

Forest Conservation Plan

Beaver Brook Family Forest Cornwall, Vermont



Prepared and Revised by:
Kathleen Stutzman, Forest Conservationist

Reviewed by:
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June 2017



**Forest Conservation Plan
For the lands of**

**Beaver Brook Properties LLC
Cornwall, Vermont**

For the 10 years beginning April 1, 2017

**Prepared by Kathleen Stutzman, Forest Conservationist, Vermont Family Forests
Reviewed by David Brynn, Licensed Forester, Vermont Family Forests**

I certify that my forestland, exclusive of any house site or other developed portion, is at least 25 acres in size and is under active, long-term, forest conservation for a variety of purposes including the conservation of forest health and, when appropriate, growing and harvesting repeated forest products in accordance with minimum acceptable standards for forest management.

These standards include following, to the maximum practical extent, the practices outlined in the booklet "*Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont*" in order to control soil erosion, stream siltation, and petroleum product discharges and to maintain natural water temperatures by retaining continuous cover of trees along streams and other water bodies.

By signing below, I understand I am signing my forest conservation plan and by doing so I agree to manage according to the current approved plan.

(Printed Name, Signature, and Date)

Approved for Use Value Appraisal by _____
County Forester Date

PROPERTY DATA SUMMARY

Landowners' Names: Beaver Brook Properties LLC
C/O Joan Donahue
Street Address: 99 Maple Street, Suite 10B
Town/State/Zip: Middlebury, VT 05753

Town Where Land Is Located: Cornwall
Acreage/Grand List Description: 167.43 acres
Total Land Enrolled for Use Value: 165.34 acres
Orthoimagery Numbers: 092160 (2012)
SPAN Number: 162-051-10046
Biophysical Region: Champlain Valley

Forest Conservation Plan Overview:

The purpose of this document is to list the existing conditions, ownership objectives and planned conservation practices for the Beaver Brook Family Forest in the town of Cornwall, Vermont. This plan and the prescribed management activities have been designed to meet the owners' objectives while fulfilling the criteria of the Use Value Appraisal (UVA) Program and Vermont Family Forests. The planned conservation practices have been designed to achieve ownership objectives without undermining the ecological functions and processes by which forests sustain themselves over time. This plan shall be revised and updated as conditions change and more information becomes available. This plan is a revision to a 2017 plan update for the Bingham Family Forest. The majority of the Bingham lands in Cornwall were sold to Beaver Brook Properties LLC. This management plan should be updated in 10 years as required by the UVA program.

Natural Setting:

The property is located in the Champlain Valley Biophysical Region. "The Champlain Valley is low, warm, and comparatively dry. Clay soils deposited by the post glacial lakes and seas, sands from post-glacial rivers, and outcrops of limestone and other Ordovician rocks form the raw materials for soil development here and provide excellent agricultural soils." (Thompson & Sorenson, 2005) Natural Community types found on the property include:

- Valley Clayplain Forest
- Wet Valley Clayplain Forest
- Woodland Seep

General Description of Property:

Location – The majority of the Beaver Brook Family Forest is located to the east of North Bingham Street, to the north of Route 74, in Cornwall, VT. A small rectangle is located to the west of South Bingham Street and south of Route 74.

Administration – The parcel is listed as 167.43 acres. 165.34 acres are enrolled and 2.09 acres are excluded for a house and outbuildings.

Boundaries – The land is bounded to the west by North Bingham Street. As it heads east, the boundaries are marked by barbed wire, old stonewalls, flagging, and blazes. The northern boundary is marked by barbed wire and blue paint. The eastern boundary is marked by barbed wire, flagging, and blazes. Route 74 runs along the southern boundary of the property. Pins were almost all found and boundaries are generally visible, except for the southeastern corner. Boundaries should be painted with long lasting red boundary paint. This helps prevent issues like timber trespass and the need for costly re-surveying.

Topography – Elevation on the property ranges from about 480 feet near the southwestern boundary to 260 feet near the northeastern boundary. Slopes range from nearly level to 40%.

Landowner Objectives for Parcel

- Maintain full compliance with Vermont Use Value Assessment Program.
- Maintain a healthy forest including a diversity of species, encouraging more hardwoods, and mixed age classes.
- Protect and enhance scenic beauty.
- Protect water quality including maintaining protective strips, using proper stream crossing techniques, and avoiding the use of pesticides.
- Maintain site productivity especially by increasing organic matter.
- Protect biological diversity by locating and buffering spring seeps, vernal pools, and wetlands.
- Have a place to find peace and solitude
- Improve wildlife habitat particularly wetlands, seeps and other wet areas.
- Maintain opportunities for compatible, non-motorized recreation such as walking and hiking, cross-country skiing, peace and solitude, bird watching, and hunting.

FOREST HEALTH SUMMARY

Conservation & maintenance of soil and water resources

Forest components that contribute to biological diversity and that can be influenced by forest conservation activities include: species richness; canopy closure %; perch types; deciduous or coniferous overstory inclusions; tree boles of various conditions ranging from dead to live and hard to soft; midstory layer; shrub layer; ground cover vegetation %; duff and ground layer elements including forest litter and moss, exposed soil, rocky forest floor, dead and down woody debris, and waterside decaying logs; mast and fruit trees including nut-bearing trees and fleshy fruit-producing trees and shrubs; seeps; vernal pools; woods roads; slash piles; and log landings. Upland non-forest components include: cultivated crop land; grasslands; forbs; shrubs and old fields; and pasture. Wetland components include: sedge meadows; shallow marshes, deep marshes, shrub swamps; bogs; ponds; lakes, streams or rivers; and riparian zones.

Status--- Beaver Brook runs through the heart of the property. A Class 2 wetland can be found along the northwestern boundary. Another wetland and shallow emergent marsh is located near the northeastern boundary. Small shrub swamps, cattail marshes, and shallow emergent marshes can be found in throughout the property. Area 5 has sections of the Wet Valley Clayplain Forest Natural Community where soils are poorly drained. Seeps and ephemeral and intermittent streams can be found throughout the forest.

Sections of old access networks can be found throughout the forest, though are mostly concentrated in Areas 1, 2, 3, and 5. These trails are generally well laid out and at a good slope. Some have seen recent use, while other are dense with regeneration. Slopes throughout the forest are gentle and Area 2 was the only section with steep trails that may be in need of additional erosion control. Area 3 has the greatest density of trails, probably due to the thinning of the plantation. These trails occupy a significant portion of the forest and redundant trails should be closed out and allowed to return to forest. A heavy blanket of snow prevented a full assessment of any erosion issues. All access networks should be in compliance with the *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont (VT AMPs)*.

Water Quality Practices			
Satisfactory	Needs Work	Not Applicable at Present	
✓			Protective strips with minimal soil disturbance, nearly-complete canopy closure, and many large trees are maintained between the access network and surface water.
✓			There is little or no exposed soil in the protective strip.
		✓	Stream crossings have been properly restored and non-permanent structures have been removed.
		✓	Bridges and culverts are properly sized and installed at right angles across streams.

Access Network Practices			
Satisfactory	Needs Work	Not Applicable at Present	
✓			The timber harvesting access network including truck roads, forwarding trails, and log landings is well located and occupies less than 10% of the area.
✓			Truck road grades are 3% to 10% and any grades in excess of 10% are less than 300 feet in length.
✓			Forwarding trail grades are 3% to 15% and any grades in excess of 15% are less than 300 feet in length.
	✓		Truck roads are properly drained according to the VT AMP's.
	✓		Forwarding trails are properly drained according to the VT AMP's.
✓			Log landings are on nearly-level, stable ground; away from protective strips; have water diversions installed; and are properly graded to prevent erosion and sedimentation.
✓			Post-harvest use of the access network has been restricted prevent erosion and site disruption.

		✓	Sediment from roads and trails is prevented from reaching streams by turn-ups and broad-based dips.
		✓	Drainage ditches do not feed directly into streams or other surface waters.

The most advanced soil erosion on:	Forwarding trail(s)	Truck road(s)	Log landing(s)
None to slight	*	*	*
Rill (1-6" deep)			
Initial gully (6-12" deep)			
Marked gully (12-14" deep)			
Advanced gully (+24" deep)			
Not applicable			

* A heavy blanket of snow prevented a full assessment of any erosion issues.

Maintenance of forest ecosystem health

Status--- The infestation of invasive plants ranges from light to heavy. Infestation is lightest in Areas 1 and 2. These areas were allowed to return to forest from agricultural lands first, have greater canopy closure, and less edge. Infestation is moderate in Area 3. Infestation is heaviest in Areas 4, and 5. These areas were allowed to return to forest last, have greater edge densities, and experience greater browse pressure.

Invasive species include buckthorn, bush honeysuckles, Japanese barberry, and prickly ash.

Satisfactory	Needs Work	
	✓	Invasive exotic species do not pose a significant threat.
✓		Domestic animals have been prevented from grazing in the area.

FOREST USE SUMMARY

Maintenance of long-term socio-economic benefits

Cultural Elements or Archeological Sites--- This land was cleared for agriculture and some of it is still used for agriculture today. Apple trees, stonewalls, and barbed wire fences speak to this past.

Recreation--- This forest has trails open for walking, hiking, snowshoeing, cross country skiing, bird watching, and hunting.

Scenic Beauty--- A 60+ acre beaver wetland sits along the northwestern boundary and Beaver Brook, which runs out of the wetland, carves stately ravines through the center of the property.

SCHEDULE OF CONSERVATION ACTIVITIES

Management standards allow for carrying out prescribed activities within three years of the treatment year. Conservation activities are described in more detail in the following sections.

Treatment Year	Area #	Conservation Activity	Silvicultural Guide or Tech. Reference, Prescription # or Letter, if appropriate
2020	ALL	Invasive Species Control	
2020	2 & 3	Closeout Steep and/or Redundant Trails	
2024	1	Individual Tree Selection	
2024	1	Increase Snag and Coarse Woody Debris Totals	
2024	4	Row Thinning/Group Shelterwood	
2027	ALL	Re-examine.	

AREA 1. ~ RICH WEST WOODS



Acreage:	27.15
Cover Type:	Sugar Maple – Basswood (SAF 26)
Natural Community Type:	Rich Northern Hardwood Forest

---OVERVIEW ---

Area Description and Land Use History--- Area 1 is situated along the northwestern boundary of the property. It takes up 16% of the property and slopes range from 2 to 15%. Sugar maple makes up 32% of the canopy and basswood makes up 16%. Calcium enrichment from limestone bedrock is apparent. A small shallow emergent marsh/cattail marsh can be found in the southwestern corner of Area 1.

Wolf sugar maples, stonewalls, and barbed wire fences speak to the lands' agricultural past. This land was farmed or pastured until being abandoned and allowed to return to forest 60 – 80 years ago. Stumps, girdled trees, and old paint markings point to previous forest management activities.

Soils and Site Productivity---

“The Amenia series consists of deep, moderately well drained, loamy soils, These soils formed on glacial till deposits that contain many fragments of limestone...A seasonal high water table keeps the soils wet from late in fall to early in spring and moist throughout most of the growing season” (Addison County Soil Survey 1971).

“The soils of the Colton series are deep, sandy, and very gravelly. They are excessively drained and do not retain moisture well, or are droughty. They formed in water-deposited sand and gravel derived from schist, granite, and quartzite” (1971).

“The Vergennes series consists of moderately well drained clays that formed on deep water-laid deposits of clay that contain much lime. These soils are gently sloping to very steep. They are sticky and plastic when wet, hard when dry, and are difficult to till or dig. Water moves very slowly through these soils” (1971).

See appendix for additional soil information.

Soil type: Amenia extremely stony loam 0 – 15% (AsC) with Vergennes clay 2 – 6% (VgB), Colton gravelly sandy loam 5 – 12% (CtB), and Amenia stony loam 8 – 15% (AmC)

Site index (Northern Hardwood): 59+ (determined from soils – USDA SCS, 1971)

Site class: I (determined from soils – USDA SCS, 1971)

Conservation of biological diversity

Upland non-forest components include: grasslands; forbs; shrubs and old fields. Wetland components include: shallow emergent marsh; cattail marsh; seeps; ephemeral streams and riparian zones. Species richness is high with 11 species recorded. Canopy closure ranges from 75 – 100%. Fruit and mast trees include basswood, American beech, bitternut and shagbark hickory, butternut, hophornbeam, and red oak.

Habitat Conditions		
Satisfactory	Needs Work and/or Time	
	✓	There are at least four (1-21”+; 4-15”+ DBH) cavity and/or snag trees per acre.
	✓	There are at least four (1-21”+; 4-15”+ DBH) down trees per acre.
✓		There are at least three vigorous and wind-firm legacy trees (19”+ DBH)

Wildlife Use and Habitat Observations --- Mouse, squirrel, and deer tracks were seen. Deer browse moderate to heavy. Porcupine den was found.

Unique and/or Fragile Communities --- Rich Northern Hardwood forests are ranked S4 (‘common’) in the state of Vermont.

Invasive/exotic species--- Bush honeysuckle, prickly ash, and Japanese barberry in light to moderate infestation. Buckthorn in light levels, generally near edges or canopy gaps.

Insects and diseases--- Butternut canker in lethal levels. Beech bark disease moderate to heavy. Basswood with fungal issues. Galls on bitternut hickory branches. Sugar maple borer damage light. Dutch elm disease in moderate levels.

Maintenance of productive capacity

Forest products include: wood products (i.e. timber, fuelwood, and pulpwood) and small woods; non-wood forest products (i.e. plants such a wild ramps and berries and plant products such as maple syrup); and forest ecosystem services.

Access Distance: less than 1 mile

BAF: 10

Number of points: 9

Date of data collection: March 2017

Present Age Class of Dominants and Co-Dominants: 60 - 80 years

Dominant and Co-Dominant basal area per acre: 77 sq. ft.
Acceptable Timber Growing Stock basal area per acre: 48 sq. ft.
Quadratic Mean Stand Diameter: 9 inches
Number of Dominant and Co-Dominant trees per acre: 154

Species Composition:

Species	% of Total Basal Area of Dominants and Co- Dominants
Sugar Maple	32
Basswood	16
American Beech	12
Bitternut Hickory	10
White Ash	9
Hophornbeam	7
Shagbark Hickory	4
Red Maple	4
Slippery Elm	3
Red Oak	1
Eastern White Pine	1

Stand Age Class Structure: Uneven-aged

Timber Status: Low stand quality – acceptable growing stock basal area less than “C” level

Uneven-aged Timber Stands:

Size Class Distribution		Existing Basal Area (square feet/acre)			
(name)	(inches DBH)	Total	AGS	UGS	Cull
Seedlings-Saplings	2-4”	3	0	3	0
Poles	6-10”	28	12	16	0
Mid-size	12-14”	23	17	7	0
Large trees	16”+	14	12	2	0
Elders and seedlings	24”+ and declining	8	7	1	0
Total		77	48	29	0

Timber Quality:

Dominant and Co-dominant Trees		
Quality	Basal Area	#Stems
	(square ft/acre)	(per acre)
Acceptable – USFS Tree Grade #2 or better	36	55
Non-acceptable – less than #2 but could be sold	29	95
Mature –USFS Tree Grade #2 or better & at goal age or DBH	12	4

Regeneration--- Established sugar maple, hophornbeam, American beech; adequate bitternut hickory, ash, and elm; inadequate basswood and shagbark hickory.

Primary Landowner Objectives for Area

- Maintain a healthy forest including a diversity of species, encouraging more hardwoods, and mixed age classes.
- Protect and enhance scenic beauty.
- Maintain site productivity especially by increasing organic matter.
- Protect biological diversity by locating and buffering spring seeps, vernal pools, and wetlands.
- Have a place to find peace and solitude
- Improve wildlife habitat particularly wetlands, seeps and other wet areas.
- Maintain opportunities for compatible, non-motorized recreation such as walking and hiking, cross-country skiing, peace and solitude, bird watching, and hunting.

--- SCHEDULE OF CONSERVATION ACTIVITIES ---

Long Range Vegetation Management Objectives and Approaches ---

Uneven-aged management:

Desired diameter (DBH) for principal species: 20 inches

Maturity age: 100 years

Stewardship cycle: 10 years

acres to regenerate: .27 per year or 2.7 per stewardship cycle

Conservation Activities ---

Based on *NE – 603: Silvicultural Guide for Northern Hardwood Types – Prescription E*: “This stand has suitable quality and structure to implement uneven-age management. But stand density is not critically high. Re-examine in 10 to 20 years, unless the possible loss of valuable high-risk trees warrants immediate harvest cut by selection or group selection methods”.

The Beaver Brook Family Forest, like many former agricultural lands in the Champlain Valley, is under great threat from invasive species. Area 1 is one of the healthiest parts of the forest, with greater canopy closure and less invasive species pressure. The Amenia soils that dominate this forest are very productive for hardwoods. Sugar maple is in abundance due to the availability of calcium in the soil. This makes Area 1 one of the most productive areas of the Beaver Brook Family Forest and focusing on timber management here will give us the biggest bang for our buck.

NRCS cost-share funding should be sought for invasive species control for all areas of the forest.

The average basal area is 77 sq. ft. per acre, however stocking is variable. Individual tree selection can be used to remove unacceptable growing stock (UGS) and release acceptable growing stock (AGS) in areas with higher stocking. Basal area should not be reduced below 80 sq. ft. per acre. UGS trees can be girdled to increase wildlife habitat and reduce residual stand damage; felled across slope and left in place to increase wildlife habitat, create soil, and slow, spread, and sink the flow of water; or removed for use as firewood. Harvesting should only be done in the winter to prevent soil scarification, which would benefit invasive species, as well as to protect the clay soils and seeps, wetlands etc.

Up to 1 tree greater than 15” in DBH and 1 tree greater than 21” DBH per acre can be girdled to increase wildlife habitat and up to 2 trees greater than 15” in DBH and 1 tree greater than 21” DBH per acre can be felled and left in place to increase wildlife habitat.

The access network is generally well laid out and at a good slope. Access networks should be in compliance with the *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont* (VT AMPs).

Year*	Acres	Forest Conservation Practices	
		Activity	Specifications
2020	Up to ALL	Control invasive exotics.	<p>Apply for NRCS cost-share funding</p> <p>Plan for annual and continuous monitoring of the forest following invasive plant treatment work, forest management activities and restoration efforts.</p> <p>Conduct proper pretreatment of invasive plant infestations before commencing timber harvesting or using roads, skid trails and landings during timber harvesting activities.</p> <p>Consider invasive plant populations and their likely response when prescribing timber harvesting activities that result in an increase of sunlight reaching the forest understory.</p> <p>Consider invasive plant populations and their likely response when prescribing timber harvesting activities that result in soil disturbance.</p> <p>To the extent feasible, clean all equipment before moving onto and off the property to reduce the chance of spreading invasive plants.</p>
2024	9	Individual tree selection	Individual tree selection should be used to remove UGS from the forest and release AGS in areas with higher stocking. Basal area should not fall below 80 sq. ft. per acre. Any heavy equipment should only enter the woods on winter snowpack to prevent soil scarification and the proliferation of invasive species.
2024	9	Increase the number of large cavity and snag trees.	Up to 1 tree greater than 15” in DBH and 1 tree greater than 21” DBH per acre can be girdled to increase wildlife habitat. This should be done in conjunction with the individual tree selection.
2024	9	Increase the number of down trees.	Up to 2 trees greater than 15” in DBH and 1 tree greater than 21” DBH per acre can be felled and left in place to increase wildlife

			habitat. This should be done in conjunction with the individual tree selection.
2027	ALL	Re-examine.	

(* ± 3 years from this date)

AREA 2. ~ BEAVER BROOK WOODS



Acreage: 20.48
Cover Type: Eastern Hemlock (SAF 23)
& Red Maple (SAF 108)
Natural
Community
Type: Valley Clayplain

---OVERVIEW ---

Area Description and Land Use History--- Area 2 is located in the center of the property and surrounds Beaver Brook. It occupies 12% of the property and is situated on slopes of 2 – 70%. The area is dominated by red maple and eastern hemlock, each making up 37% of the canopy. A wide floodplain surrounds Beaver Brook and the hills rise steeply above the floodplain. There are some planted Norway spruce and red pine. Tip ups are the most common form of disturbance. One 40+” DBH hemlock was encountered.

This area was likely cleared and used for pasture, before being allowed to return to forest 60 – 80 years ago. This forest is underlain mostly by Vergennes clay. These soils typically give rise to the Valley Clayplain Forest natural community. When this land was cleared for agriculture, it lost the seed source for some key components of Valley Clayplain Forests, like oaks and hickories. As the forest was allowed to return, hemlock and red maple became dominant. While these species can be components of a Valley Clayplain Forest, they are usually not the dominant species. Stumps and old paint markings speak to previous management activities. Deer pressure is heavy in this forest and regeneration is very limited. Along the eastern edge, the forest is younger, mostly pole sized with some wolf, mother trees. This area is two aged, while the rest of the forest is uneven aged.

Soils and Site Productivity---

“The Swanton series consists of nearly level or gently sloping, poorly drained and somewhat poorly drained soils that are fine sandy loam to a depth of 20 to 30 inches. Under the fine sandy loam is clay or silty clay. Water moves through the sandy layer readily but may flow downhill on top of the clayey layer. Water moves slowly through the clayey layer. The Swanton soils are wet from late in fall to early in spring and remain moist throughout most of the growing season” (Addison County Soil Survey 1971).

“The Vergennes series consists of moderately well drained clays that formed on deep water-laid deposits of clay that contain much lime. These soils are gently sloping to very steep. They are sticky and plastic when wet, hard when dry, and are difficult to till or dig. Water moves very slowly through these soils” (1971).

See appendix for additional soil information.

Soil type: Vergennes clay 2 – 6% (VgB) & 20 – 50% (VgE) with Swanton fine sandy loam (Sw)

Site index (Northern Hardwoods): 53 – 58 (determined from soils – USDA SCS, 1971)

Site class: II (determined from soils – USDA SCS, 1971)

Conservation of biological diversity

Upland non-forest components include: grasslands; forbs; shrubs and old fields. Wetland components include: seeps; shallow emergent marsh; shrub swamps; ephemeral, intermittent, and perennial streams; and riparian zones. Species richness is high with 11 species recorded. Canopy closure ranges from 50 – 100%. Fruit and mast trees include yellow birch, big tooth aspen, American beech, red oak, bitternut hickory, and black cherry.

Habitat Conditions		
Satisfactory	Needs Work and/or Time	
	✓	There are at least four (1-21”+; 4-15”+ DBH) cavity and/or snag trees per acre.
	✓	There are at least four (1-21”+; 4-15”+ DBH) down trees per acre.
✓		There are at least three vigorous and wind-firm legacy trees (19”+ DBH)

Wildlife Use and Habitat Observations --- Deer browse is heavy; many paths and scats were seen.

Unique and/or Fragile Communities --- Valley Clayplain Forests are ranked S2 (‘rare’) in Vermont. Due to past land use history, this is not a high quality example.

Invasive/exotic species--- Light levels of prickly ash and bush honeysuckles. These are concentrated in canopy gaps and along edges. The edge with Route 74 and with Area 5 have the highest levels of infestation, which are still moderate. Buckthorn was also found along the northern boundary with Area 5.

Insects and diseases--- Dutch elm disease in moderate levels; white pine weevil light; beech bark disease light.

Maintenance of productive capacity

Forest products include: wood products (i.e. timber, fuelwood, and pulpwood) and small woods; non-wood forest products (i.e. plants such a wild ramps and berries and plant products such as maple syrup); and forest ecosystem services.

Access Distance: less than 1 mile

BAF: 10 **Number of points:** 7

Date of data collection: March 2017

Present Age Class of Dominants and Co-Dominants: 60 - 80 years

Dominant and Co-Dominant basal area per acre: 97 sq. ft.

Acceptable Timber Growing Stock basal area per acre: 66 sq. ft.

Quadratic Mean Stand Diameter: 10 inches

Number of Dominant and Co-Dominant trees per acre: 174

Species Composition:

Species	% of Total Basal Area of Dominants and Co- Dominants
Red Maple	37
Eastern Hemlock	37
Norway Spruce	7
Eastern White Pine	4
Yellow Birch	4
Big Tooth Aspen	3
American Beech	1
Sugar Maple	1
Red Oak	1
Red Pine	1
Bitternut Hickory	1

Stand Age Class Structure: Uneven-aged with two-aged sections

Timber Status: Low stand quality – acceptable growing stock basal area less than “C” level

Uneven-aged Timber Stands:

Size Class Distribution		Existing Basal Area (square feet/acre)			
(name)	(inches DBH)	Total	AGS	UGS	Cull
Seedlings-Saplings	2-4”	7	4	3	0
Poles	6-10”	13	9	4	0
Mid-size	12-14”	31	23	9	0
Large trees	16”+	43	29	14	0
Elders and seedlings	24”+ and declining	3	1	1	0
Total		97	66	31	0

Timber Quality:

Dominant and Co-dominant Trees		
Quality	Basal Area	#Stems
	(square ft/acre)	(per acre)
Acceptable – USFS Tree Grade #2 or better	56	111
Non-acceptable – less than #2 but could be sold	31	59
Mature –USFS Tree Grade #2 or better & at goal age or DBH	10	4

Regeneration--- Heavy browse pressure and limited regeneration, especially in hemlock dominated areas. More regeneration east, established red maple and American beech.

Primary Landowner Objectives for Area

- Maintain a healthy forest including a diversity of species, encouraging more hardwoods, and mixed age classes.
- Protect and enhance scenic beauty.
- Protect water quality including maintaining protective strips, using proper stream crossing techniques, and avoiding the use of pesticides.
- Maintain site productivity especially by increasing organic matter.
- Protect biological diversity by locating and buffering spring seeps, vernal pools, and wetlands.
- Have a place to find peace and solitude
- Improve wildlife habitat particularly wetlands, seeps and other wet areas.
- Maintain opportunities for compatible, non-motorized recreation such as walking and hiking, cross-country skiing, peace and solitude, bird watching, and hunting.

--- SCHEDULE OF CONSERVATION ACTIVITIES ---

Long Range Vegetation Management Objectives and Approaches ---

Uneven-aged management:

Desired diameter (DBH) for principal species: 20 inches

Maturity age: 120 years

Stewardship cycle: 10 years

acres to regenerate: .17 per year or 1.7 per stewardship cycle

Conservation Activities ---

Based on *NE – 603: Silvicultural Guide for Northern Hardwood Types – Prescription E*: “This stand has suitable quality and structure to implement uneven-age management. But stand density is not critically high. Re-examine in 10 to 20 years, unless the possible loss of valuable high-risk trees warrants immediate harvest cut by selection or group selection methods”.

Area 2, similar to Area 1, is one of the healthier sections of this property. High canopy closure, reduced edge, and returning to forest earlier than other former agricultural lands on the property have worked to reduce the invasive pressure. NRCS cost-share funding should be sought for invasive species control for all areas of the forest.

Beaver Brook has a wide flood plain with steep sides, which can be up to 70% in slope. The floodplain and ravine banks should be protected from entry by heavy machinery and extractive use. According to *Conserving Vermont’s Natural Heritage*, “Riparian areas are important not only for the plants and animals that inhabit them, but also for what they provide to the waters near them. The downed wood, leaves, and similar organic material that riparian areas contribute to aquatic systems are important components of the food base and habitat structure in Vermont’s water bodies. Mature trees in riparian areas also shade aquatic habitats, which helps to reduce water temperatures. Riparian vegetation is crucial in filtering overland runoff, thus protecting water quality, and in stabilizing stream banks, thus preventing excessive streambank erosion and sediment buildup in aquatic habitats” (2004).

The booklet *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont* contains a table detailing the relationship between the slope of the land and the distance roads or landings should be from surface waters:

Slope of Land Between Roads or Landings and Streambanks or Lake Shores (percent)	Width of Strip Between Roads or Landings and Stream (feet along surface of ground)
0 – 10	50
11 – 20	70
21 – 30	90
31 – 40	110

*Add 20 feet for each additional 10 percent side slope.

This buffer between surface water and the nearest road should also be a zone protected from extractive uses because, “the best way to protect both aquatic and terrestrial wildlife habitat

functions within the riparian area is to maintain as much of it as possible in an *undisturbed, naturally vegetated state*” (Wildlife Habitat Management 2015).

If there is land owner interest, up to 3 trees greater than 15” in DBH and 1 tree greater than 21” DBH per acre can be girdled to increase wildlife habitat and up to 1 tree greater than 21” DBH per acre can be felled and left in place to increase wildlife habitat.

The access network is generally well laid out and at a good slope. Access networks should be in compliance with the *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont* (VT AMPs). Any steep trails should be closed out and all trails should have functioning erosion control structures, in accordance with the AMPs.

Year*	Acres	Forest Conservation Practices	
		Activity	Specifications
2020	Up to ALL	Control invasive exotics.	<p>Apply for NRCS cost-share funding.</p> <p>Plan for annual and continuous monitoring of the forest following invasive plant treatment work, forest management activities and restoration efforts.</p> <p>Conduct proper pretreatment of invasive plant infestations before commencing timber harvesting or using roads, skid trails and landings during timber harvesting activities.</p> <p>Consider invasive plant populations and their likely response when prescribing timber harvesting activities that result in an increase of sunlight reaching the forest understory.</p> <p>Consider invasive plant populations and their likely response when prescribing timber harvesting activities that result in soil disturbance.</p> <p>To the extent feasible, clean all equipment before moving onto and off the property to reduce the chance of spreading invasive plants.</p>
2020	Up to ALL	Install erosion control on skid trails, truck roads, and/or landings.	Maintain compliance with VT AMPs.
2027	ALL	Re-examine.	

(* ± 3 years from this date)

AREA 3. ~ THE NORTHERN WOODS



Acreage: 19.04
Cover Type: Conifer Plantation
Natural
Community
Type: Valley Clayplain Forest

---OVERVIEW ---

Area Description and Land Use History--- Area 3 occupies the northern most portion of the property. It is flanked to the east by a 60+ acre wetland and another wetland runs north south through the heart of the Area. This forest occupies 11% of the property and is situated on a 0 – 8% slope. This area is dominated by Norway spruce, making up 70% of the canopy. Many roads are present in this forest.

This area was cleared and used for agriculture. It was planted with red pine, scots pine, Norway spruce, and eastern white pine 55 – 60 years ago. The red pine was row thinned in 1990. Red pine and scots pine stagnated and are now in decline or dead. Norway spruce dominates the remaining forest. Tip ups and breakage due to disease are very prevalent. Canopy closure ranges from 25 – 100%.

The southern and eastern sections have been cleared and are regenerating. Species present include eastern white pine, white birch, red and white oak, elm, red maple, and black cherry. Invasive species are present, namely buckthorn, honeysuckle, and prickly ash. However, they are not outcompeting native regeneration.

Soils and Site Productivity---

“The Elmwood series, coarse variant, consists of moderately well drained soils that are mainly loamy fine sand to a depth of about 18 to 26 inches. Underlying the loamy fine sand is clay or clay loam. Water moves through the loamy fine sandy readily and flows downhill on top of the clay or clay loam. The loamy fine sand, clay, and clay loam were deposited by water...The Elmwood soils...are slightly wet and lie mainly in broad areas or in depressions. In some places the soils are on slopes that receive water from higher areas. A seasonal high water table keeps these soils wet from late in fall to early in spring” (Addison County Soil Survey 1971).

“The Vergennes series consists of moderately well drained clays that formed on deep water-laid deposits of clay that contain much lime. These soils are gently sloping to very steep. They are sticky and plastic when wet, hard when dry, and are difficult to till or dig. Water moves very slowly through these soils” (1971).

See appendix for additional soils information.

Soil type: Vergennes clay 2 – 6% (VgB) with Elmwood fine sandy loam, coarse variant, 0 – 8%
Site index (Northern Hardwoods): 59+ (determined from soils – USDA SCS, 1971)
Site class: I (determined from soils – USDA SCS, 1971)

Conservation of biological diversity

Upland non-forest components include: grasslands; forbs; shrubs like dogwood and old fields. Wetland components include: seeps; wetlands; ephemeral streams; and riparian zones. Species richness is low with 3 tree species recorded. Canopy closure ranges from 25 – 100%. Fruit and mast trees are limited to big tooth aspen.

Habitat Conditions		
Satisfactory	Needs Work and/or Time	
✓		There are at least four (1-21”+; 4-15”+ DBH) cavity and/or snag trees per acre.
	✓	There are at least four (1-21”+; 4-15”+ DBH) down trees per acre.
✓		There are at least three vigorous and wind-firm legacy trees (19”+ DBH)

Wildlife Use and Habitat Observations --- Grouse was encountered. Turkey, mouse, and deer tracks seen. Deer paths and scat; browse moderate.

Unique and/or Fragile Communities --- Valley Clayplain Forests are ranked S2 (‘rare’) in the state of Vermont. Due to past land use, this is not a high quality example.

Invasive/exotic species--- Buckthorn, bush honeysuckle, and prickly ash in moderate levels. Native regeneration is competing fiercely.

Insects and diseases--- White pine weevil in light to moderate levels. Epicormic branching in white pines.

Maintenance of productive capacity

Forest products include: wood products (i.e. timber, fuelwood, and pulpwood) and small woods; non-wood forest products (i.e. plants such a wild ramps and berries and plant products such as maple syrup); and forest ecosystem services.

Access Distance: less than 1 mile

BAF: 10 **Number of points:** 5

Date of data collection: March 2017

Present Age Class of Dominants and Co-Dominants: 55 - 60 years

Dominant and Co-Dominant basal area per acre: 82 sq. ft.

Acceptable Timber Growing Stock basal area per acre: 46 sq. ft.

Quadratic Mean Stand Diameter: 11.5 inches

Number of Dominant and Co-Dominant trees per acre: 115

Species Composition:

Species	% of Total Basal Area of Dominants and Co- Dominants
Norway Spruce	70
Eastern White Pine	28
Big Tooth Aspen	3

Stand Age Class Structure: Even-aged & being regenerated

Timber Status: Low stand quality – acceptable growing stock basal area less than “C” level

Even-Aged Timber Stands: Adequately stocked

Timber Quality:

Dominant and Co-dominant Trees		
Quality	Basal Area	#Stems
	(square ft/acre)	(per acre)
Acceptable – USFS Tree Grade #2 or better	42	41
Non-acceptable – less than #2 but could be sold	36	72
Mature –USFS Tree Grade #2 or better & at goal age or DBH	4	2

Regeneration--- Established white pine, Norway spruce, and striped maple under plantation canopy. In open area, established eastern white pine, red and white oak, and white birch; adequate elm, black cherry, red maple, and bitternut hickory.

Primary Landowner Objectives for Area

- Maintain a healthy forest including a diversity of species, encouraging more hardwoods, and mixed age classes.
- Protect water quality including maintaining protective strips, using proper stream crossing techniques, and avoiding the use of pesticides.
- Protect biological diversity by locating and buffering spring seeps, vernal pools, and wetlands.
- Improve wildlife habitat particularly wetlands, seeps and other wet areas.

--- SCHEDULE OF CONSERVATION ACTIVITIES ---

Long Range Vegetation Management Objectives and Approaches ---

Uneven-aged management:

Desired diameter (DBH) for principal species: 20 inches

Maturity age: 100 years

Stewardship cycle: 10 years

acres to regenerate: .19 per year or 1.9 per stewardship cycle

Conservation Activities ---

The recently cleared areas are regenerating to native species well and should be left alone for the next 10 years. If there is funding available, a crop tree release could be preformed but is not necessary at this stage.

The Norway spruce and white pine plantation has moderate quality. It is experiencing natural regeneration through tip ups and breakage from disease. Advanced white pine regeneration waits below. Re-examine in 10 years.

Apply for NRCS cost-share funding for invasive species control.

If there is landowner interest, up to 1 tree greater than 21” DBH per acre can be felled and left in place to increase wildlife habitat.

The access network in this Area takes up too much of the forest and has many redundant trails, likely due to the row plantation. Redundant trails should be closed out and allowed to return to forest. Access networks should be in compliance with the *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont* (VT AMPs).

Year*	Acres	Forest Conservation Practices	
		Activity	Specifications
2020	Up to ALL	Control invasive exotics.	<p>Apply for NRCS cost-share funding</p> <p>Plan for annual and continuous monitoring of the forest following invasive plant treatment work, forest management activities and restoration efforts.</p> <p>Conduct proper pretreatment of invasive plant infestations before commencing timber harvesting or using roads, skid trails and landings during timber harvesting activities.</p> <p>Consider invasive plant populations and</p>

			<p>their likely response when prescribing timber harvesting activities that result in an increase of sunlight reaching the forest understory.</p> <p>Consider invasive plant populations and their likely response when prescribing timber harvesting activities that result in soil disturbance.</p> <p>To the extent feasible, clean all equipment before moving onto and off the property to reduce the chance of spreading invasive plants.</p>
2020	Up to ALL	Close out redundant trails	
2027	ALL	Re-examine.	

(* ± 3 years from this date)

AREA 4. ~ PINE PLANTATIONS



Acreage: 15.42
Cover Type: Red and White Pine
Plantation
Natural
Community Type: Mesic Maple – Ash –
Hickory – Oak Forest

---OVERVIEW---

Area Description and Land Use History--- Area 4 is a pine plantation located along Route 74, with a small section along North Bingham Street. The plantation is mainly white pine, with red pine along the western end and scots pine along North Bingham Street. This area occupies 9% of the property and is situated on a 0 – 15% slope. This area is dominated by eastern white pine, at 96% of the canopy. There is a high incidence of white pine weevil and white pine blister rust. Most trees are in decline. A small shallow emergent marsh/shrub swamp was seen in the eastern end of the forest.

This area was cleared and used for agriculture before being planted around 45 years ago. There is no evidence of thinning.

Soils and Site Productivity---

“The Amenia series consists of deep, moderately well drained, loamy soils, These soils formed on glacial till deposits that contain many fragments of limestone...A seasonal high water table keeps the soils wet from late in fall to early in spring and moist throughout most of the growing season” (Addison County Soil Survey 1971).

“The Covington series consists of poorly and somewhat poorly drained, nearly level or gently sloping silty clays and clays. These soils formed in deep water-laid deposits of clay that contains much lime. Water moves down very slowly through these soils. The Covington soils are wet from late fall to early spring. Their subsoil is moist throughout most of the growing season but becomes dry during some of it. The surface layer dries out almost every growing season” (1971).

“The Panton series consist of nearly level or gently sloping, poorly drained and somewhat poorly drained silty clays and clays formed in deep water-laid deposits of clay that contain much lime. Water moves down very slowly through these soils. The Panton soils are wet from late in fall to early in spring. Their subsoil is moist throughout most of the growing season but becomes dry during some of it. The surface layer dries out almost every growing season” (1971).

“The Vergennes series consists of moderately well drained clays that formed on deep water-laid deposits of clay that contain much lime. These soils are gently sloping to very steep. They are

sticky and plastic when wet, hard when dry, and are difficult to till or dig. Water moves very slowly through these soils” (1971).

See appendix for additional soil information.

Soil type: Amenia stony loam 0 – 8% (AmB) & 8 – 15% (AmC) with Covington and Panton silty clays (Cw) and Vergennes clay 2 – 6% (VgB)

Site index (Northern Hardwoods): 59+ (determined from soils – USDA SCS, 1971)

Site class: I (determined from soils – USDA SCS, 1971)

Conservation of biological diversity

Upland non-forest components include: grasslands; forbs; shrubs like dogwood and elderberry and old fields. Wetland components include: seeps; shrub swamps; ephemeral streams; and riparian zones. Species richness is low with 4 tree species observed. Canopy closure ranges from 75 – 100%.

Habitat Conditions		
Satisfactory	Needs Work and/or Time	
	✓	There are at least four (1-21”+; 4-15”+ DBH) cavity and/or snag trees per acre.
	✓	There are at least four (1-21”+; 4-15”+ DBH) down trees per acre.
	✓	There are at least three vigorous and wind-firm legacy trees (19”+ DBH)

Wildlife Use and Habitat Observations --- Deer browse was moderate to heavy. Deer paths and scat observed. Barred owl seen in the scots pine plantation.

Unique and/or Fragile Communities --- Mesic Maple – Ash – Hickory – Oak Forests are ranked S3 (‘uncommon’) in the state of Vermont. Due to land use, this is not a high quality example.

Invasive/exotic species--- Buckthorn and bush honeysuckles were in moderate to heavy infestation. Any actions removing the declining white pine canopy would release these invasives and allow them to flourish.

Insects and diseases--- White pine weevil in moderate to high levels. White pine blister rust in heavy levels in the center of the forest, light along edges.

Maintenance of productive capacity

Forest products include: wood products (i.e. timber, fuelwood, and pulpwood) and small woods; non-wood forest products (i.e. plants such a wild ramps and berries and plant products such as maple syrup); and forest ecosystem services.

Access Distance: less than 1 mile

BAF: 10 **Number of points:** 4 **Date of data collection:** March 2017

Present Age Class of Dominants and Co-Dominants: 40 - 50 years

Dominant and Co-Dominant basal area per acre: 138 sq. ft.

Acceptable Timber Growing Stock basal area per acre: 45 sq. ft.

Quadratic Mean Stand Diameter: 6.7 inches

Number of Dominant and Co-Dominant trees per acre: 561

Species Composition:

Species	% of Total Basal Area of Dominants and Co- Dominants
Eastern White Pine	96
White Ash	4

*Planted red and scots pine also observed but did not occur in plots.

Stand Age Class Structure: Even-aged

Timber Status: Low stand quality – acceptable growing stock basal area less than “C” level

Even-Aged Timber Stands: Overstocked

Timber Quality:

Dominant and Co-dominant Trees		
Quality	Basal Area	#Stems
	(square ft/acre)	(per acre)
Acceptable – USFS Tree Grade #2 or better	45	157
Non-acceptable – less than #2 but could be sold	93	404
Mature –USFS Tree Grade #2 or better & at goal age or DBH	0	0

Regeneration--- Established buckthorn; adequate ash and bitternut hickory.

Primary Landowner Objectives for Area

- Maintain a healthy forest including a diversity of species, encouraging more hardwoods, and mixed age classes.
- Protect biological diversity by locating and buffering spring seeps, vernal pools, and wetlands.

--- SCHEDULE OF CONSERVATION ACTIVITIES ---

Long Range Vegetation Management Objectives and Approaches ---

Uneven-aged management:

Desired diameter (DBH) for principal species: 20 inches

Maturity age: 100 years

Stewardship cycle: 10 years

acres to regenerate: .15 per year or 1.5 per stewardship cycle

Conservation Activities ---

Area 4 is a declining pine plantation. Under normal circumstances, removing the overstory would be best for forest productivity. However, an abundance of invasive species, like buckthorn and honeysuckle, lie in wait in the understory. Removing the canopy would allow these invasives to flourish. While some native regeneration is established in the understory, it is not at nearly the level of the invasive plants. Cost-share funding for invasive species control should be sought from NRCS.

Once effective invasive species control has taken place, liberation cutting can be used to release desirable regeneration. The first step of a 2 to 3 step shelter wood cut can take place, removing up to one third of the basal area in rows. Trees can be girdled to increase wildlife habitat or felled and left in place to create soil; slow, spread, and sink the flow of water; and reduce browse pressure. Up to 2 trees greater than 15” DBH and 1 tree greater than 21” DBH per acre could be girdled to meet snag targets and up to 4 trees greater than 15” DBH and 1 tree greater than 21” DBH per acre could be felled and left in place to meet coarse woody debris targets. Due to the smaller size of trees in this area, mean stand diameter is 6.7 “, finding enough trees greater than 15” and 21” may not be possible on every acre. Harvesting should only be done in the winter to prevent soil scarification, which would benefit invasive species, as well as to protect the clay soils and seeps, wetlands etc.

Year*	Acres	Forest Conservation Practices	
		Activity	Specifications
2020	Up to ALL	Control invasive exotics	<p>Apply for NRCS cost-share funding.</p> <p>Plan for annual and continuous monitoring of the forest following invasive plant treatment work, forest management activities and restoration efforts.</p> <p>Conduct proper pretreatment of invasive plant infestations before commencing timber harvesting or using roads, skid trails and landings during timber harvesting activities.</p>

			<p>Consider invasive plant populations and their likely response when prescribing timber harvesting activities that result in an increase of sunlight reaching the forest understory.</p> <p>Consider invasive plant populations and their likely response when prescribing timber harvesting activities that result in soil disturbance.</p> <p>To the extent feasible, clean all equipment before moving onto and off the property to reduce the chance of spreading invasive plants.</p>
2024	Up to ALL	Group shelterwood	After effective invasive species control has taken place, up to 50 sq. ft. of basal area per acre can be removed to release advance regeneration. Thinning will likely take place in rows. Trees can be girdled or felled and left in place. It is very unlikely that there would be enough volume for a commercial harvest.
2027	ALL	Re-examine.	

(* ± 3 years from this date)

AREA 5. ~ WETLAND'S EDGE



Acreage: 12.28

Cover Type: Pioneer Species

Natural
Community Type: Valley Clayplain and Wet
Valley Clayplain

---OVERVIEW---

Area Description and Land Use History--- The majority of Area 5 is located to the east of the 60+ acre beaver wetland along the northwestern boundary. There are one other small section, which lies between the western edge of Area 4 and the open land/old apple orchard. This area occupies 7% of the property and is situated on a 0 – 8% slope. This area is dominated by trembling aspen at 25% of the canopy and American elm at 20%.

This area was cleared and used as pasture before being allowed to return to forest 20 – 30 years ago. Apple trees and old-field white pines speak to this legacy. Diseases like Dutch elm disease and butternut canker have taken a toll on this forest and invasive species are present in heavy levels.

Soils and Site Productivity---

“The Amenia series consists of deep, moderately well drained, loamy soils, These soils formed on glacial till deposits that contain many fragments of limestone...A seasonal high water table keeps the soils wet from late in fall to early in spring and moist throughout most of the growing season” (Addison County Soil Survey 1971).

“The Vergennes series consists of moderately well drained clays that formed on deep water-laid deposits of clay that contain much lime. These soils are gently sloping to very steep. They are sticky and plastic when wet, hard when dry, and are difficult to till or dig. Water moves very slowly through these soils” (1971).

See appendix for additional soil information.

Soil type: Vergennes clay 2 – 6% (VgB) with Amenia stony loam 0 – 8% (AmB)

Site index (Northern Hardwood): 59+ (determined from soils – USDA SCS, 1971)

Site class: I (determined from soils – USDA SCS, 1971)

Conservation of biological diversity

Upland non-forest components include: grasslands; forbs like sensitive fern; shrubs such as red osier dogwood; vines like riverbank grape and old fields. Wetland components include: seeps; shallow emergent marsh; ephemeral streams; and riparian zones. Species richness is high with 11 species recorded. Canopy closure ranges from 25 – 75%. Fruit and mast trees include trembling aspen, bitternut hickory, black cherry, hophornbeam, and butternut.

Habitat Conditions		
Satisfactory	Needs Work and/or Time	
	✓	There are at least four (1-21”+; 4-15”+ DBH) cavity and/or snag trees per acre.
	✓	There are at least four (1-21”+; 4-15”+ DBH) down trees per acre.
✓		There are at least three vigorous and wind-firm legacy trees (19”+ DBH)

Wildlife Use and Habitat Observations --- Deer browse moderate to heavy, paths and scat observed.

Unique and/or Fragile Communities --- Valley Clayplain and Wet Valley Clayplain Forests are ranked S2 (‘rare’) in the state of Vermont. Due to past land use this is not a high quality example.

Invasive/exotic species--- Buckthorn, bush honeysuckles, and prickly ash are present in moderate to very heavy levels. See photo below.



Insects and diseases--- Butternut canker in lethal levels. Dutch elm disease in moderate to high levels. White pine weevil in moderate levels.

Maintenance of productive capacity

Forest products include: wood products (i.e. timber, fuelwood, and pulpwood) and small woods; non-wood forest products (i.e. plants such as wild ramps and berries and plant products such as maple syrup); and forest ecosystem services.

Access Distance: less than 1 mile

BAF: 10 **Number of points:** 6 **Date of data collection:** March 2017

Present Age Class of Dominants and Co-Dominants: 20 - 30 years

Dominant and Co-Dominant basal area per acre: 73 sq. ft.

Acceptable Timber Growing Stock basal area per acre: 33 sq. ft.

Quadratic Mean Stand Diameter: 6.5 inches

Number of Dominant and Co-Dominant trees per acre: 315

Species Composition:

Species	% of Total Basal Area of Dominants and Co- Dominants
Trembling Aspen	25
American Elm	20
Bitternut Hickory	11
White Birch	11
Red Cedar	7
Eastern White Pine	7
Norway Spruce	5
White Ash	5
Black Cherry	5
Hophornbeam	2
Red Maple	2

Stand Age Class Structure: Even-aged

Timber Status: Low stand quality – acceptable growing stock basal area less than “C” level

Even-Aged Timber Stands: Adequately stocked

Timber Quality:

Dominant and Co-dominant Trees		
Quality	Basal Area	#Stems
	(square ft/acre)	(per acre)
Acceptable – USFS Tree Grade #2 or better	32	194
Non-acceptable – less than #2 but could be sold	40	120
Mature –USFS Tree Grade #2 or better & at goal age or DBH	2	1

Regeneration--- Established buckthorn; adequate elm and bitternut hickory.

Primary Landowner Objectives for Area

- Maintain a healthy forest including a diversity of species, encouraging more hardwoods, and mixed age classes.
- Maintain site productivity especially by increasing organic matter.
- Protect biological diversity by locating and buffering spring seeps, vernal pools, and wetlands.
- Improve wildlife habitat particularly wetlands, seeps and other wet areas.
- Maintain opportunities for compatible, non-motorized recreation such as walking and hiking, cross-country skiing, peace and solitude, bird watching, and hunting.

--- SCHEDULE OF CONSERVATION ACTIVITIES ---

Long Range Vegetation Management Objectives and Approaches ---

Uneven-aged management:

Desired diameter (DBH) for principal species: 20 inches

Maturity age: 100 years

Stewardship cycle: 10 years

acres to regenerate: .12 per year or 1.2 per stewardship cycle

Conservation Activities ---

Based on *NE – 603: Silvicultural Guide for Northern Hardwood Types – Prescription H*: “This stand has too little quality growing stock for efficient uneven-age management. Reconsider the possibility of even age management through clearcutting or shelterwood cutting. The other alternative is a long series of improvement cuts and selection/group selection to gradually improve the quality of the stand”.

Area 5 has the greatest incidence of invasive species. Apply for NRCS cost-share funding for invasive species control.

Area 5 has a low proportion of acceptable growing stock and would benefit from liberation cutting once effective control of invasive species has taken place. However, there is a lot of pre-commercial work that could take place in this forest and there are limited means. Unless cost-share funding is obtained, re-examine in 10 years.

The access network is generally well laid out and at a good slope. Access networks should be in compliance with the *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont (VT AMPs)*.

Year*	Acres	Forest Conservation Practices	
		Activity	Specifications
2020	Up to ALL	Control invasive exotics.	<p>Apply for NRCS cost-share funding.</p> <p>Plan for annual and continuous monitoring of the forest following invasive plant treatment work, forest management activities and restoration efforts.</p> <p>Conduct proper pretreatment of invasive plant infestations before commencing timber harvesting or using roads, skid trails and landings during timber harvesting activities.</p> <p>Consider invasive plant populations and their likely response when prescribing</p>

			<p>timber harvesting activities that result in an increase of sunlight reaching the forest understory.</p> <p>Consider invasive plant populations and their likely response when prescribing timber harvesting activities that result in soil disturbance.</p> <p>To the extent feasible, clean all equipment before moving onto and off the property to reduce the chance of spreading invasive plants.</p>
2027	ALL	Re-examine.	

(* ± 3 years from this date)

FORESTRY GLOSSARY

(by S. DeBonis and P. van loon, Vermont Land Trust)

Acceptable Growing Stock (AGS): Any potential crop tree to be retained and managed to meet the landowner's objectives. UVA guidelines (for sawlog production) describe AGS as trees of commercial species which have the potential to produce one 12-foot log or two non-contiguous 8-foot logs.

Acre: A standard unit of area measure. One acre equals: 43,560 square feet; 4840 square yards; 10 square chains.

Advanced regeneration: Natural regeneration that is established prior to a timber harvest.

Adventitious buds: Buds that form in an unusual spot on a tree, usually on the bole.

Age Class: One of the intervals, commonly 10-20 years, into which the age range of trees are divided for classification.

AMP's: Accepted management practices pertaining to logging operations developed by the Department of Forests, Parks and Recreation and outlined in the booklet titled "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont."

Apical meristem: The growing tip of a tree stem or root.

Aspect: The direction towards which a slope faces.

Basal Area: The cross sectional area of the stem of a tree at 4.5 feet above the ground (dbh). The basal area of a stand is the summation of all the trees or classes of trees per unit area of land. Basal area is expressed in square feet per acre. Basal area is directly related to stand volume and density.

Biomass: The total weight of all harvestable vegetation from a stand. This term can also be used to describe a harvest that results in all material being processed into chips.

Board Foot: The volume of solid wood equivalent to a piece 12 inches long, 12 inches wide and 1 inch thick. A measure of standing or felled timber usually related to sawlogs.

Bog: A poorly drained, wet area with very acidic (ph 4.0 or less), peaty soil. Bogs receive little or no ground water influence and support vegetation such as sedges, mosses, orchids and black spruce.

Bole: The stem of a tree.

Browse: Buds, leaves, and twigs of seedling and sapling regeneration that are utilized as a food resource by wildlife.

Canopy: The combined cover of individual tree crowns.

Chain: A measurement of horizontal distance, 66 feet. Areas expressed in square chains can immediately be converted to acres by dividing by 10.

Cleaning: The removal of competing vegetation to release desired regeneration for optimal growth.

Clearcut: A silvicultural method which removes all trees from a designated area at one time for the purpose of creating a new, even-aged stand. This management system is usually used to regenerate shade-intolerant tree species. Variations include patch and strip clearcutting.

Climax: An association of plants and animals that will prevail in the absence of disturbance.

Coarse woody debris: (CWD) is a term for fallen dead trees and the remains of large branches on the ground in forests and in rivers or wetlands.

Codominant: Trees with crowns forming the general level of the forest canopy and receiving full sunlight from above but comparatively little from the sides.

Crop Trees: Trees to be grown to the end of the rotation.

Crown: The branches and twigs of the upper part of a tree.

Cruise: A survey of forest stands to determine the number, size and species of trees, as well as terrain, soil condition, access and any other factors relevant to forest management planning.

Cull: Trees that have no current or potential commercial value.

Diameter at Breast Height (dbh): The diameter of a standing tree measured at 4.5 feet above the ground and expressed in inches.

Dominant: Trees with well developed crowns which are above the canopy and receive direct sunlight from above and partially from the side.

Ephemeral Streams: Streams that sit above the water table and dry up between heavy rains.

Epicormic branching: Branches that sprout from adventitious buds on the bole of a tree, usually when it is stressed or is subjected to full sunlight.

Even-aged: An age class description of a stand in which the age of the trees is relatively close, usually within 20 years. Stands with two distinct age classes can also be referred to as even-aged.

Even-aged Management: Timber management that produces a stand of trees with relatively little difference in age usually 10-20 years. Even-age silvicultural systems include clearcut, seed-tree and shelterwood.

Forest Management Plan (FMP): A long range plan designed to identify a landowner's goals and objectives and the silvicultural methods that will be employed to achieve those goals. FMP's in Vermont are typically written for a 15 year period and updated every 10 years.

Forest Type: A natural group or association of different species of trees which commonly occur together over a large area. Forest types are defined by one or more of the dominant species of trees in the type. Common commercial types in the northeast are: beech-birch-maple; beech-red maple; mixedwood; spruce-fir; white pine.

Forestry: The art and science of growing and managing forests and forest lands for the continuing use of their resources.

Girdle: To destroy the conductive tissue of a tree in a ring around the bole.

Group Selection: An uneven-aged harvesting method designed to favor intolerant or intermediate species. Trees are generally removed in groups in areas ranging from 1/20-2 acres in size.

Habitat: The place where a plant or animal can live and maintain itself.

Hardwoods: Broad-leaved trees which lose their leaves in the fall.

Harvest: A silvicultural treatment that is intended to establish regeneration. A harvest is generally a higher level of cutting intensity than a thinning.

High-grading: A liquidation cut in which only the best quality, highest value trees are removed. Cuts of this nature are short sighted and exploitative and result in the degradation of the forest ecosystem.

Hydrologic Class: A measure of a bare soil's runoff characteristics. Group A soil has a high water infiltration rate and a low runoff potential. Group D soil has a very slow rate of water infiltration and is prone to high runoff.

Improvement Cutting: A silvicultural treatment in which poor quality and low value trees are removed to give the best trees more room to grow.

Individual Tree Selection: An uneven-aged harvesting method designed to favor tolerant species. Trees are removed individually to maintain a continuous and uniform crown cover. Also referred to as single tree selection.

Intermediate: Trees whose crowns reach the canopy level but receive little or no direct light from above and none from the sides.

Intermediate Treatments: Harvesting methods employed during even-aged management. The removal of trees from a stand between the time of establishment and the final harvest with the purpose of improving stand growth and/or species composition and/or health.

Intermittent Streams: Streams that sit above the water table and flow only during the wet seasons of winter, spring, and early summer, when the water table is high. They also flow after heavy rains during the rest of the year.

Intolerant Species: Trees unable to grow and develop in the shade of other species. Intolerant commercial species in Vermont include: paper birch and aspen.

Landing: Any place where logs are assembled for further transport.

Liquidation Cutting: Removal of all merchantable products from the forest with no regard for stand improvement or regeneration, usually preceding the sale of the land.

Log Rule: A table or formula showing estimated volumes, usually in board feet, for various log diameters and lengths.

Mast: Nuts, berries, and seeds utilized by wildlife as a food resource.

Maturity: Expressed in two ways: 1. Financial maturity occurs when a tree has reached the point where it has maximized value growth from the prospective market place; 2. Biological maturity occurs when a tree has reached the point where the energy costs of maintaining itself exceeds the energy input from photosynthesis. Financial maturity is reached long before biological maturity.

MBF: The abbreviation for one thousand board feet.

Mean Stand Diameter (MSD): The arithmetic mean diameter of the trees in a stand.

Medial Diameter (MDL): This is developed by determining by the sum of each diameter class multiplied by the basal area in that class and then dividing the result by the total basal area. MDL is useful in stands with a high

proportion of saplings because it is less influenced by these small trees and more accurately the size of the crop trees.

Mixed Hardwoods: Timber stands characterized by a mixture of hardwood species.

Overmature: A stand of trees that is older than normal rotation age for the type.

Overstory: Those trees making up the main canopy.

Overstory: The upper crown canopy of the forest. The overstory is usually referenced as the larger trees in the stand.

Perennial Streams: Streams situated at or below the water table and are fed by groundwater year round.

Phloem: Tissue of the inner bark that conducts photosynthate from the leaves down to the roots.

Pioneer: Shade intolerant species that are the first trees to develop in an area after or the abandonment of a field or after a disturbance that covers a fairly large area. Pioneer species include aspen and paper birch.

Pole or Pole Timber: A tree or trees greater than 4.0 inches dbh and less than 10.0 inches dbh.

Precommercial Thinning: An intermediate harvesting operation in a young stand that does not generate income.

Prescription: A course of action to effect change in a forest stand (harvest, planting, TSI).

Q-factor: A devise used to describe the structure of an uneven aged stand. The q-factor is the ratio of the number of trees in a diameter class divided by the number of trees in the next smaller diameter class. The lower the q-factor, the higher the proportion of large diameter trees.

Regeneration: Renewal of a tree crop by natural or artificial means.

Release: The freeing of well-established seedlings or saplings from surrounding growth.

Residual: Trees that are left to grow in a stand after a silvicultural treatment.

Rotation: The length of time required to grow an even aged crop of trees to a desired age.

Rotation Age: The age at which an even aged stand is considered ready for harvest.

Salvage Cut: The removal of dead, dying and damaged trees after a natural disaster or insect or disease infestation to utilize the wood before it loses all of its commercial value.

Sanitation Cut: The removal of dead, dying or damaged trees to prevent or interrupt the spread of insects or disease.

Sapling: Trees taller than 4.5 feet but less than 5.0 inches dbh.

Sawlog: A log considered suitable in size and quality for producing lumber. Regional standards apply for diameter, length and freedom from defect. Sawlog is also used to refer to a tree that has reached sufficient size to produce a sawlog. Small sawlog trees are 12-16 inches dbh, medium sawlog trees are 17-20 inches dbh, and large sawlog trees are 22 inches dbh or greater.

Sawtimber: Trees that have obtained a minimum diameter at breast height that can be felled and processed into sawlogs. Typical minimum size limits for commercial species in Vermont are 8 inches dbh for softwoods and 12 inches dbh for hardwoods.

Seedlings: Trees that are less than 4.5 feet tall.

Seed Tree: An even-aged silvicultural method in which most of the merchantable trees are removed in the first cut, leaving a few scattered trees of desirable species to serve as a seed source for the new stand. The seed trees are removed after successful regeneration has developed. The seed tree method is a regeneration cut used to create an even-aged stand of shade intolerant species.

Selection method: An uneven-aged silvicultural system where individual trees, or groups of trees, are removed from a stand to ensure a sustained yield from an uneven-aged stand.

Shade tolerance: The ability of trees to reproduce and grow in the shade of other trees. Tolerance ratings are very tolerant, tolerant, intermediate, intolerant, and very intolerant.

Shelterwood: An even-aged silvicultural system in which the mature trees are removed in a series of partial cuts that take place over a small portion of the rotation. The residual trees are left as a seed source and to provide shade and protection for the new seedlings. Three types of cuttings are used in this method:

1. The preparatory cut, in which the least desirable trees are removed to improve the quality and growth of the stand,
2. The seed cut, in which the regeneration is established,
3. The removal cut (or cuts) in which the mature trees are cut to release the regeneration.

Variations of this method include the group, irregular, strip, and uniform shelterwood.

Silviculture: Manipulation of the forest ecosystem to achieve specific goals and objectives.

Site Class: A measurement of the quality of the soil in terms of its potential productivity. A site class of 1 indicates that the soil is highly productive and a site class of 4 is considered non-productive, usually due to excessively wet, dry, or thin soil.

Site Index: A measure of the relative productive capacity of an area. Site index is species specific and is based on a comparison of tree age and height.

Skid Trail: Any path in the woods over which multiple loads of logs are hauled, usually by a skidder or tractor. Primary skid trails are the main pathways that enter the landing.

Skidder: A four wheel drive, tractor-like vehicle, articulated in the middle for maneuverability, with a cable or grapple on the back end designed to bring logs or whole trees to the landing once that they have been felled.

Slope: A relative measure of steepness of the ground. Slope can be computed by dividing the rise in elevation by the horizontal distance traveled. Slope is usually expressed in percent (rise ft /run) X 100. Slope can be derived automatically using various forest measurement tools.

Snag: A standing, dead tree.

Softwood: Coniferous trees, usually “evergreen” (the exception being tamarack), with needles or scale-like leaves.

Stand (Treatment Unit): A community of trees possessing sufficient uniformity in regards to composition, constitution, age, spatial arrangement or condition to be distinguishable from adjacent communities.

Stocking: An indication of the number of trees in a stand as compared to the optimum number of trees required to achieve some management objective, usually improved growth rates or increased timber values.

Stocking Level: Stocking levels are calculated by comparing either the basal area or the number of trees the site could support, if the growth potential of the land was fully utilized, to the basal area or number of trees actually on the site. UVA stocking categories include: understocked, adequately stocked, or overstocked.

Strip Cut: A timber harvesting operation where all of the merchantable trees are cut within a long narrow strip. An even-aged cutting method usually used to regenerate spruce and fir.

Stumpage: The value of timber as it stands in the woods just before harvest (“on the stump”). Loggers are usually bid on timber based on its stumpage value. Stumpage can also be used to refer to standing timber.

Succession: The orderly and predictable replacement of one plant community by another over time in the absence of disturbance.

Suppressed: Trees with crowns entirely below the general level of the forest canopy that receive no direct sunlight from above or the sides.

Thinning: A silvicultural treatment that reduces stand density to allow the best trees to grow with less competition. There are three kinds of thinning: crown thinning, low thinning, and free thinning.

Timber Stand Improvement (TSI): A non-commercial timber harvest conducted in stands of timber to improve the health, growth rate, and form of the remaining trees.

Tolerant Species: Trees that can grow satisfactorily in the shade of other trees. Tolerant species of commercial importance in Vermont include sugar maple, beech, red spruce, and hemlock.

Truck Road: A road capable of supporting a trailer truck that hauls logs from the landing to the mill.

Understory: Those plants growing under the main canopy.

Uneven aged: An age class description of a stand of trees that contains more than two distinct age classes and a variety of size classes.

Uneven-aged (All-aged) Management: Timber management that produces a stand composed of a variety of age classes. Harvesting methods used in uneven-aged management include individual tree and group selection.

UVA: Use Value Appraisal. A property tax incentive program offered by the State of Vermont to forest land owners who have at least 25 acres of contiguous forest land and agree to manage their land according to state standards under an approved FMP.

Vigor: The health and vitality of a tree. Vigor can most accurately be assessed by observations of foliage (density, width and color) and percent live crown.

Volume Table: A table that utilizes tree dbh or log diameters and log length(usually 16 feet) to estimate board foot volumes according to a set of assumptions (“log rules”) about how the log will be processed into boards.

Windthrow: A tree or trees that have been toppled by high winds. A common phenomena along the edge of strip cuts and clearcuts.

Xylem: Vascular tissue of the outer wood that conducts water and nutrients from the roots to the upper part of the tree.

Yield: Total forest growth over a specified period of time, less mortality, unmarketable fiber and cull.

Yield Table: A species-specific representation of the amount of useable wood fiber a forest can be expected to produce during a single rotation based on site index.

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Established Series
Rev. MGC-JEW-MFF
11/2015

AMENIA SERIES (AmB, AmC, & AsC)

The Amenia series consists of very deep, moderately well drained soils formed in till. They are on uplands of till plains. Slope ranges from 0 to 25 percent. Saturated hydraulic conductivity is moderately high to high in the mineral surface layer and subsoil and low to moderately high in the substratum. Mean annual temperature is 47 degrees F, and mean annual precipitation is 38 inches.

TAXONOMIC CLASS: Coarse-loamy, mixed, active, mesic Aquic Eutrudepts

TYPICAL PEDON: Amenia silt loam, on a 3 percent slope in a pasture. (Colors are for moist soil unless otherwise indicated)

Ap -- 0 to 8 inches; very dark grayish brown (10YR 3/2), light brownish gray (10YR 6/2) dry, silt loam; moderate medium and fine granular structure; friable; many fine roots; many fine pores; 5 percent rock fragments; slightly acid; clear smooth boundary. (7 to 12 inches thick.)

Bw1 -- 8 to 14 inches; brown (10YR 4/3) silt loam; pale brown (10YR 6/3) dry; weak coarse granular structure; friable; many fine roots; common vertical tubular pores and few spherical pores; many 1/8 to 1/4-inch vertical channels filled with very dark grayish brown (10YR 3/2) silt loam; 5 percent rock fragments; neutral; clear wavy boundary.

Bw2 -- 14 to 22 inches; brown (10YR 5/3) loam; yellowish brown (10YR 5/4) crushed; moderate medium subangular blocky structure; friable; few patchy clay films in depressions on vertical faces of peds; few fine and medium roots; 10 percent rock fragments; common medium faint yellowish brown (10YR 5/4) masses of iron accumulation; neutral; gradual wavy boundary. (Combined thickness of the Bw horizons is 5 to 26 inches.)

2BC -- 22 to 28 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam; weak thin platy structure; firm; common fine pores; few fine roots;

20 percent rock fragments; common medium distinct dark yellowish brown (10YR 4/4) masses of iron accumulation; neutral; abrupt wavy boundary. (0 to 8 inches thick.)

2Cd -- 28 to 72 inches; grayish brown (10YR 5/2) gravelly fine sandy loam; moderate thick platy structure; firm; few pores; 35 percent rock fragments; common medium and fine distinct dark yellowish brown (10YR 4/4) masses of iron accumulation; slightly effervescent, slightly alkaline.

TYPE LOCATION: Lewis County, New York; 0.5 mile toward Castorland on Highway No. 410 from its junction with Highway No. 26; 50 feet south of the southern edge of the high right-of-way. USGS Carthage, NY topographic quadrangle, Latitude 43 degrees, 52 minutes, 43 seconds. N. and Longitude 75 degrees, 31 minutes, 43 seconds W., NAD 27.

RANGE IN CHARACTERISTICS: Thickness of solum ranges from 18 to 36 inches and depth to carbonates range from 10 to 34 inches. The carbonates are nearly all of calcium. Depth to bedrock is more than 60 inches. Rock fragments range from 4 to 35 percent by volume throughout the soil.

Undisturbed pedons have A horizons 4 to 7 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4 and chromas of 2 or 3. Texture is silt loam, loam, or fine sandy loam in the fine earth fraction. Structure is weak or moderate granular and consistence is friable or very friable. Reaction ranges from moderately acid to slightly alkaline.

Some pedons have a A/B or AB horizon up to 6 inches thick.

The B horizon has hue of 5YR through 2.5Y, value of 4 or 6, and chroma of 2 through 6. Texture is fine sandy loam, loam, or silt loam in the fine earth fraction. Structure is weak or moderate, fine to coarse subangular blocky or granular, and consistence is very friable to firm. Reaction ranges from moderately acid to slightly alkaline.

The BC horizon has moderate to weak subangular blocky or platy structure.

The C or Cd horizon has hue of 7.5YR to 5Y, value of 4 or 5, and chroma of 1 or 4. Texture is silt loam, loam, very fine sandy loam or fine sandy loam in the

fine earth fraction. It is massive and may part to plate-like divisions or has platy structure. Consistence is firm or very firm. Some pedons have a friable C horizon above the Cd. Reaction is slightly alkaline or strongly alkaline.

COMPETING SERIES: There are no other series in the same family.

The Benson, Farmington, Georgia, Grenville, Herkimer, Hogansburg, Nellis, Pittsfield, and Stockbridge series are similar soils in related families. Benson and Farmington soils have bedrock within a depth of 20 inches. Georgia soils are more acid in the solum and have free carbonates at a greater depth. Grenville and Hogansburg soils have a frigid temperature regime. Nellis, Pittsfield and Stockbridge soils lack low chroma depletions within a depth of 24 inches.

GEOGRAPHIC SETTING: Amenia soils are nearly level to moderately steep soils on till plains. Slope ranges from 0 to 25 percent. The soil formed in calcareous, loamy till that in some places is covered by a thin silty mantle. Mean annual temperature ranges from 45 to 50 degrees F., mean annual precipitation ranges from 26 to 45 inches, and mean frost-free season ranges from 120 to 180 days. The elevation ranges from 95 to 1100 feet above sea level.

GEOGRAPHICALLY ASSOCIATED SOILS:

These are the competing Benson, Farmington, Nellis, Pittsfield, and Stockbridge soils, and the Galway, Massena, and sun soils. The well drained Nellis, somewhat poorly drained Massena, and poorly drained Sun soils are drainage associates. The Galway soils and the Bensen and Farmington soils are associated where the soil mantle is moderately deep and shallow respectively over bedrock. Pittsfield and Stockbridge soils are on nearby landscapes where the depth to free carbonates is greater.

DRAINAGE AND SATURATED HYDRAULIC

CONDUCTIVITY: Moderately well drained. The potential for surface runoff is low to high. Saturated hydraulic conductivity is moderately high to high in the mineral surface layer and subsoil and low to moderately high in the substratum.

USE AND VEGETATION: Most areas are cleared and used for growing hay, small grains, and corn. Vegetables are grown in a few places. Woodlots contain sugar maple, basswood, white ash, tulip poplar, and other hardwoods.

DISTRIBUTION AND EXTENT: New York, Connecticut, Massachusetts, and Vermont. (MLRA's 101, 142, 143, and 144A) The extent is moderate.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts

SERIES ESTABLISHED: Dutchess County, New York, 1939.

REMARKS: The present TP is in an area that is now considered to be in the frigid temperature family. The TP will be relocated during the MLRA update.

Diagnostic horizons and other features recognized in the typical pedon are as follows:

- (1) Ochric epipedon - the zone from 0 to 8 inches (Ap horizon).
- (2) Cambic horizon - the zone from 8 to 22 inches (Bw1 and Bw2 horizons)
- (3) Aquic subgroup - as evidenced by the low chroma matrix and high chroma masses of iron accumulation at 22 to 28 inches (2BC horizon).

ADDITIONAL DATA: Laboratory data are available for the typical pedon - S57NY25-2(1-5).

National Cooperative Soil Survey
U.S.A.

LOCATION COLTON NY+MA ME NH
VT

Established Series
Rev. LWK-SWA-MHS
04/2013

COLTON SERIES (CtB)

The Colton series consists of very deep, excessively drained soils formed in glacio-fluvial deposits. They are on terraces, kames, eskers, and outwash plains. Slope ranges from 0 through 70 percent. Estimated saturated hydraulic conductivity is high or very high in the solum and very high in the substratum. Mean annual temperature is 42 degrees F. and mean annual precipitation is 40 inches.

TAXONOMIC CLASS: Sandy-skeletal, isotic,

frigid Typic Haplorthods

TYPICAL PEDON: Colton gravelly loamy sand, on a 3 percent, west facing slope, in a pasture. (Colors are for moist soil unless otherwise noted.)

Ap -- 0 to 7 inches; grayish brown (10YR 5/2) gravelly loamy sand; weak fine granular structure; very friable; many fine roots; 25 percent gravel; very strongly acid; abrupt smooth boundary. (0 to 12 inches thick.)

E -- 7 to 8 inches; pinkish gray (7.5YR 7/2) gravelly loamy sand; single grain; loose; few fine roots; 25 percent gravel; very strongly acid; abrupt irregular boundary. (0 to 12 inches thick.)

Bhs -- 8 to 11 inches; dark reddish brown (5YR 2/2) gravelly loamy sand; weak fine granular structure; weakly cemented, 20 percent very firm masses; friable; few fine roots; 30 percent gravel; very strongly acid; clear wavy boundary.

Bs -- 11 to 16 inches; reddish brown (5YR 4/4) gravelly loamy sand; weak fine and very fine granular structure; very friable; few fine roots; 30 percent gravel and cobbles; very strongly acid; gradual irregular boundary. (Combined thickness of the Bhs and Bs horizons is 5 to 26 inches thick.)

BC -- 16 to 22 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; 35 percent gravel; very strongly acid; gradual wavy boundary. (0 to 28 inches thick.)

C -- 22 to 72 inches; pale brown (10YR 6/3) and grayish brown (10YR 5/2) stratified extremely gravelly sand; single grain; loose; 70 percent gravel; strongly acid.

TYPE LOCATION: Franklin County, New York; 0.4 mile east and 1.1 miles south of the Village of Burke, at the junction of unnamed N-S and E-W roads. USGS Burke, NY topographic quadrangle; Latitude 44 degrees, 53 minutes, 23 seconds N. and Longitude 74 degrees, 9 minutes, 34 seconds W., NAD 1927.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 18 through 49 inches. Depth to bedrock is greater than 60 inches. Rock fragments, mainly gravel and cobbles, range from 5 through 55 percent in the mineral surface and subsurface layers, from 15 through 65 percent in the subsoil, and from 35 through 70 percent in the C horizon.

Some undisturbed pedons have an O horizon that has hue of 5YR through 10YR or is neutral, value of 2 through 4, and chroma of 0 through 4. It is up to 8 inches thick.

The Ap horizon has hue of 10YR through 5YR, value of 2 through 5, and chroma of 2 through 4. Texture is sand, loamy coarse sand, loamy sand, loamy fine sand, sandy loam or fine sandy loam in the fine-earth fraction. It has granular structure or it is structureless. Reaction is extremely acid through moderately acid unless limed. Some pedons have a thin A horizon with chroma of 0 through 3.

The E horizon has hue of 5YR through 10YR, value of 4 through 7, and chroma of 1 or 2. Texture is coarse sand, sand, loamy coarse sand, loamy sand, loamy fine sand or coarse sandy loam in the fine-earth fraction. Some pedons have thin horizons of fine sandy loam. Reaction is extremely acid through moderately acid.

The Bhs, or Bh, horizon has hue of 2.5YR through 10YR, value of 2 through 3, and chroma of 1 through 3. Texture is coarse sand, sand, fine sand, loamy coarse sand, loamy sand, or loamy fine sand in the fine-earth fraction. Some pedons have thin horizons of fine sandy loam. It has granular or subangular blocky structure, or it is massive. It is very friable or friable, with or without cemented masses. Reaction is extremely acid through moderately acid.

The Bs horizon has hue of 2.5YR through 10YR, value of 3 through 6, and chroma of 3 through 8. Texture is coarse sand, sand, loamy coarse sand, loamy sand, or loamy fine sand in the fine-earth fraction. Some pedons are coarse sandy loam in the upper part. Some pedons have thin horizons of fine sandy loam. It has granular or subangular blocky structure, or it is massive or single grain. Reaction is extremely acid through moderately acid.

The BC horizon has hue of 5YR through 2.5Y, value of 3 through 6, and chroma of 2 through 6. Texture is coarse sand, sand, loamy coarse sand, loamy sand, or loamy fine sand in the fine-earth fraction. Reaction is extremely acid through moderately acid. Some pedons have a CB horizon with properties similar to the BC.

The C horizon has hue of 7.5YR through 5Y, value of 3 through 7, and chroma of 2 through 6. It is composed of gravel, cobbles, or stones with coarse sand, loamy coarse sand, loamy sand, or sand in the interstices and has varying degrees of stratification. Reaction is very strongly acid through slightly acid.

COMPETING SERIES: These are the Hermon, Marsardis, and Stetson series. Hermon soils formed in till and are not stratified in the lower part of the substratum. Marsardis soils have rock fragments usually dominated by slate and phyllite, and have a loamy mantle greater than 10 inches thick. Stetson soils have loamy B horizons.

Constable, Success, and Trout River series are similar soils in related families. Constable and Success soils have ortstein. Trout River soils are Entic.

GEOGRAPHIC SETTING: Colton soils are on glacial outwash terraces, plains, kames, and eskers. Slope ranges from 0 through 70 percent. The soils formed in water-sorted sand, gravel, cobbles, and stones of predominantly granite rocks with lesser amounts of sandstone and schist. Mean annual temperature ranges from 38 through 46 degrees F., mean annual precipitation ranges from 30 through 50 inches, and mean annual frost-free days ranges from 90 through 160 days. Elevation ranges from 5 feet through 3000 feet above sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Adams, Becket, Constable, Duane, Hermon, and Worth soils. Adams soils are on nearby sand plains. Becket, Hermon, and Worth soils formed in glacial till and are on nearby uplands. Constable soils are common associates where ortstein layers are prominent. Duane soils are moderately well drained and on lower, nearby landscapes.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Excessively drained. The potential for surface runoff is very low to medium. Estimated saturated hydraulic conductivity is high or very high in the solum and very high in the substratum.

USE AND VEGETATION: Large areas are idle and support seedling birch and pine, bracken fern, and blueberries. Farmed areas are used mainly for grass hay or pasture with some corn and oats. Forests include sugar maple, eastern white pine, red pine, and white spruce.

DISTRIBUTION AND EXTENT: Maine, New Hampshire, Northern New York, and Vermont. MLRAs 141, 142, 143, 144A, and 144B. The series is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: St. Lawrence County, New York, 1925.

REMARKS: Although Colton is Frigid, it has a legacy of use in MLRA 144A. This should be corrected in the MLRA update process.

Diagnostic horizons and other features recognized in the typical pedon are:

- a. Ochric epipedon - the zone from 0 through 7 inches (Ap horizon).
- b. Albic horizon - the zone from 7 through 8 inches (E horizon).
- c. Spodic horizon - the zone from 8 through 16 inches (Bhs and Bs horizons).

National Cooperative Soil Survey
U.S.A.

LOCATION COVINGTON VT NY
Established Series
Rev. BGW-RVJ-RLM-SHG
05/2006

COVINGTON SERIES (Cv, Cw)

The Covington series consists of very deep, poorly drained soils that formed in calcareous glaciolacustrine and estuarine clays on glacial lake plains. Saturated hydraulic conductivity is low to moderately high in the mineral surface layer and the subsoil, and moderately low to very low in the substratum. Slope ranges from 0 to 8 percent. Mean annual precipitation is about 36 inches, and mean annual temperature is about 46 degrees F.

TAXONOMIC CLASS: Very-fine, mixed, active, mesic Mollic Endoaqualfs

TYPICAL PEDON: Covington silty clay, in a nearly level, cultivated field. (Colors are for moist soil.)

Ap-- 0 to 8 inches; very dark brown (10YR 2/2) silty clay, dark grayish brown (10YR 4/2) dry; strong medium and coarse granular structure; friable; many roots; moderately acid; abrupt smooth boundary. (6 to 10 inches thick.)

BAg-- 8 to 11 inches; dark grayish brown (10YR 4/2) clay; strong coarse prismatic structure parting to strong very fine and fine blocky; firm; common roots; common fine pores with clay linings; light brownish gray (10YR 6/2) thin silt coats on prisms; many medium distinct brown (7.5YR 4/4) and many medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid; abrupt smooth boundary. (0 to 8 inches thick.)

Btg1-- 11 to 20 inches; dark gray (10YR 4/1) clay; strong coarse prismatic structure parting to strong fine blocky; firm, very plastic, very sticky; common roots; few medium pores; clay films on vertical and horizontal faces of peds and in pores; black patchy coats on peds; many medium distinct dark yellowish brown (10YR 4/4) masses of iron accumulation and many medium faint gray (10YR 5/1) areas of iron depletion; moderately acid; clear wavy boundary.

Btg2-- 20 to 25 inches; very dark gray (10YR 3/1) clay; moderate coarse prismatic structure parting to strong fine and medium blocky; very firm, very plastic, very sticky; few roots; clay films on vertical and horizontal faces of peds; few fine black hard nodules; common black patchy coats on faces of peds; many fine distinct dark yellowish brown (10YR 3/4) masses of iron accumulation; neutral; clear smooth boundary. (Combined thickness of the B horizon is 8 to 20 inches.)

BCg-- 25 to 33 inches; dark gray (N4/0) clay; moderate coarse prismatic structure parting to strong fine and medium blocky; very firm, very plastic, very sticky; few roots; few medium light gray (10YR 7/1) lime nodules; common black patches on peds; many fine distinct dark grayish brown (2.5Y 4/2) areas of iron depletion; slightly alkaline, strong effervescence with cold dilute hydrochloric acid; abrupt wavy boundary. (7 to 18 inches thick.)

Cg-- 33 to 65 inches; dark gray (N4/0) clay; moderate medium prismatic structure parting to strong fine, medium, and coarse angular blocky; very firm, very plastic, very sticky; few roots; few fine black patches on peds; few pale brown (10YR 6/3) nodules all of which do not effervesce with cold dilute hydrochloric acid; violent effervescence on faces of peds, and strong effervescence in ped interiors; many coarse prominent olive brown (2.5Y 4/4) masses of iron accumulation; slightly alkaline.

TYPE LOCATION: Addison County, Vermont; Town of Addison; two miles north of Vermont-New York bridge, between Chimney Point and West

Addison, 0.4 mile east of intersection of Vermont Highway No. 17 and Lake Street, 150 feet north of Highway No. 17; USGS Port Henry, NY-VT topographic quadrangle; Latitude 44 degrees, 04 minutes, 01 seconds N. Longitude 73 degrees, 23 minutes, 55 seconds W. NAD 1927.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 20 to 40 inches. Depth to the calcareous material ranges from 20 to 60 inches. Depth to contrasting strata or bedrock is more than 60 inches. Rock fragments range from 0 to 5 percent. Reaction ranges from moderately acid to neutral in the surface layer, moderately acid to slightly alkaline in the subsoil, and moderately acid to moderately alkaline in the substratum.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 to 3 moist and 5.5 or less dry, and chroma of 1 or 2. Texture is clay, silty clay, silty clay loam, or clay loam. Structure is moderate to strong, medium to coarse granular or moderate to strong, very fine to medium subangular blocky. Consistence is friable, firm, plastic, or sticky.

The BA and B horizons have hue of 7.5YR to 5Y, value of 3 to 5, and chroma of 1 or 2. Redoximorphic features of higher chroma range from few to many and distinct to prominent. Texture is clay with thin strata or subhorizons of silty clay. Structure is weak to strong, coarse prismatic that parts to moderate or strong, very fine to coarse angular blocky or it is weak or moderate, thin to thick platy. Consistence is firm, very firm, very plastic, or very sticky.

The C horizon is neutral or has hue of 2.5Y or 5Y, value of 3 to 5, and chroma of 0 to 2. Redoximorphic features with higher chroma range from few to many and distinct to prominent. Texture is clay or silty clay, but silt and silt loam varves alternate with clay varves in some pedons. Structure is weak or moderate, medium or coarse prismatic that parts to weak or moderate, fine to coarse angular blocky or it is massive. Consistence is firm, very firm, very plastic, or very sticky.

COMPETING SERIES: There are currently no other series in the same family.

Barre, Chaumont, Hoytville, Kingsbury, Lakemont, Lorain, Livingston, Madalin, Panton, Paulding, and Roselms series are in related families. Hoytville, Lorain, Paulding and Roselms soils are from outside of Region R. Barre, Hoytville, Lakemont, Lorain, and Madalin soils have less than 60 percent clay in the

particle-size control section. The Roselms soils have horizons with chroma greater than 2. The Livingston and Paulding soils do not have an argillic horizon. Panton soils have lighter colored surface horizons. Chaumont soils have bedrock at a depth of 20 to 40 inches.

GEOGRAPHIC SETTING: Covington soils are level to gently sloping soils on lake and marine plains. They are on broad plains and in depressions and drainageways and on toeslopes of swells and knolls. Slope ranges from 0 to 8 percent. The soils formed in calcareous, lacustrine or marine clays. The mean annual precipitation ranges from 26 to 36 inches and the mean annual temperature ranges from 45 to 52 degrees F. The frost-free season ranges from 130 to 165 days.

GEOGRAPHICALLY ASSOCIATED SOILS:

These are the Chaumont, Elmwood, Kingsbury, Livingston, Melrose, Panton, Swanton, Vergennes, Whately, and Wilpoint soils. The moderately well drained Vergennes, somewhat poorly drained Kingsbury, poorly and somewhat poorly drained Panton, and very poorly drained Livingston soils developed in similar material and are in a drainage sequence with Covington soils. Elmwood, Melrose, Swanton and Whately soils are on landforms that are in higher positions on the lake plain. These soils have less than 18 percent clay in the solum. Chaumont and Wilpoint soils are on bedrock controlled landforms and are moderately deep to deep to bedrock.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Poorly drained. The potential surface runoff is negligible or very high. Saturated hydraulic conductivity is low to moderately high in the mineral surface layer and the subsoil, and moderately low to very low in the substratum.

USE AND VEGETATION: Most areas of Covington soils have been cleared of trees and are used for hay and pasture. Corn and small grain are grown where the soils are adequately drained. Common trees in forested areas are red maple, Eastern white pine, balsam fir, white ash, sugar maple, and white spruce.

DISTRIBUTION AND EXTENT: The St. Lawrence and Champlain Lowlands of northern and eastern New York and western Vermont (MLRA 142). The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Franklin County, New York, 1953.

REMARKS: 1. The classification is updated to the 6th edition of the Keys to Soil Taxonomy with this revision. The previous classification was very-fine, illitic, mesic Mollic Ochraqualfs.

2. Diagnostic horizons and features recognized in this pedon are:

a. Ochric epipedon - the zone from 0 to 8 inches (Ap horizon).

b. Argillic horizon - the zone from 11 to 25 inches (Btg1 and Btg2 horizons).

ADDITIONAL DATA: NSSL lab data is available for pedons S56VT-7-3 (1-7) and S56VT-7-4 (1-7).

National Cooperative Soil Survey
U.S.A.

LOCATION ELMWOOD ME+MA
NH NY VT
Established Series
Rev. KJL-JAF-WDH
01/2000

ELMWOOD SERIES (EIB)

The Elmwood series consists of very deep, moderately well drained soils that formed in a thin mantle of loamy outwash materials over clayey marine or lacustrine deposits on lake and marine plains, and outwash plains and deltas. Permeability is moderately rapid in the loamy mantle and slow or very slow in the clayey substratum. Slope ranges from 0 to 25 percent. Mean annual temperature is about 45 degrees F, and mean annual precipitation is about 43 inches at the type location.

TAXONOMIC CLASS: Coarse-loamy over clayey, mixed over illitic, superactive, frigid Aquic Dystric Eutrodepts

TYPICAL PEDON: Elmwood fine sandy loam - grassland. (Colors are for moist soil)

Ap--0 to 9 inches; dark brown (10YR 4/3) fine sandy loam; moderate fine granular structure; friable; many grass roots; moderately acid; abrupt smooth boundary. (6 to 10 inches thick)

Bw1--9 to 16 inches; yellowish brown (10YR 5/6) sandy loam; weak fine granular structure; friable; common roots; moderately acid; clear wavy boundary. (3 to 9 inches thick)

Bw2--16 to 21 inches; light olive brown (2.5Y 5/6) sandy loam; massive; friable; few roots; common medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid; clear wavy boundary. (5 to 15 inches thick)

Eg--21 to 23 inches; olive gray (5Y 5/2) sandy loam; massive; friable; common medium prominent dark yellowish brown (10YR 4/4) masses of iron accumulation; moderately acid; abrupt wavy boundary. (0 to 7 inches thick)

2Bw--23 to 31 inches; pale olive (5Y 6/3) silty clay loam; moderate fine subangular blocky structure; firm; few films of clay or silt on vertical faces of peds and very few on horizontal faces; thin films of silt and clay in root channels and pores; common medium prominent yellowish brown (10YR 5/8) masses of iron accumulation; slightly acid; clear wavy boundary. (0 to 10 inches thick)

2C--31 to 65 inches; olive (5Y 4/3) silty clay loam; greenish gray (5GY 6/1) faces of peds; moderate medium and thick platy structure; firm; manganese stains on faces of peds; thin discontinuous films of fine silt on all faces; slightly acid.

TYPE LOCATION: Sagadahoc County, Maine; Town of Topsham; along Maine Route 24, about one-half mile south of the cemetery; USGS Brunswick, ME topographic quadrangle; latitude 43 degrees, 56 minutes, 22 seconds N., longitude 69 degrees, 53 minutes, 03 seconds W., NAD 27.

RANGE IN CHARACTERISTICS: Depth to the underlying fine-textured material ranges dominantly from 20 to 40 inches with a few pedons ranging to 18 inches. Depth to bedrock is more than 60 inches. The coarse-loamy material has 0 to 3 percent rock fragments and the clayey material lacks rock fragments. Reaction ranges from very strongly acid to slightly acid above the lithologic discontinuity and from moderately acid to slightly alkaline below. Thin horizons of loamy sand or loamy fine sand occur in some pedons above the lithologic discontinuity.

The Ap, or A horizon where present, has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. It is very fine sandy loam, fine sandy loam, sandy loam or loam. It has weak or moderate fine granular structure. Consistence is very friable or friable.

The Bw horizon has hue of 5YR to 2.5Y, value of 3 to 5, and chroma of 3 to 6. It is fine sandy loam, sandy loam or loam except thin layers of loamy sand or loamy fine sand are allowed. It has weak or moderate very fine or fine granular or subangular blocky structure or it is massive. Consistence is very friable or friable.

The Eg horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 2 to 4. It is sandy loam, fine sandy loam, very fine sandy loam or silt loam. It has weak thin to thick platy structure that may part to subangular blocky, or the horizon is massive.

The 2Bw horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 2 to 4. It is clay loam, silty clay loam, or silty clay. It has weak or moderate, very fine to medium subangular blocky structure.

The 2C horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 2 to 4. It is clay loam, silty clay loam, silty clay, or clay. Some pedons have thin strata of coarser material ranging from sand to silt below a depth of 40 inches. It has weak or moderate, very fine to medium subangular blocky, moderate medium to very thick platy, or prismatic structure that parts to blocky, or the horizon is massive. Thin films of silt or clay are present on faces of peds in some pedons. Some pedons have manganese stains on faces of peds in the lower part of the horizon.

COMPETING SERIES: Elmwood is currently the only series in this family. Eldridge soils are similar but have a mesic temperature regime.

GEOGRAPHIC SETTING: Elmwood soils are on glaciolacustrine, marine or outwash plains and deltas. Slope ranges from 0 to 25 percent. These soils formed in loamy outwash or lacustrine materials underlain by fine-textured lacustrine or marine deposits. The climate is humid and cool temperate. Mean annual temperature ranges from 43 to 46 degrees F, and the mean annual precipitation ranges from 38 to 55 inches. The frost-free season ranges from 130 to 190 days. Elevation ranges from 5 to 900 feet above mean sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Adams, Allagash, Biddeford, Buxton,

Lamoine, Madawaska, Melrose, Scantic, Suffield, Swanton and Whately series. Adams, Allagash and Madawaska soils do not have the fine-textured substratum and are in similar or higher positions on the landscape. Biddeford and Whately soils are very poorly drained soils in depressions. Buxton, Lamoine, Scantic and Suffield soils do not have the coarse-loamy mantle. Melrose soils are well drained and in higher positions on the landscape. Swanton soils are somewhat poorly drained and poorly drained soils in lower positions on the landscape.

DRAINAGE AND PERMEABILITY: Moderately well drained. Permeability is moderately rapid in the loamy mantle and slow to very slow in the clayey substratum.

USE AND VEGETATION: Most areas of this soil are used for hay and pasture with a small amount used for growing row crops and woodland. Common tree species are white pine, red oak, hemlock, sugar maple, beech, elm, gray birch and white birch.

DISTRIBUTION AND EXTENT: Maine, Massachusetts, New Hampshire, Vermont, and eastern New York; MLRA'S 101, 141, 142, 143, 144A, 144B and 145 (SEE REMARKS). The soil is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Connecticut Valley Survey, 1903.

REMARKS: 1. Elmwood soils were mapped and correlated as mesic soils prior to 1979. They were subsequently reclassified as having a frigid temperature regime and are now restricted to frigid areas. Its use in MLRA's 101, 144A, and 145 will be restricted. The Elmridge series is the mesic counterpart to Elmwood. 2. Diagnostic horizons and features recognized in this pedon are:
a. Ochric epipedon - the zone from 0 to 9 inches (Ap horizon).
b. Cambic horizon - the zone from 9 to 31 inches (Bw1, Bw2 Bg, and 2Bw horizons).
c. Aquic conditions - redox features within 24 inches of the mineral soil surface.

ADDITIONAL DATA: Soil Interpretation Record Numbers for the Elmwood series are: Elmwood, ME004; and Elmwood Very Stony Variant, ME0053.

National Cooperative Soil Survey
U.S.A.

LOCATION PANTON VT+NY
Established Series
Rev. RVJ-RLM-SHG
10/97

PANTON SERIES (Cw)

The Panton series consist of very deep, poorly and somewhat poorly drained soils that formed in calcareous glaciolacustrine and estuarine clays on glacial lake plains. Permeability is very slow. Slope ranges from 0 to 8 percent. Mean annual precipitation is about 36 inches, and mean annual temperature is about 46 degrees F.

TAXONOMIC CLASS: Very-fine, illitic, mesic
Typic Epiaqualfs

TYPICAL PEDON: Panton silty clay, in a nearly level meadow. (Colors are for moist soil.)

Ap--0 to 4 inches; dark grayish brown (10YR 4/2) silty clay; moderate fine and medium angular blocky structure; firm; many fibrous roots; slightly acid; abrupt smooth boundary. (5 to 9 inches thick)

Ag--4 to 8 inches; dark gray (10YR 4/1) silty clay; strong medium angular blocky structure parting to moderate medium subangular blocky moderate and medium granular; very firm, very sticky, very plastic; many fibrous roots; peds coated with light gray to gray (10YR 6/1); many medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; slightly acid; clear wavy boundary. (0 to 5 inches thick)

Btg1--8 to 15 inches; dark gray (10YR 4/1) clay; strong coarse prismatic structure parting to moderate medium angular blocky; very firm, very sticky, very plastic; common fibrous roots; clay films; slickensides in lower part of horizon; many fine distinct dark yellowish brown (10YR 4/4) masses of iron accumulation; neutral; clear smooth boundary. (6 to 15 inches thick)

Btg2--15 to 20 inches; very dark grayish brown (10YR 3/2) clay; moderate coarse prismatic structure parting to weak fine angular blocky; very firm, very

sticky, very plastic; common fibrous roots; clay films; manganese patches; some streaks of dark gray (N 4/0); few fine distinct olive brown (2.5Y 4/4) masses of iron accumulation; neutral; clear smooth boundary. (6 to 14 inches thick)

Btg3--20 to 25 inches; dark gray (N 4/0) and gray (5Y 5/1) clay; weak medium platy and moderate very fine subangular blocky structure; very firm, very sticky, very plastic; common fibrous roots; clay films; many light brownish gray (2.5 6/2) lime seams 1/2 inch wide; few manganese patches; few medium distinct olive (5Y 4/4) and very dark grayish brown (10YR 3/2) masses of iron accumulation; mildly alkaline; slight effervescence with cold dilute hydrochloric acid; clear wavy boundary. (0 to 7 inches thick)

Btg4--25 to 38 inches; dark gray (5Y 4/1) clay; weak medium platy structure; very firm, very sticky, very plastic; common fibrous roots; clay films along root channels and some dark gray (N 4/0) clay films on faces of peds; few fine light brownish gray (2.5Y 6/2) lime seams; few manganese patches; many medium prominent olive brown (2.5Y 4/4) masses of iron accumulation; mildly alkaline; strong effervescence along ped faces with cold dilute hydrochloric acid; gradual wavy boundary. (0 to 14 inches thick)

Btg5--38 to 46 inches; dark gray (5Y 4/1) clay; moderate medium angular blocky structure; very firm, very few fibrous roots; clay films; gray (10YR 5/1) lime seams; manganese patches; common fine and medium prominent olive brown (2.5Y 4/4) masses of iron accumulation with brighter centers; mildly alkaline; slight effervescence with cold dilute hydrochloric acid; gradual wavy boundary. (0 to 9 inches thick)

Cg1--46 to 58 inches; dark gray (5Y 4/1) clay; massive; firm; very few fibrous roots; manganese patches; common medium prominent dark yellowish brown (10YR 4/4) masses of iron accumulation; moderately alkaline; strong effervescence with cold dilute hydrochloric acid; gradual wavy boundary.

Cg2--58 to 70 inches; dark gray (5Y 4/1) clay; massive; firm; very few fibrous roots; manganese patches on ped faces; common fine distinct olive brown (2.5Y 4/4) masses of iron accumulation with light gray to gray (10YR 6/1) centers; moderately alkaline; strong effervescence with cold dilute hydrochloric acid; gradual wavy boundary.

Cg3--70 to 80 inches; dark grayish brown (10YR 4/2) and dark gray (2.5Y 4/1) clay; massive; firm; very few fibrous roots; manganese patches on ped faces; common medium distinct dark yellowish brown (10YR 4/4) masses of iron accumulation with light gray to gray (10YR 6/1) centers; mildly alkaline; slight effervescence with cold dilute hydrochloric acid.

TYPE LOCATION: Addison County, Vermont; Town of Addison; about 1/4 mile west of the Vermont Department of Fish and Game Refuge Headquarters on Vermont Highway No. 17, on the north side of highway; latitude 44 degrees, 5 minutes, 15 seconds North and longitude 73 degrees, 19 minutes, 30 seconds West, NAD 27.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 46 inches. Depth to carbonates ranges from 20 to 60 inches. Depth to contrasting strata or bedrock is more than 60 inches. Rock fragments are usually absent. Reaction ranges from strongly acid to slightly acid in the surface and subsurface layers, from strongly acid to mildly alkaline in the subsoil, and from neutral to moderately alkaline in the substratum.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2. Texture is silty clay loam, silty clay, or clay. Structure is moderate or strong, very fine to coarse granular or moderate or strong, very fine to medium angular or subangular blocky. Consistence is very friable, friable, or firm.

The Eg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. Texture is silty clay loam, silty clay, or clay. Structure is moderate or strong, very fine to coarse granular or moderate or strong, very fine to medium angular or subangular blocky. Consistence is very friable, friable, or firm. Some pedons do not have an Eg horizon.

The Btg horizon is neutral or has hue of 7.5YR to 5Y, value of 3 to 5, and chroma of 1 or 2. Texture is clay. Structure is weak to strong, thin to thick, platy or coarse or very coarse prismatic parting to weak to strong, fine to coarse angular or subangular blocky. Consistence is firm, very firm, extremely firm, sticky, very sticky, plastic, or very plastic.

The Cg horizon is neutral or has hue of 7.5YR to 5Y, value of 3 to 5, and chroma of 1 or 2. Texture is typically clay, but thin lenses of more silty material are present in some pedons. Structure is massive or weak to strong, thin to thick, platy or coarse or very

coarse prismatic parting to weak to strong, fine to coarse angular or subangular blocky. Consistence is firm, very firm, extremely firm, sticky, very sticky, plastic, or very plastic.

COMPETING SERIES: There are currently no other series in the same family. The Albano, Bergland, Canadice, Concord, Condit, Covington, Indus, Kanona, Kingsbury, Latty, Munson, Paulding, Roselms, Scantic, Trumbull, Watchung, Weir, and Wetzel series are similar soils in related families. Albano have mixed mineralogy. Bergland, Kanona, Latty, Munson, Paulding, and Scantic soils do not have argillic horizons. Canadice, Concord, Condit, Trumbull, Watchung, Weir, and Wetzel soils have less than 60 percent clay in the solum. Covington soils have Mollic epipedons. Indus soils have smectitic mineralogy. Kingsbury and Roselms soils have chroma of 3 or more in some subhorizons above 30 inches.

GEOGRAPHIC SETTING: The Panton soils are nearly level to gently sloping soils on lake and marine plains. They are on broad plains and in depressions and drainageways and on sideslopes of swells and knolls. Slope ranges from 0 to 8 percent. These soils formed in calcareous glaciolacustrine or estuarine clays associated with the end of the Wisconsin glaciation. The mean annual precipitation ranges from 28 to 36 inches, and the mean annual temperature ranges from 45 to 52 degrees F. The growing season ranges from 135 to 165 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Covington, Elmwood, Livingston, Melrose, Swanton, Vergennes, and Whately soils. The moderately well drained Vergennes, poorly drained Covington, and very poorly drained Livingston soils are associated in a drainage sequence with Panton soils. Elmwood, Melrose, Swanton, and Whately soils are on outwash landforms and are moderately coarse textured in the upper part of the solum.

DRAINAGE AND PERMEABILITY: Somewhat poorly and poorly drained. Permeability is very slow.

USE AND VEGETATION: Most areas have been cleared and are used for hay, pasture, and where adequately drained for silage corn and small grain. Common trees are red maple, eastern white pine, balsam fir, northern red oak, white oak, shagbark hickory, white ash, and sugar maple.

DISTRIBUTION AND EXTENT: The Champlain, St. Lawrence and upper Hudson Valleys of New York and Vermont (MLRAs 142 and 144A). The series is moderately extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Essex County, New York, 1954.

REMARKS: 1. This series has been classified to the 6th edition of Keys to Soil Taxonomy with this revision. The former classification was very-fine, illitic, mesic Typic Ochraqualfs. 2. Diagnostic horizons and features recognized in this pedon are:

- a. Ochric epipedon - the zone from 0 to 8 inches (Ap and Eg horizons).
- b. Argillic horizon - the zone from 8 to 46 inches (Btg horizon).

ADDITIONAL DATA: NSSL lab data is available for the typical pedon, S58VT-1-3 (1-10) and for other pedons S58VT-1-1 (1-6), S73VT-1-2, S73VT-1-4, S79VT-21-3 (1-3), and S81VT-21-1 (1-3).

National Cooperative Soil Survey
U.S.A.

LOCATION SWANTON ME+MA
NH NY OH VT
Established Series
Rev. JAF-KJL-WDH
5/98

SWANTON SERIES (Sw)

The Swanton series consists of very deep, somewhat poorly drained and poorly drained soils that formed in a thin mantle of loamy outwash materials over clayey marine or lacustrine deposits on lake and marine plains, and outwash plains and deltas. Slope ranges from 0 to 8 percent. Permeability is moderately rapid in the loamy mantle and slow or very slow in the clayey substratum. Mean annual temperature is about 43 degrees F, and mean annual precipitation is about 42 inches at the type location.

TAXONOMIC CLASS: Coarse-loamy over clayey, mixed over illitic, superactive, nonacid, frigid Aeric Epiaquepts

TYPICAL PEDON: Swanton fine sandy loam on a 1 percent slope in a hayfield. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 7 inches; very dark gray (10YR 3/1) fine sandy loam, light brownish gray (2.5Y 6/2) dry; weak fine granular structure; friable; many roots; strongly acid; abrupt smooth boundary. (5 to 9 inches thick)

Bg1--7 to 10 inches; grayish brown (10YR 5/2) fine sandy loam; weak fine granular structure; friable; common roots; few medium distinct yellowish brown (10YR 5/4) masses or iron accumulation; strongly acid; abrupt wavy boundary. (2 to 8 inches thick)

Bg2--10 to 18 inches; grayish brown (2.5Y 5/2) fine sandy loam; weak fine granular structure; friable; few roots; few medium prominent yellowish brown (10YR 5/6) masses of iron accumulation; strongly acid; abrupt smooth boundary. (6 to 14 inches thick)

Eg--18 to 22 inches; light brownish gray (2.5Y 6/2) sandy loam; weak thick platy structure; friable; many coarse distinct olive brown (2.5Y 4/4) masses of iron accumulation; strongly acid; abrupt smooth boundary. (0 to 10 inches thick)

2Cg1--22 to 30 inches; olive (5Y 5/3) silty clay loam; moderate medium subangular blocky structure; firm; thin films and dark stains on peds; films of olive gray (5Y 5/2) on faces of peds; common fine prominent yellowish brown (10YR 5/6) masses of iron accumulation on interiors of peds; slightly acid; clear wavy boundary. (0 to 10 inches thick)

2Cg2--30 to 40 inches; olive (5Y 4/3) silty clay; weak medium platy structure parting to moderate very fine angular blocky; firm; few films in pores and on faces of peds; black stains on faces of peds; films of light gray (5Y 7/2) and few fine distinct light olive brown (2.5Y 5/4) masses of iron accumulation on faces of peds; slightly acid; gradual wavy boundary. (0 to 12 inches thick)

2Cg3--40 to 65 inches; olive (5Y 4/3) silty clay; weak very thick platy inherited structure; firm; few dark gray (5Y 4/1) films on faces of peds; slightly acid.

TYPE LOCATION: Androscoggin County, Maine; Town of Durham; 1200 feet northeast of the intersection of Maine Route 136 and Quaker Meeting House Road; USGS Lisbon Falls South topographic quadrangle; about lat. 43 degrees 57 minutes 2 seconds N. and long. 70 degrees 7 minutes 3 seconds W., NAD 27.

RANGE IN CHARACTERISTICS: Depth to the underlying fine-textured material ranges dominantly from 20 to 40 inches with a few pedons ranging to 18 inches. Depth to bedrock is more than 60 inches. Consistence is very friable or friable in the coarse-loamy mantle and are absent below. Reaction ranges from strongly acid to neutral in the coarse-loamy mantle and from moderately acid to moderately alkaline below.

The Ap horizon, or A horizon where present, has hue of 7.5YR to 2.5Y, value of 2 to 4, and chroma of 1 or 2. It is very fine sandy loam, fine sandy loam, or sandy loam. It has weak or moderate, very fine to medium granular structure.

The Eg horizon, where present, has hue of 10YR to 5Y, value of 5 or 6, and chroma of 2. It is very fine sandy loam, fine sandy loam, or sandy loam. It has weak or moderate, very fine to medium granular structure.

The B horizon has hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 1 to 4 and has distinct and prominent redox concentrations. It is fine sandy loam or sandy loam, but some pedons have thin loamy fine sand subhorizons. It has weak, very fine or fine granular or moderate medium subangular blocky structure.

The E' horizon has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 2 or 3 and has faint to prominent redox concentrations. The E' horizon is fine sandy loam or sandy loam, but some pedons where the horizon is thin are loamy fine sand. It has weak fine granular or weak or moderate, thin to thick platy structure.

The 2C horizon has hue of 10YR to 5GY, value of 4 to 6 and chroma of 0 to 4. Redox concentrations are faint to prominent, but may be absent in the lower part. The 2C horizon is silty clay loam, silty clay, or clay. It has weak or moderate, thin to very thick platy or weak or moderate, very fine to medium subangular or angular blocky structure, all of which is inherited from the parent material, or the horizon is massive.

COMPETING SERIES: Swanton is currently the only series in this family. Gogomain soils are in a closely related family from outside of Region R. They have free carbonates within a depth of 60 inches and receive less annual precipitation.

GEOGRAPHIC SETTING: Swanton soils are in depressional areas on marine and lake plains, outwash plains, or deltas. Slope ranges from 0 to 8 percent. The soils formed in loamy outwash or lacustrine deposits underlain by fine-textured lacustrine and marine deposits. The climate is humid and cool temperate. The mean annual temperature ranges from 40 to 46 degrees F, and the mean annual precipitation ranges from 36 to 48 inches. The frost-free season ranges from 90 to 160 days. Elevation ranges from 5 to 900 feet above mean sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Adams, Buxton, Elmwood, Lamoine, Melrose, Scantic, and Whately soils are sandy and are better drained. Buxton, Lamoine and Scantic soils have a finer-textured mantle. Elmwood and Melrose soils are better drained. Whately soils are very poorly drained.

DRAINED AND PERMEABILITY: Somewhat poorly drained and poorly drained. Permeability is moderately rapid in the coarse-loamy mantle and slow or very slow in the clayey substratum.

USE AND VEGETATION: Cleared areas are used mainly for hay and pasture and some row crops. The remaining areas are mostly forested and the common tree species are eastern white pine, white spruce, and red spruce. Hemlock, gray birch, red maple, sugar maple, balsam fir, and tamarack also are present to a lesser extent.

DISTRIBUTION AND EXTENT: Maine, Massachusetts, Connecticut, New Hampshire, New York, Ohio* and Vermont. (MLRA's 100,* 101,* 142, 143, 144A, 144B.) The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Essex County, New York, 1954.

REMARKS: 1. *Swanton soils have a frigid temperature regime and will not be maintained in MLRA 100 and 101 when these areas are updated. 2. Diagnostic horizons and features recognized in this

pedon are:
a. Ochric epipedon - the zone from 0 to 7 inches (Ap horizon).
b. Cambic horizon - the zone from 7 to 18 inches (Bg1 and Bg2 horizons).
c. Aquic conditions - redoximorphic features at 7 inches.

ADDITIONAL DATA: The Soil Interpretation Record Number for the Swanton series is ME0017.

National Cooperative Soil Survey
U.S.A.

LOCATION VERGENNES NY VT
Established Series
Rev. BGW-GWH-SHG-GWS
01/2007

VERGENNES SERIES (VgB, VgC, VgD, & VgE)

The Vergennes series consists of very deep, moderately well drained soils on glacial lake plains. They formed in calcareous estuarine and glaciolacustrine clays. Saturated hydraulic conductivity is low or moderately high in the mineral solum and moderately low to very low in the substratum. Slope ranges from 0 to 50 percent.

TAXONOMIC CLASS: Very-fine, mixed, active, mesic Glossoaquic Hapludalfs

TYPICAL PEDON: Vergennes clay described in an area of Vergennes clay, 3 to 8 percent slopes, in a cornfield. (Colors are for moist soil unless otherwise noted)

Ap-- 0 to 8 inches, dark grayish brown (10YR 4/2) clay; weak medium and coarse subangular blocky structure parting to weak fine granular; friable; slightly sticky and slightly plastic; common fine and medium and few coarse roots; neutral; abrupt smooth boundary. (5 to 8 inches thick.)

B/E-- 8 to 10 inches, 12 percent grayish brown (10YR 5/2) and 88 percent brown (10YR 5/3) clay; weak fine subangular blocky structure; friable; sticky

and plastic; common fine and medium roots; common fine vesicular and few fine tubular pores; very thin discontinuous clay films in pores; many fine and medium faint yellowish brown (10YR 5/6) soft masses of iron accumulation; neutral; clear wavy boundary. (2 to 11 inches thick.)

Bt-- 10 to 22 inches, brown (10YR 4/3) clay; ped surfaces are brown (10YR 5/3); moderate fine and medium subangular blocky structure; friable; very sticky and very plastic; common fine and medium and few coarse roots; many fine vesicular and few fine and medium tubular pores; thin discontinuous clay films on ped surfaces and pore linings; common fine and medium faint dark yellowish brown (10YR 4/6) soft masses of iron accumulation and few fine faint light brownish gray (10YR 6/2) iron depletions; neutral; clear smooth boundary. (The combined thickness of Bt horizons is 12 to 20 inches thick.)

BC-- 22 to 29 inches, 50 percent dark grayish brown (10YR 4/2) and 50 percent brown (10YR 4/3) clay; weak very coarse prismatic parting to moderate fine and very fine subangular blocky structure; friable; very sticky and very plastic; few fine, medium and coarse roots; many fine vesicular and few fine and medium tubular pores; thin discontinuous clay films on ped surfaces; common fine faint dark yellowish brown (10YR 4/6) soft masses of iron accumulation; ped surfaces are grayish brown (10YR 5/2); slightly alkaline, mild effervescence; gradual wavy boundary. (6 to 10 inches thick.)

C1-- 29 to 37 inches, 50 percent dark grayish brown (10YR 4/2) and 50 percent brown (10YR 4/3) clay; massive, weakly varved with very weak coarse prism like features; firm, very sticky and very plastic; few fine and medium coarse roots; common fine vesicular and few fine tubular pores; common coatings of light gray (10YR 7/2) CaCO₃ on feature surfaces; common fine distinct dark yellowish brown (10YR 4/6) soft masses of iron accumulation; feature surfaces are gray (10YR 5/1); moderately alkaline, strong effervescence; gradual wavy boundary.

C2-- 37 to 45 inches, brown (10YR 4/3) clay; massive, varved with weak coarse prism like features; firm, very sticky and very plastic; few fine roots; common fine vesicular and few fine tubular pores; common light gray (10YR 7/2) nodules of CaCO₃; few medium distinct dark yellowish brown (10YR 4/4) soft masses of iron accumulation; feature surfaces are gray (10YR 6/1); moderately alkaline, strongly effervescent; gradual wavy boundary.

C3-- 45 to 77 inches, variegated grayish brown (10YR 5/2) gray (5Y 5/1) and brown (10YR 4/3) clay; massive, varved with moderate very coarse prism like features; firm, very sticky and very plastic; few fine roots; few fine vesicular and tubular pores; light gray (10YR 7/2) carbonate nodules; few fine distinct dark yellowish brown (10YR 4/6) soft masses of iron accumulation; ped surfaces are gray (10YR 5/1); moderately alkaline, strong effervescence.

TYPE LOCATION: Essex County, New York, Town of Crown Point, 50 feet north of the point on Burdick Road located 1 mile east of the junction of Burdick Road and State Route 9N. USGS Crown Point, NY 7.5 minute topographic quadrangle; Latitude 43 degrees, 59 minutes, 08 seconds N. Longitude 73 degrees, 26 minutes, 13 seconds W. NAD 1927.

RANGE IN CHARACTERISTICS: Thickness of solum ranges from 14 to 40 inches. Depth to bedrock is greater than 60 inches. Rock fragments range from 0 to 2 percent. Reaction ranges from very strongly acid to neutral in the upper part of the solum and moderately acid to slightly alkaline in the lower part. The C horizon is moderately alkaline. Depth to free carbonates ranges from 18 to 40 inches.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 1 through 4. The A horizon is clay, silty clay, silty clay loam, or silt loam.

Some pedons have an E horizon which has hue of 7.5YR through 2.5Y, value of 5 or 6, and chroma of 2 or 3. The E horizon is clay, silty clay, silty clay loam, or silt loam.

The B/E horizon has colors and textures similar to the Bt and E horizons.

The Bt horizon has hue of 7.5YR through 5Y, value of 3 through 5, and chroma of 1 through 4. It is clay.

Some pedons have a BC horizon.

The C horizon has hue of 7.5YR through 5Y, value of 3 through 5, and chroma of 1 through 4. It is clay with silt and silty clay varves.

COMPETING SERIES: There are no series in the same family.

The Boxfort, Broughton, Buxton, Caneadea, Covington, Fulton, Hudson, Livingston, Nappanee,

St. Clair, and Suffield series are similar soils in related families. Caneadea, Bulton, Hudson, Nappanee, and St. Clair series have more silt and less than 60 percent clay in the B horizons. Nappanee and St. Clair series are dominated by less well sorted material containing more rock fragments. The Boxford, Buxton and Suffield soils have textures of silt loam in the upper B horizons and do not have argillic horizons. The Covington, Livingston, and Panton soils have distinct or prominent mottles just below the A horizons. The Livingston soils have a mollic epipedon. The Broughton soils lack the light colored ped coatings and interfingering of E horizon into the Bt horizons.

GEOGRAPHIC SETTING: The Vergennes soils are nearly level to steep soils on glacial lake plains. They are on broad plains and on the tops and side slopes of hills ridges and knolls. Slope ranges from 0 to 50 percent. The soils formed in calcareous estuarine and glaciolacustrine clays. The mean annual precipitation ranges from 26 to 36 inches and the mean annual temperature ranges from 45 to 52 degrees Fahrenheit. The frost-free season ranges from 130 to 165 days.

GEOGRAPHICALLY ASSOCIATED SOILS: The very poorly drained Livingston, the poorly drained Covington, the somewhat poorly and poorly drained Panton, and the somewhat poorly drained Kingsbury soils are associated in a drainage sequence. The Benson, Elmridge, Farmington, Galoo, Galway, Grenville, Melrose, Nellis, and Windsor soils are associated with Vergennes soils. The Elmridge soils have loamy material over clays. The Melrose soils have sandy or loamy material over clays. The Windsor soils are very deep sands. The Benson, Farmington, Galoo, Galway, Grenville, and Nellis soils developed in loamy till.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Moderately well drained. Saturated hydraulic conductivity is low or moderately high in the mineral solum and moderately low to very low in the substratum. The soils remain wet for a long time in the spring and become wet early in the fall.

USE AND VEGETATION: Most areas are cleared and used for hay, pasture, and to a lesser extent for silage corn and apple orchards. In wooded areas common trees are eastern white pine, red maple, sugar maple, American beech, red oak, white oak, eastern hemlock, northern white-cedar, and eastern red cedar.

DISTRIBUTION AND EXTENT: Northwestern Vermont and Northern New York in the upper St. Lawrence River Valley and bordering Lake Champlain. MLRA 142 and 144A. The series is extensive, about 250,000 acres.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts

SERIES ESTABLISHED: Addison and Rutland Counties, Vermont and Essex and Warren Counties, New York, 1904.

REMARKS: The Vergennes soil series is a benchmark series and is in the soil series Hall of Fame.

This revision reflects new horizon designations and general updating.

The horizons and features diagnostic for the typical pedon are:

1. Ochric epipedon from 0 to 8 inches (Ap horizon).
2. Argillic horizon from 10 to 22 inches (Bt horizon).
3. Interfingering of albic materials (B/E horizon).
4. The particle size control section, from 10 to 22 inches, is very fine.
5. Udic soil moisture regime.
6. Mesic soil temperature regime.

ADDITIONAL DATA: NSSL laboratory data is available for the typical pedon S85NY031-08 and the following pedons: S58VT-1-5 (SSIR 20), S58VT-1-6 (SSIR 20), S73VT-1-1, S73VT-1-3, S80VT-1-1, S80VT-1-2, and S57NY-16-1

National Cooperative Soil Survey
U.S.A.



FOREST HEALTH CONSERVATION CHECKLIST

Optimal Conservation Practices to protect water quality, site productivity, native biological diversity, and carbon sequestration and storage and to attenuate flood damage in forests actively managed for wood products, non-wood forest products and other forest ecosystem products and services.

Updated 3/16/2015

Introduction

Vermont Family Forests™, Inc. is a not-for-profit organization working to conserve the health of the forest community and, when appropriate, promoting the careful cultivation of local family-owned forests for community benefits. Vermont Family Forests (VFF) has adopted a set of principles to guide forest conservation activities. One of these principles states that “ECOLOGICAL FORESTRY should conserve native biodiversity, water quality, site productivity and scenic beauty; use only biological pest control; and mimic natural processes.” The following forestry practices have been designed for forest friends and stewards who are interested in practicing ecological forestry. They are most applicable to the following natural community types: Northern Hardwood Forest; Rich Northern Hardwood Forest; Mesic Red Oak-Northern Hardwood Forest; Red Spruce – Northern Hardwood Forest; Hemlock-Northern Hardwood Forest; Mesic Maple-Ash-Hickory-Oak Forest; and the Valley Clayplain Forest. Owners of lands in the VFF-certified pool agree to comply with the VFF Forest Health Conservation Checklist to the maximum practical extent.

Accessing the Forest

Forwarding Paths, Truck Roads, Skid Trails and Log Landings

- ✓ Forwarding paths, truck roads, skid trails, and log landings should be built and maintained in full compliance with the standards contained in the *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont* (VT FP&R 1987). The drainage structures should remain fully functional with post-harvest use.
- ✓ Avoid spring harvests and rutting that extends beyond the A soil horizon. Out-slope access and avoid ditches.
- ✓ To maximize the soil’s ability to store carbon, harvesting should only be done when the soil is completely frozen.
- ✓ It is strongly recommended that all forwarding paths, skid trails, truck roads, and log landings be designed and constructed prior to the inception of harvesting. The average grade of the access network should be 7% or less.
- ✓ The timber harvesting access network should not expose mineral soil on more than 5% of the treated area.
- ✓ Properly buffer and protect special habitats such as cliffs, caves, talus slopes, beaver meadows, vernal pools, spring seeps, and remnant patches of old growth forest.
- ✓ Take special care to protect wetlands, particularly those with muck and peat soils and a thick organic layer as these wetland soils are capable of storing ten times as much carbon as other soils in the region.
- ✓ Use low-impact logging equipment, including small forwarders, to minimize residual stand damage and soil compaction.
- ✓ Winter harvesting is preferred to protect breeding birds. Delay summer harvests until after August 15th.
- ✓ Forwarding paths, skid trails, truck roads, and log landings -- should only be used when adequately dry or frozen.
- ✓ Minimize the width, number and extent of truck roads and skid trails -- particularly in or near sensitive areas such as stream crossings and protective strips. Access networks should be designed to avoid topography with slopes of 35% or greater.
- ✓ Road and trail networks should be planned to avoid fragmenting forest blocks and to avoid creating linear openings in the

forest. These can serve as vectors for predators or contribute to desiccation of leaf litter on the forest floor.

- ✓ Log landings should: be located on nearly-level, stable ground; be kept away from protective strips; have water diversions installed; and be graded to prevent erosion and sedimentation.

Protective Strips and Buffer Strips

- ✓ Protective strips -- characterized by minimal soil disturbance, nearly-complete canopy closure, and many large, mature trees - should be maintained between the access network and surface waters according to Table 4 in the Vermont AMPs at a minimum.
- ✓ Areas of exposed soil that occur within the protective strip should be seeded using native species and sources to the maximum extent possible and mulched with material free of invasive exotics and applied according to Table 3 in the AMPs.
- ✓ Stream buffer strips should: be kept free of logging vehicles; have only little or no tree cutting; and be at least 25 feet in width.
- ✓ Particular care should be taken to prevent stream bank erosion in order to avoid the release of sediment and stored carbon.

Stream Crossings

- ✓ Stream crossings should be restored and non-permanent structures should be removed as soon as possible.
- ✓ Streams should be crossed with bridges or culverts which are properly sized according to Table 2 in the Vermont AMPs and installed at right angles.
- ✓ Sediment should be prevented from reaching streams by using turn-ups or broad-based dips on forwarding paths, truck roads and skid trails prior to all stream crossings. Drainage ditches should not feed directly into streams or other surface waters.

Closeout

- ✓ Post-harvest use of the access network should be restricted in order to prevent erosion, compaction, and site disruption.

Vegetation Management

- ✓ The single tree and small group selection methods should be used for communities with gap-phase replacement (e.g. northern hardwoods) and the irregular shelterwood method should be used for communities with stand-replacing disturbance regimes (e.g. spruce-fir). Uneven-aged management by area regulation is recommended. Where the group-selection method is employed, canopy openings of 0.25 acres or less are preferred. Where the group-shelterwood method is employed, the size of the regenerated areas can be increased. Clear-cutting and whole-tree harvesting should be avoided.
- ✓ Forests generally sequester and store the most carbon when left untouched. Therefore, it is not recommended to artificially create canopy gaps other than those that are deemed essential to meet non-ecological forest functions and values.
- ✓ Gradual or soft edges between habitats are preferred. Allow native shrubs, saplings, and some overstory trees to remain along the harvest boundary. Edges may also be “feathered” by retaining more trees closer to the uncut forest and gradually fewer trees closer to the harvested area.
- ✓ Manage for at least four large and secure cavity, snag, and/or decadent, living trees per acre on average, with one exceeding 21 inches diameter breast height (DBH) and four exceeding 15 inches DBH.¹ Leave trees that have cavities of varying sizes and are located in the upper trunk of the tree. Also, give priority to hardwood trees with cavities, rather than softwood, as they remain intact longer.
- ✓ Manage for at least four downed trees or 16+ foot long logs per acre on average, with one exceeding 21” DBH and four

¹ To address safety issues, this may be accomplished by clustering cavity and snag trees in areas such as riparian zones and wetlands and away from access roads and trails.

exceeding 15" DBH.

- ✓ Grow the largest trees and use the longest rotations possible within site and log quality limitations. Retain a minimum of three vigorous and wind-firm legacy trees per acre measuring over 19 inches DBH. Intermediate treatments should raise the average (mean) diameter of the residual dominant and co-dominant trees of the forest.
- ✓ Any forest management in natural communities that are ranked as "very rare"(S1) and "rare" (S2) or in natural communities ranked as "uncommon" (S3), "common" (S4), and "very common"(S5) but with little or no evidence of past human disturbance should be reviewed and approved by the VT F&W Natural Heritage Biologists.
- ✓ When planting, use only local sources of native species, plant three or more species, and include deciduous species.
- ✓ When thinning or regenerating stands, favor native species over non-native species and trees and shrubs that produce seeds and fruits.
- ✓ Use natural regeneration to the maximum practical extent.
- ✓ Biological legacies of the forest community -- including coarse dead wood, logs, and snags; trees that are large, living, and old; buried seeds; soil organic matter; invertebrates; sprouting plants; and mycorrhizal fungi -- should be protected to aid in post-harvest recovery and to keep the forest from becoming "oversimplified".
- ✓ Promote the seed bearing capacities of poorly represented members of the forest.
- ✓ Tree felling should be avoided on slopes exceeding 50%.
- ✓ In general, leave as much biomass on site as possible including all materials that are less than 3 inches in diameter.
- ✓ Promote a vertical stand structure that includes over-story, mid-story, shrub, and herbaceous vegetation layers.
- ✓ Most woody, invasive exotics should be removed before harvesting forest products. The use of agrochemical pesticides or hormone herbicides must be avoided.
- ✓ Use biodegradable, non-petroleum bar and chain oil to protect forest workers and groundwater supplies.
- ✓ The use of genetically modified organisms or "GMOs" must be avoided.
- ✓ Residual stand damage -- including basal wounds, broken and/or scraped tops, and exposed roots -- should be confined to 10% or fewer of the dominant or co-dominant trees.
- ✓ It is recommended that all trees to be removed be marked prior to the inception of harvest.
- ✓ Average annual removal of woody biomass from the site should not exceed 70% of the average annual growth.
- ✓ Avoid grazing by domestic animals and support active control of deer populations.

Sensitive and Special Habitat Areas

Areas including wetlands, raptor nests, upturned tree roots, seeps, vernal pools, hard/soft mast species, and other unique or fragile, natural or cultural sites including areas of historical or community significance sites require identification and protection.² Harvesting and road building in wetlands, including the construction of new roads or expansion of the width of existing roads by more than 20%, will require a permit or review by the Wetlands Office of the Water Quality Division (802) 241-3770. The UVM publication "Wetlands Rules and Regulations: What they mean to your logging operation in Vermont" should be referred to when building or upgrading access and managing vegetation around wetland

² Cultural resources should be protected by following best management practices contained in *Stonewalls and Cellarholes* (VT ANR 1994). Well-drained terraces within 100 feet of permanent streams and having south to west aspect are potential prehistoric sites. These should be mapped and/or otherwise identified and avoided. If site disruption is likely, the Vermont Division of Historic Preservation should be consulted with permission of the landowner(s).

Table 1: Recommended Distances Between Drainage Structures on Logging Roads

Feet

Road Grade (Percent)	Distance Between Waterbars	Distance Between Culverts	Distances Between Turnups, Dips & Pole Culverts
1	400	400	400
2	250	250	250
5	135	235	135
10	80	80	80
15	60	60	60
20	45	n/a	n/a
25+	40	n/a	n/a

Table 2: Guide for Determining Culvert Size When Permanent and Temporary Truck Roads Cross Streams.

DRAINAGE AREA - The number of acres sloping toward the stream

Well Drained Soils	Shallow Soils with Frequent Rock Outcrops Or Impermeable Soil Conditions	Recommended Pipe Diameter (Inches)
16	4	15
25	7	18
40	12	21
55	16	24
84	27	30
130	47	36
190	64	42
260	90	48
335	120	54
400	166	60
550	205	66
650	250	72

Table 3: Methods of Seeding and Mulching Logging Roads, Log Landings and Skid Trails.

Temporary Cover

Material	Rate of Application	Recommended Time of Application
(A) Straw or hay free of invasive species seed	60 bales/acre	Any time
(B) Domestic Ryegrass	20 lbs./acre	Fall (for spring growth)

OR

Permanent Cover

Material	Rate of Application	Recommended Time of Application
(A) Soil Conservation Mix*	42 lbs./acre	April 15-June 15 Or Aug. 1-Sept 15

*Use mixes that contain native species only.

Table 4: Protective Strip Width Guide

Slope of Land Between Roads or Landings and Streambanks or Lake Shores (percent)**	Minimum Width Between Roads or Landings and Stream (Feet Along Surface of Ground)
0-10	50
11-20	70
21-30	90
31-40*	110

*Add 20 ft. for each additional 10% side slope.