Report to VINS on the 1995 Mansfield Vegetation study by Charles Cogbill

This report summarizes the vegetation on two vegetation plots sampled on Mount Mansfield in the September and October 1995. The work was done on the permanent 20 ha (500X400m) grids laid out by VINS in the Nose Dive and Ranch Brook areas (Fig. 1). The plots were laid out with compass and tape and marked with Al tags and flagging at 25m grid points. A total of 60 100m² plots were established on the regular grid (see Figs 2 & 3) which. The samples were taken in the 10m X 10m quadrats cornered at the intersections of a 100 m grid and square within the grid. The general location and topographic setting were described, the slope and aspect measured with inclinometer and compass, and the drainage conditions, forest floor, soil, and surface rockiness noted. Within each plot all trees over 5cm dbh were tallied by diameter to the nearest cm. Canopy height was estimated using eye and tape and canopy cover was estimated by eye as % of the plot covered. Dead trees were also tallied by diameter and dead downed wood was treated in the same manner if originally rooted in the plot. In addition the death mode (standing, snapped, snag, tip-up) and the decay (8 step) class was recorded for dead trees. A complete species list of all vascular plants was compiled for a nested series of quadrats (1X1m; 3.1X3.1m; 10X10m; and entire 100X100m plot). In addition the cover of all plants in the 1X1m plot cornered on the grid intersection was estimated by eye. In several locations a small soil (cat) pit was dug and the soil described and soil temperature taken at depth. One upper mineral soil sample was recovered and used for chemical determinations. A few trees were cored for age and growth determinations. Complete data available with Cogbill, Plainfield, VT and at VINS, Woodstock, VT

Conclusions

1) The two grids are not that well matched as the Nose Dive is at lower elevation -~3200' than Ranch Brook at ~3500'. Both sites are relatively heterogenous with ragged canopies (averaging a low 10.7 m at Nose Dive and even more depauperate 9.5m at Ranch Brook), many openings filled with herbs (more so at Nose Dive), and presently criss-crossed by ski (both official and bootleg) and hiking trails. Neither site is that enriched but the understory is richer at the Nose Dive and although more canopy open more mossy at Ranch Brook. Both the forests are dominated by fir but the Nose Dive is denser with a sizable mix of mountain paper birch.. Neither site has much more than scattered, albeit small spruce although the Nose Dive has more while Ranch Brook has larger (not especially old) holdovers. The total basal area of 29 m2/ha at the Nose Dive is about 2/3 that expected of well developed subalpine forest in the region, while the 24 m2/ha at Ranch Brook reflects the more open (distinctly gladey!--using the correct ecological not management word) over shallow soil on ledges. Dynamics seen in dead trees are prominent at both sites but Ranch Brook has the expected 1:1 dead:live ratio, but Nose Dive is closer to 1:2 dead:live ratio indicating a relatively younger and aggrading forest. Both sites are significantly disturbed (distinctly second-growth) , most probably by cutting 90 to 110 years ago and at least at Ranch Brook have a cohort of 60-70 year old trees.

2) An ordination of the understory vascular flora from 59 subalpine sites that have been sampled in VT (including a subset of Siccama's 1960s on Abraham, Bolton,

Camel's Hump and Jay) , NH, and NY place the Mansfield sites within the middle of things with the Nose Dive being toward the wet-mesic end of things and Ranch Brook being toward a slightly higher elevation affinity. Interestingly a classification (TWINSPAN) of these sites places both sites together with many of Siccama's sites in the Green Mountains-particularly on Bolton--just over the hill and the nearest geographically. Ranch Brook was joined with the Abraham site at 3400' while the Nose Dive site stood alone but close to lower elevation sites such as sites on Bolton at 3200 & 3400, Camel's Hump at 3000' and Jay at 3200'. Thus the understory flora seems routine for the Green Mountains and at the expected position --that is mid subalpine-- on an elevation gradient. Ranch Brook seems to be tending to a higher lee slope snowbanky system while the Nose Dive seems to be more lower slope mesic.

Summary grid characteristics

Nose Dive 20 ha Grid, Mount Mansfield State Forest

Mt. Mansfield, (Stowe) VT 72° 48.5' 44° 32.2' at 915-1050m (3000-3450')

Nose Dive permanent plot located below the ledges southeast of the Cliff House centered near the junction of the Cliff and the Upper Rim Rock ski trails (see Fig. 1) Sampled on 6, 11, 12, 19, and 25 Sept 1995 by KPMcFarland, JFChase, JDLambert, and CVCogbill

Average slope 20.9° ± 7.9 angle and azimuth aspect 106.8 mag° (due E) ± 22.0

Soil: (at 6C grid point: well drained spodosol with weak E and Bs at 3240') 4.37 pH, 6.5% LOI (organic matter), 27.5 cmol/Kg exchange acidity Ca 168 mg/Kg, K 29 mg/Kg; Mg 20.9 mg/Kg; Mn 3.7 mg/Kg; Fe 239 mg/Kg

Soil Temperature Mid-Sept 10.5°C

Age: spruce core (28cm dbh) from K5 grid 115 years old with release 90 yr ago

Overstory for 27 10X10m quadrats	live		dead and dead downed	
(> 5 cm dbh)	stems/ha	m²/ha	stems/ha	m²/ha
Abies balsamea	904	15.31	270	8.09
Betula cordifolia	367	10.15	130	3.55
Picea rubens	215	2.93	82	3.59
Pyrus americana/decora	63	0.74		
Prunus pensylvanica	7	0.02		
Betula alleghaniensis			11	0.27
Total trees	2915	29.15	493	15.5

Canopy average characteristics: height 10.7 m ± 2.9 62% cover

Ranch Brook Understory (below 1.5m) **This is Nose Dive Understory** – JR 12/20/02

	% freq of 27 m²	% cov		% freq of 27 m²	%cov
Oxalis montana	70	14.89	*Athyrium felix-femina*	7	1.19
Dryopteris campyloptera	63	16.74	*Betula cordifolia*	7	0.30
Abies balsamea	48	8.22	*Cornus canadensis*	7	0.11
Clintonia borealis	37	5.37	*Carex arctata*	7	0.11
Lycopodium lucidulum	37	3.67	*Dennstaedtia punctiloba*	4	0.37
Picea rubens	33	8.70	*Trillium undulatum*	4	0.19
Solidago macrophylla	19	0.59	*Thelypteris novaborensis*	4	0.15
Dryopteris phegopteris	15	0.30	*Gaultheria hispidula*	4	0.15
Pyrus americana	11	1.37	*Fragaria virginiana*	4	0.15
Aster acuminatus	11	0.74	*Cinna latifolia*?	4	0.15
Monotropa uniflora	11	0.19	*Acer spicatum*	4	0.07

Total (62spp in 20 ha) 4.11/m² 64%

Understory Cover: shrubs 19% herbs 45% moss carpet in places

Ranch Brook 20 ha Grid, Mount Mansfield State Forest

Mt. Mansfield, (Stowe) VT 72° 48.60' 44° 31.29 at 975-1150m (3200-3780')

Ranch Brook permanent plot located in steep ledgy (and seepy) headwaters of Ranch Brook including sections of the South Link and rerouted Long Trails (see Fig. 4) west of the Octagon and south of the Nose. Sampled on 29 & 31 Aug and 5, 7, 18, 19, & 20 Sept 1995 by KPMcFarland, JFChase, JDLambert, and CVCogbill

Average slope 21.3° ± 7.1 angle and azimuth aspect 162 mag° (SSE) ± 32.9

Soil: (at K7 grid point: well drained histosol with 3cm A/O and Regolith at 3600') 3.42 pH, 8.8% LOI (organic matter), 26.7 cmol/Kg exchange acidity Ca 69 mg/Kg, K 75 mg/Kg; 20.9 20.9 mg/Kg; Mn 3.8 mg/Kg; Fe 29 mg/Kg

Soil Temperature Mid-Sept 9.4°C

Ages: spruce (24.2cm):170 yr; (34.8cm): 142yr; (20.6cm): 71 yr; (15.5): 73 yr
median age 115 years oldest 170 years release about 110 years ago
fir cores (26.2cm): 62yr; (18.9): 77yr

Overstory for 30 10X10m quadrats (> 5 cm dbh)	live stems/ha	live m²/ha	dead and dead downed stems/ha	dead and dead downed m²/ha
Abies balsamea	1350	16.80	801	17.80
Betula cordifolia	340	4.75	111	1.76
Picea rubens	150	1.72	73	4.17
Pyrus americana/decora	66	0.39		
Prunus pensylvanica	10	0.06		
Betula alleghaniensis			3	0.01
Total trees	1920	23.72	986	23.71

Canopy average characteristics: height 9.5 m ± 3.6 52 % cover

Nose Dive Understory (below 1.5m)

	% freq of 30 m²	%cov		% freq of 30 m²	%cov
Oxalis montana	73	9.57	*Picea rubens*	10	1.67
Clintonia borealis	67	4.57	*Trientalis borealis*	10	0.13
Dryopteris campyloptera	60	5.47	*Cornus canadensis*	7	0.33
Abies balsamea	50	8.87	*Dryopteris phegopteris*	3	0.27
Lycopodium lucidulum	37	2.10	*Thelypteris novaborensis*	3	0.27
Coptis groenlandica	23	0.93	*Athyrium felix-femina*	3	0.07
Solidago macrophylla	13	0.27	*Acer saccharum*	3	0.07
Aster acuminatus	17	0.43	*Trillium undulatum*	3	0.03
Betula cordifolia	13	0.43	*Carex disperma*	3	0.03
Maianthemum canadense	10	0.47			

Total (50 spp. in 20 ha) 4.08/m² 36%

Understory Cover: shrubs 11% herbs 25% moss carpet in places

Table 3. Basal area (in m²/ac of trees >5 cm dbh) in 27-100m² sample plots on the 20 ha grid at the Nose Dove area Mt. Mansfield, VT

Basal Area	Balsam Fir	Mt. Birch	Spruce	Mt. Ash	Pin Cherry	m^2/ha
1C	0.87	4.59	3.68	0.67	0	9.81
1E	13.7	0	0	0	0	13.7
1G	9.04	24.28	1.74	0	0	35.06
1I	1.15	7.69	15.43	0	0	24.27
1K	2.45	8.15	0.28	0	0	10.88
3A	24.78	17.14	0	0	0	41.92
3C	7.74	0	25.38	0	0	33.12
3E	12.13	8.33	4.59	0	0	25.05
3G	28.67	5.73	0.95	0	0	35.35
3I	13.38	0	2.54	0	0	15.92
3K	31.6	24.63	1.02	0	0	57.25
5A	10.21	8.55	0.7	1.13	0	20.59
5C	5.32	7.38	0	0	0	12.7
5E Trail	0	.20	0	0	0	.20
5G	21.18	13.2	6.19	0.2	0	40.77
5I	28.55	11.34	0	0	0	39.89
5K	28.14	5.26	0.95	0	0	34.35
7A	9.26	17.55	0.5	0	0	27.31
7C Trail	0	.90	0	2.5	3.7	7.1
7E	14.29	18.21	0.38	0	0	32.88
7G	28.41	0	0.48	0	0	28.89
7I	14.76	10.75	9.08	0.38	0	34.97
7K Trail	0	0	0	0	.9	0.9
9A	21.61	9.7	0.38	1.15	0.57	33.41
9C	8.44	3.55	0.28	3.46	0	15.73
9E	10.19	16.48	2.75	8.91	0	38.33
9G	12.24	12.27	0.67	3.46	0	28.64
9I	27.9	7.8	0.92	0.2	0	36.82
9K	12.11	18.33	0	0.39	0	30.83
#/ha 27 forested	15.3	10.2	2.9	0.7	0.02	29.15

Table 4. Basal area (in m²/ha of trees >5 cm dbh) in 30-100m² sample plots on the 20 ha grid at the Ranch Brook area Mt. Mansfield, VT

Basal Area	Balsam Fir	Mt. Birch	Spruce	Mt. Ash	Pin Cherry	m^2/ha
1A	24.7	3.4				27.9
1C	29.1	10.1				39.2
1E	26.4	3.1				29.5
1G	11.1	.3	.3			11.7
1I	11.2	1.6	2.0			14.7
1K	34.2	2.0	1.8			37.9
3A	41.5	3.5	1.8			46.7
3C	26.2					26.2
3E	8.1	1.0				9.1
3G	33.8	3.2	.8			37.8
3I	36.7	5.0				41.7
3K	16.1	3.6				19.7
5A	9.0	3.3	.3			12.7
5C	1.7	.6				2.4
5E	13.9	4.9				18.8
5G	11.9		15.6			27.6
5I	6.3	2.3	3.0			11.6
5K	4.4	4.5				8.9
7A	15.0	8.1		.9		24.0
7C	12.6	10.6		.3		23.5
7E	29.2	7.8		.4		37.4
7G	9.3	4.7	2.0	.4		16.3
7I	17.9	.5	.4	.2	1.3	20.3
7K	12.4	6.9	5.6			24.9
9A	8.2	7.4	3.1	5.4		24.2
9C	9.4	29.9	3.9			43.2
9E	18.1	2.9	1.2			22.1
9G	7.2	5.3	1.5	3.5	.5	18.0
9I	13.7	6.3	2.8	.8		23.6
9K	4.7		5.5			10.3
all 30 forested	16.8	4.7	1.7	.4	.1	23.7

Species list from the forested areas of the Nose Dive and Ranch Brook 20 ha grids and the VMC studies from the west side of Mansfield at comparable elevations.

	ND	RB	West
Abies balsamea	p	p	p
Acer saccharum	p	p	
Acer pensylvanicum	p	p	p
Acer rubrum	p	p	
Acer spicatum	p	p	p
Aralia nudacaulis	p	p	p
Aster acuminatus	p	p	p
Aster punicius	p		
Athyrium felix-femina	p	p	
Amelanchier bartramiana	p		
Betula alleghaniensis	p		
Betula cordifolia	p	p	p
Rumex acetocella	p		
Carex arctata	p	p	
Carex debilis		p	
Carex disperma	p	p	
Carex brunnescens	p	p	
Carex trisperma	p	p	p
Carex intumescens	p	p	p
Chysoplenium	p		
Chelone glabra	p		
Cinna latifolia?	p		
Clintonia borealis	p	p	p
Coptis groenlandica	p	p	p
Cornus canadensis	p	p	p
Deschampsia flexulosa		p	
Diervilla lonicera	p		
Dennstaedtia punctiloba	p	p	p
Drosera rotundifolia	p		
Dryopteris campyloptera	p	p	p
Dryopteris disjuncta	p		
Dryopteris phegopteris	p	p	p
Fagus grandifolia	p		
Habenaria dilatata		p	
Gaultheria hispidula	p	p	p
Glyceria melicaria	p	p	
Lycopodium annotinum			p
Lycopodium lucidulum	p	p	p
Lycopodium clavatum		p	
Lycopodium obscurum		p	
Maianthemum canadense	p	p	p

Medeola virginiana	p		
Monotropa uniflora	p	p	p
Nemopanthus mucronata		p	p
Oxalis montana	p	p	p
Osmumda cinnamonea	p		
Osmunda claytoniana	p	p	
Picea rubens	p	p	p
Picea mariana			p
Prunus pensylvanica	p	p	p
Polypodium virginianum	p	p	
Prunus serotina			p
Pyrus americana	p	p	p
Pyrus decora	p	p	p
Ribes glandulosum	p	p	p
Rubus idaeus	p	p	
Rubus allegheniensis			p
Rubus pubescens	p		
Sambucus pubens	p		
Salix bebbiana	p		p
Solidago macrophylla	p	p	p
Streptopus amplexifolius	p	p	
Streptopus roseus		p	
Thalactrium polygamum	p		
Trientalis borealis	p	p	p
Thelypteris novaborensis	p	p	
Tsuga canadensis	p		
Trillium erectum	p		p
Trillium undulatum	p	p	p
Vaccinium angustifolium	p	p	p
Veratrum viride	p	p	p
Viburnum alnifolium	p		
Viburnum cassinoides		p	
Viola incognita	p	p	