

THE UPLAND FIELDS OF THE MARY FLAGLER CARY ARBORETUM

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INTRODUCTION

Abandoned agricultural fields represent a major component of the landscape of the Hudson Valley of New York. Much of the structural diversity of the vegetation within this region can be attributed to the various stages of secondary succession that occur following abandonment of land from cultivation or pasture. The Mary Flagler Cary Arboretum encompasses 795 ha of land within the Mid-Hudson Valley, at elevations between 90 and 220 meters. The general geology, soils and climate of the Arboretum are described in Canham et al. (ms., in prep.). The forests and fields within the Arboretum represent a major resource for the research program of the Institute of Ecosystem Studies. The primary motivation for this study was to provide an inventory and analysis of the vegetation, environment and land-use history of the upland fields within the Arboretum in the hope that our results will aid both the management of those fields and promote their use in future research.

METHODS

The present study was restricted to open fields located within upland areas of the Arboretum. Lowland fields along the floodplain of Wappinger Creek were excluded because they reflect a very different environment than the upland fields, and because they have been subjected to intensive management within the past decade.

INVENTORY

Our inventory consists of descriptions of the land-use history, environment and current vegetation of the major upland fields within the Arboretum. The criteria for selecting fields for the inventory were designed to identify sites with the greatest potential for future research. These criteria were:

- (1) that a field was > 1 ha in size;
- (2) that it had not been heavily disturbed or intensively managed for non-research uses in the past decade; and
- (3) that it did not contain plantings currently maintained by the Arboretum.

In addition, the fields around the Gifford House (south of Wappinger Creek) were excluded because of the likelihood of their use in public education programs.

The boundaries of each field were determined from stone walls, hedgerows and fences. In most cases, these features delimit areas of relatively uniform land-use, although the environment and vegetation within any given field is often strikingly heterogeneous. Using these criteria, 23 separate fields covering approximately 66 ha were identified and chosen for the inventory (Fig. 1). The fields occupy predominantly well-drained, rolling topography on either thin glacial till over bedrock or upper elevations of the thick layer of glacial outwash present in the valley bottoms. Elevations range from [] to [] m. Many of the fields have small local depressions that are poorly drained and may have standing water for some portion of the year. The vegetation of the fields ranges from almost exclusively herbaceous to complex mosaics of herbaceous and woody species. Many of the fields are in late stages of old field succession, with considerable invasion by tree and shrub species.

A variety of sources were used to compile a history of recent land-use for each field. Our efforts were focused primarily on identifying (1) agricultural uses immediately prior to abandonment, and (2) subsequent land-use. Our principal sources of information on agricultural practices prior to abandonment were interviews and field trips with several members of the families that farmed the land prior to abandonment (in particular, Mr. Jim Henry, Mr. Harry Pettit and Mr. Wendell Fowler). Historical records, including land deeds and agricultural censuses were used to provide background information on earlier agricultural practices. Mr. John Bouton, a former employee of both the Arboretum and the Davie Tree Company, provided details on management of the fields under Mrs. Cary. Present and past employees of the Arboretum were consulted for details of the management of each field following the formation of the Arboretum.

Our inventory of the vegetation within each field consists of a general description of the physical structure (particularly the relative distribution of trees, shrubs and herbaceous species) of the vegetation of the field, as well as lists of the major vascular plant species with an estimate of their abundance. Four abundance classes were used for trees and shrubs:

1. Rare - a single or few individuals of a species present in a field,
2. Low density - widespread throughout a field, but in low density,
3. Local patches - locally high densities of individuals or clones, but not found throughout the field, and

4. Abundant - relatively dense and widespread throughout the field. The abundance classes record the abundance of a particular species relative to the overall abundance of that growth form (i.e. trees or shrubs) in the field. Trees species that were found primarily along field edges were specifically noted, since these trees often serve as sources of seed dispersal into the fields. The diversity and often inconspicuous nature of the herbaceous species precluded any attempt at a detailed abundance ranking. Instead, the dominant species were noted, and other unusual or characteristic species were listed separately. The field inventories were done during mid-summer (of 1985) in order to identify both early and late season species. Nomenclature follows Gleason and Cronquist (1963) unless otherwise noted.

INTENSIVE STUDY

A subset of the inventoried fields was selected for more intensive, quantitative analysis. These sites were chosen to cover the range of vegetation, substrate, and land-use history encountered during the inventory. Seven major fields and two small (1 ha) fields from the different primary land parcels were chosen as the study sites for intensive research.

Five 200 m² circular plots (plot radius = 7.98m) were randomly located in each of the fields selected for study. Plot centers were randomly located using polar coordinates from an arbitrarily designated point of origin established at a prominent grid corner or map feature. Plot locations were rejected if the plot center fell within 10m of a road or track, or within 15m of the edge of the field, or in an active research area. The two 1 ha fields were treated as a single unit for the purposes of plot location due to the small size of these fields.

The projected cover of erect woody vegetation (erect shrubs and tree stems > 1m in height) was measured along four 7.5m line transects oriented in random

compass directions from the plot center. Adjacent transects were separated by at least 30°. The presence of species of trees and shrubs found within the plot but not encountered along the line transects was also recorded. Projected cover of herbaceous species and creeping woody plants was sampled using two 1m x 0.5m rectangular quadrats located at random distances along each of the four line transects. The cover of bare rock, litter, bare soil, mosses and lichens, as well as the density of tree seedlings, was also recorded. A complete list of herbaceous species present in the 200 m² plot was also compiled.

For each tree species, the densities of saplings (tree stems > 1m in height and < 10cm DBH) within the entire 200 m² plot were recorded in 2 cm DBH size classes. The actual DBH of tree-sized stems (stems > 10cm DBH) were recorded individually by species.

The physical environment of each plot was characterized by recording descriptive information, including the slope, principal aspect, and slope position of the overall plot. Soil was collected for chemical analyses by removing cores from the top 10cm of mineral soil at 5 randomly located points within each plot.

Two-way indicator species analysis (TWINSpan) (Hill 1979) was used to identify levels of similarity in vegetation between plots both within a given field and between different fields.

LAND USE HISTORY

In many ways the Arboretum provides a microcosm of the landscape of southern New England. The present composition and structure of both fields and forests can be traced to the waxing and waning of agricultural practices and land use history over the past 3 centuries. For this report, we have concentrated on the period beginning immediately before agricultural abandonment.

RECENT AGRICULTURAL HISTORY

Prior to their acquisition by the Melbert and Mary Flagler Cary, the fields included in this study were part of farms owned by the Henry, Chase, Pettit, and Saccomanda families. The farms were primarily devoted to dairy and cattle, and although some land was cultivated, crop yields were largely devoted to the support of livestock. The typical dairy herd averaged about 100 head, requiring about 15 ha. of pastureland. Pasturing usually occurred on land too steep or rocky for conventional tilling, while more suitable land was usually used for producing crops or hay. Much of the land remained in pasture permanently, with little improvement beyond clearing. Thus, these fields often supported populations of the native grasses of the region.

Crop rotation was commonly practiced to maintain soil fertility. The principal crop rotation cycle consisted of one year of corn followed by a year of oats, then three years of hay. Corn was grown to be used as grain and livestock feed and silage, oats were threshed to serve as horse and cattle feed, and hay was stored for silage and bedding. Rye and wheat were also occasionally planted in small amounts, but barley was rarely ever planted. Conventional tillage by horse and plow was standard, and by the time tractors were beginning to be used in the late 1930's, most of this land was already fallow.

ABANDONMENT AND POST-AGRICULTURAL HISTORY

By 1930, the Cary's had acquired most of the land surrounding the Canoe Hills, but they permitted the farmers who had sold the land to remain as tenants for as long as they wished, continuing their farming operations much as they had done in the past. The Chase farm was abandoned first, in 1932, but the lower section of this property continued to be pastured by the Henry's. The Henry's left soon after this in the early 1930's, after which their property was leased to W. Braddock. He maintained the livestock, but there was little use of the land, even for pasturing. When he left after 4-5 years, the next tenants did not use the farm at all, and simply let the land become fallow. The Saccomanda dairy farm was not sold to the Carys until 1937, who chose not to remain as tenants and left about the same time. The Pettit farm continued to operate until late in 1939. By 1940, all agricultural use of the lands included in this study had ceased. Following the departure of the Pettits, it appears that there was little, if any, management of the land for the next 20 years.

Beginning in the early 1960's, Mary Flagler Cary employed a number of workers from the Davie Tree Company for a variety of projects, including pruning, clearing brush, cutting vistas, and moving trees. This work was concentrated around the Tea House Hill, consequently, most of the fields were left undisturbed. These activities continued until Mrs. Cary's death in 1967 (J. Bouton, pers. comm.).

Dominance of herbaceous vegetation in some of the old fields was preserved throughout the 1970's by mowing ("brush-hogging") that cut back invading woody plants. A small tractor was used to pull a hedge-cutting rig set at approximately half a meter above the ground. Larger shrubs and saplings were sometimes removed with a chain saw or by axe. Cutting was usually done once in the late spring, which allowed the herbaceous species to grow back later in the summer. Cutting was occasionally repeated in the late summer if time permitted. This practice inadvertently favored woody species which could rapidly spread vegetatively from a perennial root stock, most notably smooth sumac (*Rhus glabra*) and black locust (*Robinia pseudoacacia*), while selecting against more slowly invading tree species such as maples and oaks.

Some of the fields have been used since 1977 for studies of white-tailed deer and their effect on vegetation. In several fields these studies have included management practices designed to regenerate clones of succulent woody species, primarily smooth sumac, through the cutting of old clones. This management has been largely concentrated near stone walls and field edges, leaving other areas of a field undisturbed.

ANALYSIS OF THE VEGETATION, ENVIRONMENT AND LAND-USE HISTORY OF THE UPLAND FIELDS

Characteristics of the 23 major upland fields are summarized in Table 1. The 40 intensively sampled plots were distributed in 8 fields that reflect the range of environmental conditions and land-use history encountered in the 23 fields. The intensively sampled plots allow a limited but quantitative analysis of relationships between vegetation, environment and land-use history in the upland fields of the Arboretum.

Two species - a shrub (Cornus racemosa, gray dogwood) and a grass (Andropogon scoparius, little bluestem) - are abundant throughout the old fields (Table 2). Gray dogwood was present in 85% of the plots, covering as much as 74% of a given plot (mean % cover = 14.6%). Little bluestem was present in 97.5% of the plots, covering as much as 76% of a plot (with a mean cover of 31.9%). The next most abundant herbaceous and woody species (species of Solidago and Juniperus virginiana respectively) had much more restricted distributions and much lower average cover values (Table 2).

Although the presence of little bluestem and gray dogwood provides a strong common element among all of the fields, classification of the fields using TWINSpan does allow the objective identification of relatively distinct groups of plots (Figure 2). The distribution of species among the 40 plots is given in Table 3. The 4 major groups of plots identified by the classification procedure appear to represent 4 relatively distinct combinations of environment and land-use history. The fact that most but not all of the separate plots from within a given field were placed in the same group by TWINSpan supports the assumption that there is significant environmental heterogeneity within fields, but a more general similarity among plots within a field as a result of a common land-use history.

The first major group identified by the classification procedure is a set of 7 plots, including all 5 of the plots from field #460, and 1 plot each from fields #710 and #720. Both gray dogwood and little bluestem are common in these fields (Table 3), but this set of plots is distinctive in the presence of 3 woody species that are characteristic of dry and infertile soils - Betula populifolia (gray birch), Quercus ilicifolia (scrub oak) and Vaccinium vacillans (early low blueberry). The virtual absence of any of the species of Solidago (goldenrods) (Table 3) also suggests that these sites are drier than most of the upland fields. Field #460 occupies relatively level terrain on glacial outwash deposits, with soils that are largely Hoosic gravelly loams. Fields #710 and #720 are both mapped as predominantly Nassau slaty silt loams derived from a thin layer of glacial till. We could not conclusively identify the agricultural use of field #460 prior to abandonment of the field in 1939, however fields #710 and #720 were both used as pasture prior to abandonment in 1932. The most distinctive aspect of land-use history for these three fields has been the virtual absence of any management since abandonment in the 1930's. While invasion of the fields by gray birch and scrub oak is responsible for the distinctiveness of the vegetation in field #460, the absolute rate of invasion of the field by woody plants has been remarkably low. Although it has been almost 50 years since the field was abandoned, the total cover of woody plants was greater than 15% in only 1 of the 5 plots within the field.

The second set of plots identified by TWINSpan can be best described as red cedar (Juniperus virginiana) woodlands. The group consists of 4 plots from field #710, 4 plots from field #123 and one plot each from fields #715 and #720. The plots, particularly those from field #710, have relatively dense populations of red cedars reaching 10 m in height over an herbaceous layer dominated by little bluestem. The plots occur on a variety of soils (Table 1), and were primarily used for pasture prior to abandonment during the 1930's. All of the 4 fields have received little, if any, management or human disturbance since abandonment. The average cover of tree and shrub species is greater in this group of plots than any other group (Figure 2), with almost

half of the total cover of woody plants contributed by red cedar. However, tree species that might eventually form a closed hardwood canopy are still uncommon and largely restricted to the edges of the fields.

The largest group of plots identified by TWINSPAN is a set of 18 plots, primarily from fields cultivated as part of the Henry farm (fields #904, #937, and #960). The fields are currently dominated by little bluestem, gray dogwood, a number of species of goldenrods (particularly Solidago graminifolia and Solidago rugosa) and both creeping and erect species of raspberries (Rubus spp.). In addition to the history of cultivation prior to abandonment in the mid 1930's, two of the fields (#937 and #960) were brush-hogged between 1973 and 1982 both to control woody invasion and for research purposes. Despite (or more likely, because of) these activities, this set of plots had the highest average cover of shrubs (Figure 2). Most of the plots are on shallow soils derived from a thin layer of glacial till over bedrock.

The final group of plots identified by TWINSPAN is the set of 5 plots from field #177. This field is the most distinctive of any of the fields surveyed for the inventory. It was used regularly as a hay field between 1961 and 1968, and was mowed regularly until 1982. The grass Phleum pratense (timothy, presumably sown for hay) and Galium mollugo (an introduced, weedy species of bedstraw) are the dominant species in these plots. Both little bluestem and gray dogwood are only sparsely distributed in this field.

AN INVENTORY OF THE MAJOR UPLAND FIELDS

A map showing the locations of each of the 23 major upland fields within the Arboretum is provided in Figure 1. Characteristics of the vegetation, environment and history of the 23 fields are also summarized in Table 1. The remainder of this section of the report provides the more detailed inventory of each of the fields.

INDIVIDUAL FIELD SUMMARIES

FIELD #123

Vegetation Structure

The field edges are amorphous, becoming open woods. Trees are relatively dense, large (some over 10m in height), and dominating in an open canopy. Hardwoods are most common toward the edges, with red cedar abundant in the open areas. The shrub layer is patchily distributed and mostly composed of solitary or clumped individuals present in open areas with the mixed herbaceous layer of grasses and broad-leaved plants abundant throughout the field.

Environmental Parameters

Hilltops and east- to southeast-facing hillsides form the terrain, sloping up to 15°. Most of the well-drained soil is acid Hoosic gravelly loam, along with some Wassaic stony loam, which is more neutral and underlain by limestone bedrock. Exposed rock is sparsely present on the steep hillside in the northwest corner.

Historical Information

The land was part of the Saccomanda dairy farm, and may have been used for pastureland at that time. The field has not been managed or used since it was abandoned in the late 1930's.

Species List

TREES

ABUNDANT:

Juniperus virginiana
Acer rubrum

LOW DENSITY:

Cornus florida
Prunus serotina
Quercus velutina
Ailanthus altissima

LOCAL PATCHES:

Populus tremuloides (edge)

RARE:

Fraxinus americana
Quercus rubra
Quercus prinus
Acer saccharum
Pyrus malus
Pinus strobus

SEEDLINGS

ABUNDANT:

Juniperus virginiana

LOW DENSITY:

Fraxinus americanaQuercus velutina

LOCAL PATCHES:

Populus tremuloides

RARE:

Ulmus americanaQuercus rubraQuercus prinusCarya glabraPinus strobus

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Cornus racemosa (s,t)

LOW DENSITY:

Rhus glabra (s,t)Juniperus communis (s)

LOCAL PATCHES:

Rubus sp. (c)Toxicodendron radicans (c)

RARE:

Lonicera morrowii (s)Vaccinium vacillans (s)Rosa sp. (s)Rhamnus cathartica (s)Cornus amomum (s)Vaccinium stamineum (s)Viburnum dentatum (s)Parthenocissus quinquifolia (c)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Solidago sp., Carex sp., Anthoxanthum odoratumOTHERS: Pycnanthemum flexuosum, Rudbeckia hirta, Achillea millefolium, Prunella vulgaris, Anaphalis margaritacea, Hypericum perforatum, Trifolium agrarium, Hieracium florentinum, Rumex acetosella, Asclepias sp., Dianthus armeria, Aster sp., Centaurea jacea, Lobelia spicata

FIELD #130

Vegetation Structure

The site is a complex mix of woody and herbaceous plants, with shrubs patchily distributed in an herbaceous matrix. The hilltops are dominated by grasses, with shrubs dominant elsewhere. Trees and seedlings are present throughout, particularly on the periphery of the field and in hedgerows and local depressions. Patches of bare soil or lichens are present on the hilltops.

Environmental Parameters

The terrain is composed of hilltops at the southwest edge divided by a depression between a south-facing hillside to the northeast. Slopes are moderate, ranging up to 20° down to a stream to the north.

Historical Information

The site was used as pastureland for the nearby Saccomanda dairy farm up until abandonment in 1937, and has remained untouched since that time.

Species Lists

TREES

ABUNDANT:

Juniperus virginiana

LOCAL PATCHES:

Acer rubrum (edge)
Acer saccharum (edge)
Populus tremuloides
Betula populifolia

LOW DENSITY:

Prunus serotina

RARE:

Ulmus americana
Fraxinus americana
Cornus florida
Pinus strobus

SEEDLINGS

ABUNDANT:

Juniperus virginiana

LOCAL PATCHES:

Betula populifolia
Populus tremuloides

LOW DENSITY:

Quercus rubra
Fraxinus americana

RARE:

Ulmus americana
Acer rubrum
Acer saccharum
Quercus alba
Pyrus malus

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

LOCAL PATCHES:

Parthenocissus quinquefolia (c)
Myrica asplenifolia (s,t)
Cornus racemosa (t)
Rhus glabra (t)
Lonicera morrowii (s)
Viburnum lentago (s)

LOW DENSITY:

Rubus sp. (c)
Rosa multiflora (s)

RARE:

Humulus lupulus (v)
Cornus amomum (s)

Toxicodendron radicans (c)
Prunus mahaleb (s)
Gaylussacia baccata (s)
Vaccinium corymbosum (s)
Viburnum dentatum (s)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Anthoxanthum odoratum

OTHERS: Lysimachia quadriflora, Rudbeckia hirta, Achillea millefolium,
Chrysanthemum leucanthemum, Dianthus armeria, Dactylis glomerata, Potentilla
simplex, Trifolium agrarium, Erigeron strigosus, Erigeron annuus, Galium
mollugo, Trifolium pratense, Sisyrinchium sp., Poa pratensis, Potentilla recta,
Silene cucubalus, Juncus tenuis, Rumex acetosella
 RARE:

FIELD #141

Vegetation Structure

Patches of trees up to 8m in height dominate the field. Juniperus virginiana is abundant throughout the site, with tree seedlings and saplings common. Shrubs are also common, solitary or arranged in low clumps < 1.5 m high, rarely in thickets and never dense. The herbaceous cover is not complete, with bare soil between grass clumps and mosses, particularly at the south end of the field.

Environmental Parameters

The topography is mostly steep upper hillsides on east- and southeast-facing slopes reaching 25°. Shallow Nassau slaty silt loams (underlain by shale < 50 cm deep) along with some deep Hoosic gravelly loams are present at the site. These well-drained soils are characteristic of till and outwash soils in the area, respectively. Exposed bedrock is concentrated in the center and upper areas of the hillside.

Historical Information

This site was probably pastured until 1937 (before abandonment) as part of the working dairy farm which occupied the present greenhouse area. A stone wall is located nearby in the woods to the south.

Species Lists

TREES

ABUNDANT:
Juniperus virginiana

LOCAL PATCHES:
Acer rubrum
Betula populifolia

LOW DENSITY:

Acer saccharum
Prunus serotina
Quercus velutina

RARE:

Fraxinus americana
Populus tremuloides
Quercus alba
Quercus rubra
Alnus rugosa
Carya glabra
Cornus florida
Pyrus malus

SEEDLINGS

ABUNDANT:

Quercus velutina

LOCAL PATCHES:

Betula populifolia

LOW DENSITY:

Juniperus virginiana
Acer rubrum

RARE:

Prunus serotina
Ulmus americana
Quercus rubra
Quercus alba
Populus tremuloides
Ulmus americana

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Rubus sp. (c)

LOCAL PATCHES:

Toxicodendron radicans (c)
Rhus glabra (s)

LOW DENSITY:

Cornus racemosa (s,t)
Rosa multiflora (s,c)
Vaccinium angustifolium (s)
Vaccinium vacillans (s)

RARE:

Parthenocissus quinquefolia (c)
Rubus canadensis (c)
Viburnum lentago (s)
Rhamnus cathartica (s)
Viburnum dentatum (s)
Vitis sp. (v)

HERBACEOUS PLANTS

DOMINANTS: Shizachyrium scoparius

OTHERS: Lycopodium complantum, Apocynum androsaemifolium, Rumex acetosella,
Fragaria virginiana, Hieracium florentinum, Stellaria graminea, Verbascum
thapsis, mosses, lichens (Cladonia cristatella and other Cladonia)

FIELD #177

Vegetation Structure

The vegetation is dominated by mixed herbaceous and creeping plants; shrubs are rare and primarily found near the field periphery. A small patch of trees and shrubs is located at the extreme southwest corner.

Environmental Parameters

The site is flat, located on a hilltop with minor local depressions. The soil is a deep, acid, Hoosic gravelly loam.

Historical Information

The Saccomanda dairy farm used the land for pasturing before its abandonment in 1937. This field was regularly hayed between 1961 and 1968, and either hayed or mowed annually until 1982.

Species Lists**TREES**

LOCAL PATCHES:

Juniperus virginiana (edge)

RARE:

Quercus velutina

Cornus florida (edge)

SEEDLINGS

RARE:

Prunus serotina

Carya glabra

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

LOCAL PATCHES:

Cornus racemosa (s)

Toxicodendron radicans (c)

LOW DENSITY:

Rubus sp. (c)

RARE:

Rhus glabra (s)

Humulus lupulus (s)

Lonicera morrowii (s)

HERBACEOUS PLANTS

DOMINANTS: Galium mollugo, Andropogon scoparius, Anthoxanthum odoratum, Phleum pratense

OTHERS: Bromus inermis, Arrhenatherum elatius, Dactylis glomerata, Poa compressa, Poa pratense, Potentilla recta, Solanum carolinense, Lotus corniculatus, Achillea millefolium, Dianthus armeria, Veronica officinalis, Chrysanthemum leucanthemum, Lepidium campestre, Fragaria virginiana, Stellaria graminea, Hieracium florentinum, Hieracium sp., Asclepias sp., Erigeron sp.

FIELD #398

Vegetation Structure

Red cedar and red maple are relatively abundant, some reaching 8 m in height, with other trees found along the edges. The ground cover is primarily mixed herbaceous and shrub species < 1 m high, with the shrubs dominant in the south end of the field.

Environmental Parameters

The terrain is mostly flat, with no discernable slope or aspect. The soil is Hoosic gravelly loam; a deep, gravelly, well-drained soil formed on outwash.

Historical Information

The field was pastured as part of the Pettit farm, which was abandoned late in 1939. The field has apparently not been managed since then, except in 1979, when it was mowed once.

Species Lists

TREES

ABUNDANT:

Juniperus virginiana
Acer rubrum

LOCAL PATCHES:

Robinia pseudoaccacia
Populus tremuloides
Quercus rubra (edge)
Quercus velutina (edge)

RARE:

Prunus serotina
Pinus strobus
Pinus rigida
Acer saccharum
Tilia americana

SEEDLINGS

LOCAL PATCHES:

Populus tremuloides

RARE:

Quercus rubra
Acer rubrum
Fraxinus americana
Robinia pseudoaccacia

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Rubus sp. (c)
Cornus racemosa (s,t)

LOCAL PATCHES:

Spirea latifolia (t)
Rhus glabra (s,t)
Parthenocissus quinquefolia (c)

RARE:

Lonicera morrowii (s)
Humulus lupulus (v)
Toxicodendron radicans (c,v)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Solidago spp.

OTHERS: Asclepias tuberosa, Rumex acetosella, Oxalis stricta, Fragaria virginiana, Hieraracium florentinum, Achillea millefolium, Silene cucubalus, Chrysanthemum leucanthemum, Potentilla simplex, Solidago bicolor, Erigeron sp., Carex sp.

FIELD #460

Vegetation Structure

The field is dominated by a matrix of grasses and creeping plants, but shrub clumps and tree seedlings are common. Trees reaching 8 m in height are present, but are mostly confined to the edges and hedgerows. Tree seedlings are well-dispersed within the field.

Environmental Parameters

The field mostly occupies a northeast-facing, nearly level, hilltop. A depression bisects this site along an east axis, with gentle slopes ranging up to 10°. The soil is primarily Hoosic gravelly loam, with no apparent bedrock exposed within the field.

Historical Information

A stone wall runs along the east edge of the site, which is surrounded by woods. The field was part of the Pettit farm when purchased by the Carys in 1930. Abandonment from agriculture occurred in late 1939, and there has been no known management in the area since then.

Species Lists

TREES

LOCAL PATCHES:

Betula populifolia
Acer rubrum (edge)
Populus grandidentata
Quercus rubra (edge)

LOW DENSITY:

Juniperus virginiana
Prunus serotina

RARE:

Quercus coccinea
Quercus prinus
Pinus strobus
Pinus rigida
Fraxinus americana (edge)
Ulmus americana (edge)
Hamamelis virginiana
Carya glabra

SEEDLINGS

LOCAL PATCHES:

Betula populifolia
Populus grandidentata

LOW DENSITY:

Quercus rubra

RARE:

Juniperus virginiana
Prunus serotina
Pinus rigida
Quercus alba

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Rubus sp. (c)

LOCAL PATCHES:

Vaccinium vacillans (s,t)
Cornus racemosa (t)
Rhus glabra (t)
Gaylussacia baccata (s,t)

LOW DENSITY:

Vaccinium stamineum (s,t)
Vaccinium angustifolium (s,t)

RARE:

Myrica asplenifolium (s)
Toxicodendron radicans (c,v)
Quercus illicifolia (s)
Rosa sp. (s,v)
Rhamnus cathartica (s)
Crataegus sp. (s)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Danthonia spicata, Lysimachia quadrifolia

OTHERS: Rumex acetosella, Hieracium florentinum, Fragaria virginiana, lichens (including some Cladonia), Potentilla simplex

FIELD #510

Vegetation Structure

A mixed herbaceous cover is dominant and nearly complete, with only a single individual tree and sparsely distributed low shrubs (< 1 m high) growing at the south end of the field. Overall herbaceous cover is heterogeneous and patchy due to the nature of the management history of the site.

Environmental Parameters

The terrain is artificially flat, located on a hilltop with no exposed bedrock. Hoosic gravelly loam is the major soil type.

Historical Information

This field was part of the Pettit property until it was sold in 1930. The recent management history of this site eclipses any of its previous uses. The Arboretum has been using the area as a dumping site and tire field, and brush-burning is usually carried out during the winter. Gravel for the

Arboretum internal road system was stripped off this site, resulting in an approximately 2 m drop in relief, as well as levelling the terrain. A gravel pit was established in 1981 near the southwest corner. Mowing was done 2 to 3 times a year prior to 1982, and more recently only once a year.

Species Lists

TREES

RARE:

Fraxinus americana

SEEDLINGS

LOCAL PATCHES:

Ulmus americana

RARE:

Populus tremuloides

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

LOCAL PATCHES:

Cornus racemosa (s)

LOW DENSITY:

Lonicera morrowii (s)

RARE:

Rosa sp. (s)

Rubus sp. (c)

Aronia melanocarpa (s)

HERBACEOUS PLANTS

DOMINANTS: Shizachyrium scoparius, Galium mollugo, Ambrosia artemisiifolia, Solidago canadensis

OTHERS: Lotus corniculatus, Dianthus armeria, Fragaria virginiana, Silene cucubalus, Trifolium agrarium, T. pratensis, T. repens, Stellaria graminea, Potentilla recta, Chrysanthemum leucanthemum, Oxalis stricta, Rumex acetosella, Melilotus sp., Hypericum perforatum, Erigeron sp., Asclepias sp., Hieracium sp.

FIELD #644

Vegetation Structure

Trees and shrubs are dominant, but distributed in patches. Trees are mostly assembled in copses toward the periphery, with two major rows crossing the field, up to 10m in height. Shrub thickets reaching 2 m high are common, with open spaces of exclusively herbaceous cover also present.

Environmental Parameters

The topography is mostly flat with gentle sloping areas not exceeding 5°. A pond occurs toward the northeast corner of the field. The soil is a Hoosic gravelly loam, on a deep, gravelly, well-drained outwash. No exposed rock was observed.

Historical Information

Abandonment of this land, which had been part of the Chase farm, occurred in 1932, followed by an approximately 25-year fallow period. Mrs. Cary had all dead elm trees cleared from the area around the pond at the northeast edge, as well as some selective cutting of woody vegetation. Horticulture crews have used the field to clip white pine branches for vegetation cover. This field may have been brushhogged after 1973, but was mowed from 1978 to 1982/83 and used as a site to study winter deer browse and deer repellants.

Species Lists

TREES

LOCAL PATCHES:

Acer saccharum
Robinia pseudoaccacia

RARE:

Juniperus virginiana
Ulmus americana
Pinus strobus (edge)
Acer rubrum (edge)
Prunus serotina (edge)

SEEDLINGS

RARE:

Acer saccharum
Prunus serotina
Robinia pseudoaccacia
Quercus rubra

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Rhus glabra (t)
Cornus racemosa (s,t)

LOCAL PATCHES:

Toxicodendron radicans (c)
Rubus sp. (c)
Spiraea latifolia (s)

LOW DENSITY:

Rosa multiflora (c,s)

RARE:

Lonicera morrowii (s)
Rhamnus cathartica (s)
Viburnum dentatum (s)
Elaeagnus commutata (s)
Vaccinium vacillans (s)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Solidago spp.

OTHERS: Lysimachia quadrifolia, Apocynum androsaemifolium, Chrysanthemum leucanthemum, Potentilla simplex, Stellaria graminea, Lepidium campestre, Hieracium sp., Rumex acetosella, Carex sp.

FIELD #710

Vegetation Structure

Trees dominate the site, reaching 10 m in height (predominately red cedars in a relatively dense array forming an open canopy). The shrub cover is sparse, rare in places and mostly composed of solitary individuals or clumps < 1 m high, with tall shrubs exceeding 2 m in more open, low areas. Herbaceous cover is mostly composed of grasses and mosses which are abundant throughout the understory.

Environmental Parameters

The site topography is heterogeneous, with a hilltop on the southeastern edge sloping steeply (up to 30°) down to flat low areas adjacent to a small stream along the northwestern edge of the field. The hillside is northwest- to west-facing, with patches of exposed bedrock common on the upper slopes, sometimes projecting vertically out of the hill. The shallow, well-drained soil is a Nassau slaty silt loam, underlain by shale at depths of < 50 cm.

Historical Information

This land was used as pasture when it was part of the Chase farm, until 1932. There has been little subsequent management beyond the possible removal of some dead elm trees in the 1960's.

Species Lists

TREES

ABUNDANT:

Juniperus virginiana

LOCAL PATCHES:

Quercus prinus

Acer rubrum

Quercus rubra

Alnus rugosa

LOW DENSITY:

Acer saccharum

RARE:

Pinus rigida

Quercus velutina

Ulmus americana

Cornus florida

Prunus serotina

Populus tremuloides (edge)

Quercus alba (edge)

SEEDLINGS

ABUNDANT:
Juniperus virginiana

LOW DENSITY:
Acer saccharum

LOCAL PATCHES:
Alnus rugosa

RARE:
Acer rubrum
Fraxinus americana
Carya glabra
Ulmus americana
Prunus serotina
Quercus alba

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

LOCAL PATCHES:
Vaccinium angustifolium (s)
Rhus glabra (s)
Spiraea latifolia (s)
Juniperus communis (s,c)

RARE:
Corylus americana (s)
Elaeagnus commutata (s)
Vaccinium corymbosum (s)
Rhamnus cathartica (s)
Vaccinium vacillans (s)
Vaccinium stamineum (s)
Prunus sp. (s)
Rubus sp. (c)
Viburnum dentatum (s)

LOW DENSITY:
Cornus racemosa (s,t)
Toxicodendron radicans (c,v)
Rosa multiflora (s,c)

HERBACEOUS PLANTS

DOMINANTS: Anthoxanthum odoratum, Andropogon scoparius, Solidago sp.

OTHERS: lichens (Cladonia cristatella, other Cladonia), mosses, Lycopodium complanatum, Equisetum arvense, Rumex acetosella, Potentilla simplex, Hieracium florentinum, Solidago bicolor

FIELD #714

Vegetation Structure

Large clonal populations of black locust and smooth sumac dominate this field. Most of the canopy consists of patches of trees up to 10 m in height with a shrub undercanopy reaching 2 m high. Herbaceous cover is composed primarily of grasses.

Environmental Parameters

The site is almost entirely flat, gently sloping from the road with slopes < 5°. The soil is a Dutchess gravelly silt loam.

Historical Information

This field was pastured during its ownership by the Chases, and possibly also used as an orchard. It was abandoned with their departure in 1932. Stone walls separate it from adjacent fields to the N, E, and S. A road for access ~~dumping area~~ goes through the land, and it has been recently used as a small

Species Lists**TREES**

ABUNDANT:

Robinia pseudoaccacia

LOW DENSITY:

Juniperus virginiana

Acer saccharum

Fraxinus americana

RARE:

Juglans nigra

Prunus serotina (edge)

Carya glabra (edge)

SEEDLINGS

LOCAL PATCHES:

Robinia pseudoaccacia

LOW DENSITY:

Juniperus virginiana

RARE:

Acer rubrum

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Rhus glabra (t)

LOCAL PATCHES:

Cornus racemosa (t)

Parthenocissus quinquefolia (c)

LOW DENSITY:

Rubus sp. (c)

RARE:

Lonicera morrowii (s)

Rosa sp. (s)

Crataegus sp. (s)

HERBACEOUS PLANTS

DOMINANTS: Bromus inermis, Arrhenatherum elatius, Solidago spp.

OTHERS: Phleum pratense, Linaria vulgaris, Rumex acetosella, Cynanchum nigrum, Trifolium agrarium

FIELD #715

Vegetation Structure

Trees are common near the west edge of the field, with black locusts along the roadside. Shrub thickets are abundant and dominant in a large fraction of the area.

Environmental Parameters

The site is mostly flat, with a southeast-facing slope reaching 10°. The soil is a Dutchess gravelly silt loam.

Historical Information

Stone walls form boundaries from adjacent fields to the north, east, and south. The field is a former orchard and pasture on the Chase farm. There has been no known management of this site since its abandonment in 1932.

Species Lists**TREES**

ABUNDANT:

Juniperus virginiana

LOCAL PATCHES:

Robinia pseudoaccacia

Prunus serotina

Carya glabra

Juglans nigra (edge)

Quercus velutina

LOW DENSITY:

Quercus rubra (edge)

RARE:

Betula lenta

Quercus coccinea (edge)

SEEDLINGS

LOCAL PATCHES:

Robinia pseudoaccacia

Quercus velutina

LOW DENSITY:

Juniperus virginiana

RARE:

Prunus serotina

Quercus prinus

Juglans nigra

Pyrus malus

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Rubus sp. (c)

LOCAL PATCHES:

Toxicodendron radicans (v,c)/t

Cornus racemosa (t)

Rhus glabra (t)

LOW DENSITY:

Rosa multiflora (s)

RARE:

Rhamnus cathartica (s)Humulus lupulus (v)Elaeagnus commutata (s)Lonicera morrowii (s)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Arrhetherum elatius, Galium mollugo,
Solidago rugosa, Solidago sp.

FIELD #719

Vegetation Structure

Trees up to 10 m in height are sparse but widely distributed along with seedlings throughout the field, particularly toward the west edge along the road. Shrub cover is patchy and less common than seedling density overall. Herbaceous cover is incomplete, with bare spots becoming common in some areas. Grasses and creeping shrubs dominate the herbaceous layer.

Environmental Parameters

The terrain is rolling, with gentle slopes up to 10^0 that are primarily west- to northwest-facing. Nassau slaty silt loam comprises the well-drained soils, typically underlain by shale < 50 cm. Small exposed bedrock outcrops are widespread but very sparsely distributed.

Historical Information

The field was once part of an orchard and was abandoned along with other areas of the old Chase farm in 1932, with no known management history since that time. The south edge is separated from former pastureland by a hedgerow and stone wall which extends along part of the east side, with woods present to the northeast.

Species Lists

TREES

ABUNDANT:

Juniperus virginiana

LOCAL PATCHES:

Populus tremuloides

LOW DENSITY:

Quercus rubraQuercus velutinaAcer rubrum

RARE:

Quercus albaFraxinus americanaAcer saccharumPinus strobusJuglans nigraFraxinus americanaRobinia pseudoaccaciaBetula lenta

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)**ABUNDANT:**Rubus sp. (c)**LOW DENSITY:**Cornus racemosa (t)Quercus illicifolia (s)**LOCAL PATCHES:**Rhus glabra (s)/tMyrica asplenifolium (s)/tLonicera morrowii (s)Parthenocissus quinquefolia (c)/vToxicodendron radicans (c)Rosa multiflora (s)**RARE:**Crataegus sp. (s)Rosa sp. (s)Juniperus communis (s)Prunus virginiana (s)Amelanchier sp. (s)Vaccinium angustifolium (s)Gaylussacia baccata (s)Rubus allegheniensis (s)Elaeagnus commutata (s)Rhamnus cathartica (s)Viburnum prunifolium (s)**HERBACEOUS SPECIES****DOMINANTS:** Andropogon scoparius, Anthoxanthum odoratum, Agrostis tenuis, Solidago sp.**OTHERS:** mosses, lichens, Dianthus armeria, Sisyrinchium sp., Erigeron sp., Trifolium agrarium, Hieracium sp., Achillea millefolium, Lysimachia quadrifolia**FIELD #720**Vegetation Structure

Trees up to 10 m in height are present at the edges of the field, except for red cedar, which is well-distributed throughout the field. The plant canopy is mostly an herbaceous layer dominated by grasses and creeping plants in which low, solitary shrubs and seedlings are common.

Environmental Parameters

A northeast to southwest-running ridge is prominent in the western half of the field, forming a gentle south-facing slope reaching 10°. The soil is a Nassau slaty silt loam underlain by shale < 50 cm, with small areas of exposed rock on the ridgetop.

Historical Information

Bounded on all 4 sides by stone walls and adjacent fields, this land was used for pasturing up until 1932, when the Chase farm was abandoned. There has

been no known use of the land since that time.

Species Lists

TREES

ABUNDANT:

Juniperus virginiana

LOW DENSITY:

Acer rubrum

Quercus velutina (edge)

Carya glabra (edge)

LOCAL PATCHES:

Acer saccharum

Prunus serotina

Quercus rubra

RARE:

Juglans nigra

Quercus alba (edge)

Quercus prinus

Cornus florida

SEEDLINGS

LOCAL PATCHES:

Fraxinus americana

Quercus rubra

LOW DENSITY:

Acer rubrum

Carya glabra

Juniperus virginiana

RARE:

Prunus serotina

Acer saccharum

Quercus prinus

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Rubus sp. (c)

LOCAL PATCHES:

Rhus glabra (s)

Parthenocissus quinquefolia (c)

Myrica asplenifolium (s)

LOW DENSITY:

Cornus racemosa (t)

RARE:

Juniperus communis (c)

Viburnum dentatum (s)

Vaccinium vacillans (s)

Prunus maritima (s)

Gaylussacia baccata (s)

Rhamnus cathartica (s)

Vitis sp. (v)

Lonicera morrowii (s)

Humulus lupulus (c)

Berberis thunbergii (s)

Rosa multiflora (s)

Rubus allegheniensis (s)

Spiraea latifolia (s)

Viburnum lentago (s)

Corylus americana (s)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Anthoxanthum odoratum, Danthonia spicata

OTHERS: mosses, Dennstaedtia punctilobula, Hieracium sp., Rudbeckia hirta, Chrysanthemum leucanthemum, Hypericum perforatum, Apocynum androsaemifolium, Rumex acetosella, Carex sp., Juncus tenuis, lichens (Cladonia cristatella and other Cladonia)

FIELD # 788

Vegetation Structure

An herbaceous matrix surrounds large clumps and thickets of shrubs on two ridges, separated by an open canopy of trees between the ridges.

Environmental Parameters

The terrain is dominated by a set of ridges running northeast to southwest. Open bedrock outcrops are common in patches on these ridges. The hillside is primarily southwest-facing, with slopes ranging up to 15°.

Historical Information

Stone walls are present to the south and west. This land was abandoned as part of the old Chase farm in 1932. No known management has occurred on the land since that time.

Species Lists

TREES

ABUNDANT:

Juniperus virginiana

LOW DENSITY:

Quercus velutina
Pinus strobus (edge)
Acer rubrum

LOCAL PATCHES:

Acer saccharum
Quercus rubra
Betula populifolia

RARE:

Quercus alba
Cornus florida
Betula lenta
Populus tremuloides

SEEDLINGS

ABUNDANT:

Juniperus virginiana

LOCAL PATCHES:

Quercus rubra
Populus tremuloides

LOW DENSITY:

Acer rubrum

RARE:

Acer saccharumCarya glabraPrunus serotinaFraxinus americana**SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)**

LOCAL PATCHES:

Rubus sp. (c)Spiraea latifolia (s)Toxicodendron radicans (c)Cornus racemosa (t)Rhus glabra (t)

LOW DENSITY:

Quercus illicifolia (s)Juniperus communis (s,c)Gaylussacia baccata (s,t)Vaccinium vacillans (s,t)

RARE:

Rubus allegheniensis (s)Lonicera morrowii (s)Rosa sp. (s)Crataegus sp. (s)**HERBACEOUS PLANTS**DOMINANTS: Andropogon scoparius, Anthoxanthum odoratum, Danthonia spicataOTHERS: Rumex acetosella, Apocynum androsaemifolium, Carex sp.**FIELD #904**Vegetation Structure

Herbaceous plants form a continuous matrix in which tall shrubs are common in thickets and dominant in much of the field. Trees up to 8 m in height are sparse and widespread throughout, but are most common at the periphery with abundant black locust trees toward the northwest corner.

Environmental Parameters

The field is on a south-facing hillside sloping moderately to 10°, with flat level areas both at the north edge and at the south edge by Wappinger's Creek. Pawlet silt loam forms the alluvial soil on the floodplain adjacent to the stream, with shallow Nassau slaty silt loam on till and deep Hoosic gravelly loam on glacial outwash. There is little visible exposed bedrock.

Historical Information

A stone wall is present in the thick hedgerow to the north, and the field is bounded by woods in the other directions. The field is adjacent to the old Henry farmhouse, and was planted until abandonment around the mid-1930's. Subsequently, the land has been unmanaged except for some recent cutting of black locust trees to provide posts for the Arboretum.

Species Lists**TREES**

LOCAL PATCHES:

Acer rubrum
Prunus serotina
Robinia pseudoaccacia

LOW DENSITY:

Juniperus virginiana
Ulmus americana

RARE:

Acer saccharum (edge)
Cornus florida
Pinus strobus
Acer griseum
Quercus rubra (edge)

SEEDLINGS

RARE:

Acer saccharum
Fraxinus americana
Ulmus americana
Prunus serotina
Robinia pseudoaccacia
Juniperus virginiana
Quercus rubra
Hamamelis virginiana

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Cornus racemosa (s,t)

LOW DENSITY:

Rubus sp. (c)
Rhus glabra (t)

RARE:

Lonicera morrowii (s)
Vitis sp. (v)
Rhamnus cathartica (s)
Berberis thunbergii (s)
Rosa sp. (s)
Prunus sp. (s)
Prunus virginiana (s)
Toxicodendron radicans (c)
Viburnum lentago (s)

HERBACEOUS PLANTS

DOMINANTS: Galium mollugo, Solidago rugosa, Andropogon scoparius,
Cynanchum nigrum

OTHERS: Sisyrinchium sp., Carex sp., Trifolium agrarum, Chrysanthemum
leucanthemum, Silene cucubalus, Lepidium campestre, Stellaria graminea,
Dianthus armeria, Convolvulus spithameus, Convolvulus sepium, Lobelia inflata

FIELD #924

Vegetation Structure

This site is very heterogeneous, consisting of a mosaic of open woods and meadows with amorphous boundaries. Trees are abundant, up to 10 m high in a network separating meadow areas, but do not form a closed canopy except around the pond and stream. The overall shrub cover is low, forming sparse but widely distributed individual clumps. Little bluestem dominates the herbaceous layer in open areas.

Environmental Parameters

The terrain is hilly, with small hilltop areas separated by a permanent pond near the north edge, and a south-flowing outlet that becomes a temporary pond or marshy area in the center of this site. The hillside is south-facing, with slopes $< 18^{\circ}$ and widespread but small patches of exposed bedrock. The soil is primarily a shallow Nassau slaty silt loam.

Historical Information

The land was part of the old Henry farm, and was used as pasture until it was abandoned in the early 1930's. Stone walls are present in hedgerow to the east and south, and to the north in the woods. The field has remained untouched since then, except possibly for some cutting to create a vista in the 1960's.

Species Lists**TREES**

LOCAL PATCHES:

Acer rubrum

LOW DENSITY:

Juniperus virginiana

Prunus serotina

Quercus rubra (edge)

RARE:

Quercus alba (edge)

Robinia pseudoaccacia

Betula lenta

Fraxinus americana (edge)

Quercus prinus (edge)

Acer saccharum

Cornus florida

Ulmus americana (edge)

SEEDLINGS

LOW DENSITY:

Juniperus virginiana

Quercus rubra

RARE:

Fraxinus americana

Robinia pseudoaccacia

Carya ovata

Quercus alba

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

LOCAL PATCHES:

Elaeagnus commutata (s)

Vaccinium vacillans (s)

LOW DENSITY:

Cornus racemosa (s)

Prunus virginiana (s)

RARE:

Vaccinium stamineum (s)

Spiraea latifolia (s)

Lonicera morrowii (s)

Rhus glabra (s)

Viburnum dentatum (s)

Toxicodendron radicans (s)

Rosa sp. (s)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius

OTHERS: Lysimachia quadrifolia, Veronica officinalis, Achillea millefolium, Rudbeckia hirta, Hieracium florentinum, mosses, lichens (Cladonia cristatella and other Cladonia)

FIELD #935

Vegetation Structure

The vegetation is heterogeneous, composed of dominant trees reaching 6m in height in a herbaceous matrix, composed primarily of graminoids. An open hedgerow of hardwood trees occurs along a north to south axis toward the south-facing hillside. red cedar trees and saplings are common on the south and east exposures of the hill. Shrub cover is patchily distributed within the herbaceous layer as a relatively minor component of total cover.

Environmental Parameters

The terrain is mostly flat hilltop with steep slopes up to 30° at the south end and moderately sloping to woods to the W. Sparse exposed bedrock is located on the north (s) ridge and hill. Dutchess gravelly silt loam is the soil type of the till.

Historical Information

Stone walls are present to the S, W, and east in hedgerows, as well as to the north in the woods. At the N-most boundary of the old Henry farm, this land probably served as orchard and pastureland prior to abandonment around 1932. Management did not occur again until the 1960's when a vista was probably cut through at least part of this area, as there are some cedar stumps present. Infrequent brush-hogging was carried out between 1974 and 1980, with no subsequent management.

Species Lists**TREES**

LOCAL PATCHES:

Acer rubrum
Acer saccharum
Juniperus virginiana
Quercus alba

RARE:

Populus tremuloides
Ulmus americana
Cornus florida
Platanus occidentalis
Quercus coccinea

LOW DENSITY:

Fraxinus americana
Quercus rubra
Prunus serotina

SEEDLINGS

LOW DENSITY:

Fraxinus americana
Acer saccharum
Acer rubrum
Quercus rubra
Ulmus americana
Carya ovata
Pyrus malus

RARE:

Prunus serotina

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

LOCAL PATCHES:

Toxicodendron radicans (c,t)
Rhus glabra (t)
Rubus sp. (c)

LOW DENSITY:

Cornus racemosa (t)
Rosa multiflora (c,s)

RARE:

Lonicera morrowii (s)
Vitis sp. (v)
Prunus virginiana (s)
Humulus lupulus (v)
Parthenocissus quinquefolia (c)
Viburnum dentatum (s)
Berberis thunbergii (s)
Rhamnus cathartica (s)
Elaeagnus commutata (s)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Solidago spp.

OTHERS: Asclepias sp., Apocynum androsaemifolium, Trifolium pratense, Lotus corniculatus, Fragaria virginiana, Rumex acetosella, Erigeron annuus, Carex spp., Phleum pratense

FIELD #937

Vegetation Structure

Trees reaching 10 m in height are common throughout the field, with abundant tall shrubs solitary or in thickets up to 3 m high. Mixed sugar maple and american ash trees are prominent in a hedgerow along the ridge on the east side of the field. Grasses and dicots form a dense herbaceous layer.

Environmental Parameters

This is a large field, covering over 6 ha. Topography ranges from a low, wet area on the west side of the field (along Canoe Hill Road) to a ridgetop at the north corner of the field. Most of the field occurs along the hillside between between these two extremes. The deep, gravelly, well-drained soil is a Dutchess gravelly silt loam, along with some Pittstown gravelly silt loam, forming a more shallow acid soil with a clay fragipan. The slope is moderate, approaching 25° in the northwest corner of the field. Exposed bedrock is sparse but present in patches, especially in the northwest and southwest corners of the field.

Historical Information

Stone walls and hedgerows form boundaries on all sides of the field, which was tilled as cropland of the Henry farm. Abandonment occurred around 1932 (an old rusted car is still present in the southeast corner of the field). Management by the Arboretum to control woody plants (through brush-hogging) occurred between 1973 and 1982 in coordination with use of the site for deer repellent testing since 1978.

Species Lists

TREES

ABUNDANT:

Fraxinus americanaAcer saccharum

LOW DENSITY:

Juniperus virginianaPrunus serotinaAcer rubrumPyrus malus

LOCAL PATCHES:

Ulmus americana (edge)

RARE:

Cornus floridaQuercus alba (edge)Betula populifoliaUlmus rubraQuercus velutinaQuercus coccineaQuercus rubraRobinia pseudoaccacia

SEEDLINGS

LOW DENSITY:

Fraxinus americanaAcer rubrum

RARE:

Prunus serotinaRobinia pseudoaccaciaQuercus rubraPopulus tremuloidesJuniperus virginianaAcer saccharum

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Cornus racemosa (t)

LOCAL PATCHES:

Rubus sp. (s)Spirea latifolia (s,t)Rhus glabra

LOW DENSITY:

Toxicodendron radicans (v,t)Parthenocissus quinquefolia (v,t)Rosa multiflora (s,c)Elaeagnus commutata (s)

RARE:

Lonicera morrowii (s)Vitis sp. (v)Amelanchier sp. (s)Berberis thunbergii (s)Crataegus sp. (s)Prunus sp. (s)

HERBACEOUS PLANTS

DOMINANTS: Solidago canadensis/S. gigantea, Andropogon scoparius,
Anthoxanthum odoratumOTHERS: Potentilla recta, Trifolium agrarium, Prunella vulgaris, Rudbeckia hirta, Hieracium florentinum, Oenothera perennis, Dianthus armeria, Penstemon digitalis, Ranunculus sp., Geranium maculatum, Trifolium pratense, Potentilla simplex, Achillea millefolium, Apocynum androsaemifolium, Onoclea sensibilis

FIELD #955

Vegetation structure

Woody plants dominate the structure of this field. Trees are mostly confined to the edges and central depression of this field, increasing in density toward the eastern edge. Clonal smooth sumac and black locust populations have proliferated in the northeast corner of the field. Shrubs are well-dispersed among the herbaceous cover, forming a loose matrix within the herbaceous plants. Seedlings are present in very low density. Little bluestem is the dominant herbaceous species.

Environmental Parameters

The field is located on a hilltop, and slopes of $< 17^{\circ}$ lead to streams to the east and south. A distinct depression bisects the field along a north-south axis. The soil of the upper slopes is a well-drained Dutchess gravelly

silt loam, with deep, acid Pawlet silt loam in the alluvial soil adjacent to Wappinger Creek. Exposed bedrock is present on the east-facing steep slope and the extreme northeast corner of the field.

Historical Information

This field was used principally as cropland prior to abandonment, which occurred after the Henry farm was leased to other renters in the mid- 1930's. A rock wall with barbed wire forms the north boundary, suggesting pasturing in the adjacent field. Active management was resumed when the Arboretum began brush-hogging once a year in 1973. This practice occurred sporadically between 1978 and 1982/83 while deer repellent testing was carried out on this land.

Species Lists

TREES

LOCAL PATCHES:

Robinia pseudoaccacia

LOW DENSITY:

Juniperus virginiana

Prunus serotina

Acer rubrum (edge)

Acer saccharum (edge)

Fraxinus americana (edge)

Ulmus americana (edge)

RARE:

Quercus rubra

Quercus prinus

Acer griseum

SEEDLINGS

LOCAL PATCHES:

Robinia pseudoaccacia

LOW DENSITY:

Fraxinus americana

RARE:

Juniperus virginiana

Acer rubrum

Prunus serotina

Quercus alba

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

LOCAL PATCHES:

Cornus racemosa (t)

Rhus glabra (t)

LOW DENSITY:

Rubus sp. (c)

Lonicera morrowii (s)

RARE:

Toxicodendron radicans (c)

Cornus ammomum (s)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Galium mollugo, Solidago spp.

OTHERS: Carex sp., Dianthus armeria, Rumex acetosella, Silene cucubalus,
Achillea millefolium, Poa sp.

FIELD #957

Vegetation Structure

Shrub thickets reaching 3 m in height dominate parts of this field, with dense populations of Lonicera morrowii in the west end. Trees are mostly sparse, but become abundant in the east end where a tall clonal population of black locust trees (< 10 m in height) forms a canopy over extensive smooth sumac thickets. The herbaceous layer occurs throughout most of the field, but the grass composition is relatively low overall.

Environmental Parameters

Flat, hilltop terrain characterizes the topography, with a gentle 10⁰ slope to the west. A small, wet field lies adjacent at this end. The characteristic soil is Dutchess gravelly silt loam. Two small, minor patches of exposed rock are found at the east and west ends of the field.

Historical Information

A barn area lies at the end of the field, separated by a barbed wire fence from the rest of the field. Remains of old farm equipment from this barn, which burned down during the 1940's, include buckets and an engine. Stone walls are in hedgerows to the north and south, and to the east in the woods. This field was most recently an orchard area and pastured by the Henrys and Wm. Braddock, who leased this area from the Carys until about 1937. There was little or no management by the subsequent tenant, and the field remained relatively untouched to the present, except for some cutting of black locust trees to provide posts for the Arboretum.

Species Lists

TREES

LOCAL PATCHES:

Robinia pseudoaccacia

LOW DENSITY:

Juniperus virginiana

Fraxinus americana

RARE:

Prunus serotina

Acer saccharum (edge)

Quercus alba

Ulmus americana

Acer rubrum

Juglans nigra (edge)

SEEDLINGS

LOCAL PATCHES:

Robinia pseudoaccacia

RARE:

Acer rubrum

Acer saccharum

Fraxinus americana

Prunus serotina

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Lonicera morrowii (s,t)

LOCAL PATCHES:

Cornus racemosa (t)

Rhus glabra (s,t)

LOW DENSITY:

Rubus sp. (c)

RARE:

Rhamnus cathartica (s)

Ligustrum sp. (s)

Rosa multiflora (c)

Vitis sp. (v)

Rubus allegheniensis (c)

HERBACEOUS PLANTS

DOMINANTS: Galium mollugo, Solidago graminifolia, Solidago rugosa,
Andropogon scoparius

OTHERS: Stellaria graminea, Rumex acetosella, Hieracium florentinum, Carex
sp., Saponaria officinalis, Cynanchum nigrum, Lotus corniculatus, Alliaria
officinalis, Phleum pratense, Agropyron repense, Poa sp.

FIELD #960

Vegetation Structure

A hedgerow to the south separates this field from field #972. The vegetation cover is largely composed of shrubs and herbaceous plants. Widely scattered individual trees up to about 8 m in height are present in a mixed array of species, reaching the highest density in the northeast corner of the field. Overall, shrubs occur in a patchy matrix of low thickets or isolated clumps of single species, surrounded by a mixed association of herbaceous plants. Tree seedlings are rare.

Environmental Parameters

The topography is characterized by flat hilltop areas with east- and west-facing slopes, reaching 12-15°. Dutchess gravelly silt loam is the major soil type, on deep, gravelly, well-drained till. Some exposed bedrock is present on the eastern edge of the field and north of the center in small patches.

Historical Information

This field was tilled as part of the Henry farm, and was purchased by the Carys in 1930. Stone walls are present both to the north and west in hedgerows. Abandonment from active agriculture probably occurred in the early 1930's, followed by an absence of management until the early 1970's. Brush-hogging to control or remove woody vegetation was carried out between 1973 and 1978 at least once a year, and sporadically continued through the winter of 1982-83 as part of a deer repellant testing program at the Arboretum.

Species Lists

TREES

LOW DENSITY:

Juniperus virginiana
Acer rubrum
Prunus serotina

RARE:

Fraxinus americana
Quercus alba
Quercus velutina
Quercus rubra
Cornus florida

SEEDLINGS

LOCAL PATCHES:
Fraxinus americana

RARE:
Acer rubrum
Juniperus virginiana

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:
Cornus racemosa (t)
Rubus sp. (c)
Toxicodendron radicans (c)

LOW DENSITY:
Lonicera morrowii (s)

LOCAL PATCHES:
Rhus glabra (s,t)

RARE:
Vaccinium vacillans (s)
Vitis sp. (v)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Galium mollugo, Solidago rugosa, Solidago spp., Anthoxanthum odoratum.

OTHERS: Fragaria virginiana, Hieracium florentinum, Potentilla recta, Rumex acetosella, Trifolium agrarium, Asclepias sp.

FIELD #969

Vegetation Structure

The field is dominated by herbaceous species and creeping woody plants, with shrubs present in localized thickets. Trees are primarily located toward the periphery of the field, except red cedar, which is sparsely present in more open spaces. Vegetation cover is absent in a few, sparsely distributed spots.

Environmental Parameters

The terrain is mostly flat to slightly rolling, with a gentle slope of $< 10^0$ toward a low area at the southwest corner of the field. The characteristic soil is a Dutchess gravelly silt loam with some Nassau silty loam also present. Exposed bedrock is found primarily at the northeast end and southeast corner of the field.

Historical Information

Evidence of an old stone foundation and orchard is present, but the field was planted and pastured until the early 1930's as part of the Henry farm. This area was brush-hogged from 1973/74 to 1980. Logging undertaken as part of the CETA program occurred to the north in 1981, but there is no evidence of any use of the field in this operation.

Species Lists**TREES**

LOCAL PATCHES:

Acer rubrum (edge)
Quercus coccinea (edge)
Quercus alba
Acer saccharum

LOW DENSITY:

Juniperus virginiana
Prunus serotina

RARE:

Quercus rubra
Quercus velutina
Quercus prinus
Fraxinus americana (edge)
Ulmus americana
Cornus florida
Carya ovata

SEEDLINGS

LOCAL PATCHES:

Acer rubrum

LOW DENSITY:

Fraxinus americana

RARE:

Prunus serotina
Quercus rubra
Quercus alba
Quercus coccinea
Ulmus americana

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

LOCAL PATCHES:

Cornus racemosa (t)
Toxicodendron radicans (c)
Rubus sp. (c)

LOW DENSITY:

Rhamnus cathartica (s)

RARE:

Crataegus sp. (s)
Lonicera morrowii (s)
Rosa multiflora (v,c)
Prunus virginiana (s)
Rhus glabra (t)
Vaccinium angustifolium (s)
Berberis thunbergii (s)
Amelanchier sp. (s)

HERBACEOUS PLANTS

DOMINANTS: Galium mollugo, Andropogon scoparius,

OTHERS: Lotus corniculatus, Chrysanthemum leucanthemum, Potentilla simplex,

Hieracium aurantiacum, Hieracium florentinum, Ranunculus sp., Carex sp.,
Penstemon digitalis, Erigeron annuus, Oenothera perennis, Fragaria virginiana,
Trifolium agrarium, Phleum pratense, Sisyrinchium sp., Bromus sp.

FIELD #972

Vegetation Structure

Trees up to 5-8 m in height are scattered throughout the field in low density, but forming a patchy, open canopy in the east and southwest corners of the field. The shrub layer is patchy and relatively sparse overall, composed of only a few thickets and scattered individuals. The herbaceous cover is complete outside of these thickets, consisting mostly of grasses, particularly beneath the tree canopy.

Environmental Parameters

The field is located on a hilltop and slopes facing south and east. A large bedrock outcrop faces due west with a steep slope reaching 35°. Small, sparse areas of exposed bedrock are found throughout the field. The soil is almost exclusively Dutchess gravelly silt loam.

Historical Information

This field was probably planted as part of the old Henry farm, and abandoned around 1932. It is bounded on all four sides by stone walls. Brush-hogging occurred annually beginning in 1973, and was carried out in coordination with deer repellent testing from 1978 until 1982/83. Currently, small mammal traps are set up in part of the field. (1985)

Species Lists

TREES

LOCAL PATCHES:

Quercus velutina
Prunus serotina
Pyrus malus
Robinia pseudoaccacia

LOW DENSITY:

Juniperus virginiana

RARE:

Quercus alba
Quercus coccinea
Quercus rubra
Cornus florida
Acer rubrum
Acer saccharum
Sassafras albidum

SEEDLINGS

LOCAL PATCHES:

Prunus serotina
Robinia pseudoaccacia

LOW DENSITY:

Quercus rubra

RARE:

Quercus alba
Fraxinus americana
Quercus velutina
Sassafras albidum

SHRUBS (t= thicket, s= solitary, v= vine, c= creeping)

ABUNDANT:

Cornus racemosa (t)

LOCAL PATCHES:

Toxicodendron radicans (v,c)
Vitis sp. (v)
Rubus sp. (c)

LOW DENSITY:

Amelanchier sp. (s)
Rhamnus cathartica (s)

RARE:

Rhus glabra (s)
Viburnum lentago (s)
Prunus sp. (s)
Rosa multiflora (v,c)
Rosa sp. (c)
Ligustrum sp. (s)
Lonicera morrowii (s)
Vaccinium angustifolium (s)
Parthenocissus quinquefolia (c)
Viburnum dentatum (s)
Berberis thunbergii (s)
Juniperus communis (s,c)

HERBACEOUS PLANTS

DOMINANTS: Andropogon scoparius, Anthoxanthum odoratum,
Galium mollugo.

OTHERS: Panicum sp., Achillea millefolium, Carex sp., Verbascum thapsis,
Ambrosia artemisiifolia, Rumex acetosella, Potentilla simplex.

ACKNOWLEDGEMENTS

Many sources of information were used to compile histories of land-use for the fields covered in this study. We would particularly like to thank the members of the local community - Sally Gifford O'Brien, Wendell Fowler, Jim Henry, Katherine Lovelace and Harry Pettit - who agreed to be interviewed and provided us with essential information on former land-use patterns. Many members of the Arboretum staff, particularly Ray Winchcombe and Brad Roeller, provided information on management of the fields during the past 15 years. Financial support for this study was provided by the Mary Flagler Cary Charitable Trust. This study is a contribution to the program of the Institute of Ecosystem Studies, The New York Botanical Garden.

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FIGURE 1. Distri
the Arboretum.

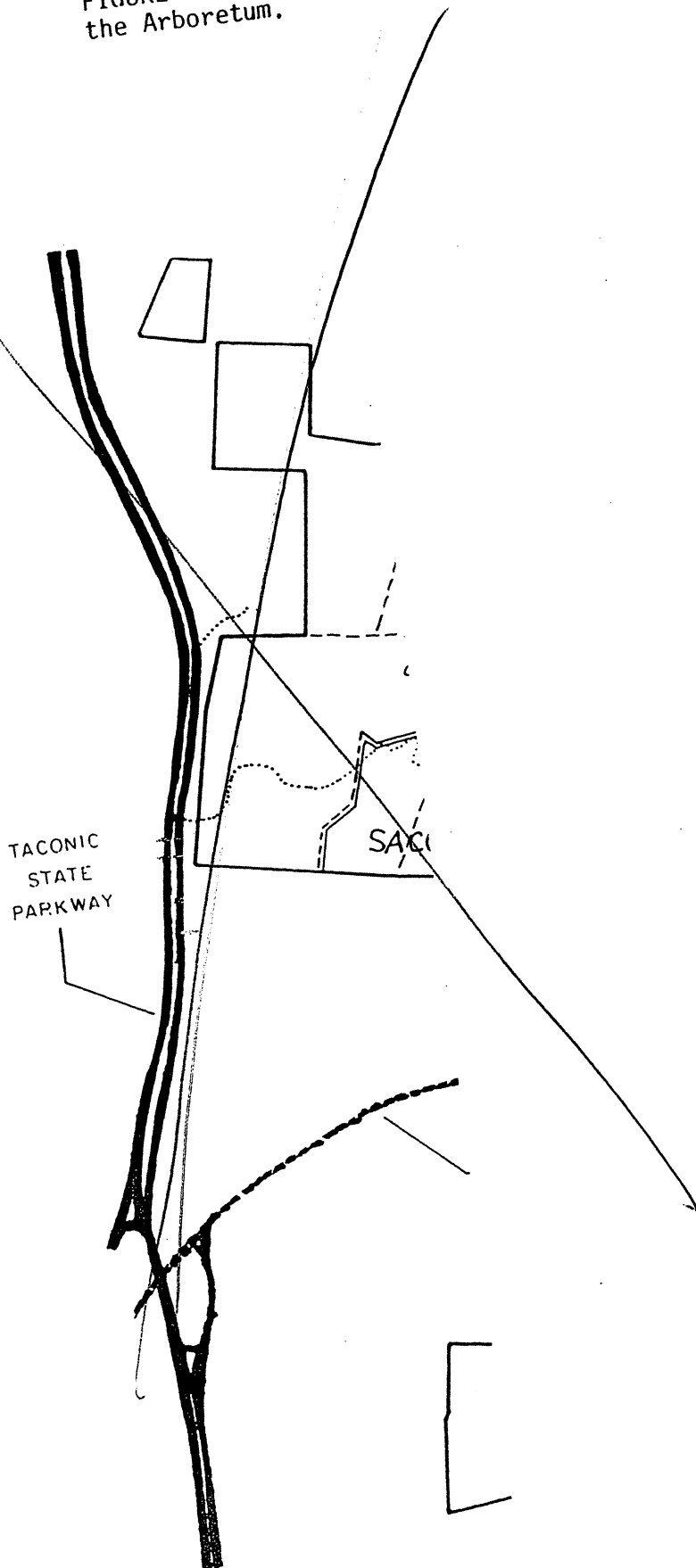


FIGURE 2. Dendrogram of the classification of 40 upland field plots using TWINSpan. The major groups discussed in the text, as well as summaries of their characteristics, are also noted.

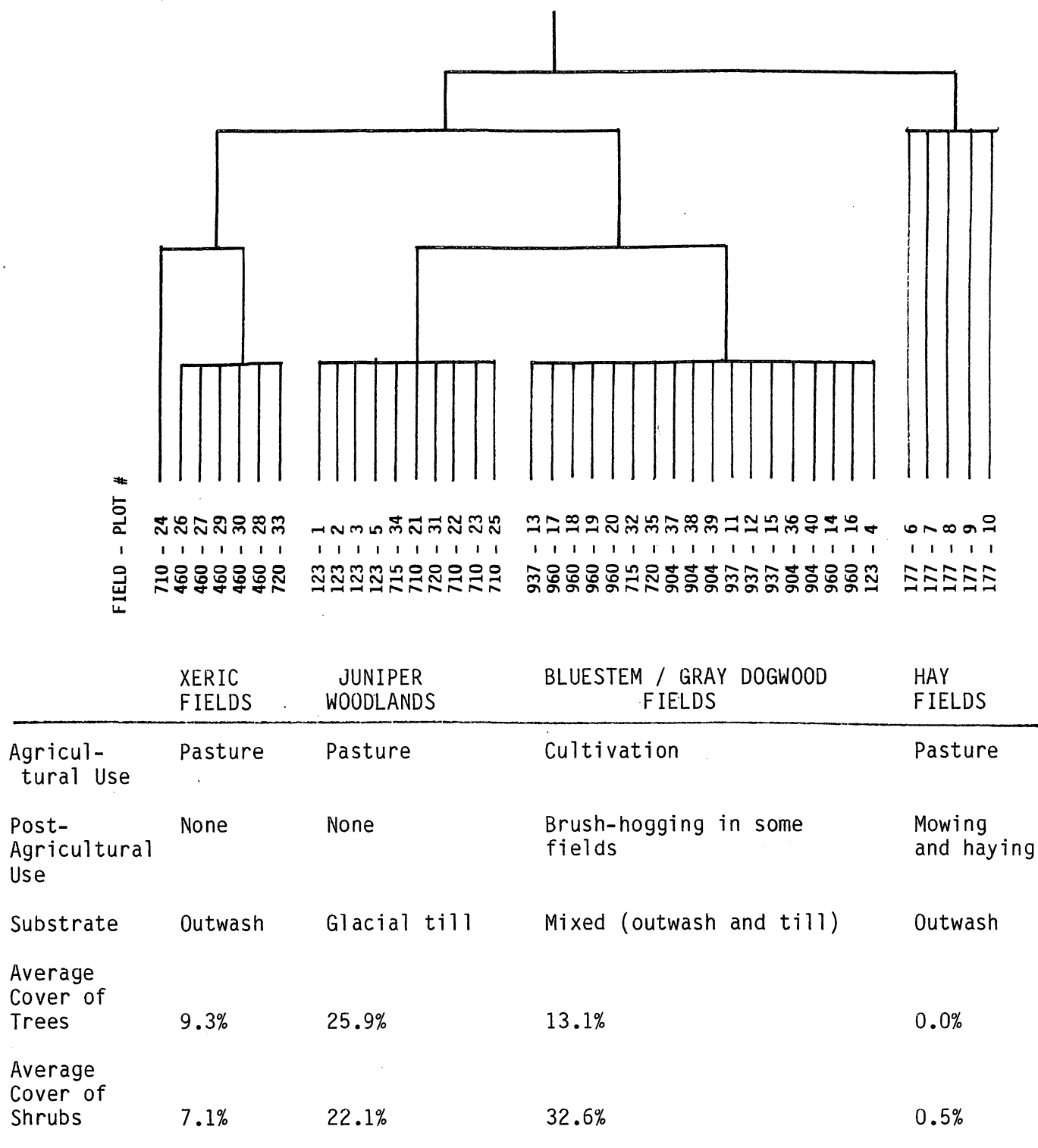


Table 1. A summary of the characteristics of 23 major upland fields of the Mary Flagler Cary Arboretum.

FIELD #	SIZE (HA)	SUBS- TRATE ¹	SOIL SERIES ²	FARM ³	AGRIC. USE	YEAR ABAND.	SUBSEQUENT USE ⁴	SHRUB COVER ⁵	TREE DENS. ⁵
123	3	T,O	H,W	S	Pasture (?)	late 30's	none	P	A
130	5	T		S	Pasture	1937	none	P	W
141	4	T,O	N,H	S	Pasture	1937	?	A	A
177	4	O	H	S	Pasture	1937	haying/mowing	R	R
398	2	O	H	P	Pasture	1939	mowed in '79	P	A
460	3	O	H	P	?	1939	none	W	P
510	4	O	H	P	?	1939	extensive	R	R
644	4	O	H	C	?	1932	mowed 1978-1982	P	P
710	3	T	N	C	Pasture	1932	slight	R	A
714	1	T	D	C	Pasture	1932	slight	A	A
715	1	T	D	C	?	1932	none	A	P
719	2	T	N	C	Orchard	1932	none	P	W
720	1	T	N	C	Pasture	1932	none	W	W
788	2	T	N,Pi	C	?	1932	none	P	W
904	3	T,O,A	N,H,Pa	H	Tilled	mid 30's	some tree cutting	A	W
924	3	T	N	H	Pasture	early 30's	slight	W	A
935	2	T	D	H	Pasture/Orch.	1932	mowed 1974-1980	P	W
937	6	T	D,Pi	H	Tilled	1932	mowed 1973-1982	A	W
955	3	T	D,Pa	H	Tilled	mid 30's	mowed 1978-1982	A	P
957	2	T	D	H	Pasture/Orch.	1937	slight	P	W
960	3	T	D	H	Tilled	early 30's	mowed 1973-1983	P	W
969	3	T	D,N	H	Pasture	early 30's	mowed 1973-1980	P	R
972	2	T	D	H	Tilled	1932	mowed 1973-1983	P	P

- ¹ T = glacial till, O = glacial outwash, A = alluvial sediments
² D = Dutchess, H = Hoosic, N = Nassau, Pa = Pawlet, Pi = Pittstown
³ S = Saccomanda, P = Pettit, C = Chase, H = Henry
⁴ see the individual field summaries for more detail
⁵ A = abundant, P = patchy, W = widespread but sparse, R = rare

TABLE 2. Cover and percent frequency of woody and herbaceous species in 40 plots distributed among the major upland old fields of the Mary Flagler Cary Arboretum. Local cover is the mean cover of a species averaged over only those plots in which it occurred. Zero values indicate that the species was present in at least one plot, but was not encountered in the quadrats or along the transects used to measure actual cover.

SPECIES	MEAN COVER	MIN. COVER	MAX. COVER	FRE- QUENCY	LOCAL COVER
A. WOODY SPECIES					
Acer griseum	0.00	0.00	0.00	2.50	0.00
Acer rubrum	1.55	0.00	29.33	27.50	5.62
Acer saccharinum	0.50	0.00	19.83	10.00	4.96
Alnus rugosa	0.22	8.67	8.67	2.50	8.67
Betula lenta	0.00	0.00	0.00	2.50	0.00
Berberis thunbergii	0.09	0.00	3.67	7.50	1.22
Berberis vulgaris	0.00	0.00	0.00	2.50	0.00
Betula populifolia	0.54	0.00	13.00	10.00	5.41
Carya glabra	0.00	0.00	0.00	2.50	0.00
Cornus amomum	0.01	0.00	0.57	5.00	0.28
Cornus florida	0.01	0.33	0.33	2.50	0.33
Cornus racemosa	14.58	0.00	73.53	85.00	17.15
Cornus sp.	0.04	1.67	1.67	2.50	1.67
Crataegus sp.	0.00	0.00	0.00	7.50	0.00
Elaeagnus commutata	0.20	0.00	6.00	10.00	1.96
Fraxinus americana	0.10	0.00	4.00	17.50	0.57
Gaylussacia baccata	0.00	0.00	0.00	2.50	0.00
Humulus lupulus	0.03	0.00	1.33	5.00	0.66
Juglans nigra	0.12	4.67	4.67	2.50	4.67
Juniperus communis var. depressa	0.89	0.00	13.67	15.00	5.92
Juniperus virginiana	7.94	0.00	50.67	65.00	12.21
Lonicera morrowi	0.98	0.00	8.33	55.00	1.78
Pinus strobus	0.00	0.00	0.00	2.50	0.00
Populus grandidentata	0.72	28.83	28.83	2.50	28.83
Populus tremuloides	0.00	0.00	0.00	2.50	0.00
Prunus serotina	1.44	0.00	33.33	30.00	4.79
Prunus virginiana	0.03	1.26	1.26	2.50	1.26
Pyrus malus	0.00	0.00	0.00	2.50	0.00
Quercus alba	0.00	0.00	0.00	2.50	0.00
Quercus borealis	0.00	0.00	0.00	2.50	0.00
Quercus ilicifolia	0.05	0.00	2.13	7.50	0.71
Quercus prinus	1.02	0.00	41.00	5.00	20.50
Quercus velutina	0.00	0.00	0.00	12.50	0.00
Rhamnus catharticus	0.24	0.00	7.03	7.50	3.18
Rhus glabra	2.60	0.00	29.17	32.50	7.99
Rosa multiflora	0.08	0.00	3.33	5.00	1.66
Rosa sp.	0.07	0.00	2.07	22.50	0.33
Rubus sp.	0.00	0.00	0.00	2.50	0.00

TABLE 2. (continued)

SPECIES	MEAN COVER	MIN. COVER	MAX. COVER	FRE- QUENCY	LOCAL COVER
A. WOODY SPECIES (continued)					
Salix rigida	0.06	2.33	2.33	2.50	2.33
Spirea latifolia	0.02	0.00	0.67	15.00	0.14
Toxicodendron radicans	0.00	0.00	0.00	2.50	0.00
Ulmus americana	0.00	0.00	0.00	5.00	0.00
Ulmus rubra	0.00	0.00	0.00	2.50	0.00
Vaccinium angustifolium	0.04	0.00	1.57	5.00	0.78
Vaccinium corymbosum	0.13	0.00	5.00	5.00	2.50
Vaccinium stamineum	0.00	0.00	0.00	2.50	0.00
Vaccinium vacillans	0.29	0.00	8.50	12.50	2.33
Viburnum dentatum	0.00	0.00	0.20	15.00	0.03
Viburnum lentago	0.00	0.00	0.00	2.50	0.00
Viburnum rufidulum	0.00	0.00	0.00	2.50	0.00
Vitis sp.	0.00	0.00	0.00	2.50	0.00
Vitis vulpina	0.00	0.00	0.00	5.00	0.00
B. HERBACEOUS AND CREEPING WOODY SPECIES					
Achillea millefolia	0.21	0.00	3.00	50.00	0.41
Agropyrum repens	0.10	0.06	3.13	10.00	0.98
A.stolonifera var.major	0.53	21.25	21.25	2.50	21.25
Agrostis sp.	0.00	0.00	0.06	5.00	0.03
Agrostis tenuis	0.00	0.06	0.06	5.00	0.06
Andropogon scoparius	31.89	0.00	76.00	97.50	32.71
Anthoxanthum odoratum	2.79	0.00	43.13	47.50	5.87
Apocynum androsaemilifolium	0.02	0.00	1.00	7.50	0.33
Arabis glabra	0.00	0.06	0.13	5.00	0.09
Arrhenatherum elatius	0.29	0.63	7.50	7.50	3.88
Asclepias syriaca	0.00	0.00	0.00	2.50	0.00
Aster sp.	0.00	0.13	0.13	2.50	0.13
Bromus inermis	0.05	0.00	1.88	7.50	0.63
Carex complanata	0.02	0.06	0.38	10.00	0.22
Carex normalis	0.00	0.00	0.00	2.50	0.00
Carex sp.	0.08	0.00	1.75	27.50	0.29
Caryophyllidae sp.	0.00	0.06	0.06	2.50	0.06
Centaurea maculosa	0.09	0.00	2.00	17.50	0.53
Cerastium vulgatum	0.00	0.13	0.13	2.50	0.13
Chrysanthemum leucanthemum	0.12	0.00	2.00	30.00	0.40
Cirsium arvense	0.04	0.06	0.88	7.50	0.56
Convolvulus sepium	0.00	0.13	0.13	2.50	0.13
Convolvulus sp.	0.25	0.25	4.63	20.00	1.25
Cynanchum nigrum	0.02	0.00	0.50	12.50	0.15
Dactylis glomerata	0.26	1.25	4.38	12.50	2.10
Danthonia spicata	0.37	0.00	6.25	22.50	1.65
Daucus carota	0.00	0.00	0.06	7.50	0.04
Dennstaedtia punctilobula	0.00	0.00	0.00	2.50	0.00
Dianthus armeria	0.02	0.00	0.56	25.00	0.07

TABLE 2. (continued)

SPECIES	MEAN COVER	MIN. COVER	MAX. COVER	FRE- QUENCY	LOCAL COVER
B. HERBACEOUS AND CREEPING WOODY SPECIES (cont.)					
Equisetum arvense	0.00	0.00	0.00	2.50	0.00
Erigeron sp.	0.00	0.00	0.06	12.50	0.01
Fragaria virginiana	1.13	0.38	10.75	30.00	3.78
Fraxinus americana	0.04	0.06	0.88	10.00	0.44
Galium mollugo	4.71	0.06	29.00	47.50	9.92
Galium verum	0.00	0.06	0.06	2.50	0.06
Hieracium florentinum	0.25	0.75	4.38	10.00	2.55
Hieracium sp.	2.01	0.06	25.00	52.50	3.82
Hypericum perforatum	0.22	0.00	3.25	62.50	0.35
Juncus effusus	0.02	0.06	0.63	5.00	0.34
Juncus tenuis	0.02	0.63	0.63	2.50	0.63
Juniperus virginiana	0.41	0.06	11.25	27.50	1.49
Lactuca canadensis	0.04	0.00	1.25	10.00	0.42
Lactuca sp.	0.03	0.06	0.63	10.00	0.30
Lepidium campestre	0.00	0.13	0.13	2.50	0.13
Linaria vulgaris	0.11	0.00	1.25	45.00	0.25
Lobelia inflata	0.00	0.13	0.13	2.50	0.13
Lotus corniculatus	1.61	7.88	16.88	12.50	12.85
Lycopodium obscurum	0.01	0.25	0.25	2.50	0.25
Lysimachia ciliata	0.00	0.00	0.00	2.50	0.00
Lysimachia quadrifolia	0.24	0.00	9.63	5.00	4.81
Oxalis stricta	0.14	0.06	0.81	55.00	0.25
Panicum sp.	0.11	0.06	1.38	27.50	0.38
Parthenocissus quinquefolia	0.06	0.06	1.25	10.00	0.64
Penstemon digitalis	0.00	0.06	0.06	2.50	0.06
Phleum pratense	3.94	21.75	36.88	12.50	31.53
Plantago lanceolata	0.06	0.00	1.13	15.00	0.43
Poa compressa	0.45	0.00	9.56	20.00	2.23
Poa pratensis	0.39	15.63	15.63	2.50	15.63
Poa sp.	1.10	0.06	22.50	10.00	10.97
Potentilla canadensis	0.20	0.25	5.69	12.50	1.60
Potentilla recta	0.51	0.13	5.38	20.00	2.56
Potentilla simplex	0.41	0.00	4.00	52.50	0.77
Prunella vulgaris	0.03	0.00	1.31	5.00	0.65
Pycnanthemum flexuosum	0.75	0.00	30.00	5.00	15.00
Rubus flagellaris	2.21	0.25	41.00	12.50	17.69
Rubus sp. (creeping)	6.26	0.06	31.50	52.50	11.92
Rubus sp. (erect)	0.03	1.25	1.25	2.50	1.25
Rubus sp.	3.25	0.63	43.38	22.50	14.46
Rudbeckia hirta	0.03	0.00	0.94	10.00	0.27
Rumex acetosella	3.91	0.06	13.38	92.50	4.23
Satureja vulgaris	0.04	0.00	1.00	10.00	0.42
Silene cucubalis	0.16	0.00	1.63	30.00	0.54
Solanum carolinense	0.01	0.06	0.25	12.50	0.11

TABLE 2. (continued)

SPECIES	MEAN COVER	MIN. COVER	MAX. COVER	FRE- QUENCY	LOCAL COVER
B. HERBACEOUS AND CREEPING WOODY SPECIES (cont.)					
Solidago bicolor	0.28	0.00	4.00	25.00	1.12
Solidago canadensis	0.01	0.50	0.50	2.50	0.50
Solidago gigantea	0.26	1.06	9.25	5.00	5.15
Solidago graminifolia	0.73	0.00	11.88	50.00	1.45
Solidago juncea	1.49	0.00	19.38	60.00	2.48
Solidago rugosa	2.47	0.00	21.50	57.50	4.30
Solidago sp.(unknown)	7.58	0.50	22.31	77.50	9.78
Stellaria graminea	0.00	0.00	0.06	7.50	0.04
Taraxacum officinale	0.02	0.06	0.31	12.50	0.19
Toxicodendron radicans	0.36	0.00	4.13	27.50	1.32
Trifolium agrarium	0.59	0.00	11.75	45.00	1.30
Trifolium pratense	0.00	0.00	0.00	2.50	0.00
Trifolium repens	0.00	0.06	0.06	2.50	0.06
Trifolium sp.	0.00	0.06	0.06	2.50	0.06
Unknown	0.54	0.06	7.31	30.00	1.81
Veronica officinalis	0.32	0.06	3.13	37.50	0.86
Veronica sp.	0.02	0.69	0.69	2.50	0.69

TABLE 3. Two-way table of species importance values in 40 plots distributed among the major upland fields of the Mary Flagler Cary Arboretum. The arrangements of plot numbers and species reflect the results of a two-way indicator species analysis of the data. See Appendix C for an explanation of the species codes.

Abundance Scale (based on % cover):

1 : < 2%, 2 : < 5%, 3 : < 10%, 4 : < 20%, 5 : > 20%

	XERIC FIELDS	JUNIPER WOODLANDS	BLUESTEM - GRAY DOGWOOD	HAY FIELD
SPECIES CODES	2222323 4679083	323222 1235411235	11112333331113411 378902578912560464	1 78906
RUBU SPC.	1523444	---134-1-	1333555351-	-----
BET POP	-4113-	-----	-----	-----
CRA SPP	---1---	-----1---	1-----	-----
QUE ILI	-1--21-	-----	-----	-----
VAC VAC	31--1--	2-----1-	-----	-----
APOC ANDR	-1-----	---1---	-----1---	-----
DANT SPIC	1--11-1	2--3-1-	-----2-----	1-----
ACE SAC	1-----	-----114	-----	-----
SOLI BICO	2-----	1-----22-	---1-11-1---	1-----
TOXI RAD	-11-----	---2---2-	-12---1--1-2---	1-----
QUE VEL	---1--1	-1-1-1-1-	-----	-----
CARE COMP	1-----	---1-1-	1-----	-----
JUN VIR	4-1-111	24454545541	-4--31--1-11341-	5-----
RHU GLA	-----111	-532--24-	5-4--1-2-1---	-----
JUN COM	1-----	---11444	-----	-----
ROS SPP	1-----	---1112-1	---1-----1--1	-----
VIB DEN	1-----	---1111	-----1---	-----
ELA COM	-----	1-1-3--1	-----	-----
CIRS ARVE	-----	---1--11	-----	-----
RUDB HIRT	-----	---1-1--1	-----	1-----
ACE RUB	1-----	---1-1-41-	---2---14-15-1-	-----
RHA CAT	-----	---2---1	-----	3-----
SPI LAT	-----	---111	---1---1--1--1	-----
CHRY LEUC	-----	1111---11	-----211--11--1	-----
CONV SPP.	-----	---11---1-11	-----1--21---	-----
LACT CANA	-----	---1---	---1--11---	-----
LACT SPP.	-----	---1---	---1--1---	1-----
PANI SPP.	-----	---11---	---1-1111-11-1--1	-----
SATU VULG	-----	---1---	---1-----1---	1-----
SOLI GRAM	-----1-	-2---1--11	1111-11412311-11-1	-----
SOLI RUGO	-----3-	-21-1-1-1	3211-31311253-2214	--1-
BER THU	-----	-----	---1-1---2---	-----
FRA AME	-----	---1-----	---2---1--11--1-	-----
POTE CANA	-----	-----	11---1-----31-	-----

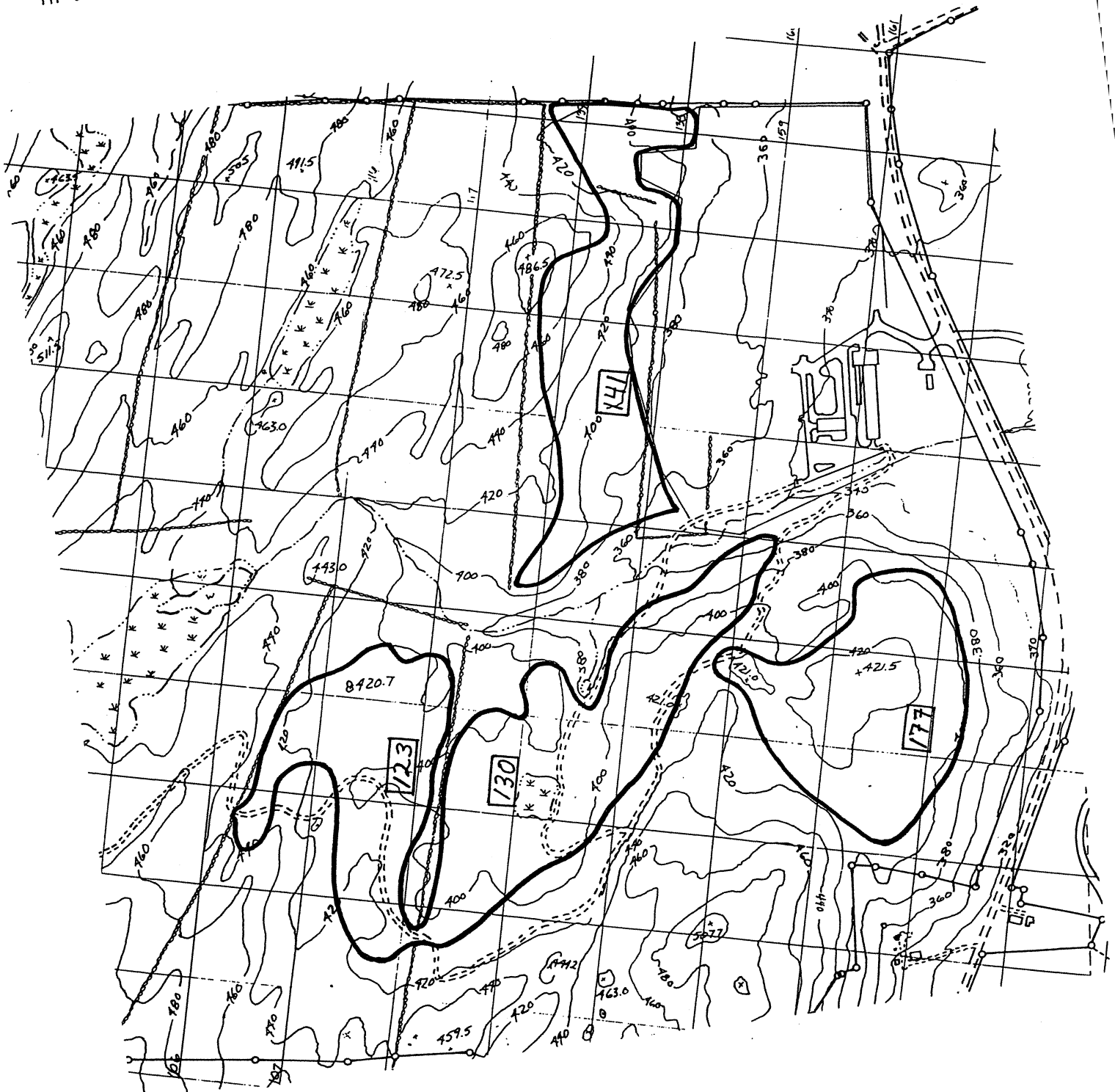
TABLE 3. (continued)

	XERIC FIELDS	JUNIPER WOODLANDS	BLUESTEM - GRAY DOGWOOD	HAY FIELD
SPECIES CODES	2222323 4679083	PLOT NUMBERS 3232221 1235411235	11112333331113411 878902578912560464	1 78906
RUBU SPP.	-----	-----2--	-----55454-31	--1--
COR RAC	-11115-	11551412-2	5555-425445-545155	-111-
ANTH ODOR	1-----	51-1111	1221-3---111-4-15	--1--
SOLI JUNC	-----	1111121	1111-1132-11213114	--1-
SOLI SPP.	-----	3444322214	4434-324534244412	-1113
LON MOR	--3-1-1-	3111-11-	2-2--11-2222221-	--1---
PRU SER	1--11--	14--2--	15-----	11-1---
ANDR SCOP	3555555	5555455555	4255-55255444555511	-115
POTE SIMP	1-111--	211-112-	1-1---1-11-1-11-	-1-1-
RUME ACET	1141122	343312311-	1222-1223413133431-	133-
ACHI MILL	-----	121-1-1111	1111-1111----1--12	-11--
CARE SPP.	---1---	1---	11---11--1--1-1-	-1--
CENT MACU	-----	1-----	1-----11---21-	-1---
CYNA NIGR	-----	-----	1111-----	---1
HYPE PERF	1-----	1--1-111111	11-1-1-111-112111-	111--
LINA VULG	--1-1-	11-1-1---	1-1---1111-1-1--1-	-111-
OXAL STRI	-----	1111-1111	1111--1--1-111-11-	-111
ERIG SPP.	-----	11-----	11-----	-1---
FRAG VIRG	-----	3123--1-2--	1-----	24--22-
SILE CUCU	-----	11-1-----	11-----11---	11111
VERO OFFI	--1---	2111-1-1-	-----11111-	11-2-
HIER FLOR	-----	2-1-----	-----	2--2-
PART QUIN	-----	1-----	-----1--1-	-1--
POA COMP	-----	12--2-1--1-	1-----	3--
POA SPP.	-----	5-----	1-----	4-1-
DAUC CARO	-----	-----	1-----	1-1---
GALI MOLL	-----	1-----	3312---31-3-123-23	55445
RUBU FLAG	-----	1-----	3-----	53---5
ARRH ELAT	-----	-----	21-----	3---
AGRO REPE	-----	1-----	-----	1--12
DACT GLOM	-----	1-----	-----	2121-
BROM INER	-----	-----	-----	11-1
LOTU CORN	-----	-----	-----	44433
PHLE PRAT	-----	-----	-----	55555
PLAN LANC	-----	1-----	1-----	11-11-
POTE RECT	-----	-----	1-----1-----	22332
SOLA CARO	-----	-----	1-----	1-111
TARA OFFI	-----	-----	1-----	1111-
STEL GRAM	-----	-----	1-----	11---
DIAN ARME	-----	11-----	1-----1-1--1-	111-1
HIER SPP.	1-211-	11--21--1-	3-1-----1-1-21	44531
TRIF AGRA	-----	11-1-----	1111--1--1--11-	12142-

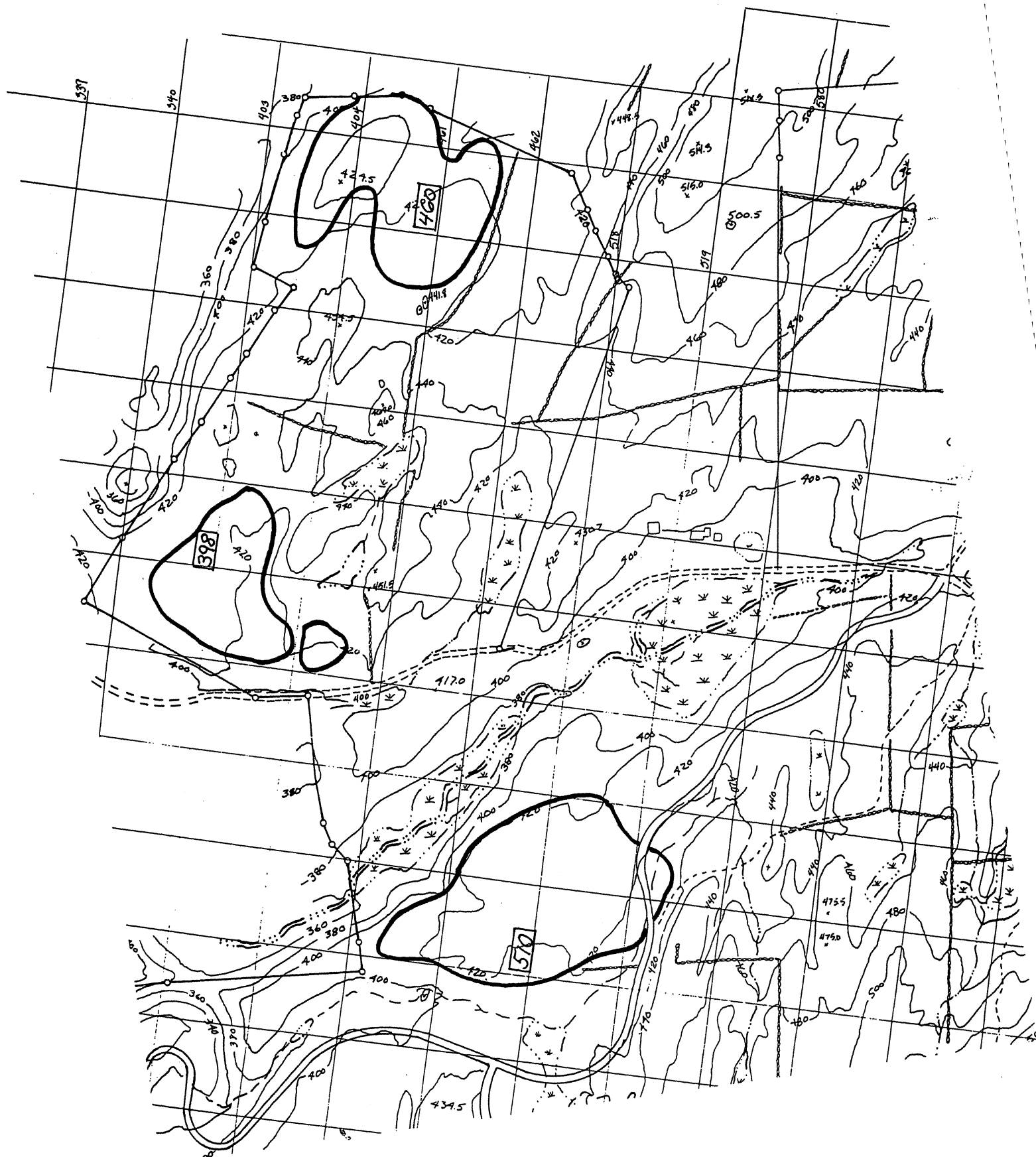
APPENDIX A: MAPS OF THE MAJOR UPLAND FIELDS

SACCOMANDA FARM: FIELDS #123 - #177

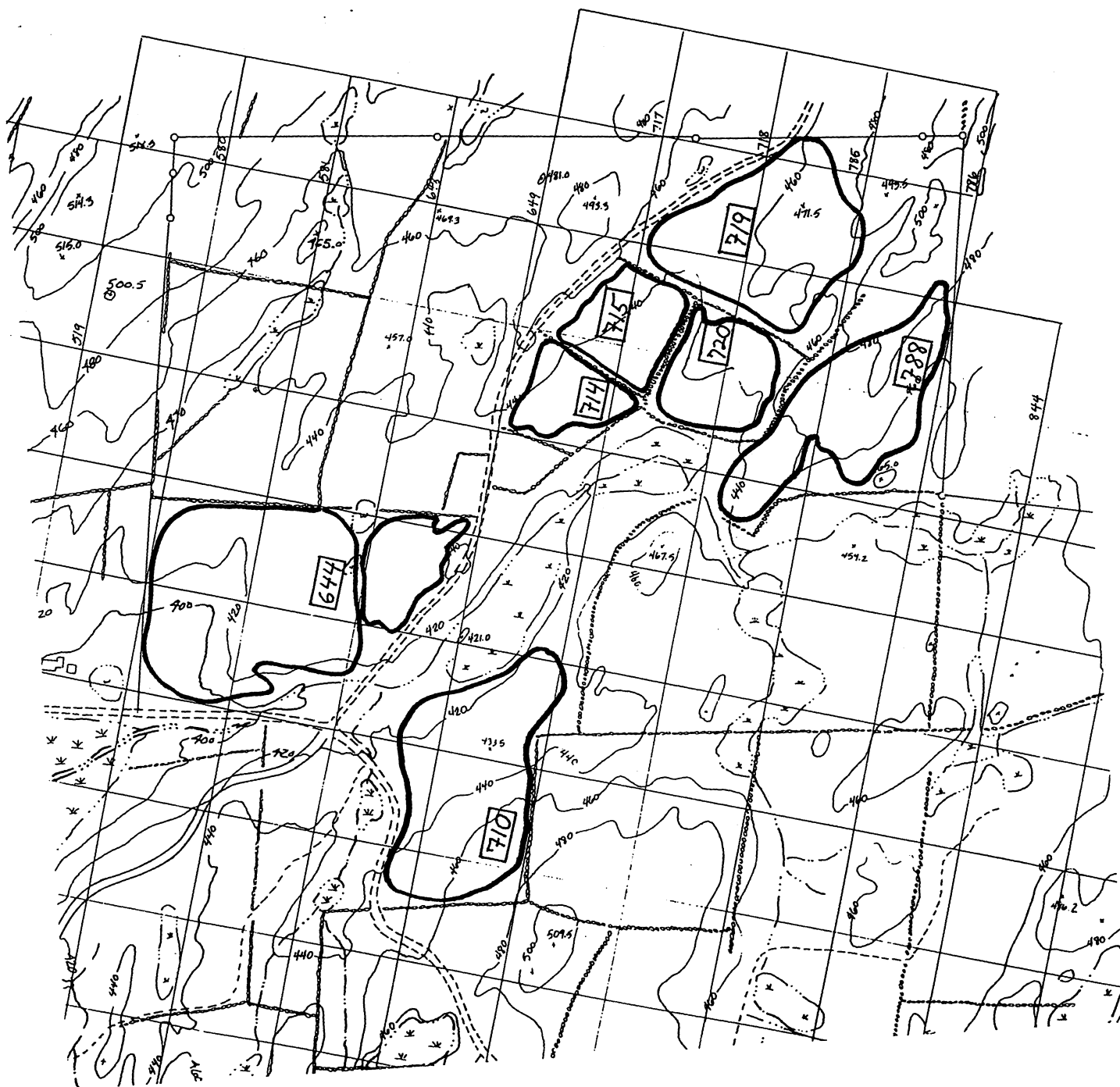
Note: The grid square number for which the field was numbered is enclosed in a box.



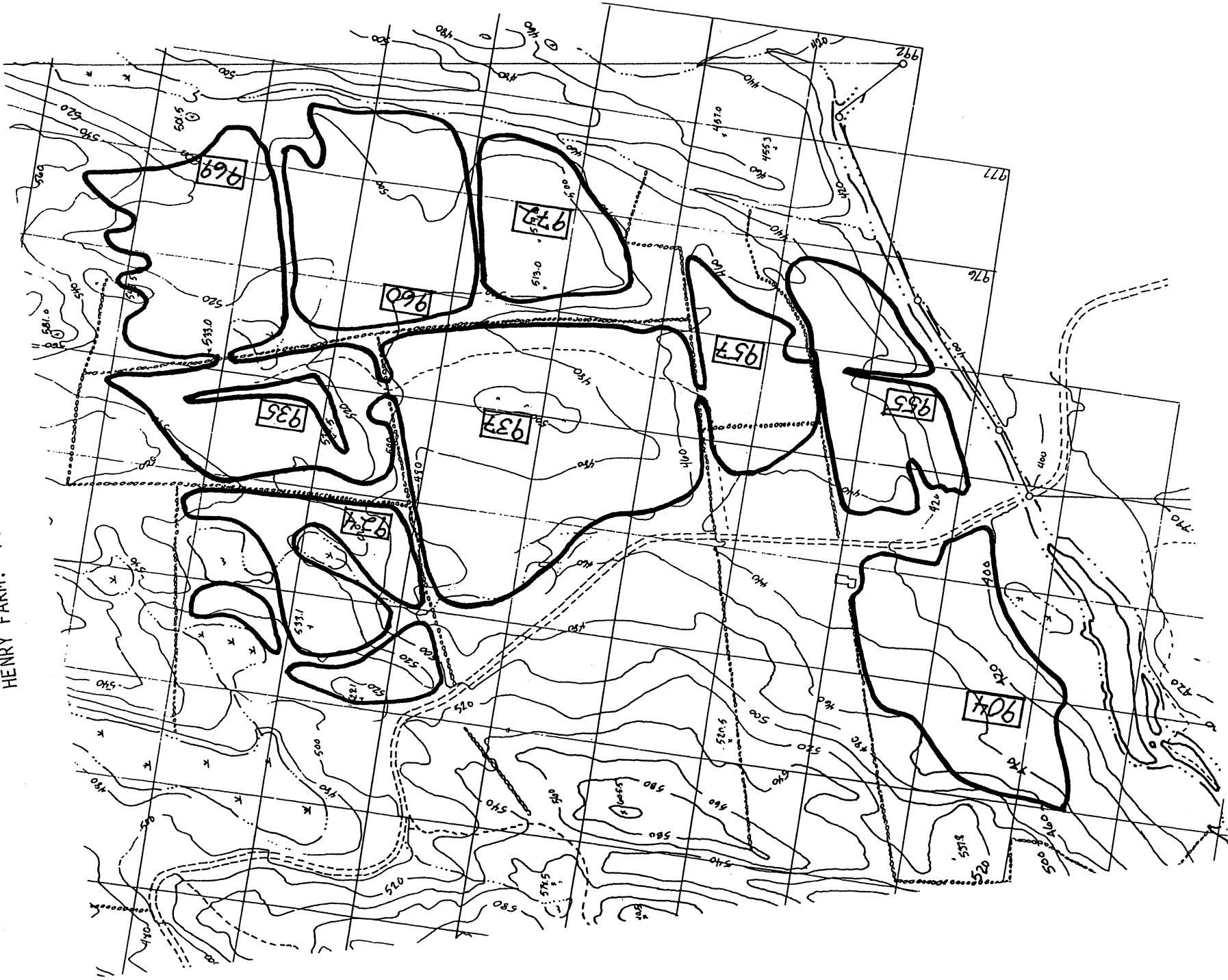
PETTIT FARM: FIELDS #398 - #510



CHASE FARM: FIELDS #644 - #788



HENRY FARM: FIELDS #904 - #972



APPENDIX B: LAND TRANSACTIONS INVOLVING THE UPLAND FIELDS

Chase Parcels: Land Transactions

The Chases owned two farms surrounding Pettit Rd. and extending along Canoe Hill Rd.; the upper parcel (107 acres) included the fields used in this study. The Chases left in 1932, after which the Henrys leased the lower parcel of 98 acres for a short period to use as pastureland.

UPPER PARCEL

<u>Year</u>	<u>By</u>	<u>From</u>	<u>Document</u>	<u>Acreage</u>
1930	M.B. Cary	Chas and Mary Chase	deed 504:433	
1927	Charles Chase	C. VanBenshoten	475:321	107
1925	C. VanBenshoten T. Purcell, ref.	Pettit family members (mortgage dispute)	475:320	107
1862	Jas W. Pettit	Fred B. and Sarah Hicks	121:491	107

LOWER PARCEL

1930	M.B. Cary	Chas Chase	504:433	98
1921	Chas Chase	Geo A. & Daisy Phillips	419:308	98
1906	George Phillips	Geo T. Underhill	347:474	98
1896	George Underhill	Jane Hallock	287:436	
1896	Jane Hallock	heirs of Jas H. Hallock	287:203	
1856	Jas H. Hallock	Lewis E. & Jane Hallock	106:519	

Henry Parcel: Land Transactions

The Henry farm covered about 187 acres and surrounded the lower part of Canoe Hill Road, north of Wappinger Creek, adjacent to the Chase farm to the north. They also owned a small parcel, either 31 or 41 acres, which was adjacent to the Gifford property, the west-most part of which was a woodlot. Another woodlot was located at the N corner of their property. The Henrys left in the early 1930's soon after the Chases. Their land was then leased to Wm. Braddock for 4-5 years, who did no planting and only used some of the land for pasture. The subsequent renters left the land abandoned, and did not use or otherwise manage it for any purpose.

Land acquisition record

<u>Year</u>	<u>By</u>	<u>From</u>	<u>Document</u>	<u>Acreage</u>
1930	M.B. Cary	James Henry	deed 504:452	
1925	James Henry	Georgiana Smith and James Henry		

1923	Georgiana Smith and James Henry	How'd F. Carter (referee)	deed 439:200	187
1882	Georgia Smith	Abraham Dates	will B 9981	187
1878	Abraham Dates	Wm. & Annie Smith Thomas & Georgia Smith	deed 192:243	
1876	heirs of T.H. Smith	Thos. H. Smith	will B 8636	
1842	T.H. Smith	Wm. E. Newcomb	deed 75:470	187
1839	Wm. E. Newcomb	James L. Ackert	deed 67:167	31
1839	J.L. Ackert	Joseph Thorne	deed 67:166	31
1833	Wm. E. Newcomb	heirs of Wm. Tripp	51:75	167

Pettit Parcel: Land Transactions

The ca. 177 acre Pettit farm was located on both sides of the north part of Canoe Hill Rd., near the intersection with Fowler Rd. The Pettits owned a tractor in the late 1930's, but it was not used much, if even at all, for tilling. There were two orchards, one south of Canoe Hill Rd., and two woodlots which totalled 40 acres, one in the northwest corner of their property and the other at the spur of their property extending south toward Tea House Hill. The whole property was originally divided into a major parcel and a small 5 acre parcel.

Land acquisition record

<u>Year</u>	<u>By</u>	<u>From</u>	<u>Document</u>	<u>Acreage</u>
1930	M.B. Cary	F.L. Pettit	deed 504:443	179
1906	Fred L. Pettit	J.M. Reardon	deed 346:173	171,5
1905	James M. Reardon	Anna F. Haines, Herbert W. Hallock	deed 343:373	171,5
1896	Charles Haines	Phebe L. Fowler	deed 284:230	5
1894	Charles Haines	Jennie S. Pell	deed 279:426	171
1894	Charles Haines	heirs of S. Haines	deed 277:427	171
(C. Haines is listed as head of the family in the 1865, 75, and 1880 censuses)				
1857	Smith Haines	Morehouse Haines	will	
1833	Morehouse Haines	Eli Barnum	deed 50:125	166
1822	Eli Barnum	J. H. Sharpsteen	mort. 28:286	166
1802	John Sharpstone	Jacob Sharpstone	will B 345	166

Saccomanda Parcels: Land Transactions

The Saccomandas sold their dairy farm, located at the present site of the greenhouse, to the Cary's in 1937. The property had originally been four separate parcels; all of the fields in this study were located in the 184 acre eastern parcel.

<u>Year</u>	<u>By</u>	<u>From</u>	<u>Document</u>	<u>Acreage</u>
1937	M.B. Cary	M. Saccomanda	deed 560:67	332
1926	M. Saccomanda	Ralph Prete	473:175	332
1921	R. Prete,	John Prete	413:329	332
1919	John Prete	L.W. Howshield	405:202	
1917	L. Howshield	S.J. Simmons & C. Ferry	398:137	
1907	S. and Herman Simmons	Isaac Boyce	353:384	332
1904	Isaac Boyce (mortgage dispute: Wilbur vs. Howell and Budd)	various landowners	332:190	184, 13, 15, 120
1880	Geo. W. Howell	Franklin J. Traver	206:381	184, 13
1878	Franklin Traver (mortgage dispute: Cole vs. the Travers)		192:182	184, 13
1877	Franklin Traver	John C. Traver	190: 76	184, 13
1867	John C Traver	J. Simmons and A. Sutherland	140:326	184
1866	J. Simmons and A. Sutherland	Henry Sutherland	135:299	184
1856	Henry Sutherland	Benj. F. Halstead	107:436	
1848	Benj. Halstead	W.R. Hazzard	86:603	
1841	Jacob Fowler	William Hazzard	70:313	

APPENDIX C: SPECIES CODES FOR WOODY AND HERBACEOUS SPECIES

A: ERECT WOODY SPECIES

Species Code	Species
ACEGRI	Acer griseum
ACERUB	Acer rubrum
ACESAC	Acer saccharinum
ALNRUG	Alnus rugosa
BETLEN	Betula lenta
BERTHU	Berberis thunbergii
BERVUL	Berberis vulgaris
BETPOP	Betula populifolia
CARGLA	Carya glabra
CORAMO	Cornus amomum
CORFLO	Cornus florida
CORRAC	Cornus racemosa
CORSPP	Cornus sp.
CRASPP	Crataegus sp.
ELACOM	Elaeagnus commutata
FRAAME	Fraxinus americana
GAYBAC	Gaylussacia baccata
HUMLUP	Humulus lupulus
JUGNIG	Juglans nigra
JUNCOM	Juniperus communis var. depressa
JUNVIR	Juniperus virginiana
LONMOR	Lonicera morrowi
PINSTR	Pinus strobus
POPGRA	Populus grandidentata
POPTRE	Populus tremuloides
PRUSER	Prunus serotina
PRUVIR	Prunus virginiana
PYRMAL	Pyrus malus
QUEALB	Quercus alba
QUEBOR	Quercus borealis
QUEILI	Quercus ilicifolia
QUEPRI	Quercus prinus
QUESPP	Quercus sp.
QUEVEL	Quercus velutina
RHACAT	Rhamnus catharticus
RHUGLA	Rhus glabra
ROSMUL	Rosa multiflora
ROSSPP	Rosa sp.
RUBALL	Rubus allegheniensis
RUBSPP	Rubus sp.
SALRIG	Salix rigida
SPILAT	Spiraea latifolia
TOXRAD	Toxicodendron radicans
ULMAME	Ulmus americana
ULMRUB	Ulmus rubra
VACANG	Vaccinium angustifolium
VACCOR	Vaccinium corymbosum
VACSTA	Vaccinium stamineum
VACVAC	Vaccinium vacillans

A. ERECT WOODY SPECIES (cont.)

Species	
Code	Species
VIBDEN	Viburnum dentatum
VIBLEN	Viburnum lentago
VIBRUF	Viburnum rufidulum
VITSPP	Vitis sp.
VITVUL	Vitis vulpina

B: HERBACEOUS AND CREEPING WOODY SPECIES

Species	
Code	Species
ACHIMILL	Achillea millefolia
AGROREPE	Agropyrum repens
AGROALBA	A.stolonifera var.major
AGROSPP.	Agrostis sp.
AGROTENU	Agrostis tenuis
ANDRSCOP	Andropogon scoparius
ANTHODOR	Anthoxanthum odoratum
APOCANDR	Apocynum androsaemilifolium
ARABGLAB	Arabis glabra
ARRHELAT	Arrhenatherum elatius
ASCLSYRI	Asclepias syriaca
ASTESPP.	Aster sp.
BROMINER	Bromus inermis
CARECOMP	Carex complanata
CARENORM	Carex normalis
CARESPP.	Carex sp.
CARYSPP.	Caryophyllidae sp.
CENTMACU	Centaurea maculosa
CERAVULG	Cerastium vulgatum
CHRYLEUC	Chrysanthemum leucanthemum
CIRSARVE	Cirsium arvense
CONVSEPI	Convolvulus sepium
CONVSPP.	Convolvulus sp.
CYNANIGR	Cynanchum nigrum
DACTGLOM	Dactylis glomerata
DANTSPIC	Danthonia spicata
DAUCCARO	Daucus carota
DENNPUNC	Dennstaedtia punctilobula
DIANARME	Dianthus armeria
EQUIARVE	Equisetum arvense
ERIGSPP.	Erigeron sp.
FRAGVIRG	Fragaria virginiana
GALIMOLL	Galium mollugo
GALIVERU	Galium verum
HIERFLOR	Hieracium florentinum
HIERSPP.	Hieracium sp.
HYPERPERF	Hypericum perforatum
JUNCEFFU	Juncus effusus
JUNCTENU	Juncus tenuis
LACTCANA	Lactuca canadensis
LACTSPP.	Lactuca sp.

B: HERBACEOUS AND CREEPING WOODY SPECIES (cont.)

Species Code	Species
LEPICAMP	Lepidium campestre
LINAVULG	Linaria vulgaris
LOBEINFL	Lobelia inflata
LOTUCORN	Lotus corniculatus
LYCOOBSC	Lycopodium obscurum
LYSICILI	Lysimachia ciliata
LYSIQUAD	Lysimachia quadrifolia
OXALSTRI	Oxalis stricta
PANISPP.	Panicum sp.
PARTQUIN	Parthenocissus quinquefolia
PENSDIGI	Penstemon digitalis
PHLEPRAT	Phleum pratense
PLANLANC	Plantago lanceolata
POA COMP	Poa compressa
POA PRAT	Poa pratensis
POA SPP.	Poa sp.
POTECANA	Potentilla canadensis
POTERECT	Potentilla recta
POTESIMP	Potentilla simplex
PRUNVULG	Prunella vulgaris
PYCNFLEX	Pycnanthemum flexuosum
RUBUFLAG	Rubus flagellaris
RUBUSPC.	Rubus sp. (creeping)
RUBUSPE.	Rubus sp. (erect)
RUBUSPP.	Rubus sp.
RUDBHIRT	Rudbeckia hirta
RUMEACET	Rumex acetosella
SATUVULG	Satureja vulgaris
SILECUCU	Silene cucubalis
SOLACARO	Solanum carolinense
SOLIBICO	Solidago bicolor
SOLICANA	Solidago canadensis
SOLIGIGA	Solidago gigantea
SOLIGRAM	Solidago graminifolia
SOLIJUNC	Solidago juncea
SOLIRUGO	Solidago rugosa
SOLISPP.	Solidago sp.(unknown)
STELGRAM	Stellaria graminea
TARAOFFI	Taraxacum officinale
TOXIRADI	Toxicodendron radicans
TRIFAGRA	Trifolium agrarium
TRIFPRAT	Trifolium pratense
TRIFREPE	Trifolium repens
TRIFSPP.	Trifolium sp.
UNKNOWN.	Unknown
VEROOFFI	Veronica officinalis
VEROSPP.	Veronica sp.