Thesis of

E. W. Lovell

1937

Complete except for

one graph of

the pictures

INTRODUCTION

Although, in recent years, some general statements have been made as to the wildlife food production of forests (McAtee, 1936 and Edminster, 1935), detailed studies of actual production of various types at different ages and under silvicultural treatment have been lacking. Wight (21) is now working along this line, determining the influences of forest cultural practices on wildlife in Michigan.

This study was undertaken to evaluate the production of game foods in four of the more common forest types occuring in Petersham, Massachusetts; namely, old field, pure pine, pine cuttings, and hardwoods. These four types, in the order named, constitute the usual succession on the better sites. All data included are for production of foods edible in winter. Data were taken in the field from October, 1936 to April, 1937.

The values obtained in this study should be taken as comparative rather than final, as time did not permit taking a large number of samples in each type and age class.

An attempt was made to determine the effect on wildlife food production of thinning pure pine stands.

Location of the Area and History of the Forests.

Petersham is located in northern Worcester County, Massachusetts. When it was settled in 1720, about ninety per cent of the land area was covered with a many-aged stand containing both hardwoods and softwoods. Pine occurred as a tall and scattering overwood rather than in pure stands such as are now common. By 1830, sixty per cent of the land was in farms and pastures. With the opening of the West and the Civil War many farms were abandoned. Many of these abandoned areas seeded in to pure stands of white pine and now constitute the bulk of the commercial timber. Others, where pine seed was not available, seeded in to gray birch, poplar, pin cherry and red maple, all inferior species. Any pines in these areas were usually killed out in the first twenty years. When these lands, whether pine or hardwood, are cut over, there is a tendency to revert to a larger and larger proportion of hardwoods (1).

The topography of Petersham is characterized by long, low ridges running in a general north and south direction. Elevations range between 800 and 1400 feet above sea level.

The soils on the ridges consist principally of Gloucester stony sandy loam. This is dark brown or almost black, sandy, underlain by light brown sandy loam to a depth of five or six inches. The subsoil is a light yellowish-brown; at a depth of twenty-four to twenty-six inches the material is gray, coarse, sandy unweathered till. Rock fragments are scattered over the surface and through the entire soil mass.

In the valleys the soil is a Gloucester stony loam, which is similar to that on the ridges except that it is of better quality and the rocks scattered throughout the area are larger, some of them

being several feet in diameter (2). The bed rock for most of the area is Hardwick granite (3).

The best soils of the area are unsuited for cultivation because of the accumulation of rocks. They are fit only for pastures and forests. Hardwoods do very well on these soils.

The winter during which this study was made was the mildest in fifty-two years and only twelve inches of snow fell between November and March as compared with the normal of fifty-two inches.

DESCRIPTION OF TYPES

The old field type is made up of pastures or cultivated lands which have been abandoned but which do not yet support a forest. The principal species of shrubs and trees coming in are gray birch, poplar, willow, blueberry, apple, sumac, and juniper. The greater part of these areas is covered with a rank growth of dwarf raspberry, wintergreen, strawberry, cinquefoil or goldenrod.

The white pine type usually occurs pure. At forty to fifty years of age the crowns open sufficiently to allow several species of hardwoods, particularly black birch, red maple, black cherry and chestnut, to grow. At this stage there is often a heavy ground cover of partridge berry, wintergreen and Canada mayflower.

The cutover pine type is usually characterized in its early stages by an extremely heavy growth of dwarf raspberry, wintergreen and sprouts or seedlings of hardwoods. After several years the hardwoods dominate the areas to the exclusion of nearly everything else.

The hardwood type consists mainly of oak, red and sugar maple, chestnut sprouts, birches, and, on the more moist sites, white ash.

Up to fifteen or twenty years of age a large amount of browse is available for deer, rabbits, and hares. After twenty years the density is usually so great as to choke out all but the most tolerant ground cover plants.

HISTORICAL REVIEW

No attempt was made to survey all the literature on food habits of game species; however, most of the important work for this and similar regions was covered. The results of these various investigations have been incorporated into the following table. Only the species known to be found in this region are listed (20). Where references are made to genus only, it indicates that the stomach contents were not identified to species. However, this is usually in addition to that listed to species. For example, some of the material in a stomach can be identified as Betula lutea; other similar material cannot be identified to species, so it is listed as Betula sp.

Table .

Use of Native Plants by Game Birds and Mammals in the Northeast

B = Browse-Lvs, buds & twigs

S = Seed-fruit or nuts

	Ruffed Grouse (4,5)		White-tailed Deer (6,7,8)		Cottontail Rabbit (9,10,11)		Bobwhite Quail (18)		Ring-neck Pheasant (12,13)		Snowshoe Hare (14)		Raccoon (15)		Striped Skunk (16)		Gray Squirrel (17)		Red Fox (19)	
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Abies balsamea (balsam fir)			X																	
Acer spp. (maple)	X	X	X				X													
Acer pennsylvanicum (Striped maple)			X		X															
Acer rubrum (red maple)			X		X															
Acer saccharum (sugar maple)			X		X				X											
Acer saccharinum (silver maple)					X															
Acer spicatum (mountain maple)			X		X															
Alnus spp. (alder)	X		X						X											
Alnus incana (speckled alder)	X				X						X									
Ambrosia spp. (ragweed)					X		X													
Ambrosia artemisiifolia (lesser ragweed)			X						X											
Amelanchier spp. (service berry)			X		X											X				
Amelanchier canadensis (shadbush)			X																	X
Antennaria spp. (everlasting)	X										X									
Aralia spp. (sarsaparilla)			X													X				
Aralia hispida (sarsaparilla)																				X
Aronia spp. (chokeberry)	X	X			X		X		X											
Aronia melanocarpa (black chokeberry)		X			X															

	Ruffed Grouse (4,5)		White-tailed Deer (6,7,8)		Cottontail Rabbit (9,10,11)		Bobwhite Quail (15)		Ring-neck pheasant (12,13)		Snowshoe Hare (14)		Raccoon (15)		Striped Skunk (16)		Gray Squirrel (17)		Red Fox (19)	
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Aspidium spinulosum (spiny shield fern)	X		X																	
Aspidium marginale (wood fern)			X																	
Aster spp. (wild aster)	X		X																	
Azalea spp. (rhodora)	X		X																	
Benzoin aestivale (spice bush)		X	X		X															
Berberis vulgaris (barberry)		X			X				X											
Betula spp. (birches)	X		X		X						X		X							
Betula lenta (black birch)	X		X		X						X									
Betula lutea (yellow birch)	X		X		X						X									
Betula papyrifera (paper birch)	X		X								X									
Betula populifolia (gray birch)	X		X		X															
Botrychium obliquum (moonwort)	X																			
Carpinus caroliniana (blue beech)		X	X		X		X													
Castanea dentata (chestnut)		X	X																X	
Celastrus scandens (bittersweet)		X			X		X		X											
Chamaedaphne calyculata (leather-leaf)					X															
Coptis groenlandica (goldthread)	X		X																	
Cornus spp. (dogwood)	X		X				X									X				
Cornus alternifolia (alt. lvd. dogwood)		X	X		X											X				
Cornus amomum (silky dogwood)		X														X				
Cornus canadensis (bunchberry)		X	X													X				
Cornus circinata (round-lvs. dogwood)					X											X				
Cornus florida (flowering dogwood)		X					X									X				

	Ruffed Grouse		White-tailed Deer		Cottontail Rabbit		Bobwhite Quail		Ring-neck Pheasant		Snowshoe Hare		Raccoon		Striped Skunk		Gray Squirrel		Red Fox	
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Cornus paniculata (panicled dogwood)		X			X		X		X						X					
Cornus stolonifera (red-osier dogwood)					X		X		X						X					
Corylus spp. (hazelnut)		X			X				X		X								X	
Corylus americana (Am. hazelnut)	X		X																X	
Corylus rostrata (beaked hazelnut)			X		X															
Crataegus spp. (hawthorn)		X	X		X		X		X											
Daucus carota (wild carrot)	X				X															
Diervilla lonicera (bush honeysuckle)			X		X				X											
Epigaea repens (arbutus)			X																	
Epilobium angustifolium (fireweed)	X																			
Fagus grandifolia (American beech)	X		X	X	X				X				X				X			
Fragaria spp. (wild strawberry)	X	X	X								X		X		X				X	
Fragaria virginiana (strawberry)	X	X	X		X						X		X		X				X	
Fraxinus spp. (ash)								X												
Fraxinus americana (white ash)			X		X															
Fraxinus nigra (black ash)					X															
Gaultheria procumbens (wintergreen)	X	X	X	X															X	
Gaylussacia baccata (black huckleberry)		X	X		X			X		X										
Gleditsia triacanthos (honey locust)			X																	
Hamamelis virginiana (witch-hazel)	X	X	X		X					X										
Carya spp. (hickory)			X					X										X		
Carya glabra (pignut hickory)					X													X		
Carya ovata (shagbark hickory)					X													X		

	Ruffed Grouse		White-tailed Deer		Cottontail Rabbit		Bobwhite Quail		Ring-neck Pheasant		Snowshoe Hare		Raccoon		Striped Skunk		Gray Squirrel		Red Fox	
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Hypericum spp. (St. Johnswort)	X																			
Ilex glabra (American holly)			X																	
Ilex verticillata (black alder)			X				X	X			X									
Juglans cinerea (butternut)			X		X														X	
Juglans nigra (black walnut)																			X	
Juniperus communis (juniper)			X								X									
Juniperus virginiana (red cedar)			X		X			X												
Kalmia angustifolia (lambkill)	X		X																	
Kalmia latifolia (mountain laurel)	X		X																	
Lactuca spp. (wild lettuce)	X				X		X													
Larix Europea (European larch)			X									X								
Larix laricina (eastern larch)			X									X								
Lespedeza spp. (bush clover)								X												
Ligustrum vulgare (common privet)			X																	
Liriodendron tulipifera (tulip)			X		X															
Lonicera spp. (honeysuckle)			X					X												
Lycopodium spp. (club moss)			X																	
Maianthemum canadense (Canada mayflower)		X	X																	
Malus spp. (apple)	X	X	X	X	X	X		X		X	X	X		X	X	X		X		X
Mitella diphylla (Miterwort)	X																			
Mitchella repens (partridge berry)	X	X	X												X		X			X
Morus rubra (red mulberry)			X					X			X									
Myrica spp. (sweet gale)									X											

	Ruffed Grouse		White-tailed Deer		Cottontail Rabbit		Bobwhite Quail		Ring-neck Pheasant		Snowshoe Hare		Raccoon		Striped Skunk		Gray Squirrel		Red Fox	
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Myrica asplenifolia (sweet fern)			X																	
Myrica carolinensis (bayberry)		X							X											
Nyssa sylvatica (sour gum)		X							X											
Oenothera biennis (evening primrose)					X															
Ostrya virginiana (hop hornbeam)	X	X	X		X				X											
Parthenocissus quinquefolia (woodbine)		X	X						X		X			X			X			
Physalis (ground cherry)																	X			
Picea excelsa (Norway spruce)			X		X															
Picea mariana (black spruce)											X									
Pinus spp. (pine)									X		X									
Pinus resinosa (red pine)			X		X															
Pinus rigida (pitch pine)			X																	
Pinus strobus (white pine)	X		X		X						X									
Pinus sylvestris (Scotch pine)			X		X						X									
Plantago spp. (plantain)			X		X					X										
Polygonum spp. (Knot grass)		X	X						X											
Polygonum convolvulus (bindweed)										X										
Polypodium virginianum (rock fern)			X																	
Polystichum acrostichoides (C. fern)	X		X																	
Polytrichum spp. (moss)	X	X																		
Populus spp. (aspen)	X		X		X						X									
Populus tacamahacca (balsam poplar)	X																			
Populus grandidentata (large-toothed aspen)	X				X						X									

	Ruffed Grouse		White-tailed Deer		Cottontail Rabbit		Bobwhite Quail		Ring-neck Pheasant		Snowshoe Hare		Raccoon		Striped Skunk		Gray Squirrel		Red Fox	
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Populus tremuloides (trembling aspen)	X	X	X		X					X										
Potentilla spp. (cinquefoil)	X		X		X															
Prunus spp. (wild cherries)		X	X		X			X		X						X				
Prunus pennsylvanica (pin cherry)	X	X	X		X			X		X										
Prunus serotina (black cherry)	X	X	X		X			X		x				X						X
Prunus virginiana (choke cherry)		X	X		X							X								
Pteris aquilina (bracken fern)			X																	
Pyrola americana (shinleaf)	X																			
Pyrola elliptica (shinleaf)	X		X																	
Pyrus communis (common pear)					X															
Quercus spp. (oak)		X	X		X			X		X				X				X		
Quercus alba (white oak)		X	X		X					X										
Quercus borealis (red oak)		X	X		X															
Quercus prinus (chestnut oak)		X	X		X															
Quercus velutina (black oak)			X		X															
Ranunculus spp. (buttercup)	X																			
Rhamnus cathartica (buckthorn)		X																		
Rhus spp. (sumac)		X	X	X	X			X		X										
Rhus copallina (dwarf sumac)		X						X												
Rhus glabra (smooth sumac)		X	X	X	X					X										
Rhus typhina (staghorn sumac)		X	X	X	X															
Rhus toxicodendron (poison ivy)		X	X					X		X										
Rhus vernix (poison sumac)		X			X															
Ribes spp. (currant)		X	X		X			X								X				

	Ruffed Grouse		White-tailed Deer		Cottontail Rabbit		Bobwhite Quail		Ring-neck Pheasant		Snowshoe Hare		Raccoon		Striped Skunk		Gray Squirrel		Red Fox	
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Ribes nigrum (black currant(											X									
Robinia pseudoacacia (black locust)			X		X				X		X									
Rosa sp. (rose)		X			X				X		XX									
Rubus spp. (bramble)	X	X									X						X			
Rubus aculeatissimus (wild red raspberry)			X		X				X		X									
Rubus alleghenienses (blackberry)		X	X		X				X		X	X								
Rubus canadensis (raspberry)					X															
Rubus hispidus (dwarf raspberry)	X	X	X						X											
Rubus occidentalis (black raspberry)					X															
Rubus odoratus (purple flowering rasp.)					X															
Rubus villosus (dewberry)			X						X											
Rumex acetosella (sheep sorrel)	X		X																	
Salix spp. (willow)	X		X		X						X									
Salix discolor (pussy willow)					X															
Salix fragilis (crack willow)					X															
Salix lucida (shining willow)					X															
Salix rostrata (beaked willow)					X															
Sambucus spp. (elderberry)			X																	
Sambucus canadensis (black elderberry)			X						X		X									
Sambucus racemosa (red elderberry)			X	X							X									
Sassafras varilfolium (sassafras)			X						X											
Smilacina racemosa (false Solomons seal)			X																	
Smilax spp. (greenbrier)			X		X				X											

	Ruffed Grouse		White-tailed Deer		Cottontail Rabbit		Bobwhite Quail		Ring-neck Pheasant		Snowshoe Hare		Raccoon		Striped Skunk		Gray Squirrel		Red Fox	
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Solanum spp. (nightshade)		X		X		X		X		X						X				
Solidago spp. (goldenrod)	X		X		X															
Sorbus spp. (mountain ash)										X										
Sorbus americana (American mountain ash)			X	X																
Spirea spp. (hardhack)										X										
Spirea latifolia (meadowsweet)		X				X														
Taraxacum officinale (dandelion)	X					X						X								
Taxus spp. (yew)										X										
Taxus canadensis (ground hemlock)				X						X										
Thuja occidentalis (white cedar)				X		X						X								
Tilia americana (basswood)				X		X														
Trientalis americana (starflower)		X																		
Trifolium spp. (clover)	X		X		X							X				X				
Tsuga canadensis (hemlock)				X		X						X		X						
Ulmus spp. (elm)						X														
Ulmus americana (American elm)						X														
Vaccinium spp. (blueberry)	X	X	X		X			X		X								X		X
Vaccinium corymbosum (highbush blueberry)			X		X															
Vaccinium oxycoccus (small cranberry)		X								X										
Vaccinium pennsylvanicum (lowbush b.)	x	X	X																	
Viburnum spp. (arrowwood)		X	X							X										
Viburnum acerifolium (maple-leaved v.)		X				X														
Viburnum alnifolium (hobble bush)			X			X														

	Ruffed Grouse		White-tailed Deer		Cottontail Rabbit		Bobwhite Quail		Ring-neck Pheasant		Snowshoe Hare		Raccoon		Striped Skunk		Gray Squirrel		Red Fox	
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Viburnum cassinoides (wild raisin)		X	X		X															
Viburnum lantana (wayfaring tree)		X																		
Viola spp. (violet)		X						X												
Vitis spp. (grape)		X	X	X	X			X		X						X				X
Vitis labrusca (fox grape)		X																		X
Vitis vulpina (frost grape)		X								X										X

All of the above listed species are not important as game foods. The following tables will give some indication as to the more important species for this state.

Table ____.

Eleven Most Important Winter Deer Foods in Order of Preference (8)

1. Apple fruit (Malus sp.)
2. Dwarf raspberry (Rubus hispidus)
3. Ground hemlock (Taxus canadensis)
4. Wintergreen (Gaultheria procumbens)
5. Red maple (Acer rubrum)
6. Black cherry (Prunus serotina)
7. Hemlock (Tsuga canadensis)
8. Hazel (Corylus sp.)
9. Staghorn sumac (Rhus typhina)
10. Red oak (Quercus borealis)
11. Pasture juniper (Juniperus communis)

Table ___.

Analysis of 139 Ruffed Grouse Stomachs* from Massachusetts: Ten Most Important Species

	Species	Average Crop Content %	Average Frequency %
1.	Oaks (Quercus sp.)	15.51	36
2.	Hawthorn (Crataegus sp.)	8.26	32
3.	Partridge berry (Mitchella repens)	5.61	45
4.	Canada mayflower (Maianthemum canadense)	4.03	47
5.	Apple (Malus sp.)	3.46	10
6.	Barberry (Berberis vulgaris)	3.37	12
7.	Panicled dogwood (Cornus paniculata)	3.17	15
8.	Blueberry (Vaccinium sp.)	2.55	19
9.	Summer grape (Vitis bicolor)	2.46	4
10.	Black cherry (Prunus serotina)	2.41	20

* All but three were taken between October 7 and March 22. Records are from the files of the U. S. Biological Survey.

METHOD

Mil-acre plots (6.6 feet square) were used in sampling the vegetation. Plots were laid out mechanically at one-chain intervals in the various types. In some of the plots Turberville (1937, unpublished) had taken samples to a height of two feet. On these plots only the vegetation between two and six feet in height was clipped to complete the data for this study. Six feet was considered the maximum height to which deer would browse. Each species collected was kept separately in paper bags. These were later placed in an electric oven, dried forty-eight hours at 82° C., and weighed to the nearest 0.01 gram. For each species only the parts known to be taken as food by game were clipped.

Owing to the fact that 1936 was a very poor seed year for all species, there being no pine seeds or beech mast and only a very few acorns and practically no apple fruit, the values found for some of the older age classes of pine and hardwood stands are probably somewhat lower than average.

On the following pages are listed, in the order of abundance, the species found in each type and age class. The number of kilograms per acre of each species is given. (A kilogram is the equivalent of 2.2 pounds.) In summarizing the data for each age class, the weights of each species in the plots were averaged.

It should be pointed out that the figures given for the birches do not take into account the buds found above six feet in height. For obvious reasons it was impossible to clip these. However, ruffed grouse browse extensively in the tops of birch trees in winter, and the buds are an important source of food for them.

In the discussion the dominant species of hardwoods appear to change, while in actuality they do not. This is due to the small number of samples which were taken.

Average Weight Per Acre of Each Species for Each Age Class and Type

Old Field: 7 years (15 plots)

1.	Rubus hispidus (dwarf raspberry)	11.55	kilograms
2.	Populus tremuloides (trembling aspen)	10.93	
3.	Betula populifolia (gray birch)	5.73	
4.	Kalmia angustifolia (lambkill)	4.10	
5.	Salix rostrata (beaked willow)	1.51	
6.	Solidago sp. (goldenrod)	1.01	
7.	Pyrola elliptica (shinleaf)	0.71	
8.	Fragaria virginiana (strawberry)	0.54	
9.	Amelanchier canadensis (shadbush)	0.18	
10.	Viburnum cassinoides (wild raisin)	0.17	
11.	Acer rubrum (red maple)	0.13	
12.	Vaccinium pennsylvanicum (lowbush blueberry)	0.11	
13.	Fraxinus americana (white ash)	0.11	
14.	Potentilla (cinquefoil)	0.01	
		36.79	

Old Field: 15 years (15 plots)

1.	Rubus hispidus (dwarf raspberry)	14.02	kilograms
2.	Prunus virginiana (choke cherry)	2.95	
3.	Vaccinium pennsylvanicum (lowbush blueberry)	1.03	
4.	Solidago sp. (goldenrod)	0.87	
5.	Potentilla sp. (cinquefoil)	0.70	
6.	Rumex acetosella (sheep sorrel)	0.59	
7.	Antennaria sp. (pearly everlasting)	0.36	
8.	Botrychium sp. (rattlesnake fern)	0.13	
9.	Fragaria virginiana (strawberry)	0.10	
10.	Hypericum prolificum (St. Johnswort)	Tr.*	
		20.75	

Old Field: 20 years (4 plots)

1.	Fragaria virginiana (strawberry)	3.61	kilograms
2.	Rumex acetosella (sheep sorrel)	2.54	
3.	Potentilla sp. (cinquefoil)	1.76	
4.	Malus sp. (apple)	1.22	
5.	Solidago sp. (goldenrod)	0.35	
6.	Vaccinium pennsylvanicum (lowbush blueberry)	0.32	
7.	Prunus serotina (black cherry)	0.22	
8.	Botrychium sp. (rattlesnake fern)	0.15	
9.	Undetermined species #2	0.06	
		10.23	

* Trace

Pine: 10 years (10 plots)

1.	Rubus hispidus (dwarf raspberry)	1.20	kilograms	
2.	Solidago sp. (goldenrod)	0.67		
3.	Fraxinus americana (white ash)	0.20		
4.	Mitchella repens (partridge berry)	0.11		
5.	Acer rubrum (red maple)	0.09		
6.	Alnus incana (speckled alder)	0.05		
7.	Gaultheria procumbens (wintergreen)	0.02		
8.	Fragaria virginiana (strawberry)	0.01		2.35

Pine: 20 years (10 plots)

1.	Unidentified herbaceous species	0.20	kilograms	
2.	Pyrola elliptica (shinleaf)	0.06		
3.	Pyrola americana (shinleaf)	0.04		
4.	Aspidium spinulosum (wood fern)	0.01		
5.	Epipactis (rattlesnake plantain)	0.01		0.32

Pine: 30 years (10 plots)

1.	Pyrola elliptica (shinleaf)	0.50	kilograms	
2.	Vaccinium pennsylvanicum (lowbush blueberry)	0.39		
3.	Rubus hispidus (dwarf raspberry)	0.28		
4.	Gaultheria procumbens (wintergreen)	0.27		
5.	Amelanchier canadensis (shadbush)	0.06		
6.	Aspidium spinulosum (wood fern)	0.05		
7.	Pyrola americana (shinleaf)	0.04		
8.	Solidago sp. (goldenrod)	0.02		
9.	Fragaria virginiana (strawberry)	0.01		
10.	Maianthemum canadense (Canada mayflower)	0.01		
11.	Epipactis sp. (rattlesnake plantain)	Tr.		
12.	Trientalis americana (starflower)	Tr.		1.63

Pine: 40 years (10 plots)

1.	Aspidium spinulosum (wood fern)	1.67	kilograms	
2.	Polystichum acrostichoides (Christmas fern)	1.47		
3.	Castanea dentata (chestnut)	0.20		
4.	Ilex verticillata (black alder)	0.20		
5.	Fraxinus americana (white ash)	0.18		
6.	Viburnum cassinoides (wild raisin)	0.15		
7.	Vaccinium pennsylvanicum (lowbush blueberry)	0.12		
8.	Maianthemum canadense (Canada mayflower)	0.11		
9.	Cornus alternifolia (alternate-leaved dogwood)	0.04		
10.	Betula lenta (black birch)	0.04		
11.	Quercus borealis (red oak)	0.03		
12.	Acer rubrum (red maple)	Tr.		
13.	Trientalis americana (starflower)	Tr.		
				4.22

Pine: 45 years (3 plots)

1.	Vaccinium pennsylvanicum (lowbush blueberry)...	6.37	kilograms
2.	Gaultheria procumbens (wintergreen).....	5.23	
3.	Mitchella repens (partridge berry).....	3.54	
4.	Pyrola americana (shinleaf).....	1.60	
5.	Rubus hispidus (dwarf raspberry).....	0.66	
6.	Maianthemum canadense (Canada mayflower).....	0.18	
7.	Epigaea repens (trailing arbutus).....	0.14	
8.	Viburnum cassinoides (wild raisin).....	0.06	
9.	Trientalis americana (starflower).....	0.01	
		17.79	

Pine: 50 years (12 plots)

1.	Gaultheria procumbens (wintergreen).....	14.25	kilograms
2.	Vaccinium corymbosum (highbush blueberry).....	5.43	
3.	Vaccinium pennsylvanicum (lowbush blueberry)...	2.12	
4.	Quercus borealis (red oak).....	2.02	
5.	Corylus rostrata (beaked hazelnut).....	1.47	
6.	Maianthemum canadense (Canada mayflower).....	1.12	
7.	Betula lenta (black birch).....	1.11	
8.	Rubus hispidus (dwarf raspberry).....	0.96	
9.	Kalmia angustifolia (lambkill).....	0.77	
10.	Viburnum cassinoides (wild raisin).....	0.61	
11.	Prunus serotina (black cherry).....	0.57	
12.	Acer rubrum (soft maple).....	0.43	
13.	Pyrola americana (shinleaf).....	0.18	
14.	Mitchella repens (partridge berry).....	0.17	
15.	Pyrola elliptica (shinleaf).....	0.15	
16.	Solidago sp. (goldenrod).....	0.14	
17.	Crataegus sp. (hawthorn).....	0.10	
18.	Cornus canadensis (bunchberry).....	0.09	
19.	Amelanchier canadensis (shadbush).....	0.09	
20.	Ilex verticillata (black alder).....	0.04	
21.	Fragaria virginiana (strawberry).....	0.01	
22.	Trientalis americana (starflower).....	Tr.	
		31.83	

Pine: 60 years (10 plots)

1.	Mitchella repens (partridge berry).....	11.19	kilograms
2.	Gaultheria procumbens (wintergreen).....	7.19	
3.	Corylus rostrata (beaked hazelnut).....	6.50	
4.	Aspidium spinulosum (wood fern).....	3.41	
5.	Pyrola elliptica (shinleaf).....	1.54	
6.	Acer spicatum (mountain maple).....	1.23	
7.	Coptis groenlandica (goldthread).....	1.18	
8.	Cornus canadensis (bunchberry).....	0.75	
9.	Lonicera canadensis (bush honeysuckle).....	0.73	
10.	Fagus grandifolia (beech).....	0.60	
11.	Vaccinium pennsylvanicum (lowbush blueberry)...	0.40	
12.	Maianthemum canadense (Canada mayflower).....	0.32	
13.	Betula lutea (yellow birch).....	0.20	
14.	Rubus hispidus (dwarf raspberry).....	0.16	
15.	Acer rubrum (red maple).....	0.15	

Pine: 60 years (10 plots) Cont.

16.	Viburnum cassinoides (wild raisin)	0.14	kilograms
17.	Cornus paniculata (panicled dogwood)	0.12	
18.	Quercus alba (white oak)	0.12	
19.	Prunus serotina (black cherry)	0.07	
20.	Fraxinus americana (white ash)	0.05	
21.	Epipactis (rattlesnake plantain)	0.04	
22.	Kalmia angustifolia (lambkill)	0.04	
23.	Tiarella cordifolia (false miterwort)	0.04	
24.	Ilex verticillata (black alder)	0.04	
25.	Trientalis americana (starflower)	Tr.	
		36.22	

Pine: 70 years (10 plots)

1.	Gaultheria procumbens (wintergreen)	2.98	kilograms
2.	Castanea dentata (chestnut)	2.39	
3.	Acer rubrum (red maple)	1.06	
4.	Acer saccharum (sugar maple)	1.03	
5.	Quercus borealis (red oak)	0.87	
6.	Mitchella repens (partridge berry)	0.56	
7.	Corylus rostrata (beaked hazelnut)	0.55	
8.	Prunus serotina (black cherry)	0.49	
9.	Aspidium spinulosum (wood fern)	0.33	
10.	Fraxinus americana (white ash)	0.17	
11.	Cornus alternifolia (alternate-leaved dogwood)	0.09	
12.	Viburnum cassinoides (wild raisin)	0.09	
		10.60	

Cut Over: 2 years (6 plots)

1.	Rubus hispidus (dwarf raspberry)	10.77	kilograms
2.	Rumex acetosella (sheep sorrel)	9.06	
3.	Vaccinium pennsylvanicum (lowbush blueberry)	2.86	
4.	Acer rubrum (red maple)	2.58	
5.	Rubus alleghenienesis (blackberry)	2.06	
6.	Hypericum prolificum (St. Johnswort)	1.36	
7.	Pyrola americana (shinleaf)	0.89	
8.	Gaultheria procumbens (wintergreen)	0.87	
9.	Fraxinus americana (white ash)	0.71	
10.	Rhus typhina (staghorn sumac)	0.69	
11.	Prunus pennsylvanica (fire cherry)	0.68	
12.	Solidago sp. (goldenrod)	0.28	
13.	Undetermined species #2	0.13	
14.	Viola sp. (violet)	0.08	
15.	Rubus aculeatissimus (red raspberry)	0.02	
16.	Fragaria virginiana (strawberry)	0.02	
17.	Maianthemum canadense (Canada mayflower)	Tr.	
		33.08	

Cut Over: 3 years (4 plots)

1.	Rubus hispidus (dwarf raspberry)	24.04	kilograms
2.	Undetermined species #2	17.78	
3.	Mitchella repens (partridge berry)	7.52	
4.	Quercus alba (white oak)	3.51	

Cut Over: 3 years (4 plots) Cont.

5.	Fragaria virginiana (strawberry)	2.44	kilograms
6.	Quercus borealis (red oak)	1.54	
7.	Acer rubrum (red maple)	1.06	
8.	Prunus serotina (black cherry)	0.61	
9.	Hypericum prolificum (St. Johnswort)	0.44	
10.	Solidago sp. (goldenrod)	0.40	
11.	Betula papyrifera (paper birch)	0.38	
12.	Vaccinium pennsylvanicum (lowbush blueberry)	0.31	
13.	Viola sp. (violet)	0.28	
14.	Prunus pennsylvanica (fire cherry)	0.12	
15.	Lactuca scariola (wild lettuce)	0.07	
16.	Epipactis sp. (rattlesnake plantain)	0.07	
17.	Potentilla sp. (cinquefoil)	0.04	
18.	Verbascum Thapsus (mullein)	0.02	
19.	Botrychium sp. (rattlesnake fern)	0.01	
20.	Rumex acetosella (sheep sorrel)	Tr.	
		60.64	

Cut Over: 7 years (5 plots)

1.	Acer saccharum (sugar maple)	4.29	kilograms
2.	Tilia americana (basswood)	3.60	
3.	Acer rubrum (red maple)	3.59	
4.	Rubus alleghenienses (blackberry)	2.06	
5.	Fraxinus americana (white ash)	1.57	
6.	Hicoria ovata (shagbark hickory)	1.43	
7.	Corylus rostrata (beaked hazelnut)	0.92	
8.	Ilex verticillata (black alder)	0.80	
9.	Cornus alternifolia (alternate-leaved dogwood)	0.53	
10.	Prunus serotina (black cherry)	0.49	
11.	Populus tremuloides (trembling aspen)	0.40	
12.	Rhus typhina (staghorn sumac)	0.39	
13.	Betula lenta (black birch)	0.27	
14.	Quercus borealis (red oak)	0.09	
		20.43	

Hardwood: 10 years (10 plots)

1.	Fraxinus americana (white ash)	5.11	kilograms
2.	Acer rubrum (red maple)	3.78	
3.	Betula papyrifera (paper birch)	2.94	
4.	Quercus borealis (red oak)	1.28	
5.	Acer saccharum (sugar maple)	0.90	
6.	Prunus serotina (black cherry)	0.76	
7.	Castanea dentata (chestnut)	0.60	
8.	Rubus hispidus (dwarf raspberry)	0.42	
9.	Aspidium spinulosum (wood fern)	0.38	
10.	Solidago sp. (goldenrod)	0.38	
11.	Quercus alba (white oak)	0.36	
12.	Mitchella repens (partridge berry)	0.33	
13.	Salix rostrata (beaked willow)	0.28	
14.	Undetermined species #4	0.27	
15.	Rhus typhina (staghorn sumac)	0.19	
16.	Viola sp. (violet)	0.15	
17.	Rubus alleghenienses (blackberry)	0.10	

Hardwood: 10 years (10 plots) Cont.

18.	Cornus canadensis (bunchberry)	0.02
19.	Potentilla sp. (cinquefoil)	Tr.
20.	Trifolium sp. (clover)	Tr.
21.	Undetermined species #5	Tr.
22.	Undetermined species #6	Tr.
		18.25

Hardwood: 20 years (10 plots)

1.	Polystichum acrostichoides (Christmas fern)	5.28	kilograms
2.	Fraxinus americana (white ash)	1.98	
3.	Acer saccharum (sugar maple)	0.62	
4.	Betula lutea (yellow birch)	0.19	
5.	Quercus borealis (red oak)	0.11	
6.	Lonicera canadensis (bush honeysuckle)	0.11	
7.	Prunus serotina (black cherry)	0.10	
8.	Solidago sp. (goldenrod)	0.06	
9.	Rubus alleghenienses (blackberry)	0.05	
10.	Ilex verticillata (black alder)	0.05	
11.	Mitchella repens (partridge berry)	0.03	
12.	Castanea dentata (chestnut)	0.02	
13.	Aspidium spinulosum (wood fern)	0.01	
		8.61	

Hardwood: 30 years (10 plots)

1.	Gaultheria procumbens (wintergreen)	7.77	kilograms
2.	Polystichum acrostichoides (Christmas fern)	1.42	
3.	Betula lenta (black birch)	1.21	
4.	Viburnum cassinoides (wild raisin)	0.52	
5.	Castanea dentata (chestnut)	0.50	
6.	Vaccinium pennsylvanicum (lowbush blueberry)	0.49	
7.	Polypodium sp. (rock polypody)	0.46	
8.	Fraxinus americana (white ash)	0.35	
9.	Epigaea repens (trailing arbutus)	0.32	
10.	Prunus serotina (black cherry)	0.26	
11.	Viola sp. (violet)	0.20	
12.	Kalmia angustifolia (lambkill)	0.20	
13.	Rubus hispidus (dwarf raspberry)	0.20	
14.	Cornus paniculata (panicled dogwood)	0.20	
15.	Coptis groenlandica (goldthread)	0.19	
16.	Acer saccharum (sugar maple)	0.16	
17.	Betula lutea (yellow birch)	0.09	
18.	Quercus borealis (red oak)	0.09	
19.	Mitchella repens (partridge berry)	0.09	
20.	Acer rubrum (red maple)	0.08	
21.	Maianthemum canadense (Canada mayflower)	0.02	
22.	Cornus canadensis (bunchberry)	0.02	
23.	Fragaria virginiana (strawberry)	0.01	
24.	Trientalis americana (starflower)	Tr.	
		14.85	

Hardwood: 35 years (2 plots)

1.	Gaultheria procumbens (wintergreen)	12.97	kilograms
2.	Vaccinium pennsylvanicum (lowbush blueberry)	5.61	
3.	Kalmia angustifolia (lambkill)	2.97	
4.	Mitchella repens (partridge berry)	2.31	
5.	Quercus borealis (red oak)	1.32	
6.	Pyrola americana (shinleaf)	0.59	
7.	Epigaea repens (trailing arbutus)	0.32	
8.	Rubus hispidus (dwarf raspberry)	0.13	
9.	Viburnum cassinoides (wild raisin)	0.07	
10.	Trientalis americana (starflower)	Tr.	
		26.29	

Hardwood: 40 years (10 plots)

1.	Gaultheria procumbens.(wintergreen)	8.19	kilograms
2.	Aspidium spinulosum.(wood fern)	3.64	
3.	Acer rubrum (red maple)	1.29	
4.	Betula lutea (yellow birch)	0.93	
5.	Rubus hispidus (dwarf raspberry)	0.38	
6.	Fagus grandifolia.(beech)	0.36	
7.	Quercus borealis)red oak)	0.20	
8.	Mitchella repens (partridge berry)	0.17	
9.	Amelanchier canadensis (shadbush)	0.16	
10.	Castanea dentata (chestnut)	0.10	
11.	Pyrola americana (shinleaf)	0.10	
12.	Vaccinium pennsylvanicum (lowbush blueberry)	0.08	
13.	Prunus serotina (black cherry)	0.08	
14.	Maianthemum canadense (Canada mayflower)	Tr.	
		15.68	

Hardwood: 50 years (20 plots)

1.	Polystichum acrostichoides (Christmas fern)	5.24	kilograms
2.	Gaultheria procumbens (wintergreen)	1.26	
3.	Hamamelis virginiana (witch hazel)	0.95	
4.	Acer saccharum (sugar maple)	0.52	
5.	Castanea dentata (chestnut)	0.41	
6.	Viburnum cassinoides (wild raisin)	0.35	
7.	Betula lenta (black birch)	0.28	
8.	Betula lutea (yellow birch)	0.18	
9.	Quercus borealis (red oak)	0.17	
10.	Mitchella repens (partridge berry)	0.16	
11.	Aspidium marginale (spiny shield fern)	0.16	
12.	Fraxinus americana (white ash)	0.14	
13.	Tilia americana (basswood)	0.14	
14.	Pyrola americana (shinleaf)	0.13	
15.	Quercus alba (white oak)	0.07	
16.	Vaccinium pennsylvanicum (lowbush blueberry)	0.05	
17.	Prunus serotina (black cherry)	0.04	
18.	Kalmia angustifolia (lambkill)	0.03	
19.	Acer rubrum (red maple)	0.02	
20.	Ostrya virginiana (hop hornbeam)	0.01	
21.	Amelanchier canadensis (shadbush)	Tr.	
22.	Aspidium spinulosum (wood fern)	Tr.	
23.	Lonicera canadensis (bush honeysuckle)	Tr.	
24.	Epipactis repens (rattlesnake plantain)	Tr.	
		10.31	

Hardwood: 60 years (10 plots)

1.	Castanea dentata (chestnut)	2.30	kilograms
2.	Polystichum acrostichoides (Christmas fern)	1.58	
3.	Acer saccharum (sugar maple)	0.71	
4.	Ilex verticillata (black alder)	0.47	
5.	Hamamelis virginiana (witch hazel)	0.46	
6.	Mitchella repens (partridge berry)	0.30	
7.	Fraxinus americana (white ash)	0.29	
8.	Betula lutea (yellow birch)	0.21	
9.	Quercus borealis (red oak)	0.17	
10.	Prunus serotina (black cherry)	0.13	
11.	Amelanchier canadensis (shadbush)	0.11	
12.	Ostrya virginiana (hop hornbeam)	0.09	
13.	Aspidium spinulosum (wood fern)	0.07	
14.	Acer rubrum (red maple)	0.03	
15.	Polypodium sp. (rock polypody)	0.01	
16.	Rubus hispidus (dwarf raspberry)	0.01	
		6.94	

Hardwood: 70 years (6 plots)

1.	Acer rubrum (red maple)	1.06	kilograms
2.	Acer saccharum (sugar maple)	0.89	
3.	Polystichum acrostichoides (Christmas fern)	0.60	
4.	Tilia americana (basswood)	0.14	
5.	Hicoria ovata (shagbark hickory)	0.13	
6.	Betula lenta (black birch)	0.07	
7.	Aspidium spinulosum (wood fern)	0.02	
8.	Aspidium marginale (wood fern)	0.02	
		2.93	

Old Field:

Dwarf raspberry, trembling aspen, gray birch, lambkill or sheep laurel, beaked willow and goldenrod, in the order named, were the most important foods produced during the first few years following the abandonment of fields. They made up ninety-four per cent of the 37.47 kilograms of game food produced per acre.

Fifteen years after abandonment dwarf raspberry was still the most important food produced on old fields, making up seventy per cent of the 20.73 kilograms produced per acre. Other species of importance were chokecherry and lowbush blueberry. The total amount of food produced was slightly over half that in fields which had been abandoned seven years. This decrease in production appeared to be the result of the heavy accumulation of dead grasses, etc., which choked out the more tolerant old field species.

Twenty years after abandonment the total food production was 10.23 kilograms per acre, or approximately one-half that in fields abandoned fifteen years. The most important food species were strawberry, which made up thirty-six per cent of the food produced, followed by sheep sorrel, cinquefoil and apple, in the order named. Goldenrod and lowbush blueberry occurred only in small quantities.

Pine:

The dense crown canopy in pure pine stands ten years old intercepts so much light that only the most tolerant of old field species can persist. Total food production was very low, being only 2.35 kilograms per acre, or ten per cent of that on old fields abandoned twenty years. Dwarf raspberry was again the most important species, making up over fifty per cent of all food produced. Goldenrod per-

sisted to the extent of forming twenty-five per cent of the food. White ash, red maple and partridge berry were present in this age class.

Twenty-year-old pine stands are practically barren as far as game food is concerned. Only 0.32 kilograms per acre were produced; this was one-seventh of the amount produced in ten-year-old pine stands, and less than one per cent of that in fields abandoned seven years. Shinleaf was the most important species, making up thirty per cent of the total food produced. The only other species found in this type were the spiny shield fern, rattlesnake plantain and one unidentified herbaceous species.

Crown canopies started breaking up by the time the pine has reached the age of thirty years. The total food production was still very low, being only 1.63 kilograms per acre. However, this was over five times as much as was produced in twenty-year-old pine stands. Shinleaf was again the most important species, making up nearly thirty per cent of all food; this was followed by lowbush blueberry, dwarf raspberry and wintergreen, in the order named. Canada mayflower, a favorite food of the ruffed grouse, came in at this time. A total of twelve species was found in this age class.

Forty-year pine stands produced nearly three times as much food as thirty-year stands. The spiny shield and Christmas ferns made up seventy-five per cent of the 4.22 kilograms produced per acre. The rest of the food in this type was made up of eleven species of plants, of which chestnut, black alder, white ash, wild raisin, lowbush blueberry and Canada mayflower were the most important.

Crown class differentiation is very marked in fifty-year-old

pine stands. Many of the weaker individuals have been killed through suppression. The crowns, though fairly dense, are often enough to allow a heavy growth of ground cover species. Total food production amounted to 31.83 kilograms per acre, or over seven times as much as in forty-year-old stands. Wintergreen made up forty-five per cent of all food. Of the twenty-one other species which were found in this age class, highbush blueberry, lowbush blueberry, red oak, beaked hazelnut, Canada mayflower, black birch and dwarf raspberry, in the order named, were the more important.

Of all ages of pines, the sixty year class produced the most game food per acre, 36.22 kilograms. This was slightly more than in fifty-year-old stands, and over eight times that of forty-year-old stands. Partridge berry replaced wintergreen as the most important food species, making up nearly thirty per cent. Wintergreen, beaked hazelnut and the spiny shield fern were the other important species. Shrubs and hardwood tree species were more abundant in this age class than in any other in the pure pine type. The total production of Canada mayflower decreased to about one-third of that in fifty-year-old pine stands. There were twenty-five species represented in this age class.

The seventy-year-old pine type was on the decline as far as game food production was concerned. It seemed probable that this decrease was due to two influences: the hardwood tree species had reached a height at which they were no longer available for browsing, and the heavy accumulation of litter on the ground acts as a barrier to the usual ground cover species.

Cutover Pine:

When the pine was cut off, the effect was immediate and striking. The litter and duff decomposed rapidly, leaving the soil greatly enriched. Two years after cutting the total amount of food produced was three times that of seventy-year-old pine stands and two kilograms per acre greater than in sixty-year-old pines. Several species, especially dwarf raspberry and lowbush blueberry, which had been barely existing under old pine stands, took a new lease on life. Dwarf raspberry made up approximately thirty per cent of the 33.08 kilograms of game food produced per acre. This was followed by sheep sorrel, lowbush blueberry, red maple and blackberry.

Three years after cutting the pine the total food production was 60.64 kilograms per acre, nearly six times that of seventy-year-old pine stands. Dwarf raspberry was again the most important species, making up nearly forty per cent of all the food, followed by an unidentified herbaceous species (#2), partridge berry, white oak, strawberry, red oak, red maple and black cherry.

Seven years after cutting off the pine, hardwood species have become well established and are the most important food species. The total food production is only about one-third of that on areas which have been cut three years, namely, 20.43 kilograms per acre. Sugar maple, blackberry, and white ash, in the order named, made up about seventy-five per cent of all food produced. Other species which occurred in this type were shagbark hickory, beaked hazelnut, black alder, alternate-leaved dogwood, black cherry, trembling aspen, staghorn sumac, black birch and red oak.

Hardwoods:

In the ten-year-old hardwood stands, white ash, red maple, paper birch, red oak and sugar maple made up over seventy per cent of the 18.25 kilograms produced per acre. The total food production was about ten per cent less than seven years after cutting off the pine. The crown canopy was very dense and only a few low-growing cover plants, such as violets, clover, cinquefoil, and bunchberry, were present, but these were not important.

When the hardwoods are twenty years old, the crown canopies are still very dense, but most of the browse is out of reach. Most of the ground cover species were absent. Total food production was less than half that of ten-year-old hardwoods. Christmas fern successfully withstood the heavy shade because it made up over sixty per cent of the 8.61 kilograms produced per acre. White ash, occurring as advanced growth, was next in importance, totalling about twenty per cent of all the food.

Thirty-year hardwoods were nearly twice as productive of game foods as twenty-year hardwood stands. This may be due to the breaking up of the crown canopy. A total of 14.85 kilograms per acre was produced, of which wintergreen made up fifty per cent, Christmas fern, ten per cent, and black birch, about nine per cent. Among the twenty-one other species present were wild raisin, chestnut, lowbush blueberry, rock fern, white ash, trailing arbutus and black cherry.

Thirty-five-year-old hardwoods produced 26.29 kilograms of game food per acre, the highest for any age class of hardwoods. However, since only two mil-acre plots were taken in this age class, it may not be truly representative. Wintergreen was again the most important species, amounting to nearly fifty per cent of the total food. This

was followed by lowbush blueberry, sheep laurel or lambkill and partridge berry, in the order named.

Food production was slightly higher in forty-year than in thirty-year hardwood stands. Wintergreen made up over fifty per cent of the 15.68 kilograms produced per acre. Of the thirteen other species found in this age class, the spiny shield fern, red maple and yellow birch were most important.

Fifty-year-old hardwood stands produced only two-thirds as much as forty-year hardwood stands, or 10.31 kilograms per acre. The Christmas fern was by far the most important food species, making up over fifty per cent of all food produced. Of the twenty-four species occurring in this age class, wintergreen, witch hazel and sugar maple were the only other important ones.

The sixty-year hardwood type is not important from a game food standpoint. The 6.94 kilograms produced per acre was less than half that of fifty-year hardwoods. There were no outstandingly important species among the sixteen represented. The more important ones were chestnut, Christmas fern, sugar maple, black alder and witch hazel.

Wildlife food was practically absent in the seventy-year-old hardwood stands. Only 2.94 kilograms per acre were present, or about forty per cent of that in sixty-year-old stands. Only eight species were found; of these sugar maple, red maple, Christmas fern and basswood were most common.

The question is often raised as to whether pine or hardwood produces more game food. In adding up the average number of kilograms produced per acre in each age class, pine totals 104.96 kilograms and hardwood 103.66 kilograms. This shows that the two types are about equally productive. However, the ages at which each are least pro-

ductive are not the same. Pine is least productive at twenty years of age and hardwood at seventy years; pine is most productive at sixty years, hardwood at thirty-five years. This indicates that for a given area, good interspersion of both pine and hardwood types is best for game food production.

Effect of Thinnings in Pine on Game Food Production

An attempt was made to determine the effect of thinning old field pine stands on game food production. The four age classes sampled, forty, forty-five, fifty and sixty years, had all been thinned in 1926, giving them ten growing seasons since thinning. As might be expected, opening up the crown canopies gave large increases in the amount of game food produced. Often, in these thinned stands, there was an abundance of advance growth hardwoods.

The forty-year thinned stand produced 23.21 kilograms per acre as compared with 4.22 kilograms in forty-year stands unthinned. The most important species were partridge berry, wood fern and red maple.

Food production in forty-five-year thinned stands, 25.85 kilograms per acre, was slightly higher than in forty-year thinned stands, and about thirty per cent higher than in forty-five-year stands which had not been thinned. The most important species were red maple, black cherry, wood fern, ground hemlock, and shinleaf, in the order named.

Fifty-year thinned stands produced nearly twice as much game food as stands of similar age which had not been thinned. Total production was 52.70 kilograms per acre, of which partridge berry made up 28.91 kilograms. Other important species were wood fern, rock polypody, wintergreen, black birch, chestnut, white oak and red maple. A total of twenty-four species was found in this type.

Sixty-year-old thinned pine stands produced about two and one-half times as much as untreated stands of the same age. Partridge berry again was the most important species, making up over thirty per cent of the 88.08 kilograms produced per acre. Other important species were beaked hazelnut, red maple, white oak, wintergreen, wood fern, chestnut, red oak and lowbush blueberry.

In general, it may be said that pine stands which have been thinned ten years produce approximately twice as much game food as stands of the same age which have not been thinned. The variety of game foods produced does not vary appreciably from that in unthinned stands.

Pine: 40 years (4 plots) Thinned.

1.	Mitchella repens (partridge berry).....	6.40	kilograms
2.	Chimaphila umbellata (Prince's pine).....	4.37	
3.	Gaultheria procumbens (wintergreen).....	3.48	
4.	Viburnum dentatum (arrowwood).....	2.23	
5.	Aspidium spinulosum (wood fern).....	1.86	
6.	Acer rubrum (red maple).....	1.17	
7.	Vaccinium corymbosum (highbush blueberry)....	0.84	
8.	Quercus borealis (red oak).....	0.83	
9.	Prunus serotina (black cherry).....	0.53	
10.	Rubus hispidus (dwarf raspberry).....	0.40	
11.	Fraxinus americana (white ash).....	0.38	
12.	Castanea dentata (chestnut).....	0.26	
13.	Vaccinium pennsylvanicum (lowbush blueberry).	0.20	
14.	Amelanchier canadensis (shadbush).....	0.19	
15.	Pyrola americana (shinleaf).....	0.08	
		23.21	

Pine: 45 years (4 plots) Thinned.

1.	Acer rubrum (red maple).....	8.12	kilograms
2.	Prunus serotina (black cherry).....	6.28	
3.	Aspidium spinulosum (wood fern).....	4.19	
4.	Taxus canadensis (Canada yew).....	3.56	
5.	Pyrola americana (shinleaf).....	2.18	
6.	Betula lutea (yellow birch).....	0.87	
7.	Maianthemum canadense (Canada mayflower).....	0.33	
8.	Mitchella repens (partridge berry).....	0.12	
9.	Coptis trifolia (goldthread).....	0.08	
10.	Epipactis repens (rattlesnake plantain).....	0.07	
11.	Viburnum cassinoides (wild raisin).....	0.03	
12.	Trientalis americana (starflower).....	0.02	
		25.85	

Pine: 50 years (10 plots) Thinned.

1.	Mitchella repens (partridge berry).....	28.91	kilograms
2.	Aspidium spinulosum (wood fern).....	6.26	
3.	Polypodium virginianum (rock fern).....	4.04	
4.	Gaultheria procumbens (wintergreen).....	2.88	
5.	Betula lenta (black birch).....	2.43	
6.	Castanea dentata (chestnut).....	2.36	
7.	Quercus alba (white oak).....	1.21	
8.	Acer rubrum (red maple).....	1.12	
9.	Amelanchier canadensis (shadbush).....	0.61	
10.	Quercus borealis (red oak).....	0.41	
11.	Cornus alternifolia (alternate-leaved dogwood	0.38	
12.	Prunus serotina (black cherry).....	0.31	
13.	Vaccinium corymbosum (highbush blueberry)....	0.30	
14.	Betula lutea (yellow birch).....	0.28	
15.	Fraxinus americana (white ash).....	0.22	
16.	Rubus hispidus (dwarf raspberry).....	0.19	
17.	Viburnum cassinoides (wild raisin).....	0.18	
18.	Quercus velutina (black oak).....	0.16	

Pine: 50 years (10 plots) Thinned. (Cont.)

19.	Pyrola elliptica (shinleaf)	0.13	kilograms
20.	Ilex verticillata (black alder)	0.10	
21.	Pyrola americana (shinleaf)	0.09	
22.	Hicoria ovata (shagbark hickory)	0.06	
23.	Aronia melanocarpa (black chokeberry)	0.05	
24.	Cornus canadensis (bunchberry)	0.02	
		52.70	

Pine: 60 years (4 plots) Thinned.

1.	Mitchella repens (partridge berry)	30.96	kilograms
2.	Corylus rostrata (beaked hazelnut)	11.73	
3.	Acer rubrum (red maple)	10.42	
4.	Quercus alba (white oak)	9.36	
5.	Gaultheria procumbens (wintergreen)	7.17	
6.	Aspidium spinulosum (wood fern)	6.68	
7.	Castanea dentata (chestnut)	6.30	
8.	Quercus borealis (red oak)	2.22	
9.	Vaccinium pennsylvanicum (lowbush blueberry)	1.56	
10.	Prunus serotina (black cherry)	0.73	
11.	Viburnum cassinoides (wild raisin)	0.48	
12.	Maianthemum canadense (Canada mayflower)	0.25	
13.	Pyrola elliptica (shinleaf)	0.19	
14.	Epipactis repens (rattlesnake plantain)	0.03	
15.	Trientalis americana (starflower)	Tr.	
		88.08	

Summary of Data by Age Classes and Types

Type	Age	Number of Plots	Total Weight	Kilograms per Acre
Old Field	7	15	551.85	36.79
Old Field	15	15	313.48	20.89
Old Field	20	4	40.93	10.23
Old Field	25	6	142.63	23.94
Pine	10	10	23.64	2.36
Pine	20	10	3.39	0.34
Pine	30	10	16.31	1.63
Pine	40	10	42.47	4.25
Pine	45	3	56.39	18.79
Pine	50	12	409.88	34.16
Pine	60	10	361.78	36.18
Pine	70	10	105.94	10.59
Cut Over	2	6	199.53	33.26
Cut Over	3	4	242.48	60.62
Cut Over	7	5	103.85	20.77
Hardwood	10	10	182.61	18.26
Hardwood	20	10	87.82	8.78
Hardwood	30	10	143.16	14.32
Hardwood	35	2	52.88	26.44
Hardwood	40	10	156.80	15.68
Hardwood	50	20	206.20	10.31
Hardwood	60	10	70.16	7.02
Hardwood	70	6	17.62	2.94
		THINNED		
Pine	40	4	92.81	23.20
Pine	45	4	102.46	25.61
Pine	50	10	529.66	52.97
Pine	60	4	352.48	88.12

On the following page is shown graphically the production of game foods in the various types and age classes, based on the summary of the data obtained.

Old fields before being abandoned contain little game food. Seven years after abandonment the peak of game food production in this type is reached. From then until the young pine stands became established, the amount of food produced decreased steadily.

Food production was very low in the pure pine stands until they reached forty years of age. From then until sixty years the increase was quite rapid. Peak production for pine stands was at sixty years. From sixty to seventy years the amount of game food produced decreased rapidly.

When the old pine stands were cut off, game food production increased six-fold in three years. Then it decreased rapidly until in ten-year-old hardwood stands it amounted to only about eighteen kilograms per acre. The decrease continued in the hardwoods until twenty years; then it increased to a peak of twenty-six kilograms per acre at thirty-five years. The decrease was rapid from thirty-five to forty years, but from there to seventy years it was more gradual. Total production in seventy-year hardwood stands was only 2.94 kilograms per acre.

In the thinned pine stands ten years after thinning, food production increased rapidly between forty and sixty year stands. Forty, forty-five, fifty and sixty-year-old stands were the only ones which had been thinned.

SUMMARY

1. The field work was carried on between October, 1936 and April, 1937.

2. The winter was the mildest in fifty-two years. Only twelve inches of snow fell as compared with a ten-year average of fifty-two inches.

3. 266 mil-acre quadrats were taken in four of the common types occurring in this region. These were old field, pure pine, cutover pine, and hardwood.

4. Food species are given in the decreasing order of abundance for each age class and type.

5. The least productive type was twenty-year-old pure pine.

6. In general, hardwood and pine stands produce nearly equal amounts of game foods over a period of seventy years.

7. Maximum food production for the various types is as follows: old field, seven years after abandonment; pure pine, fifty to sixty years; cutover pine, three years after cutting; hardwood, thirty to thirty-five years. The most productive type was the cutover pine.

8. Food production of the various types and age classes is shown graphically.

9. Thinning in pine stands greatly stimulates the production of game foods. In the age classes between forty and sixty years, the amount of game food produced was doubled ten years after the thinning.

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	Ruffed Grouse			White Tailed Deer			Cottontail Rabbit			Bobwhite Quail			Ringnecked Pheasant			Snowshoe hare			Raccoon			Striped skunk			Gray Squirrel		
	B	S	T	B	S	T	B	S	T	B	S	T	B	S	T	B	S	T	B	S	T	B	S	T	B	S	T
Corylus		X											X			G											
Corylus americana				G																							
Crataegus		X		G			G			X			X														
Diervilla Diervilla							G																				
Diervilla Lonicera				G									X														
Epigea repens				G																							
Fagus grandifolia		X		G			G						X						X								
Fragaria																				X		X					
Fraxinus										X																	
Fraxinus Americana				G			G																				
Fraxinus nigra							G																				
Gaultheria procumbens				G																							
Gaylussacia baccata		X		G			G			X																	
Gleditsia triacanthos				G																							
Hamamelis Virginiana	X	X		G			G						X														
Hicoria				G						X															X		
Hicoria glabra							G																				
Hicoria ovata							G																				
Ilex Verticillata		X								G			X														
Juglans Cinerea				G			G																				
Juniperus Communis				G									G														
Juniperus Virginiana				G			G			X																	
Kalmia angustifolia			X	G																							
Kalmia latifolia	X		X	G																							
Larix Europaea				X		X										G											
Lospedeza										X																	
Liriodendron tulipifera				G			G																				
Lonicera				G						X																	
Lycopodium				G																							
Malus	X	X	X	X	X	G	G			X			X			X							X				
Mitchella repens																			X			X	X				
Morus rubra		X																	X			X					
Myrica													G														

1. Hd. 30. Bl I comp 2. (2 plots) X

2. Pine 18. third. Comp I Bl I. (10 plots) X

3. Hdwd in PH Hd 2 comp I Sq Brook - 60 yrs. (X) X

4. Hd. 40. 143 - Comps I X 8; PH. (10 plots)

5. Hdwd 70. TS Swamp plots? comp? (X plots) 6 X

6 Pine 3. Comp 6 Bl I. Thinned 1926 - (10 plots.) X

7. open field. Blocks 2. 6 yrs.. (10 plots)

8. Pine 20. Bl 2. 20 yrs. - (5 plots) X

9 Pine 60-70 - Bl 2. TS. adj comp I - (10 plots) X

DATA ON SAMPLE PLOTS.

Plot 1. Pine 50 years. Density .7 Prospect Hill I.

Gaultheria procumbens	26.5 grams
Quercus borealis	8.23
Rubus hispidus-leaves	2.70
Rubus hispidus-browse	1.37
Amelanchier canadensis	1.05
Vaccinium pennsylvanicum	2.81
Pyrola americana	0.13
Maianthemum canadense	0.09
Ilex verticillata	0.49

Plot 2. Pine 50 years. Density .7 Prospect Hill I

Cornus canadensis	0.13 grams
Fragaria virginiana	0.13
Vaccinium pennsylvanicum	0.91
Rubus hispidus-leaves	5.29
Rubus hispidus-browse	1.68
Solidago sp.	1.19
Prunus serotina	0.24
Pyrola americana	1.62
Viburnum cassinoides	0.21
Acer rubrum	0.03
Quercus borealis	1.23
Gaultheria procumbens	68.70
Maianthemum canadense	3.95

Plot 3. Pine 50 years. Density 1.0 Prospect Hill I

Gaultheria procumbens	75.60 grams
Maianthemum canadense	0.36
Vaccinium pennsylvanicum	2.23
Mitchella repens	0.02
Kalmia angustifolia	9.18
Prunus serotina	0.03

Plot 4. Pine 50 years. Density 1.0 Prospect Hill I

Vaccinium corymbosum	65.10 grams
Vaccinium pennsylvanicum	2.52
Solidago sp.	0.50
Trientalis americana	0.01
Maianthemum canadense	1.33
Acer rubrum	0.06

Plot 5. Pine 50 years. Density .6 Prospect Hill I

Vaccinium pennsylvanicum	9.81 grams
Cornus canadensis	1.00
Rubus hispidus-leaves	0.28
Rubus hispidus-browse	0.03
Maianthemum canadense	1.69
Pyrola americana	0.16
Quercus borealis	8.95

Plot 6. Pine 50 years. Density .9

Castanea dentata	14.01 grams
Rubus	0.03
Quercus borealis	0.06
Vaccinium pennsylvanicum	4.68
Viburnum cassinoides	3.98
Maianthemum canadense	0.11
Pyrola americana	0.28

Plot 7. Pine 50 years. Density .9

Maianthemum canadense	3.63 grams
Quercus borealis	5.54
Acer rubrum	0.55

Plot 8. Pine 50 years. Density .8

Viburnum cassinoides	3.10 grams
Quercus borealis	0.25
Prunus serotina	6.61
Crataegus sp.	1.17
Acer rubrum	0.46
Gaultheria procumbens	0.17
Mitchella repens	0.89
Vaccinium pennsylvanicum	0.06

Plot 9. Pine 45 years. Density .9

Trientalis americana	0.01 grams
Epigea repens	0.44
Mitchella repens	0.86
Maianthemum canadense	0.54
Rubus-leaves	0.06
Rubus-browse	0.07
Gaultheria procumbens	3.60
Vaccinium pennsylvanicum-leaves	8.42

Plot 10. Pine 45 years. Density .8

Mitchella repens	9.77 grams
Viburnum cassinoides	0.17
Gaultheria procumbens	3.92
Pyrola americana	4.80
Vaccinium pennsylvanicum-leaves	6.23
Trientalis americana	0.01
Rubus	0.08

Plot 11. Pine 45 years. Density .8

Trientalis americana	0.01 grams
Rubus-leaves	1.15
Rubus-browse	0.63
Vaccinium pennsylvanicum-leaves	4.47
Gaultheria procumbens	8.16

Plot 12. Pine 45 years. Density .7 Thinned.

Taxus canadensis	14.26 grams
Acer rubrum	26.60
Maianthemum canadense	0.19
Prunus serotina	24.66
Coptis trifolia	0.34
Mitchella repens	0.49
Betula lutea-buds	1.94
Betula lutea-twigs	1.55
Viburnum cassinoides	0.13
Aspidium	16.79

Plot 13. Pine 45 years. Density .8 Thinned.

Epapactis	0.12 grams
Maianthemum canadense	0.40
Acer rubrum	5.88
Pyrola americana	8.73
Trientalis americana	0.05

Plot 14. Pine 45 years. Density .6 Thinned.

Prunus serotina	0.50 grams
Maianthemum canadense	0.56
Trientalis americana	0.01
Mitchella repens	0.01
Epapactis	0.08

Plot 15. Pine 45 years. Density 1.0 Thinned.

Maianthemum canadense	0.16 grams
Trientalis americana	0.01

Plot 16. Pine 20 years. Density .9

Epapactis	0.03 grams
Pyrola americana	0.33

Plot 17. Pine 20 years. Density .6

Pyrola elliptica	0.49 grams
? (1)	2.06

Plot 18. Pine 20 years. Density .6

Pyrola elliptica	0.19 grams

Plot 19. Pine 60 years. Density .6 Slab City IV.

Rubus hispidus-leaves	0.10 grams
Rubus hispidus-browse	0.17
Cornus paniculata	1.20
Kalmia angustifolia	0.19
Acer rubrum	0.21
Epapactis americana	0.34
Trientalis americana	0.01
Mitchella repens	30.43
Pyrola elliptica	8.86
Gaultheria procumbens	3.04
Corylus rostrata	14.81

Plot 19 (Cont.)

Betula lutea-buds---------- 0.37 grams
Betula lutea-browse-------- 0.91
Lonicera canadensis-------- 5.10
Acer spicatum-------------- 0.25
Fraxinus americana--------- 0.34
Pyrola americanna---------- 1.34
Aspidium spinulosum--------20.73

Plot 20. Pine 60 years. Density .8 Slab City IV.

Aspidium spinulosum-------- 4.80 grams
Ilex verticillata---------- 0.39
Mitchella repens----------10.70
Acer spicatum-------------- 3.95
Corylus rostrata----------13.94
Pyrola elliptica----------- 0.54
Gaultheria procumbens------ 2.07
Vaccinium pennsylvanicum--- 0.08

Plot 21. Pine 60 years. Density .6 Slab City IV.

Mitchella repens----------15.48 grams
Acer spicatum---------------7.44
Corylus rostrata----------14.84
Cornus canadensis---------- 0.48
Rubus hispidus--leaves----- 0.28
Rubus hispidus--browse----- 0.39
Gaultheria procumbens------ 4.58
Tiarella cordifolia-------- 0.37

Plot 22. Pine 60 years. Density .8 Slab City IV.

Aspidium spinulosum-------- 8.52 grams
Cornus canadensis---------- 7.00
Rubus hispidus--leaves----- 0.14
Rubus hispidus--browse----- 0.15
Corylus rostrata----------- 9.54
Mitchella repens----------32.24
Coptis greenlandica--------11.75
Acer spicatum-------------- 0.19
Kalmia angustifolia-------- 0.17

Plot 23. Pine 60 years. Density .6 Slab City IV.

Corylus rostrata----------11.86 grams
Prunus serotina------------ 0.14
Rubus hispidus--leaves----- 0.08
Rubus hispidus--browse----- 0.14
Mitchella repens----------- 20.83
Acer spicatum-------------- 0.43
Gaultheria procumbens------23.74
Pyrola elliptica----------- 1.61
Vaccinium pennsylvanicum--- 0.10
Lonicera canadensis-------- 1.30

Plot 24. Pine 50 years. Density .6 Slab City V.
Corylus rostrata----------17.59 grams
Betula lenta--buds--------- 5.05
Betula lenta--browse------- 8.28
Pyrola elliptica----------- 1.36
Maianthemum canadense------ 0.08

Plot 26. Pine 50 years. Density .6 Slab City V.
Pyrola elliptica----------- 1.68 grams
Vaccinium pennsylvanicum--- 2.39

Plot 27. Pine 50 years. Density .6 Slab City V.
Maianthemum canadense------ 0.22 grams

Plot 28. Pine 50 years. Density .5 Slab City V.
Acer rubrum---------------- 4.52 grams
Maianthemum canadense------ 1.94
Tsuga canadensis----------12.50
Trientalis americana------- 0.01
Pyrola elliptica----------- 0.09
Mitchella repens----------- 1.08

Plot 29. Pine 20 years. Density 1.0
Epapactis americana-------- 0.02 grams
Pyrola elliptica----------- 0.01

Plot 30. Pine 60 years. Density .5 Thinned.
Epapactis repens----------- 0.10 grams
Viburnum cassinoides------- 1.93
Trientalis americana------- 0.01
Pyrola elliptica----------- 0.70
Gaultheria procumbens------12.25
Castanea dentata----------25.18
Vaccinium pennsylvanicum--- 5.91
Mitchella repens----------39.02

Plot 31. Pine 60 years. Density .6 Thinned.
Gaultheria procumbens------10.47 grams
Mitchella repens----------81.27
Aspidium spinulosum--------10.57
Vaccinium pennsylvanicum--- 0.24
Quercus borealis----------- 0.99
Acer rubrum---------------- 8.45
Prunus serotina------------ 2.90
Maianthemum canadense------ 1.00

Plot 32. Pine 60 years. Density .6 Thinned.
Maianthemum canadense------ 0.26 grams
Acer rubrum----------------14.12
Gaultheria procumbens------ 5.90
Quercus alba---------------13.96
Quercus borealis-----------7.89
Pyrola elliptica----------- 0.04
Aspidium spinulosum--------11.36
Mitchella repens----------- 3.40

Plot 33. Pine 60 years. Density .5 Thinned.
Gaultheria procumbens------ 0.06 grams
Acer rubrum----------19.10
Corylus rostrata----------46.92
Quercus alba----------23.49
Vaccinium pennsylvanicum--- 0.07
Aspidium spinulosum-------- 4.77
Mitchella repens---------- 0.15

Plot 34. Pine 20 years. Density 1.0
Nothing.

Plot 35. Pine 20 years. Density 1.0
Nothing.

Plot 36. Pine 20 years. Density .9
Aspidium spinulosum-------- 0.12 grams
Pyrola elliptica---------- 0.14

Plot 37. Pine 60 years. Density .7
Maianthemum canadense------ 1.19 grams
Prunus serotina---------- 0.06
Acer rubrum---------- 0.14
Betula lutea--buds--------- 0.08
Betula lutea--browse------- 0.63
Pyrola elliptica---------- 1.10
Epipactis---------- 0.01
Trientalis americana------- 0.03
Gaultheria procumbens------ 3.55

Plot 38. Pine 60 years. Density .8
Rubus hispidus--leaves----- 0.09 grams
Rubus hispidus--browse----- 0.04
Maianthemum canadense------ 1.04
Viburnum cassinoides------- 1.36
Pyrola elliptica---------- 1.96
Prunus serotina---------- 0.47
Trientalis americana------- 0.03
Fagus grandifolia--browse-- 6.01
Vaccinium pennsylvanicum--- 0.37
Gaultheria procumbens------34.88

Plot 39. Pine 60 years. Density 1.0
Maianthemum canadense------ 0.01 grams
Vaccinium pennsylvanicum--- 0.07

Plot 40. Pine 60 years. Density .7
Acer rubrum---------- 0.12 grams
Fraxinus americana--------- 0.20
Trientalis americana------- 0.02
Lonicera canadensis-------- 0.94
Vaccinium pennsylvanicum--- 3.35
Mitchella repens---------- 2.31

Plot 41. Pine 30 years. Density .9

Trientalis americana-------	0.01 grams
Aspidium spinulosum--------	0.04
Pyrola elliptica----------	0.40
Rubus hispidus--leaves-----	0.14
Rubus hispidus--browse-----	0.16
Maianthemum canadense------	0.13
Vaccinium pennsylvanicum---	1.12

Plot 42. Pine 30 years. Density .8

Rubus hispidus--leaves-----	0.07 grams
Rubus hispidus--browse-----	0.06
Pyrola americana----------	0.36
Trientalis americana-------	0.01
Vaccinium pennsylvanicum---	0.63

Plot 43. Pine 30 years. Density .5

Epapactis-----------------	0.04 grams
Pyrola elliptica----------	0.39
Trientalis americana-------	0.01
Vaccinium pennsylvanicum---	0.20
Rubus hispidus--leaves-----	0.36
Rubus hispidus--browse-----	0.34

Plot 44. Pine 30 years. Density .6

Fragaria virginiana--------	0.08 grams
Gaultheria procumbens------	2.72
Vaccinium pennsylvanicum---	1.55
Rubus hispidus--leaves-----	0.98
Rubus hispidus--browse-----	0.64

Plot 45. Hardwood 30 years. Density 1.0

Quercus borealis----------	0.35 grams
Gaultheria procumbens------	4.85
Vaccinium pennsylvanicum---	0.98

Plot 46. Hardwood 30 years. Density .9

Betula lutea--buds--------	0.17 grams
Betula lutea--browse-------	0.77
Vaccinium pennsylvanicum---	0.64

Plot 47. Hardwood 30 years. Density .8

Quercus velutina----------	0.29 grams
Trientalis americana-------	0.02
Vaccinium pennsylvanicum---	0.06
Acer rubrum---------------	0.38

Plot 48. Hardwood 30 years. Density .8

Castanea dentata----------	0.70 grams
Acer rubrum---------------	0.33
Prunus serotina-----------	0.84
Vaccinium pennsylvanicum---	0.15
Betula lenta--buds--------	2.71
Betula lenta--browse-------	9.25

Plot 49. Hardwood 30 years. Density .9
Maianthemum canadense------ 0.06 grams
Trientalis americana------- 0.02
Mitchella repens---------- 0.11
Gaultheria procumbens------ 8.46
Vaccinium pennsylvanicum--- 1.03
Viola sp.----------------- 1.77

Plot 50. Hardwood 30 years. Density .7
Cornus canadensis---------- 0.19 grams
Kalmia latifolia---------- 2.03
Betula lenta--buds--------- 0.20
Betula lenta--browse------- 0.50
Gaultheria procumbens------20.35

Plot 51. Hardwood 30 years. Density .9
Rubus hispidus--leaves----- 0.35 grams
Rubus hispidus--browse----- 0.12
Coptis trifolia------------ 1.87
Polypodium---------------- 4.57
Epigaea repens------------- 3.16
Gaultheria procumbens------27.45

Plot 52. Hardwood 30 years. Density .8
Gaultheria procumbens------13.90 grams
Maianthemum canadense------ 0.12
Quercus borealis---------- 0.28
Acer rubrum--------------- 0.06
Viburnum cassinoides------- 5.15
Vaccinium pennsylvanicum--- 0.51

Plot 53. Hardwood 35 years. Density .6
Viburnum cassinoides------- 0.14 grams
Quercus borealis--seed----- 2.64
Rubus hispidus--leaves----- 0.16
Rubus hispidus--browse----- 0.08
Pyrola americana---------- 1.17
Epigaea repens------------ 0.63
Kalmia angustifolia-------- 5.94
Mitchella repens---------- 4.63
Gaultheria procumbens------10.90
Vaccinium pennsylvanicum--- 5.63

Plot 54. Hardwood 35 years. Density .8
Trientalis americana------- 0.01 grams
Rubus hispidus--leaves----- 0.01
Rubus hispidus--browse----- 0.01
Gaultheria procumbens------15.04
Vaccinium pennsylvanicum--- 5.59

Plot 55. Cutover pine 1933-1934.
Prunus serotina----------- 2.12 grams
Viola sp.----------------- 0.09
Lactuca scariola---------- 0.26
#2 ?---------------------- 0.12
Betula papyrifera--buds---- 0.17

Plot 55 (Cont.)

Betula papyrifera--browse--	1.36 grams
Vaccinium pennsylvanicum---	1.22
Prunus pennsylvanica-------	0.49
Quercus alba----------	14.05
Verbascum thaspus----------	0.06
Mitchella repens----------	6.09
Fragaria virginiana---------	5.23
Rubus hispidus--leaves-----	36.26
Rubus hispidus--browse-----	29.68

Plot 56. Cutover pine 1933-1934.

Quercus borealis----------	6.16 grams
Solidago sp.----------	1.22
Prunus serotina----------	0.32
Viola sp.----------	0.03
Potentilla----------	0.10
Fragaria virginiana--------	0.01
Hypericum prolificum-------	0.34
Epipactis----------	0.28
Acer rubrum----------	4.24
Mitchella repens----------	23.96
Rubus hispidus--leaves-----	16.01
Rubus hispidus--browse-----	13.88

Plot 57. Cutover pine 1933-1934.

Botrychium virginianum-----	0.03 grams
Rubus hispidus--leaves-----	0.22
Rubus hispidus--browse-----	0.11
Viola sp.----------	0.26
Hypericum prolificum-------	1.40
Solidago sp.----------	0.37
Fragaria virginiana--------	4.52
Potentilla----------	0.06
? #2----------	7.04

Plot 58. Cutover pine 1934-1935.

Maianthemum canadense------	0.03 grams
Acer rubrum----------	0.04
Rubus aculeatissimus-------	0.11
Rubus hispidus--leaves-----	0.02
Rubus hispidus--browse-----	0.09
Vaccinium pennsylvanicum---	1.31

Plot 59. Cutover pine 1934-1935.

Acer rubrum----------	0.24 grams
Rubus allegheniensis-------	1.46
Prunus serotina----------	0.17
Gaultheria procumbens------	5.23
Prunus pennsylvanica-------	2.67
Fraxinus americana---------	4.27
Vaccinium pennsylvanicum---	4.86
Solidago sp.----------	1.46

Plot 60. Cutover pine 1934-1935.
Acer rubrum----------14.39 grams
Rubus alleghenienses------- 6.28
? #2---------- 0.77
Rumex acetosella---------- 4.30
Vaccinium pennsylvanicum--- 5.04
Rubus hispidus--leaves-----14.59
Rubus hispidus--browse-----15.01

Plot 61. Cutover pine 1934-1935.
Acer rubrum---------- 0.55 grams
Rubus hispidus--leaves----- 5.29
Rubus hispidus--browse----- 4.12
Vaccinium pennsylvanicum--- 0.21
Pyrola americana---------- 5.36
Rumex acetosella----------10.41
? #2---------- 0.79
Hypericum prolificum------- 0.30

Plot 62. Cutover pine 1934-1935.
Prunus pennsylvanica------- 1.42 grams
Viola sp.---------- 0.47
Solidago sp.----------0.23
Rumex acetosella---------- 0.02
Hypericum prolificum------- 7.72
Fragaria virginiana---------0.14
Rubus alleghenienses------- 1.10
Rhus typhina---------- 4.72
Vaccinium pennsylvanicum--- 5.14
Rubus hispidus--leaves-----13.29
Rubus hispidus--browse----- 9.50

Plot 63. Cutover pine 1933-1934.
Mitchella repens---------- 0.02 grams
? #2----------63.95
Viola sp.---------- 0.74
Rumex acetosella----------0.01

Plot 64. Cutover pine 1934-1935.
Acer rubrum----------0.28 grams
Rubus alleghenienses------- 3.54
Rubus hispidus--leaves----- 1.86
Rubus hispidus--browse----- 0.93
Rumex acetosella----------39.64
Vaccinium pennsylvanicum--- 0.52

Plot 65. Poor Farm. Abandoned Field 15 years.
Potentilla----------1.06 grams
Fragaria virginiana-------- 0.18
Solidago sp.---------- 0.26

Plot 66. Poor Farm. Abandoned Field 15 years.
Rubus hispidus--leaves-----11.97 grams
Rubus hispidus--browse----- 7.40
Potentilla---------- 0.35
Rumex acetosella---------- 0.26
Solidago sp.---------- 1.06

Plot 67. Poor Farm. Abandoned Field 15 years.
Fragaria virginiana-------- 0.20 grams
Solidago sp.--------------- 2.30
Rumex acetosella----------- 0.30
Potentilla----------------- 0.28

Plot 68. Poor Farm. Abandoned Field.15 years.
Potentilla----------------- 0.08 grams
Rumex acetosella----------- 0.07

Plot 69. Poor Farm. Abandoned Field 15 years.
Rumex acetosella----------- 1.12 grams
Antennaria----------------- 4.31
Botrychium virginianum----- 1.38

Plot 70. Poor Farm. Abandoned Field 15 years.
Rubus hispidus--leaves-----12.37 grams
Rubus hispidus--browse----- 9.01
Fragaria virginiana-------- 0.98
Potentilla----------------- 0.01
Hypericum prolificum------- 0.06
Prunus virginiana----------44.18
Solidago sp.--------------- 0.01

Plot 71. Old Field. Poor Farm. Abandoned 15 years.
Rubus hispidus--leaves----- 3.29 grams
Rubus hispidus--browse----- 3.32
Vaccinium pennsylvanicum---13.82
Fragaria virginiana-------- 0.20
Solidago sp.--------------- 4.40
Rumex acetosella----------- 0.01

Plot 72. Old Field. Poor Farm. Abandoned 15 years.
Rubus hispidus--leaves-----11.23 grams
Rubus hispidus--browse-----10.27
Pearly everlasting--------- 1.13
Rumex acetosella----------- 0.01

Plot 73. Old Field. Poor Farm. Abandoned 15 years.
Rumex acetosella----------- 2.13 grams
Solidago sp.--------------- 0.08

Plot 74. Old Field. Poor Farm. Abandoned 20 years.
Vaccinium pennsylvanicum--- 1.27 grams
Fragaria virginiana-------- 0.33
Solidago sp.--------------- 0.39
Potentilla----------------- 0.01
Botrychium virginianum----- 0.20

Plot 75. Old Field. Poor Farm. Abandoned 20 years.
Malus sp.------------------ 4.89 grams
Fragaria virginiana-------- 3.95
Rumex acetosella----------- 0.55
Botrychium virginianum----- 0.19

Plot 76. Old Field. Poor Farm. Abandoned 20 years.
Prunus serotina---------- 0.87 grams
Fragaria virginiana-------- 9.64
Rumex acetosella---------- 1.50
Botrychium virginianum----- 0.20
? #2---------- 0.20
Potentilla---------- 0.25
Solidago sp.---------- 1.03

Plot 77. Old Field. Poor Farm. Abandoned 20 years.
Potentilla---------- 6.77 grams
Fragaria virginiana-------- 0.51
Rumex acetosella---------- 8.18

Plot 78. Old Field. Abandoned 15 years. Broderick Place.
Rumex Acetosella---------- 0.78 grams

Plot 79. Old Field. Abandoned 15 years. Broderick Place.
Potentilla---------- 6.03 grams
Rumex acetosella---------- 3.12

Plot 80. Old Field. Abandoned 15 years. Broderick Place.
Rubus hispidus--leaves-----41.45 grams
Rubus hispidus--browse-----43.43
Potentilla---------- 0.97
Rumex acetosella---------- 0.67
Botrychium virginianum----- 0.60
Solidago sp.---------- 0.29

Plot 81. Old Field. Abandoned 15 years. Broderick Place.
Solidago sp.---------- 4.43 grams
Potentilla---------- 1.68
Rumex acetosella---------- 0.32

Plot 82. Old Field. Abandoned 15 years. Broderick Place.
Vaccinium pennsylvanicum----1.70 grams
Potentilla---------- 1.13
Rumex acetosella---------- 0.42
Solidago sp.---------- 0.29

Plot 83. Hardwoods 50 years. Density .9 Tom Swamp.
Acer saccharum---------- 4.81 grams
Polystichum acrostichoides-35.43

Plot 84. Hardwoods 50 years. Density .8 Tom Swamp.
Acer saccharum---------- 1.31 grams
Hamamelis virginiana------- 7.44
Polystichum acrostichoides-40.00

Plot 85. Hardwoods 50 years. Density 1.0 Tom Swamp.
Hamamelis virginiana------- 7.34 grams
Betula lutea--buds--------- 0.73
Betula lutea--browse--------2.74

Plot 86. Hardwoods 50 years. Density .9 Tom Swamp.
Acer saccharum---------- 0.88 grams
Hamamelis virginiana------- 1.33
Aspidium marginale--------- 3.06

Plot 87. Abandoned Field. 15 years. Broderick Place.
Potentilla---------- 0.17 grams
Solidago sp.---------- 0.26
Rubus hispidus--leaves-----30.68
Rubus hispidus--browse-----25.97

Plot 88. Hardwoods 50 years. Density .7 Tom Swamp.
Polystichum acrostichoides-29.40 grams
Ostrya virginiana---------- 0.17
Lonicera canadensis-------- 0.09
Pyrola americana---------- 2.47
Hamamelis virginiana------- 2.87

Plot 89. Hardwoods 10 years. Density .6 Tom Swamp.
Betula papyrifera--buds---- 1.10 grams
Betula papyrifera--browse-- 6.26
Fraxinus americana-------- 0.53
Acer rubrum---------- 0.78
Viola sp.---------- 0.08
Prunus serotina---------- 1.39
Castanea dentata---------- 6.03

Plot 90. Hardwoods 10 years. Density .5 Tom Swamp.
Acer rubrum---------- 6.12 grams
Fraxinus americana--------- 4.41
Betula papyrifera--buds---- 0.75
Betula papyrifera--browse-- 2.10
Viola sp.---------- 1.41
Aspidium spinulosum-------- 0.08
Rhus typhina---------- 1.94

Plot 91. Hardwoods 10 years. Density .5 Tom Swamp---WEEDED
Fraxinus americana---------12.01 grams
Acer saccharum---------- 4.88
Acer rubrum---------- 9.82
Solidago sp.---------- 0.03
Prunus serotina---------- 0.34
Betula papyrifera--buds-----0.57
Betula papyrifera--browse-- 1.95

Plot 92. Hardwoods 10 years. Density .6 Tom Swamp.
Fraxinus americana---------12.24 grams
Quercus borealis---------- 1.50
Acer rubrum---------- 0.90

Plot 93. Hardwoods 10 years. Density .7 Tom Swamp.

Quercus borealis	5.98 grams
Acer saccharum	3.66
Salix rostrata	0.50
Potentilla	0.02
Solidago sp.	0.61
Fraxinus americana	1.88
Betula papyrifera--buds	1.22
Betula papyrifera--browse	5.54
Rubus hispidus--leaves	2.16
Rubus hispidus--browse	1.47

Plot 94. Hardwoods 10 years. Density .5 Tom Swamp.

Rubus hispidus--leaves	0.30 grams
Rubus hispidus--browse	0.24
Fraxinus americana	0.71
Solidago sp.	0.42
Trifolium sp.	0.04
Salix sp.	2.32
Betula papyrifera--buds	0.31
Betula papyrifera--browse	1.91
? #5	0.04
? #6	0.03

Plot 95. Hardwoods 10 years. Density .8 Tom Swamp.

Acer rubrum	19.86 grams
Prunus serotina	5.90
Aspidium spinulosum	3.70
Quercus borealis	5.28
Betula papyrifera--buds	1.26
Betula papyrifera--browse	1.49
Mitchella repens	2.93
Rubus allegheniensis	0.98
Maianthemum canadense	0.03
Solidago sp.	0.14
? #4	2.72

Plot 96. Hardwoods 10 years. Density .8 Tom Swamp.

Fraxinus americana	15.36 grams
Quercus alba	3.58
Mitchella repens	0.40
Acer rubrum	0.33
Solidago sp.	0.06

Plot 97. Hardwoods 10 years. Density .7 Tom Swamp.

Betula papyrifera--buds	1.31 grams
Betula papyrifera--browse	3.62
Solidago sp.	0.78
Cornus canadensis	0.15

Plot 98. Hardwoods 10 years. Density .7 Tom Swamp.

Fraxinus americana	4.00 grams
Solidago sp.	1.73
Acer saccharum	0.41

Plot 99. Hardwoods 20 years. Density 1.0 Tom Swamp.
Quercus borealis---------- 1.07 grams
Acer saccharum---------- 0.19
Fraxinus americana--------- 1.64
Solidago sp.---------- 0.05
Betula lutea--buds--------- 0.46
Betula lutea--browse------- 0.97

Plot 100. Hardwood 20 years. Density .8 Tom Swamp.
Polystichum acrostichoides- 8.80 grams
Acer saccharum---------- 0.48
Rubus alleghenienses------- 0149

Plot 101. Hardwood 20 years. Density .9 Tom Swamp.
Fraxinus americana---------10.64 grams
Castanea dentata---------- 0.19
Lonicera canadensis-------- 1.02
Prunus serotina---------- 1.04

Plot 102. Hardwood 20 years. Density .7 Tom Swamp.
Acer saccharum---------- 3.79 grams
Fraxinus americana--------- 1.56

Plot 103. Hardwood 20 years. Density .9 Tom Swamp.
Acer saccharum---------- 1.56 grams
Fraxinus americana--------- 2.94

Plot 104. Hardwood 20 years. Density 1.0 Tom Swamp.
Fraxinus americana--------- 2.67 grams
Acer saccharum---------- 0.24
Prunus serotina---------- 0.17
Betula lutea--buds--------- 0.06
Betula lutea--browse------- 0.38

Plot 105. Hardwood 20 years. Density .9 Tom Swamp.
Polystichum acrostichoides--5.47 grams
Aspidium spinulosum-------- 0.14
Acer saccharum---------- 0.35
Mitchella repens---------- 0.28
Solidago sp.---------- 0.22

Plot 106. Hardwood 20 years. Density .9 Tom Swamp.
Solidago sp.---------- 0.05 grams

Plot 107. Hardwood 20 years. Density 1.0 Tom Swamp.
Acer saccharum---------- 0.36 grams
Ilex verticillata--------- 0.47
Solidago sp.---------- 0.32
Lonicera canadensis-------- 0.11

Plot 108. Hardwood 20 years. Density .8 Tom Swamp.
Polystichum acrostichoides-38.55 grams
Fraxinus americana--------- 0.31
Acer saccharum---------- 0.78

Plot 109. Hardwood 30 years. Density .9 Tom Swamp II.
Acer saccharum---------- 0.19 grams
Fraxinus americana------- 2.27
Prunus serotina---------- 1.73
Castanea dentata--------- 4.33
Mitchella repens--------- 0.80
Polystichum acrostichoides- 0.90
Viola sp.----------------0.20

Plot 110. Hardwood 30 years. Density .9 Tom Swamp II.
Acer saccharum----------1.45 grams
Cornus paniculata-------- 1.99
Fraxinus americana------- 1.25
Polystichum acrostichoides-13.30

Plot 111. Hardwood 60 years. Density .8 Tom Swamp V. S. of Brook.
Ostrya virginiana-------- 0.94 grams
Hamamelis virginiana----- 4.77
Polystichum acrostichoides- 9.80

Plot 112. Hardwood 60 years. Density .7
Castanea dentata--------- 2.08 grams
Hamamelis virginiana----- 4.59
Polystichum acrostichoides- 6.00

Plot 113. Hardwood 60 years. Density .7
Castanea dentata--------- 4.76 grams
Mitchella repens--------- 0.30
Aspidium spinulosum------ 0.70
Polypodium sp.----------- 0.10

Plot 114. Hardwood 60 years. Density .8
Amelanchier canadensis---- 1.13 grams
Castanea dentata--------- 4.46
Betula lutea--buds------- 0.53
Betula lutea--browse----- 1.56

Plot 115. Hardwood 60 years. Density .9
Acer saccharum----------- 7.07 grams
Fraxinus americana------- 2.86

Plot 116. Hardwood 60 years. Density .7
Castanea dentata--------- 3.96 grams
Quercus borealis--------- 1.69
Mitchella repens--------- 2.70
Rubus hispidus----------- 0.10

Plot 117. Hardwood 60 years. Density .9
Ilex verticillata-------- 4.34 grams

Plot 118. Hardwood 60 years. Density .8
Prunus serotina---------- 1.25 grams

Plot 119. Hardwood 60 years. Density .9 Tom Swamp V. S. of Brook.
Castanea dentata---------- 1.97 grams
Acer rubrum---------- 0.32
Ilex verticillata---------- 0.36

Plot 120. Hardwood 60 years. Density .8
Castanea dentata---------- 1.82 grams

Plot 121. Pine 50 years. Density .8 Tom Swamp VI. Thinned 1926.
Quercus borealis---------- 1.16 grams
Amelanchier canadensis----- 0.58
Betula lenta--buds--------- 3.45
Betula lenta--browse-------12.86
Gaultheria procumbens------12.90
Pyrola americana---------- 0.50
Vaccinium corymbosum------- 0.70
Maianthemum canadense------ 0.10

Plot 122. Pine 50 years. Density .7 T. S. VI. Thinned 1926.
Castanea dentata---------- 1.56 grams
Acer rubrum---------- 5.78
Prunus serotina---------- 2.89
Betula lenta--buds--------- 0.16
Betula lenta--browse------- 1.06
Mitchella repens---------- 5.70
Gaultheria procumbens------ 5.20
Pyrola elliptica---------- 1.20

Plot 123. Pine 50 years. Density .7 T. S. VI. Thinned 1926.
Amelanchier canadensis----- 0.61 grams
Castanea dentata---------- 4.64
Acer rubrum---------- 0.57
Betula lutea--buds--------- 0.26
Betula lutea--browse------- 1.13
Mitchella repens----------11.60
Rubus hispidus------------ 0.50
Pyrola elliptica---------- 0.10
Vaccinium corymbosum------- 0.10
Gaultheria procumbens------ 4.20

Plot 124. Pine 50 years. Density .6 T.S. VI. Thinned 1926.
Quercus borealis---------- 1.06 grams
Castanea dentata---------- 4.57
Acer rubrum---------- 0.30
Quercus alba---------- 9.59
Vaccinium corymbosum------- 1.15
Mitchella repens----------17.90
Gaultheria procumbens------ 3.10
Cornus canadensis---------- 0.20
Aspidium spinulosum-------- 2.80

Plot 125. Pine 50 years. Density .7 T.S. VI. Thinned 1926.

Prunus serotina	1.69 grams
Betula lutea--buds	0.22
Betula lutea--browse	1.15
Betula lenta--buds	0.19
Betula lenta--browse	0.64
Mitchella repens	81.20
Pyrola americana	0.40
Rubus hispidus	0.70
Gaultheria procumbens	1.70
Aspidium spinulosum	9.40

Plot 126. Pine 50 years. Density .8 T.S. VI. Thinned 1926.

Quercus velutina	1.57 grams
Viburnum cassinoides	1.00
Amelanchier canadensis	4.24
Betula lenta--buds	0.43
Betula lenta--browse	1.27
Mitchella repens	23.70
Rubus hispidus	0.70
Gaultheria procumbens	1.70
Aspidium spinulosum	1.10

Plot 127. Pine 50 years. Density .6 T.S. VI. Thinned 1926.

Acer rubrum	0.97 grams
Ilex verticillata	0.95
Viburnum cassinoides	0.77
Castanea dentata	4.10
Quercus alba	2.53
Cornus alternifolia	3.82
Amelanchier canadensis	0.66
Mitchella repens	87.90
Aspidium spinulosum	37.00

Plot 128. Pine 50 years. Density .8 T.S. VI. Thinned 1926.

Quercus borealis	1.85 grams
Hicoria ovata	0.58
Acer rubrum	3.52
Betula lenta--buds	1.00
Betula lenta--browse	3.21
Aronia melanocarpa	0.46
Mitchella repens	25.20
Aspidium spinulosum	9.10
Polypodium virginiana	40.40

Plot 129. Pine 50 years. Density .7 T.S. VI. Thinned 1926.

Acer rubrum	0.09 grams
Castanea dentata	6.86
Prunus serotina	0.81
Mitchella repens	25.80
Aspidium spinulosum	3.20

Plot 130. Pine 50 years. Density .8 T.S. VI. Thinned 1926.
Fraxinus americana---------- 2.20 grams
Castanea dentata---------- 1.85
Prunus serotina---------- 0.56
Vaccinium corymbosum-------- 1.01
Mitchella repens----------10.10

Plot 131. Pine 40 years. Density .8 T.S. V. Thinned 1926.
Fraxinus americana---------- 1.52 grams
Viburnum dentata---------- 0.33
Acer rubrum---------- 1.34
Gaultheria procumbens------- 7.00
Vaccinium pennsylvanicum---- 0.80
Rubus hispidus---------- 1.20
Mitchella repens---------- 3.10
Chimaphila umbellata--------15.60

Plot 132. Pine 40 years. Density .7 T.S. V. Thinned 1926.
Amelanchier canadensis-------0.76 grams
Vaccinium corymbosum-------- 3.37
Aspidium spinulosum--------- 7.10
Rubus hispidus---------- 0.40
Mitchella repens----------22.50
Chimaphila umbellata-------- 1.90

Plot 133. Pine 40 years. Density .6. T.S. V. Thinned 1926.
Viburnum dentatum---------- 8.59 grams
Prunus serotina---------- 2.12
Gaultheria procumbens------- 3.70
Aspidium spinulosum--------- 0.30

Plot 134. Pine 40 years. Density .7 T.S. V. Thinned 1926.
Castanea dentata---------- 1.02 grams
Acer rubrum---------- 3.34
Quercus borealis---------- 3.32
Gaultheria procumbens------- 3.20
Pyrola americana---------- 0.30

Plot 135. Hardwood 70 years. Density .9 T.S.
Acer saccharum---------- 0.97 grams
Hicoria ovata---------- 0.79
Aspidium spinulosum--------- 0.10

Plot 136. Hardwood 70 years. Density .9 T.S.
Acer rubrum---------- 5.72 grams

Plot 137. Hardwood 70 years. Density .8 T.S.
Acer saccharum---------- 1.83 grams
Aspidium marginale---------- 0.20

Plot 138. Hardwood 70 years. Density .9 T.S.
Acer rubrum---------- 0.63 grams
Polystichum acrostichoides-- 3.20

Plot 139. Hardwood 70 years. Density .9 T.S.
Tilia americana---------- 0.84 grams
Acer saccharum---------- 1.55

Plot 140. Hardwood 70 years. Density .8 T.S.
Acer saccharum---------- 0.99 grams
Polystichum acrostichoides--0.40
Betula lenta---------- 0.40

Plot 141. Pine 70 years. Density .7 T.S.
Acer rubrum---------- 4.23 grams
Mitchella repens---------- 2.80

Plot 142. Pine 70 years. Density .8 T.S.
Prunus serotina---------- 1.16 grams
Acer saccharum---------- 1.63
Castanea dentata---------- 6.09

Plot 143. Pine 70 years. Density .8 T.S.
Prunus serotina---------- 3.32 grams
Acer saccharum---------- 2.65
Acer rubrum---------- 0.41
Quercus borealis---------- 2.04

Plot 144. Pine 70 years. Density .8 T.S.
Castanea dentata---------- 4.19 grams
Mitchella repens---------- 2.80

Plot 145. Pine 70 years. Density .9 T.S. Block II
Quercus borealis---------- 1.10 grams
Castanea dentata---------- 2.78
Fraxinus americana--------- 0.67
Prunus serotina---------- 0.40
Acer rubrum---------- 2.34
Corylus rostrata---------- 0.86
Gaultheria procumbens------ 8.60
Aspidium spinulosum-------- 3.30

Plot 146. Pine 70 years. Density .7 T.S. Block II
Castanea dentata---------- 1.25 grams
Viburnum cassinoides------- 0.91
Quercus borealis---------- 1.06
Corylus rostrata---------- 1.99
Gaultheria procumbens------ 6.20

Plot 147. Pine 70 years. Density .8 T.S. Block II
Cornus alternifolia-------- 0.85 grams
Quercus borealis---------- 4.52
Corylus rostrata---------- 2.67

Plot 148. Pine 70 years. Density .6 T.S. Block II
Castanea dentata---------- 5.10 grams
Acer rubrum---------- 3.50

Plot 149. Pine 70 years. Density .8 T.S. Block II
Castanea dentata---------- 3.71 grams
Gaultheria procumbens-----15.00

Plot 150. Pine 70 years. Density .8 T.S. Block II
Castanea dentata---------- 0.80 grams
Fraxinus americana-------- 1.02
Acer saccharum------------ 5.99

Plot 151. Abandoned field. 7 years. T.S. Block II
Populus tremuloides-------29.75 grams
Betula populifolia--buds-- 1.76
Betula populifolia--browse 5.48
Pyrola elliptica---------- 6.20

Plot 152. Abandoned field. 7 years. T.S. Block II
Fraxinus americana-------- 1.62 grams
Betula populifolia--buds-- 0.79
Betula populifolia--browse 2.81
Potentilla---------------- 0.20
Fragaria virginiana------- 0.30

Plot 153. Abandoned field. 7 years. T.S. Block II
Populus tremuloides-------16.04 grams

Plot 154. Abandoned field. 7 years. T.S. Block II
Salix rostrata------------ 3.94 grams
Populus tremuloides------- 53.62
Betula populifolia--buds-- 2.94
Betula populifolia--browse 5.71
Rubus hispidus------------31.60
Pyrola elliptica---------- 4.50
Fragaria virginiana------- 2.20

Plot 155. Abandoned field. 7 years. T.S. Block II
Salix rostrata------------10.65 grams
Populus tremuloides-------20.99

Plot 156. Abandoned field. 7 years. T.S. Block II
Populus tremuloides-------26.08 grams
Rubus hispidus------------ 8.40

Plot 157. Abandoned field. 7 years. T.S. Block II
Populus tremuloides-------10.13 grams
Rubus hispidus------------24.80
Fragaria virginiana------- 0.40

Plot 158. Abandoned field. 7 years. T.S. Block II
Populus tremuloides------- 1.60 grams
Salix rostrata------------ 7.35
Rubus hispidus------------16.00
Fragaria virginiana------- 2.70

Plot 159. Abandoned field. 7 years. T.S. Block I[I]
Populus tremuloides-------- 1.77 grams
Acer rubrum---------- 1.97
Betula populifolia--buds--- 2.16
Betula populifolia--browse- 9.22

Plot 160. Abandoned field. 7 years. T.S. Block II
Salix rostrata---------- 0.63 grams
Populus tremuloides-------- 4.02
Betula populifolia--buds--- 9.45
Betula populifolia--browse-45.69
Rubus hispidus----------1.20

Plot 161. Pine 20 years. Density 1.0 T.S. Block III
No vegetation.

Plot 162. Pine 20 years. Density .9 T.S. Block II
No vegetation.

Plot 163. Pine 20 years. Density .9 T.S. Block II
No vegetation.

Plot 164. Pine 10 years. Density 1.0 S. of Sunset Lane
Acer rubrum---------- 0.93 grams
Gaultheria procumbens------ 0.10
Mitchella repens---------- 1.11
Solidago sp.---------- 0.05

Plot 165. Pine 10 years. Density .9 S. of Sunset Lane
Rubus hispidus--leaves----- 0.17 grams
Rubus hispidus--browse----- 0.03
Gaultheria procumbens------ 0.06

Plot 166. Pine 10 years. Density 1.0 S. of Sunset Lane
Rubus hispidus--leaves----- 0.36 grams
Rubus hispidus--browse----- 0.33

Plot 167. Pine 10 years. Density 1.0 S. of Sunset Lane
Solidago sp.---------- 0.06 grams

Plot 168. Pine 10 years. Density 1.0 S. of Sunset Lane
No vegetation.

Plot 169. Pine 10 years. Density .8 S. of Sunset Lane
Solidago sp.---------- 2.80 grams

Plot 170. Pine 10 years. Density .9 S. of Sunset Lane
Solidago sp.---------- 1.13 grams

Plot 171. Pine 10 years. Density .9 S. of Sunset Lane
Fragaria virginiana-------- 0.07 grams
Fraxinus americana--------- 1.02
Solidago sp.---------- 0.12

Plot 172. Pine 10 years. Density .8 S. of Sunset Lane
Solidago sp.---------- 2.61 grams
Rubus hispidus---------- 3.66
Rubus hispidus--browse----- 6.13

Plot 173. Pine 10 years. Density .7 S. of Sunset Lane
Fraxinus americana--------- 1.02 grams
Alnus incana---------- 0.54
Rubus hispidus--leaves----- 0.71
Rubus hispidus--browse----- 0.63

Plot 174. Hardwood 40 years. Density .6 T.S. Block II
Betula lenta--buds--------- 0.19 grams
Betula lenta--browse------- 0.53
Fraxinus americana--------- 1.32
Quercus borealis---------- 2.49
Castanea dentata---------- 0.55

Plot 175. Hardwood 40 years. Density .7 T.S. Block II
Mitchella repens---------- 2.60 grams
Prunus serotina---------- 0.06
Gaultheria procumbens------ 4.53
Quercus borealis---------- 0.31
Vaccinium pennsylvanicum--- 0.17
Betula lenta--buds--------- 1.35
Betula lenta--browse------- 3.31

Plot 176. Hardwood 40 years. Density .7 T.S. Block II
Betula lenta--buds--------- 0.05 grams
Betula lenta--browse------- 0.14
Gaultheria procumbens------ 9.00
Quercus borealis---------- 0.44
Mitchella repens---------- 0.19
Vaccinium pennsylvanicum--- 0.48

Plot 177. Hardwood 40 years. Density .8 T.S. Block II
Prunus serotina---------- 0.17 grams
Fraxinus americana--------- 0.45
Gaultheria procumbens------ 2.19

Plot 178. Hardwood 40 years. Density .8 T.S. Block II
Gaultheria procumbens------ 2.87 grams
Castanea dentata---------- 4.38

Plot 179. Hardwood 40 years. Density .8 T.S. Block II
Castanea dentata---------- 3.25 grams
Epipactis repens---------- 0.04
Vaccinium pennsylvanicum--- 0.23
Amelanchier canadensis----- 0.12

Plot 180. Hardwood 40 years. Density .7 T.S. Block II
Kalmia angustifolia-------- 0.52 grams
Gaultheria procumbens------ 6.62

Plot 181. Hardwood 40 years. Density .7 T.S. Block II
Mitchella repens---------- 0.42 grams
Viburnum cassinoides------- 6.99

Plot 182. Hardwood 40 years. Density .9 T.S. Block II
Quercus alba-------------- 1.39 grams

Plot 183. Hardwood 40 years. Density .9 T.S. Block II
Prunus serotina----------- 0.72 grams

Plot 184. Pine 60 years. Density .9 T.S. Block II
Acer rubrum--------------- 0.99 grams
Quercus alba-------------- 1.16
Maianthemum canadense------ 0.91

Plot 185. Pine 40 years. Density .8 T.S. Block II
Maianthemum canadense------ 0.34 grams
Fraxinus americana--------- 1.58
Betula lenta--buds--------- 0.11
Betula lenta--browse------- 0.30

Plot 186. Pine 40 years. Density .8 T.S. Block II
Fraxinus americana--------- 0.26 grams
Trientalis americana------- 0.01
Cornus alternifolia-------- 0.15

Plot 187. Pine 40 years. Density .7 T.S. Block II
Polystichum acrostichoides-14.71 grams
Viburnum cassinoides------- 1.42
Aspidium spinulosum--------11.23
Trientalis americana------- 0.02
Maianthemum canadense------ 0.09

Plot 188. Pine 40 years. Density .8 T.S. Block II
Viburnum cassinoides------- 0.12 grams
Vaccinium pennsylvanicum--- 0.09
Maianthemum canadense------ 0.39

Plot 189. Pine 40 years. Density .9 T.S. Block II
Maianthemum canadense------ 0.19 grams
Cornus alternifolia-------- 0.20

Plot 190. Pine 40 years. Density .8 T.S. Block II
Trientalis americana------- 0.03 grams
Aspidium spinulosum-------- 4.10
Maianthemum canadense------ 0.08
Ilex verticillata---------- 0.44
Castanea dentata----------- 1.56
Vaccinium pennsylvanicum--- 0.60

Plot 191. Pine 40 years. Density .9 T.S. Block II
Trientalis americana------- 0.01 grams
Castanea dentata----------- 0.46
Cornus alternifolia-------- 0.09

Plot 192. Pine 40 years. Density .9 T.S. Block II
Acer rubrum---------- 0.04 grams
Quercus borealis------- 0.13
Trientalis americana--- 0.02
Vaccinium pennsylvanicum0.36

Plot 193. Pine 40 years. Density .9 T.S. Block II
Epipactis repens------- 0.10 grams
Trientalis americana--- 0.02
Quercus borealis------- 0.14
Vaccinium pennsylvanicum0.13

Plot 194. Pine 40 years. Density .9 T.S. Block II
Aspidium spinulosum---- 1.34 grams
Trientalis americana--- 0.01
Ilex verticillata------ 1.60

Plot 195. Hardwood 50 years. Density .9 W. of Harry Upham's
Acer rubrum---------- 0.27 grams
Acer saccharum--------- 0.75

Plot 196. Hardwood 50 years. Density .9 W. of H. Upham's
Acer saccharum--------- 1.01 grams
Tilia americana-------- 2.74
Aspidium spinulosum---- 0.11

Plot 197. Hardwood 50 years. Density .9 W. of H. Upham's
Acer saccharum--------- 0.35 grams

Plot 198. Hardwood 50 years. Density .8 W. of H. Upham's
Acer saccharum--------- 1.55 grams
Quercus obrealis------- 0.13

Plot 199. Hardwood 50 years. Density .8 W. of H. Upham's
Acer saccharum--------- 0.61 grams

Plot 200. Pine 30 years. Density .9 T.S. Block II
Amelanchier canadensis--0.56 grams
Vaccinium pennsylvanicum0.14

Plot 201. Pine 30 years. Density .8 T.S. Block II
Pyrola elliptica-------- 3.15 grams

Plot 202. Pine 30 years. Density .8 T.S. Block II
Pyrola elliptica-------- 0.99 grams

Plot 203. Pine 30 years. Density .9 T.S. Block II
No vegetation.

Plot 204. Pine 30 years. Density .8 T.S. Block II
Aspidium spinulosum----- 0.45 grams
Solidago sp.------------ 0.21
Vaccinium pennsylvanicum 0.28

Plot 205. Pine 30 years. Density .9 T.S. Block II
Pyrola elliptica--------- 0.07 grams
Solidago sp.------------- 6.02

Plot 206. Cutover 1929. Sunset Lane
Fraxinus americana------- 2.31 grams
Rhus typhina------------- 0.54
Tilia americana---------- 5.01
Acer saccharum----------19.00

Plot 207. Cutover 1929. Sunset Lane
Fraxinus americana------- 0.30 grams
Rubus alleghenienses----- 3.12
Hicoria ovata------------ 2.90
Acer saccharum----------- 2.43
Corylus rostrata--------- 1.04
Acer rubrum-------------13.22
Tilia americana---------- 5.58

Plot 208. Cutover 1929. Sunset Lane
Corylus rostrata--------- 3.56 grams
Prunus serotina---------- 2.45
Acer rubrum-------------- 4.28
Betula lenta--buds------- 0.31
Betula lenta--browse----- 1.05
Populus tremuloides------ 1.98
Tilia americana---------- 3.01
Rhus typhina------------- 1.40

Plot 209. Cutover 1929. Sunset lane
Fraxinus americana------- 4.25 grams
Hicoria ovata------------ 4.24
Rubus alleghenienses----- 1.89
Tilia americana---------- 3.97
Ilex verticillata-------- 4.00

Plot 210. Cutover 1929. Sunset Lane
Acer rubrum-------------- 0.48 grams
Quercus borealis--------- 0.45
Cornus alternifolia------ 2.64
Rubus alleghenienses----- 5.30
Tilia americana---------- 0.42
Fraxinus americana------- 2.77

Plot 211. Hardwood 40 years. Density .9 P.H. VII; Hd. 3.
Quercus borealis--------- 0.09 grams
Vaccinium pennsylvanicum- 0.38
Rubus hispidus--leaves--- 0.75
Rubus hispidus--browse--- 0.47
Fagus grandifolia-------- 0.92
Mitchella repens--------- 0.61
Acer rubrum-------------- 0.57

Plot 212. Hardwood 40 years. Density .9 P.H. VII; Hd. 3.
Aspidium spinulosum--------- 3.64 grams
Acer rubrum----------------- 0.63

Plot 213. Hardwood 40 years. Density .8 P.H. VII; Hd. 3.
Acer rubrum----------------- 0.43 grams
Castanea dentata------------ 1.01
Quercus borealis------------ 0.62
Aspidium spinulosum--------- 6.58
Betula lutea--buds---------- 0.64
Betula lutea--browse-------- 2.20
Mitchella repens------------ 0.63

Plot 214. Hardwood 40 years. Density .8 P.H. VII; Hd. 3.
Prunus serotina------------- 0.46 grams
Gaultheria procumbens-------39.50
Acer rubrum----------------- 0.83
Amelanchier canadensis------ 1.64
Vaccinium pennsylvanicum---- 0.44
Pyrola americana------------ 0.81

Plot 215. Hardwood 40 years. Density .8 P.H. VII; Hd. 3.
Betula lutea--buds---------- 0.34 grams
Betula lutea--browse-------- 1.83
Aspidium spinulosum--------- 4.42
Acer rubrum----------------- 0.61
Quercus borealis------------ 0.31

Plot 216. Hardwood 40 years. Density .9 P.H. VII; Hd. 3.
Acer rubrum----------------- 1.89 grams
Aspidium spinulosum---------21.72

Plot 217. Hardwood 40 years. Density .7 P.H. VII; Hd. 3.
Quercus borealis------------ 0.93 grams
Maianthemum canadense------- 0.01
Rubus hispidus--leaves------ 0.75
Rubus hispidus---browse----- 0.50

Plot 218. Hardwood 40 years. Density .8 P.H. VII; Hd. 3.
Gaultheria procumbens--------42.39 grams
Acer rubrum----------------- 3.93
Fagus grandifolia------------ 2.68

Plot 219. Hardwood 40 years. Density .7 P.H. VII; Hd. 3.
Acer rubrum----------------- 4.61 grams

Plot 220. Hardwood 40 years. Density .8 P.H. VII; Hd. 3.
Pyrola americana------------ 0.18 grams
Mitchella repens------------ 0.46
Prunus serotina------------- 0.34
Rubus hispidus--leaves------- 0.86
Rubus hispidus--browse------- 0.50
Betula lutea--buds---------- 0.64
Betula lutea--browse--------- 3.63

Plot 221. Old Field 7 years. Petersham Village.
Fragaria virginiana---------- 1.08 grams
Rubus hispidus--leaves-------19.88
Rubus hispidus--browse-------14.96

Plot 222. Old Field 7 years. Petersham Village
Gaultheria procumbens-------- 2.26 grams
Fragaria virginiana---------- 0.56
Rubus hispidus--leaves-------17.26
Rubus hispidus--browse-------14.82

Plot 223. Old Field 7 years. Petersham Village
Solidago sp.----------------- 0.51 grams
Fragaria virginiana---------- 0.22
Viburnum cassinoides--------- 2.59
Kalmia angustifolia----------61.42
Rubus hispidus--leaves-------13.44
Rubus hispidus--browse------- 8.26

Plot 224. Old Field 7 years. Petersham Village
Solidago sp.----------------- 5.91 grams
Fragaria virginiana---------- 0.62
Vaccinium pennsylvanicum----- 1.64
Rubus hispidus--leaves------- 1.49
Rubus hispidus--browse------- 0.94

Plot 225. Old Field 7 years. Petersham Village
Solidago sp.----------------- 0.02 grams
Amelanchier canadensis------- 2.76
Rubus hispidus--leaves------- 0.14
Rubus hispidus--browse------- 0.07