road
- Woods Road
- Trails

TimberH\Clients2019\Private\
Falconer\Fredonia_Village

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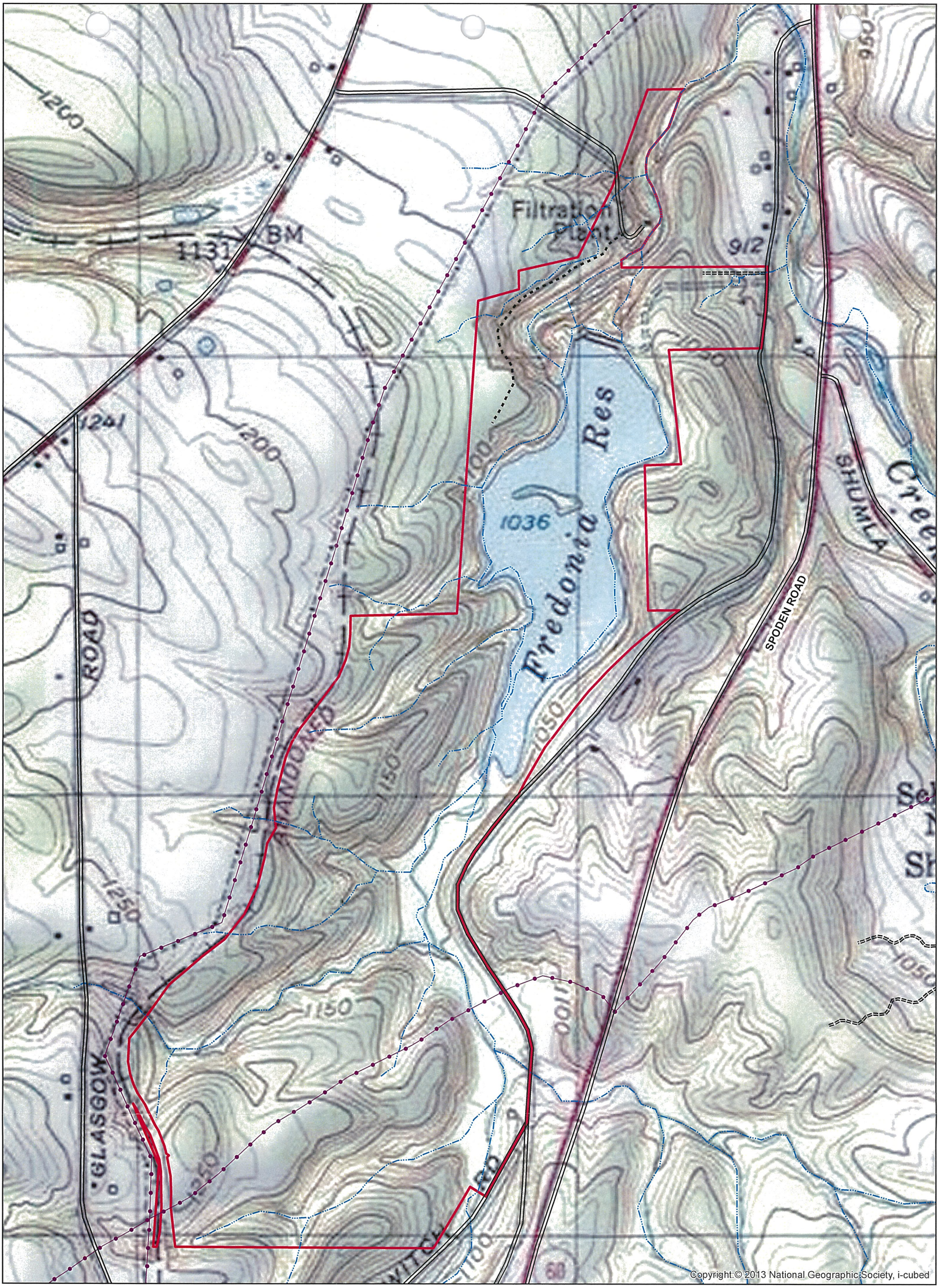

VILLAGE OF FREDONIA
SPODEN ROAD TRACT
346.3 ACRES
SPODEN ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
PROPERTY LOCATION MAP

Feet
0 330 660 1,320

N

Legend

- Property Line
- Stream
- Power/Gas Line
- Paved Road
- Woods Road
- Trails

TimberH\Clients2019\Private\Falconer\Fredonia_Village

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VILLAGE OF FREDONIA
GLASGOW PARK TRACT
43.1 ACRES
GLASGOW ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
PROPERTY LOCATION MAP

Feet
0 165 330 660

Legend

- Property Line
- Stream
- Power/Gas Line
- Paved Road
- Woods Road
- Trails

N

TimberH\Clients2019\Private\
Falconer\Fredonia_Village

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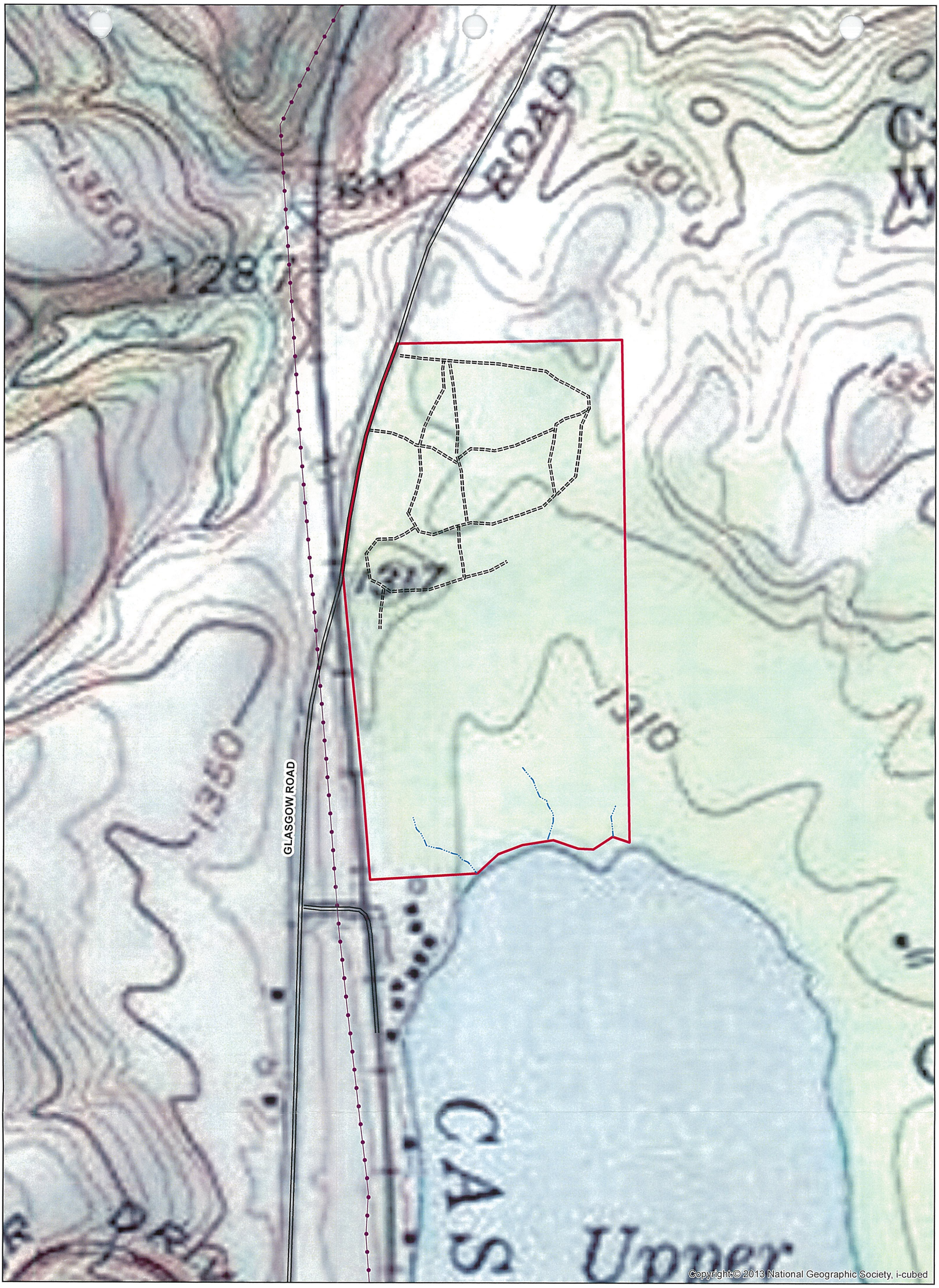

VILLAGE OF FREDONIA
GLASGOW PARK TRACT
43.1 ACRES
GLASGOW ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
PROPERTY LOCATION MAP

Feet
0 165 330 660

Legend

- Property Line
- Stream
- Power/Gas Line
- Paved Road
- Woods Road
- Trails

N

TimberH\Clients2019\Private\
Falconer\Fredonia_Village

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Summary of 10 Year Cash Flow, Growth, & Sustainability Model - Spoden

The following spreadsheet represents a financial analysis that was developed to project and model revenue, growth, and sustainability of the timber resource on the Spoden Tract. It specifically represents how the timber asset will perform under the proposed management program (which includes harvesting) at current fair market timber values.

The year one inventory shows that there is approximately 1,272,000 boardfeet of sawtimber and 2,000 cords of pulpwood with an approximate fair market timber value of approximately $418,000.

Over the course of the 10 year plan period, harvests are estimated to yield a total of approximately 438,000 board feet of sawtimber and 1,200 cords of pulpwood throughout the plan period.

With harvesting and growth, the year 1 sawtimber volumes of approximately 1,272,000 board feet are projected decrease to approximately 984,000 board feet by the end of year 10, while year 1 pulpwood volumes of approximately 2,000 cords will decrease to 600 cords by the end of year 10. Total timber value will increase from approximately $418,000 to $432,000.

Total gross revenues from timber harvesting in real dollars (not accounting for inflation) are projected to total approximately $120,000 for the plan period.

The timber asset is projected to fluctuate depending on the amount of harvesting, but return on average between 1 and 4% annually, with a total cumulative return of 3% for the 10-year period.

This assumes that there will be no major swings in stumpage values across this period and that stumpage prices will increase at relatively stable rates based on historical market trends.

Based on the inventory, harvest projections, growth projections, and the silvicultural recommendations, indications are that proposed management program will not produce sustainable results for this plan period. Harvesting exceeds growth. This might be alarming at first glance, however, this can be explained by pointing out the following:

- This is a relatively mature timber resource with a general lack of quality young growing stock to grow in and replace sawtimber as harvested (see also stand descriptions for more details), and in many cases certain species in certain stands actually showed a natural negative growth trend without harvesting. Because of the large size (and old age) of some of the timber, the projection is anticipating mortality; this with minimal ingrowth results in a net loss of volume. But harvesting is planned and therefore will capture the volume in over mature timber before mortality can occur, negating most projected losses. This will generate a yield versus a simple loss, but there will still be minimal ingrowth and produce unsustainable results. Thus, harvesting exceeds growth.
- While not large scale there are two small stands of planted softwoods that are recommended for conversion/regeneration where all or nearly all the softwood trees are to be removed to regenerate native hardwoods. In other cases, there are remnants of old plantings in other stands where the plan is for those remaining softwood trees to be removed in favor of the hardwoods that are there now. The removal of nearly all the old softwood plantings results in a large volume of softwood timber being harvested all at one time that will not be replaced for some time.
- Where it has been some time since any harvesting has taken place on the property, harvesting is being planned across all stands over the next 10 years. The recommended rate of harvesting will result in a general draw down of volume across the entire property quicker than the residual timber can grow to replace that volume in the 10 year window of this projection model. Plus, because

there are no stands sitting idle during this period, there is no growth occurring in untouched stands to offset some of the harvesting taking place in other stands.

- Despite these results, be assured that the management practices prescribed in this plan follow and will be implemented in a manner that is consistent with, principles of sustainable forest management. It will just take a longer period of time than the 10 year projection to achieve the growth necessary to replace the volume harvested. If for example, no harvesting was to take place for another 10 year period to the year 2040, a rudimentary extension of the current projection suggests that by that time, total sawtimber volume will grow to exceed 1,200,000 boardfeet, which comes very close to the current 2020 volume. This indicates that harvesting will match growth over a 20 year time frame. Likewise, by extending the projection of stumpage values forward at the same appreciation rate, the timber value by 2040 would increase to just over $650,000. Note that value is much less predictable that far out, than growth, as market fluctuations are likely and a steady price increase for 20 years straight is highly unlikely; this information was provided to merely illustrate that growth could achieve sustainable results given more time.

This financial analysis is based on gross timber sale revenues only and does not include other revenues, management costs, operating costs, property taxes, or capital investments made on the property.

It is important to understand that while these projections are a helpful tool to learn what the financial possibilities might be for this property, they are estimates based on statistically derived averages and experienced based adjustments to some of the variables. Actual harvest volumes and values will vary from these projections. The forest will ultimately yield what it is capable of within the limits of actual site quality/condition, sustainability, and the silviculture practiced at the stand level.

It is also important to understand that these projections are based on regional average growth rates for forests of similar type, species composition, and stocking levels. The accuracy of these projections may be limited by forest origin, site quality/condition, and past management practices. In the case of past high-grade harvesting, for example, the forest may have lost genetic quality and vigor as a result; the models used to develop these projections cannot account for this circumstance and could overestimate rates of growth, thus over-predicting this timber assets financial performance. This can only be accounted for and adjusted through comparisons to future inventory updates.

10 Year Tract Level Financial Analysis of Projected Revenue, Growth — 7 Forest Stands — Created: October 2020 — Updated: 2020

Species	2020 Volume	2020 Value	2020 Harvest	202 Volu	2028 Value	2028 Harvest	2029 Volume	2029 Value	2029 Harvest	2030 Volume	2030 Value	Total Hvst & Rev.
Black Cherry	92,805	$64,964	15,000	818	$77,712	0	90,091	$82,284	0	92,614	$87,126	23,000
Sugar Maple	465,360	$232,680	55,000	417	$225,312	0	357,205	$233,036	5,000	353,866	$237,783	126,000
White Ash	29,610	$8,883	14,550	0	$0	0	0	$0	0	0	$0	15,753
Red Maple	75,650	$30,260	11,000	614	$34,626	0	69,362	$36,201	3,500	66,852	$35,937	18,500
Red Oak	111,740	$44,696	20,000	930	$42,082	0	83,897	$43,787	10,000	74,766	$40,192	45,000
Hemlock	219,800	$10,990	50,000	1771	$10,384	0	217,340	$10,867	3,500	223,858	$11,193	80,500
Tulip Poplar	27,840	$5,568	0	285	$7,993	0	38,229	$8,362	4,000	35,457	$7,833	4,000
Red Pine	67,530	$1,688	63,730	0	$0	0	0	$0	0	0	$0	67,822
White Pine	28,000	$1,400	12,500	147	$1,158	0	22,266	$1,218	0	23,180	$1,280	12,500
All Other	153,675	$10,849	25,000	1367	$9,025	0	120,144	$9,277	8,000	114,210	$8,907	58,000
Estimated Total Sawtimber Volume (Bdft Doyle)	1,272,011	$411,978	266,780	1,011	$408,292	0	998,534	$425,031	34,000	984,802	$430,251	451,075
Estimated Total Pulpwood Volume (Cords)	2,045	$6,135	575	4	$2,082	0	684	$2,051	70	604	$1,811	1,300
Estimated Total Timber Asset Value		**$418,113**			**$410,373**			**$427,082**			**$432,063**	
Estimated Gross Revenues:												
Timber Sale Income			$60,233			$0			$10,890			
Other Tract Level Income 1			$0			$0			$0			
Other Tract Level Income 2			$0			$0			$0			
Other Tract Level Income 3			$0			$0			$0			
Other Tract Level Income 4			$0			$0			$0			
Estimated Total Gross Revenues			$60,233			$0			$10,890			$120,211
Annual Return on Timber Asset[a]			---			4.1%			4.1%		1.2%	
Cummulative Return on Timber Asset[b]			---			-1.9%			2.1%		3.3%	
Present Value of Annual Revenues @ 2%			$60,233			$0			$9,112			
Present Value of Annual Revenues @ 5%			$60,233			$0			$7,020			
Present Value of Annual Revenues @ 7%			$60,233			$0			$5,923			
Net Present Value of Revenues[c] @ 2%			**$116,316**			$9,112			$9,112			
Net Present Value of Revenues[c] @ 5%			**$111,301**			$7,020			$7,020			
Net Present Value of Revenues[c] @ 7%			**$108,407**			$5,923			$5,923			

[a] Annual Return on Timber Asset is the change in timber asset value from the prior year expressed as a percer

[b] Cummulative Return on Timber Asset is the total change in timber asset value from the original year-1 timbe

[c] If Net Present Value equals 0, the gross revenue stream has returned the desired rate; if greater than 0, the gr

Notes, Assumptions, & Disclaimers:

- All Year-1 timber volumes are average estimates based on a statisitcal sample that was collected for manage
- All future volumes are projected estimates, calculated using regional average annual growth rates that vary by
- All standing timber asset values are calculated using the following Year-1 stumpage prices per thousand boar — White Pine $0 — All Other $71 — Cordwood $3
- All future standing timber asset values are estimated based on stumpage prices that have been compounded — White Pine --- — All Other 1% — Cordwood 0%
- All Year-1 stumpage prices are established from an opinion of fair market value by species for the entire owne be guaranteed.
- Stumpage prices used to predict estimates of timber sale revenue are specifically set for the individual sale ve
- All timber sale revenues are rudimentary estimates based on projected volume removals; sale income will var
- All harvest volumes are estimates based on prescribed treatments at the stand level and professional experie
- All values are reported for informational purposes only. At the owners discretion these figures can be used fo
- These figures are not intended for use in advertising the sale of standing timber and/or real estate; Forecon, I
- All timber values and revenues are expressed as real values and do not account for inflation.
- If this model represents a scenario involving stumpage price changes at some future point, the year of change

Forest Inventory & Data Management Methodology

Before forest management recommendations can be made, an inventory of the forest must first be conducted. The information gathered from that inventory is the foundation for making forest management decisions and determining the appropriate silvicultural treatments for sustainability. It is also the first stage in seeking answers to the questions: "What do we have?"; "What's its condition?"; and "Can we achieve our goals?"

Forest Type Mapping & Stand Delineation

An important step of the inventory process is to identify and delineate the different management areas of the forest (forest stands). This delineation is typically based on the combination of three variables: 1) forest cover type (i.e. northern hardwood, central hardwood, etc.); 2) Density or Stocking level (i.e. overstocked, understocked, etc.); and 3) size classification (i.e. saplings, poles, sawtimber, etc.). Where necessary or sensible, stand boundaries may also be delineated using physical features (i.e. streams, roads, topographic features, etc.).

The inventory method used for this management plan allows for thorough systematic coverage of forested areas. As such, we are able to accurately identify and map changes in forest type, stocking, and size class during the inventory process. Using this information together with current aerial imagery and topographic maps, we are able to clearly group the forest into stands for management.

Individual forest stand for this property are delineated over aerial imagery and topographic mapping that can be found later in this report.

Sampling & Statistical Modeling

The inventory is merely a sampling process. Small samples, or plots, are placed throughout the forest where information is collected from a set of trees at each location. Using a statistical procedure, the data from these samples are combined to calculate averages and create models of the structure and condition of the forest as a whole. The variable plot radius method (also called point sampling) was used to sample the forest for this management plan. This is one of the more common forest inventory methods used for forest management planning by the forestry profession.

The points were systematically located in grid fashion to achieve an even representative distribution across the forest. At each point, sample trees were identified by species; their diameter at breast height was measured in inches (DBH – measured 4.5 feet above the ground); their merchantable height was measured in the number of 16 foot logs to the nearest half log (i.e. 1 log = 16 feet; 1 ½ logs = 24 feet; etc.); tree quality was determined (acceptable growing stock or unacceptable growing stock); each tree was classified for its primary product (sawtimber, pulpwood, or cull); and the percent observable defect was estimated in 10% increments. Other observations made at each plot location may include: seedling and sapling regeneration; seedling, sapling, and pole quality; deer browse impact, and competing vegetation.

Detailed inventory specifications can also be found in the appendix of this report.

Timber Valuation

Any estimates of timber value are an opinion of fair market value at the time of the inventory. Stumpage prices are generically assigned at the ownership level; they do not account for individual tree or stand level quality. The prices used to estimate timber value in this report are subjectively based on any combination of published and unpublished data, anecdotal information, or FORECON, Inc. timber sales at or prior to the development of this plan. Any projected timber values are calculated using a subjective

annual rate of stumpage appreciation by species based on past trends and experience. Markets can and will change over time and any pricing cannot be guaranteed beyond current market conditions.

Disclaimers

All mapping was prepared for forest management planning purposes using the best available information about the property and does not represent instrument survey accuracy. Acreages are estimated for management planning purposes using geographic information system (GIS) technology and may not be consistent with acreages calculated by the county tax office or the ownership deed. Boundary line positions on the map may have been adjusted from county tax office mapping, but only where gross discrepancies were discovered in the field based on existing geographic/physical features. Inventory data is calculated and reported using GIS acres. As such, it may be necessary to adjust volumes, values, and/or the mapping itself if used for other purposes (i.e. sale of property, certified property appraisal, tax abatement programs, etc.).

The forest was inventoried through statistical sampling to determine stocking, structure, and condition of the forest. Statistical sampling has varying degrees of accuracy compared to 100% sampling, especially for sawtimber volume and value. Data was collected from small saplings to large mature trees and was used to characterize forest cover type, tree species composition, tree condition and quality, for prescribing silvicultural treatments, and for use in management planning. References to volume, value, and revenue are rudimentary, and only provide rough estimations. While this information may be useful for financial and estate planning, these figures do not constitute a formal appraisal and do not represent guarantees of present or future income, or timber asset performance. Furthermore, estimates of volume and value are not intended for use in advertising the sale of timber and/or real estate; FORECON, Inc. cannot guarantee any result if used in such a manner. FORECON, Inc. should be contacted for additional consultation if it is desirable to use this information for anything beyond the intended use associated with this plan.

Please also note in smaller stands, sample sizes are also small. The smaller the sample size the less reliable the data becomes. Figures from smaller stands need to be used carefully with this in mind.

Forest Type

Northern Hardwoods are represented by stands where most of the stocking is made up by sugar maple, red maple, American beech, yellow birch, black birch, hemlock, and basswood, with cucumber, black cherry, white ash, or tulip poplar occurring secondarily.

Shrub species that are commonly found in the understory of this forest type are witch-hazel, striped maple, witch-hobble, serviceberry, and ironwood. Various species of fern and grass are the most common herbaceous species that can be found on the forest floor.

The soil conditions for northern hardwoods range from moist but well-drained and fertile on upland sites to damper less fertile lowland sites.

Central Hardwoods, or upland oaks are represented by stands where the dominant species are red oak, white oak, chestnut oak, black oak, etc. Hickory, black gum, red maple, sugar maple, tulip poplar, white ash, black cherry, basswood, and black walnut are the more common tree associates found growing secondarily with this type.

Shrub species commonly found in the understory of this forest type include dogwood, sassafras, ironwood, blue beech, blueberry, hazelnut, rhododendron and witch-hazel.

These forests tend to grow in well-drained drier sandier soils.

Allegheny Hardwoods are represented by stands composed of northern hardwoods, but where black cherry, white ash, and/or tulip poplar are the more dominant species – typically making up about a quarter or more of the stocking.

Similar to the northern hardwood forests, witch-hazel, striped maple, witch-hobble, serviceberry, and ironwood are commonly found in the understory. Ferns too are typical on the forest floor.

This forest type is most often associated with soils that are rich, fertile, and moist.

Mixed Hardwoods & Softwoods are represented by stands where half or more of the stocking is made up by softwoods (i.e. conifers/evergreens like hemlock, pine, spruce). Red maple, black cherry, yellow birch, black birch, American beech, and sugar maple are the more common hardwood components of this forest type.

Rhododendron, witch-hazel, and striped maple are the typical shrub species found in the understory of this type. A sparse herbaceous layer (mostly fern) and a rich moss layer are common.

This forest type can be found across soils with a fairly broad range of drainage patterns, from moist but well drained upland areas to poorly drained lowland areas. Natural mixed forests, however, are found more often than not in lowland areas along creeks and other water bodies.

Plantations are manmade forests composed of trees established in rows through planting. The practice was borrowed from Europe and promoted to return abandoned fields and pastures to productive use. The most common species planted were red pine, white pine, Norway spruce, Scots pine, and European larch. Some native hardwood component is common in plantations; composition and stocking varies depending on the survival rate of the planted trees and harvesting; black cherry, white ash, and red maple tend to occur more commonly than others. Because of close competition and crowding, plantations must be tended on a regularly scheduled basis (i.e. every 20 years) or individual trees can become weakened and more susceptible to wind throw, breakage, and ice and snow damage. Most plantation species are short lived reaching maturity at 60-80 years of age. With only a couple of exceptions, most plantation species will not naturally regenerate; at some point the plantation will either fail naturally or slowly lost through harvesting. Careful management of hardwood trees as sources of seed is important to facilitate successful regeneration and conversion to native forest.

Early successional forest, or transition forest, is a generic term widely used to describe forests that have naturally developed and evolved on abandoned fields and pastures. They are found on a wide variety of sites and soil conditions, and vary in species composition, stocking, condition, and quality. Aspen, elm, white ash, red maple, black cherry, white pine, gray birch, pin cherry, thorn apple, blue beech, iron wood, service berry, etc. are common tree species in transition forests. Grasses and other types of herbaceous vegetation are also a common component of these sites. The tree species tend to be relatively short lived and in many cases will eventually be replaced by other longer-lived species as the site continues to evolve and change. They are in transition, not yet having fully developed into commercially manageable forest. For the most part these areas have little commercial value with limited management opportunities; they do, however, provide important forest cover and add habitat diversity to a property. Outside of any habitat management activities, common practice is to allow them to continue developing on their own.

Forest Health & Condition

Competing Vegetation

Competing vegetation refers to those species of trees, shrubs, or plants that would interfere with the ability of commercially or ecologically important species to regenerate, survive, and grow. Ferns, beech, striped maple, and black birch are some the most common types of interfering vegetation encountered in the forest.

Ferns are aggressive, they prosper in shade as easily as they do in full sunlight, and are capable of spreading quickly by way of their root system and by seed. They are capable of forming a dense layer of intense shade and competition on the forest floor where seed germination occurs, essentially stopping other species from regenerating. Research has found that the presence of ferns can reduce the number of desirable seedlings by as much as 80% compared to stands where ferns were controlled.

Their aggressive nature is illustrated in the series of pictures below. The first picture to the far left is of a forested area prior to harvest. While they do not overwhelm the site, ferns are noticeably present. The second picture in the middle is taken at the same location immediately following the clearing of a 1-acre patch that was purposely created to regenerate hardwoods; the ferns were not perceived as a problem and were not treated prior to harvest. The last picture is taken at the same patch cut location 1 year following treatment. The ferns have invaded and spread to completely cover the site. At this fern density tree seeds are unable to germinate, become established, and survive. This happens commonly when fern cover is not properly evaluated prior to prescribing regeneration treatments.

Beech spread aggressively; they prosper very well in shade and are able to grow new trees directly from their root systems (referred to as root suckering). This often gives beech an advantage over other tree species that must germinate from seed. Their tolerance to shade allows them to develop at a faster rate, and they are able draw water and nutrients through a well-established and often extensive root system – they have a head start. They often form dense thickets, creating intense shade in the understory. Other species struggle to compete for light, water, and nutrients.

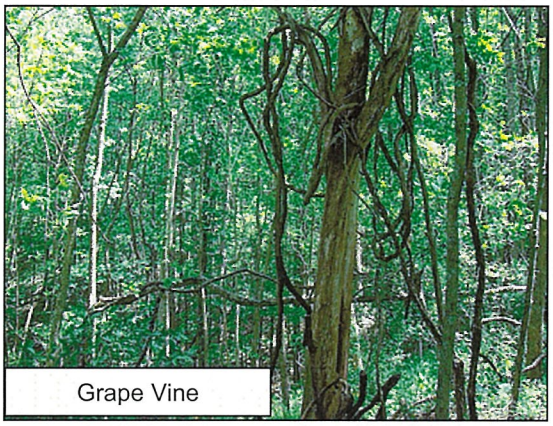
All of the saplings in the top right picture are beech trees in a thicket that formed through suckering; it shows how extensively they are able to dominate an area.

Beech suckering is especially widespread following the harvest of a larger tree (i.e. 6" +); the second picture down to the right shows where this has occurred. In the upper middle of the picture is a barely discernable beech stump. The stump itself has sprouted to the point of obscurity, and root suckers have formed a thick carpet around it. This will easily develop into a thicket of saplings like the picture above.

Striped maple produces large quantities of seed and has a high germination rate. Like beech, they form dense thickets and create very intense shade that prohibits other tree species from germinating, becoming established, and surviving with any degree of success. They are able to tolerate shade and in large populations their broad leaves create umbrella like conditions like that formed in the third picture down to the right

Black birch is another tree species that reproduces in large numbers. It has a moderate tolerance to shade, but responds very well in sunlight. If seed producing trees of even minor abundance are present they can produce enough seed to easily invade harvested sites, especially where large openings were created. The bottom picture to the right is of a forest that had been previously harvested. The vast majority of the light brown colored saplings in the understory are black birch.

Invasive species are a serious concern for forest management and regeneration. Some of the more common native and non-native species include: grape vine, garlic mustard, Japanese knotweed, honeysuckle, multiflora rose, mile-a-minute weed, Japanese stilt grass, and bindweed (Photos below). All of these grow aggressively and threaten the successful regeneration of other desirable species.


Grape Vine


Garlic Mustard

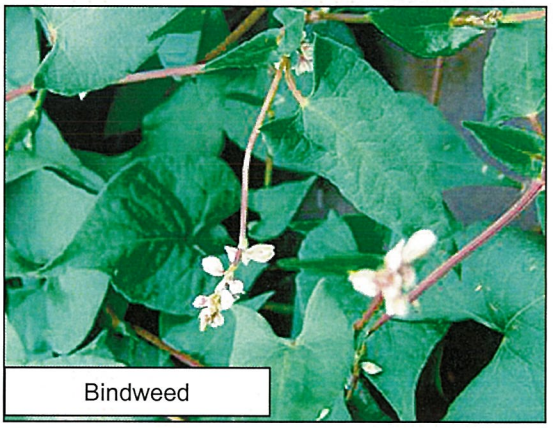

Japanese Knotweed


Honeysuckle


Multiflora Rose


Mile-a-Minute Weed


Japanese Stilt Grass


Bindweed

Competing Vegetation and Invasive Species Control

Species of competing vegetation like birch, striped maple, ironwood, etc. can be controlled through manual cutting. However, this is not always the most cost effective form of control as efficiencies vary with the age, size, and densities of the trees and the size of the site.

Merely cutting species like beech, grapevine, or the invasive herbaceous vegetation summarized above does not eliminate the problems they create for regeneration – they just keep coming back and can actually worsen from cutting. These species can be managed with limited success, through manual cutting and pulling, but only through regular dedicated treatment; and there are still no guarantees. The most effective and efficient form of control is through the application of herbicides. Handheld application with backpack spraying equipment is effective for small areas of herbaceous vegetation where herbicide is sprayed directly on the foliage or a pre-emergent herbicide (for herbaceous plants) is sprayed on the ground in early spring.

For beech trees and grapevine, hand application is also an effective tool; a specially formulated chemical can be applied directly on the bark at the base of the tree, where it will absorb through, killing it. The same chemical can be applied to a fresh cut stump or vine with even greater effectiveness, as it will be drawn down into and spread throughout the root system killing it and any suckers growing from it.

Where chemical control over a large area is required, ground vegetation and saplings can be mechanically treated using wheel or track driven machines mounted with mist sprayers. Mechanical spraying is very effective, but it is sometimes necessary to follow up with spot hand treatment to deal with taller trees that the mist sprayers could not reach (typically anything over 15 feet in height) or any patches that were missed.

The picture below illustrates the benefits of treating competing vegetation with herbicide. This area was densely populated by beech and striped maple. The dense vegetation that is still green in the background marks the boundary line with the neighboring property, beyond which chemical was not applied. The area in the foreground was just as dense prior to treatment. The difference is quite dramatic. The herbicide treatment was effective in killing the beech and striped maple. With sunlight able to reach the ground other species have the opportunity to germinate, become established, and survive. The best window for regeneration to develop and colonize the site is typically between 3 and 5 years after treatment.

The pair of pictures below is an example of fern control through the mechanical application of herbicides. The picture to the left is of an area dominated by fern. The picture to the right was taken at the same location one year after the area had been treated with herbicide. The treatment was successful.

If handled and used correctly according to the manufactures directions, herbicides are safe and approved for use in the forest. Glyphosate or Sulfmetruon-methyl are the most common chemical ingredients in herbicides used for treating ferns and grasses or for application on foliage. Glyphosate is one of the more common chemical ingredients in herbicides used for basal bark, cut stump, or frilling application. These chemicals are environmentally friendly having no soil activity because they have high rate of absorption in the plant material and bind tightly to soil particles; they are broken down quickly by microorganisms and sunlight and have a short half-life of approximately 30-45 days.

Sulfmetruon-methyl is somewhat mobile in runoff if exposed to rain immediately after application – none of these, however, is a threat to ground water or aquatic organisms; they are categorized by the EPA as the least toxic and do not cause health problems like cancer, mutations, nerve damage, DNA damage, or birth defects in humans or animals; and in animals they do not accumulate in the food chain. These chemicals only affect plants, because animals do not have the same enzymes that are affected by them. Furthermore these chemicals are laced with a repellent to deter animals from eating the vegetation that has been treated.

All chemicals should be applied according to manufacturers Material Safety Data Sheets (MSDS). Herbicides should be minimally applied to achieve the desired result, and should be applied by a trained and licensed applicator.

Deer Impacts

Deer can have a significant negative impact on young seedlings and must be considered when managing for forest regeneration. One of their primary feeding mechanisms is to browse on the young tender shoots of tree seedlings and shrubs. In doing so they remove buds and kill a small portion of the stem; the buds are critical to the future growth, development, and form of trees. Regular and repeated browsing can have a pruning effect on young trees, causing them to become poorly formed (i.e. crooked or bushy/bonsai-like) and prevents them from growing taller.

When the deer population exceeds the ability of the range to support it, damage to timber or farm and vegetable crops occurs, and forest sustainability is threatened. Deer populations in many parts of the northeastern U.S. are high and present a considerable problem for the successful regeneration of forests. Excessive browsing will result in death among seedlings and is chiefly responsible for substantial losses - forest sustainability is at risk in many areas. Deer numbers continue to increase, which is evidenced by the widespread reports of damage caused to trees, shrubs, and plants in residential settings, as they search beyond the forest for additional sources of food.

Deer Management and the Woodland Owner:

The woodland owner plays an important role in deer management. Effective deer management is a combination of actions by government agencies, landowners, and hunters. The first and most fundamental tool in deer management is to control the harvest. Overall control of the deer harvest is accomplished by the state agency regulations, which set the open hunting seasons and bag limits each year. The length of the seasons and the bag limits may be vary for different parts of the state based on deer populations and hunting pressure. They are designed to give hunters a chance to harvest the proper number of deer from the standpoint of herd management to satisfy the demand for recreational hunting. These regulations and their enforcement are the state's share of the management process.

Deer are a natural part of the forest, a community that supplies them with food and cover. Deer populations within the carrying capacity of the range cause no serious damage. Overpopulation of deer, however, can eliminate understory vegetation, including reproduction of desired timber species. If overpopulation continues for several years, deer will eventually eat almost all the vegetation within their reach, and the woods will have a "browse line" or park-like appearance. This is accompanied or followed by disease and starvation in the deer herd until the herd size matches the reduced carrying capacity. When such deer die-offs occur, then the deer, forest, woodland owner, and deer hunter lose.

One alternative is to maintain a healthy herd in harmony with its environment by harvesting a sufficient number of deer of both sexes each year. In addition, habitat management can be practiced, increasing the population level and providing more quality hunting.

Owners that do not actively hunt their property should consider inviting others onto their property for hunting or consider entering into a lease agreement with hunters. A lease agreement with specific requirements for herd management can be helpful for landowners trying to control deer on their property.

Managing post-harvest debris may offer another form of protection to seedlings. By leaving tops from felled trees intact, and/or by felling trees in a pattern where the residual tops form a pseudo fence, can limit access to seedlings. The tops will eventually begin to break down, so this is only a temporary measure and has limited results. If this method is employed, it is recommended that timber sale contracts include specific requirements and specifications about top lopping limitations, top placement, and/or minimum top diameter restrictions.

A comprehensive approach that incorporates as many of these practices as possible to controlling the impacts from deer is the best one.

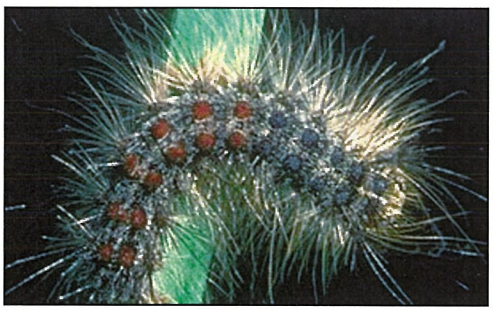
The most effective method to prevent damage from browsing is to erect a fence around the perimeter of the harvest area after the harvest is complete. This is only recommended and necessary for stands where harvesting is specifically planned for regenerating purposes, and especially where an investment in herbicide has been made beforehand. This can be very expensive and is typically a worst-case recommendation, where deer populations are very high and all else has failed. Where deer populations are high, the difference made by an exclosure can often be dramatic, as illustrated in the picture to the right.

Insect Pests

Insects that prey upon trees pose one of the greater threats to our forests. Those most common to the eastern United States and subject to scrutiny, surveillance, and research by government agencies, forest industry, universities, and the forestry community include:

The **emerald ash borer** is native to Asia, arriving in the United States in the early 1990's. Since its arrival it has devastated ash populations in many areas throughout the central Great Lakes region. It has been found in Michigan, Ohio, Indiana, Illinois, Pennsylvania, and most recently in West Virginia. The adult beetles lay eggs under the bark of the ash tree; once hatched the larvae feed extensively on the tender wood just under the bark forming wide spread galleries up and down the trunk of the tree. Their numbers are so large that collectively they girdle the tree killing it. The larvae burrow into the tree only to later emerge as an adult when the cycle repeats itself. The exit hole of the adult beetle has a distinctive "D" shape on its side. Current efforts to control the spread have been through quarantines to restrict the transport of ash logs, firewood, removed trees and tree parts from residences, and nursery stock. Research is in progress for insecticidal control, but little has been developed and there is no known wide spread control method.

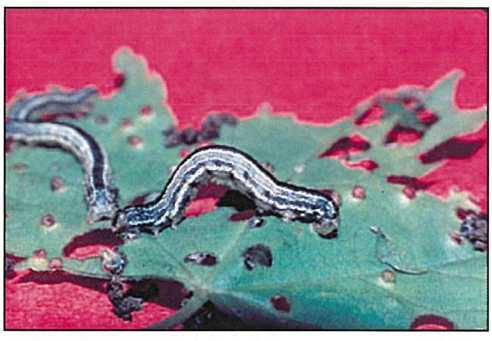
The **forest tent caterpillar** is native to the United States and has always been a natural inhabitant of the forests of the northeast. The adult moth lays eggs in masses that hatch when leaves first begin to appear in the spring. They are defoliators, typically preferring to feed on the leaves of sugar maple and aspen trees. When out breaks occur, populations rise to astronomical levels and typically remain there for 3 years and then subside. During that time they can defoliate vast areas of forest. In most cases mortality is unlikely except where repeated defoliation occurs and is compounded by other stresses like harvesting, drought, re-foliation, etc. They do, however, cause diameter growth to decline by as much as 90%. During out breaks, this insect is best controlled through aerial spraying of pesticide over larger areas. If applied at the right time of year and during the right stage of caterpillar development, pesticides are very effective.



The **gypsy moth** is native to Europe and Asia, first arriving in the United States over 100 years ago. It has since become a natural part of forests, but is one of our most devastating forest pests. Like the forest tent caterpillar, they are defoliators, preferring to feed on the leaves of oak trees. When outbreaks reach epidemic levels, complete defoliation over large areas is catastrophic. Growth rates decline significantly and repeated defoliation compounded by other stresses, results in relatively high levels of mortality. Aerial spraying of pesticide over larger areas is also the most effective means of controlling this insect. Applied during the right stage of caterpillar development, pesticide is very effective.

The **Asian long horned beetle** is another native of Asia, first arriving to the United States in the mid 1990's. It was first discovered in NY City, where it destroyed thousands of maple trees. It has since been discovered in Chicago and New Jersey. The adult beetles lay their eggs under the bark of the maple tree and when the larvae hatch they feed on the tender tissue just under the bark. As they mature they burrow deeper into the tree and later emerge as an adult to begin the cycle over again. To date it has been mostly limited to urban areas, but if it spreads to the native maple forests of the northeast it could devastate the maple population. Current efforts to control its spread have been to remove or chemically treat all maple trees within a half mile radius of an infected host tree. Quarantines are in place to restrict the transport of packaging material, nursery stock, and removed trees from residences. There no known wide spread control method.

The **hemlock wooly adelgid** was also introduced from Asia; first, on the west coast of the United States in the 1920's and later spreading to the east coast in the 1950's. It is a small aphid-like insect distinguished by its white waxy wool-like covering. Hemlock is its primary host species with spruce being an alternative. They appear like masses of tiny cotton balls on the underside of branches at the base of the needles. Immature nymphs and adults damage trees by sucking sap from the twigs to where the trees lose vigor, drop needles prematurely to the point of defoliation, and typically causes death within a few years. These insects reproduce quickly – a single adelgid will produce up to 300 eggs per year, which in total can yield 90,000 new insects per year. These vast numbers can spread to other trees and areas easily by way of wind, birds, mammals, humans, and the transport of nursery stock. Its greatest impact has been in regions where winters are relatively mild; it currently infests about one half of the region where hemlocks grow in the east. These areas have seen wide scale defoliation and death of hemlock forests – this insect could cause catastrophic ecological impacts. It is possible to inject trees with pesticides and spray individual trees with insecticidal oils and soaps. This is, however, not practical for landscape scale application. This insect has no natural enemies in the U.S., but government agencies have found two non-native beetle species that feed exclusively on the adelgids, and in areas where they have been introduced adelgid populations have been reduced by 50-90% within a few months; the beetles themselves quit reproducing when there are no adelgids present. To date, the beetles are the only known control that can be applied to large-scale forest areas.



The **spring and fall cankerworm** are native to the U.S. Often called inch worms or loopers, they are common defoliators of a wide variety of hardwood trees; oak, elm, hickory, maple, ash, and cherry are among some of the primary host species. There has not been a large-scale outbreak of this insect in several decades, but the fall cankerworm in particular does cause some small areas of defoliation in the forest every year. Local infestations can last for three or four years; trees defoliated for two or more years will become weaker with slowed growth,

slowed or reduced mast production, and may die as a result. The eggs and larvae are attacked by other insect parasites and predators and other natural enemies normally help control the population, but like other worm species, larger outbreaks can be controlled through the application of pesticide when applied at the right time.

The **sugar maple borer** is a native long horned beetle to the U.S. This beetle is a common pest to the sugar maple, and is found where ever it grows – sugar maple is the only known host to this insect. Its outbreaks are relatively inconsequential compared to defoliating insects, but it is very damaging where it occurs. The adult beetles lay eggs in cracks, under bark scales, or around wounds; when the larvae hatch they burrow forming a meandering gallery across the tree beneath the bark; this takes place over a two year period before the larvae develop into adults and emerge. Mortality is rare, but partial girdling of the tree results. This damage, however, usually occurs within the first 20 feet of the stem degrading the most valuable part of the tree due to scarring, discoloration, and rot. The partial girdling further causes decreased productivity due to crown dieback above the wounded area. The tree is also more susceptible to breakage where larger wounds have weakened the stem. The maple borer is actually a secondary insect and tends to attack trees that are already under stress. The most common stress associated with borer damage is overcrowded conditions due to lack of management. The best way to control and minimize damage from the maple borer is forest management that includes the removal of poor quality and previously damaged trees. Timber stand improvement thinnings are particularly important in younger pole stands when they are just reaching the size most susceptible to attack.

The **sirex woodwasp** (Sirex noctilio) is native to Europe, Asia, and Africa. It is the most common species of wood wasp found in solid wood packing materials at U.S. ports-of entry. This wasp attacks pine plantations and is reported to cause up to 80% mortality. In the northeastern U.S. it is a specific threat to red pine, Scots pine, and Austrian pine, but will occasionally attack spruce and fir trees; other target species in North America include Monterey, loblolly, slash, shortleaf, ponderosa, lodgepole, and jack pine. There are several native woodwasps (or horntails) in North America; the native species only attack dead or dying trees, whereas the Sirex woodwasp will attack living trees. As females lay their eggs in the sapwood of the tree, they simultaneously inject a fungus and a toxic mucus to create an environment for the larvae to develop; together they kill the tree. The larvae feed on the fungus as they tunnel through the wood. Infested trees will drip sap from the small holes created at egg laying sites. After the larvae mature into adults, they emerge from the tree leaving exit holes 1/8 to 3/8 inch in diameter. After emerging, females will lay between 20 and 450 eggs. This woodwasp can be controlled successfully, by introducing a parasitic nematode into infected trees; the nematode infects larvae and sterilizes adult females. An active forest management program, however, can also help control the population by controlling stocking levels and mortality; stressed and suppressed trees are more susceptible to infestation. Only an entomologist can positively identify Sirex noctilio. Suspect woodwasps should, therefore, be collected and brought to a local county extension office or the State Department of Agriculture.

Monitoring for these and other pest should be included in any regular property inspections. Insects are a natural part of the forest, but where damage is occurring beyond what appear to be normal levels, further assessment and monitoring should be considered, and if necessary a suppression program should be employed. In particular, if the presence of the emerald ash borer, the Asian long horn beetle, or the Sirex woodwasp is suspected, governmental agencies should be notified immediately and control measures should be taken to minimize or eliminate the threat they pose.

Silvicultural Systems & Management Guides

Silviculture

"Silviculture has been variously defined as: the art of producing and tending a forest; the application of knowledge of silvics in the treatment of a forest; the theory and practice of controlling forest establishment, composition, structure, and growth. Silvicultural practice consists of the various treatments that may be applied to forest stands to maintain and enhance their utility for any purpose. The duties of the forester are to analyze the natural and social factors bearing on each stand and then devise and conduct the treatments most appropriate to the objective of management." [Smith, 1986]

Silviculture is both an art and a science. The science (silvics) gives us the knowledge to understand how trees and forests grow; how they react to treatment, stress, natural forces, soil conditions, etc. The art is applying the knowledge in the field; the ability to make decisions and adapt to changing situations; the ability to take innovative approaches in the application of silviculture; the willingness to experiment.

Silviculture is a tool used to manipulate forest vegetation for many different purposes. Growing timber to produce lumber, paper, fuel, etc., has always been the traditional purpose of silviculture. However, it can also be used directly or indirectly to enhance wildlife habitat, water quality and quantity, recreation, aesthetics, forest sustainability, etc. by strategically manipulating the forest for a specific outcome.

Silviculture does not merely focus on the harvesting of trees. It is the harvest of trees to enhance the growth and development of other trees; it is the harvest of trees to ensure the continuity of ecological functions; it is the harvest of trees to improve the health and productivity of the forest; it is the harvest of trees to produce income and increase the value of the forest; it is the harvest of trees for the regeneration and renewal of the forest; it is the harvest of trees to enhance other uses; and sometimes it is the decision at any point in time to not harvest at all. In most cases, the practice of silviculture is more concerned with what is left behind; what results from harvesting. It is about providing the landowner the ability to realize continued and sustainable benefit from the forest.

Sustainable Forest Management

The organization of a forested property to provide a sustained flow of forest benefits is the very heart of forest management. A formal management structure is essential to ensure periodic harvesting activities do not degenerate into opportunistic timber mining; instead harvesting occurs in a strategic and orderly manner to sustain forest benefits over the long-term.

The basic requirements of a fully managed forest are that tree age and size classes are in the right proportion with consistent rates of growth, so predictable periodic yield of forest benefits may be obtained. Such a system can also facilitate the sustained production of a broad array of forest values, such as: continuous forest cover, clean water, wildlife habitat, timber, and recreational opportunities.

From a silvicultural standpoint there are two kinds of forest units, or stands: those that are evenaged and those that are all aged (unevenaged). An evenaged stand is one whose individual trees originated at about the same time, either naturally or artificially. An all aged stand is one where the trees have originated at different times, with several different age classes throughout. The silvicultural process for managing each type is slightly different.

Evenage Silviculture

Under traditional evenage silviculture, a forest is systematically tended until mature and then harvested to regenerate and start over – always maintaining a forest composed of trees approximately the same

age. This is a long process, and depending on the species could take up to a century to complete the cycle (or rotation). It is a process of sustainability - repeated renewal of the forest. Typically several different treatments would take place throughout this rotation that focus on tending, harvesting, and then regenerating the forest.

Forest Thinning

From the beginning stages of a young forest, thinning would be strategically planned every 10 to 20 years aimed at tending and growing the best crop trees until they reach maturity and are ready to regenerate again.

A thinning during the very early stages of development might be a noncommercial treatment (often referred to as forest or timber stand improvement - TSI), where stems that are not yet large enough (or good enough) to be sold, are cut for the purpose of improving the growth and development of the better crop trees – often thinning from below the main crown canopy to remove unacceptable growing stock first.

Timber stand improvement paves the way early on for the next set of treatments to be more commercial in nature, where forest products are harvested and sold to generate interim income while continuing the tending process; low-grade commercial products (i.e. firewood, pulpwood, or pallet logs) are removed first, and perhaps some of the codominant and dominant sawtimber trees of unacceptable quality. In many cases, a thinning is a combination of both TSI and the removal of commercial products. If harvesting concentrates on removing poor quality trees during these first treatments, later thinnings provide greater return, as we will be in position to select the worst of the best trees for removal.

In all cases, we always strive to maintain an optimal level of stocking to fully utilize the site and maximize growth. The key to improving and maintaining value from thinning is to maintain high levels of stocking of the desired species of the best quality so that successive treatments yield the highest amount of benefit and allow the seed source to perpetuate.

Forest Regeneration

Once an evenaged forest has reached maturity it is time to consider starting the process over again by regenerating the forest. One of the more effective methods used for forest regeneration is the shelterwood method. A shelterwood is essentially a heavy thinning to open up the canopy so sunlight is allowed to reach forest floor, stimulating seeds to germinate. Depending on the species, this might occur in one or two harvests (two stage shelterwood). The higher quality dominant and codominant desirable species of trees are retained in the stand as a source of seed for the next generation of forest. They will also provide short-term cover for the new seedlings until they become fully established.

If the forest has been thinned properly to this point, the trees forming the shelterwood should have good genetic character and they should have the best commercial qualities. Many of the trees removed in the shelterwood harvest should also have been of decent quality and value providing further interim income.

If there is any competing vegetation on site that will interfere with seed germination, growth, and establishment (i.e. beech saplings, black birch, ferns, striped maple, grass, shrubs, grape vine, invasive species, etc.), they will need to be treated with herbicide or by other methods before the shelterwood harvest. If the competing vegetation is not brought under control, a second application may be necessary. If the deer population is high, and other methods to control their numbers are unsuccessful, it may be necessary to erect fencing at some point following the shelterwood harvest.

Depending on the site and the species, it takes approximately 2 to 3 years for the site to "green up" and usually takes 3 to 10 years (depending on the species composition, seed production, site quality, growing

season, climate, etc.) for the new forest of large seedlings and saplings to become fully established. By maintaining the parent trees on site for 3-10 years, not only are we able to take advantage of the pre-existing seed bank, but we also take advantage of the continual input of seed from the trees that are retained – especially during the bumper seed crops that typically occur at 3-5 year intervals for most hardwood species. With the proper light conditions created through the harvest, the large volumes of seed that are dropped, and the control of competing vegetation and deer, large numbers of seedlings should become established.

Once the site has reached the appropriate level of stocking, the parent trees are removed. This releases the young forest to develop on its own without competition, thereby allocating all of the available growing space to them. What remains is a dense forest of small saplings. Approximately 10 to 20 years following the overstory removal, the trees should be tall enough to maneuver and see through comfortably.

(Timing is important for the shelterwood harvest; parent trees should be removed *before* the new trees are allowed to grow larger than 1 inch in diameter at breast height; any larger and they become less flexible and more susceptible to permanent damage and breakage during the removal of the larger trees.)

And a new evenaged forest begins, and the silvicultural process is repeated – Tend, Harvest, and Regenerate. These are known mechanisms to affect seedling regeneration and survival in an evenaged forest.

Before tending operations begin again, the forest should be allowed to undergo a natural selection process. Competition early on in stand development is important – the trees will begin to reveal their genetic qualities as the poorer ones struggle for canopy position. It will also force the trees to grow straight and tall, which induces clear stem development – the shedding of lower limbs from a lack of sunlight (fewer limbs = fewer knots = better lumber). This natural selection process should not be allowed to go on for too long though or we risk the trees developing small crowns – larger crowns allow for better food production and, hence, a greater rate of growth. A stand should be examined 20 to 40 years following regeneration and parent tree removal; at that time consideration should be given to prescribing a noncommercial timber stand improvement thinning – the first treatment directing the future development of the stand.

Age vs. Size

It is important at this point to explain that in a typical evenaged forest, smaller trees are not necessarily younger. In most cases the trees in these forests are very close in age; the larger ones are more vigorous having developed faster and better than the others. For all intents and purposes the smaller trees are "runts" that have become suppressed by the more vigorous overstory trees. They are not as healthy and less productive; and for most species their suppressed state will only worsen over time leaving them little ability to improve, even with management. It is not a genetic quality that we want to put effort and resources into perpetuating.

As an example, this characteristic is most easily recognized in a plantation setting like that shown in the picture to the right. Both of these trees are the same age – they were planted at the same time. Yet the one on the right is half the

size of the one on the left. This is a genetic shortcoming. It is important to address these trees early on in stand development – if we do not remove as many of them that silviculture will allow as soon as they can be identified, they only add to the competition in the stand and take up valuable resources and sun light that are important to the better trees. It is very likely that the tree to the left could have achieved an even better rate of growth if the competition created by the tree on the right had been removed earlier.

All-Age (Unevenage) Silviculture

The process for all-age silviculture is essentially the same as evenage silviculture, except we tend, harvest, and regenerate at the same time with each harvest. In an all-aged forest we are maintaining a structure that includes trees of different age classes from young to old. Instead of managing an entire community of trees we focus more on managing individuals or small groups – selected mature trees are harvested to regenerate new trees in their place; and we simultaneously tend the younger age classes by removing the excess numbers. The forest continually undergoes the renewal process through harvesting, but always maintains a high canopy, because the overstory is never removed in its entirety. To maintain an all-age structure thinning is strategically planned every 15 years.

There are two subsystems of all-age silviculture – "single tree selection" and "group selection". Each caters to a slightly different circumstance. Single tree selection is used in managing trees with higher tolerances to shade, as it involves removing single trees scattered through the forest. Group selection can also be used with trees more tolerant to shade, but is also used in managing trees less tolerant to shade; small opening are created to expose the ground to more direct sunlight. Both methods can be used together effectively to manage for an all aged structure.

It was mentioned above that in evenaged forests smaller trees were often smaller because of genetic differences and not age. This is not always the case in an all aged forest – smaller trees are younger trees that have been deliberately managed for. There will, however, still be undesirable genetic qualities in trees that must be identified and addressed while tending the younger age classes.

The first important difference between all-aged and evenaged silviculture, is that this type of management can only be successful if the species present will tolerate shade – sugar maple, beech, hickory, red maple, hemlock, balsam fir, and red spruce are some of the primary shade tolerant species in the northeast. In all aged silviculture, only small amounts of sunlight will reach the forest floor at a time, and that is typically for only a short period. Once regeneration is established it will need to be able to survive and thrive in the shade, until it can be released during the next thinning.

Competing vegetation must be monitored continuously in an all aged forest and must be dealt with as needed to sustain desirable seedling germination and establishment.

Two Age Silviculture

The visual impacts from evenage management are much more dramatic than those resulting from all-age management. The final harvest to release the understory changes the forest from one composed of widely spaced tall trees to one composed of densely spaced short trees. Two-age silviculture may offer an alternative to mitigate some of the visual impacts from evenage management.

This approach is a variation of evenage management, where some of the shelterwood trees are retained when the understory is released. By leaving overstory trees, the residual stand would be composed of two distinct age classes. The retained trees allow some of the high canopy to remain intact, but are few enough to not interfere with the development of the young forest growing underneath. In pursuing two-age management, basal area stocking would be reduced to 20 to 30 square feet per acre made up by 15 to 20 evenly distributed sawtimber trees per acre in dominant and codominant positions. The goal is for

both age classes to share the site equally for the short term (i.e. each composing about 50% of the basal area).

An added benefit to retaining some of the original overstory is the opportunity to generate revenue during the first TSI treatment that would normally not produce sawtimber. This approach also provides for some habitat management opportunities by maintaining diversity of tree size and crown position; it also ensures some mast production where species like oak, hickory, etc. remain on site. For the benefits outlined above, it is often a good decision to employ this method, but should be made on a case-by-case basis.

Evenage to All Age Conversion Silviculture

Under some circumstances or where appropriate to the landowner's goals, it is sometimes desirable to attempt converting an evenaged stand to an all-aged stand. In order to facilitate this kind of conversion, however, it is critical that the species composition of the stand be heavier towards those species that are tolerant of shade, as is ideal for all aged management. While not required, it is also beneficial for quicker short-term results if the stand has adequate numbers pole size trees of acceptable growing stock.

The conversion begins by creating small patch cuts $1/5^{th}$ acre in size throughout the forest/stand. Approximately 1-2 patch cuts should be created for every 3 acres of the stand area, where all trees down to 1" in diameter are to be cut inside the patch perimeter. The rest of the forest between the patches would be thinned as per a normal evenaged prescription where stocking levels are reduced by about 20-25%. It is important that as many of the largest trees and the best pole trees in the matrix between patches are maintained in the stand.

This process would need to be repeated every ten years. This will slowly incorporate new age classes into the forest, as it develops into an all-age system. It could, however, take 50 to 100 years to fully make the conversion.

It is important to note that if the intervals are spread too much further than 10 -15 years, the understory trees (especially those intolerant to shade) are at risk of developing a "flat top". This condition results from the adjustment that overtopped suppressed trees make to a low light environment. The trees develop the flat top in an effort spread their leaves horizontally to keep from shading its own leaves. The problem is that once a tree does this, it has relegated itself to a subordinate life and will never truly develop properly. So in this situation, even trees of good genetic composition could be forced into a suppressed runt like condition that is irreversible.

If it is apparent that any competing vegetation will interfere with the establishment and development of new age classes, they will need to be treated with herbicide before hand or they will hinder the success of conversion.

Skid trail location is an important consideration with this form of management. Skidders can be permitted to enter the patches to retrieve cut trees, but main skid trails should not be located through the patches. The soil compaction caused by repeated skidding will prohibit seedling germination and development on the trail. Skid trails should be located well outside the edge of the patch, as seedlings are also likely to develop outside of the patch due to the side lighting that will occur into the shaded areas.

This is a relatively new concept. Current research does not extend very far into the future of a stands development to predict outcome precisely. If this is technique is employed, it will be important to evaluate the results at the start of each cycle before the next treatment begins, and after 2 or 3 entries it may be necessary to adapt management.

Growing Stock Condition

Used in forestry, the term "inventory" has to take on a broader meaning than just a list of goods or materials. This is true primarily because a tree is both the factory and the product. Distinguishing between the two is important for deciding which trees should be kept as growing stock (the factory) and which should be harvested for use (the product). For this reason, forest inventory means more than accounting for the products that would be harvested for use. It includes information about growth, quality, treatment needs, and other things that go beyond a listing of what there is at a given time. For silvicultural purposes, growing stock is a more comprehensive forest measurement than volume, and can be a important tool to understand the health, condition, trajectory, and potential of a forest.

There are two basic classifications of growing stock, that which is acceptable and that which is unacceptable. Where as, unacceptable growing stock trees (UGS) can be described as those trees having a higher risk for future survival (typically not able to survive for another 20 years) or with little or no potential to improve in quality and value (to develop into lumber producing sawtimber); they are trees of low vigor, poor health, poor form, that have excessive levels of decay, or are an undesirable species. The cherry tree pictured left, is an example of unacceptable growing stock; it is crotched low to the ground and has a large sprout growing from the left side at the stump. In this condition, the tree would be graded as pulpwood/firewood and will not improve to a sawtimber grade.

A "cull" tree is a specific kind of unacceptable growing stock. It is defined as a tree having less than 50% useable volume due to decay or physical abnormalities, and is considered too poor to be useable. The sugar maple tree pictured above in the middle above would be considered a cull because of the large canker and associated rot.

Acceptable growing stock trees (AGS) are simply in the opposite condition of their unacceptable counterparts; they are straight, sound, healthy, and vigorous. AGS are expected to survive until the next harvest and either are or have the potential to grow into sawtimber. The sugar maple tree pictured all the way to the right above exhibits these desirable characteristics.

It is also important to distinguish that the sawtimber product classification does not automatically mean that a tree is of high quality. In fact, trees can produce lumber volume, but because they may be expected to die within the next 20 years or have extremely poor form or are unlikely to improve in quality, may be rated as an UG. Likewise, a smaller pole or sapling sized tree that is straight, relatively free of defects, looks like it will survive, and appears to have sawtimber potential, may in fact be a suppressed understory tree with a poorly formed crown that will never truly develop any further beyond its current status would be rated as an UG.

For stands that are fairly well stocked, we typically aim to maintain acceptable growing stock levels to 75% or better throughout the life of the stand. The proportion of acceptable growing stock can be

improved through the removal of unacceptable growing stock trees. Any treatments administered should target their removal first before removing any of the acceptable growing stock. By reducing undesirable growing stock to the extent possible during early thinnings, intermediate thinnings and the first harvest of the regeneration sequence have more opportunity to yield better timber and more value. Selecting and maintaining trees of acceptable growing stock condition starts early in the development of a stand (i.e. 20-40 years of age). By putting forth the time, effort, and cost to control unacceptable growing stock early in stand development, there are likely to be greater financial benefits throughout the life of a stand.

Growing stock is primarily measured according the number of square feet of basal area. Basal area is the cross sectional area of a tree at 4.5 above the ground (diameter at breast height – DBH) and is expressed on a per acre basis. It is the total area of an acre that is physically covered by trees.

The growing stock condition and basal area stocking for each stand is covered in greater detail in the individual stand summaries in this plan.

In making decisions about selecting which trees should be harvested, not *every* "bad" tree in the forest needs to be cut. A bad tree, but of the right species and in the right place is as important as a good tree in the right place. For example, a large over mature "bushy" sugar maple, cherry, or oak tree may still be a good seed producer or a heavily limbed hemlock tree might contribute to the species diversity of a forest; in the right circumstances trees like these may be important to leave in the residual stand. It is also important to maintain a stocking of regularly spaced trees of the right number to keep the site fully utilized; it is often necessary to leave some UGS to maintain the level of stocking above this threshold. Plus with large over mature bushy trees, it is important to consider if they will cause excessive damage or destruction of other desirable trees in the forest when harvested; some times it is better to leave a bad tree to avoid irreparably harming others during logging.

Growing stock used in the context of this discussion is used to help make silvicultural decisions aimed at sustainable forest management. In many cases for the sake of maintaining or enhancing aesthetics, it may often be the best decision to leave a particular tree, regardless of its growing stock condition. Sometimes the shape, form, size, or location of a particular tree has a visual appeal to those that might use the forest. Den and other trees used by wildlife, that would be rated as unacceptable growing stock most of the time, are valuable to birds and mammals and could be retained for purposes other than timber production. Culls, trees with cavities, and trees of deteriorating condition are critical habitat components. Just as important to wildlife, are those trees that are good mast producers like beech, oak, and hickory; their nuts are an important food source and may be valuable to retain as well, regardless of their timber quality. Maintaining a diversity of species is also taken into consideration; it is often warranted to maintain trees of a particular species that are less abundant, regardless of their growing stock condition.

The maple tree pictured right would be considered an UG, but might be desirable to retain for its form and aesthetic appeal. Additionally, this particular tree is of a desirable species and has an expansive healthy crown - it may be good seed producer and is likely the parent of many of the smaller trees growing around it; it also has several cavities that can provide wildlife dens. Leaving a tree like this may be beneficial for no other reason than to protect the forest from damage; a tree of this size with

its wide crown will damage a large number of trees when felled and more yet during skidding. The benefits of harvesting do not out way the costs to the residual stand.

Stocking Density

The stocking density of a stand is an important measurement to determine whether or not a stand is ready for treatment. It is technically defined as the actual stand density compared to the average maximum density common to its forest type. Simply put, it is used to describe how crowded the trees are for that particular forest type. Stocking is used here to prescribe management for maximum tree growth and regeneration.

The level of crowding can be characterized in one of five ways to prioritize treatment.

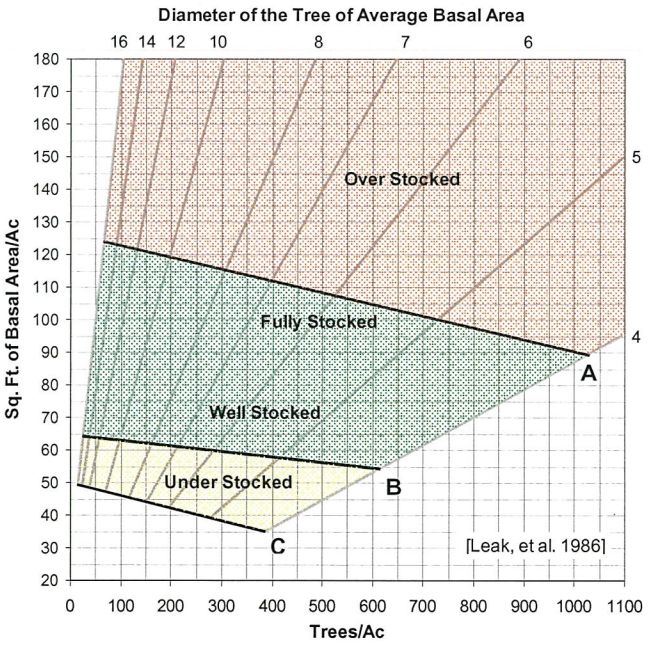
Over stocked stands are highly crowded with slow rates of growth and high rates of mortality. These stands should receive the highest priority for treatment.

Fully stocked stands become increasingly crowded, with slowing rates of growth and increasing rates of mortality. These stands should also be prioritized for treatment.

Well stocked stands are not crowded and the trees are able to achieve high rates of growth without competition. On a per acre basis volume production in total is highest at this stocking level. Unless it is ready for regeneration these stands do not require treatment.

Under stocked stands are not crowded either, but the site is underutilized and total volume production is much lower. This condition would be expected on a temporary basis in mature stands harvested for regeneration purposes. In other circumstances where exploitive or negligent over harvesting has occurred in an immature stand, it will be susceptible to invasion by competing vegetation, and/or the development of an unwanted or premature understory. There is also risk that tree quality may deteriorate as the trees become more open grown – branches may sprout on the main trunk from dormant buds and existing limbs may not shed as quickly; the trees become knottier, creating poorer quality lumber. If the stand still contains enough trees of acceptable growing stock to warrant further management, it should be left alone to accumulate additional growing stock.

Under stocked with acceptable growing stock would be used to characterize a stand that, regardless of total stocking, does not have enough good trees to warrant further management. If there is an adequate seed source of desirable species, an attempt to regenerate the stand should be made. Otherwise consideration should be given to an alternative use for the land other than the production of high quality timber.



For evenage silviculture stocking is evaluated and characterized through the use of an evenaged stocking guide, an example of which is depicted right. Using a chart like this, we are able to plot the stocking density for a particular stand based on the number of trees and the square feet of basal area present in the upper canopy (excludes most understory trees). We

are then able to accurately assess the degree of crowding by comparing the stand against the A, B, or C lines and make decisions about when to harvest. Charts like this one are used to illustrate stocking density in the individual stand summaries in this plan.

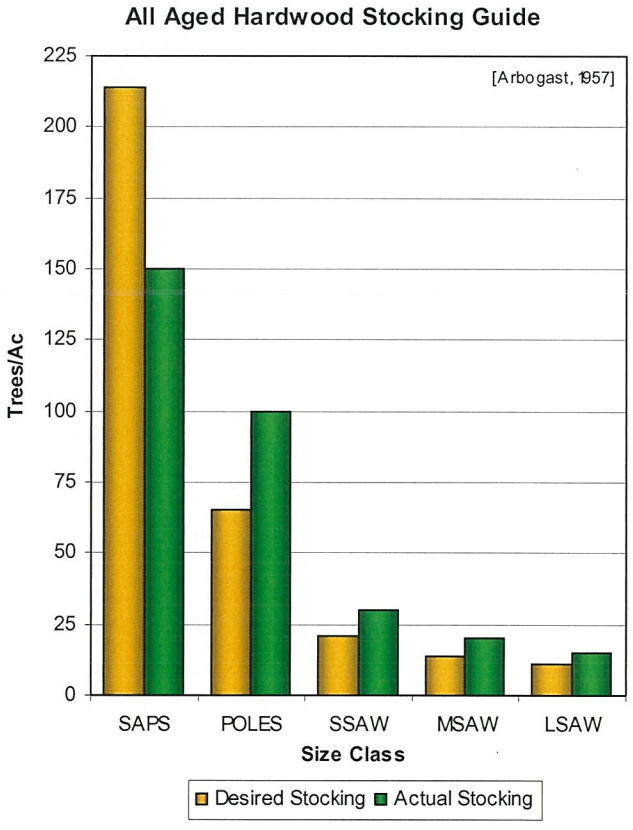
Stands with densities over the A line are over stocked. Stands with densities from the A line to about half way to the B line are fully stocked. Stands with densities from the B line to about half way to the A line are well stocked. Stands with densities below the B line are under stocked; this is normal for stands where proper regeneration harvesting has occurred (i.e. shelterwood). Stands where parent trees have been removed to release new forest and/or where a two-age silviculture is being employed are likely to drop below the C line temporarily; this is not of concern if new forest regeneration has been successfully established underneath first.

The degree of crowding (stocking density) can be controlled through thinning. By removing trees from the stand we are able to stimulate growth of those that remain. We are also able to control the degree of mortality by reducing the competition between trees and concentrate growth on those trees that are expected to stay alive between treatments. Managing within the thresholds established by the guide typically allows for harvesting every 10-20 years.

Even age management can be used in all kinds of timber/forest types, but works especially best with species that prefer full sunlight (i.e. cherry, ash, oak, etc.).

Different guides exist and are used based on the forest type that is being evaluated. The guides primarily used in the eastern United States are for: Northern Hardwoods, Mixed Northern Hardwoods & Softwoods, Allegheny Hardwoods, Central Hardwoods, and various softwood/plantation species. A different guide may be used and is displayed in the individual stand summaries in this plan.

For all age silviculture stocking is evaluated and characterized through the use of an all aged stocking guide, an example of which is depicted right. This bar chart shows the number of trees per acre of desired stocking levels vs. actual stocking levels. For this silvicultural system stocking levels are evaluated exclusively by the number of trees per acre present in a particular diameter/size class. It is assumed that trees of different diameter represent trees of differing age. They are grouped together into five specific size classes to represent five age classes: SAPS – saplings sized trees 1-5 inches DBH; POLES – pole sized trees 6-11 inches DBH; SSAW – small sawtimber sized trees 12-15 DBH; MSAW – medium sawtimber sized trees 16-19 inches DBH; and LSAW – large sawtimber sized trees 20+ inches DBH.



Research has determined that to maintain a sustainable all aged structure there is a certain minimum number of trees within each age class that need to be maintained all the time (Desired Stocking). As new age classes are

formed through regeneration of trees and others grow and advance into larger size/older age classes the numbers of trees increases beyond the desired stocking level for any one particular class; once there are enough trees over these minimums to support a thinning, harvesting can occur sustainably. The surpluses in any class determine the number of trees per acre that can be safely removed without jeopardizing sustainability. Typically managing to these minimums allows for harvesting every 15 years.

This form of management works best with species that can tolerate shade (i.e. sugar maple, red maple, hickory, hemlock, etc.)

The all age stocking guide above is an example of a stand, where it is overstocked in most size classes except for the saplings class (Actual Stocking – green bars; Desired Stocking – orange bars). The surpluses are quite evident, and may be enough to support a commercial thinning.

In this example, it is critical to note that without an adequate number of saplings to grow into the larger classes, a deficiency will eventually form. Harvesting in this stand would need to ensure proper treatment to start a new age class. It may also be prudent to leave smaller trees in the pole class above the desired stocking level to keep them in the stand longer to make up for any possible future deficiencies.

It is also important to consider species composition when evaluating stocking levels and developing prescriptions. Undesirable species like beech and other forms of competing vegetation can sometimes make the stocking levels look better on paper than in reality (especially in the sapling class). It is not uncommon to have an all aged forest with a heavy beech component in the sapling class. This is not a favorable condition, because without desirable seedling and sapling regeneration, the stand will not be able to maintain a sustainable structure long term if the competing vegetation is not addressed.

Best Management Practices for Erosion & Sedimentation Control

Best Management Practices (BMP's) are methods that prevent or reduce the erosion and movement of sediment, nutrients, pesticides and other pollutants from the land to surface or ground water, or which otherwise protect water quality from potential adverse effects of timber harvest activities. These practices are developed to achieve a balance between water quality protection and the management of timber.

Due to the potential erosion problem, designated management activities should occur at a safe distance from main drainages, spring/seep areas, and vernal pools. Buffer strips around these locations should be designated and when deemed necessary, no forest management activities should occur within these areas. Disturbance to wetlands should be minimized to ensure little or no loss of function. Rutting from skidding activities should be minimized wherever possible, most especially on slopes where water flow can occur causing erosion and sedimentation.

Wherever water resources are present, minimizing erosion during management activities should be mandatory. Any drainages or creeks that flow on a property pose a potential for creek bank erosion during high rainfalls and spring thaws. If access through any of these areas is necessary, the use of culverts, corduroys, bridges, etc. should be used to keep erosion to a minimum.

Planning & Methods of Protection:

Landing areas should be appropriately sized for the scope and size of the timber harvest and should be located on firm or frozen ground. As often as possible they should be located at least 200 feet from water bodies, watercourses, and wetlands. Where it is necessary to locate landings within 200 feet of a water resource, additional measures should be employed if necessary to ensure that water flow is minimized and sediment is prevented from flowing into the water (i.e. silt fence, hay bales, water bars, etc.).

Haul roads should be located as often as possible in stable locations, with minimal slope, and should be constructed using suitable materials. They should be located away from water bodies, watercourses, and wetlands, and whenever possible should allow for an adequate filter strip. The road should be crowned and ditched where appropriate to shed and capture water. Where crossing streams or drainages is necessary, properly sized culverts or bridges should be used. Avoid crossing wetlands, but if necessary design the road to have minimal impact or loss of function.

Skid trails should be located as often as possible on stable ground and should avoid steep slopes where possible. When operating on steep slopes break the grade and ensure proper drainage and soil stabilization (i.e. water turnouts, water bars, etc.). When operating on unstable ground avoid skidding under wet conditions and/or take steps to minimize rutting (i.e. corduroy, tree tops, etc.). Where necessary to cross drainages or streams, culverts or temporary bridges should be installed. If necessary, hay bales and/or silt fence should be installed down stream from the crossing to prevent sediment from flowing downstream. Careful planning and location of skid trails will help considerably in controlling soil erosion.

Streamside Management Zones (SMZ's) are those areas directly associated with a water body, watercourse, or wetland that are specifically designated and maintained as a buffer during and after a harvest operation. Harvest activities should be minimized or avoided in these areas to protect water quality while equipment is operating on the property. Benefits from SMZ designation can include sediment filtration; shade to maintain cool water temperatures; food in stream courses; stream bank protection; flood plain stabilization; recreation; wildlife corridors; and timber production. SMZ's should be maintained along all perennial streams, ponds, perennial springs, and any springs, reservoirs, and streams

that serve as domestic water supplies. The distance of the SMZ edge from the stream could vary from 50 to 300 feet minimum depending on the slope, sensitivity of the water resource, and the stability of the soil.

Some examples of different erosion and sedimentation control methods and practices are depicted below.

Temporary bridges provide an effective stream crossing for heavy equipment and helps protect and minimize disturbance to the streambed and banks.

When placed in smaller creeks and drainages, hay bales can provide an effective temporary sediment trap downstream from a stream crossing.

Geotextile mats help stabilize and support forest roads. This material is permeable to water and can help control rutting and water flow.

Smoothing ruts in skid trails after use minimizes the channeling and ponding of water during rainfalls and spring melts.

Waterbars are one of the most effective means of slowing and diverting the flow of water off of skid trails, and provides long-term erosion control on slopes.
[Photo courtesy of NYC Watershed Forestry Program]

Silt fence is good temporary measure that can be used to capture and prevent sediment from entering a body of water.
[Photo courtesy of NYC Watershed Forestry Program]

Stream Bank Management & Protection:

Erosion control along stream banks and drainages is a long-term commitment. Several methods of protection can be implemented to slow down the erosion process. Possible controls are as follows:

1. Remove trees that have tipped over and have fallen into the stream. These trees can alter the stream course and cause immediate bank erosion. Release pressure on stream banks from trees that are "out of the vertical".
2. Seeding of creek banks will slow down soil erosion into the creek. Applications that include mulching and netting form an additional protective mat that holds the soil and fertilizer in place until the seed germinates and grows. Several types of seed are available. The use of soil maps and aspect of an area will aid in determining the correct seed.
3. Application of logs and stones in the creek bed will help stop undercutting of the creek bed. Coordinating this activity during the dry season will allow erosion access and the least amount of disruption to the tributary of Great Forks Creek. Any activity on the creek should be done with the cooperation of the lead state forestry agency to ensure the proper permits have been obtained.
4. Biotechnical erosion control measures such as planting willow wattles, dead-tree revetments, etc. are also viable options.

Wildlife Habitat Management Practices

Diverse forest types coupled with, brushy transition areas, and open fields provide a significant amount of "edge" which is crucial to many forms of wildlife. Many practices can be applied both in the forested and open areas of any property to enhance wildlife habitat. Some examples of these practices include:

- Create and/or leave snags and cavity trees standing in the forest for nesting and dens sites, and places for birds to forage for insects. Care should be taken, however, as some snags and/or dead trees may pose an overhead hazard.
- Plant and/or maintain a reasonable level of mast producing trees like oak, hickory, and beech.
- Utilize woody debris/blocks of wood left on landings after harvesting to create piles that serve as "wildlife condominiums". Stumps piled from road or landing construction provide the same kind of cover.
- Regeneration harvesting allows young succulent herbaceous plants and trees to develop on the forest floor and provide food, cover, breeding, and nesting habitat for a variety of animal and bird species.
- Minimize or restrict timber harvesting in springtime when birds are nesting in trees, shrubs, and on the ground.
- Create brush piles from slash accumulated from harvesting to create dens for rabbits and other wildlife.
- Create living brush piles by partially cutting through small diameter trees or shrubs and tipping them over in groupings.
- Maintaining dead woody debris and logs on the forest floor provide shelter for salamanders, amphibians, small mammals, reptiles, etc. In the right location larger down trees or tipped out root systems can help create
  ground dens for larger mammals like bear, coyote, and fox.
- Create and/or maintain rock piles and rock walls or protect open hill slopes with exposed flat rocks for snakes and small mammals to use.
- Vernal pools are small shallow temporary wetlands that form in depressions from spring/fall rains and snowmelt. They should be protected from disturbance as they provide much-needed habitat to amphibians like frogs, toads, and salamanders. These are also a

Snags/dead standing trees provide feeding and nesting areas for birds, bats, and other small tree dwelling animals.

While they have little or no timber value, trees like this make ideal dens for a variety of animals.

Mast producing trees, like oak, drop their nuts in late summer early fall providing an excellent source of food for many mammals and birds.

source of drinking water for forest dwelling animals and are a rich food supply for many different organisms.

- Create and/or maintain open fields – A single opening is fine, but several smaller openings are better. Seasonally mowing open fields keeps grasses lush for grazing. Mowing specifically in late summer and early fall has the added benefit of stimulating the production of seed, which is an important source of food for many animal and bird species. It is important to avoid mowing grass areas in spring and early summer when most bird species are breeding and nesting. These areas also attract large numbers of insects providing an important source of food for many bird species.

Brush piles are a simple and effective way to create habitat for small birds and mammals.

- Create grassland food plots that contain: wheat, rye, oats, clover, alfalfa, crown vetch, soybeans, winter pea, sunflower, etc. Fall plantings of wheat or rye mixed with clover, alfalfa, or vetch provides good fall and spring feeding. A planting of a perennial hay crop provides seed and insect foraging in the summer months. Areas planted with a mixture of soybean, millets, winter pea, and chufas will provide feeding areas in the fall and winter.

Down decaying trees provide cover for amphibians, salamanders, small mammals, snakes, etc. They also provide opportunities for wildlife to forage for insects, grubs, etc.

- Create and/or maintain shrub communities; periodically mowing these areas will prevent them from reverting to forest cover. Mowing small sections of these areas on a rotational basis will maintain brush in some areas while the mowed ones grow back. As with grass areas, mowing in spring and early summer is not recommended.

Rock piles are simple to create and provide effective cover for small mammals, snakes, etc.

- Create shrub land food plots that contain black berry, raspberry, elderberry, blue berry, apple, sumac, rhododendron, crab apple, hawthorn, dogwood, choke cherry, wild plum, etc.
- Create woodland food plots - Interplant tree and/or shrub species like white cedar, aspen, ironwood, red oak, white oak, balsam fir, hemlock, witch hazel, serviceberry, flowering dogwood, etc. in more open areas (i.e. regeneration harvests)
- Create small coniferous plantings in patches or long corridors to create additional browse and cover. Dense stands of softwoods provide wildlife with significant benefits. Bear and deer will use such areas for denning or bedding in winter months; the dense canopy provides cover from convective heat loss on cold winter nights or during winter storm events. Many wildlife species will use these areas as secure travel routes or ambush points.

- As per best management practices, protect streams, ponds, wetlands, and water bodies from disturbances that cause sediment, erosion, or degradation that would disrupt or inhibit their function. These are sources of drinking water for animals and habitat to fish and other water dwelling organisms.
- Protecting spring seeps is important for a number of reasons, but in addition to being a source of water for wildlife, spring seeps rarely freeze in the winter and provide them access to insect larvae and vegetation in the winter months; especially for turkeys and other birds.
- Plan for the retention of a few tall individual trees during overstory removal harvesting in regeneration areas. These trees provide hunting perches for raptors and other birds of prey.

Amphibians, salamanders, and other organisms live and reproduce in vernal pools in the spring and early summer months.

More detailed information and recommendations on wildlife enhancement activities can be provided as desired. Information is readily available on management for deer, grouse, turkey, and rabbits and their food and shelter needs. Information is also available for the management of non-game species of birds, mammals, reptiles, and amphibians.

Biodiversity

In the ever-changing field of resource management, "biodiversity" has become a necessary consideration and integral part of decision making. Multiple use management is the Conservationist's approach to maintaining biodiversity.

Where timber harvesting is involved, the responsible agencies must consider:

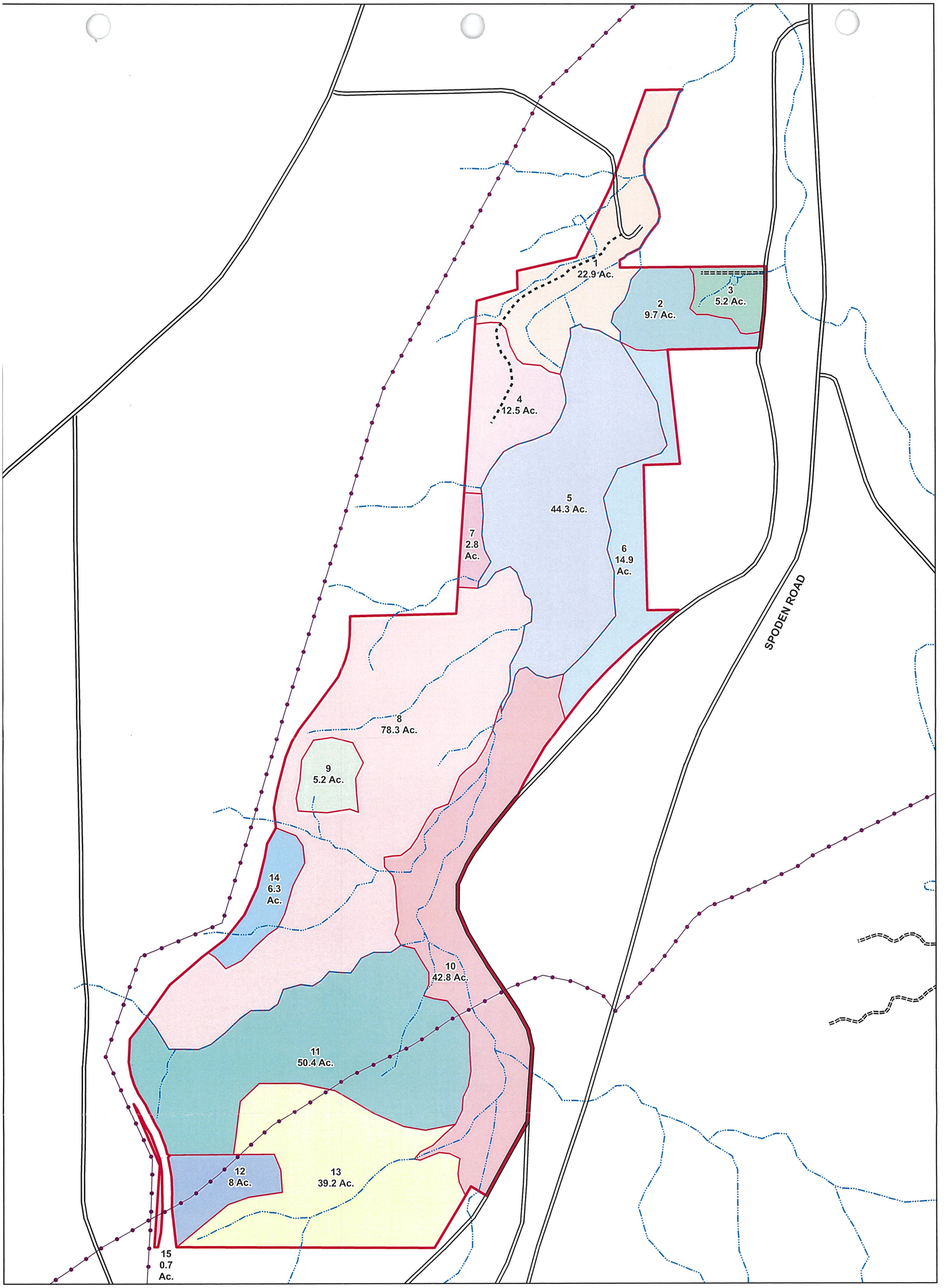
1. The presence of rare, threatened or endangered plant or animal species.
2. Preservation of trees that are scarce seed sources in a given stand.
3. Preservation of species diversity.

Inquiries were submitted to the appropriate State Agency to review the most current significant habitat mapping relative to the ownership. Responses are summarized in the Executive Summary and/or the Appendix.

If rare, threatened, or endangered plant or animal species are present in forest management areas on the ownership, the resource manager should understand the implications that forest management activities may have and adjust accordingly.

Furthermore, in each stand where harvesting, thinning, or timber stand improvement is to be performed, it is important to preserve scarce seed sources.

It is also incumbent upon resource managers to preserve and enhance tree species diversity in a given stand. Simply stated, this means that no particular species of tree should be eliminated through thinning, harvesting, or timber stand improvement.



VILLAGE OF FREDONIA
SPODEN ROAD TRACT
346.3 ACRES
SPODEN ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
STAND LOCATION MAP

Feet
0 330 660 1,320

N

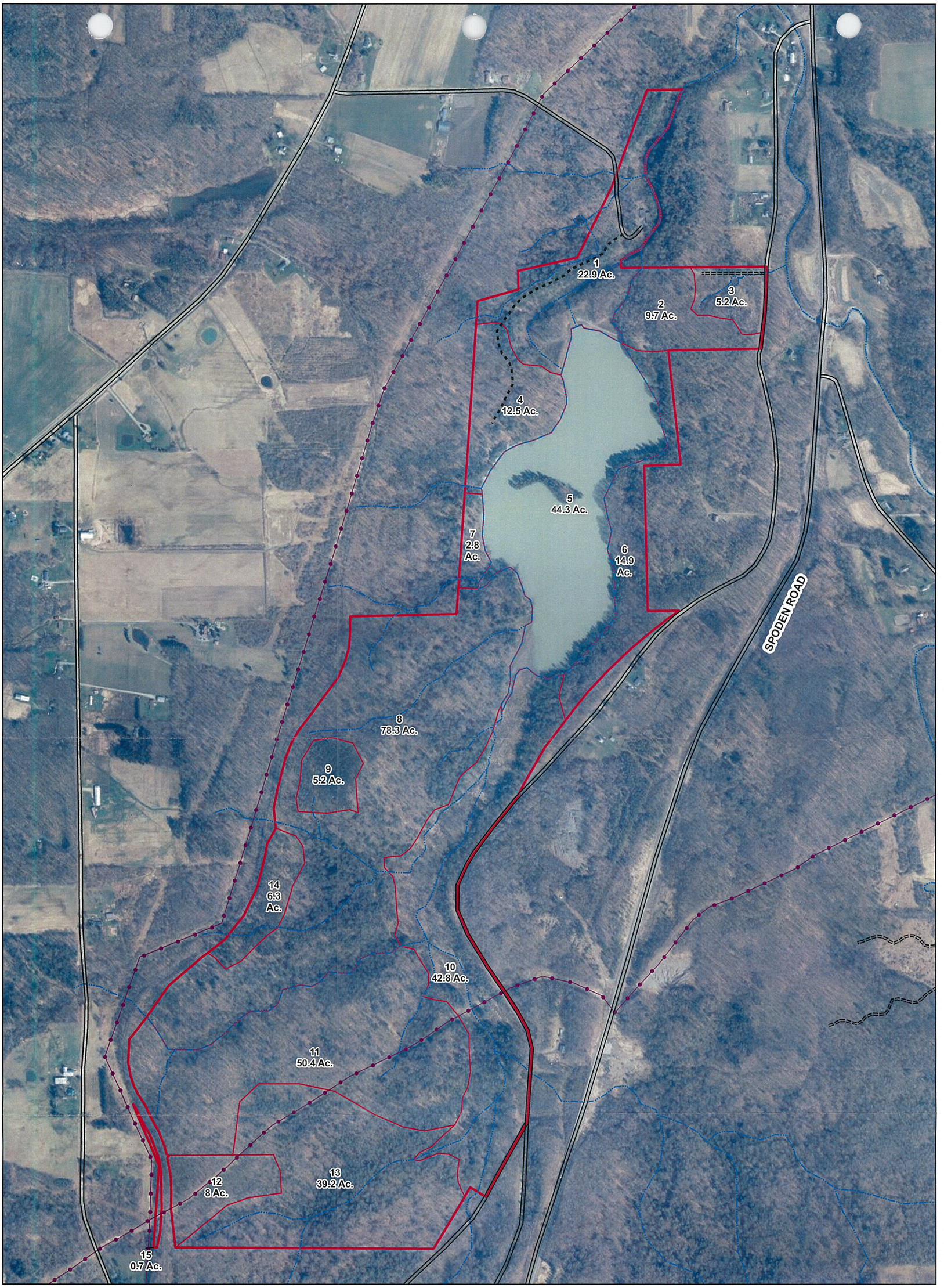
Legend

- Property Line
- Stand Line
- Stream
- Power/Gas Line
- Paved Road
- Woods Road
- Trails

TimberH\Clients2019\Private\
Falconer\Fredonia_Village

All mapping was prepared using the best available information about the property from various sources and does not represent instrument survey accuracy. Acreages are estimated using geographic information system (GIS) technology and may not be consistent with acreages calculated by the county tax office or the ownership deed. This map is not a legal survey.

FORECON



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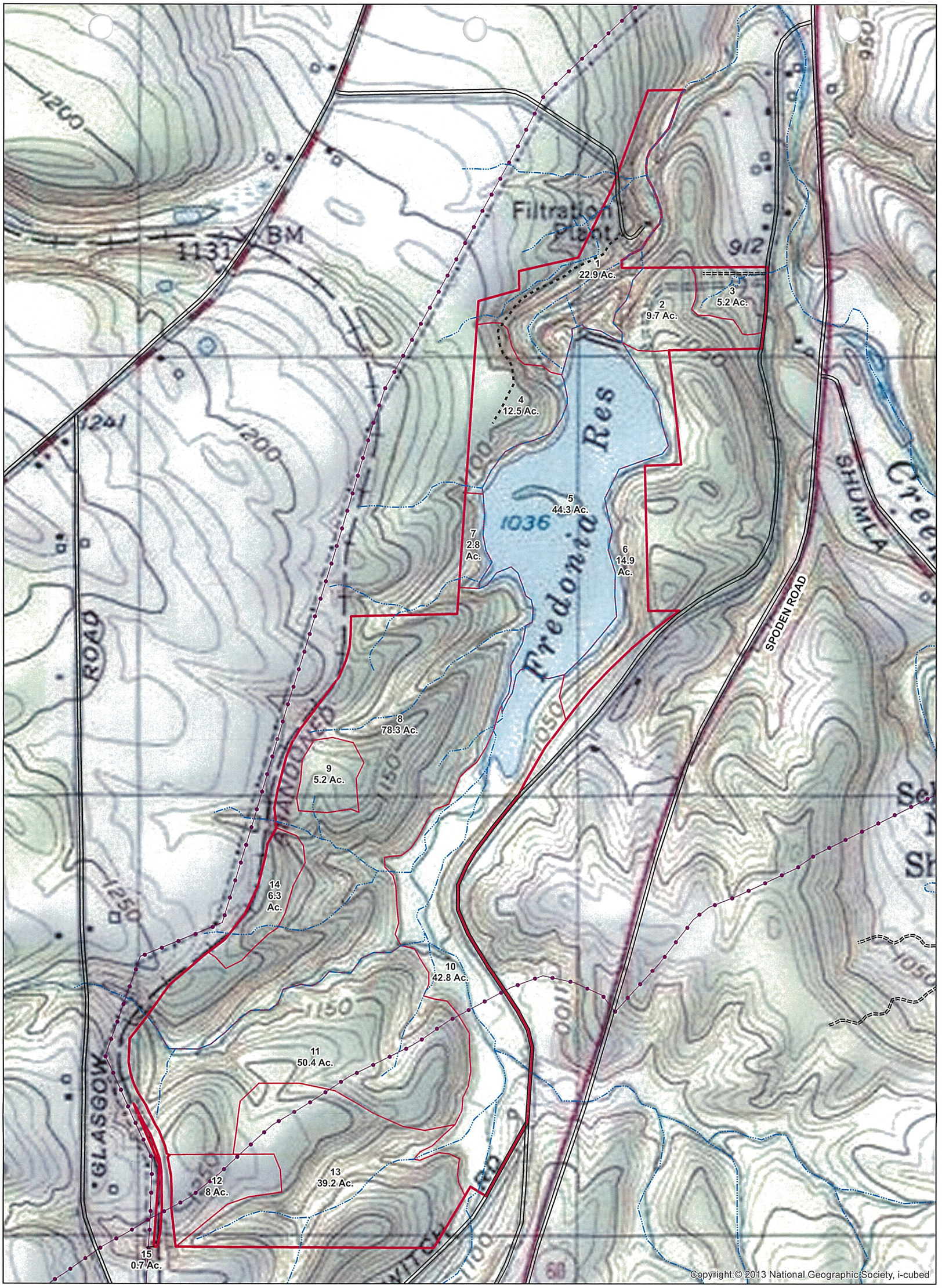

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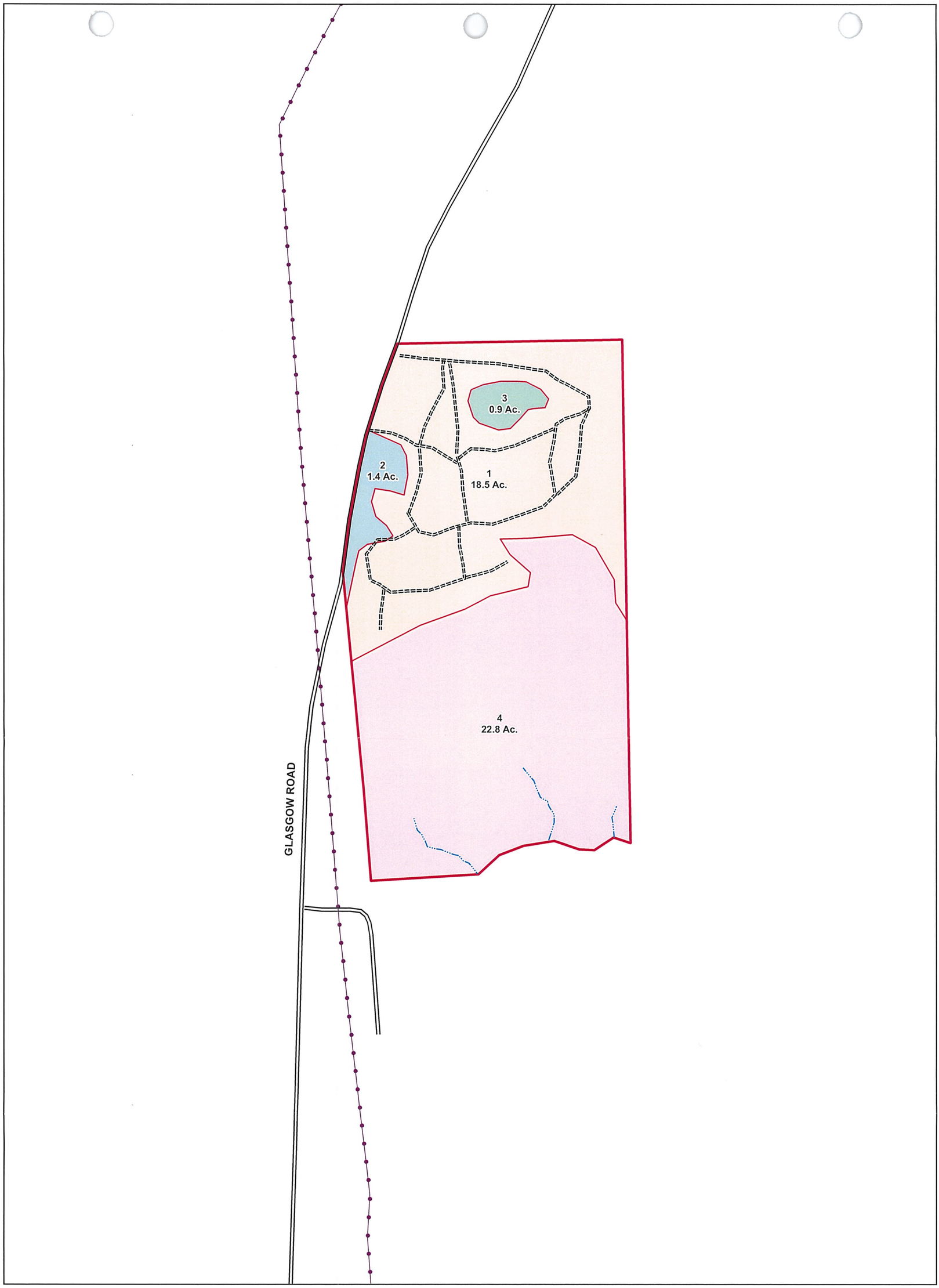

VILLAGE OF FREDONIA
GLASGOW PARK TRACT
43.1 ACRES
GLASGOW ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
STAND LOCATION MAP

Feet
0 165 330 660

Legend

- Property Line
- Stand Line
- Stream
- Power/Gas Line
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- Woods Road
- Trails

N

TimberH\Clients2019\Private\
Falconer\Fredonia_Village

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FORECON

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GLASGOW PARK TRACT
43.1 ACRES
GLASGOW ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
STAND LOCATION MAP

Feet
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Legend

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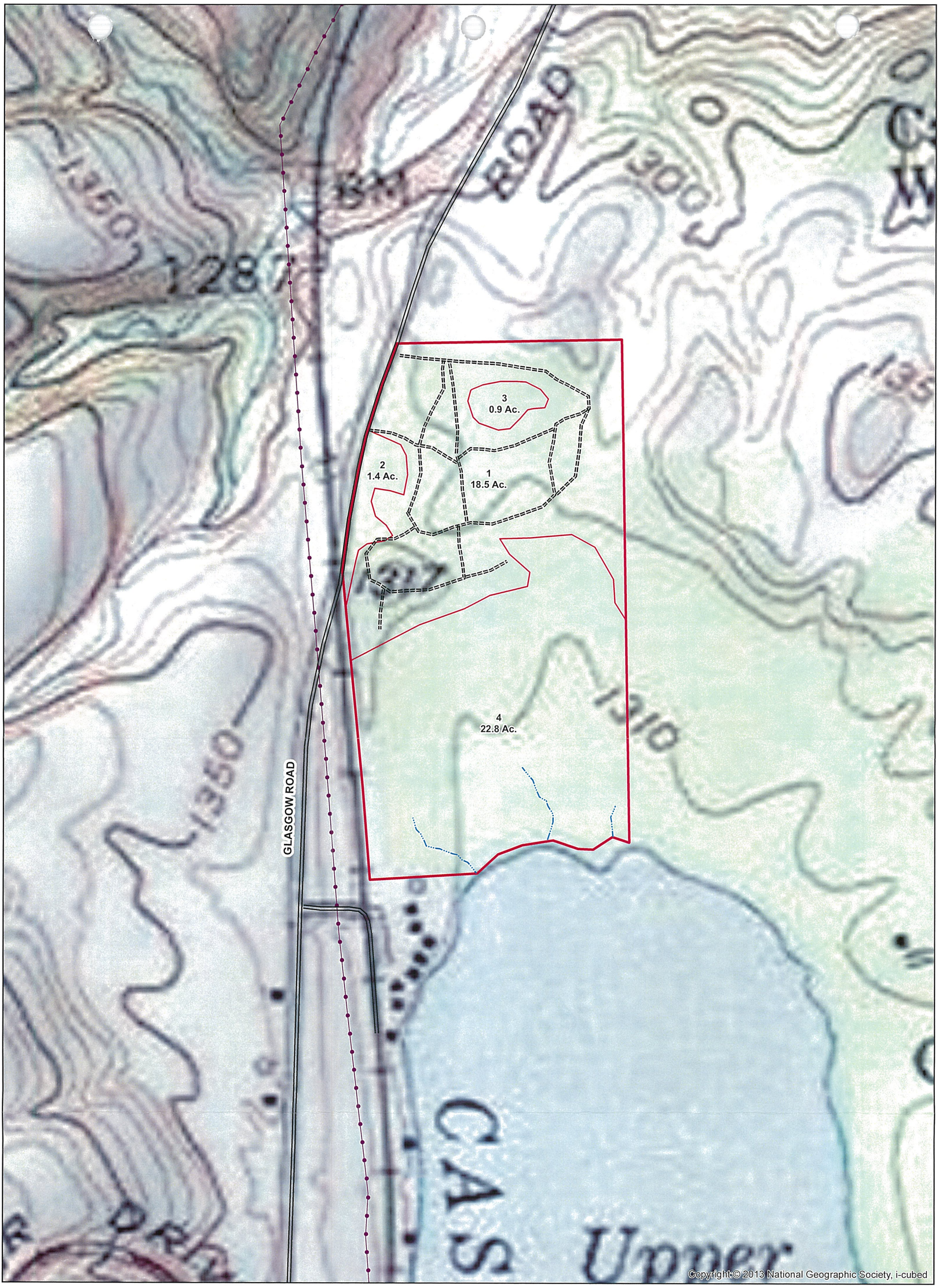

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FORECON

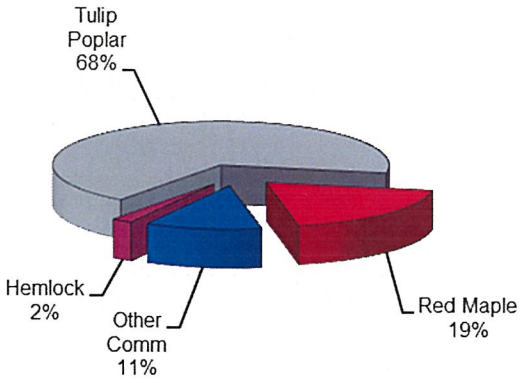
Commercial Stand Description

Spoden - Stand 2

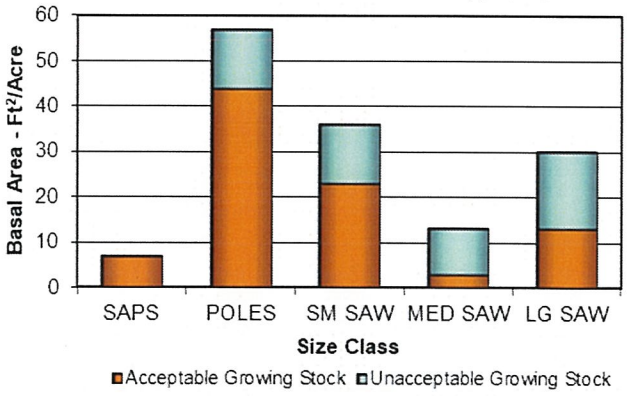
Acreage: 9.7
Forest Cover Type: Allegheny hardwood
Topography: flat, sloping
Water Resources: minor creek, reservoir
Special Sites: spillway
Age Structure: even aged
Size Class: large pole/small sawtimber
Site Quality: good-fair
Total Sawtimber Volume (Bdft-Doyle): +/- 38,100
Total Pulpwood Volume (Cords): +/- 160
Total Timber Value: +/- $8,000
Timber Quality: good-fair
Last Harvest: none

Primary Pole Species: red maple, tulip poplar
Pole Condition: fair
Primary Seedling Species: tulip poplar
Seedling Stocking: none-low
Deer Browse Intensity: moderate-low
Primary Sapling Species: red maple, tulip poplar
Sapling Stocking: low
Sapling Condition: fair
Woody Comp. Species: grapevine, beech, shrubs
Woody Comp. Stocking: moderate-low
Herbaceous Veg. Species: none
Herbaceous Veg. Coverage: none

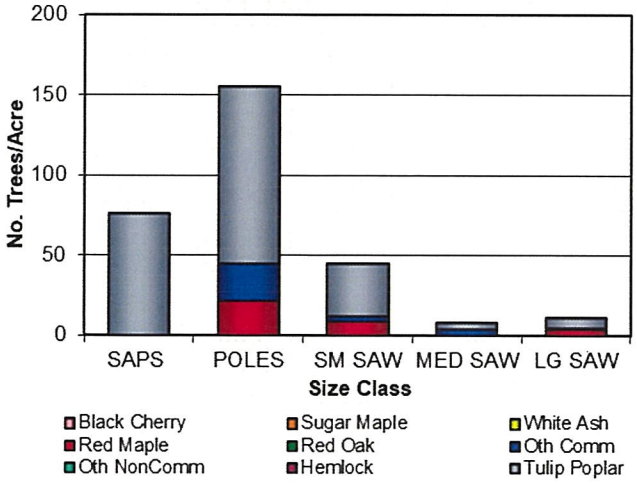
Species Composition (% Basal Area)



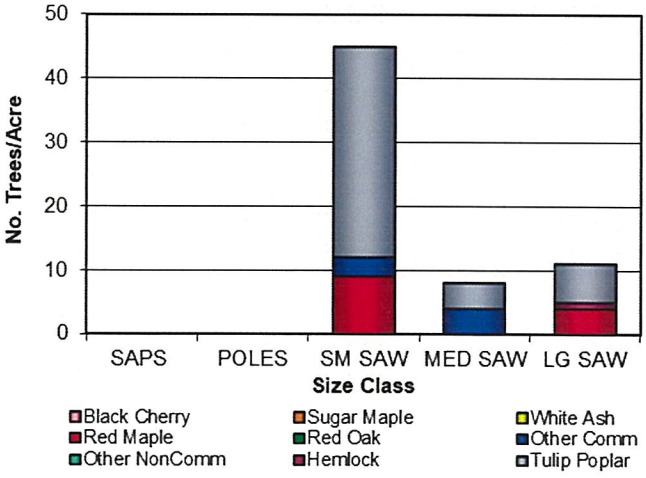
Distribution of Growing Stock
143 Ft² Basal Area/Ac - 63% AGS



Distribution of Trees
294 Trees/Ac All Size Classes

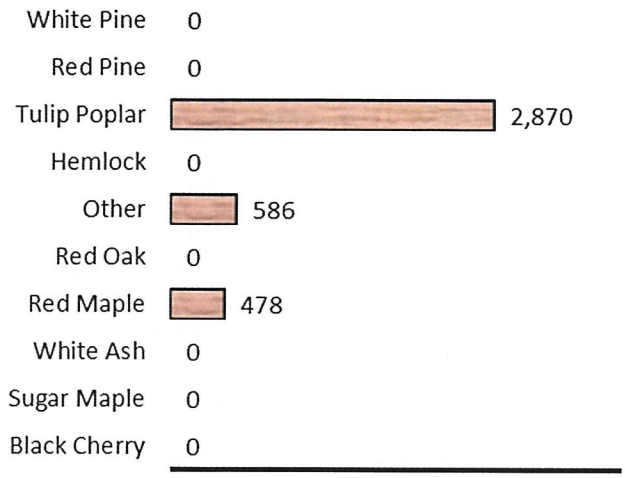


Distribution of Trees
64 Trees/Ac Sawtimber Size Classes

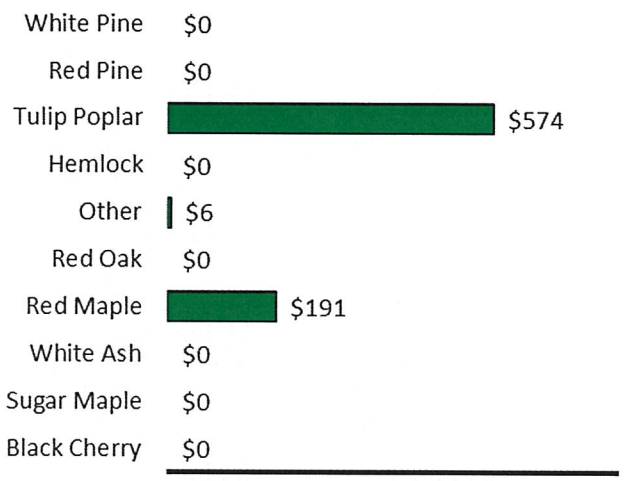


Spoden - Stand 2 (Continued)

Sawtimber Volume (D): +/- 3,934 BF/Acre



Sawtimber Value: +/- $771/Acre

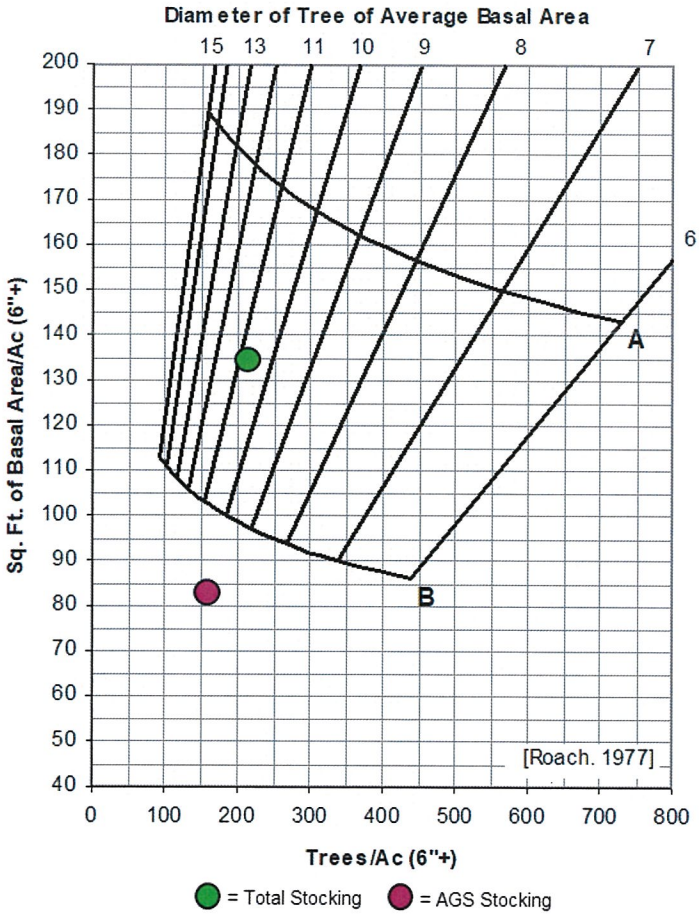


All volumes and values are estimates based on a statistical sample. Volumes will vary plus or minus depending on sample size and are not guaranteed. Values are established from an opinion of fair market pricing by species for the entire ownership and are not guaranteed. These figures are not intended for use in advertising the sale of standing timber or real estate; Forecon, Inc. cannot guarantee any result if used in such a manner.

Diagnosis & Prescription:

Stocking Level: well stocked
Adequately Stocked with AGS: no
Next Harvest: 10-15 years
Harvest Type: timber stand improvement
Target BA/Acre: +/- 140
Necessary to Retain UGS: yes
Understory Potential: low
Regeneration Inhibited: no
Herbicide Treatment: monitor
Herbicide Target: grapevine
Next Herbicide Treatment: 10-15 years
Future Management Potential: fair-high
Aesthetic Impact of Prescription: moderate
Insect/Disease: none
Accessible: yes
Site Limitations: steep
Stream Crossing: none
OGM/Utilities: none

Even Aged Allegheny Hardwood Stocking Guide
60% BC, WA, YP



Spoden - Stand 2 (Continued)

General Analysis/Information:

- This stand appears to have originated from abandoned agriculture; it has developed nicely into a well stocked stand of pole dominated timber with a great deal of potential to grow quality sawtimber in the future – the trees are mostly straight and tall, and of desirable species. There is a higher proportion of UGS in the medium and large sawtimber size classes; many of them appear to be open grown pasture trees, that may have been the parent stock for the pole and sapling trees that define the stand now.
- The poles and small sawtimber trees have developed well with decent long-term potential. Timber volume in stands like this tend to have a lot of growth potential and add sawtimber volume quickly as pole sized trees make the jump from pulpwood to sawtimber. Current projections indicate that the sawtimber volume in this stand could increase by a third over the next 10 years.
- At the current stocking level the degree of crowding is low, growth rates will be high, and mortality will be low.
- The stocking in AGS alone is not adequate enough to support a well-stocked stand. The next harvest should focus exclusively on the removal of UGS; it will be necessary to retain some UGS as place holders and as additional future sources of seed to maintain target residual stocking levels.
- The prescribed harvest will not be a commercial timber sale and will produce little to no income. It will, however, be an important investment to reduce crowding and improve growth rates for the best growing stock trees, accelerating their development into more valuable sawtimber trees in the future. Depending on the response to this thinning, this stand may be ready for a commercial harvest by the time of the next one (i.e. 20 years after).
- There is a minor component of grapevine in this stand. While not extremely dense, at its current stocking levels it could be damaging to overstory trees long-term if it expands, and ultimately inhibit regeneration if arbor patches develop. The control of this competing vegetation is not critical to the current management for the stand, but may be prudent to control with the next harvest. If not controlled, this vegetation could threaten the long-term sustainability of the stand and damage or destroy the growing stock that is still developing.
- Care should be taken with harvesting along creeks and drainages, around any spring seeps or large vernal pools, on or near soils and steep slopes that are more erodible, and along the reservoir - slightly higher stocking levels should be maintained along the creeks to minimize over exposure to sunlight to keep water temperatures cool, keep the soil along the banks stable, and minimize erosion. It may also be prudent to leave an unmanaged buffer (i.e. 100 feet) along the reservoir to maximize forest cover along the edge and further stabilize the shoreline. Bridge pads should be used for any creek crossings to minimize disturbance to the banks and bed, and minimize sedimentation.

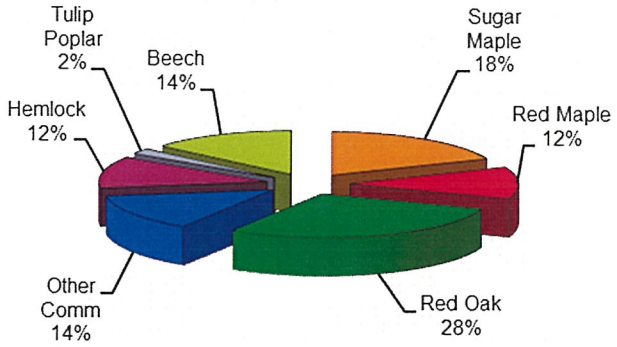
Commercial Stand Description

Spoden - Stand 4

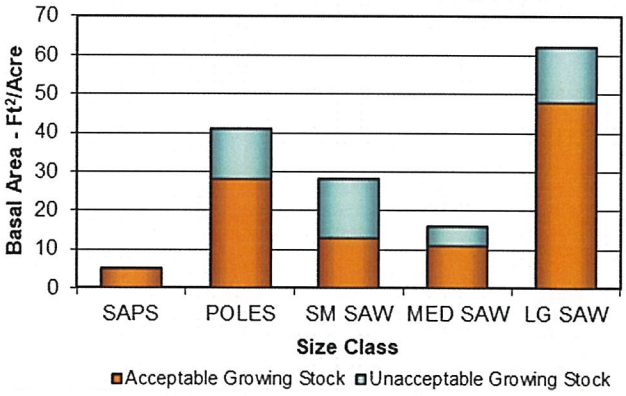
Acreage: 12.5
Forest Cover Type: central hardwood
Topography: flat, sloping, side hill, gullies
Water Resources: major creek, reservoir
Special Sites: ATV trail
Age Structure: even aged
Size Class: large sawtimber
Site Quality: good
Total Sawtimber Volume (Bdft-Doyle): +/- 73,600
Total Pulpwood Volume (Cords): +/- 120
Total Timber Value: +/- $24,800
Timber Quality: good
Last Harvest: 1991

Primary Pole Species: red maple, sugar maple
Pole Condition: fair
Primary Seedling Species: red maple
Seedling Stocking: none-low
Deer Browse Intensity: high
Primary Sapling Species: sugar maple
Sapling Stocking: low
Sapling Condition: fair
Woody Comp. Species: beech, grapevine, low hemlock
Woody Comp. Stocking: high-moderate
Herbaceous Veg. Species: fern
Herbaceous Veg. Coverage: low

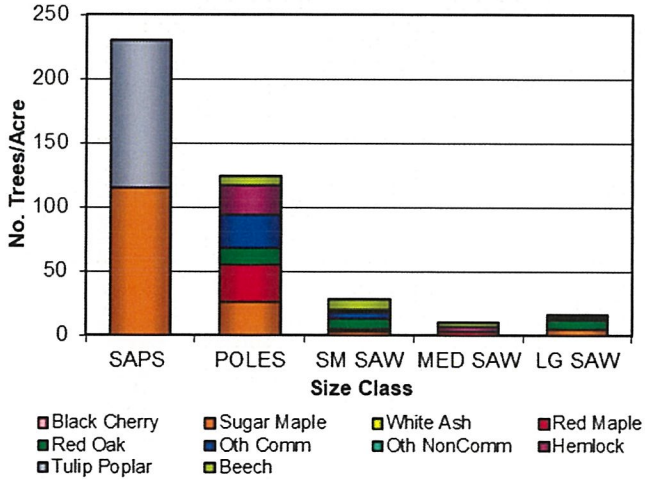
Species Composition (% Basal Area)



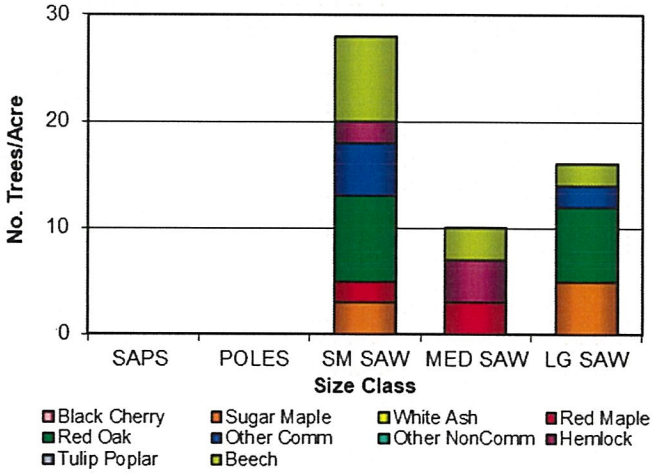
Distribution of Growing Stock
148 Ft² Basal Area/Ac - 69% AGS



Distribution of Trees
409 Trees/Ac All Size Classes

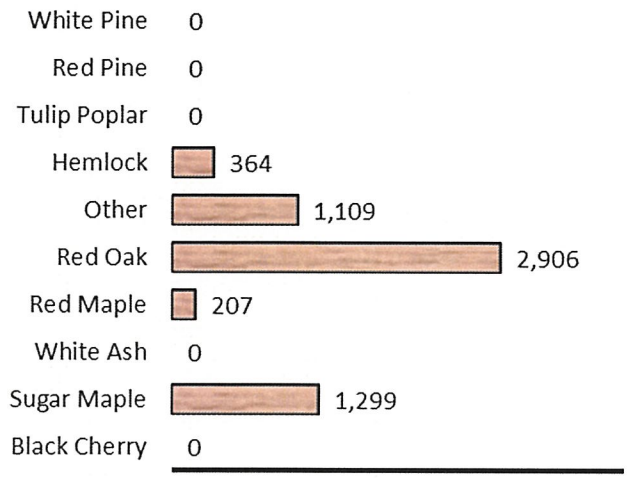


Distribution of Trees
54 Trees/Ac Sawtimber Size Classes

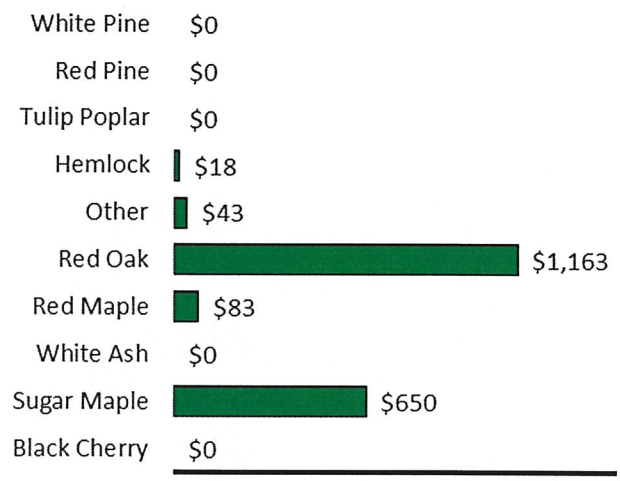


Spoden - Stand 4 (Continued)

Sawtimber Volume (D): +/- 5,886 BF/Acre



Sawtimber Value: +/- $1,956/Acre



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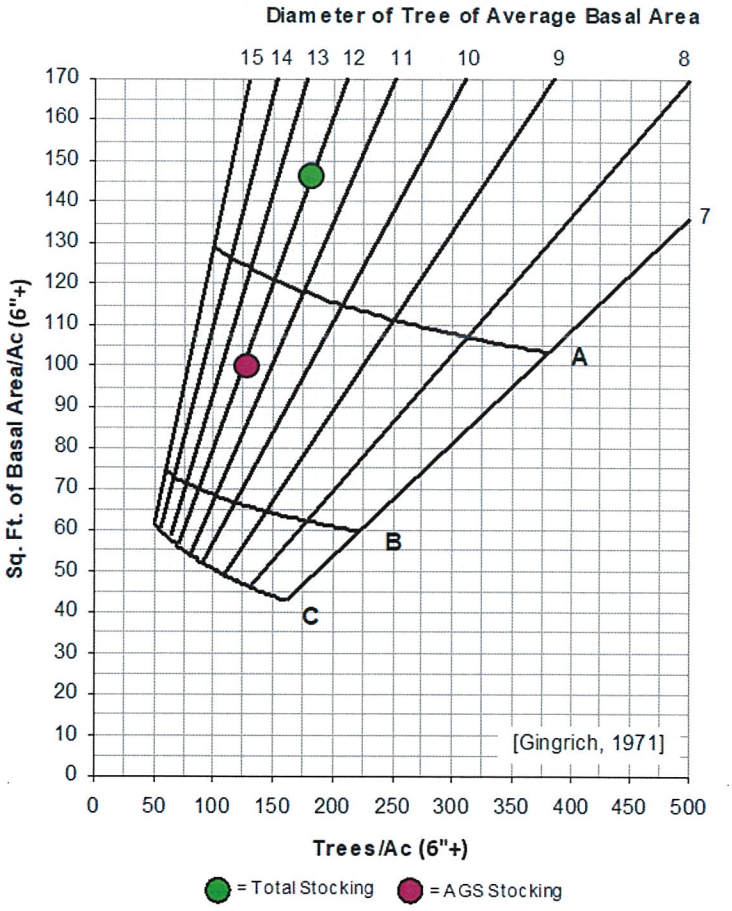
Diagnosis & Prescription:

Stocking Level: over stocked
Adequately Stocked with AGS: yes
Next Harvest: 0-5 years
Harvest Type: non-commercial 1st stage shelterwood
Target BA/Acre: +/- 80-90
Necessary to Retain UGS: yes
Understory Potential: low-fair
Regeneration Inhibited: yes
Herbicide Treatment: frilling, cut stump
Herbicide Target: beech, low hemlock, grapevine
Next Herbicide Treatment: 0-5 years
Future Management Potential: fair
Aesthetic Impact of Prescription: high
Insect/Disease: none
Accessible: yes
Site Limitations: steep
Stream Crossing: bridge pad
OGM/Utilities: none

Even Aged Central Hardwood Stocking Guide



Spoden - Stand 4 (Continued)

General Analysis/Information:

- This stand was thinned by prescription in 1991. Harvesting appears to have been generally conservative focusing on retaining good growing stock.
- The potential for management is decent across most of the size classes, but the understory lacks any significant stocking in seedling or saplings, and the overstory timber is generally large and over mature. Overall, the understory offers little long-term potential and cannot be relied upon to make a long-term contribution towards replacing overstory sawtimber trees. It will be imperative to control this vegetation short-term and promote the regeneration of more desirable species; current and future harvesting needs to take this into consideration and be conservative in nature.
- At the current stocking level the degree of crowding is high, growth rates will be low, and mortality will be high.
- The stocking in AGS alone is adequate enough to support a well-stocked stand. The next harvest should focus on the removal of UGS first; it may be necessary to retain some UGS as place holders and as additional future sources of seed to maintain target residual stocking levels.
- The short-term focus of management in this stand should be to regenerate a new crop of trees using a two stage shelterwood harvest. This would involve a series of two successive harvests; the first to specifically reduce low and mid story shade by primarily targeting removals of undesirable saplings, pole timber and small sawtimber, while minimally harvesting the larger size classes to open the canopy up by about 30%, which would allow some sunlight to reach the ground to germinate new seedling growth. Once desirable regeneration becomes established (5-10 years) the second harvest would open the canopy up to about 50% to foster more regeneration and begin the release of established regeneration.
- The stand should be monitored following the second harvest, and when it has been determined that regeneration has been successfully established (approximately 5-10 years after harvest), a third harvest can be planned to release the new crop of trees. It is recommended, however, that the overstory only be partially removed to create a two age structure, where a crop of timber trees (the best poles, small sawtimber, and some medium sawtimber) are retained to grow independently from, but along with, the new seedlings to minimize the aesthetic impact of harvesting and retain a timber crop. This crop of timber will be available for harvest sooner than the seedlings, shortening the length of time the stand will produce income again, but should not interfere with the growth of the new seedlings. If regeneration does not become established as desired, management will need to be adapted accordingly.
- Controlling the deer population will also play a role in the success of this regeneration effort. Deer can cause a lot of damage to young seedlings when they browse; they are particularly attracted to regeneration harvests where there is an abundance of seedlings available. The harvest of does in particular is highly encouraged in an effort to reduce herd size and browsing impact.
- The prescribed treatment will be heavily composed of low-grade timber, but may also produce some sawtimber with it. it may not produce a significant amount of income. The bulk of the income will be postponed until the second stage shelterwood harvest and subsequent one to release the new crop of trees; all three income events will more than pay back the upfront forestry and herbicide costs.
- There is a significant component of beech, undesirable low hemlock, and grapevine in the understory and in the canopy (grapevine) of this stand. It will interfere with the successful regeneration of desirable trees and will threaten the long-term sustainability of the stand if not controlled. The prescribed regeneration treatment will fail if this vegetation is not treated with herbicide before the shelterwood harvest. A

Spoden -Stand 4 (Continued)

combination of frilling and cut stump (grapevine) treatments are the recommended methods of herbicide application and should be performed before harvesting.

- Care should be taken with harvesting along creeks and drainages, around any spring seeps or large vernal pools, on or near soils and steep slopes that are more erodible, and along the reservoir - slightly higher stocking levels should be maintained along the creeks to minimize over exposure to sunlight to keep water temperatures cool, keep the soil along the banks stable, and minimize erosion. It may also be prudent to leave an unmanaged buffer (i.e. 100 feet) along the reservoir to maximize forest cover along the edge and further stabilize the shoreline. Bridge pads should be used for any creek crossings to minimize disturbance to the banks and bed, and minimize sedimentation.
- The long-term management for the oak species in this stand is unpredictable. Oaks are difficult to regenerate – they do not tolerate shade well, are favored by deer for browse, and the acorns are eaten by a number of different wildlife species, are prone to infestation by an acorn weevil, and only last for one year; oaks are also not heavy seed producers and without a bumper crop (every 3-5 years), the acorns are overwhelmed by predation. Despite any attempts to promote the oak species as prescribed for this stand, there is a distinct possibility that the oaks will not sustainably regenerate in abundance.

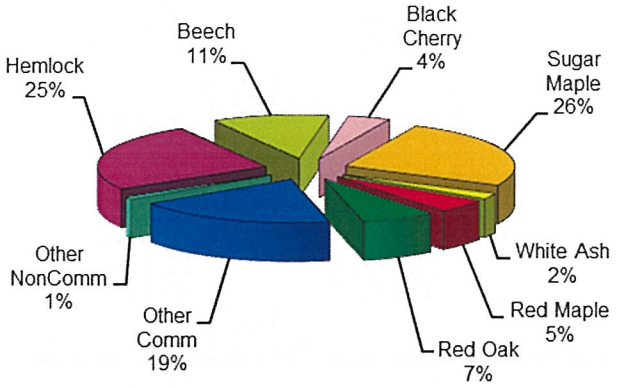
Commercial Stand Description

Spoden - Stand 8

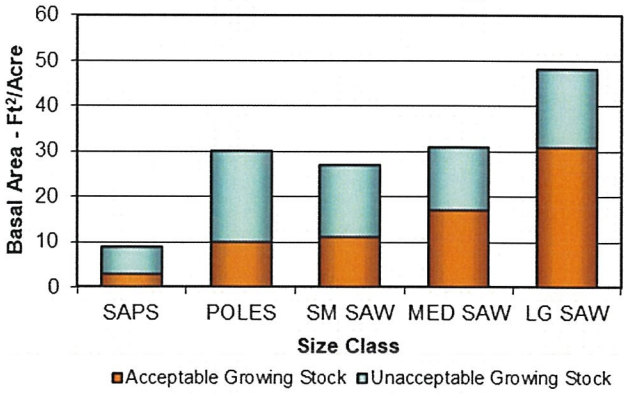
Acreage: 78.3
Forest Cover Type: northern hardwood
Topography: sloping, rolling, side hill, steep, ravine, gullies
Water Resources: minor creek, major creek, drainages reservoir, spring seeps
Special Sites: abandoned RR bed
Age Structure: even aged
Size Class: medium/large sawtimber
Site Quality: good-fair
Total Sawtimber Volume (Bdft-Doyle): +/- 593,000
Total Pulpwood Volume (Cords): +/- 755
Total Timber Value: +/- $173,500
Timber Quality: good-fair
Last Harvest: 2000

Primary Pole Species: sugar maple
Pole Condition: fair-poor
Primary Seedling Species: none
Seedling Stocking: none
Deer Browse Intensity: high-moderate
Primary Sapling Species: sugar maple
Sapling Stocking: low
Sapling Condition: fair-poor
Woody Comp. Species: grapevine, beech, hazel
Woody Comp. Stocking: high-moderate
Herbaceous Veg. Species: fern
Herbaceous Veg. Coverage: none-low

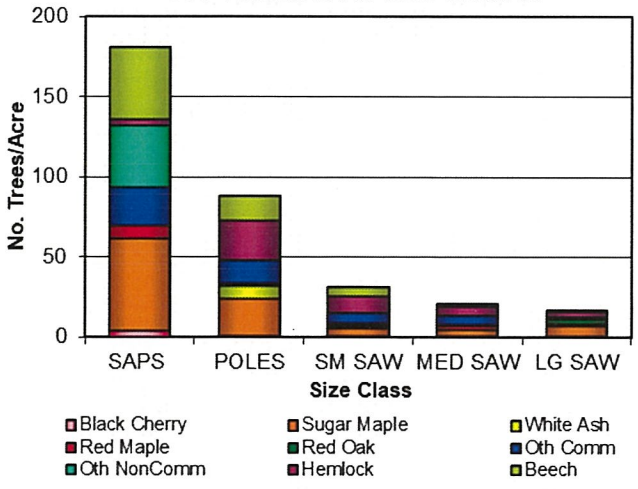
Species Composition (% Basal Area)



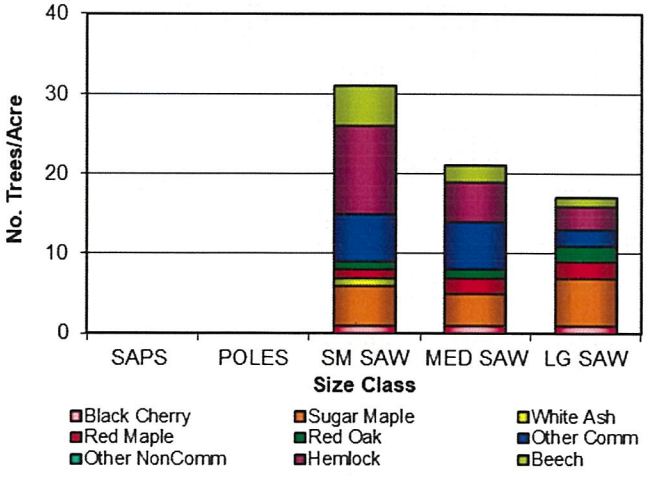
Distribution of Growing Stock
145 Ft² Basal Area/Ac - 50% AGS



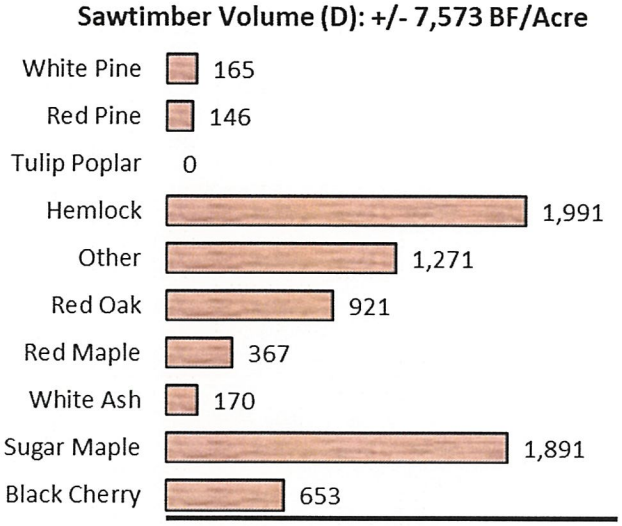
Distribution of Trees
339 Trees/Ac All Size Classes

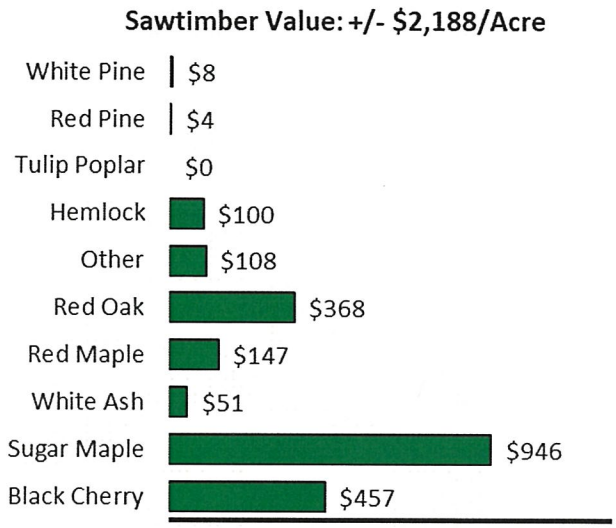


Distribution of Trees
69 Trees/Ac Sawtimber Size Classes



Spoden - Stand 8 (Continued)





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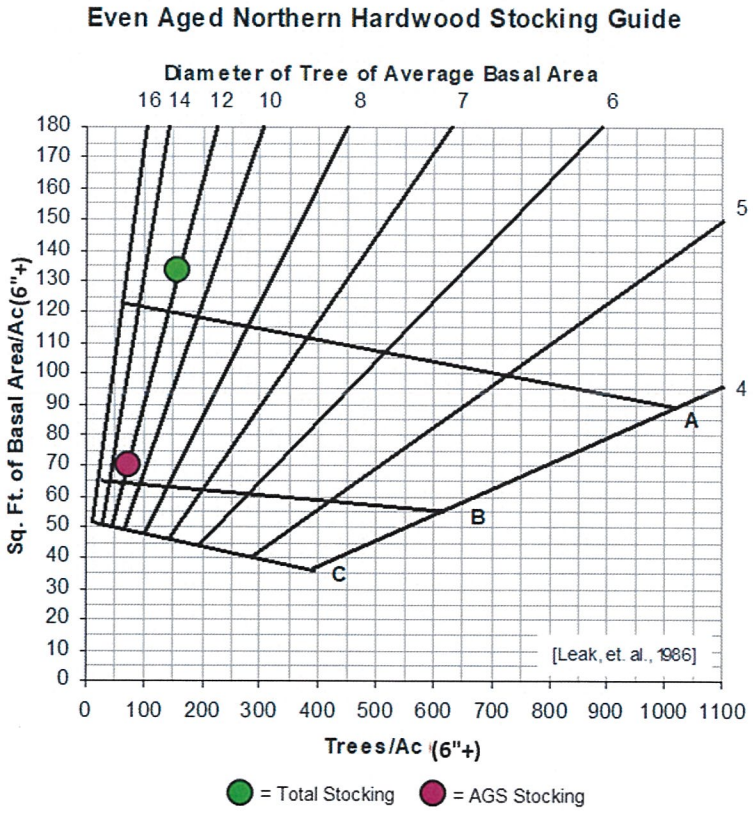
Diagnosis & Prescription:

Stocking Level: over stocked
Adequately Stocked with AGS: yes (just)
Next Harvest: 0-5 years
Harvest Type: thinning
Target BA/Acre: +/- 90
Necessary to Retain UGS: yes
Understory Potential: low
Regeneration Inhibited: yes
Herbicide Treatment: monitor/frilling
Herbicide Target: fern, grapevine/beech
Next Herbicide Treatment: 5-10 years
Future Management Potential: fair
Aesthetic Impact of Prescription: moderate
Insect/Disease: emerald ash borer threat
Accessible: no
Site Limitations: steep, gullies, restricted
Stream Crossing: bridge pad
OGM/Utilities: power line



Spoden - Stand 8 (Continued)

General Analysis/Information:

- This stand was thinned by prescription in 2000. Harvesting appears to have been generally conservative focusing on retaining good growing stock. Prior to that an effort to control grapevine using the county prisoner work program was undertaken in 1991 and 1992.
- The potential for management is decent across the larger diameter classes, but there is still a high proportion of UGS amongst the small and medium sawtimber size classes; it may have been necessary to retain some UGS in the prior harvest to maintain target residual stocking levels. The mid and understory lacks any significant stocking in desirable seedlings and saplings, and only about a third of the poles have any future potential; those present are suppressed from the crowded canopy with no long-term potential. The trees in these size classes probably cannot be relied upon to make a long-term contribution towards replacing overstory sawtimber trees. As the timber in this stand is maturing, it will be important then to manage the stand carefully for the removal of UGS, control of competing vegetation, and its long-term strategic regeneration.
- At the current stocking level the degree of crowding is high, growth rates will be low, and mortality will be high.
- The stocking in AGS alone is just adequate enough to support a well-stocked stand, but at the bottom end of the ideal range. The next harvest should focus exclusively on the removal of UGS; it will be necessary to retain some UGS as place holders and as additional future sources of seed to maintain target residual stocking levels.
- White ash is not a huge component of the stand, but in the face of the threat posed by the Emerald Ash Borer, it would be prudent to "pre-salvage" the sawtimber trees during the prescribed harvest. This would not eliminate all ash trees, but would limit future potential losses associated with this devastating insect and would remove those trees with the highest financial risk before infestation.
- There is a wide variety and significant component of competing vegetation that includes grapevine, beech, witch hazel, blue beech, ironwood, and fern. These will inhibit the successful establishment of desirable seedling regeneration. The control of this competing vegetation is not critical to the current prescription, but it will probably be necessary to treat some of it with herbicide in the future. This should be monitored over the next 5-10 years after the prescribed harvest, especially the grapevine which if it expands could be damaging to the timber and may need to be controlled (cut stump herbicide) sooner than the other woody and herbaceous competition. The other woody and herbaceous competing vegetation will need to monitored too and it may be prudent to incorporate a frilling treatment of the beech and any other woody competing vegetation with the next harvest after the current one prescribed; likewise, if the fern expands it will need to be treated (foliar herbicide) before any regeneration harvesting, which could be the next harvest. Any regeneration harvesting without controlling this vegetation first will fail.

  Note: Consideration could also be given to scheduling a grapevine treatment simultaneously with the current prescribed harvest to be proactive and so costs can be timed with the timber sale revenue.
- Care should be taken with harvesting along creeks and drainages, around any spring seeps or large vernal pools, on or near soils and steep slopes that are more erodible, and along the reservoir - slightly higher stocking levels should be maintained along the creeks to minimize over exposure to sunlight to keep water temperatures cool, keep the soil along the banks stable, and minimize erosion. It may also be prudent to leave an unmanaged buffer (i.e. 100 feet) along the reservoir to maximize forest cover along the edge and further stabilize the shoreline. Bridge pads should be used for any creek crossings to minimize disturbance to the banks and bed, and minimize sedimentation.

Spoden - Stand 8 (Continued)

- The long-term management for the oak species in this stand is unpredictable. Oaks are difficult to regenerate – they do not tolerate shade well, are favored by deer for browse, and the acorns are eaten by a number of different wildlife species, are prone to infestation by an acorn weevil, and only last for one year; oaks are also not heavy seed producers and without a bumper crop (every 3-5 years), the acorns are overwhelmed by predation. Despite any attempts to promote the oak species as prescribed for this stand, there is a distinct possibility that the oaks will not sustainably regenerate in abundance.

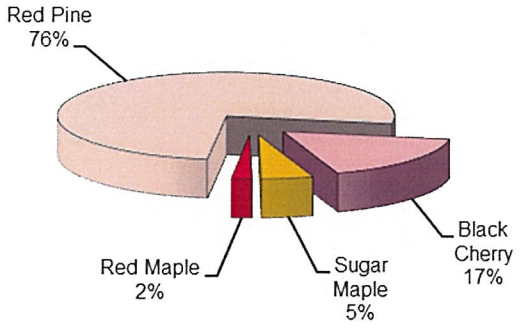
Commercial Stand Description

Spoden - Stand 9

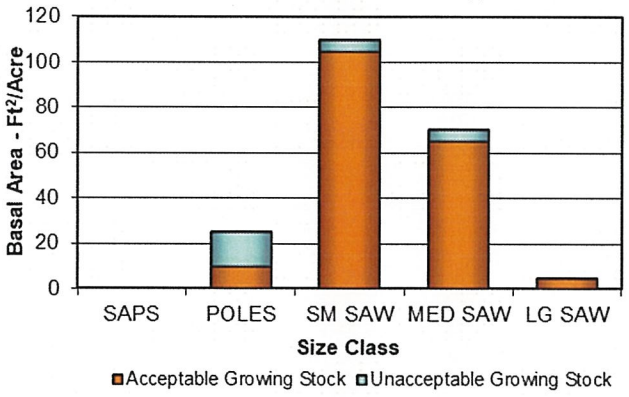
Acreage: 5.2
Forest Cover Type: plantation
Topography: flat, sloping
Water Resources: minor creek
Special Sites: abandoned RR bed
Age Structure: even aged
Size Class: small/medium sawtimber
Site Quality: good-fair
Total Sawtimber Volume (Bdft-Doyle): +/- 47,100
Total Pulpwood Volume (Cords): +/- 30
Total Timber Value: +/- $4,700
Timber Quality: good-fair
Last Harvest: 1994

Primary Pole Species: red pine, spruce
Pole Condition: poor
Primary Seedling Species: none
Seedling Stocking: none
Deer Browse Intensity: none
Primary Sapling Species: sugar maple
Sapling Stocking: low
Sapling Condition: fair-poor
Woody Comp. Species: beech
Woody Comp. Stocking: low
Herbaceous Veg. Species: fern
Herbaceous Veg. Coverage: low

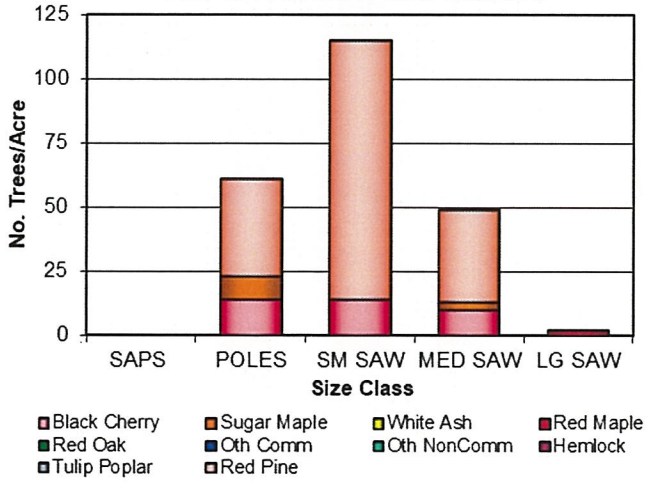
Species Composition (% Basal Area)



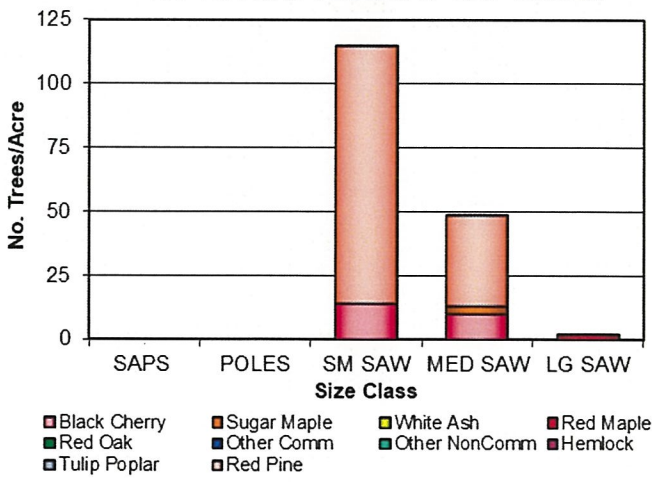
Distribution of Growing Stock
210 Ft² Basal Area/Ac - 88% AGS



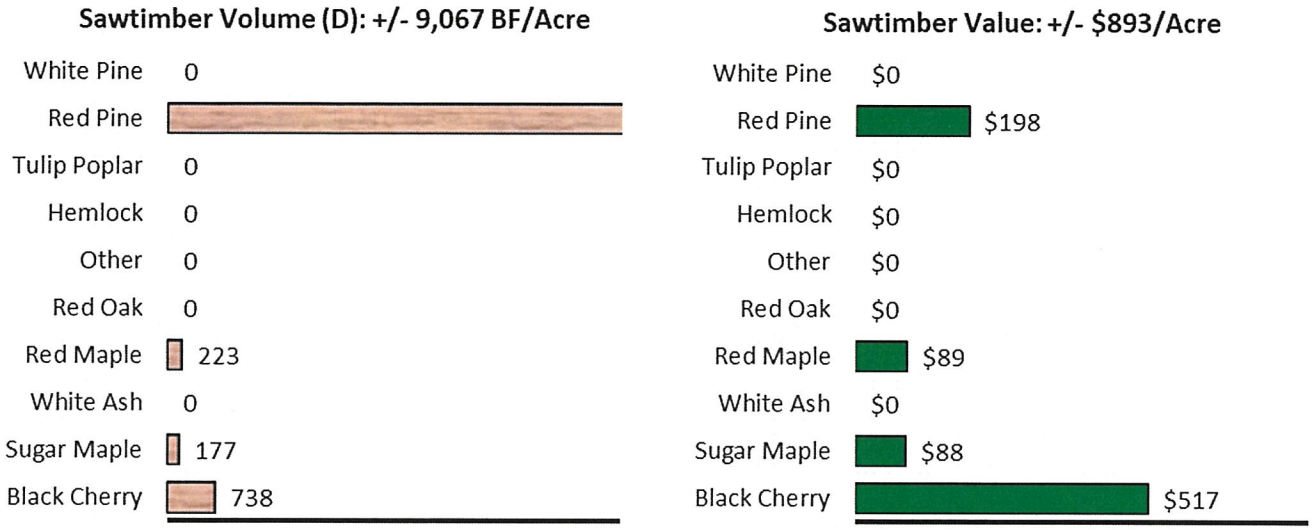
Distribution of Trees
226 Trees/Ac All Size Classes



Distribution of Trees
166 Trees/Ac Sawtimber Size Classes



Spoden - Stand 9 (Continued)



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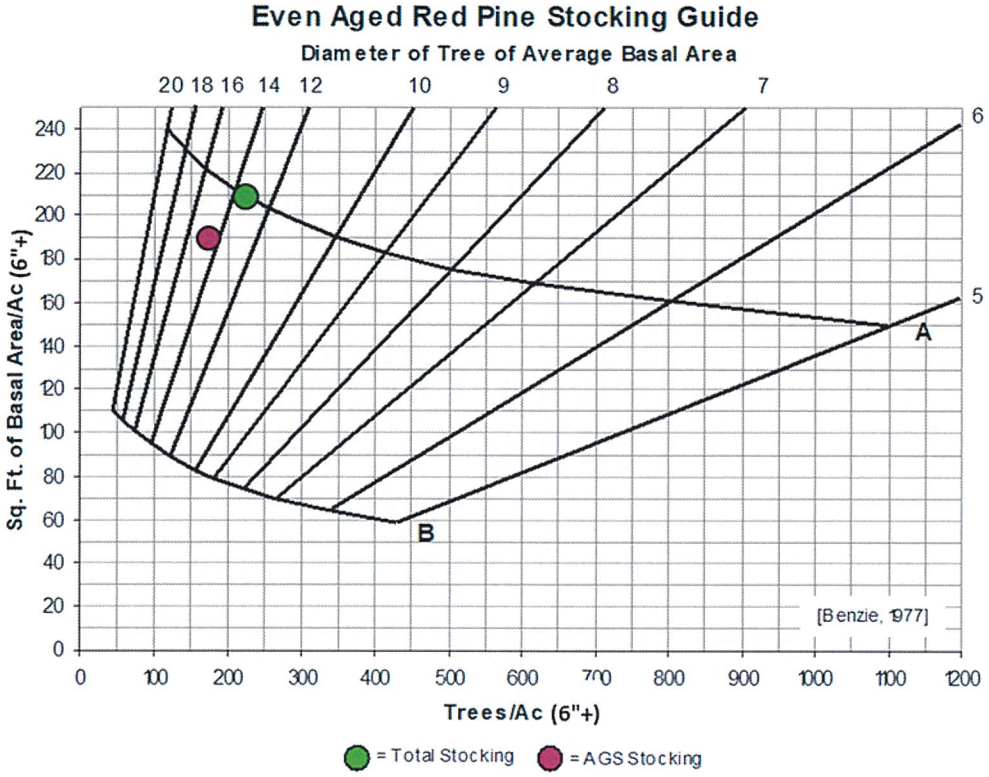
Diagnosis & Prescription:

Stocking Level: fully stocked (see stocking guide below)
Adequately Stocked with AGS: yes
Next Harvest: 0-5 years
Harvest Type: convert/regenerate
Target BA/Acre: +/- 50
Necessary to Retain UGS: yes (hardwood)
Understory Potential: low
Regeneration Inhibited: no
Herbicide Treatment: none
Herbicide Target: none
Next Herbicide Treatment: n/a
Future Management Potential: fair
Aesthetic Impact of Prescription: high
Insect/Disease: none
Accessible: no
Site Limitations: restricted
Stream Crossing: bridge pad
OGM/Utilities: power line

Spoden - Stand 9 (Continued)



General Analysis/Information:

- This stand is an established small planting of red pine.
- This stand was thinned by prescription in 1994. Harvesting appears to have been generally conservative focusing on retaining good growing stock.
- Unfortunately, red pine has very limited commercial interest or value in the timber market place for western New York. And while this stand could benefit from a thinning, there is little long-term potential to generate high timber value and therefore little return on investment.
- Pine plantations are not self-sustaining – they are planted, grow up, are harvested, or fall down and do not reseed naturally; they are either replaced by native vegetation or need to be replanted. Sites planted like this one, are usually poorly suited to grow softwood timber and it is not uncommon to see a fairly decent hardwood component throughout the stand, indicating what wants to grow there. As a case in point, 24% of the stocking in this stand is made up by cherry and maple. These hardwood trees are predominantly sawtimber sized and will serve as important sources of seed for the eventual conversion back to hardwoods.
- At the current stocking level the degree of crowding is on the rise, growth rates will be dropping, and mortality will begin to increase.
- The stocking in AGS alone is adequate enough to support a well-stocked stand. From a pure management stand point this stand is ready for thinning and will benefit, but unless it is desirable to maintain this stand short-term as a timber crop, or to forgo management altogether and maintain it for wildlife habitat or aesthetic purposes, the ideal long-term treatment for this stand is to clear most of the red pine and allow it to convert back to native hardwoods.

Spoden - Stand 9 (Continued)

- Either direction for management can be pursued with little impact to the whole property. If conversion is pursued, harvesting should focus on the removal of most of the softwood while leaving the hardwood as a source of seed to help regenerate the site. Conversion would have to be timed carefully with a good market, in order to get a buyer interested in cutting it. Because of the small size of this stand, it cannot feasibly support a timber sale alone; any harvesting should also be timed with the treatment of the other nearby stands.
- Following the conversion prescription will not generate a lot of income, but will generate some as it will capture the majority of the softwood value. If, as a worst case scenario, revenues break even with cost, it will be an important investment to convert the stand back to more valuable hardwoods and improve the long-term trajectory and value of the timber.
- Care should be taken with harvesting along creeks and drainages, around any spring seeps or large vernal pools, and on or near soils and steep slopes that are more erodible - slightly higher stocking levels should be maintained along the creeks to minimize over exposure to sunlight to keep water temperatures cool, keep the soil along the banks stable, and minimize erosion. Bridge pads should be used for any creek crossings to minimize disturbance to the banks and bed, and minimize sedimentation.

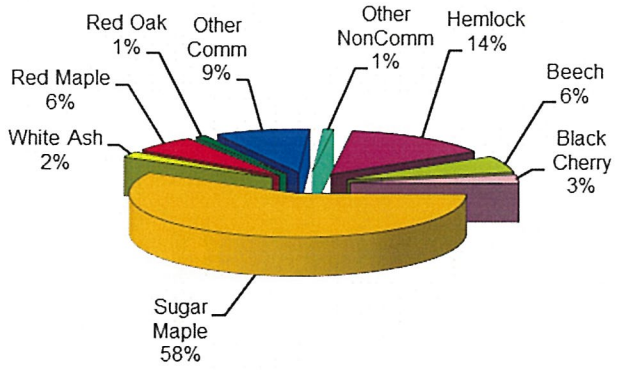
Commercial Stand Description

Spoden - Stand 11

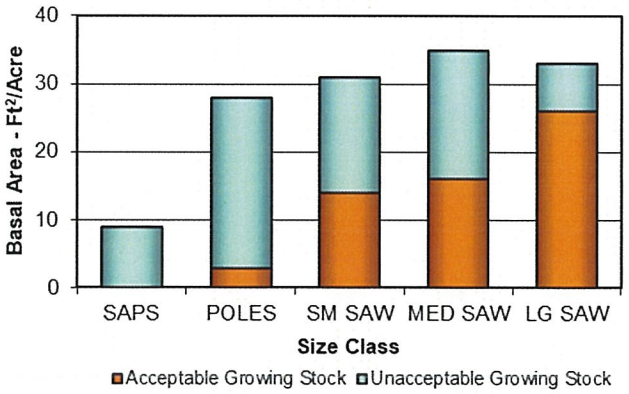
Acreage: 50.4
Forest Cover Type: northern hardwood
Topography: flat, sloping, rolling, steep, ravine
Water Resources: major creek, minor creek, major creek, drainage, spring seeps
Special Sites: abandoned RR bed
Age Structure: even aged
Size Class: medium/large sawtimber
Site Quality: good
Total Sawtimber Volume (Bdft-Doyle): +/- 376,000
Total Pulpwood Volume (Cords): +/- 410
Total Timber Value: +/- $157,300
Timber Quality: good
Last Harvest: 1994

Primary Pole Species: sugar maple
Pole Condition: fair-poor
Primary Seedling Species: none
Seedling Stocking: low
Deer Browse Intensity: moderate
Primary Sapling Species: sugar maple
Sapling Stocking: low-none
Sapling Condition: poor
Woody Comp. Species: beech, grapevine
Woody Comp. Stocking: high-moderate
Herbaceous Veg. Species: fern
Herbaceous Veg. Coverage: moderate

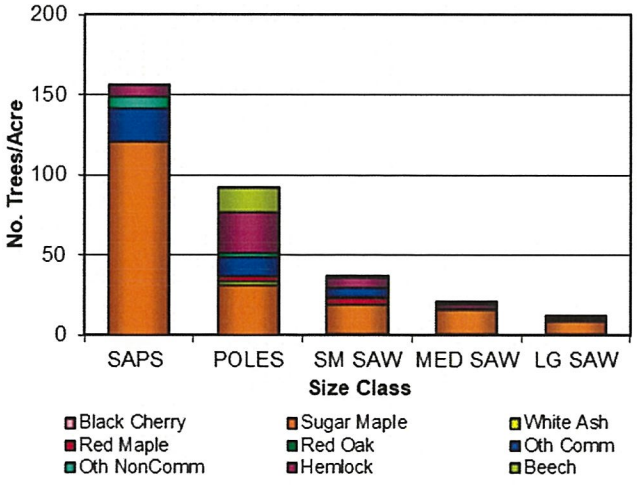
Species Composition (% Basal Area)



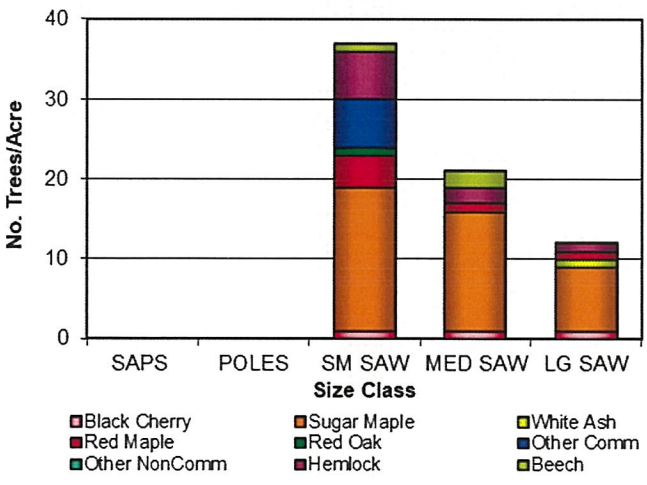
Distribution of Growing Stock
136 Ft² Basal Area/Ac - 43% AGS



Distribution of Trees
317 Trees/Ac All Size Classes

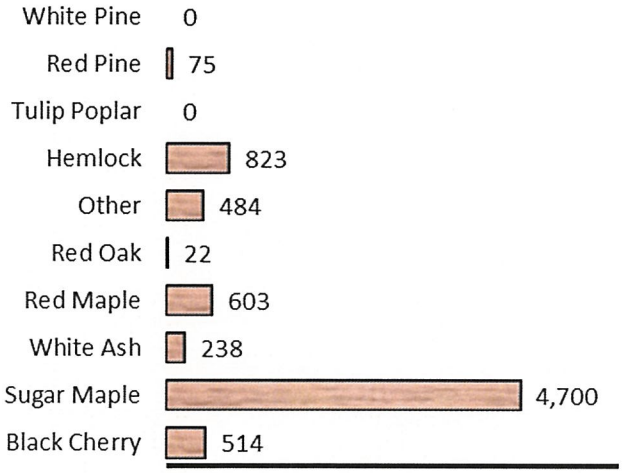


Distribution of Trees
70 Trees/Ac Sawtimber Size Classes

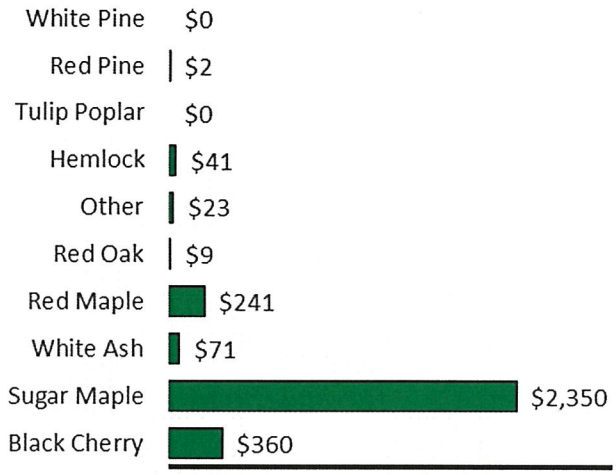


Spoden - Stand 11 (Continued)

Sawtimber Volume (D): +/- 7,460 BF/Acre



Sawtimber Value: +/- $3,097/Acre



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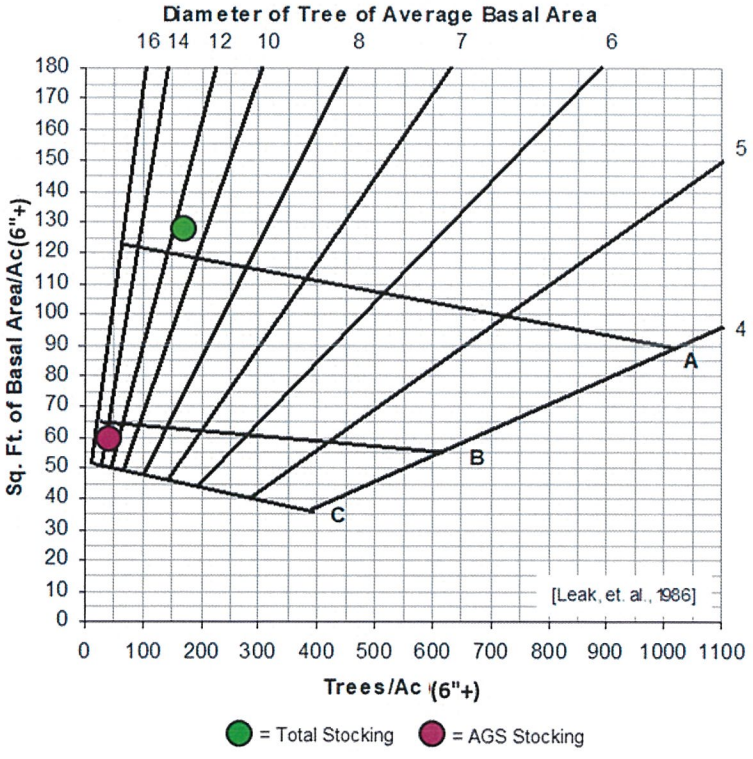
Diagnosis & Prescription:

Stocking Level: over stocked
Adequately Stocked with AGS: no
Next Harvest: 0-5 years
Harvest Type: thinning
Target BA/Acre: +/- 90
Necessary to Retain UGS: yes
Understory Potential: low
Regeneration Inhibited: yes
Herbicide Treatment: monitor/frilling
Herbicide Target: fern, grapevine/beech
Next Herbicide Treatment: @ next harvest
Future Management Potential: fair-high
Aesthetic Impact of Prescription: moderate
Insect/Disease: emerald ash borer threat
Accessible: no
Site Limitations: gullies, restricted
Stream Crossing: bridge pad
OGM/Utilities: power line, gas line

Even Aged Northern Hardwood Stocking Guide



Spoden - Stand 11 (Continued)

General Analysis/Information:

- This stand was thinned by prescription in 1994. Harvesting appears to have been generally conservative focusing on retaining good growing stock.
- The potential for management is reasonably decent across the larger diameter classes, but there is still a high proportion of UGS amongst the small and medium sawtimber size classes; it may have been necessary to retain some UGS in the prior harvest to maintain target residual stocking levels. The mid and understory lacks any significant stocking in desirable seedling and saplings, and only about half of the poles have any future potential. The sapling class is composed of sugar maple, but they are mostly suppressed from the crowded canopy with no long-term potential. Likewise, the poles are a mix of hemlock and sugar maple that are also suppressed with no long-term potential. Overall, the understory and mid story offers little future potential and cannot be relied upon to make a long-term contribution towards replacing overstory sawtimber trees. As the timber in this stand is maturing, it will be important then to manage the stand carefully for the removal of UGS, control of competing vegetation, and its long-term strategic regeneration.
- At the current stocking level the degree of crowding is high, growth rates will be low, and mortality will be high.
- The stocking in AGS alone is not adequate enough to support a well-stocked stand. The next harvest should focus exclusively on the removal of UGS; it will be necessary to retain some UGS as place holders and as additional future sources of seed to maintain target residual stocking levels.
- White ash is not a huge component of the stand, but in the face of the threat posed by the Emerald Ash Borer, it would be prudent to "pre-salvage" the largest white ash trees during the prescribed harvest. This would not eliminate all ash trees, but would limit future potential losses associated with this devastating insect and would remove those trees with the highest financial risk before infestation.
- There is a significant component of beech and fern in the understory and on the forest floor, with grapevine to a lesser extent in the upper canopy. These will inhibit the successful establishment of desirable seedling regeneration. The control of this competing vegetation is not critical to the current prescription, but it will be necessary to treat some of it with herbicide in the future. This should be monitored over the next 5-10 years after the prescribed harvest, especially the grapevine which if it expands could be damaging to the timber and may need to be controlled (cut stump herbicide) sooner than the other woody and herbaceous competition, which also if not controlled with herbicide at some point in the future may become a problem for regeneration. It is recommended to incorporate a frilling treatment of the beech and any other woody competing vegetation with the next harvest after the current one prescribed; likewise, the fern will need to be treated (foliar herbicide) before any regeneration harvesting, which could be the next harvest. Any regeneration harvesting without controlling this vegetation first will fail.

  Note: Consideration could also be given to scheduling a grapevine treatment simultaneously with the current prescribed harvest to be proactive and so costs can be timed with the timber sale revenue.
- Care should be taken with harvesting along creeks and drainages, around any spring seeps or large vernal pools, and on or near soils and steep slopes that are more erodible - slightly higher stocking levels should be maintained along the creeks to minimize over exposure to sunlight to keep water temperatures cool, keep the soil along the banks stable, and minimize erosion. Bridge pads should be used for any creek crossings to minimize disturbance to the banks and bed, and minimize sedimentation.

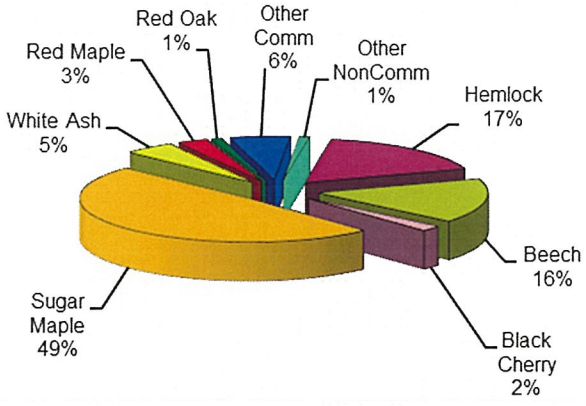
Commercial Stand Description

Spoden - Stand 13

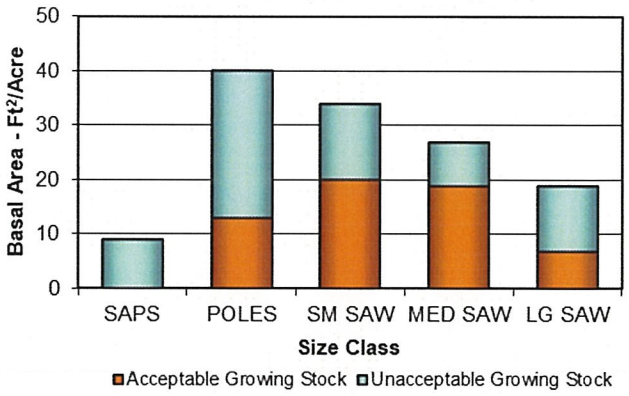
Acreage: 39.2
Forest Cover Type: northern hardwood
Topography: flat, sloping, steep, ravine
Water Resources: major creek, minor creek, drainage, spring seeps
Special Sites: none
Age Structure: even aged
Size Class: small/medium sawtimber
Site Quality: fair
Total Sawtimber Volume (Bdft-Doyle): +/- 108,600
Total Pulpwood Volume (Cords): +/- 465
Total Timber Value: +/- $44,200
Timber Quality: fair
Last Harvest: 1994

Primary Pole Species: sugar maple
Pole Condition: fair
Primary Seedling Species: none
Seedling Stocking: none
Deer Browse Intensity: none-low
Primary Sapling Species: sugar maple
Sapling Stocking: low
Sapling Condition: fair-poor
Woody Comp. Species: beech, low hemlock, hazel, grapevine
Woody Comp. Stocking: high-moderate
Herbaceous Veg. Species: fern
Herbaceous Veg. Coverage: moderate

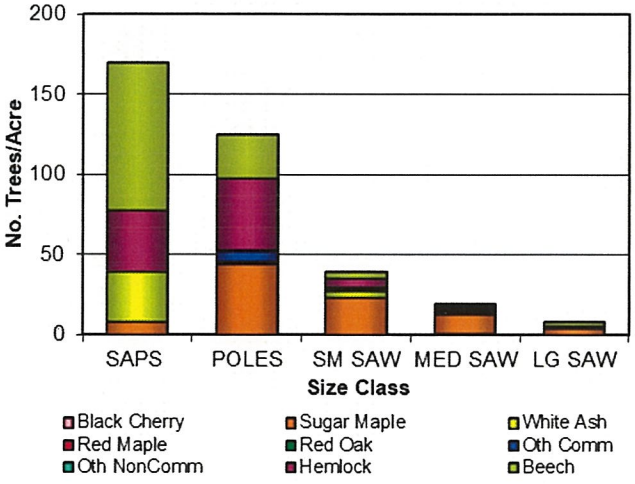
Species Composition (% Basal Area)



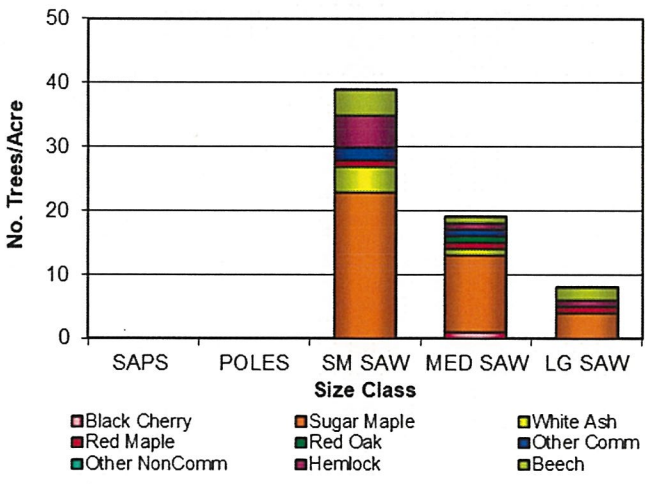
Distribution of Growing Stock
129 Ft² Basal Area/Ac - 46% AGS



Distribution of Trees
356 Trees/Ac All Size Classes

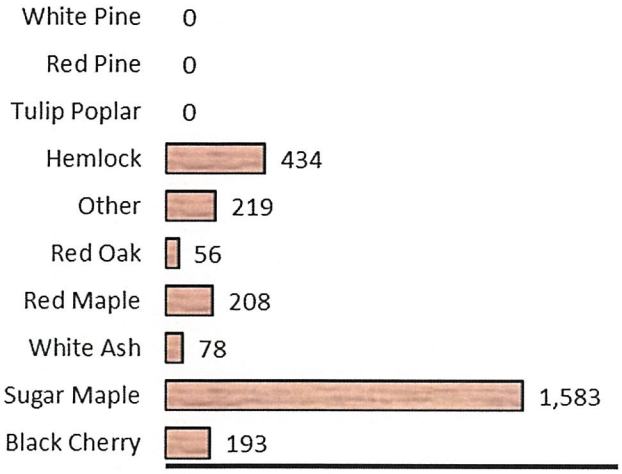


Distribution of Trees
66 Trees/Ac Sawtimber Size Classes

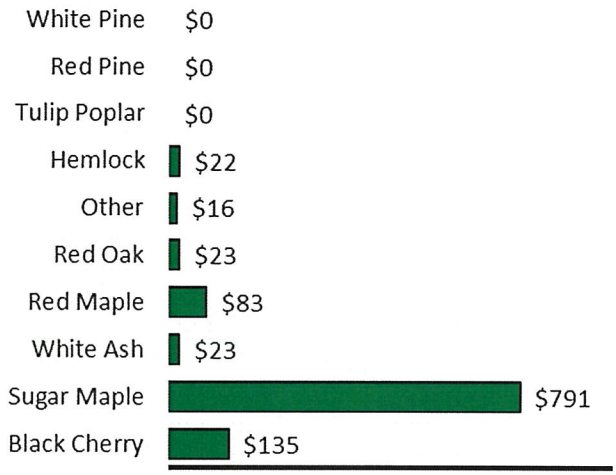


Spoden -Stand 13 (Continued)

Sawtimber Volume (D): +/- 2,771 BF/Acre



Sawtimber Value: +/- $1,093/Acre



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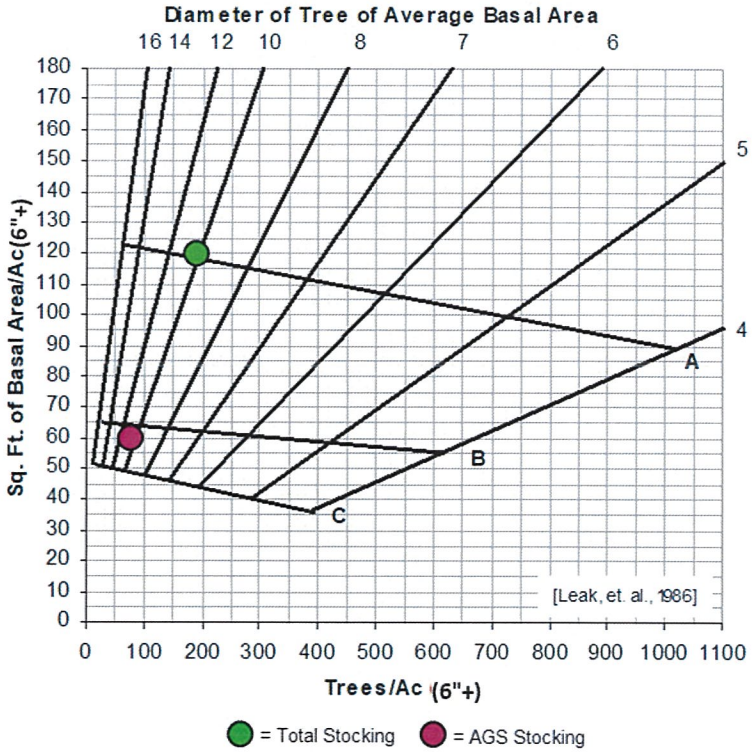
Diagnosis & Prescription:

Stocking Level: fully stocked
Adequately Stocked with AGS: no
Next Harvest: 5-10 years
Harvest Type: timber stand improvement with light sawtimber harvest
Target BA/Acre: +/- 90
Necessary to Retain UGS: yes
Understory Potential: low
Regeneration Inhibited: yes
Herbicide Treatment: monitor/frilling
Herbicide Target: fern, grapevine/beech, hazel
Next Herbicide Treatment: 5-10 years
Future Management Potential: low-fair
Aesthetic Impact of Prescription: moderate
Insect/Disease: emerald ash borer threat
Accessible: no
Site Limitations: steep, restricted
Stream Crossing: bridge pad
OGM/Utilities: gas line

Even Aged Northern Hardwood Stocking Guide



Spoden - Stand 13 (Continued)

General Analysis/Information:

- This stand was thinned by prescription in 1994. Harvesting appears to have been generally conservative focusing retaining as much good growing stock as possible.
- Overall timber volume and value is not exceptionally high, because the sawtimber trees are inconsistently stocked and scattered, but those trees are decent in quality, but there is a high proportion of UGS in the large sawtimber that limits sawtimber volume in the size class that would normally make the largest contribution to volume and value; it may have been necessary to retain some UGS in the prior harvest to maintain target residual stocking levels. The sapling class, is generally composed of beech and hemlock; the hemlock are mostly suppressed and not good growing stock serving only to create additional competition for more desirable hardwood regeneration. Likewise, only about a third of the pole trees have much future potential. Overall, the understory and mid story offers little long-term potential and cannot be relied upon to make a long-term contribution towards replacing overstory sawtimber trees. It will be imperative to control this vegetation long-term, promote the development of the best trees to serve as long-term sources of seed, and promote the regeneration of more desirable species; current and future harvesting needs to take this into consideration and be conservative in nature.
- At the current stocking level the degree of crowding is on the rise, growth rates will be dropping, and mortality will begin to increase.
- The stocking in AGS alone is not adequate enough to support a well-stocked stand. The next harvest should focus exclusively on the removal of UGS; it will be necessary to retain some UGS as place holders and as additional future sources of seed to maintain target residual stocking levels.
- White ash is not a huge component of the stand, but in the face of the threat posed by the Emerald Ash Borer, it would be prudent to "pre-salvage" the largest white ash trees during the prescribed harvest. This would not eliminate all ash trees, but would limit future potential losses associated with this devastating insect and would remove those trees with the highest financial risk before infestation.
- Past harvesting may have afforded the opportunity to cut sawtimber and generate revenue, but because of the high proportion of UGS that still remain, and the low sawtimber volume, it will be necessary short term to be ultra conservative in the removal of sawtimber in favor of the removal of low grade timber in an effort to increase the proportion of quality timber and begin setting the stage for the eventual regeneration of the stand. By taking this approach there may be an opportunity to improve the overall genetic qualities of the timber.
- With the opportunity to harvest some of the sawtimber trees, the prescribed harvest may be a commercial timber sale, but is not expected to produce an excessive amount of income. Regardless, the harvest will be important to reduce crowding and improve growth rates for the best growing stock trees, accelerating their development for the future and to promote the best seed sources for regeneration. Depending on the response to this thinning, this stand may be ready for a commercial harvest by the time of the next one (i.e. 20 years after).
- There is a significant component of beech, low hemlock, witch hazel, and fern in the understory and on the forest floor, with grapevine in the upper canopy. These will inhibit the successful establishment of desirable seedling regeneration. The control of this competing vegetation is not critical to the current prescription, but it will be necessary to treat some of it with herbicide in the future. This should be monitored over the next 5-10 years after the prescribed harvest, especially the grapevine which if it expands could be damaging to the timber and may need to be controlled (cut stump herbicide) sooner than the other woody and herbaceous competition, which also if not controlled with herbicide at some point in the future may become a problem for regeneration. It is recommended to incorporate a frilling

Spoden - Stand 13 (Continued)

treatment of the beech, witch hazel, and any other woody competing vegetation with the next harvest after the current one prescribed; likewise, the fern will need to be treated (foliar herbicide) before any regeneration harvesting, which could be the next harvest. Any regeneration harvesting without controlling this vegetation first will fail.

Note: Consideration could also be given to scheduling a grapevine treatment simultaneously with the current prescribed harvest to be proactive and so costs can be timed with the timber sale revenue.

- Care should be taken with harvesting along creeks and drainages, around any spring seeps or large vernal pools, and on or near soils and steep slopes that are more erodible - slightly higher stocking levels should be maintained along the creeks to minimize over exposure to sunlight to keep water temperatures cool, keep the soil along the banks stable, and minimize erosion. Bridge pads should be used for any creek crossings to minimize disturbance to the banks and bed, and minimize sedimentation.

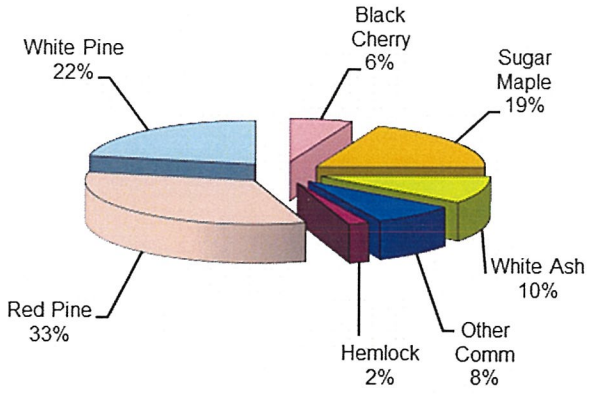
Commercial Stand Description

Spoden - Stand 14

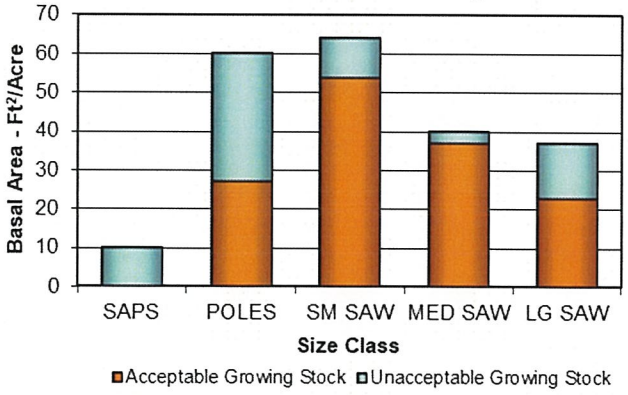
Acreage: 6.3
Forest Cover Type: plantation
Topography: flat, sloping
Water Resources: minor creek
Special Sites: abandoned RR bed
Age Structure: even aged
Size Class: small/medium sawtimber
Site Quality: good-fair
Total Sawtimber Volume (Bdft-Doyle): +/- 44,400
Total Pulpwood Volume (Cords): +/- 105
Total Timber Value: +/- $5,100
Timber Quality: good-fair
Last Harvest: 1994

Primary Pole Species: sugar maple, red pine
Pole Condition: fair/poor
Primary Seedling Species: white ash
Seedling Stocking: low
Deer Browse Intensity: moderate lo
Primary Sapling Species: sugar maple
Sapling Stocking: low
Sapling Condition: fair
Woody Comp. Species: beech
Woody Comp. Stocking: low
Herbaceous Veg. Species: fern
Herbaceous Veg. Coverage: low

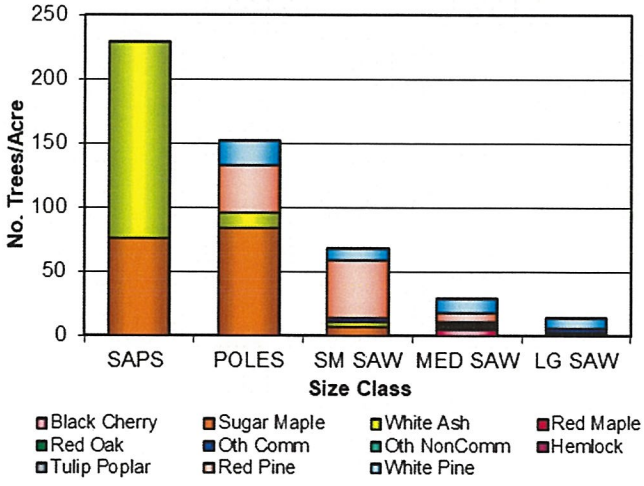
Species Composition (% Basal Area)



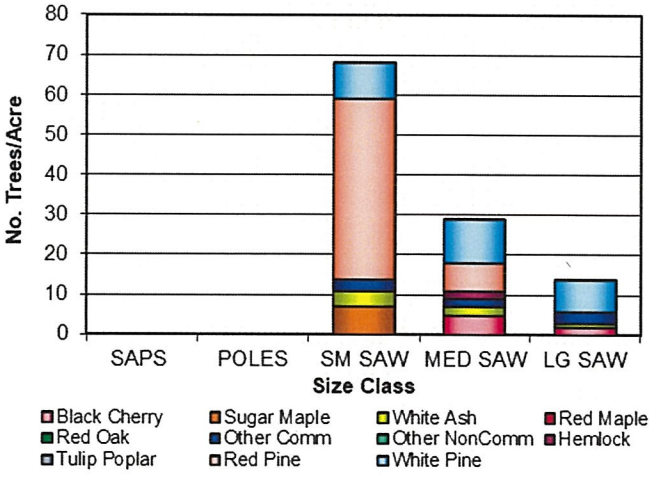
Distribution of Growing Stock
210 Ft² Basal Area/Ac - 67% AGS



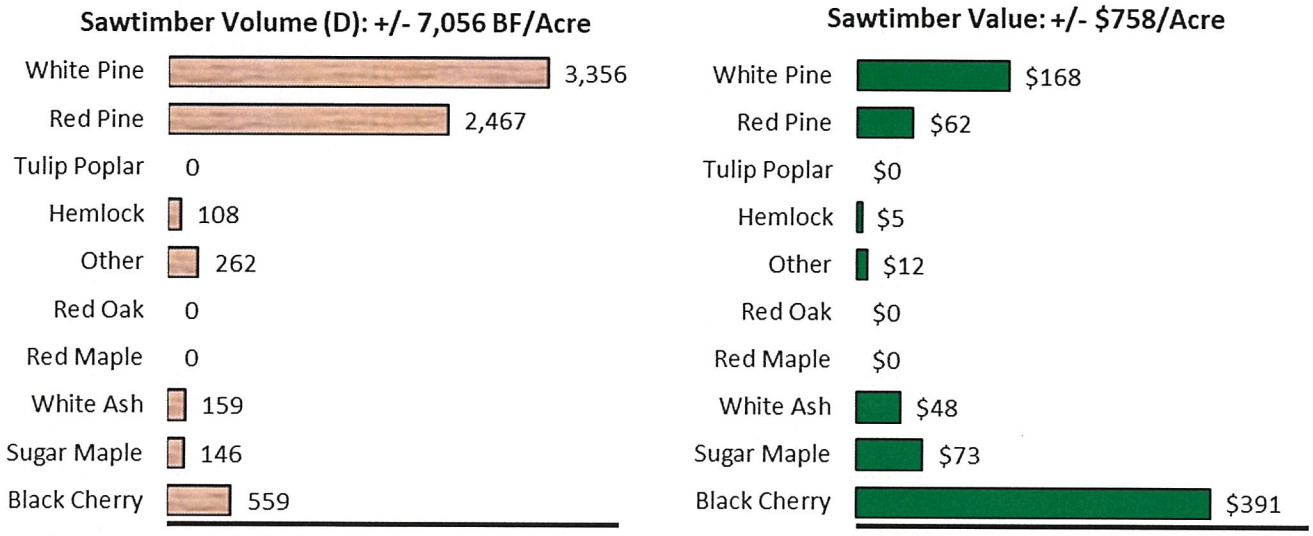
Distribution of Trees
492 Trees/Ac All Size Classes



Distribution of Trees
111 Trees/Ac Sawtimber Size Classes



Spoden - Stand 14 (Continued)



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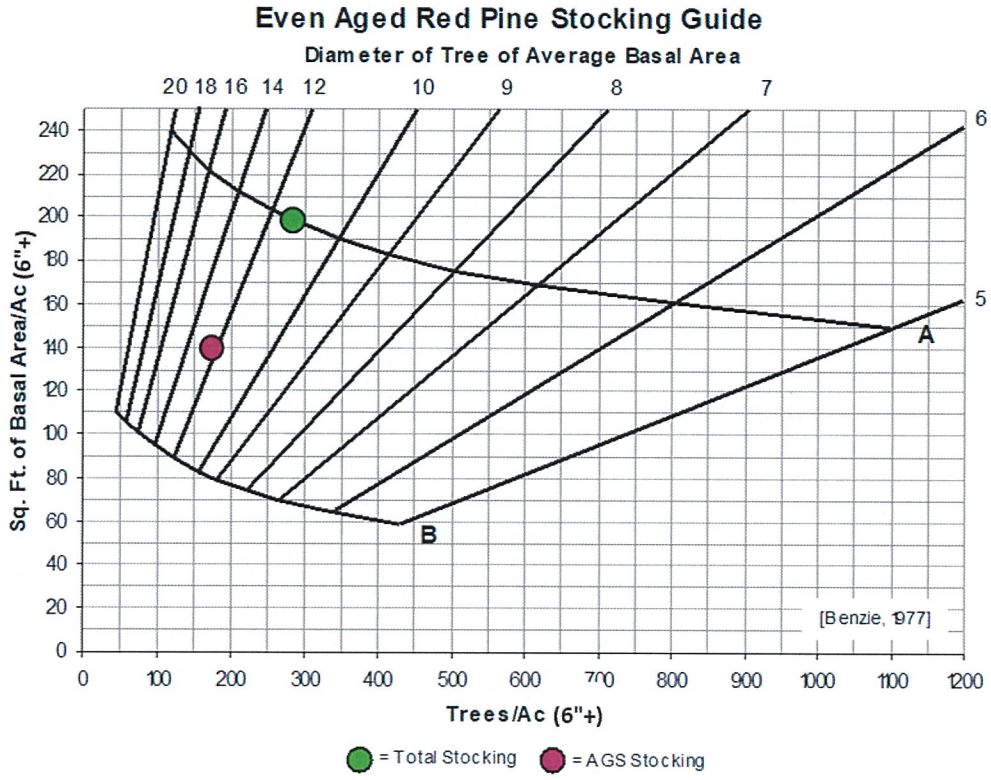
Diagnosis & Prescription:

Stocking Level: fully stocked
Adequately Stocked with AGS: yes
Next Harvest: 0-5 years
Harvest Type: convert/regenerate
Target BA/Acre: +/- 50
Necessary to Retain UGS: yes (hardwood)
Understory Potential: low
Regeneration Inhibited: no
Herbicide Treatment: none
Herbicide Target: none
Next Herbicide Treatment: n/a
Future Management Potential: fair
Aesthetic Impact of Prescription: high
Insect/Disease: emerald ash borer threat
Accessible: no
Site Limitations: restricted
Stream Crossing: bridge pad
OGM/Utilities: power line

Spoden - Stand 14 (Continued)



General Analysis/Information:

- This stand is an established small mixed planting of red and white pine.
- This stand was thinned by prescription in 1994. Harvesting appears to have been generally conservative focusing on retaining good growing stock.
- Unfortunately, red pine has very limited commercial interest or value in the timber market place for western New York; there is some demand for white pine but it too is not highly sought after or valuable. And while this stand could benefit from a thinning, there is little long-term potential to generate high timber value and therefore little return on investment.
- Pine plantations are not self-sustaining – they are planted, grow up, are harvested, or fall down and do not reseed naturally; they are either replaced by native vegetation or need to be replanted. Sites planted like this one, are usually poorly suited to grow softwood timber and it is not uncommon to see a fairly decent hardwood component throughout the stand, indicating what wants to grow there. As a case in point, 25% of the stocking in this stand is made up by cherry and maple. These hardwood trees are predominantly sawtimber sized and will serve as important sources of seed for the eventual conversion back to hardwoods.
- At the current stocking level the degree of crowding is on the rise, growth rates will be dropping, and mortality will begin to increase.
- The stocking in AGS alone is adequate enough to support a well-stocked stand. From a pure management stand point this stand is ready for thinning and will benefit, but unless it is desirable to maintain this stand short-term as a timber crop, or to forgo management altogether and maintain it for wildlife habitat or

Spoden - Stand 14 (Continued)

aesthetic purposes, the ideal long-term treatment for this stand is to clear most of the red and approximately half of white pine, leaving some of the better white pine, and allow it to convert back to native hardwoods.

- Either direction for management can be pursued with little impact to the whole property. If conversion is pursued, harvesting should focus on the removal of most of the softwood while leaving the hardwood as a source of seed to help regenerate the site. Conversion would have to be timed carefully with a good market, in order to get a buyer interested in cutting it. Because of the small size of this stand, it cannot feasibly support a timber sale alone; any harvesting should also be timed with the treatment of the other nearby stands.
- White ash is not a huge component of the stand, but in the face of the threat posed by the Emerald Ash Borer, it would be prudent to "pre-salvage" the largest white ash trees (i.e. 16 inches and larger) during the prescribed harvest. This would not eliminate all ash trees, but would limit future potential losses associated with this devastating insect and would remove those trees with the highest financial risk before infestation.
- Following the conversion prescription will not generate a lot of income, but will generate some as it will capture the majority of the softwood value. If, as a worst case scenario, revenues break even with cost, it will be an important investment to convert the stand back to more valuable hardwoods and improve the long-term trajectory and value of the timber.
- Care should be taken with harvesting along creeks and drainages, around any spring seeps or large vernal pools, and on or near soils and steep slopes that are more erodible - slightly higher stocking levels should be maintained along the creeks to minimize over exposure to sunlight to keep water temperatures cool, keep the soil along the banks stable, and minimize erosion. Bridge pads should be used for any creek crossings to minimize disturbance to the banks and bed, and minimize sedimentation.

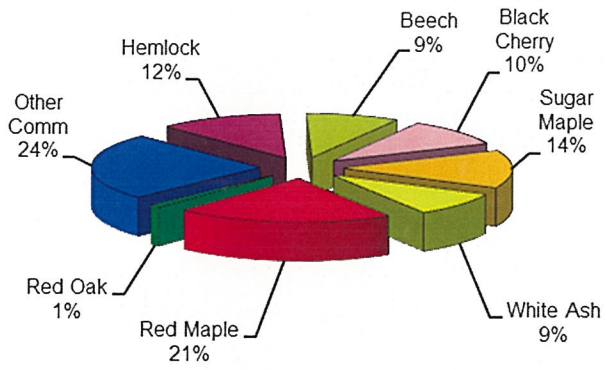
Commercial Stand Description

Glasgow - Stand 1

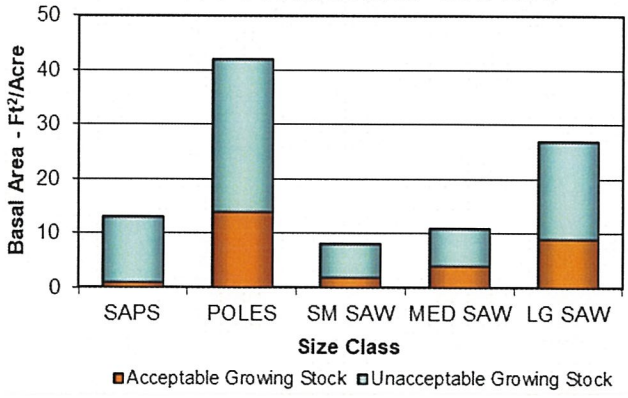
Acreage: 18.5
Forest Cover Type: northern hardwood
Topography: flat, rolling
Water Resources: lake, open marsh, ponds, vernal pools
Special Sites: abanonded buildings
Age Structure: even aged
Size Class: pole timber
Site Quality: good fair poor
Total Sawtimber Volume (Bdft-Doyle): +/- 18,900
Total Pulpwood Volume (Cords): +/- 205
Total Timber Value: +/- $7,600
Timber Quality: poor
Last Harvest: 2007

Primary Pole Species: y. birch, s. maple, r. maple, ash
Pole Condition: fair
Primary Seedling Species: ash
Seedling Stocking: none-low
Deer Browse Intensity: moderate
Primary Sapling Species: r. maple, s. maple, y. birch
Sapling Stocking: moderate-low
Sapling Condition: fair-poor
Woody Comp. Species: beech, grapevine
Woody Comp. Stocking: high/low
Herbaceous Veg. Species: fern, grass, goldenrod
Herbaceous Veg. Coverage: high-moderate

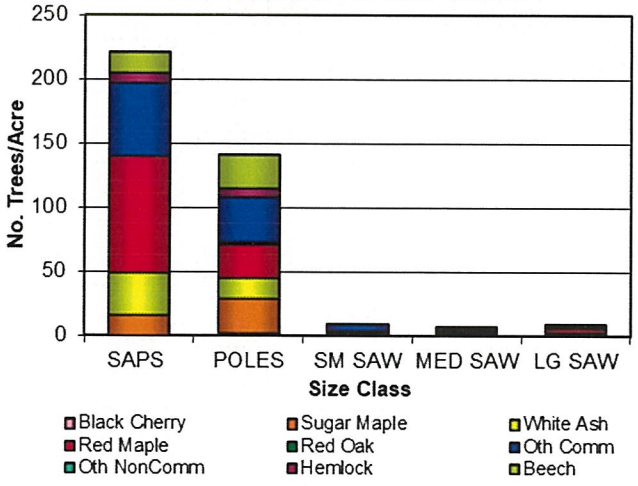
Species Composition (% Basal Area)



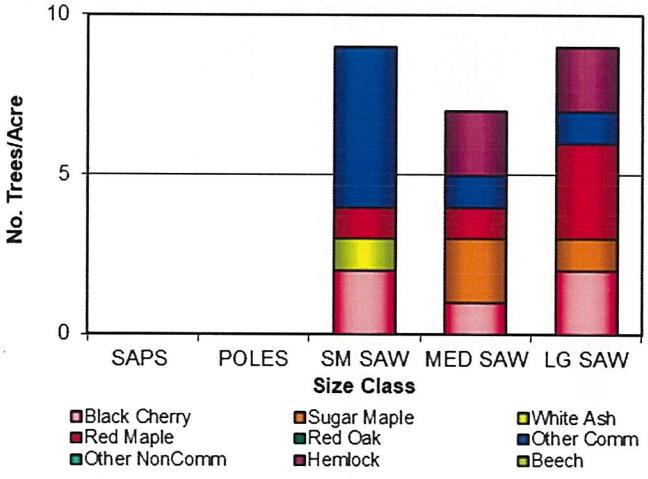
Distribution of Growing Stock
101 Ft² Basal Area/Ac - 30% AGS



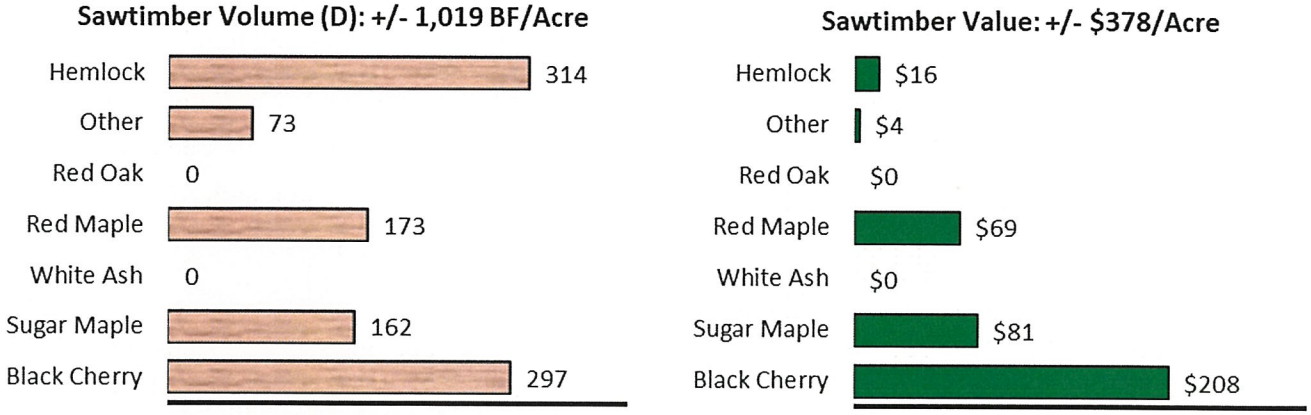
Distribution of Trees
386 Trees/Ac All Size Classes



Distribution of Trees
25 Trees/Ac Sawtimber Size Classes



Glasgow - Stand 1 (Continued)



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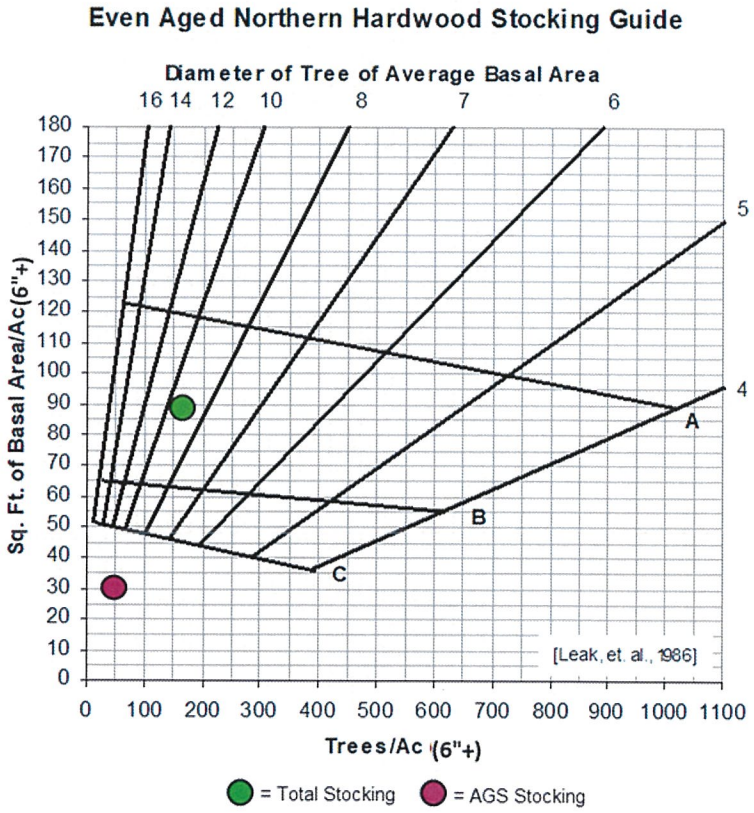
Diagnosis & Prescription:

Stocking Level: well stocked
Adequately Stocked with AGS: no
Next Harvest: none/25-30 years
Harvest Type: forgo management or let develop and re-evaluate
Target BA/Acre: n/a
Necessary to Retain UGS: n/a
Understory Potential: low
Regeneration Inhibited: yes
Herbicide Treatment: monitor
Herbicide Target: beech
Next Herbicide Treatment:
Future Management Potential: low
Aesthetic Impact of Prescription: n/a
Insect/Disease: emerald ash borer threat
Accessible: yes
Site Limitations: none
Stream Crossing: none
OGM/Utilities: power line



Glasgow - Stand 1 (Continued)

General Analysis/Information:

- This stand was previously described as an abandoned park like facility with many abandoned buildings, shelters, electric utility poles, and gravel roads throughout.
- This stand was regenerated by prescription in 2007. This stand was harvested before that by prescription in 1991. At the time of the 1991 harvest it was observed that the soil was subject to a lot of soil compaction in many places from prior use and that regeneration might be limited as a result. The prescription at that time was to create patch cut openings where soil compaction was not an issue to begin promoting regeneration, which was lacking at that time.

  The assessment in the 2006 management plan was that adequate regeneration had formed since the 1991 harvest and removing most of the overstory timber to release that regeneration was justified; this was the essence of the 2007 harvest. The seedlings that germinated following the 1991 harvest would have grown to sapling size by the time of the 2007 harvest and would have advanced to pole sized by now.

  The 2007 harvest was not necessarily a textbook overstory removal, but certainly concentrated on removing most of the sawtimber to release the next crop of trees that was thought to be adequately established and developing underneath. Unfortunately, it appears that there may have been other factors impacting the regeneration that the attention was focused on over this time period. Observations associated with this current management planning effort indicate that while there are desirable saplings present, but they are not abundant and cannot be relied upon to replace the sawtimber that was harvested. The 2006 management plan stated that there were pockets of beech that should be treated. Based on current data and field observations, it appears that the beech may have been denser than previously thought. The sapling size class and pole size class are overrun by beech now, but records do not indicate that this was not a problem before. The data specifically shows an abundance in beech trees in the poles, especially those 6 inches in diameter. They would have been saplings at the time of the 2007 harvest, but have since grown. With the advancement of these the beech trees and the invasion of new beech trees in the seedling and sapling size classes, it appears that they outcompeted and pushed out any desirable seedlings that would have been previously observed, and now prevent any new ones from becoming established. This coupled with the general site/soil conditions, saplings destroyed during the 2007 harvest, and a high deer population, it appears that in one harvest cycle the regeneration has gone from being adequate to inadequate.
- As a result of the previous harvest, current timber volume and value is very low, because the quality sawtimber trees are inconsistently stocked and scattered. Quality of the sawtimber is generally poor. There are many large diameter open grown trees that appear to be old shade trees that persisted from past use of the property. The decision to leave those trees is often made while marking timber for harvest because they cause a lot of damage to other smaller trees because of their size; and they notoriously have no merchantable value and would merely be cut and left. Many of those trees would have been left again in the most recent harvest for these reasons and also because they often have some wildlife benefit. With the decision to release the regeneration by harvesting the bigger better timber, leaving these poor quality larger trees, and the ingrowth of beech from the sapling to the pole sized trees, the result is a high proportion of UGS across all size classes, especially the largest and smallest. Normally with adequate regeneration, retaining trees of this quality would not be a concern, but that is not the case.
- The long-term potential of this stand has decreased significantly because of an unfortunate and unpredictable set of circumstances.
- At the current stocking level the degree of crowding is low, growth rates will be high, and mortality will be low.

Glasgow - Stand 1 (Continued)

- The stocking in AGS alone is not adequate enough to support a well-stocked stand, and in fact does not have enough stocking in quality stems to warrant further management. Under the circumstances, it would normally be recommended to attempt regenerating the stand again by re-establishing the shelterwood.

  This would be accomplished through a frilling herbicide treatment of the beech and any other woody competing vegetation and possibly a foliar herbicide application to control any herbaceous competing vegetation, because at their densities they will inhibit desirable regeneration from becoming established and threaten the sustainability of the timber resource. This would, however, be a significant expense with continued risk of failure given the diminished seed source. If there were a better more abundant source of seed, with increased odds of reseeding the site and the promise of a more significant payout and return on investment, it might be worth considering. Under the circumstances this would only be worth pursuing if there was a serious long-term commitment to rehabilitate this stand of timber regardless of cost and risk.

- Given the history of use on this property, the failed recent efforts to establish a long-term timber resource, and the small size of this stand, it is recommended to forgo management for timber. Furthermore, if this property is not important to managing the Villages water supply, the Village is probably further ahead to sell the property, where it's highest and best use is for its recreational value, and not as a timber asset. There is little benefit to retaining this property if it is not important for water supply management. The alternative is to let the forest develop on its own for a period of years and reinspect to see if more options and opportunities for management present themselves.

Stand Descriptions: Non-Forest & Non-Timber Areas - Spoden

Stand Area: 1

Acres: 22.9

Cover Type: Forest

Description: Steep inaccessible ravines, water filtration plant, reservoir spillway

Recommendations: None.

Stand Area: 3

Acres: 5.2

Cover Type: Forest

Description: Non-commercial forest and dense brush

Recommendations: None. While non-productive for timber, this area makes an ecological contribution to the property as diverse cover and wildlife habitat.

Stand Area: 5

Acres: 44.3

Cover Type: Open

Description: Fredonia Reservoir

Recommendations: None.

Stand Area: 6

Acres: 14.9

Cover Type: Forest

Description: Scots pine plantation, white pine plantation, hardwood forest

Recommendations: None. Harvesting has been conducted in this area in the past, but this is a thin strip of forest directly bordering the reservoir that is on sloping and steep terrain and mostly inaccessible for logging without acquiring access from the neighboring property owner. Regardless, this area does not represent a significant manageable timber asset and may be better left as an unmanaged buffer to the reservoir, accept perhaps to control grapevine invasion as needed.

Stand Area: 7

Acres: 2.8

Cover Type: Forest

Description: Steep inaccessible slope between ravines adjacent to the reservoir.

Recommendations: None.

Stand Area: 10

Acres: 42.8

Cover Type: Riparian wetland

Description: Wet inoperable bottomland and canal like open water where the reservoir backs up into the creek bottom

Recommendations: None. While non-productive for timber, this area makes an ecological contribution to the property for water filtration, ground water recharge, protection of aquatic habitat, and as diverse cover, wildlife habitat, and sources of food for wildlife.

Stand Area: 12

Acres: 8.0

Cover Type: Forest

Description: Non-commercial forest and brush.

Recommendations: None. While non-productive for timber, this area makes an ecological contribution to the property as diverse cover and wildlife habitat.

Stand Descriptions: Non-Forest & Non-Timber Areas – Glasgow

Stand Area: 2

Acres: 1.4

Cover Type: Open

Description: Open marsh/wetland, brush, power line right of way

Recommendations: None. While non-productive for timber, the brush and marsh make ecological contributions to the property as diverse cover and wildlife habitat.

Stand Area: 3

Acres: 0.9

Cover Type: Open water

Description: Mash/wetland

Recommendations: None. While non-productive for timber, the brush and marsh make ecological contributions to the property as diverse cover and wildlife habitat.

Stand Area: 4

Acres: 22.8

Cover Type: Open wetland

Description: Marsh, wet brushy lowland adjacent to Upper Cassadaga Lake

Recommendations: None. While non-productive for timber, this area makes an ecological contribution to the property for water filtration, ground water recharge, protection of aquatic habitat, and as diverse cover, wildlife habitat, and sources of food for wildlife.

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15 Year Work Schedule - Spoden

Year	Activity	Status
2020	Re-paint boundary lines	☐ Completed/Date_____
	Stand 8 – 78 ac: cut stump herbicide grapevine (see stand desc)	☐ Completed/Date_____
	Stand 8 – 78 ac: thinning	☐ Completed/Date_____
	Stand 9 - 5 ac: conversion/regenerate	☐ Completed/Date_____
	Stand 14 - 6 ac: conversion/regenerate	☐ Completed/Date_____
2021	No activity necessary	
2022	Stand 4 – 13 ac: frilling herbicide beech	☐ Completed/Date_____
	Stand 4 – 13 ac: cut stump herbicide grapevine	☐ Completed/Date_____
	Stand 4 – 13 ac: 1st Stage Shelterwood	☐ Completed/Date_____
	Stand 11- 50 ac: cut stump herbicide grapevine (see stand desc)	☐ Completed/Date_____
	Stand 11 – 50 ac: thinning	☐ Completed/Date_____
2023	No activity necessary	
2024	Stand 13 – 39 ac: cut stump herbicide grapevine (see stand desc)	☐ Completed/Date_____
	Stand 13 – 39 ac: timber stand improvement/light saw thinning	☐ Completed/Date_____
2025	No activity necessary	
2026	No activity necessary	
2027	No activity necessary	
2028	No activity necessary	
2029	Stand 2 - 10 ac: timber stand improvement	☐ Completed/Date_____
	Stand 4 – 13 ac: inspect regen/evaluate for 2nd stage shelterwood	☐ Completed/Date_____
2030	No activity necessary	
2031	No activity necessary	
2032	No activity necessary	
2033	No activity necessary	
2034	Re-inventory forest & update management plan	☐ Completed/Date_____

Glossary of Forestry Terms

Acceptable Growing Stock – Trees which are healthy, vigorous and of good form to produce sawlog material, either now or in the future.

Acre – A land area of any shape, having 43,560 square feet. A football playing field contains approximately one acre.

AGS – See Acceptable Growing Stock.

Basal Area – See Stem Basal Area.

Board Foot – A standard volume measurement of lumber. Often described as an imaginary board one foot square and one inch think; actually, any dimension of lumber with a volume of 144 cubic inches.

Biological Maturity – See Maturity.

Clearcutting – The harvesting of all, or nearly all, of a crop of trees.

Conifer/Coniferous – A term meaning "cone bearing" as in trees with needle like leaves that bear their seed in cones. See Softwood.

Cord – See Standard Pulp Cord.

Cull – A live tree which is judged to be unmerchantable, both presently and in the foreseeable future. This can be because there is no market for this species, or because the tree contains too many defects, such as rot or crookedness to sell it profitably.

DBH (dbh) – Abbreviation for Diameter at Breast Height. This height has been standardized at 4.5 feet above the ground.

Even-aged Forest or Stand – A forest, stand, or crop of trees having no, or relatively small, differences in age.

Financial Maturity – The point at which a tree's financial value to the landowner has peaked. This may or may not coincide with biological maturity. See Maturity.

Forest Succession – The various natural stages that a forest goes through from open, bare ground to a mature forest.

Forest Type – A category of forest usually defined by its vegetation, particularly its dominant vegetation as based on percentage cover of trees.

Hardwood – A conventional term meaning a tree which is broad-leaved and deciduous; that is, it looses its leaves in winter.

Hardwood Forest Type – A forested area which has a makeup of 80% or more in hardwood species, on a merchantable volume basis.

Highgrading – Process of harvesting only high-value, superior quality trees from a forest.

Inoperable – See Operability.

Intermediate – See Tolerance.

Intolerant – See Tolerance.

Maturity – A loose term for the stage at which a tree has attained full development, particularly height, and is in full seed production. Thereafter a decline in vigor, health and soundness marks the stage of overmaturity.

MBF – Abbreviation for Thousands of Board Feet, M is the Roman numeral for 1,000. For example 16,000 Board Feet would be written 16 MBF.

Merchantable – Able to be harvested and sold profitably.

Mixedwood Forest Type – A forested area which contains both hardwood and softwood species in a more or less homogeneous mixture, each of which separately does not constitute as much as 80% or more of the merchantable volume. Example, 75% hardwood and 25% softwood.

Monoculture – Raising crops of a single species, generally even-aged. Also, a crop so raised.

Operable – See Operability.

Operability – A loose term referring to the ease or economic feasibility with which timber harvesters can conduct a harvesting operation. An area that can be traversed with the heavy equipment necessary to handle timber is operable, unless lack of merchantable timber in the area or political considerations make it infeasible; then it is inoperable.

Pioneer Species – See Tolerance.

Plantation – The establishment of a stand of trees by physically planting seedlings in the ground.

Pulpwood – Trees, or sections of trees, which are sold to a paper mill to be used to make paper pulp. Since the wood is reduced by the papermaking process to its fiber content, trees are often use which are not of sufficient size, quality or soundness to be used as sawlog material. For this reason, pulpwood is usually not as valuable a product as sawlogs. The term also refers to a group of trees which have no sawlog sections in them. See also Sawtimber.

Regeneration – The act of renewing tree cover by establishing young trees naturally or artificially. Regeneration usually maintains the same forest type and is done promptly after the previous stand or forest is removed.

Relative Density – The ratio, proportion, or percent of absolute stand density to a reference level defined by some standard level of completion.

Sawlog – A section of a tree which is long enough, straight enough and sound enough to be sawn into lumber of various kinds.

Sawtimber – Trees which have sections that can be utilized as sawlogs.

Selective Harvesting – The process of removing only trees that fall into a predetermined category, usually of size, quality or species.

Shelterwood System – Even-aged silvicultural system in which, in order to proved a source of seed and/or protection for regeneration, the old crop (the shelterwood) is removed in two or more successive cuttings.

Silvics – The study of the life history and general characteristics of forest trees and stands, with particular reference to locality factors, as the basis for the practice of silviculture.

Silviculture – Generally, the science and art of cultivating forest crops, based on a knowledge of silvics. More particularly, the theory and practice of controlling the establishment, composition, and growth of forest.

Single Tree Selection System – See Selective Harvesting.

Softwood – A conventional term meaning a tree which has needle-like leaves, bears its seed in cones, and generally does not lose its leaves in winter. Frequently called "evergreens". Examples are: pine and spruce.

Softwood Forest Type – A forested area which contains 80% or more softwood species, on a merchantable volume basis.

Species – A scientific category of plant or animal. There is generally a sterility barrier between species; they cannot interbreed.

Stand – A contiguous group of trees sufficiently uniform in age-class distribution, composition, structure, and growing on a site of uniform quality.

Stand Structure – The horizontal and vertical distribution of components of a forest stand including the height, diameter, crown layers, and stems of trees.

Standard Pulp Cord – Any stack of round or split wood occupying 128 cubic feet of space; but generally described as a stack measuring four feet high, four feed wide and eight feet long.

Stem Basal Area – The cross-sectional area of a tree's trunk, measured at 4.5 feet above the ground for standardization. It is usually expressed in square feet per acre, meaning the sum of the individual tree's cross-sectional areas on the acre. It is dependent on tree diameters and tree spacing and can be used as a measure of forest density. Timber volumes can be related to this parameter. It is used a great deal by foresters to describe forest conditions because basal area per acre can be measured in moments at any given point using specially-ground optical prisms that can be carried in a pocket.

Succession – See Forest Succession.

Tolerance – This is a term that expresses a tree's ability to grow in the shade of other trees; that is its "tolerance" of shade. There are three general classes; intolerant, intermediate and tolerant. Intolerants (also called pioneer species) need lots of sunlight to exist and grow well. They are fast-growing and competitive, and can grow fairly well in partial shade. If either intolerants or intermediates are kept in heavy shade for more than five or ten years, they tend to lose their growing vigor, begin to die off, and won't regain their vigor even when shade is removed. Tolerants are able to exist for many years in the shade of other trees, and then grow well once the shade has been removed. Examples of intolerant species are: aspen and white birch.

Tolerant – See Tolerance.

UGS – See Unacceptable growing stock.

Unacceptable Growing Stock – Trees which are decadent, overmature, diseased or will never have good enough form to produce sawlog material.

Unmerchantable – Not able to be sold profitably.

Vigor – A loose term which generally refers to a tree's ability to compete with other nearby trees for sunlight and soil nutrients, its resistance to disease and insect attack, and overall size and shape when fully grown.

Inventory Specifications for Management Planning – Client Version 9.050615

Cruise Design and Statistical Standards

1.) Sampling Method: 10 Basal Area Factor Variable Radius Plot inventory, with point centers established on a systematic "line-plot" grid system.

2.) Sampling Intensity: The intent of the sampling intensity is to efficiently acquire statistically reliable information for each stand or strata. Inventory transects and sample point spacing will be determined at the project manager's discretion. A good representative inventory with minimal variability is important. Cruise grids/plot locations relative to forest types, etc. should be evaluated prior to commencing with the inventory and adjusted as necessary to assure accurate representative sampling and thorough coverage of the property. Cruisers should further evaluate sample adequacy in the field and add additional plots while on site if it is clear that sample size is inadequate or not representative for a particular stand. Suggested plot spacing is as follows, but should be adjusted as necessary depending on forest type, terrain, potential number of stands, stand size, perceived variability, property configuration, etc:

	For Basic Management Plan	For Appraisal/Financial Planning
0-30 acres	3 ch x 4 ch	3 ch x 3 ch
30-75 acres	4 ch x 5 ch	4 ch x 4 ch
75-100 acres	5 ch x 5 ch	4 ch x 5 ch
100-200 acres	5 ch x 7 ch	5 ch x 5 ch
200+ acres	7 ch x 7 ch	5 ch x 7 ch

A stand/strata must have more than one sample plot. BAF 10 sample points should be put in all stands even if small in size. This is especially important if planning to import data into TIGER – all data must be collected with the same method. Plot data based on a small sample size may be adequate enough to determine species composition, growing stock quality, and stocking levels, but will likely be unreliable for sawtimber volumes. If sawtimber volume is relatively significant in smaller stands, it may be warranted to supplement plot data for management with a 100% sawtimber inventory for stands under 30 acres size.

3.) Data Collection: All data will be collected on hand held Pocket PC data recorders incorporated with Pocket Dog data collection software, then downloaded and compiled on Two Dog (version 2.0) forestry software system.

Mapping and Stratification

Forest stand type maps will be developed to stratify inventory information. These maps will provide information relevant to forest cover types, timber size classifications, timber stocking, timber quality, species composition, etc.

Cruisers are to map the location of the following geographic features as they are encountered in the field; this information may be important for management recommendations and/or operations:

Access roads
OGM roads
OGM well sites (record OGM company name)
Gravel pits
Water wells

Gas, power, or other utility lines
Landings
Stream courses (any stream that would require BMP crossing or bridge pad)
Wet areas – wetlands (open or wooded), vernal pools, swails, large springs seeps, etc.
Openings/out areas (any non-forest/non-commercial area large enough that acreage should be removed from the stand and tract total)
Major recreational trails – hiking, cross-country skiing, ATV, etc.
Inaccessible areas – rock outcroppings, steep areas, cut-off/orphaned areas, etc.

Cruisers are expected to develop type maps in the field for the sample areas they are responsible for and are to coordinate with cruisers in adjacent areas and the field crew chief in the development of a final stand map.

The field crew chief will develop a final stand map. All plots must clearly fall within a stand. Plots that are moved must be clearly marked with an arrow pointing to and distance to the new location. Added plots must be located and clearly marked on the map with their plot number. Dropped plots must be clearly marked and noted. Any of the geographic features mapped as per above are to be marked and indicated on the final stand map.

The field crew chief will be responsible for stratifying plot data by stand post inventory and updating stand acreages in the Two Dog data file as per GIS calculations.

Field Procedures

1.) Sample point locations will be located as accurately as possible in correspondence to the cruise map. In the event a sample point falls within less than 1 chain of a map-able non-forest type or unproductive area the point will be relocated backward, forward, or perpendicular to the line of travel until it is at least 1 chain away from the non-forest type. If the relocation of the sample point in either direction is still infringed upon by the non-forest type, the sample will be taken at a location least infringed upon by the non-forest type. A sample point may be excluded from the inventory only if a reliable sample can not be obtained after all measures of relocating the sample point have been made. The cruiser will note any such adjustments to sample point location on the field and final map, and record any other pertinent information

Non-forest or unproductive types, either mapped or unmapped, include roads, power-lines, pipelines, bogs, water bodies, fields, open wetlands, beaver flows, barrens, rock outcroppings, etc. Mapping these as precisely as possible is critical to accurately calculating stand and tract acreage.

In the event a point falls within 1 chain of a boundary line, the point will be moved back along the line of travel to a point 1 chain from the boundary. The cruiser will note any such adjustments to sample point location on the field and final map, and record any other pertinent information.

2.) Cruisers will record the point number, observed forest cover type, size class, and density classification at each sample point location. Cruiser will also record information about stand health and condition, timber quality, age structure, soil conditions, site quality, wildlife considerations, competing vegetation, thoughts for management, past harvesting, any other information pertinent for management planning.

3.) **If a point is a legitimate "null" point in the inventory, it is critical in Two-Dog to indicate that the point is to be included in the data calculations**. On the point data screen in Pocket Dog there is the

Point ID box in the lower right hand corner of the screen; at the bottom of the box is a square with a red or green diamond in it. Pocket Dog will recognize if tree data was collected in the plot or not. If tree data was collected this diamond will be green. If tree data was not collected (i.e. null point) the diamond will be red. When tree data is not collected Pocket Dog automatically considers the point a deleted point, not a null point. For a legitimate null point the cruiser will need to tap on the red diamond and select "Include this point in calcs", or it will be ignored and not included.

4.) At each sample point, beginning with the first tree directly in line with the line of travel then proceeding in a clockwise direction, each tree greater than 1.1" dbh and falling within the 10 BAF variable radius plot will be measured and tallied. All borderline trees will be determined to be "in" or "out" by calculating the limiting distance of each borderline tree with slope corrections applied as necessary.

Limiting Distance for all borderline trees will be determined using the following method:

a) Measure, from the uphill side, the diameter (dbh) of the borderline tree to the nearest 0.1" (inch) and mark the point at which the measurement was made with a paint stick.
b) Measure to the nearest 0.01 feet (1/100th foot) the horizontal distance from the face of the tree (at dbh) to point center.
c) Calculate the limiting distance of the tree by either a) multiplying the diameter of the tree by the 10 BAF Conversion Factor of 2.708, or b) using a lookup table of plot radii for trees of different diameters for a 10 Basal Area Factor prism. (NOTE: the Pocket Dog look up table for limiting distance uses a 2.75 multiplier based on a measurement from the center of the tree – if using the Pocket Dog look up table, the radius of the tree must be added to horizontal distance measured from the face of the tree to get the corresponding measurement from the center of the tree.)

   If the resulting distance is greater than the measured horizontal distance then the tree is "in" and will be recorded in the tally. Conversely, if the measured distance is greater than the calculated limiting distance then the tree is "out" and is not to be recorded.

   NOTE: Adjustments to correct for slope when determining limiting distance of borderline trees will be made by sighting a clinometer on a point at eye level upon the tree in question and recording the percent slope. Determine the Slope Correction Factor from the conversion table and multiply this figure by the limiting distance of the tree to calculate the slope corrected limiting distance. Then, measure the distance, parallel to the slope, from the face of the tree to point center. If this measurement is less than the slope corrected limiting distance the tree is "in" and recorded in the tally. Conversely, if the measured distance is greater than the slope corrected limiting distance the tree is "out".

Data Collection

The following information will be recorded on the PDA for all trees tallied at each sample point location.

A. Species **(SP)**, from the specified Species Code List incorporated within each PDA unit for Pocket Dog. Species Codes are as follows:

Pocket Dog Code	*Species*
01	Black Cherry
02	Sugar Maple
03	White Ash
04	Red Maple
05	Red Oak
06	Hemlock
07	Beech
08	White Oak
09	Scarlet Oak
10	Chestnut Oak
11	Black Oak
12	Aspen
13	Basswood
14	Birch
15	Cucumber
16	Hickory
17	Yellow Poplar
18	White Pine
19	Black Gum
20	Butternut
21	Elm
22	Black Locust
23	Black Walnut
24	Tamarack/Larch
25	Scotch Pine
26	Red Pine
27	Norway Spruce
28	White Spruce
29	Red Spruce
30	Black Spruce
31	Striped Maple
32	Hophornbeam/Ironwood
33	Blue Beech
34	Other Softwood
35	Other Hardwood

B. Product Code **(PROD)** for each tree tallied is to be recorded follows:

01 = Sawtimber (**11.1" DBH and larger**)
02 = Pulpwood (**1.1" DBH and larger; see also note below**)
05 = Cull (**1.1" DBH and larger; see also note below**)

NOTE: For all non-commercial size saplings/poles 5.0" dbh and smaller the Product Code (PROD) will be recorded as either Pulpwood (if acceptable growing stock) or Cull (if unacceptable growing stock).

C. Diameter **(DBH)** measured at a point 4.5' above the ground (dbh) on the uphill side of the tree. Diameters will be measured with a diameter tape. All trees 1.1 inches dbh and larger will be recorded by two (2) inch diameter classes as per the following examples:

Diameter Range	Diameter Class
5.1" - 7.0"	6"
7.1" - 9.0"	8"
9.1" - 11.0"	10"
11.1" - 13.0"	12"
13.1" - 15.0"	14"
etc.	etc.

D. Height **(MHT)**.

Saw-timber: record the number of 16' logs (minimum ½ log) to the nearest ½ log to a minimum top diameter of 10 inches or to a point where the tree no longer meets USFS grade 3 specifications due to forks, crook, excessive sweep, defect, etc. Record all ½ logs as a 5 (i.e. 1½ log tree = 15).

Pulpwood: record the number of 16' logs by estimating the number of 8 foot bolts contained in each merchantable stem to a minimum top diameter of 4" or to a point where the tree becomes un-merchantable due to forks, defect, etc. Individual trees must contain at least one 8' bolt.

***Minimum Standards For Diameter and Height: Saw-timber trees must be 11.1" dbh or greater** and contain at least 8 feet of grade 2 log (2 clear faces) (10" minimum top diameter) anywhere in the stem. Pulpwood trees must be at least 5.1" dbh or greater and contain at least one 8 foot bolt.

NOTE: Do not record Height (MHT) for any non-commercial size sapling/poles (5.0" dbh and smaller) that are tallied. Remember that non-commercial size sapling/poles of acceptable growing stock are recorded as Pulpwood, whereas those that are unacceptable growing stock should be recorded as a cull.

E. Defect **(DFC)** will be recorded as a percentage within the given tree by increments of 10%. For a tree with no defect (100% sound), no entry will be made. A tree with 10 % defect is recorded as a 10, and a tree with 20% defect is recorded as a 20, and so on. **DO NOT RECORD IN 5% INCREMENTS.**

Determinations for defect will be made as per the following.

Tree Volume Distribution (%) by 8 foot section

1 Log	55	45					
1 ½ Logs	37	32	31				
2 Logs	29	25	24	21			
2 ½ Logs	24	22	20	18	16		
3 Logs	22	19	18	16	15	10	
3 ½ Logs	20	18	17	15	13	10	7

F. Tree Quality **(Q)** will be determined for each measured tree as either Acceptable Growing Stock **(AGS)** or Unacceptable Growing Stock **(UGS)** as **A or U** respectively using the following criteria:

A (AGS): Acceptable Growing Stock trees are those that are suitable for retention in the stand for at least the next twenty year period. They are trees of commercial species and of such form, quality, and vigor capable of yielding saw-timber products now or at some future date.

- Products restricted to sawtimber or pulpwood only (i.e. culls cannot be an AG).
- Sawlog quality must have at least 2 sides clear.
- Generally do not include clumps. There are cases where warranted (i.e. twins on same stump of high quality) – use best judgment.
- Tree should have a fair to good crown and is not in a suppressed crown position.

U (UGS): Unacceptable Growing Stock trees are those that do not have the potential to make marketable saw-timber products in the future. They may be high-risk trees with disease or die-back which threaten their survival, contain excessive damage or defect, or are of extremely poor form.

- Products can include sawtimber, pulpwood, or cull.
- All culls should automatically be coded as an UG.
- Any tree incapable of yielding sawtimber products now or at some time in the future should automatically be coded as an UG
- In most cases, beech should automatically be coded as an UG unless of perfect health and quality, but should be judged on a tree by tree or stand by stand basis.
- In all cases, beech non-commercial saplings/poles should automatically be coded as an UG.
- In all cases, black birch non-commercial saplings/poles should automatically be coded as an UG.
- Undesirable understory hemlock in a hardwood stand should be coded as an UG, unless the project manager deems otherwise.
- Generally include clumps.
- Trees with poor crowns and/or in suppressed crown positions should automatically be coded as an UG.

- In all cases, non-commercial species like ironwood, striped maple, blue beech, serviceberry, etc. should be coded as an UG

G. **Comments** (on main plot screen): The cruiser will record any information important to note about that plot area or provide clarification/explanation of data collected in the comments box accessed from the main plot screen:

H. Text Data Fields. Prior to collecting tree data for each sample point, comments and/or observations about the surrounding stand area will be made and recorded as per the following criteria. **No fields should be left blank**; the only exception is when you are not collecting data for that parameter (i.e. snow depth doesn't allow for collecting regen info; early spring – ferns haven't emerged; project manager directed to ignore specific text data, etc.). This allows the option to return to the site at a later data and collect the missing information if desired. If specific data is not collected it should be noted on the two dog file list form.

- **Seedling Regen** – this is a subjective account of **desirable** seedlings (under 1" dbh) found directly underfoot and in the adjacent surrounding area based on the cruisers judgment. You should not base your observations strictly on what is underfoot; the intention is to conduct a general assessment of the area immediate to, and represented by, the plot. Note: you are assessing desirable regen only - if the only regen on the plot is beech, for example, then record none for the plot. This information is important for judging reproductive potential, etc.

  Heavy (i.e. over 2/3 ground cover)
  Moderate
  Light (i.e. less than 1/3 ground cover)
  None

- **Seedling Species** – record the most abundant species of desirable regen present. If there is no desirable regen present as recorded for Seedling Regen above then "none" should also be recorded for the species. If the species you encounter is not included in the picklist, selecting "other" is acceptable, but it is preferable that the cruiser write in the actual species name to provide better information – especially if the "other" species is found consistently.

  Bc – black cherry
  Sm – sugar maple
  Wa – white ash
  Rm – red maple
  Ro – red oak
  Other
  None

- **Browsing** – this is a subjective account of damage to seedling and sapling from deer browsing. Generally assess the area immediate to and represented by the plot. The intent is to use this information to assess seedling condition. If something more is worth noting, record in the comments box or in field notes (i.e. everything in area heavily browsed). This information is important in not only determining deer pressure, but seedling quality/condition.

  Heavy (i.e. over 2/3 browsed, repeated browsing, etc.)
  Moderate
  Light (i.e. less than 1/3 browsed)
  None

- **Sapling Regen** - this is a subjective account of **desirable** saplings (1-5" dbh) found within the plot area and in the adjacent surrounding area based on the cruisers judgment. You should not

base your observations strictly on what is within the plot; the intention is to conduct a general assessment of the area immediate to and represented by the plot. The prism generally only picks up saplings right near plot center, and the plot data collected may not provide as accurate a picture as your observations. Note: you are assessing desirable saplings only - if the only saplings on the plot are beech, for example, then record none for the plot. Don't mistake large seedlings for saplings – make sure the observation is restricted to saplings larger than 1". Where cover is moderate to heavy, make note if saplings are large or small, record in comments - for example: "large sap".

Heavy (i.e. over 2/3 low to mid canopy overhead cover – can't see overstory well)
Moderate (i.e. 1/3 low to mid canopy overhead cover)
Light (i.e. less than 1/3 low to mid canopy overhead cover)
None

- **Sapling Species** - record the most abundant species of desirable saplings present. If there are no desirable saplings present as recorded for Sapling Regen above then "none" should also be recorded for the species. If the species you encounter is not included in the picklist, selecting "other" is acceptable, but it is preferable that the cruiser write in the actual species name to provide better information – especially if the "other" species is found consistently.

  Bc – black cherry
  Sm – sugar maple
  Wa – white ash
  Rm – red maple
  Ro – red oak
  Other
  None

- **Sapling Condition** – generally assess the condition of the saplings. Primarily you should be looking at bole form and crown form assessing the degree of suppression (if any). Record N/A if there is sapling regen is recorded as none. This information is important for assessing future development and productivity as well as assessing suitability for all-aged silviculture (if the right species comp.)

  Good (i.e. less than 1/3 suppressed)
  Fair
  Poor (i.e. over 2/3 suppressed)
  N/A

- **Pole Species** - record the most abundant species of pole present - the intent is to look beyond the plot and characterize the poles beyond what is recorded in the plot data. If there are few poles in the stand then "none" may be appropriate to record – use your best judgment (i.e. if only a couple of poles in the surrounding area is it worth noting; when in doubt, however, record the species). If the species you encounter is not included in the picklist, selecting "other" is acceptable, but it is preferable that the cruiser write in the actual species name to provide better information – especially if the "other" species is found consistently. This information is important for assessing species composition in the mid/understory and suitability for all-aged silviculture

  Bc – black cherry
  Sm – sugar maple
  Wa – white ash
  Rm – red maple
  Ro – red oak

Other
None

- **Pole Condition** – generally assess the condition of the poles. Primarily you should be looking at bole form and crown form assessing the degree of suppression (if any). Record N/A if there is sapling regen is recorded as none. This information is important for assessing future development and productivity as well as assessing suitability for all-aged silviculture (if the right species comp.)

  Good (i.e. less than 1/3 suppressed)
  Fair
  Poor (i.e. over 2/3 suppressed)
  N/A

- **Woody Interference** - this is a subjective account of woody interfering vegetation (including grapevine) of all sizes from seedlings on up, but primarily assessing the forest floor, understory, and midstory canopy layers (low shade) within the plot area and in the adjacent surrounding area that in your judgment may or may not affect the ability of the stand to regenerate. You should not base your observations strictly on what is within the plot; the intention is to conduct a general assessment of the area immediate to and represented by the plot. The plot data collected with the prism may not provide as accurate a picture as your observations. Remember: any trees recorded in the overstory prism plot that fit this category should automatically be recorded as an UG.

  Heavy (i.e. over 2/3 of understory and mid story stocking)
  Moderate
  Light (i.e. less than 1/3 of understory and mid story stocking)
  None

- **Woody Interference Species** - record the most abundant species of woody interference present. If there is no woody interference present as recorded for Woody Interference above then "none" should also be recorded for the species. Note that hemlock is one of the selections; this would apply in a predominantly hardwood stand that has an unwanted understory hemlock component; in most situations this would be considered interfering vegetation unless otherwise directed by the project manager. In a mixed wood or hemlock stand understory hemlock is probably a desirable component and should not be categorized as woody interference. Note also that grapevine is included in this category; if there is a situation where there is an abundance of undesirable trees and grapevine together, record which ever is most dominant and make a note in the comments. For example if beech is the dominant species record beech in the text field and write "grape" in the comments or vice versa. If the species you encounter is not included in the picklist, selecting "other" is acceptable, but it is preferable that the cruiser write in the actual species name to provide better information – especially if the "other" species is found consistently.

  Be – beech
  Stm – striped maple
  Bir – black birch
  Laur – laurel/rhododendron
  Iron – ironwood
  Hem – understory hemlock
  Grv – grape vine
  Shrubs
  Other

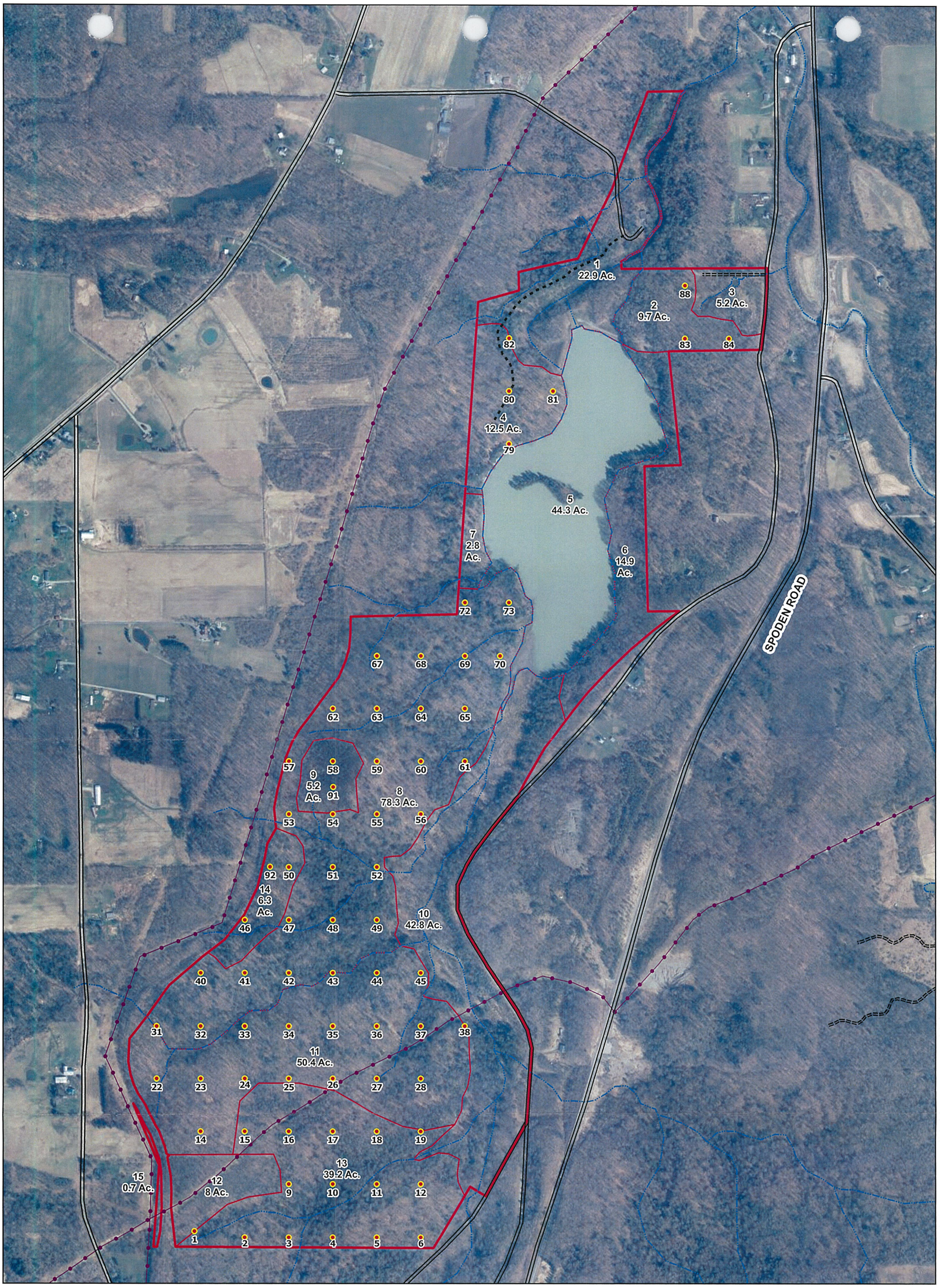
- **Herbaceous Interference** - this is a subjective account of fern, grass, or other unwanted herbaceous vegetation within the plot area and in the adjacent surrounding area that in your judgment may or may not affect the ability of the stand to regenerate. You should not base your observations strictly on what is within the plot; the intention is to conduct a general assessment of the area immediate to and represented by the plot. If selecting from the other category and if you are able to identify the vegetation, overwrite "other" with the actual species name, for example if garlic mustard is the primary herbaceous interference record "Moderate Garlic", etc.

  Heavy Fern (i.e. over 2/3 ground cover)
  Moderate Fern
  Light Fern (i.e. less than 1/3 ground cover)
  Heavy Grass (i.e. over 2/3 ground cover)
  Moderate Grass
  Light Grass (i.e. less than 1/3 ground cover)
  Heavy Other (i.e. over 2/3 ground cover)
  Moderate Other
  Light Other (i.e. less than 1/3 ground cover)
  None

I. Field Notes.

A Tract Inspection Report for Management Plans is to be completed by the field crew chief as part of the inventory process. Other members of the field crew should make notes of any information pertinent to the tract inspection report and provide that to the field crew chief. Tract inspection reports are to be placed in the job file.

A Stand Inspection Report is to be completed by the field crew chief, members of the field crew, and/or the project manager for each stand they encounter in the field that is to be designated on the stand sketch map. Preliminary stand numbers are to be assigned to the stand sketch map that corresponds to the stand inspection report. The project manager or field crew chief should inspect the property and stand delineations as per the sketch map and any adjustments should be made prior to forwarding to the GIS Dept. for final mapping. Once final stand numbers are assigned with final mapping those numbers are to be transferred to the appropriate stand inspection report. This information is critical to whoever will be authoring the plan. This information should be recorded and summarized during and immediately following the inventory of those stands. Stand inspection reports should be placed in the job file.



VILLAGE OF FREDONIA
SPODEN ROAD TRACT
346.3 ACRES
SPODEN ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
PLOT LOCATION MAP

Feet
0 330 660 1,320

N

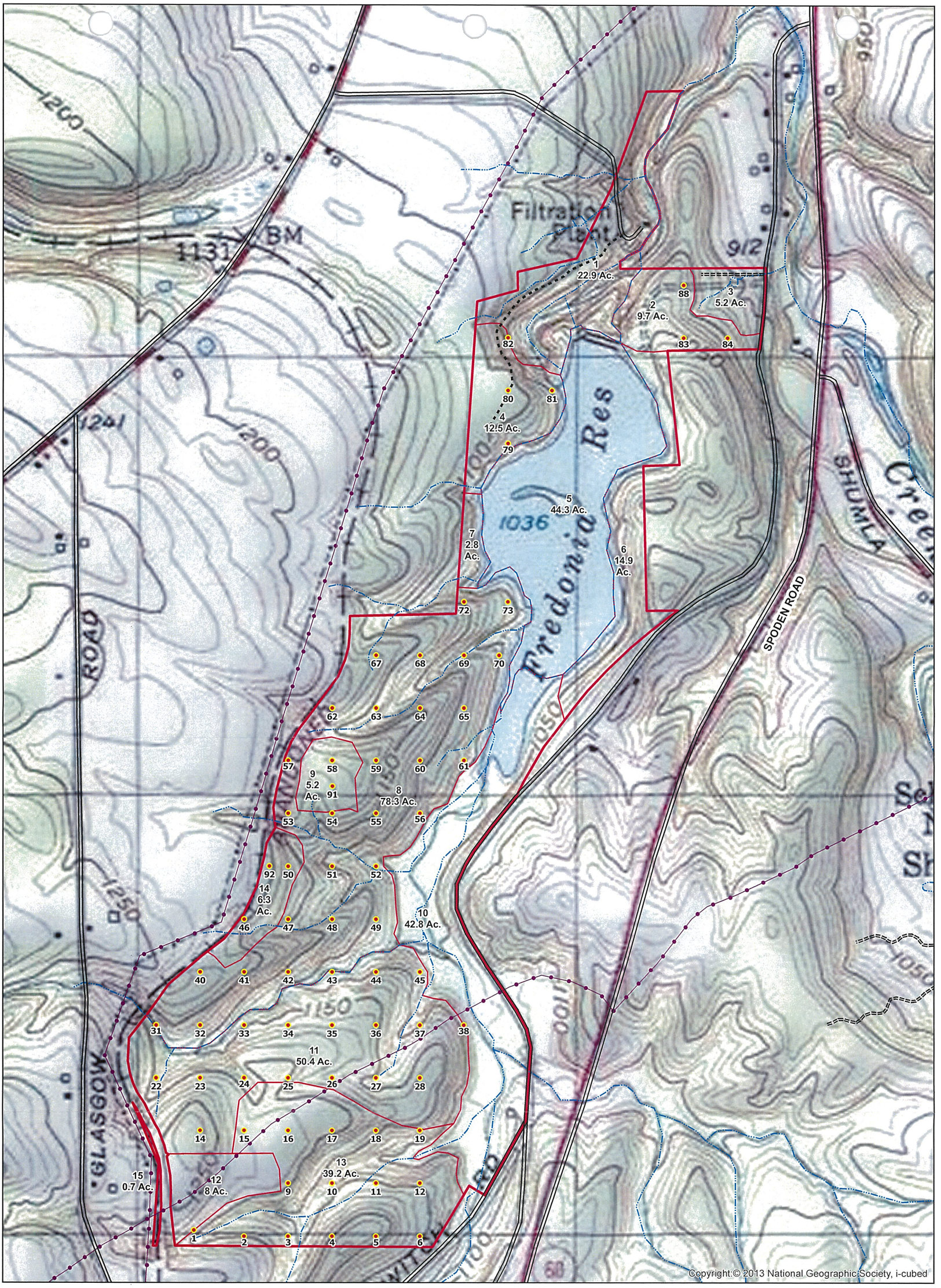
Legend

- Property Line
- Stand Line
- Stream
- Power/Gas Line
- Paved Road
- Woods Road
- Trails
- Plot

TimberH\Clients2019\Private\
Falconer\Fredonia_Village

All mapping was prepared using the best available information about the property from various sources and does not represent instrument survey accuracy. Acreages are estimated using geographic information system (GIS) technology and may not be consistent with acreages calculated by the county tax office or the ownership deed. This map is not a legal survey.

FORECON



VILLAGE OF FREDONIA
SPODEN ROAD TRACT
346.3 ACRES
SPODEN ROAD
TOWN OF POMFRET
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NOVEMBER 2019
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VILLAGE OF FREDONIA
GLASGOW PARK TRACT
43.1 ACRES
GLASGOW ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
PLOT LOCATION MAP

Feet
0 165 330 660

N

Legend

- Property Line
- Stand Line
- Stream
- Power/Gas Line
- Paved Road
- Woods Road
- Trails
- Plot

TimberH\Clients2019\Private\
Falconer\Fredonia_Village

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VILLAGE OF FREDONIA
GLASGOW PARK TRACT
43.1 ACRES
GLASGOW ROAD
TOWN OF POMFRET
CHAUTAUQUA COUNTY, NY
NOVEMBER 2019
PLOT LOCATION MAP

Feet
0 165 330 660

N

Legend

- Property Line
- Stand Line
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- Plot

TimberH\Clients2019\Private\
Falconer\Fredonia_Village

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FORECON

FORECON INC.

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Falconer, New York, 14733
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www.foreconinc.com

May 29, 2019

Village of Fredonia
Attn: Mayor Landis
9-11 Church Street
P.O. Box 31
Fredonia, NY 14063

Re: Proposal for forest management planning & plan implementation; Village of Fredonia Watershed – Spoden Road Tract 346 acres & Glasgow Road Tract 43 acres; Town of Pomfret, Chautauqua County, New York

Dear Mayor Landis,

Thank you and your staff for taking the time to meet with me about the Villages Watershed properties to discuss the options and opportunities for its continued management. After a long history of working with the Village in the management of these properties FORECON is pleased to continue that relationship. We know full well the importance these properties have to protect and clean the Villages water supply, and that they are also an important asset for timber. While sound stewardship of the timber resource is critical to its sustainability, strategic harvesting is critical to the protection of all resources, especially the water. As your forester these are our highest priorities and we sincerely appreciate the opportunity to demonstrate that.

FORECON uses many technologies and has developed several custom tools for forest management planning. We are able to efficiently provide reports that are more sophisticated than what was prepared for the Village in the past. Our approach is intended to describe the property through words, numbers, and maps to help the Village and its stakeholders see it through our eyes as foresters. By understanding more about the forest, the Village will be in position to make informed decisions and be able to demonstrate to others the level of care that is being taken. The planning process also provides us the basic technical information we need to make recommendations to the Village and the necessary guidance for sustainable management. Forest management planning is a positive step towards the stewardship of an important asset, and ultimately defines the difference between cutting trees and thoughtfully managing forest resources; the focus being as much about what is left in the forest as it is about what is removed. It is our goal to help the Village pursue and maintain the standard of care that it has set for itself.

The planning effort must cover the key silvicultural elements of characterizing the forest and relate that to its needs. To this endeavor, we would apply our state-of-the-art tools and techniques, and offer all we have learned and accomplished on the lands we have managed over the last 60 years, including our the experience we have with the Village already. As we discussed the existing plan developed in 2006 was never fully implemented and has become outdated; certainly, the forest has grown, but it is likely that other changes have taken place there too. It is our recommendation that a new inventory and assessment be conducted, and with that the development of a new plan before moving forward with any harvesting. We propose the following steps in preparing a long-term management plan for the Village forest and are able to offer you some additional upgrade options to further enhance the plan.

Phase 1 - Mapping & Forest Inventory:

The inventory allows us to learn what kind and how much timber there is, where it is, what its condition is, predict its future, evaluate it for management, and assess other forest features. This information will be gathered using a statistical plot sample method.

Estimated forest sample area: 285 acres

Sample plot grid spacing: 7 chains and 4 chains (396 and 264 feet) by 5 chains and 3 chains (330 and 198 feet), respectively for Spoden and Glasgow

Approximate number of plots: 90

Acres represented by each plot: 3.1 acres

Phase 2 – Data Analysis & 10 Year Management Plan:

The data collected in phase 1 will give us the information we need to model forest structure and provide you with a basic description of species composition, stocking levels, growing stock condition, tree size class, etc. that will be used to develop sustainable harvest recommendations to increase growth and to improve forest health.

The final report culminating from Phases 1 and 2 will include: 1) maps of the property; 2) data summary; 3) estimated timber volume at the stand and property level; 4) appraisal of timber value at the stand and property level; 5) recommendations for harvesting and treatment; and 6) a 15 year management schedule.

Upgrade Option A: Visual Summary of Data

The basic plan will provide the necessary information to describe each stand on the properties and recommendations for management in in a condensed format. If Village wants a more detailed assessment of the forest, we can expand the stand descriptions to include a written narrative analysis of the data and observations that would cover topics like timber quality and condition, management potential, forest stocking and structure, invasive and competing vegetation, etc. This would be incorporated directly into the report produced at the completion of Phases 1 & 2.

Upgrade Option B: Visual Data Summary

If the Village is interested in a more meaningful description of its forest, we can summarize and present some of the more critical inventory data using charts and graphs, allowing anyone to quickly understand the forest at a glance. This would be provided at the stand level and will be incorporated directly into the report produced at the completion of Phases 1 and 2.

Upgrade Option C: Financial Analysis of Revenue, Growth, and Sustainability

Our proprietary TIGER® database management system is a powerful data management tool allowing us the ability to model future growth that can help with decision making and financial and estate planning, etc. This analysis will show the annual change in timber volume and value by projecting growth and accounting for estimated timber harvests – much like a balance sheet, predicting the financial performance of your timber asset for a 10 year period by quantifying future timber value, projecting timber harvest revenues, and assessing sustainability of the timber resource. This will be presented in the plan by way of a written summary and a spreadsheet. This option is an expansion of Upgrade Option C above.

It is mutually understood that the intended purpose and use for any appraisal reports or financial analyses produced by Forecon, Inc. is for informational purposes and to assist in establishing an opinion of current fair market timber value; future projections of volume and value are intended to illustrate timber asset performance, but are not guaranteed. Likewise, any projections of harvest volume and timber sale revenue are intended to illustrate what the possibilities might be, but do not represent a promise of anticipated timber yield or income; actual sale volumes and values can and will vary from projected figures. Furthermore, markets can and will change over time and any pricing cannot be guaranteed beyond current market conditions; all future pricing is speculative based on a set of assumptions. While they may be useful for planning, reports are not intended for use in advertising the sale of standing timber and/or real estate; FORECON, Inc. cannot guarantee any result if used in such a manner. It is also mutually understood that statistical sampling has varying degrees of accuracy for timber volume and value

compared to 100% sampling; timber volumes and values calculated from statistical sampling cannot be guaranteed.

Samples of our management planning work are included with this proposal.

Phase 3 - Implementation:

Once the plan is completed, we will have the information needed to administer the harvesting and management recommendations. The approaches taken in this phase would be aimed at sustainable management, forest improvement, resource protection, and income generation. This would involve any combination of commercial and non-commercial harvesting and property management services.

- Commercial Harvests: Any commercial harvests would be handled through the sale of standing timber. Our timber sale administration process provides several layers of protection to the Village and its property, so it is as worry-free as possible.
  1) Each tree to be harvested will be individually selected and marked with paint according to the prescription for that area of the property. Only these trees would be allowed for harvest. Measurements would be taken to calculate volume and overall quality would be assessed to help us assign fair market value. All of this would be summarized and provided for Village records.
  2) Our sale notice clearly defines any special conditions required of the buyer and the standards in which the operation is to be conducted to minimize Village exposure to liability and minimize any negative impact of harvesting.
  3) Except for special circumstances, we require full lump sum payment of the timber before harvesting can occur.
  4) We require a performance bond to further encourage contract compliance and help cover costs if problems caused by the buyer arise that they are unwilling to address.
  5) We require the buyer to produce the appropriate insurance certificates prior to harvesting.
  6) We provide a contract to protect Village interests and commit the buyer to the terms set therein.
  7) We will monitor the active harvest on a periodic basis to evaluate compliance with the contractual obligations of the buyer and that State Best Management Practices for water protection are employed. Inspection records will be maintained and held in our files and are available to the Village upon request.
  8) We make sure skid trails and landings have been properly graded where necessary and have been secured against erosion when the harvest is complete.
- Non-Commercial Treatments: For non-commercial harvests and cultural treatments (i.e. timber stand improvement thinning, invasive and competing vegetation control, habitat management, etc.), we would provide site preparation, application, contractor selection and oversight (if needed), etc.
- Property Management: Property management would include services associated with boundary line maintenance, road/trail maintenance and construction, hunt lease management, additional data management, property inspections, etc. With Village authorization, periodic property inspections will be made to: update the management plan, monitor the results from previous treatments, monitor general forest health (insect outbreaks, storm damage, deer damage, etc.), identify security issues (trespass, theft, vandalism, boundary lines, etc.), etc.

Service Costs:

Phase 1 & 2: Inventory, Data Analysis, & 15 Year Management Plan:

Our fee for Phases 1and 2 will be a total of **$6,525.00.** An advance payment of **$2,500.00** is due with the return of this letter to proceed. The balance will be due upon delivery of the final reports.

Upgrade Option A: Narrative Stand Analysis

You will be billed an additional fee of **$850.00** to expand the descriptions of each stand to include a more detailed written narrative analysis.

Upgrade Option B: Visual Data Summary

You will be billed an additional fee of **$400.00** to summarize the inventory data using charts and graphs.

Upgrade Option C: Financial Analysis of Revenue, Growth, and Sustainability

You will be billed an additional fee of **$575.00** to estimate and report current timber volume and appraise timber value and provide a 10-year financial analysis of revenues, growth, and sustainability.

Phase 3: Implementation:

All projects and services associated with implementing the management plan will be discussed with and authorized by the Village prior to commencing with work (i.e. annual contact by email or letter summarizing scheduled work for the current year, etc.). Likewise, service fees will be quoted based on the following:

Commercial Timber Sales – For hardwood sawtimber dominated sales, the Village will be billed for time on an hourly basis, materials, and mileage on a sale-by-sale basis; plus a sale commission of 3% of the accepted gross selling price; plus a flat fee for harvest inspections, the number and cost of which will be determined in advance. This is due and payable to us at the time the gross selling price is collected by us from the purchaser.

Commercial Low-grade Hardwood & Softwood Sawtimber Sales – For low grade cordwood dominated hardwood sales (i.e. marginal commercial timber stand improvement sales) and softwood sawtimber sales, the Village will be billed for time on an hourly basis, materials, and mileage on a sale-by-sale basis; plus a flat fee for harvest inspections, the number and cost of which will be determined in advance. This is due and payable to us at the time the full gross selling amount is collected by us from the purchaser. [Note: it may be possible to generate some income from these types of sales, but because of their low value and demand, it may be possible that they will not generate enough income to cover all forestry costs. These types of sales are practically non-commercial treatments and represent the work necessary to improve long-term growth and development of the timber or management of the forest. It is a fortunate circumstance when there is an opportunity to sell the trees even to a meager market to help offset costs.]

Marketing recommendations for commercial sales will be made on a sale-by-sale basis and could include open competitive bidding, restricted competitive bidding, or direct negotiation. If the Village should choose not to offer the timber for sale after it receives our "fair market value estimate", the Village will be billed for the services we provided to the Village to that point, for time, materials, and mileage. If the Village choose to have us sell your timber, but the Village then rejects an offer which equals or exceeds our "fair market value estimate", then the Village will be responsible for paying us for time, materials, and mileage, plus the 3% sale commission, which will be computed using the amount of the offer received. If through open or restricted competitive bidding, we are unsuccessful in bringing in an offer that equals or exceeds our "fair market value estimate", the Village hereby agrees to allow FORECON, Inc. the opportunity to negotiate its timber to a prospective purchaser for the "fair-market value", or place the sale out for bid again in the future, whichever we deem appropriate to the Villages situation, or both. If either of these endeavors proves unsuccessful, the Village would be under no obligation whatsoever to pay for

our sales services until such time that we are able to successfully sell the timber. Please keep in mind that very few sales are not sold at the first offering.

Non-commercial harvests & cultural treatments – the Village will be billed for time on an hourly basis, materials, and mileage, the estimated costs of which would be quoted on a project-by-project basis. Depending on the project, an advance payment may be necessary with final payment being due upon completion of any work performed.

Property Management – the Village will be billed for time on an hourly basis, materials, and mileage. (Unless specified differently in advance, property inspections typically require no more than one man day of time.)

Any other services or customer support outside of the scope of these specific services will be billed for time on an hourly basis, materials, and mileage; this would include preparation for and attendance to meetings, additional reporting, expert witness testimony, communications, etc.

If this proposal for management planning and plan implementation is consistent with your expectations and needs, please sign below to authorize us to proceed. Please also initial in the spaces provided below if the Village would like to pursue the upgrade options. Keep a copy of this proposal for Village records and return the original executed copy to my office with the advance payment. We will schedule the work for completing this project as soon as possible after receiving this signed letter to proceed and the advance payment.

If you have any questions do not hesitate to contact me directly at 716-664-5602 ext. 322. Thank you for considering our services.

Respectfully,

Craig Vollmer, *Certified Forester*
Chief Forester

Proceed:

Village of Fredonia Authorized Signature — Date: 08/05/19

Athanasia Laudis
Print Name

Mayor
Title

Upgrade Option A: Narrative Stand Analysis
Upgrade Option B: Visual Summary of Data
Upgrade Option C: Financial Analysis

$8,350.00