

Marsh-Billings National Historic^{al} Park

Woodstock, Vermont

Revised Final Report, Small Parks Inventory, 26 August 1997

Principal Investigator:

Dr. Jeffrey Hughes,
Director, Field Naturalist Graduate Program
Department of Botany
University of Vermont
Burlington, VT 05405

Phone: (802)-656-0708
Fax: (802)-656-0440
E-mail: jwhughes@zoo.uvm.edu

Project Coordinator:

Wendy Cass, Graduate Fellow
Department of Botany
University of Vermont
Burlington, VT 05405

Correspondence:

Wendy Cass, Botanist
Shenandoah National Park
Inventory and Monitoring Bldg.
3655 U.S. Hwy. 211 E.
Luray, VA 22835

Phone: (540) 843-3254
Fax: (540) 999-3693
E-mail: Wendy_Cass@nps.gov

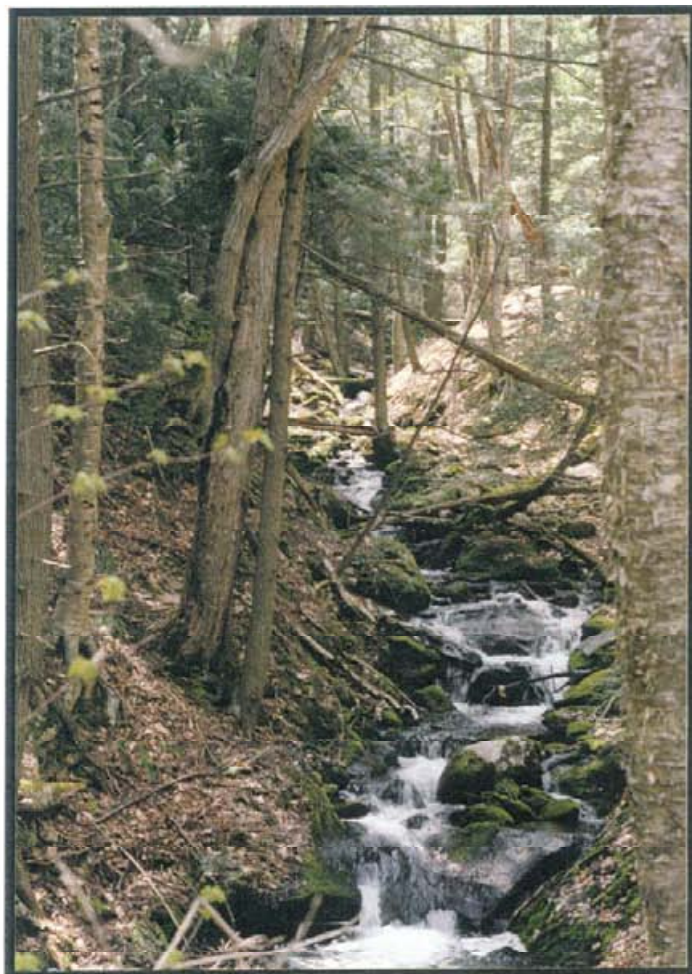


TABLE OF CONTENTS

GENERAL SITE DESCRIPTION	1
SURVEY TECHNIQUES.....	1
RESULTS	1
Rare Plant Species.....	2
Invasive Exotic Plant Species	4
Natural Communities.....	6
FUTURE SURVEY NEEDS.....	7
ACKNOWLEDGEMENTS.....	8
THREATENED AND ENDANGERED SPECIES RANKING DEFINITIONS	9
FIGURE 1.....	10
FIGURE 2.....	11
LIST OF APPENDICES	12

GENERAL SITE DESCRIPTION

The Marsh-Billings National Historic Park encompasses a diverse and beautiful landscape that is representative of central Vermont. Human influence is evident throughout much of the property as cultivation, landscaping, and forest management. Western areas of the property are the least disturbed by human activity, but do contain numerous, well maintained cross country ski trails which are used year round by Woodstock residents.

The following report summarizes presence and distribution of vascular plant species in three areas of the Park: the Billing's Farm Museum, the landscaped grounds of the Rockefeller Mansion, and the western hills beyond the Mansion. Collectively, these areas total 643 acres.

SURVEY TECHNIQUES

Prior to visiting the site, orthophoto (Appendix A), infrared aerial photo (Appendix B), topographic map (Appendix C), and forest stand (Appendix D) coverage of the property were used to delineate different habitat types. For sampling purposes the property was divided into fourteen sections (Appendix E) based on dominant vegetation (meadow, forest, cultivated) and, where applicable, forest type.

Field sampling occurred from March 1996-February 1997. After the initial pilot survey in March 1996, the property was surveyed once a month from May through September 1996, and again in February 1997. Each survey involved 20 + hours of field work that concentrated on, but was not limited to, a particular component of the flora (e.g., trees, shrubs, graminoids, spring ephemerals, or late-flowering herbs).

Each monthly site visit consisted of a walk-around survey of the fourteen sample areas with emphasis on places that were likely to contain interesting species. Our general technique was to traverse the more square sample areas with a large X pattern followed by a walk back through the center of the X. Longer narrower areas were covered in a zigzag pattern by walking from boundary to boundary while progressing in the direction of the long axis of the sample area.

RESULTS

We identified 507 vascular plant species in the Park (Appendix F). Of these, 418 were found growing wild, 80 in cultivated gardens or fields, and 9 in semi-cultivated areas. Semi-cultivated species were those that had been planted but not actively maintained. Trees in planted forest stands were considered wild. The 427 wild and semi-cultivated species represented 92 vascular plant families and included 297 forbs, 49 trees, 43 shrubs, 32 ferns,

and 6 fern allies. A complete plant list was entered into the NPFlora database program and may be accessed by calling the National Park Service in Boston.

Throughout the survey we concentrated on the wild and semi-cultivated areas of the western hills and the Billings Farm Museum. The landscaped plantings, gardens, and orchards of the Rockefeller Mansion and Billings Farm Museum were not as thoroughly surveyed. Susan Cain-McKee (Manager of Historical Gardens) and Phil Lewis (Head Gardener) are excellent resources for the contents of cultivated areas.

Several groups of plants within the Park would benefit from further survey work. Specifically, these include the: late flowering grasses, non-native honeysuckles, asters, goldenrods, and willows.

Rare Plant Species

Ten state-listed species were found on the Park property. Four of these species grew wild and six grew exclusively in cultivated or semi-cultivated areas. Two of the four wild-growing state-listed species, American ginseng (*Panax quinquefolium*, G4, VT listed S3), and Minnesota sedge (*Carex albursina*, G5, VT listed S3) were found in the western hills portion of the Park (see page 9 for definitions of state and global rank listings). The other two wild-growing state-listed species, leathery grape fern (*Botrychium multifidum*, G5, VT listed S3), and broad beech fern (*Thelypteris hexagonopteris*, G5, VT listed S2) were not located in our survey, but have been reported from the western hills by the property's forester, John Wiggin, an accomplished botanist.

NOT
STATE-
LISTED

Panax quinquefolium was found as a single reproducing plant near the top of the hill immediately west of the Pogue. Two small populations of *P. quinquefolium* have been reported (J. Wiggin) near the base of the north-facing slope of this same hill, but were not confirmed by this survey. A NHP rare plant field form was filled out (Appendix G) and a GPS point was taken for the single *Panax quinquefolium* (Fig. 2).

Threats: The main threats to the ginseng plant are trampling and harvest by park visitors. Trampling is of special concern because the plant is near the top of a hill frequently visited for its view.

Carex albursina was found scattered on the steep limy slope west of the Pogue, in the Rich Northern Hardwood Forest Community marked in Figure 1. No GPS point was taken because of the plants scattered distribution.

Threats: The plants appeared to be thriving. There are no apparent threats as the steep slope strongly discourages human traffic as well as disturbance by tree harvest.

The remaining six cultivated or semi-cultivated state-listed species were found in two areas near the Mansion. The first area comprises the cultivated hillside wildflower garden behind the Mansion (Fig. 1). This garden is loosely landscaped with woodland wildflowers along winding paths that pass by a series of interconnected pools and waterfalls. A spring walk through this garden revealed yellow lady-slipper (*Cypripedium calceolus*, G5, VT listed S3), May apple (*Podophyllum peltatum*, G5, VT listed S1), male fern (*Dryopteris filix-mas*, G5, VT listed S2-threatened), nodding trillium (*Trillium cernuum*, G5, VT listed S2), and toad shade (*Trillium sessile*, not found outside of cultivation in Vermont). A GPS point was taken in the center of the garden (Fig. 2).

Threats: Herbivory by deer is the main threat to extirpation of these plants. Mothballs are currently used to repel deer in the spring.

The second area harboring cultivated or semi-cultivated state-listed species is a woodland walk along bark-chip paths northwest of the Mansion (Fig. 1). We classified the area as semi-cultivated because uncommon plant species have been added periodically by John Wiggin. The walk begins near where ski trail #17 (pole drag) converges with ski trail #4 (lower cross). The path is reached by walking on the left side of the small meadow, and through the left side of the long open garage-like building. A spring walk through this garden revealed showy lady-slipper (*Cypripedium reginae*, G4, VT listed S3), and giant Solomon's seal (*Polygonatum biflorum*, G5, VT listed S1) growing alongside the paths. In addition, male fern (*Dryopteris filix-mas*, G5, VT listed S2-threatened) was found on the stone wall on the side of the road bridge just to the left of where the chip paths begin. A GPS point was taken along the walk approximately 30 m northwest of the stone wall (Fig. 2).

Threats: Herbivory by deer, and small population size are the main threats to extirpation of the rare plants in this area.

A special effort was made to locate the state endangered moonwort (*Botrychium lunaria*, G5) in mid-May 1996. *B. lunaria* was last collected in the Park in the early 1900's, and reports from the 1970's of a population on top of the hill west of the Pogue have not been confirmed. Arthur Gilman, an environmental consultant and well known Vermont fern identification expert, led the search in the area where *B. lunaria* was last collected. The search was executed by having three people, spaced approximately 5 m apart, walk the flat top of the hill west of the Pogue (this area is just east of trail #19). The line of observers slowly traversed the hilltop four times while scanning the ground for *B. lunaria*. No individuals of *B. lunaria* were found, but we did locate several individuals of *B. matricariaefolium*, a similar but more common species.

Invasive Exotic Plant Species

Twelve exotic plants of concern were found on the park property. Six of these species are considered Class I by the Vermont Nongame and Natural Heritage Program. Class I plants are defined as "highly invasive species that are currently disrupting native plant communities either on a localized or widespread scale." Specific locations of class I exotics and recommendations for control follow.

Lonicera morrowii

Morrow's honeysuckle is abundant in the forest along the Ottauquechee. It is also occasionally found by the large fields near the Pogue, and along some paths near the Mansion and the Bungalow (a summer home a short walk up the hill behind the mansion). The area near the Mansion is heavily landscaped and the honeysuckle plants do not appear to be causing any immediate problems. Plants along the Ottauquechee river, however, dominate the understory community in many places. It is unclear whether control by cutting followed by herbicide application is feasible or desirable given the abundance of honeysuckle, and the potential impact on the scenic walking path along the Ottauquechee.

Lonicera tatarica

Tatarian honeysuckle is found growing on the far west side of the property near the southern boundary. The forest is mainly coniferous with an open understory that supports widely spaced honeysuckles. The honeysuckles do not appear to be disrupting the plant community, however, measures should be taken to prevent creating large gaps that would allow plants to spread toward the Rich Northern Hardwood Forest plant community on the hill west of the Pogue. Tatarian honeysuckle also appears to be mixed with Morrow's honeysuckle in the forest along the Ottauquechee.

Lythrum salicaria

Purple loosestrife is found occasionally along the Ottauquechee River. Two small patches of loosestrife are located along the river at the southern boundary of the Billings Farm Museum property. Plants are also widely scattered on the shore along the Farm's eastern boundary. No loosestrife was found around the Pogue or in other wet areas of the property. The loosestrife populations along the Ottauquechee River should be eradicated with herbicides, or should have biocontrol insects (such as *Galerucella* spp.) released on them, while they are still small. We recommend that any first year loosestrife plant establishing at the Pogue be pulled or herbicided prior to flowering.

Polygonum cuspidatum

Japanese knotweed is found in a dense stand (approximately 30 m²) along the Ottauquechee river on the southern border of the Farm property. An additional small stand of knotweed is found set back from the river just east of the Billings Farm Museum Fields. The stands do not appear to be causing any immediate problems, but should be watched for signs of spreading.

Rhamnus cathartica

Common buckthorn is occasional to common on the edges of the large open meadows near the Pogue. Buckthorn invasion is particularly evident on the north and east sides of the large meadow in area B2 (appendix E). Buckthorn is also found on the edge of the thin band of forest between the Farm fields and the Ottauquechee river. Plants are especially common to the south and east of the Farm fields. Buckthorn plants east of the farm fields appear to be spreading into the natural green ash, red maple, white ash understory community, and control measures such as cutting followed by herbicide application should be considered.

Rhamnus frangula

European alder buckthorn is found occasionally along the forest edges near the Pogue. European alder buckthorn is also found in the thin band of forest between the Farm fields and the Ottauquechee river. Plants are mixed with common buckthorn and are most frequent on the south and east sides of the farm fields. At this point, plants appear to be limited to edge environments and are not disrupting deeper forest communities.

The remaining six exotic species of concern found on the property are considered Class II by the Vermont Nongame and Natural Heritage Program. Class II species are "considered to have the potential to disrupt native plant communities either on a localized or widespread scale but are currently less invasive than Class I plants."

Celandine (*Chelidonium majus*), moneywort (*Lysimachia nummularia*), and white sweet clover (*Melilotus alba*) were found in the disturbed and compacted areas near the Pogue and along the edges of the Billings Farm Museum fields. Black locust (*Robinia pseudoacacia*) was common near the back entrance gate to the western hills. Some of the trees appear intentionally planted. Japanese barberry (*Berberis thunbergii*) has escaped (was possibly planted) in places near the Mansion. Common barberry (*Berberis vulgaris*) was scattered throughout the property especially in areas Y1, G1, G4 (Appendix E) and rarely in the forest along the Ottauquechee. Common barberry was especially noticeable on the edges of the large fields near the Pogue.

Except for common barberry, the above six exotic species appeared to pose only a subtle threat to established plant communities. Common barberry is abundant enough in some areas that it may soon begin to disrupt native plant communities. Limiting disturbance and forest gap creation near established plants will probably minimize spreading.

Natural Communities

Much of the Park property has been heavily managed for forestry. While no area of the Park can be considered a completely undisturbed system, we found several good examples of natural plant communities. Community boundaries were adapted from J. Wiggin's forest stand map (Appendix D) and are designated in Figure 1. Community designations follow those outlined by the Vermont Nongame and Natural Heritage Program (Thompson, 1996)¹. Vermont state rank listings are defined on page 9 of this report.

Mesic Northern Hardwood Forest (74 acres, Vermont listed S4)

The mesic northern hardwood forest community is found throughout the western hills of the property between the planted softwood stands and mixed forest. The best example of this community is on the northern edge of the property just west of the ski cabin and south of the Gully View Trail. The canopy is dominated by mature beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), and sugar maple (*Acer saccharum*) trees. The understory is rich in sugar maple saplings, wood ferns (*Dryopteris* spp.), wild sarsaparilla (*Aralia nudicaulis*), and wild leeks (*Allium tricoccum*).

Rich Northern Hardwood Forest (20 acres, Vermont listed S3)

The extremely steep (50° in places) east-facing hillslope immediately west of the Pogue provides a small but high quality example of the rich northern hardwood forest community type. The slope supports an overstory of black cherry (*Prunus serotina*), sugar maple (*Acer saccharum*), butternut (*Juglans cinerea*), basswood (*Tilia americana*), and an abundant spring understory of blue cohosh (*Caulophyllum thalictroides*), wild leek (*Allium tricoccum*), Goldie's fern (*Dryopteris goldiana*), herb Robert (*Geranium robertianum*), maiden hair fern

¹ Thompson, E. 1996. Natural Communities of Vermont, Uplands and Wetlands. The Nature Conservancy Vermont Chapter, Montpelier, VT. pp.33.

(*Adiantum pedatum*), and hepatica (*Hepatica* spp.). As noted earlier, the state listed American ginseng (*Panax quinquefolium*) is found in one place at the top of the hill and reportedly (J. Wiggin) at the bottom of the north facing slope of this same hill. Another notable feature of this hill is a beautiful schist/crystalline limestone outcrop at its southern end. The loose soil and steep slope protect the area from human impacts.

Hemlock Forest

(9 acres, Vermont listed S4)

There is a well developed hemlock gorge at the northeast end of the western hills beyond the Mansion. The area is dominated by mature eastern hemlock (*Tsuga canadensis*) trees that provide a cool shaded environment with a very open understory. Steep loose banks crossed with wind-thrown hemlocks slope down to a swiftly flowing stream.

FUTURE SURVEY NEEDS

Future survey work should definitely include a systematic survey of the Rich Northern Hardwood Community marked on Figure 1. Ideally, this survey would include running a series of permanent transects through the area to create a grid. The creation of a 10 x 10 m grid would facilitate searching for other individuals of *Panax quinquefolium*, as well as the reported populations of *Botrychium multifidum* and *Thelypteris hexagonopteris*. Additional areas that would benefit from more detailed survey work include: the woodland wildflower walk near the Mansion, the gravel bars along the Ottawaquechee River, and the moist depression (#5) marked on Figure 1.

The *Panax quinquefolium* plant marked in Figure 2 should be monitored for survival, and the immediate area surveyed for the possible establishment of other individuals. This could be easily accompanied by a yearly site visit in July. In addition, systematic searches for *Botrychium lunaria* similar to the one described in this report may also be warranted for the next several years. These surveys should be done in late May, especially during moist years.

The abundance and vigor of the *Dryopteris filix-mas* individuals on the stone wall near the woodland wildflower walk (described on page 3, second paragraph) should also be monitored. The first step would be to count and map all individuals on or near the wall. Additional measurements of plant vigor, such as leaf number and reproductive status, would also be useful. Map updates and plant measurements should be maintained yearly.

ACKNOWLEDGEMENTS

Numerous people helped make this project successful. We especially thank: Jerry Jenkins, Arthur Gilman, Liz Thompson, John Wiggin, Susan Cain-Mckee, Phil Lewis, David Barrington, and Cathy Paris for assistance with plant identification; Steve Bless and Doug Bechtel for field assistance; and Janet Houghton, Byron Quinn, Janice Minushkin, and Nigel Shaw for on and off-site support.

THREATENED AND ENDANGERED SPECIES RANKING DEFINITIONS

Vermont State Listing Category Definitions:

The State Ranks referred to in the report are considered informational categories only and are not established by law. The rankings were developed by the Science Division of The Nature Conservancy. State ranks are assigned to species by the Nongame and Natural Heritage Program. Definitions are as follows:

S1: very rare, generally 1-5 occurrences believed to be extant and/or some factor(s) making it especially vulnerable to extirpation from the state

S2: Rare, generally 6 to 20 occurrences believed to be extant and/or some factor(s) making it vulnerable to extirpation in the state

S3: Uncommon, believed to be more than 20 occurrences and/or there is some threat to it in the state

S4: Apparently secure in state, often with more than 100 occurrences

S5: Demonstrably secure in state

State status as per the Vermont Endangered Species Law (10 V.S.A. Chap. 123)

E: Endangered: in immediate danger of becoming extirpated in the state

T: Threatened: with a high possibility of becoming endangered in the near future

Global Rank Category Definitions:

Global Ranks are assigned by the international network of Natural Heritage Data Centers, and reflect the rarity and endangerment of a species worldwide.

G5: Demonstrably secure globally

G4: Apparently secure globally, though perhaps locally rare

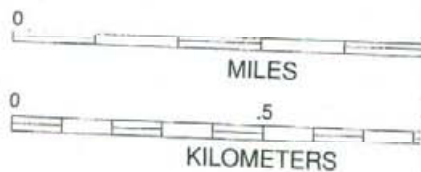
G3: Threatened globally: rare and/or local

TRAIL MAP

Woodstock

Ski Touring Center

Woodstock, Vermont 05091
Tel. 802-457-2114



- ③ EASIEST - number in symbol indicates
- ⑦ MORE DIFFICULT - number in symbol
- ⑪ MOST DIFFICULT - number in symbol

Numbers are keyed to trail system in
CONTOUR INTERVAL 20 FE

- Bridge
- Ⓟ Parking
- ⌘ Vista with picnic bench
- Open area

- Tree
- Mt.
- Route
- Mt.
- Day with

Names of trails and difficulty rating are posted at trail junctions.

Summer trail ungroomed for

Approximate Boundary of Marsh-National Historic Park

Points of Botanical Interest within Marsh-Billings National Historic Park

- ① Wildflower Garden behind Mansion
- ② Woodland wildflower walk (WWW)
- ③ *Panax quinquefolium*
- ④ Rich Northern Hardwood Forest
- ⑤ Moist depression rich in ferns
- ⑥ Hemlock Forest
- ⑦ Mesic Northern Hardwood Forest

Mt. Tom Network Trail Descriptions

- ① SLEIGH RIDE - 3.2 km - A popular route to summit overlooking Woodstock.
- ② POGUE LOOP - 1 km - A flat trail around a mountain lake.
- ③ GULLY VIEW - 2 km - Tricky corner at easternmost extent.
- ④ LOWER CROSS - .8 km - Under pine paralleling Route 12.
- ⑤ SPRING LOT TRAIL - 1 km - Easy, but for a section north of the summer pasture.
- ⑥ NORTH RIDGE TRAIL - 2.5 km - Caution on the switchbacks.
- ⑦ WHITE PINE LOOP - 1 km - Trail circles through a white pine plantation set up early this century.
- ⑧ RED PINE LOOP - .6 km - A winding trail through red pines planted in 1952.
- ⑨ LARCH LOOP - .6 km - Another curvy trail, this time through larches planted in 1880.
- ⑩ 2K GLIDE - 2.5 km - The s-curves above River Street are ungroomed and tricky.
- ⑪ BACK 40 - .6 km - This trail offers a speedy descent to the parking lot.
- ⑫ NORTH RUN - 2 km - A sugarbush closed after mid-March.
- ⑬ THE ONE LESS TRAVELLED - 2.4 km - Two separate trails really, each easily missed.
- ⑭ KING FARM LOOP - 1 km - Best skied clockwise.
- ⑮ ACER RACER - 2 km - A winding trail that passes by ancient maples.
- ⑯ THE CHUTES - .8 km - Fast, with quick curves.
- ⑰ POLE DRAG - .9 km - Fast, with gentle curves.
- ⑱ TELEMARK TRAIL - 2.7 km - Previously an alpine area. Caution at the bottom. A separate loop enters a hemlock ravine at mid-slope.
- ⑲ AIRBORNE - 1 km - Look way down upon fellow skiers on Pogue Loop. Striking view.
- ⓧ ⓧ These are various short, unnamed trails.

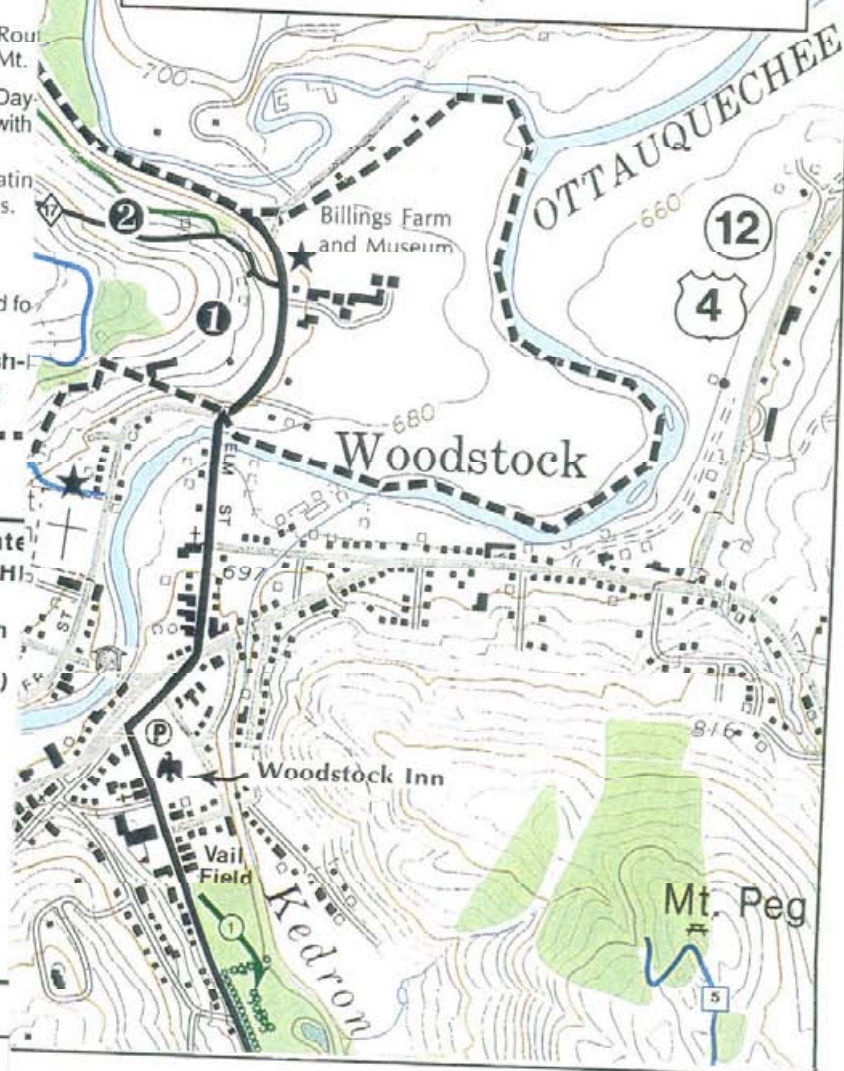


Figure 1

Woodstock Ski Touring Association map detailing survey area and points of botanical interest within Marsh-Billings NHP.

Figure 2

Approximate location of the three GPS points taken within Marsh-Billings NHP. Points 1, 2 and 3 mark the locations of the wildflower garden near the Mansion (WFG), the woodland wildflower walk (WWW), and the *Panax quinquefolium* plant, respectively.

GPS Information

GPS unit:

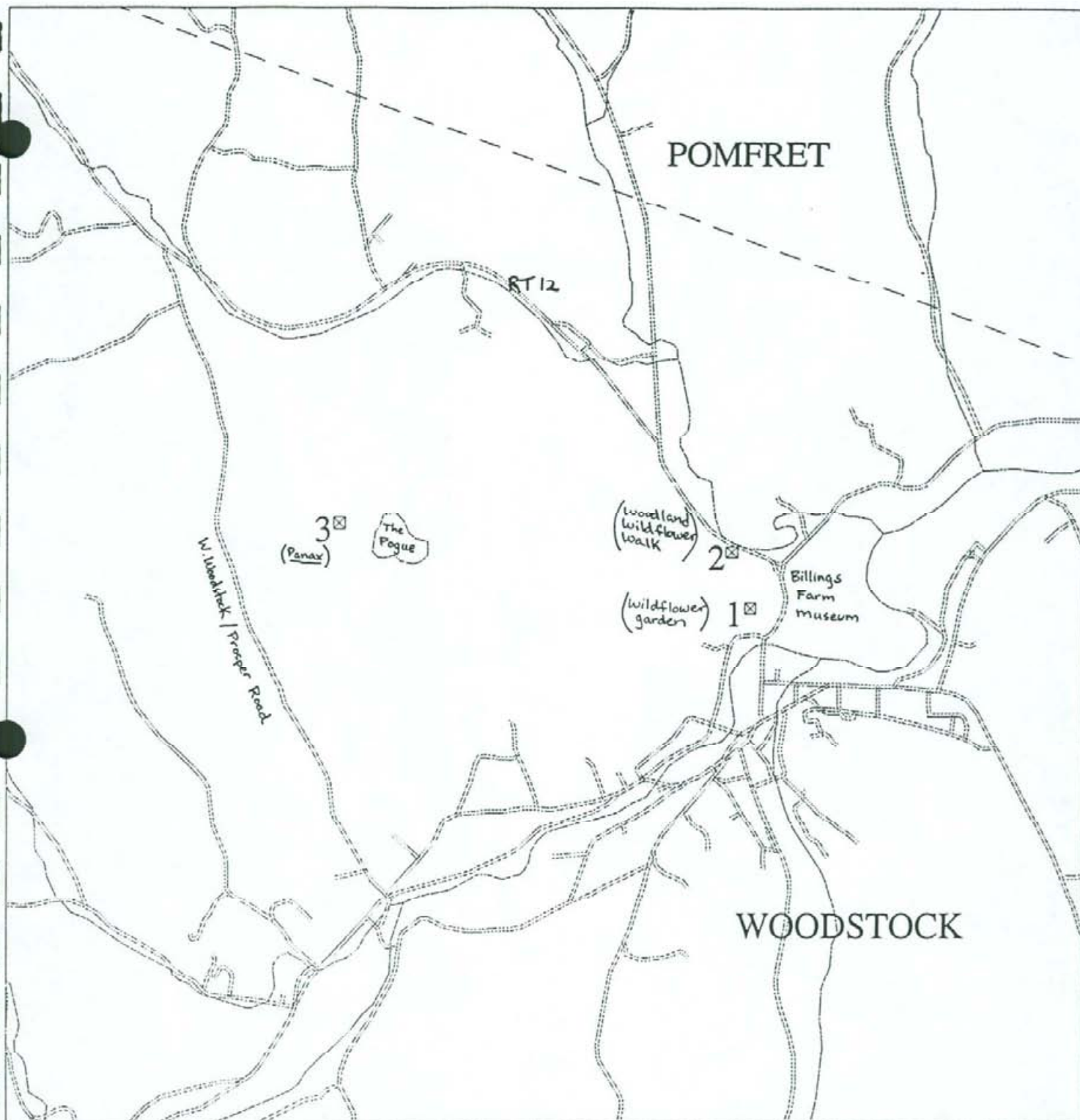
Trimble Basic Plus (should yield a 2-5 m accuracy after differential correction)

POS: 001

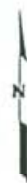
200 points/position (all points were differentially corrected)

NAD 27

	Standard Vendor Protocols	This Survey's Settings
Max PDOP	12	6
2D Switch	8	8
Elevation Mask	10	10
SNR Mask	06	06
"F" Setting	0.02	0.20



- ☒ GPS positions:
1, 700102, 4833607 (WFG)
2, 699996, 4833906 (WWW)
3, 697887, 4833993 (Panax)



- ~ Hydrology
~ Roads/Trails
- / - Town Line

(UTM zone 18 meters, NAD27)



APPENDICES

- A Vermont Mapping Program 1994 orthophoto coverage of Marsh-Billings NHP
- B Color copy of the National Aerial Photo Program, 1992-1994 series, color infrared photograph of Marsh-Billings NHP
- C Color copy of the USGS topographic map of Marsh-Billings NHP
- D General forest types at Marsh-Billings NHP (completed by J. Wiggin)
- E Woodstock Ski Association Map of Marsh-Billings NHP detailing thirteen of the fourteen plant survey areas. The working farm of the Billings Farm Museum (not shown) is the 14th sample area
- F Vascular Plant Species List for Marsh-Billings NHP
- G NHP rare plant occurrence forms and documentation for *Panax quinquefolium*
- H Telephone numbers of cooperators in the Marsh-Billings Inventory

Appendix A

Vermont Mapping Program 1994 orthophoto coverage of Marsh-Billings NHP

SHEET NO. 148124
N 125,000 m

N 40,000 FT

N 124,000 m

E 495,500

SHEET NO.
148124

NOTICE
VERMONT BASE MAPS ARE THE PROPERTY OF THE VERMONT DEPARTMENT OF TAXES. ANY REPRODUCTION OR DISTRIBUTION OF THESE MAPS WITHOUT THE WRITTEN PERMISSION OF THE VERMONT DEPARTMENT OF TAXES IS PROHIBITED.

GENERAL DATA
VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM

VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM

VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM

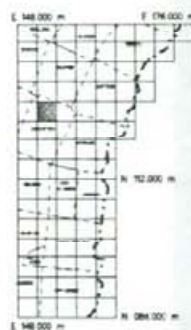
VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM

VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM
VERMONT COORDINATE SYSTEM



OFFICIAL
VERMONT BASE MAP
VERMONT MAPPING PROGRAM
Property Valuation and Review Division
DEPARTMENT OF TAXES

WOODSTOCK
SHEET NO. 148124
SERIES 5000 1994



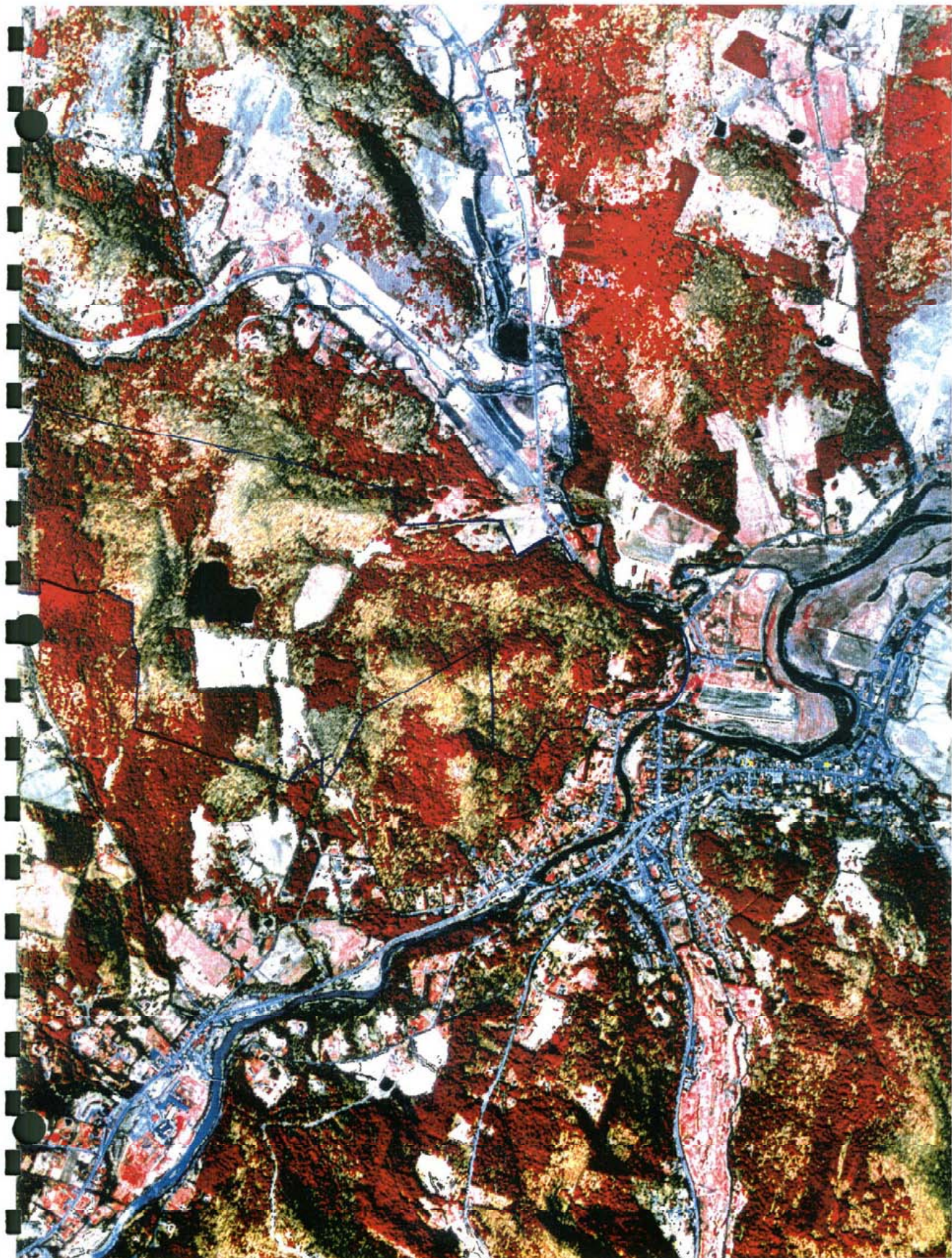
SHEET LOCATION MAP
NAD 27

SCALE 1:5000
4 854 000 m
43° 38' 30" N
SHEET NO. 148124



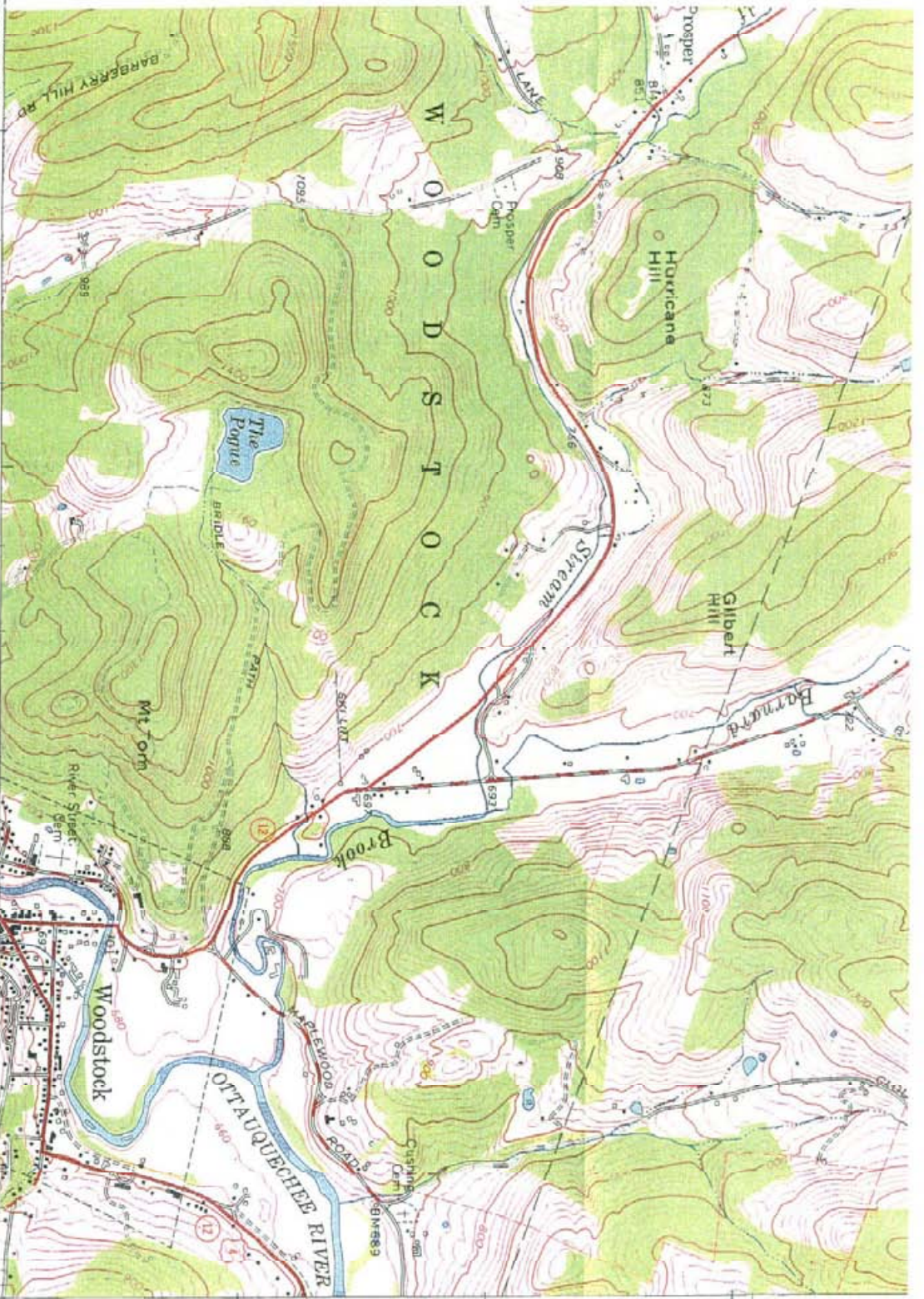
Appendix B

Color copy of the National Aerial Photo Program, 1992-1994 series, color infrared photograph of Marsh-Billings NHP

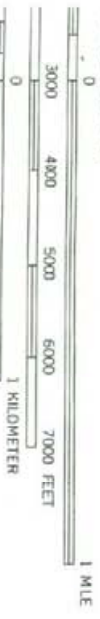


Appendix C

Color copy of the USGS topographic map of Marsh-Billings NHP



WOODSTOCK SOUTH
6471 11 SE
SCALE 1:24,000



VERTICAL INTERVAL 20 FEET
1 IS MEAN SEA LEVEL



ROAD CLASSIFICATION

Heavy-duty —————
Medium-duty —————
Light-duty —————
Unimproved dirt —————

U.S. Route State Route

BRIDGE WATER 6 MI.
RUTLAND 31 MI.
INTERIOR GEOLOGICAL SURVEY WASHINGTON, D.C. 1972

43°37'30"
72°30'

HARTLAND
6471 11 SW

TAFTSVILLE 1.9 MI.
WHITE RIVER JUNCTION (U.S. 51) 12 MI.

NATIONAL MAP ACCURACY STANDARDS
FEDERAL BUREAU OF SURVEY WASHINGTON, D.C. 20242
C MAPS AND SURVEYS IS AVAILABLE ON REQUEST

WOODSTOCK NORTH, VT.
NE/4 WOODSTOCK 15' QUADRANGLE
N43°37.5'—W72°30'7.5'

1966

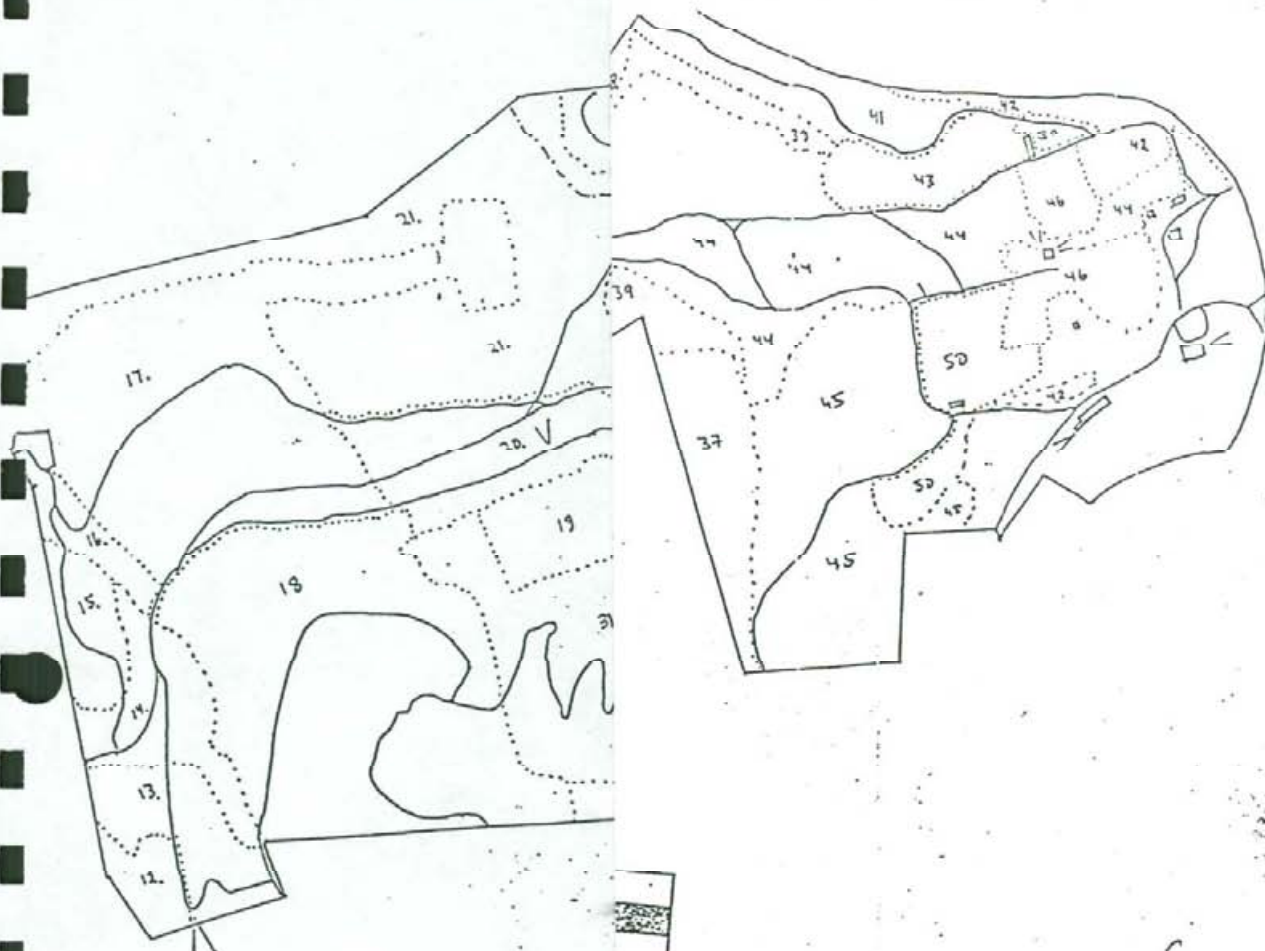
Appendix D

General forest types at Marsh-Billings NHP (completed by J. Wiggin)

KEY TO FOREST STANDS
Marsh-Billings NHP

(adapted from stand descriptions by J. Wiggin)

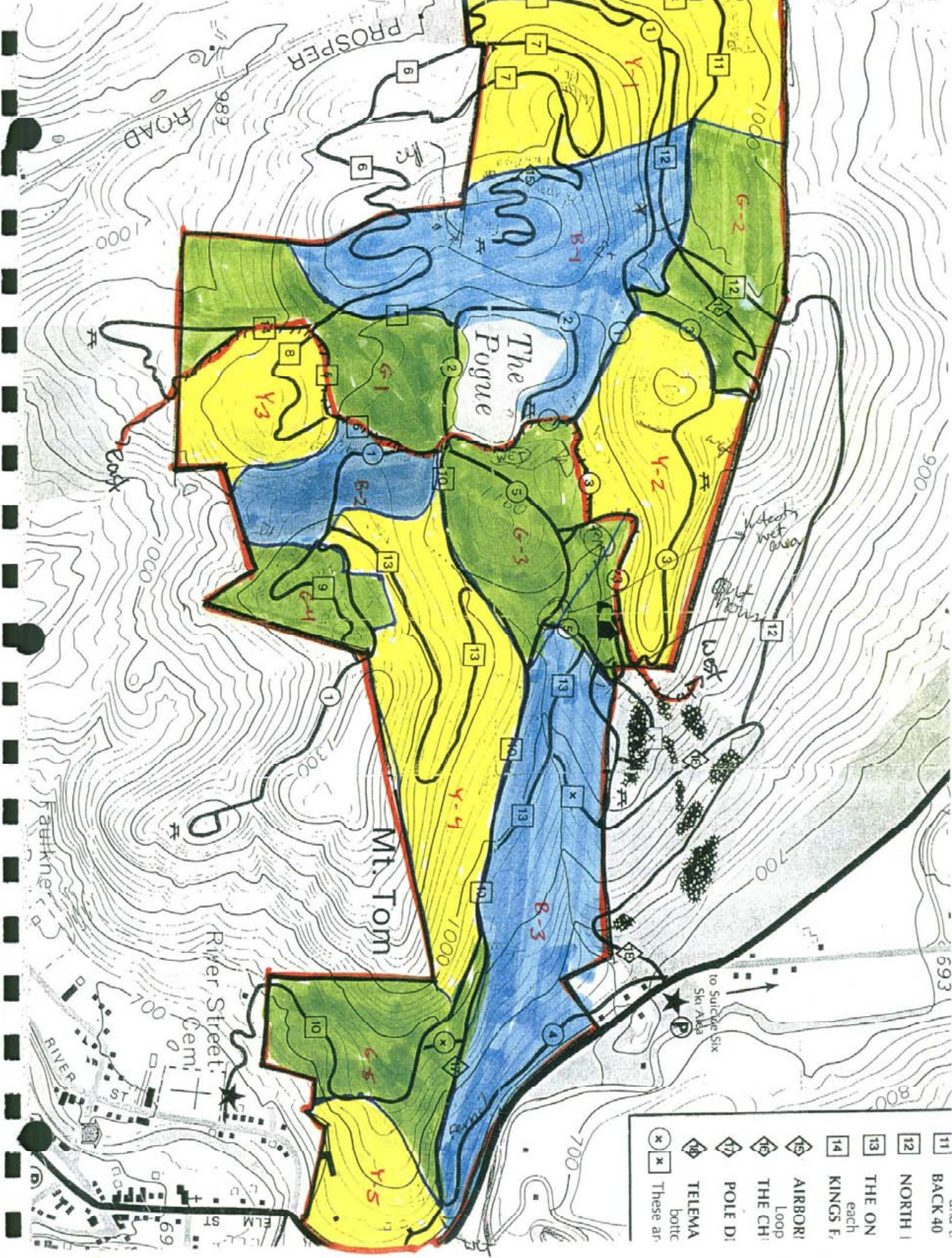
1	European larch	26	red pine
2	white pine, European ash	27	mixed hardwood, conifers
3	Norway spruce	28	Norway spruce
4	red pine	29	eastern hemlock, hardwoods
5	sugar maple, hardwoods	30	hardwoods
6	white pine, hardwoods	31	eastern hemlock, hardwoods
7	eastern hemlock	32	hardwoods
8	white pine, hardwoods	33	beech, birch, maple, hemlock
9	sugar maple, hardwoods	34	eastern hemlock, hardwoods
10	sugar maple, ash, ironwood	35	white pine
11	ironwood, sugar maple	36	red maple, black ash, hemlock
12	apple, white pine, hardwoods	37	eastern hemlock, hardwoods
13	Norway spruce	38	eastern hemlock
14	black locust, cherry, ash, birch	39	eastern hemlock, hardwoods
15	white pine	40	mixed hardwood, conifer
16	Scots pine	41	white pine, sugar maple
17	red pine	42	Norway spruce
18	white pine	43	mixed forest, European larch
19	sugar maple, hardwoods	44	hardwoods
20	hardwoods	45	mixed forest
21	eastern hemlock, hardwoods	46	white pine, spruce, hemlock
22	Scots pine	47	open water
23	big tooth aspen	48	pasture
24	maple, white ash, hardwoods	49	hayland
25	pinus (red, white, Scots)	50	open fields



Appendix E

Woodstock Ski Association Map of Marsh-Billings NHP detailing thirteen of the fourteen plant survey areas. The working farm of the Billings Farm Museum (not shown) is the fourteenth sample area.

- 11 BACK 40
- 12 NORTH
- 13 THE ON
- 14 each
- 15 KINGS F,
- 16 AIRBOR
- 17 Loop
- 18 THE CH
- 19 POLE DI
- 20 TELEMA
- 21 bottc
- 22 These ar



Appendix F

Vascular Plant Species List for Marsh-Billings NHP

Marsh Billings NHP		
GROUP	Family Latin Name	Common Name
PTERIDOPHYTE		
	Lycopodiaceae	002.0
	Lycopodium annotinum	stiff ground-pine
	Lycopodium clavatum	running ground-pine
	Lycopodium digitatum	fan ground-pine
	Lycopodium lucidulum	Shining Club-moss
	Lycopodium obscurum	princess-pine
	Lycopodium tristachyum	deep-root ground-pine
	Equisetaceae	005.0
	Equisetum arvense	field horsetail
	Equisetum hyemale	tall scouring-rush
	Equisetum scirpoides	dwarf scouring-rush
	Ophioglossaceae	006.0
	Botrychium dissectum	cut-leaf grape fern
	Botrychium matricariifolium	daisy-leaf moonwort
	Botrychium multifidum	leathery grape fern
	Botrychium virginianum	rattlesnake fern
	Osmundaceae	008.0
	Osmunda cinnamomea	cinnamon fern
	Osmunda claytoniana	interrupted fern
	Osmunda regalis	royal fern
	Adiantaceae	013.0
	Adiantum pedatum	northern maidenhair
	Polypodiaceae	022.0
	Polypodium vulgare ssp virginianum	Rock Polypody
	Dennstaedtiaceae	028.0
	Dennstaedtia punctilobula	eastern hay-scented fern
	Pteridium aquilinum	northern bracken fern
	Thelypteridaceae	029.0
	Thelypteris noveboracensis	new york fern
	Thelypteris palustris	eastern marsh fern
	Aspleniaceae	030.0
	Asplenium trichomanes	maidenhair spleenwort
	Athyrium pycnocarpon	glade fern
	Athyrium thelypteroides	silver false spleenwort
	Cystopteris fragilis var. mackayi	upland brittle bladder fern
	Thelypteris hexagonopteris	broad beech fern
	Thelypteris phegopteris	narrow beech fern
	Dryopteridaceae	037.0
	Athyrium filix-femina	subarctic lady fern
	Cystopteris bulbifera	bulblet bladder fern
	Dryopteris carthusiana	spinulose wood fern
	Dryopteris clintoniana	clinton's wood fern
	Dryopteris filix-mas	male fern
	Dryopteris goldiana	goldie's wood fern

Dryopteris intermedia	rancy wood fern
Dryopteris marginalis	marginal wood fern
Gymnocarpium dryopteris	western oak fern
Matteuccia struthiopteris	ostrich fern
Onoclea sensibilis	sensitive fern
Polystichum acrostichoides	christmas fern
Polystichum braunii	braun's holly fern
GYMNOSPERMS	
Taxaceae	005.0
Taxus canadensis	american yew
Pinaceae	006.0
Abies balsamea	balsam fir
Larix decidua	european larch
Picea abies	norway spruce
Picea glauca	white spruce
Picea rubens	red spruce
Pinus resinosa	red pine
Pinus strobus	eastern white pine
Pinus sylvestris	scotch pine
Tsuga canadensis	eastern hemlock
Cupressaceae	006.3
Juniperus communis	common juniper
Thuja occidentalis	northern white cedar
MONOCOTS	
Typhaceae	008.0
Typha angustifolia	narrow-leaf cat-tail
Typha latifolia	broad-leaf cat-tail
Sparganiaceae	010.0
Sparganium americanum	american burr-reed
Alismataceae	015.0
Sagittaria latifolia	common arrow-head
Nagadaceae	
Najas flexilis	wavy water nymph
Poaceae	019.0
Agropyron repens	creeping quack grass
Agrostis perennans	upland bent-grass
Anthoxanthum odoratum	large sweet vernal grass
Avena sativa	oat
Brachyelytrum erectum	long-awned wood grass
Bromus inermis	smooth brome
Dactylis glomerata	orchard grass
Danthonia spicata	poverty wild oat grass
Festuca pratensis	meadow fescue
Festuca arundinacea	tall fescue
Oryzopsis racemosa	black-seed mountain-rice grass
Phalaris arundinacea	reed canary grass
Phleum pratense	common timothy
Poa alsodes	grove blue grass
Poa compressa	flat-stem blue grass
Schizachne purpurascens	false melic grass
Zea mays	corn

<i>Zea mays</i> ssp. <i>saccharata</i>	sweet corn
Cyperaceae	020.0
<i>Carex albursina</i>	white bear sedge
<i>Carex blanda</i>	eastern woodland sedge
<i>Carex cephaloidea</i>	thin-leaf sedge
<i>Carex communis</i>	fibrous-root sedge
<i>Carex crinita</i>	fringed sedge
<i>Carex debilis</i>	white-edge sedge
<i>Carex disperma</i>	soft-leaf sedge
<i>Carex flava</i>	yellow-green sedge
<i>Carex gynandra</i>	nodding sedge
<i>Carex interior</i>	inland sedge
<i>Carex intumescens</i>	greater bladder sedge
<i>Carex lasiocarpa</i>	woolly-fruit sedge
<i>Carex lurida</i>	shallow sedge
<i>Carex pallescens</i>	pale sedge
<i>Carex pennsylvanica</i>	pennsylvania sedge
<i>Carex plantaginea</i>	plantain-leaf sedge
<i>Carex platyphylla</i>	broad leaf sedge
<i>Carex prasina</i>	drooping sedge
<i>Carex retrorsa</i>	retorse sedge
<i>Carex rosea</i>	rosy sedge
<i>Carex scabrata</i>	eastern rough sedge
<i>Carex sparganioides</i>	burr-reed sedge
<i>Carex sprengelii</i>	long-beak sedge
<i>Carex stipata</i>	stalk-grain sedge
<i>Carex tenera</i>	quill sedge
<i>Carex tribuloides</i>	blunt broom sedge
<i>Carex trisperma</i>	three-seed sedge
<i>Dulichium arundinaceum</i>	three-way sedge
<i>Scirpus atrovirens</i>	dark-green bulrush
<i>Scirpus microcarpus</i>	red-tinge bulrush
Araceae	023.0
<i>Arisaema triphyllum</i> ssp. <i>triphyllum</i>	jack-in-the-pulpit
<i>Calla palustris</i>	water-dragon
Lemnaceae	024.0
<i>Lemna minor</i>	common duckweed
Juncaceae	036.0
<i>Juncus tenuis</i>	poverty rush
<i>Luzula multiflora</i>	common wood-rush
Liliaceae	038.0
<i>Allium cepa</i>	garden onion
<i>Allium schoenoprasum</i>	wild chives
<i>Allium tricoccum</i>	wild leek
<i>Clintonia borealis</i>	yellow bluebead-lily
<i>Clintonia umbellulata</i>	white bluebead-lily
<i>Erythronium americanum</i>	american trout-lily
<i>Hemerocallis fulva</i>	orange day-lily
<i>Hosta ventricosa</i>	blue plantain-lily, hosta
<i>Lilium canadense</i>	canadian lily
<i>Maianthemum canadense</i>	false lily-of-the-valley
<i>Medeola virginiana</i>	indian cucumber-root
<i>Polygonatum biflorum</i>	king solomon's-seal
<i>Polygonatum pubescens</i>	hairy solomon's-seal

Smilacina racemosa	Feathery False Solomon's-seal
Streptopus roseus	rosy twistedstalk
Trillium cernuum	nodding trillium
Trillium erectum	stinking-benjamin
Trillium grandiflorum	large-flower white trillium
Trillium sessile	toadshade
Trillium undulatum	painted trillium
Uvularia grandiflora	large-flower bellwort
Uvularia sessilifolia	sesile-leaved bellwort
Iridaceae	044.0
Iris verna	dwarf violet iris
Iris versicolor	northern blue flag
Sisyrinchium montanum	strict blue-eyed-grass
Orchidaceae	050.0
Cypripedium calceolus var. parviflorum	Lesser Yellow Lady's-slipper
Cypripedium reginae	showy lady's-slipper
Epipactis helleborine	helleborine
Goodyera pubescens	downy rattlesnake-plantain
Goodyera tessellata	checkered rattlesnake-plantain
Habenaria dilatata	tall white bog-orchid
Habenaria hyperborea	Northern Green Orchid
Habenaria lacera	Green Fringed Orchid
Orchis spectabilis	Showy Orchid
Spiranthes vernalis	spring ladies'-tresses
DICOTS	
Salicaceae	056.0
Populus balsamifera	balsam poplar
Populus deltoides	eastern cottonwood
Populus grandidentata	big-tooth aspen
Populus tremuloides	quaking aspen
Salix alba	white willow
Salix babylonica	weeping willow
Salix bebbiana	gray willow
Salix eriocephala	missouri willow
Salix exigua	narrow-leaf willow
Salix nigra	black willow
Salix purpurea	purple willow
Salix sericea	silky willow
Juglandaceae	060.0
Juglans cinerea	butternut
Betulaceae	061.0
Alnus glutinosa	European alder
Alnus incana	mountain alder
Betula alleghaniensis	yellow birch
Betula papyrifera	paper birch
Betula populifolia	gray birch
Carpinus caroliniana	american hornbeam
Corylus cornuta	beaked hazelnut
Ostrya virginiana	eastern hop-hornbeam
Fagaceae	062.0
Castanea dentata	american chestnut
Fagus grandifolia	american beech

Quercus prinus	chestnut oak
Quercus rubra	northern red oak
Ulmaceae	063.0
Ulmus americana	american elm
Ulmus rubra	slippery elm
Urticaceae	065.0
Laportea canadensis	canadian wood-nettle
Pilea pumila	canadian clearweed
Urtica dioica	stinging nettle
Aristolochiaceae	074.0
Aristolochia durior	Pipevine
Asarum canadense	canadian wild ginger
Polygonaceae	077.0
Polygonum cuspidatum	japanese knotweed
Polygonum punctatum	dotted smartweed
Rumex acetosella	common sheep sorrel
Rumex obtusifolius	bitter dock
Chenopodiaceae	078.0
Beta vulgaris	sea beet
Chenopodium album	lamb's-quarters
Spinacia oleracea	spinach
Amaranthaceae	079.0
Amaranthus retroflexus	red-root amaranth
Portulacaceae	085.0
Claytonia caroliniana	carolina springbeauty
Caryophyllaceae	087.0
Cerastium viscosum	Sticky Mouse-ear Chickweed
Cerastium vulgatum	Common Mouse-ear Chickweed
Dianthus plumarius	feathered pink
Saponaria officinalis	bouncing-bett
Silene latifolia	white-campion
Nymphaeaceae	088.0
Nuphar lutea ssp. variegata	yellow pond-lily
Nymphaea odorata	american white water-lily
Ranunculaceae	091.0
Actaea alba	White Baneberry
Actaea rubra	red baneberry
Anemone canadensis	round-leaf thimbleweed
Anemone quinquefolia	wood anemone
Anemone virginiana	tall thimbleweed
Aquilegia canadensis	red columbine
Caltha palustris	yellow marsh-marigold
Cimicifuga racemosa	black cohosh
Clematis virginiana	virgin's bower
Coptis trifolia	three-leaf goldthread
Hepatica acutiloba	sharp-leaved hepatica
Hepatica americana	round-lobed hepatica
Ranunculus abortivus	kidney-leaf buttercup
Ranunculus acris	tall buttercup

Ranunculus hispidus	bristly buttercup
Ranunculus recurvatus	hispid buttercup
Thalictrum dioicum	early meadow-rue
Thalictrum pubescens	tall meadow-rue
Paeoniaceae	091.5
Paeonia lactiflora	chinese peony
Berberidaceae	093.0
Berberis thunbergii	japanese barberry
Berberis vulgaris	european barberry
Caulophyllum thalictroides	blue cohosh
Podophyllum peltatum	may-apple
Menispermum canadense	canadian moonseed
Papaveraceae	104.0
Chelidonium majus	greater celandine
Sanguinaria canadensis	bloodroot
Fumariaceae	104.1
Dicentra canadensis	squirrel-corn
Dicentra cucullaria	dutchman's-breeches
Brassicaceae	105.0
Armoracia rusticana	horse-radish
Barbarea vulgaris	garden yellow-rocket
Brassica oleracea	cabbage
Brassica rapa	turnip
Brassica rapa	field mustard
Capsella bursa-pastoris	shepherd's-purse
Cardamine diphylla	broad-leaved toothwort
Cardamine pensylvanica	quaker bittercress
Hesperis matronalis	dame's rocket
Raphanus sativus	radish
Crassulaceae	115.0
Sedum purpureum	live forever
Saxifragaceae	117.0
Astilbe biternata	appalachian false goat's-beard
Heuchera sanguinea	coralbells
Mitella diphylla	two-leaf bishop's-cap
Ribes sativum	Northern Red Currant
Saxifraga virginiana	early saxifrage
Tiarella cordifolia	heart-leaf foamflower
Grossulariaceae	117.2
Ribes cynosbati	eastern prickly gooseberry
Platanaceae	124.0
Platanus occidentalis	american sycamore
Rosaceae	126.0
Agrimonia gryposepala	tall hairy grooveburr
Amelanchier laevis	allegheny service-berry
Crataegus chrysocarpa	fire-berry hawthorn
Fragaria virginiana	virginia strawberry
Geum canadense	white avens
Geum rivale	purple avens

Potentilla argentea	silver-leaf cinquefoil
Potentilla fruticosa	shrubby cinquefoil
Potentilla norvegica	norwegian cinquefoil
Potentilla recta	sulphur cinquefoil
Prunus serotina	black cherry
Prunus virginiana	choke cherry
Pyrus communis	common pear
Pyrus coronaria	Sweet Crabapple
Pyrus malus	Apple
Rosa spp.	cultivated roses
Rubus allegheniensis	allegheny blackberry
Rubus flagellaris	northern dewberry
Rubus hispidus	bristly dewberry
Rubus idaeus	common red raspberry
Rubus occidentalis	black raspberry
Rubus odoratus	purple-flowering raspberry
Rubus pubescens	dwarf red raspberry
Sorbus americana	american mountain-ash
Spiraea alba var. latifolia	white meadowsweet
Spiraea tomentosa	steplebush
Fabaceae	128.0
Amphicarpaea bracteata	american hog-peanut
Apios americana	groundnut
Glycine max	soybean
Medicago lupulina	black medick
Medicago sativa	alfalfa
Melilotus alba	white sweetclover
Phaseolus heterophyllus	Variable-leaf Bush-bean
Pisum sativum	garden pea
Robinia pseudoacacia	black locust
Trifolium agrarium	Greater Hop Clover
Trifolium arvense	rabbit-foot clover
Trifolium aureum	greater hop clover
Trifolium pratense	red clover
Trifolium repens	white clover
Vicia cracca	purple-white tufted vetch
Geraniaceae	129.0
Geranium robertianum	herb robert
Pelargonium crispum	lemon geranium
Pelargonium fragrens	nutmeg geranium
Pelargonium graveolens	sweet-scented-geranium
Pelargonium tomentosum	peppermint geranium
Oxalidaceae	130.0
Oxalis acetosella	northern wood-sorrel
Oxalis stricta	upright yellow wood-sorrel
Tropaeolaceae	131.0
Tropaeolum majus	garden-nasturtium
Anacardiaceae	153.0
Rhus typhina	Stag-horn Sumac
Toxicodendron radicans	eastern poison-ivy
Aquifoliaceae	157.0
Ilex verticillata	common winterberry
Nemopanthus mucronatus	mountain holly

Celastraceae	158.0
<i>Celastrus scandens</i>	american bittersweet
<i>Euonymus alata</i>	winged euonymus
<i>Euonymus atropurpurea</i>	wahoo
<i>Euonymus europeus</i>	European spindle-tree
Aceraceae	163.0
<i>Acer negundo</i>	boxelder
<i>Acer pensylvanicum</i>	striped maple
<i>Acer platanoides</i>	Norway maple
<i>Acer rubrum</i>	red maple
<i>Acer saccharinum</i>	silver maple
<i>Acer saccharum</i>	sugar maple
<i>Acer spicatum</i>	mountain maple
Balsaminaceae	168.0
<i>Impatiens capensis</i>	orange touch-me-not
<i>Impatiens pallida</i>	yellow touch-me-not
Rhamnaceae	169.0
<i>Rhamnus cathartica</i>	european buckthorn
<i>Rhamnus frangula</i>	european alder-buckthorn
Vitaceae	170.0
<i>Parthenocissus quinquefolia</i>	virginia-creeper
<i>Vitis riparia</i>	river-bank grape
Tiliaceae	174.0
<i>Tilia americana</i>	american basswood
<i>Tilia cordata</i>	small-leaf linden
Malvaceae	175.0
<i>Malva moschata</i>	musk mallow
<i>Malva neglecta</i>	dwarf mallow
Clusiaceae	187.0
<i>Hypericum perforatum</i>	common st. john's-wort
<i>Hypericum punctatum</i>	spotted st. john's-wort
Violaceae	198.0
<i>Viola blanda</i>	sweet white violet
<i>Viola canadensis</i>	canadian white violet
<i>Viola conspersa</i>	american dog violet
<i>Viola macloskeyi</i> ssp. <i>pallens</i>	smooth white violet
<i>Viola nephrophylla</i>	northern bog violet
<i>Viola pubescens</i> var. <i>pubescens</i>	downy yellow violet
<i>Viola rotundifolia</i>	round-leaf yellow violet
<i>Viola sagittata</i>	arrow-leaf violet
<i>Viola selkirkii</i>	great-spur violet
<i>Viola sororia</i>	hooded blue violet
<i>Viola tricolor</i>	johnny-jump-up
Thymelaeaceae	214.0
<i>Daphne mezereum</i>	paradise-plant
<i>Dirca palustris</i>	eastern leatherwood
Lythraceae	216.0

Lythrum salicaria	purple loosestrife
Onagraceae	224.0
Circaea alpina	small enchanter's-nightshade
Circaea lutetiana	broad-leaf enchanter's-nightshade
Oenothera biennis	common evening-primrose
Araliaceae	227.0
Aralia nudicaulis	wild sarsaparilla
Aralia racemosa	american spikenard
Panax quinquefolius	american ginseng
Panax trifolius	dwarf ginseng
Apiaceae	228.0
Angelica atropurpurea	purple-stem angelica
Apium graveolens var. dulce	wild celery
Apium graveolens var. rapaceum	celeriac
Cicuta bulbifera	bulblet-bearing water-hemlock
Cicuta maculata	spotted water-hemlock
Cryptotaenia canadensis	canadian honewort
Daucus carota ssp. carota	wild carrot
Daucus carota ssp. sativus	carrot
Hydrocotyle americana	american marsh-pennywort
Osmorhiza longistylis	aniseroot
Pastinaca sativa	wild parsnip
Petroselinum crispum	parsley
Zizia aurea	golden alexanders
Cornaceae	229.0
Cornus alternifolia	alternate-leaf dogwood
Cornus amomum	silky dogwood
Cornus canadensis	canadian bunchberry
Cornus racemosa	gray dogwood
Cornus sericea	redosier
Clethraceae	230.0
Clethra alnifolia	coastal sweet-pepperbush
Pyrolaceae	231.0
Moneses uniflora	one-flowered shinleaf
Pyrola elliptica	shinleaf
Monotropaceae	231.5
Monotropa uniflora	one-flower indian-pipe
Monotropsis odorata	pygmypipes
Ericaceae	233.0
Chamaedaphne calyculata	leatherleaf
Gaultheria procumbens	eastern teaberry, wintergreen
Rhododendron spp.	cultivated Rhododendron/Azalia species
Vaccinium corymbosum	highbush blueberry
Vaccinium myrtilloides	velvet-leaf blueberry
Primulaceae	237.0
Lysimachia ciliata	fringed yellow-loosestrife
Lysimachia nummularia	moneywort
Lysimachia terrestris	swampcandles
Trientalis borealis	starflower

Oleaceae	243.0
Forsythia viridissima	green-stem forsythia
Fraxinus americana	white ash
Fraxinus excelsior	european ash
Fraxinus nigra	black ash
Fraxinus pennsylvanica	green ash
Syringa reticulata	japanese lilac tree
Syringa vulgaris	common lilac
Apocynaceae	247.0
Apocynum androsaemifolium	spreading dogbane
Apocynum cannabinum	indian-hemp
Apocynum sibiricum	dogbane
Vinca minor	lesser periwinkle
Asclepiadaceae	248.0
Asclepias incarnata	swamp milkweed
Asclepias syriaca	common milkweed
Vincetoxicum nigrum	black swallow-wort
Convolvulaceae	249.0
Calystegia sepium	hedge false bindweed
Ipomoea purpurea	common morning-glory
Hydrophyllaceae	251.0
Hydrophyllum virginianum	eastern waterleaf
Boraginaceae	252.0
Borago officinalis	borage
Hackelia virginiana	stickseed
Mertensia virginica	virginia bluebells
Myosotis scorpioides	true forget-me-not
Symphytum officinale	common comfrey
Verbenaceae	253.0
Phryma leptostachya	american lopseed
Lamiaceae	254.0
Galeopsis tetrahit	brittle-stem hemp-nettle
Glechoma hederacea	groundivy
Lamium purpureum	red dead-nettle
Lavandula angustifolia	english lavender
Leonurus cardiaca	motherwort
Lycopus americanus	cut-leaf water-horehound
Lycopus uniflorus	northern water horehound
Marrubium vulgare	white horehound
Melissa officinalis	lemonbalm
Mentha arvensis	american wild mint
Monarda fistulosa	oswego-tea
Ocimum basilicum	sweet basil
Prunella vulgaris	common selfheal
Rosmarinus officinalis	rosemary
Salvia officinalis	kitchen sage
Satureja hortensis	summer savory
Scutellaria galericulata	hooded skullcap
Scutellaria lateriflora	mad dog skullcap
Thymus vulgaris	garden thyme

Solanaceae	256.0
Capsicum annuum	green pepper
Lycopersicon lycopersicum var. pyriforme	pear tomato
Solanum dulcamara	climbing nightshade
Solanum tuberosum	irish potato
Scrophulariaceae	257.0
Chelone glabra	white turtlehead
Verbascum thapsus	great mullein
Veronica chamaedrys	germander speedwell
Veronica officinalis	common gypsyweed, speedwell
Veronica persica	bird-eye speedwell
Veronica serpyllifolia	thyme-leaf speedwell
Orobanchaceae	261.0
Epifagus virginiana	beechdrops
Orobanche uniflora	naked broom-rape
Plantaginaceae	269.0
Plantago lanceolata	english plantain
Plantago major	great plantain
Rubiaceae	270.0
Galium mollugo	false baby's-breath
Galium triflorum	fragrant bedstraw
Hedyotis caerulea	Quaker-ladies, bluets
Mitchella repens	partridge-berry
Caprifoliaceae	271.0
Lonicera canadensis	american fly-honeysuckle
Lonicera dioica	limber honeysuckle
Lonicera morrowii	morrow's honeysuckle
Lonicera tatarica	tatarian honeysuckle
Lonicera xylosteum	european fly-honeysuckle
Sambucus canadensis	american elder
Sambucus racemosa	european red elder
Viburnum acerifolium	maple-leaf viburnum
Viburnum alnifolium	Hobblebush
Viburnum dentatum	arrow-wood, withe-rod
Viburnum nudum var. cassinoides	arrow wood, wild raisin
Viburnum opulus var. americanum	highbush-cranberry
Dipsacaceae	274.0
Scabiosa atropurpurea	sweet scabious
Cucurbitaceae	275.0
Cucumis melo	melon
Cucumis sativus	garden cucumber
Cucurbita maxima	winter squash
Cucurbita maxima var. maxima	pumpkin
Cucurbita mixta	Tennessee sweet potato
Cucurbita moschata	crook-neck squash
Cucurbita pepo	field pumpkin
Echinocystis lobata	wild cucumber
Sicyos angulatus	one-seed burr-cucumber
Campanulaceae	276.0

Lobelia inflata	indian-tobacco
Asteraceae	280.0
Achillea millefolium	common yarrow
Ambrosia artemisiifolia	annual ragweed
Antennaria neglecta	field pussytoes
Anthemis cotula	Dog-fennel
Arctium minus	lesser burdock
Aster acuminatus	whorled wood aster
Aster divaricatus	white wood aster
Aster ericoides	white heath aster
Aster lanceolatus	white panicle aster
Aster lateriflorus	goblet-aster
Aster macrophyllus	large-leaf aster
Aster novae-angliae	new england aster
Aster puniceus	purple-stem aster
Aster radula	low rough aster
Aster umbellatus	parasol flat-top white aster
Bidens cernua	nodding burr-marigold
Centaurea cyanus	garden cornflower
Chrysanthemum leucanthemum	Oxeye-daisy
Cichorium intybus	chicory
Cirsium arvense	canadian thistle
Cirsium vulgare	bull thistle
Echinacea purpurea	eastern purple-coneflower
Erigeron annuus	eastern daisy fleabane
Erigeron strigosus	prairie fleabane
Eupatorium maculatum	spotted joe-pye-weed
Eupatorium rugosum	White Snakeroot
Euthamia graminifolia	flat-top goldentop
Galinsoga quadriradiata	shaggy-soldier
Helianthus annuus	common sunflower
Helianthus tuberosus	jerusalem-artichoke
Hieracium aurantiacum	devil's-paintbrush
Hieracium paniculatum	panicked hawkweed
Hieracium piloselloides	tall hawkweed
Lactuca biennis	wild blue lettuce
Lactuca sativa	garden lettuce
Ligularia tussilaginea	ligularia
Prenanthes alba	white rattlesnake-root
Prenanthes altissima	tall rattlesnake-root
Rudbeckia hirta	black-eyed-susan
Senecio aureus	golden ragwort
Solidago bicolor	white goldenrod
Solidago caesia	wreath goldenrod
Solidago canadensis	canadian goldenrod
Solidago flexicaulis	zigzag goldenrod
Solidago gigantea	late goldenrod
Solidago juncea	early goldenrod
Solidago nemoralis	gray goldenrod
Solidago rugosa	wrinkle-leaf goldenrod
Tagetes erecta	aztec marigold
Taraxacum officinale	common dandelion
Tragopogon pratensis	showy goat's beard
Tussilago farfara	colt's-foot
Xanthium strumarium	rough cocklebur
Zinnia elegans	classic zinnia

Carya cordiformis

Appendix G

NHP rare plant occurrence forms and documentation for *Panax quinquefolium*

Rare Plant Occurrence Reporting Form

Vermont Nongame and Natural Heritage Program (NNHP)

1994

OFFICE USE ONLY: Occ. # : * New: Update:]

Investigator(s) Wendy Cass, Doug Bechtel Date(s) observed 1 August 1996

Site Name (Heritage name) Marsh-Billings National Historic Park

Survey Site Steep hillside immediately west of the Pogue.

Plant Name Panax quinquefolium (american ginseng)

Quad Name Woodstock North, VT Quad Code N4337.5-W7230/7.5

The following location information is necessary only if a site survey form has not been completed.

Town Name Woodstock County Name Winsor

Directions and/or location of site: Take Rt 4 west from exit 1 on I-89, in Woodstock follow Rt 12 west about 3.5 miles to West Woodstock Road, turn left onto West Woodstock Road and follow it until you see a red barn on the right. The parking area is to your left just after the barn. Follow trails on

BIOLOGY

Phenology	Approx #	Population Area	Age Structure	Vigor
☐ in leaf	☐ ramets	☒ 1 sq. yd.	☐ % seedlings	☐ feeble
☐ in bud	(individuals	☐ 1-5 sq. yd.	☐ % immature	☐ normal
☐ in flower	connected by	☐ 5-10 sq. yd.	☐ % 1st year	☒ vigorous
☒ imm. fruit	roots or stem)	☐ 10-100	☒ % mature	
☐ mature fr.	☐ 1 genet	☐ 100 s.y.-2 ac.	☐ % senescent	
☐ dispersing	(individuals not	☐ 2 ac. +		
☐ dormant	connected by root			
	or stem)			

Comments on above (include a verbal synopsis of biological data and evidence of reproduction):

There is a single healthy plant growing away from other herbs. The fruits are swollen and green.

SURVEYSITE & HABITAT INFORMATION Natural Community form completed Y (N)

Associated Natural Community: Rich Northern Hardwood Forest

Survey site description (to be completed if a site summary has not been): The immediate area has a canopy dominated by sugar maple. The understory is very open. The topography is pit-mound (on hill slope). Nearby ground cover species include scattered individuals of Arisaema triphyllum, Dryopteris marginalis and graminoids. The loose rocky soil is covered in many areas with leaf litter and dead wood.

Substrate: Rocky soil over bedrock of Schist interbedded with micaceous crystalline limestone Topographic position: top of hill slope

Aspect: 100° Slope: 20° Elevation: 1400 ft

Light: Well shaded by forest canopy Moisture: moist

Associated plant species: none within 1 m. White ash seedlings, Jack-in-the-pulpit and Marginal wood fern are growing nearby.

How much potential habitat in the area? approx. 10 acres, maybe more

IDENTIFICATION Are there any questions about the identification or taxonomy of the plant? If so, describe:

none

Was a specimen taken? Y (N) Photos taken? (Y) N Photo #'s 7-10 Collection # _____ Repository _____

QUALITY SUMMARY (EORANK and SEORANK)

The EORANK and SEORANK represents a comparative evaluation summarizing several factors including quality, condition, viability, and defensibility.

EORANK - the global (or regional) rank.

G4

A (excellent) B (good) C (marginal) D (poor)

EORANK comments: _____

SEORANK - the state rank

S3

A (excellent) B (good) C (marginal) D (poor)

SEORANK comments: _____

CONSERVATION SUMMARY (See also Site Report)

Is the habitat natural? Yes, except for occasional vista management nearby.

Is the habitat likely to persist? yes

Is the plant likely to persist at the site? Explain. yes (if not harvested).

Threats to plant: human harvest, trampling

Conservation needs: increase population size, monitor

Management needs: discourage use of nearby deer trail by people.

OWNER(S) AND/OR MANAGER(S) (include name, telephone, address)

National Park Service

contact: Nigel Shaw, Flora survey coordinator, 15 State St.

(617)-223-5065

Boston, MA

Attach a copy of the USGS Map showing the location of the rare plant. Done ☒ N

02109

Cross-section of local topography and rare plant location. Include scale and direction.

← east

Top of Hill

Established ski trails in this area

note: two additional populations have been reported nearby. See attached maps for locations.

20 meters

Nongame and Natural Heritage Program
Department of Fish and Wildlife
103 South Main St.
Waterbury, VT 05671-0501
(802) 241-3700

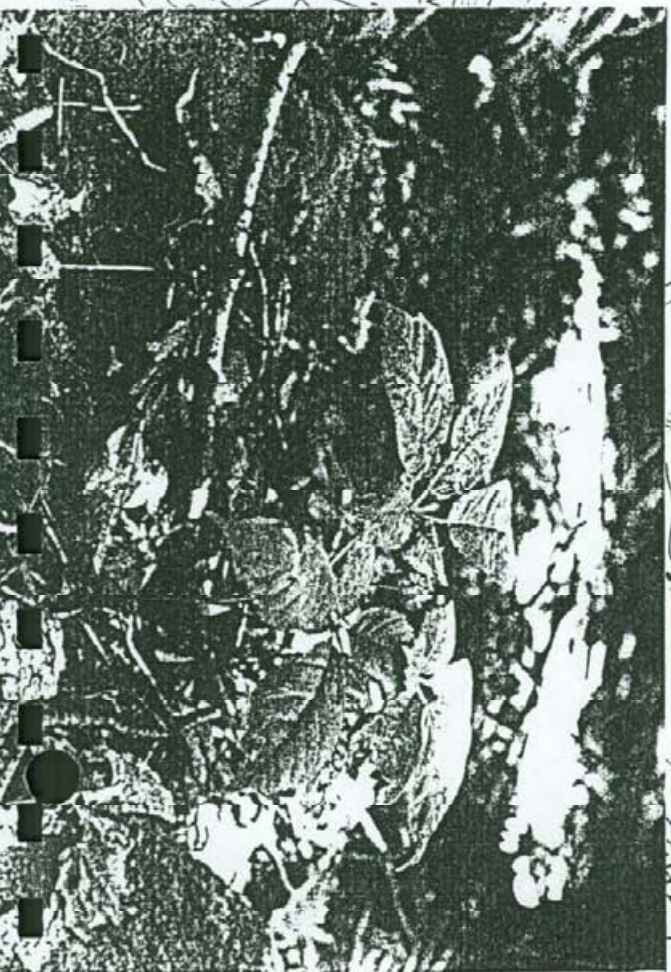
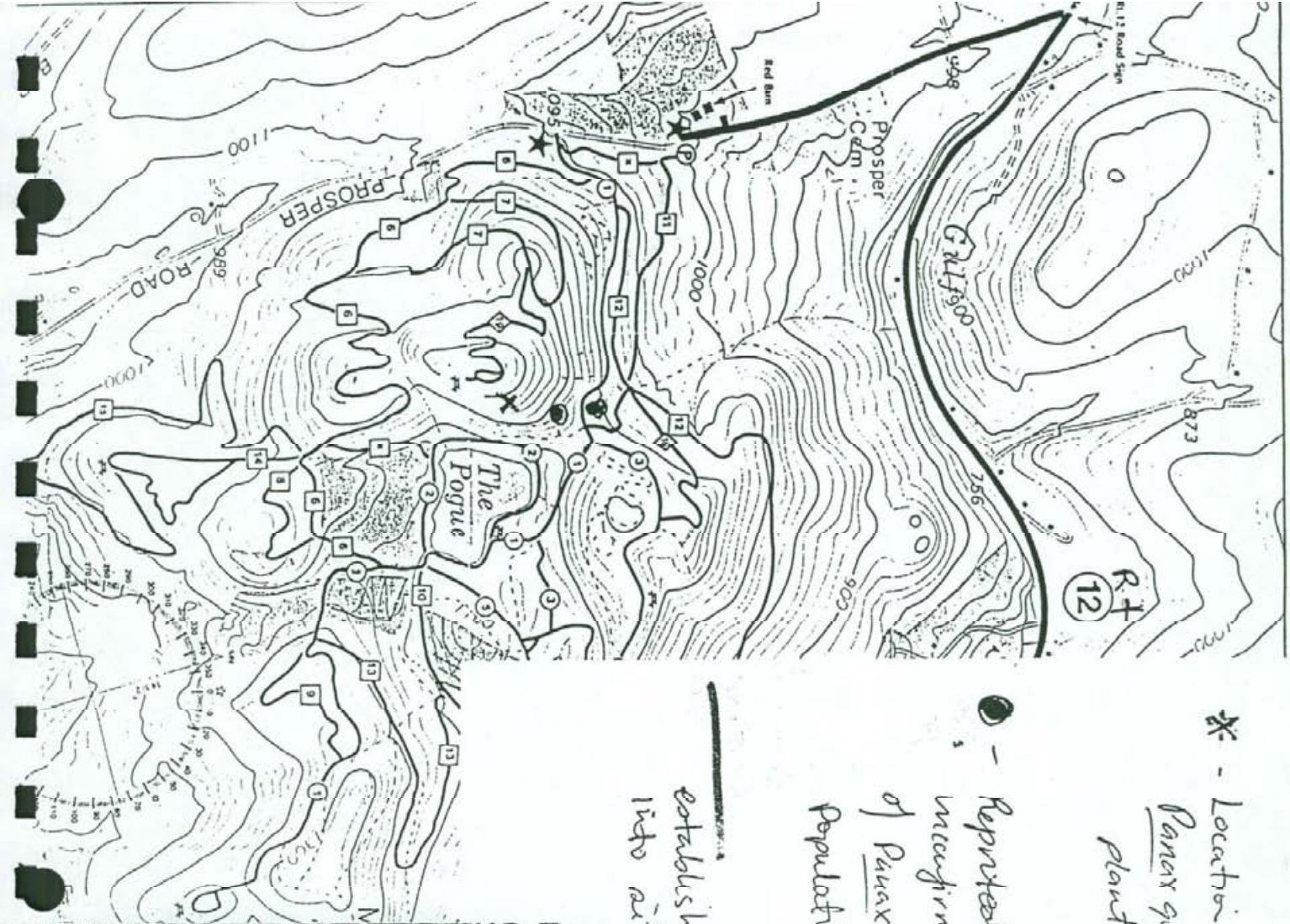
* - Location of
Parax gungaholui
plant

- Reported, but
unconfirmed location
of *Parax gungaholui*
populations.

established trail
into site.

Mt. Tom Network
Trail Descriptions

- ① SLEIGH RIDE - 3.2 km - A popular route to summit overlooking Woodstock.
- ② POGUE LOOP - 1 km - A flat trail around a mountain lake.
- ③ GULLY VIEW - 2 km - Tricky corner at easternmost extent.
- ④ LOWER CROSS - .8 km - Under pine paralleling Route 12.
- ⑤ SPRING LOT TRAIL - 1 km - Easy, but for a section north of the summer pasture.
- ⑥ NORTH RIDGE TRAIL - 2.5 km - Caution on the switchbacks.
- ⑦ WHITE PINE LOOP - 1 km - Trail circles through a white pine plantation set up early this century.
- ⑧ RED PINE LOOP - .5 km - A winding trail through red pines planted in 1952.
- ⑨ LARCH LOOP - .6 km - Another curvy trail. This time through larches planted in 1980.
- ⑩ 2K CLIMB - 2.5 km - The S-curves above River Street are ungrooved and bumpy.
- ⑪ BACK 20 - .6 km - This trail offers a superbly descent to the parking lot.
- ⑫ NORTH RUN - 2 km - A sugarbush closed after mid-March.
- ⑬ THE ONE LESS TRAVELLED - 2.4 km - Two separate trails really, each easily missed.
- ⑭ KING FARM LOOP - 1 km - Best shield clockwise.
- ⑮ ACER RACER - 2 km - A winding trail that passes by ancient maples.
- ⑯ THE CHUTES - .8 km - Fast, with quick curves.
- ⑰ POLE DRAG - .9 km - Fast, with gentle curves.
- ⑱ TELEMARK TRAIL - 2.7 km - Previously an alpine area. Caution at the bottom. A separate loop enters a hemlock forest at mid-slope.
- ⑲ AIRBORNE - 1 km - Look way down upon fallow fields on Pogue Loop. Striking view.
- ⑳ These are various short, unnamed trails.



Appendix H

Telephone numbers of cooperators in the Marsh-Billings Inventory

Telephone Numbers of Cooperators in the Marsh-Billings Inventory (August 1997)

Name	Affiliation	Title	Telephone Number
Buford	Ernest	University of Vermont	Spatial Analysis Lab Tech. II (802)-656-3324
Bulissa	Deborah	Billings Farm	Executive Secretary (802)-457-2355
Cain-McKee	Sue	Billings Farm	Manager of Historical Gardens (802)-457-2355
Cass	Wendy	University of Vermont	Project Coordinator (540)-999-3432
Donath	David	Woodstock Foundation	Director (802)-457-2355
Gilman	Art	Independent	Environmental Consultant (802)-485-8421
Goodwin	Richard	Conservation and Research Foundation	Director (301)-229-8598
Houghton	Janet	Billings Farm	Mansion Curator (802)-457-1180
Hughes	Jeffrey	University of Vermont	Professor, Principal Investigator (802)-656-0708
Jenkins	Jerry	White Creek Field School	Botanist (518)-686-7208
Lewis	Phil	Billings Farm	Head Gardener (802)-457-6653
Master	Larry	Nature Conservancy	Chief Zoologist (617)-542-1908 ext.230
Minushkin	Janice	National Park Service	Flora Data Base Administrator (617)-223-5064
Shaw	Nigel	National Park Service	Flora Survey Coordinator (617)-223-5065
Thompson	Liz	Nature Conservancy of Vermont	Asst. Head of Sci. and Stewardship (802)-229-4425
Vogelman	Hub	University of Vermont	Emeritus Professor (802)-899-4781
Wiggin	John	Billings Farm	Forester (802)-457-1574