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Timber Management and Use-Value Assessment

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Abstract

Under the Vermont Use Value Appraisal (UVA) Forest Land Program, enrolled forest lands are taxed at their forest use value rather than their fair market value. Technical forestry aspects, including approval of a mandatory management plan, are administered by the Vermont Department of Forests, Parks and Recreation. Our objectives were to use data collected by the Department to estimate the annual timber harvest from lands enrolled in the UVA Tax Program and to explore relationships among management variables and harvest information for individual stands. Overall, 31 percent of UVA properties reported a commercial harvest during 1989. In total, the harvest on enrolled lands represented 18 percent and 24 percent, respectively, of the reported total sawlog and pulpwood-fuelwood harvest in Vermont in 1989, while enrolled lands represented about 16 percent of the total timberland in the State. However, there were no significant relationships among stand and harvest variables that would be useful in predicting harvesting activity. The UVA Tax Program gives the State some influence over forestry activity on privately owned timberland that it did not have prior to the Program.

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Introduction

Among the six goals listed in the legislation that created Vermont's Forest Land Use Value Appraisal Property Tax Program, hereafter referred to as the UVA Tax Program, was the goal to encourage production from forest lands. Enrolled forest lands are taxed at their forest use value rather than their higher fair market value, which is the case for real property in general. In Vermont, as in other states, use-value legislation codified extralegal preferential assessments for agricultural and forest land (Bowman and Mikesell 1988). The analysis in this paper focuses on timber management and production from forest land enrolled in the UVA Tax Program.

Modified property taxes for forest land exist in one form or another in most states (Hickman 1983). Use-value taxation was recommended as one of the strategies proposed to protect the long-term integrity and traditional uses of forest land in northern Maine, New Hampshire, New York, and Vermont (Harper et al. 1990). Harper et al. (1990) recognized that use-value taxation produces more equitable taxes and favors traditional uses of the land, but probably would have little impact on the rate of development. This view generally is shared by those who have analyzed use-value taxation programs; see, for example, Atkinson (1977) and Bentick (1980).

A weakness of use-value assessment is that lower taxes are bestowed on a particular class of taxpayer without an attendant obligation on the taxpayer (Barlowe et al. 1973). Vermont addressed this potential weakness by requiring landowners in the UVA Tax Program to demonstrate evidence of timber management, including timber harvesting.

The UVA Tax Program requires that a timber management plan be written for each property being enrolled. In addition, an annual conformance report must be filed by the landowner that details compliance with the management plan. The technical forestry aspects of the UVA Tax Program are administered by the Vermont Department of Forests, Parks and Recreation. All data used in this study were collected by the Department from enrolled landowners. It is the Department's responsibility to review and approve management plans, obtain annual conformance reports, inspect each enrolled property once every 5 years, and maintain records on each property. The UVA Tax Program is administered through the county foresters, who are responsible for approvals, inspections, and records maintenance.

An acceptable management plan specifies management activity for each stand, which must be justified on the basis of recognized silvicultural guides for the species or species mix; see, for example, Leak et al. (1987). Deviations from the plan, i.e., a change in management activity, must be approved in advance by the county forester; otherwise, the landowner may be found to be in nonconformance, dropped from the UVA Tax Program, and subject to a land-use change penalty. The landowner must specify the year in which the management activity will take place and has a 6-year window (± 3 years) in which to initiate the activity. The

plans generally are written for 15 years and updated at least once every 5 years.

Our objectives were to use the data collected by the Department to evaluate reported management and estimate the annual timber harvest from lands enrolled in the UVA Tax Program and to explore relationships among management plan variables and harvest information for individual stands. We were interested in expanding the utility of the data beyond the administrative purpose for which they were originally collected to see how well the goal of encouraging production from forest lands was being accomplished.

Procedure

Data

The information on the UVA management plan summary form was entered into a relational data base by the Department of Forests, Parks and Recreation to be used on a personal computer by each county forester. The information included a general property description: owner, property location, total property area, plan preparer and other administrative information, and detailed information on up to 10 stands on the property. Stand data include stand area, site class, mean stand diameter (trees ≥ 5.0 inches in d.b.h.), total basal area (trees ≥ 5.0 inches in d.b.h.), acceptable growing-stock basal area, timber type, management activity codes, and scheduled dates of management activities. However, there was no requirement imposed by the State that stand attribute data be taken by survey plots, nor, obviously, was a level of survey precision specified. Definitions and codes are contained in the Appendix.

Harvested volumes are reported by the landowner to the Department on the annual conformance report. Information on this one-page report is keyed to stands in the plan and kept on file in the county forester's office, but it was not part of the computer data base. To obtain information from the conformance reports, visits were made to each county forester's office. At the time of the study, the latest complete year for data availability was 1989.

Sample

The stand was chosen as the sample unit because management is applied to stands and we were interested in stand-level activity. A sample size of 1,000 stands was chosen to ensure a large enough sample of harvested stands based on a pilot study in one county. The sample was allocated among counties in proportion to the total number of stands in the data base. Stands were numbered consecutively within counties as they were listed in the data base. Random numbers were used to select stands within each county. A set of alternate stands also was drawn to replace original selections that were unuseable. About 6 percent of the original sample was replaced by alternates because the folder was missing from the files or no 1989 conformance report was filed. In addition, 36 percent of the sampled stands had data that were missing or incorrect. These latter cases were resolved through consultation with

the county foresters. We obtained complete information on 1,002 stands enrolled in the UVA Tax Program in 1989.

In addition to stand-level activity, another objective was to estimate the total timber harvest from enrolled properties in 1989. Each property is made up of one or more stands, and by virtue of every stand in the sample being associated with a property, the selected properties formed another sample. Although in the sampling scheme used the probability of any stand being chosen was the same, the probability of selecting a property was not. Since the probability of a property being in the sample was dependent on the number of stands on that property, these probabilities needed to be calculated to estimate total volumes harvested and sampling error. Once the property was included in the sample on the basis of the inclusion of one or more of its stands, the probability of its inclusion in the sample of properties, along with the probability of its inclusion with any other property in the sample, could be computed. Given these probabilities for the sample of properties, the estimation principles set forth in Kendall et al. (1983) were used to obtain estimates of total harvest and sampling errors.¹

A complicating factor built into the data storage scheme designed by the Department was a 10-stand limit per property. This limit tended to decrease the probability of selecting large properties, which typically had more than 10 stands identified in the management plan. A check of the data base indicated that almost all properties of 500 acres or more had 10 stands entered, while almost all properties with fewer than 500 acres had fewer than 10 stands entered. Thus, properties totaling 500 or more acres were defined as large properties and a census was attempted on these properties for estimating the harvest. The large property group totaled 203 properties and data were obtained on 197 of these properties. The small property sample was based on the selection of stands and totaled 877 of 4,395 properties of fewer than 500 acres. So, of 4,598 properties in the UVA Tax Program, data were collected on 1,074.

Statistical Analysis

Initially, descriptive statistics were calculated for variables associated with stands for both harvested and unharvested stands. The descriptive analysis was followed by the estimation of the simple correlation coefficient between the dependent variable, harvested volume, and all explanatory variables, one at a time.

The Vermont UVA Tax Program requires that every enrolled stand classified as productive forest land will periodically yield commercial crops of timber. Therefore, we assumed that all stands would be harvested eventually. A binary choice (probit) model was used to analyze whether a stand was harvested in 1989 or not (Aldrich and Nelson 1984). A linear regression model was used to estimate the amount of timber harvested from a stand. Probit analysis was used to estimate

¹Gerald S. Walton, mathematical statistician with the Northeastern Forest Experiment Station, derived the specific formulas for the inclusion probabilities and the estimates and errors appropriate to the sample of properties.

Table 1.—Definition of variables used in regression analyses

Variable	Definition/unit
HARV	Dependent variable, coded 1 if any timber harvest occurred in the stand in 1989 and 0 otherwise.
VOL	Dependent variable, total volume harvested in the stand in 1989 (ft ³).
AREAS	Area of stand (acres).
AREAP	Area of property (acres).
DBH	Mean stand diameter (inches at breast height).
TOTALBA	Total basal area of stand (ft ² /acre).
BARATIO	Acceptable growing-stock basal area as a percentage of total stand basal area.
INVSDIST	Reciprocal of distance in miles to center of nearest town with a sawmill from center of town where UVA property was located, equal to 1 if same town.
INVPDIST	Same as INVSDIST except for pulpmill locations.
PREFRD ^a	Preferred timber types, coded 1 if white pine, red oak; white pine; sugar maple; or beech, yellow birch, sugar maple and 0 otherwise (part of a three-way indicator variable).
OTHER ^a	Secondary timber type, coded 1 if aspen and/or white birch; hemlock; spruce; spruce-fir; or beech, red maple and 0 otherwise (part of a three-way indicator variable).
DATE	Scheduled date for management activity, coded 1 if 1988, 89, or 90 and 0 otherwise.
HEAVY ^b	Scheduled management activity resulting in a potentially heavy timber cut, coded 1 if shelterwood cut; overstory removal cut; clearcut; progressive clearcut; (uneven-age) harvest cut; or salvage cut and 0 otherwise (part of a three-way indicator variable).
LIGHT ^b	Scheduled management activity resulting in a potentially light timber cut, coded 1 if intermediate thinning; (uneven-age) improvement cut; sugarbush thinning; or species conversion and 0 otherwise (part of a three-way indicator variable).

^aPREFRD and OTHER are both coded 0 if timber type is pioneer species; mixed wood; or other types.

^bHEAVY and LIGHT are both coded 0 if scheduled management activity is precommercial thinning; no activity; or other activity.

the relationship between a dichotomous dependent variable, Y_i , coded 1 if timber was harvested from the stand and 0 if it was not, and X_i , a vector of selected stand characteristics and management activities reported in the management plan and market proxy variables INVSDIST and INVPDIST (Table 1). There were no economic variables, such as timber prices, in the data base.

We assumed that the probability of harvesting a stand of timber in 1989 in the UVA Tax Program was represented by an unobserved or latent index, Y_i^* , that can be defined by a function of observed characteristics, X_i , B , and a random disturbance, e_i . If the observed harvest variable, Y_i , equals one (harvest) when $Y_i^* > 0$ and zero (no harvest) when $Y_i^* < 0$, then:

$$P(Y_i = 1) = P(Y_i^* > 0) = P(e_i < X_i' B) = F(X_i' B) = \int_{-\infty}^{X_i' B} f(e) de$$

where $F(\cdot)$ is the standard normal cdf and $f(\cdot)$ is the corresponding density function. Probit maximum likelihood techniques were used to estimate the parameters in B .

The linear regression model was used to estimate the relationship between the dependent variable, total timber volume harvested (given that a harvest occurred), and the same vector, X_i , of selected stand characteristics and management activities and market proxy variables used in the probit analysis. Ordinary least squares was used to estimate the parameters of the model.

Results

Descriptive Statistics

The UVA Tax Program recognizes two forest site classes: productive and nonproductive forest land. Productive forest land is producing, or has the potential to produce, crops of

industrial wood at the rate of more than 20 ft³/acre/year. Nonproductive forest land includes open land and land incapable of producing 20 ft³/acre/year of industrial wood. We broke the nonproductive class into two classes based on the study finding that there was significant harvest in stands classed as "nonproductive." Therefore, a third class was added and defined as truly nonproductive. This class included predominantly wetlands, often, beaver swamps and alder thickets as well as open land. Eighteen of a total of 1,002 stands were classified in this third class, accounting for 156 acres compared to 40,635 acres classified as productive forest land. No further analysis was done on nonproductive stands.

Of the 984 sampled productive forest stands, 102, or 10 percent, had a commercial timber harvest in 1989. Stands with harvest activity were larger in area, on average, and were part of properties that were larger in size, on average, but these means were not significantly different ($p \leq 0.05$) (Table 2). Two indicators of timber volume, mean stand diameter and basal area, showed that harvested stands carried more volume, on average, than stands with no harvesting activity. Mean stand diameter, basal area, acceptable growing-stock basal area, and acceptable growing-stock basal area as a percentage of total basal area were significantly different between harvested and unharvested stands. A probability value of $0.05/6 = 0.008$ was used to protect against the six stand-characteristic hypotheses and to ensure that the overall Type I error rate was no larger than approximately 0.05.

The volume cut per harvested stand averaged 16 mbf of sawlogs and 49 cords of pulpwood and firewood, a total average cut per stand of 6,705 ft³. The average volumes harvested per stand may seem low, especially on a per-acre basis using the average area of the stand in Table 2.

Table 2.—Comparison of means for key variables for sampled stands in the UVA Tax Program that were unharvested in 1989 and commercially harvested

Variable	Stands with no harvest (n = 882)	Stands with harvest (n = 102)
-----Sample mean ^a -----		
Area of stand (acres)	40 ^b	54 ^c
Area of property (acres)	264 ^b	285 ^c
Mean stand diameter (d.b.h., inches)	8.2	9.1
Total basal area/acre (ft ²)	93	109
Acceptable growing stock basal area/acre (ft ²)	67	81
Acceptable growing stock as a percentage of total basal area	68	74
Cordwood volume harvested (cords)	0	49 ^c
Sawtimber volume harvested (mbf)	0	16 ^b
Total volume harvested (ft ³)	0	6,705 ^c

^aStandard errors < 5 percent of mean, except where noted.

^bStandard errors > 5 percent and < 15 percent of mean.

^cStandard errors > 15 percent and < 35 percent of mean.

However, the volume cut represents a variety of harvesting and thinning activities; the area of the stand may not accurately reflect the area of the sale, which could be much smaller; nor was the reported volume cut in 1989 necessarily the total volume of the sale that may have spanned more than 1 year.

Three timber-type categories — beech, birch, and sugar maple; mixed wood (25 to 65 percent softwood); and spruce-fir — account for most of the area enrolled in the UVA Tax Program (Table 3). This is true for both harvested and unharvested stands, and generally true for the State. For stands with no harvesting activity in 1989, 41 percent of the area was classified as being under even-age management and 26 percent under uneven-age management (Table 4). For harvested stands, 67 percent of the area was classified as being under even-age management and 26 percent under uneven-age management. It should be noted that the activity categories are mutually exclusive, though the "miscellaneous activity," "no activity," and "other" categories could be accomplished under even-age or uneven-age management. Thirty-six percent of the area in stands with no harvesting activity in 1989 was scheduled for some type of thinning, while 58 percent of the area harvested had cutting activity resulting from a thinning operation. Thinning was the most frequently scheduled activity on lands in the UVA Tax Program.

A harvest of crop trees was scheduled for the near future for 31 percent of the area that reported no harvesting activity for 1989. For this area, 58 percent was scheduled for a selection harvest and 42 percent for some type of even-age harvesting technique. Only 22 percent of the area scheduled for harvest under even-age management was scheduled for a clearcut or progressive clearcut. For stands that had harvesting activity in 1989, 34 percent of the area had some

type of crop tree harvest; 43 percent of this area was cut by a selection harvest method and 57 percent by an even-age harvesting technique. Only 23 percent of the area harvested under even-age management was involved in a clearcut or progressive clearcut. Forest land in the UVA Tax Program that had been clearcut in 1989 accounted for less than 1 percent of the land enrolled in the Program.

Estimating Quantity of Timber Harvest

A primary objective of the study was to estimate the timber volume harvested from UVA Tax Program properties for the study period. Of the estimated 4,395 small properties in the UVA Tax Program in 1989, an estimated 1,339 (30 percent) reported a commercial timber harvest. Of the 203 large properties in the UVA Tax Program, an estimated 74 (37 percent) reported a commercial timber harvest. Overall, 31 percent of the UVA Tax Program properties reported a commercial harvest during 1989. In total, 39,485 mbf of sawlogs and 119,280 cords of pulpwood-fuelwood were cut (Table 5); this represents 18 percent and 24 percent, respectively, of the reported total sawlog and pulpwood-fuelwood harvest in Vermont for 1989 (De Geus 1990).

Association Among Stand and Harvest Variables

In the correlation analysis between the total timber volume harvested and the other variables in Table 1, little association was found. Except for the obvious associations, for example, very young stands not being harvested, most stands were mature and had similar reported characteristics whether or not they were harvested. One variable that was positively and significantly correlated with volume cut was the total acreage of the property. The other variable that was correlated positively with harvest activity was scheduled date of activity. Stands scheduled for some type of cutting activity

Table 3.—Distribution of sampled stand area by timber type for stands in the UVA Tax Program that were unharvested in 1989 and commercially harvested

Timber type	Stands with no harvest (n = 882)	Stands with harvest (n = 102)
-----Acres (percent)-----		
Aspen, white birch, or both	455 (1.3)	70 (1.3)
White pine, red oak	115 (0.3)	10 (0.2)
White pine	990 (2.8)	225 (4.1)
Hemlock	545 (1.5)	75 (1.4)
Sugar maple	620 (1.8)	180 (3.3)
Beech, birch, maple	16,645 (47.3)	3,375 (61.7)
Beech, red maple	150 (0.4)	20 (0.4)
Spruce	300 (0.9)	5 (0.1)
Spruce-fir	2,425 (6.9)	455 (8.3)
Pioneer species	1,205 (3.4)	20 (0.4)
Mixed wood (25 to 65 percent softwood)	9,220 (26.2)	980 (17.9)
Other	2,500 (7.1)	50 (0.9)
Total	35,170 (100.0)	5,465 (100.0)

Table 4.—Distribution of sampled stand area by management activity for stands in the UVA Tax Program that were unharvested in 1989 and commercially harvested

Management activity	Stands with no harvest (n=882)		Stands with harvest (n=102)	
	-----Acres (percent)-----			
Even-age management				
Precommercial thinning	875	(2.5)	30	(0.5)
Intermediate thinning	9,005	(25.6)	2,580	(47.2)
Shelterwood cut	1,625	(4.6)	760	(13.9)
Overstory removal cut	525	(1.5)	60	(1.1)
Clearcut	1,665	(4.7)	20	(0.4)
Progressive clearcut	810	(2.3)	225	(4.1)
Uneven-age management				
Thinning (improvement cut)	2,690	(7.6)	565	(10.3)
Harvest	6,390	(18.2)	800	(14.6)
Miscellaneous activity				
Salvage cut	975	(2.8)	10	(0.2)
Sugarbush thinning	605	(1.7)	20	(0.4)
Species conversion	90	(0.3)	—	(—)
No activity	8,890	(25.3)	355	(6.5)
Other	1,025	(2.9)	40	(0.7)
Total	35,170	(100.0)	5,465	(100.0)

in 1989 (± 1 year) were likely to have reported a harvest in 1989. This result indicates that plans are being followed, though fully 16 percent of the total volume harvested was from stands that indicated "no management activity." The 6-year window around a scheduled activity also gives the landowner considerable flexibility in following the plan.

In estimating the probit model, the best model included scheduled date of management activity, total stand basal area, and mean stand diameter as explanatory variables, all estimated coefficients significant ($p \leq 0.05$). However, this model failed to predict correctly any of the harvested stands in the sample. Similarly, attempts to predict amount harvested using least squares regression based on the same stand attributes did not improve upon the estimated mean volume harvested per stand. Two explanatory variables had estimated coefficients that were significant—total acres in the property and scheduled management activity. This lack of statistical association may be due to lack of economic data, such as owner income, and of important timber sale attributes, such as detailed inventory and value data. The focus of the State's data collection on the stand and property rather than the timber sale itself also works against modeling harvest behavior with this data set.

Discussion

A goal of the UVA Tax Program was to encourage production from forest lands. According to Newton et al. (1990), in the year ending August 1, 1988, 32 percent of the total land disturbed by timber harvesting in Vermont was UVA Tax Program land. Based on an average enrollment in the program in 1987 and 1988, about 16 percent of the total area of timberland was enrolled (Vermont Dept. Taxes 1992;

Frieswyk and Malley 1985). These percentages indicate that timber harvesting activity was more likely on UVA Tax Program forest land than on forest land not enrolled in the Program. This finding was not surprising because owners holding land for timber production are more likely to enroll in the Program (Dennis and Sendak 1992). However, the program is responsible for encouraging landowners to work with foresters. Brighton (1988) reports that 40 percent of UVA Tax Program participants who are now following forestry management plans never worked with a forester before enrolling.

In addition to the UVA Tax Program lands, Newton et al. (1990) found that 14 percent of the land disturbed by harvesting was on publicly managed timberland. Together with the results of the current study, this means that almost half the harvested area in Vermont falls under a timber management plan specifying a silvicultural goal for each stand. This can be contrasted with the statement by Gansner et al. (1990) on timber harvesting in New England, where "economics more than textbook silviculture determines the kind of cutting that takes place." They add that the practice of diameter-limit cutting, disapproved by silviculturists, remains widespread in the region. The UVA Tax Program is a point of influence that is further supported by the monetary incentive of reduced property taxes on private land. The county forester can influence the kind of forestry that is practiced on UVA Tax Program lands when management plans and changes are reviewed for approval, when annual conformance reports are filed, and during periodic property inspections.

Other management goals besides strict timber management may be encouraged. For example, the State has prepared

Table 5.--Timber-harvest volume in 1989 from properties enrolled in Vermont's Forest Land Use Value Appraisal Property Tax Program

Product and species group	Properties < 500 acres ^a	Properties ≥ 500 acres ^{a,b}	All properties ^a
Sawtimber (mbf)			
Hardwood	7,275	4,250	11,525
Softwood	9,795	2,505 ^c	12,575
Mixed hard/softwood	11,830	2,775 ^c	21,360
Total	29,950	9,530	39,485
Pulpwood-fuelwood (cords)			
Hardwood	19,835	22,180	42,015
Softwood	31,035	2,475 ^c	33,510
Mixed hard/softwood	28,900	13,810 ^c	42,710
Total	80,815	38,465	119,280
Total volume (100 ft ³) (all products)	116,655	48,255	164,910

^aStandard errors > 1 percent and < 5 percent of volume, except where noted.

^bThe standard error for an estimate obtained from a census is zero; however, only a near census was obtained. The estimated variance was adjusted by the finite population correction factor to obtain the standard errors for properties ≥ 500 acres.

^cStandard errors > 5 percent and < 10 percent of volume.

guidelines for managing stands that serve as deer wintering range on UVA Tax Program forest land (Reay and Weber 1987). Winter deer yards are a critical habitat need for white-tail deer in certain areas. The guidelines help ensure that deer yards on some private land are perpetuated through proper harvesting and regeneration practices. Other guidelines could be developed to encourage broader wildlife management goals. DeGraaf et al. (1992) produced guides that use standard silvicultural practices to simultaneously produce habitat diversity and timber on New England forest land.

In our judgment, the data collected by the Department from forest owners enrolled in the UVA Tax Program were useful for monitoring the Program but not useful for predicting harvesting activity. A summary of the information contained in the annual conformance report resulted in an estimate of amount of timber harvested from properties in the UVA Tax Program. As Gloudemans (1974) suggested for use-value assessment programs in general, analyses over time of information such as that contained in the data base and conformance reports will allow an assessment of how the program is changing: changes in enrollment, stand attributes, management activities, and harvested volumes.

Conclusions

There is ample evidence from management plans and conformance reports that enrolled landowners are working with foresters and are using "textbook" silvicultural methods in managing their timber stands. The amount of timber being harvested on UVA Tax Program lands is slightly in excess of

the amount expected based on the land area enrolled, but probably not significantly greater from a practical point of view. Newton et al. (1990) reported about twice the rate of harvesting activity on enrolled lands than would be expected had harvesting activity been distributed uniformly over all timberland in the State.

In the Introduction it was stated that a legislative goal in creating the UVA Tax Program was to encourage production from forest lands. This goal is subject to interpretation, but if it is assumed to mean increasing the amount of land devoted to the practice of scientific forestry, it can then be argued that the goal is being met to a degree. The extent of achievement could not be estimated using the data available for this study because Program enrollment is to an extent self-selecting for owners who hold land for timber production (Dennis and Sendak 1992). However, Brighton (1988) indicated that owners who never managed for timber production have entered the Program and others who have cut timber without a management plan are now working with a forester as a result of enrolling in the Program.

The proof of the forest-production goal involves the monitoring of the sites in the field over time, which was beyond the scope of this study. Evidence of management under the UVA Tax Program might include fewer trees per acre averaging larger diameters, a smaller fraction of cull volume, and a shift in tree quality with more sawtimber volume in the higher quality log grades relative to land under less intensive management (Sendak and Dennis 1989). The UVA Tax Program allows the State some influence over forest practices on privately owned timberland and offers the

opportunity for more influence in the future, perhaps forestalling the need to adopt a comprehensive State forest practices act. But much depends on how the Department views its roll. If the county foresters are viewed as gatekeepers, controlling access to and performance within the program, the full potential for use-value taxation to influence forest production might be reached.

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Appendix

Data fields, variables, definitions, and codes entered for each stand for forested properties enrolled in the Use Value

1. Stand size; to nearest acre.
 2. Even-age management; stands with one or two size classes; coded 1.
Uneven-age management; stands with three or more size classes; coded 2.
 3. Site class; predominant site class:
Site Class 1
Site Class 2
Site Class 3
Site Class 4, nonproductive land
 4. Mean stand diameter; to nearest inch for all trees ≥ 5 inches d.b.h.
 5. Total basal area/acre; to nearest square foot for all trees ≥ 5 inches d.b.h.
 6. Acceptable growing-stock basal area/acre; to nearest square foot for all trees ≥ 5 inches d.b.h. and capable of producing at least a No. 2 sawlog.
 7. Timber type:
 1. Aspen or white birch, or both
 2. White pine, red oak
 3. White pine
 4. Hemlock
 5. Sugar maple
 6. Beech, yellow birch, sugar maple
 7. Beech, red maple
 8. Spruce
 9. Spruce-fir
 10. Pioneer species
 11. Mixed wood (25 to 65 percent softwood species)
 12. Other
 8. Management activity codes
- A. Even-Age Management
1. Precommercial thinning. Thinning in sapling or young pole stands leaving at least 350 stems of acceptable growing

stock per acre.

2. Intermediate thinning. Reduce stocking to B level of the appropriate stocking guide or remove one-third of basal area in overstocked stands.
3. Shelterwood cut. Basal area reduced to between 30 and 70 ft²/acre for hardwoods, 100 to 120 ft²/acre for softwoods.
4. Overstory removal cut. Removing overstory after a new featured stand has become established. This applies to two-aged as well as recently regenerated stands. After harvest, residual stand should have at least 60 ft²/acre of acceptable growing-stock basal area or 350 stems per acre for stands with a mean stand diameter of ≤ 6 inches d.b.h.
5. Clearcut. Stand basal area reduced below 30 ft²/acre.
6. Progressive clearcut. Removing a portion of the stand in strips or patches, to be followed by similar treatment on a fixed schedule until entire stand is clearcut.

B. Uneven-Age Management

7. Thinning (improvement cut). Converting an immature stand or mature even-age stand to uneven-age management. Residual stand should have at least 60 ft²/acre of growing stock.
8. Harvest. After cut, residual stand should have at least 60 ft²/acre of growing stock. Stand should have at least 10 ft²/acre of growing stock in each of sapling, pole, and sawtimber size classes.

C. Miscellaneous Activity

9. Salvage cut. Removing a portion of the stand because of damage or disease. Resulting residual stand may not fit standards in available guides.
 10. Sugarbush thinning. Cut designed to establish or improve a sugarbush. Cut should follow sugarbush guides.
 11. Species conversion. Usually, a cut done in mixed hardwood-softwood stands to favor certain species. Treatment should not favor species that are offsite.
 12. No activity. Indicate reason.
 13. Other. In cases where none of the above come reasonably close to describing the management activity. Clearly describe activity and justify silviculturally.
9. Scheduled date. Year management activity is scheduled. A 3-year deviation ($\pm$) is allowed from scheduled date without justification.

Sendak, Paul E.; Huyler, Neil K. 1994. **Timber management and use-value assessment.** Res. Pap. NE-691. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 8 p.

Describes timber management activity and estimates timber harvest from forest land enrolled in Vermont's Use Value Appraisal (UVA) Forest Land property tax program. Data were compiled from the mandatory management plans and annual conformance reports filed for each property enrolled in the Program. Overall, 31 percent of the UVA properties reported a commercial harvest during 1989. The harvest on enrolled lands represented 18 percent and 24 percent, respectively, of the reported total sawlog and pulpwood-fuelwood harvest in Vermont in 1989, while enrolled lands represented about 16 percent of the total timberland in the State.

Keywords: Silviculture; timber harvest; Vermont; property tax



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