FLORISTICS AND ENVIRONMENTAL PLANNING IN WESTERN NEW YORK AND ADJACENT ONTARIO

RICHARD H. ZANDER
Floristics and Environmental Planning in Western New York and Adjacent Ontario:

*Distribution of Legally Protected Plants and Plant Sanctuaries*

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The author thanks Dr. Robert Andrle, Associate Director of the Buffalo Museum of Science, for critically reviewing the manuscript.

Cover photograph by Sheldon Merritt of the Buffalo Audubon Society. Uncommon aberrant forms of *Trillium grandiflorum*; the upper plant approaches forma *viride*, with green petals almost leaf-like in texture, while the lower is near forma *striatum*, with broad, green stripes on the petals.
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ABSTRACT

A dot map survey compares the geographic distribution of limited-access sanctuaries with known stations of plant species of the Niagara Frontier recognized as threatened by New York State law. Wetland species are well represented in sanctuaries, but calciphilic species are not. Minor political districts are ranked by richness in numbers of species, especially those of restricted habitat. Botanically significant areas are listed.
CONSERVATION AND PLANT MAPPING

This publication is primarily intended for persons concerned with environmental planning and conservation. Analysis of the known distribution of plant species by the compilation of “dot maps” enables areas of species richness, diversity, and habitat restriction to be distinguished. The dot maps in this distributional study reflect the known geographic distribution of certain rare or uncommon plant species in western New York State and the Regional Municipality of Niagara in the Province of Ontario. With this knowledge, floristically important areas are identified for possible protection through the eventual establishment of sanctuaries, preserves, wild areas, parks, or easement areas.

The data for compiling these maps are taken mainly from citations in the Flora of the Niagara Frontier Region by C. A. Zenkert (1934) and its Supplement by Zenkert and R. H. Zander (1975). Burgess (1877) provides, in those cases where the nomenclature of his species citations is unambiguous, much data for parts of Chautauqua County not covered by the Flora and its Supplement, as do House and Alexander (1927), House and Gordon (1940) and Smith (1961) for southern Cattaraugus County. Little is known of Allegany County except for Cook’s (1970) flora of Moss Lake Sanctuary in the town of Caneadea. These data are supported largely by voucher specimens deposited in various herbaria, being “proof” of the existence of a species at some particular place and time. Sight records of the Niagara Falls Nature Club reported by Yaki (1970) are not included here, though these reports are taken into account in the section on significant habitats. Reported occurrence of a species is indicated on the maps by a dot in the appropriate town (equivalent to township in other states) or other minor political district. Mapping of species on an individual basis shows that many are restricted wholly or partly to special kinds of habitats. Mapping of several species together on one map eliminates spotty collection data and provides a better picture of the distribution of plants with similar habitat affinities.

The 1974 law, Section 193.3 of the New York State Penal Code, protects certain native wildflowers, ferns, and shrubs in New York State and provides for a small fine for picking, transplanting or removing any of them. However, it affords no protection to these plants from the owners of the land upon which they grow. Only sanctuary status or the equivalent for critical lands will ensure continued existence of endangered plants. This law lists only plants with showy flowers or attractive foliage. Many unusual and rare plants are not
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covered by special legislation. The 1974 law, however, is useful in that it names a number of plants considered especially valuable to the people of the state, as selected by a committee of botanists, teachers, conservationists, and naturalists. The list of species specifically protected (Zander, 1975a) can be used in mapping studies to indicate the botanical richness of a piece of land to be considered for designation as a "wild area." An area important for conservation considerations should have a great proportion of the legally protected species present. Alternatively, minor importance may be assigned areas lacking many of the species. One need not require equal botanical study of the minor political areas in the presence of other considerations, such as the extension of similar habitat types through several contiguous districts and the selection of the better collecting sites through several generations of local botanists. The purpose of this paper is to evaluate present knowledge of the floras of minor political districts in the Niagara Frontier Region, identify those areas that are well studied and have botanical reputations, compare them in regard to diversity of protected species, and especially, to identify areas supporting populations of rare species or those with special habitat requirements.

Plant sanctuaries can be established and effectively maintained through either private or public ownership. Several societies in Western New York, among them the Buffalo Audubon Society (publications: Audubon Outlook and The Prothonotary), the Nature Conservancy, the Nature Sanctuary Society of Western New York (publication: Sanctuary News), and the Federation of Ontario Naturalists (publication: Federation of Ontario Naturalists Newsletter), in Ontario, own small sanctuaries (Map 13) in several botanically critical areas. However, public ownership of land often opens rich areas to overuse as recreational space. For instance, much of Chestnut Ridge Park in the town of Orchard Park, Erie County, is traversed by access roads, and as it is close to the city of Buffalo and is popular for weekend outings, its flora has consequently suffered. Showy native wildflowers, such as trilliums, spring beauties, orchids, hepaticas, and others, are for the most part absent from all but the most poorly accessible areas. However, the Shale Creek Nature Center, a portion of Chestnut Ridge Park controlled by the Buffalo Museum of Science in conjunction with Erie County Department of Parks and Recreation for teaching nature field study, has the above wildflowers in comparative abundance (Zander, 1975b). Apparently, the deciding factors for the success of the Nature Center as a place of persistent floral beauty are its relative
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isolation from access by automobiles, attitudes of appreciation on the part of teachers, students, and guests, and limited admission, in this case not through fencing but by the attraction of more convenient parking and picnic areas elsewhere in the park.

In many areas, fencing is necessary to preserve floral integrity. Small fenced areas demonstrating untrampled vegetation are occasionally maintained at scenic viewing points and other popular areas of certain National Parks. The luxuriant vegetation growing within even a very small fenced plot shows a startling contrast to areas subjected to “people pressure.” One might suggest that special fenced areas, to be entered by appointment only, be placed in all parks and even in many sanctuaries, to help preserve vegetation in its natural state. These areas need not be large, but will show clearly, through contrast, any general degradation of the unfenced vegetation, and will serve as yardsticks against which to measure the effects of possibly insufficiently restricted access to natural areas. Additionally, special areas of rare plants may be isolated. This is done at Letchworth Park in Wyoming County, where three rare species (Zenkert, 1932) found on dripping wet cliffs are in a forbidden area. Access is restricted primarily for safety reasons here but serves a conservation purpose as well. Tracts of the large Allegany State Park in Cattaraugus County have been proposed (Gordon et al., 1937, p. 375-378) as Natural History Preserves to be left in a wilderness state, isolated from recreational areas.

The distribution of sanctuaries owned by private groups in the region of western New York State and adjacent Ontario is shown on Map 13. These are sanctuaries with limited access largely due to isolation from population centers and little advertisement of their locations except to small, responsible groups of citizens. Most sites are intended primarily for the preservation of bog and other wetland species and are located on the Allegheny Plateau.

LOCAL FLORISTICS

Botanical studies have not been done equally over western New York State and adjacent Canada. Certain areas have been favored by botanists, being “nature haunts” of long renown. Publications about them include those of Alexander (1922, 1923, 1924), Johnson (1924), and Thorpe (1953). Though some places cited in older publications may have been degraded floristically through cutting of natural vegetation and introduction of alien species—with subsequent elimination
of many showy native forms—many of these areas remain of importance to naturalists, hikers, and other outdoors people in the Niagara Frontier. Such lush natural areas that still exist should be considered for possible preservation from encroaching residential and industrial development, as has been the case with the few sanctuaries that have been established in Western New York and adjacent Ontario. Many of these sites have been selected for intensive floristic and ecological analysis by botanists. "Local floras" are publications listing all species of plants found in the areas studied and provide the best information for purposes of comparing relative richness of the flora. Well-known nature haunts are listed in the section on significant habitats, together with citations of local floras and other informative publications. A factor that restricts the completeness of the botanical record of any area is sheer distance. Parts of Monroe, Cattaraugus, and Allegany Counties have been little studied on account of their relative isolation from botanists, most of the local collectors having resided in Buffalo or elsewhere in Erie County. Allegany County is considered by McVaugh (1958) botanically the least known county in New York State. The Regional Municipality of Niagara in Ontario is not well collected by American botanists on account of customs restrictions, though these usually involve only simple declaration of the herbarium specimens at the border. For purposes of the present paper, the most distant areas cannot be compared floristically with areas close to Buffalo.

GEOLOGIC AND CLIMATIC FACTORS

Topography in Western New York is extremely varied, affording plants many habitat possibilities. The highest elevations occur in the south, in Allegany County, rising to 2548 feet near Pikeville. The areas south of the Portage Escarpment, line number 3 on Map 9, comprise the Allegheny uplands, while northern areas are lower, ancient lake plains, sloping from the base of the Portage Escarpment at about 900 feet elevation north to Lake Ontario at 246 feet and west to Lake Erie at 573 feet. Escarpments up to 100 feet in height, but usually rather less, cross the lake plains from east to west. The Niagara Escarpment, number 1 on Map 9, crosses the Niagara River at Lewiston, while the Onondaga Escarpment, number 2 on Map 9, essentially ends in the city of Buffalo, though emerging occasionally inland along the north shore of Lake Erie in the Regional Municipality of Niagara. The Pleistocene glaciation—the southern limits in Western New York noted by line 4 on Map 9—covered much of this region,
leaving behind glacial till and kettle holes that have produced numerous bogs in the southern counties. Bogs (and associated bog plants) are absent in the unglaciated southernmost portion of Cattaraugus County (House & Alexander, 1927).

Map 10 shows the distribution of extensive tracts of surficial calcareous rock. Limy soil and carbonate rock outcroppings occur throughout much of northern Western New York and the Niagara peninsula but are uncommon south of the Portage Escarpment. Whole dots on Map 10 indicate towns with calcareous bedrock exposures—of Lockport dolomite in the northernmost towns and of Onondaga limestone in the southernmost. Half dots indicate regions of calcareous Silurian shales as bedrock. The entire northern area is overlain with glacial till and lake deposits, but major exposures of calcareous rock occur along rivers and streams, and especially at and along the Niagara and Onondaga Escarpments. South of this area, the bedrock consists of Middle Devonian shales and limestones grading south into shales, siltstones, sandstones, and limestones in Cattaraugus County. Further geological information on the distribution of bedrock and soils is provided by Rickard and Fisher (1970) and Thompson (1966).

Other factors apparently influencing the north-south distribution of many species of Western New York flora are indicated on Maps 11 and 12, adapted from Zenkert (1934). Map 11 shows the average length of the growing season in days. The area along the Lake Erie shore has the longest growing season and is also a major grape-growing region. Map 12 shows the mean precipitation for the growing season in inches. The Allegheny uplands to the south receive the most rainfall.

**LEGALLY PROTECTED PLANTS**

The plants concerned in this study are those found in Western New York and adjacent Ontario that are listed in Section 193.3 of the New York State Penal Code. The nomenclature follows that of Gleason and Cronquist (1963).

*Arisaema dracontium*, Green-dragon  
*Asclepias tuberosa*, Butterfly-weed  
*Campanula rotundifolia*, Harebell  
*Celastrus scandens*, American Bittersweet  
*Chimaphila*, all species, Pipsissewa and Spotted Evergreen  
*Cornus florida*, Flowering Dogwood  
*Drosera*, all species, sundews
Epigaea repens, Trailing Arbutus
Euonymus, all species, Burning-bush, Strawberry-bush, etc.
Filices, all native species of ferns except Bracken, Hay-scented, and
Sensitive Fern
Gentiana, all species, Ague-weed, Blue-bottles, etc.
Hydrastis canadensis, Golden Seal
Ilex, all native species, Holly, Black Alder, etc.
Kalmia, all species, Laurel, Lambkill, etc.
Lilium, all species, Canada Lily, Turk’s-cap Lily, etc.
Lobelia cardinalis, Cardinal Flower
Lycopodium, all species, club mosses
Mertensia virginica, Bluebells
Monarda didyma, Oswego Tea
Myrica pensylvanica, Northern Bayberry
Orchidaceae, all species of the Orchid Family
Panax quinquefolius, Ginseng
Pyrus coronaria, Wild Crab Apple
Rhododendron, all native species, Rhododendron and Azalea
Sanguinaria canadensis, Bloodroot
Sarracenia purpurea, Pitcher Plant
Trillium, all species, trilliums
Trollius laxus, Globe-flower

Of these, several species are not uncommon in rural areas, but are
seldom seen near cities and in parks on account of overpicking,
removal, or destruction of habitats. Eliminating these species, a total
of 113 species of rare or uncommon protected plants is mapped here, in
groups sharing a common habitat, or in various taxonomic groupings.

DISTRIBUTION MAPS

Map 1 gives the total number of species of uncommon protected
plants reported for each minor political district. Most areas with low
numbers of species can be assumed to be poorly explored botanically.
This is probably due to distance from the city of Buffalo, but also
possibly to lack of scenic areas or nature haunts attractive to botan­
ists, or relative homogeneity of topography and preponderance of
farmland or residential areas, factors that restrict vegetational diver­
sity. The numbers of species in well-collected minor political districts
are an indication of the floristic diversity throughout contiguous
districts with similar habitats.
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The higher numbers of species listed in Map 1 are generally close to Buffalo, this being a major center of botanical activity. Past intensive floristic studies of special areas account for many of the high numbers elsewhere, such as the local floras published by Cook (1973), Day (1888), Futyma (1975), Getty et al. (1952), Grisez (1973), House and Alexander (1927), Miller and Ehrle (1969), Muenscher (1946, 1951), Panton (1890), Schick and Eaton (1963), Seidman (1975), and Smith (1961). Often, floral studies of large areas emphasize much collection in scenic places, for instance, Burgess's (1877) numerous plant citations from Panama Rocks, Arkwright Falls, and the Cassadaga and Bear Lake regions in Chautauqua County. Other high numbers in Map 1 may be due to simple convenience in collecting, such as the extensive local collections made by A. D. Pease, a physician and amateur botanist who lived in the town of Wilson, Niagara County, in the late 1800's; collections of Dr. Anne E. Perkins of the State Hospital in the town of Collins, Erie County, in the early 1900's; and the collections amassed by members of the Buffalo Naturalists' Field Club in the city of Buffalo and the town of West Seneca and other towns along railroad routes south of Buffalo in the late 1800's and early 1900's.

Most of the large numbers in the minor political districts are apparently due to a combination of two factors, 1, intrinsic large diversity of species and, 2, the general attractiveness of the collecting site to botanists, due to unique topography, aesthetic reasons, or reputation as a favorite nature haunt. Because plants often have special habitat and climatic requirements, diversity of species is related to diversity of topography. This is possibly the reason for the unusually large number of species recorded for the town of Concord in Erie County. This town includes exposed bluffs along the gorge of the Cattaraugus Creek in Zoar Valley, deep woods in major forest reserves, and the well-known Concord Bogs, valued as collecting areas for unusual species since the late 1800's (Zander, 1975c).

Though there has been sustained botanical activity in western New York State and adjacent Ontario since the 1860's, floral distribution in the Niagara Frontier region is as yet imperfectly known. Generalizations are difficult to make at this time, but an indication of species distribution in the area is presently needed for use by the many town development planning boards and environmental commissions. Judging from Map 1, it is evident that the southern towns of Erie County are rich in uncommon protected species. Certain districts in other counties and the Regional Municipality of Niagara also stand
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out. Often visited collecting sites, nature haunts, sanctuaries, and topographic features that are important determinants of the apparent diversity are listed in the section on significant habitats. The districts with greatest diversity of species are noted in Map 14 for those with 10 or more uncommon protected species, and Map 15 for those with 20 or more. That wetlands contribute a great deal to the total number is shown in comparing Maps 14 and 16, which show similar distribution except in the northern counties.

WETLAND SPECIES

Emphasis in planning the establishment of sanctuaries (Map 13) in Western New York and adjacent Ontario has been placed upon wetland preservation in recognition that such areas support a diverse and unique flora, distinguished by many species of orchids, unusual insectivorous plants, and other species restricted to wet or boggy environments. Wetlands are also well known to be of major importance for wildlife management and for recreation. Recent studies by Futyma (1975) and Seidman (1975), supported by the Erie County Environmental Management Council, concern swamp and bog habitats and include recommendations favoring preservation of certain areas. Other major floristic studies on swamp and bog habitats in Western New York, all reporting a diversity of showy native wildflowers and unusual species, include publications by Cook (1973), Getty et al. (1952), Grisez (1973), Muenscher (1946, 1951), and Schick and Eaton (1963). Especial attention to wetlands is afforded by the recently enacted state Freshwater Wetlands Law which would give some protection from encroachment by developers to wetlands over 12.4 acres in extent. “Wetlands” are defined in the new Law by the presence of any of such indicator species as Black Spruce, Swamp White Oak, Larch, Buttonbush, Leatherleaf, cattails, arrowheads, Wild Rice, Water Lily, duckweeds, sphagnum mosses, Bog Rosemary, Pitcher Plant, cranberries, and pondweeds, among others.

Maps 2 and 16 show the distribution of those 22 uncommon protected plants in Western New York that are restricted mainly to wetland habitats. These species are:

* Arethusa bulbosa, Dragon's Mouth Orchid
* Calopogon pulchellus, Grass Pink Orchid
* Calypso bulbosa, Calypso Orchid
* Corallorhiza trifida, Early Coral Root Orchid
* Cypripedium candidum, Small White Lady's Slipper Orchid
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*Drosera intermedia,* Spatulate-leaved Sundew  
*D. rotundifolia,* Sundew  
*Habenaria clavellata,* Small Green Wood Orchid  
*H. dilatata,* Tall Leafy White Orchid  
*Ilex verticillata,* Deciduous Holly  
*Kalmia angustifolia,* Sheep-laurel  
*K. polifolia,* Swamp-laurel  
*Liparis loeselii,* Loesel's Twayblade Orchid  
*Listera australis,* Southern Twayblade Orchid  
*Myrica pensylvanica,* Northern Bayberry  
*Pogonia ophioglossoides,* Rose Pogonia Orchid  
*Rhododendron maximum,* Great Rhododendron  
*R. nudiflorum* (including *R. roseum*), Pinkster-flower or Mountain Azalea  
*Sarracenia purpurea,* Pitcher Plant  
*Spiranthes romanzoffiana,* Hooded Lady's Tresses Orchid  
*Trollius laxus,* American Globe Flower  
*Woodwardia virginica,* Virginia Chain Fern

The dots on Map 2 chart the known distribution of *Sarracenia purpurea,* the Pitcher Plant, an indicator species found only in sphagnum bogs. Most of the higher numbers on Map 2 appear to be correlated with the appearance of this species. Bogs support a variety of environmentally restricted plants, especially various orchid species. Map 17 indicates towns with 5 or more species of wetland plants. Bogs are often threatened by peatcutting operations, as is the case in the Wainfleet Bog in the township of Wainfleet in the Regional Municipality of Niagara. The Federation of Ontario Naturalists is presently working for the preservation of part of this extensive bog. With the major exception of the Bergen-Byron Swamp in towns of the same names in Genesee County, most bogs in Western New York are southern in distribution, though absent from the southern unglaciated portions of Cattaraugus County. Wetlands in Erie County close to population centers, especially sphagnum bogs in the town of Aurora, may need immediate sanctuary status as unusual areas for scientific and nature study and for teaching purposes. Day (1883) reports the “Sphagnous Swamp,” excavated to form the present lake in Delaware Park in the city of Buffalo, once supported plants such as *Cypripedium spectabile* (= *C. reginae*), the Showy Lady's Slipper Orchid. As with all fragile ecosystems, there should be only limited access to bogs, perhaps controlled through a central administrative agency. The recent floristic study by Seidman (1975) on bogs of Erie County surveys
several sites and indicates that large bogs in the southern towns are definitely threatened. Futyma (1975) has conducted a similar study on wetlands in the towns of Clarence and Amherst in Erie County that likewise describes the vegetation and indicates preservation as being worthwhile. Such botanical studies are valuable because changes in vegetational composition over time, due to possible destruction or overuse, can be measured at intervals by comparing floral surveys made many years apart. Increasing prevalence of alien “weed” species and increasing absence of native species is a result of disturbance beyond a tolerable threshold. Futyma and Seidman also have taken photographs documenting vegetational character of portions of the wetlands they worked on, which can be used in more general comparative studies of vegetational changes over time.

**CALCIPHILIC SPECIES**

Many species highly valued for their showy flowers or that are rare in the Niagara Frontier Region seldom or never occur in wetlands. Instead, they appear only in generally dry, well-drained areas often with abundant surficial limestone or calcareous outcappings, as noted on Map 10. Day (1883) says of an area in the city of Buffalo now built over with factories and residences: “That portion of the city which lies east of Delaware Street and north of Scajaquadas Creek, offers to the botanist a field of no little attraction. It early acquired the name of ‘Buffalo Plains.’ Here, throughout an extensive area, the corniferous limestone, occupying a position almost horizontal, approaches very near the surface. In places, the rock remains uncovered. But, notwithstanding the fact that the soil is very shallow, the region was once well-wooded; and it is still the home of some most interesting plants, rarely seen in other portions of our district.” Among the rare plants Day lists for the Buffalo Plains are the presently protected species *Aplectrum hymale*, the Putty-root Orchid; *Asclepias tuberosa*, the Butterfly-weed; *Gentiana puberula*, the Fringed Gentian; *G. quinquifolia*, the Stiff Gentian; *Ophioglossum vulgatum*, the Adder’s Tongue Fern; and, *Spiranthes gracilis*, the Slender Lady’s Tresses Orchid. Zenkert (1934) reports that limestone areas northeast of Buffalo support an unusual flora, similar to that once known for the Buffalo Plains. These areas and other lands supporting calciphilic species are unfortunately receiving minimal attention in the establishment of wild areas and sanctuaries. Maps 3 and 18 show the distribution of 16 uncommon protected species that are known to be restricted
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to calcareous substrates, or occasionally also found on shale or sandy soil. Map 19 indicates districts with 5 or more calciphilic species. The species selected for mapping here are:

- *Asclepias tuberosa*, Butterfly-weed
- *Asplenium platyneuron*, Ebony Spleenwort
- *A. trichomanes*, Maidenhair Spleenwort
- *Botrychium lunaria*, Moonwort
- *Campanula rotundifolia*, Harebell
- *Camptosorus rhizophyllus*, Walking Fern
- *Cryptogramma stelleri*, Slender Cliff Brake
- *Cystopteris bulbifera*, Bulb-bearing Bladder Fern
- *C. fragilis*, Brittle Bladder Fern
- *Gentiana quinquefolia*, Stiff Gentian
- *Lilium philadelphicum*, Wood Lily
- *Polypodium vulgare*, Polypody Fern
- *Polystichum lonchitis*, Holly Fern
- *Pellaea atropurpurea*, Purple Cliff Brake
- *P. glabella*, Smooth Cliff Brake
- *Spiranthes gracilis*, Slender Lady’s Tresses Orchid

A comparison of the maps of the distribution of these plants with Map 10 noting major areas of surficial calcareous bedrock indicates a correlation of large numbers of these species and extensive areas of available substrate. In addition to level land with calcareous rock outcroppings, exposures along river bluffs such as the gorge of the Niagara River between Niagara County and the Regional Municipality of Niagara, the Cazenovia Creek area in the Erie County towns of West Seneca, Elma, Aurora and Wales, and Zoar Valley of the Cattaraugus Creek between Erie and Cattaraugus Counties apparently account for many of the records indicated on the maps. The Harris Hill area in the town of Clarence, and the land along the Onondaga Escarpment east of Harris Hill toward Akron in the town of Newstead, Erie County, is singled out by Zenkert (1934) as a significant habitat harboring rare calciphilic species of plants in unusual diversity. McVaugh (1958) maps the distribution of *Pellaea atropurpurea* in Columbia County, New York, and states that the known stations for this rare species and a group of others are almost exactly that of limestone outcroppings in that county. In Ontario, the Niagara Escarpment Commission in Georgetown is concerned with the planning of conservation areas and development controls along the Escarpment. They publish a magazine entitled *Cuesta*. No comparable organization exists in New York State, where the Escarpment
is likewise threatened by pit and quarry operations and residential development. A comparison of Maps 17 and 19 shows that, though many areas of Western New York and adjacent Ontario are rich in either calciphilic or wetland species, no one area is rich in both.

Sanctuaries protecting calciphilic plants should at minimum be established in the following several areas: in the Regional Municipality of Niagara in the City of Niagara Falls, as fenced areas at Niagara Falls and in and along the gorge of the Niagara River; in Niagara County in the towns of Lewiston and Niagara, in the same kind of areas, and as parks along the Niagara Escarpment; in the town of Lockport, as a park plus fenced area at the Niagara Escarpment; in Erie County in the town of Clarence and Newstead, as parks plus several isolated areas along the Onondaga Escarpment and at and east of the Harris Hill area; in the towns of West Seneca and Elma, as parks and perhaps isolated areas in the valley of the Cazenovia Creek; in the towns of Brant, Collins and Concord, as parks and isolated sanctuaries in Zoar Valley along Cattaraugus Creek; in Cattaraugus County in the town of Persia, as expansion and better control of access for Deer Lick Sanctuary along the South Branch of Cattaraugus Creek; in the towns of Cold Spring, Red House and Carrollton, as special preserves in Allegany State Park following the recommendations of Gorden et al. (1937); and in Genesee County in the towns of Alabama and Pembroke, as isolated sanctuaries along the Onondaga Escarpment, and in the towns of Byron and Bergen as additional support of the present sanctuary protecting Bergen-Byron Swamp and vicinity. It is important that the establishment of sanctuaries not be delayed as the re-establishment of extirpated species is difficult and often impossible and does not replace genetic stock. The Akron Falls area on Murder Creek in the town of Newstead in Erie County would be ideal for a sanctuary but is now a county park with unlimited access and no fenced areas, and is suffering consequent depauperization of the native flora.

Many other species of showy and rare native wildflowers that are not protected by New York law also have distributions in western New York State and adjacent Ontario that are restricted to special habitats. These have distribution patterns similar to those of protected species with similar habitat requirements. Sanctuaries established for the species whose distributions are mapped in this paper will also serve to protect many other species. For instance, unprotected calciphilic species with general distribution in the area shown by Map 10 include such uncommon showy native wildflowers as Aquilegia cana-
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densis, the Wild Columbine; Castilleja coccinea, the Painted Cup; Lupinus perennis, the Wild Lupine; and, Penstemon hirsutus, the Hairy Beardtongue, as well as numerous rare species that are of considerable scientific interest, though not having such showy flowers or particularly attractive foliage.

**ORCHIDS**

Orchids are of especial interest to scientists, naturalists, and flower lovers on account of their unusual beauty and often bizarre forms. Many species are restricted to wetlands, but some, such as *Spiranthes gracilis*, the Slender Lady’s Tresses, are restricted to limy sites. Map 4 indicates the distribution of 39 uncommon protected species of Orchidaceae, the Orchid Family. These are:

- *Aplectrum hymale*, Putty-root
- *Arethusa bulbosa*, Dragon’s Mouth
- *Calypso bulbosa*, Calypso
- *Corallorhiza maculata*, Large Coral Root
- *C. odontorhiza*, Small Coral Root
- *C. trifida*, Early Coral Root
- *Calopogon pulchellus*, Grass Pink
- *Cypripedium acaule*, Stemless Lady’s Slipper
- *C. calceolus*, Yellow Lady’s Slipper
- *C. candidum*, Small White Lady’s Slipper
- *C. reginae*, Showy Lady’s Slipper
- *Epipactis helleborine*, Helleborine
- *Goodyera pubescens*, Downy Rattlesnake Plantain
- *G. repens*, Rattlesnake Plantain
- *G. tesselata*, Lodigee’s Rattlesnake Plantain
- *Habenaria blephariglottis*, White Fringed Orchid
- *H. clavellata*, Small Green Wood Orchid
- *H. dilatata*, Tall Leafy White Orchid
- *H. fimbriata*, Larger Purple-fringed Orchid
- *H. flava*, Small Pale-green Orchid
- *H. hookeri*, Hooker’s Orchid
- *H. hyperborea*, Tall Leafy Green Orchid
- *H. lacerata*, Ragged Fringed Orchid
- *H. orbiculata*, Round-leaved Orchid
- *H. psychodes*, Smaller Purple-fringed Orchid
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H. viridis, Long-bracted Orchid
Isotria verticillata, Five-leaves
Liparis liliifolia, Lily-leaved Twayblade
L. loeselii, Loesel's Twayblade
Listera australis, Southern Twayblade
L. cordata, Heart-leaved Twayblade
Malaxis monophylla, White Adder’s Mouth
M. unifolia, Green Adder’s Mouth
Orchis spectabilis, Showy Orchid
Pogonia ophioglossoides, Rose Pogonia
Spiranthes gracilis, Slender Lady’s Tresses
S. lucida, Shining Lady’s Tresses
S. romanzoffiana, Hooded Lady’s Tresses
Triphora trianthophora, Three Birds

A comparison of Map 20, showing towns with 5 or more orchid species, with Map 17, showing towns with 5 or more wetland species, indicates a general positive correlation, as many orchid species are restricted to swamps and bogs. Liston and Liston (1965), present further notes on orchids and associated conservation practices in the Niagara Frontier region.

FERNS

All but three species of ferns in New York State are protected by law. Map 5 shows the distribution of 29 uncommon protected species. These are:

Athyrium pycnocarpon, Narrow-leaved Spleenwort
A. thelypteroides, Silvery Spleenwort
Asplenium platyneuron, Ebony Spleenwort
A. trichomanes, Maidenhair Spleenwort
Azolla caroliniana, Mosquito Fern
Botrychium dissectum, Dissected Grape Fern
B. lanceolatum, Lance-leaved Grape Fern
B. lunularia, Moonwort
B. matricariaefolium, Matricary Grape Fern
B. multifidum, Leather Grape Fern
B. simplex, Little Grape Fern
Camptosorus rhizophyllus, Walking Fern
Cryptogramma stelleri, Slender Cliff Brake
Floristics and Environmental Planning

Cystopteris bulbifera, Bulb-bearing Bladder Fern
C. fragilis, Brittle Bladder Fern
Dryopteris cristata, Crested Shield Fern
D. goldiana, Goldie's Shield Fern
Gymnocarpium dryopteris, Oak Fern
Matteuccia struthiopteris, Ostrich Fern
Ophioglossum vulgatum, Adder’s Tongue Fern
Osmunda claytoniana, Interrupted Fern
Pellaea atropurpurea, Purple Cliff Brake
P. glabella, Smooth Cliff Brake
Polypodium vulgare, Rock Polypody
Polystichum lonchitis, Holly Fern
Thelypteris hexagonoptera, Broad Beech Fern
T. phlegopteris, Long Beech Fern
Woodsia obtusa, Large Woodsia
Woodwardia virginica, Virginia Chain Fern

Many species of ferns are restricted in habitat, some needing boggy soil, many calcareous substrate, yet numerous others are found mainly in deep woods. The map shows a general distribution of fern species associated with diverse topography. Thus a variety of sanctuaries established in many kinds of habitats will best preserve the spectrum of local fern species.

CLUB MOSSES

Club mosses are evergreen low-growing herbs related to the ferns. Plants of the genus, Lycopodium, are now protected by law, though still harvested on private lands for making decorative wreaths. Four of the seven species in western New York State and adjacent Ontario are uncommon or rare, and their distribution is noted on Map 6. These species are:

Lycopodium annotinum, Stiff Club Moss
L. clavatum, Running Club Moss
L. inundatum, Bog Club Moss
L. trystachyum, Ground Pine

These club mosses are apparently restricted to wetlands in the southern counties, especially the southern towns of Erie County, but disjunctive to Bergen-Byron Swamp in Genesee County.
Trilliums or wake robins, the genus *Trillium*, have long needed protection by law. These are showy spring wildflowers in the Lily Family, often gathered for bouquets. Two of the five species known for Western New York and adjacent Ontario are relatively common in rich woods. The distribution of three uncommon or rare species is noted in Map 7. These species are:

*Trillium cernuum*, Nodding Wake Robin  
*T. sessile*, Sessile-flowered Wake Robin  
*T. undulatum*, Painted Trillium

These trilliums have a scattered and local distribution, being found in rich, moist woods and mainly confined to the Allegheny uplands. Only the towns of Pomfret and Kiantone in Chautauqua County apparently support more than one uncommon species and nowhere are all three known to grow together. The known distributions of these three species of trillium are given in Maps 57, 58 and 59.

**RARE SPECIES**

Map 8 notes the distribution of 27 rare protected species, selected as those with six or fewer known sites — many with only a single known collection. These species are:

*Azolla caroliniana*, Mosquito Fern  
*Botrychium lunaria*., Moonwort  
*B. simplex*, Little Grape Fern  
*Calypso bulbosa*, Calypso  
*Corallorrhiza odontorhiza*, Small Coral Root  
*Cryptogramma stelleri*, Slender Cliff Brake  
*Cypripedium candidum*, Small White Lady’s Slipper  
*Drosera intermedia*, Spatulate-leaved Sundew  
*Gentiana procera*, Small Fringed Gentian  
*G. puberula*, Downy Gentian  
*Goodyera tesselata*, Loddiges’s Rattlesnake Plantain  
*Ilex montana*, Large-leaved Holly  
*Isotria verticillata*, Five-leaves  
*Kalmia angustifolia*, Sheep-laurel  
*K. latifolia*, Mountain Laurel  
*Lilium superbum*, Turk’s-cap Lily
Floristics and Environmental Planning

Liparis liliifolia, Lily-leaved Twayblade
Listera australis, Southern Twayblade
Lycopodium tristachyum, Ground Pine
L. inundatum, Bog Club Moss
Malaxis unifolia, Green Adder’s Mouth
Pellaea atropurpurea, Purple Cliff Brake
P. glabella, Smooth Cliff Brake
Spiranthes gracilis, Slender Lady’s Tresses
Trillium cernuum, Nodding Wake Robin
T. sessile, Sessile-flowered Wake Robin
Triphora trianthophora, Three Birds

Several districts, the city of Niagara Falls in the Regional Municipality of Niagara, the Bergen-Byron Swamp in Genesee County, the towns of Brant and Concord in Erie County, the towns of Cold Spring and Red House in Cattaraugus County, and the town of Caneadea in Allegany County, are comparatively “rich” in rare species. However, the 27 species are extremely scattered and local in distribution, no minor political district having more than four species together. Judging from present data, many sanctuaries would be needed to preserve the majority of these species in the Niagara Frontier region. Perhaps special small sites could be officially designated as havens for each species, these areas maintained by local government, local societies, or informed individuals.

INDIVIDUAL SPECIES

All protected uncommon species except ferns, orchids, and club mosses are mapped on an individual basis. Each species has a somewhat different genetic tolerance for various habitats, a different history of competition and dispersal, and a different probability of being noticed and collected by botanists. Therefore, dot maps of geographic distribution are seldom identical; however, general trends may be discerned. The distribution of many species approximates special habitats—wetlands or limy sites—while other species have less restricted ranges.


Map 22. Asclepias tuberosa L., Butterfly-weed or Pleurisy-root. A showy, orange-flowered species of milkweed, restricted in this area to limy soils, occurring along roadsides and in open woods.
Map 23. *Campanula rotundifolia* L., Harebell or Scotch Bluebell. A showy, blue-flowered species found only on calcareous bluffs above streams or occasionally on sand or shale.

Map 24. *Celastrus scandens* L., Climbing Bittersweet. A vine with colorful red and orange fruit, often collected in autumn and dried for sale at roadside stands. Found in open, rocky woods, probably more common than published reports indicate. Soper *et al.* (1956) report this species from several sites along the Niagara River, the Niagara Escarpment, and occasional stations along the shore of Lake Erie in the Regional Municipality of Ontario without citation of minor political districts.


Map 27. *Cornus florida* L., Flowering Dogwood. Found in open woods and becoming scarce due to transplanting and residential development. Often found on calcareous substrate but not restricted to it.

Map 28. *Drosera intermedia* Hayne, Spatulate-leaved Sundew. A very rare species of insectivorous plant, found in this region only at Moss Lake Sanctuary, in Allegany County and Eager Bog, in Wyoming County. Restricted to bog habitats.

Map 29. *Drosera rotundifolia* L., Sundew. A species of insectivorous plant found only in sphagnum bogs, as is the case with the Pitcher Plant, *Sarracenia purpurea*.


Map 32. *Euonymus atrupurpureus* Jacq., Burning Bush or Wahoo. A shrub with colored fruit valued as ornament, found mainly in valleys and wetlands in the northern counties. This species is present in the Niagara Gorge and along the Niagara Escarpment in the Regional Municipality of Niagara according to Soper *et al.* (1956).
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Map 33. *Euonymus obovatus* Nutt., Running Strawberry Bush. A low shrubby plant with attractive foliage and fruit, found in rich woods throughout this area, apparently tolerant of calcareous soils.

Map 34. *Gentiana andrewsii* Griseb., Closed Gentian. A plant with showy blue flowers, found in wet areas.

Map 35. *Gentiana clausa* Raf., Bottle Gentian. Similar to the last, but less common.


Map 37. *Gentiana procera* Holm., Small Fringed Gentian. A species similar to the last, but not collected in this area since the end of the last century, when it was present on wet calcareous rock at Niagara Falls. Reintroduction might be appropriate for this species.

Map 38. *Gentiana puberula* Michx., Downy Gentian. Once found in limestone areas of the city of Buffalo, but not seen in western New York State and adjacent Ontario since the last century.

Map 39. *Gentiana quinquifolia* L., Stiff Gentian. Another rare gentian, found only in areas of limy or sandy soils in the northern counties, and on gravel or sand in the Allegany State Park.

Map 40. *Hydrastis canadensis* L., Golden Seal. An herb found in open woods, much collected for its value as a medicinal plant and probably for this reason now rarely encountered.

Map 41. *Ilex montana* (T. & G.) Gray (= *I. monticola* Gray), Large-leaved Holly. A rare species of deciduous holly found only in woods at higher elevations in the Allegheny Uplands.

Map 42. *Ilex verticillata* (L.) Gray, Deciduous Holly, Winterberry or Black Alder. A deciduous holly found in wetlands. This species is rather common in areas of the southern Regional Municipality of Niagara according to Soper et al. (1956).

Map 43. *Kalmia angustifolia* L., Sheep-laurel. A low, flowering shrub found only in boggy, acid soils. In this region, restricted to Wainfleet Bog and now threatened by peatcutting operations.

Map 44. *Kalmia latifolia* L., Mountain Laurel or Calico Bush. A tall shrub with pink flowers and attractive foliage often made into wreaths. Rarely found in the southern counties.

Map 46. *Lilium canadense* L., Canada Lily. A beautiful yellow-flowered lily found in wet woods and streamsides throughout this region.

Map 47. *Lilium philadelphicum* L., Wood Lily. Less frequent than the last, this lily is found mainly on limy or sandy soils in the northern counties. The flowers are orange, spotted and erect.


Map 49. *Lobelia cardinalis* L., Cardinal Flower. An herb with brilliant red flowers, found along streamsides and in rich woods throughout the area.

Map 50. *Mertensia virginica* (L.) Pers., Bluebells or Virginia Cowslip. A beautiful wildflower of valleys and streamsides, found mainly in Erie County. Occasionally transplanted to gardens.

Map 51. *Monarda didyma* L., Oswego Tea. A mint with bright red flowers in terminal heads, found in wet wooded areas and along streams.

Map 52. *Myrica pensylvanica* Loisel., Northern Bayberry or Wax Myrtle. A shrub with waxy fruit found in this region only in wetlands.

Map 53. *Panax quinquefolium* L., Ginseng. A plant with a thick, branching root much used in herbal medicine, found at scattered locations in rich woods.

Map 54. *Rhododendron maximum* L., Great Rhododendron. A large, evergreen shrub often transplanted to gardens for its attractive foliage and flowers. Found in this region only in wetlands.

Map 55. *Rhododendron nudiflorum* (L.) Torr. (including *R. roseum* (Loisel.) Rehder), Pinkster-flower or Mountain Azalea. A shrub, mainly of wet areas but occurring also in dry sites in Allegany State Park, valued for its foliage and flowers.

Map 56. *Sarracenia purpurea* L., Pitcher Plant. An insectivorous plant restricted to sphagnum bogs in this region. Often picked or transplanted into terraria for its unusual water-holding leaves and nodding flowers. This plant is quickly eliminated from bogs when nearby lands
are opened for residential and industrial development, as is the case in Holmes County, Ohio, studied by Wilson (1974). In his discussion of the Holmes County flora, Wilson states that bogs are “... unique ecosystems, containing many species populations that have been isolated from their ancestral gene pools for many generations [being] of great interest to the ecologist and evolutionary biologist. Local species extirpations, such as the elimination of the pitcher plant (Sarracenia purpurea) from Holmes County, are an indication that these living laboratories are becoming a lost resource. ...” As Seidman (1975) has further indicated, bogs are extremely fragile and only relative isolation through restricted admittance can guarantee their survival.

Map 57. Trillium cernuum L., Nodding Wake Robin. A very rare white-flowered trillium that is found in acid soils in the northern United States and in Canada, but has been found in this region only in wet woods in the town of Pendleton, Niagara County.

Map 58. Trillium sessile L., Toadshade or Sessile Trillium. A red-flowered trillium that is relatively rare in New York State, found in this area only in the town of Ellicott, Chautauqua County.

Map 59. Trillium undulatum Willd., Painted Trillium. More common than the last two species, this trillium with red and white flowers is found in non-calcareous soils of rich woods, mainly south of the latitude of Buffalo.

Map 60. Trollius laxus Salish., American Globe Flower. A plant in the Buttercup Family, with a large yellow flower. Rare throughout its range in the northeastern United States and occurring in this region sporadically in swampy areas mainly south of the latitude of Buffalo.

SIGNIFICANT HABITATS

Each entry here has, or at least has had in the past, a reputation for importance as a botanical refuge for native wildflowers, ferns, trees, and shrubs. These are attractive natural areas much visited by botanists, naturalists, educators, and hikers in search of unspoiled scenic beauty and the native flora. Many are often cited in collection reports by Zenkert (1984) and other authors of floristic studies. Those sites not yet developed for industry, residence or recreation should be considered for designation entirely or in part as sanctuaries,
preserves, or parks with limited access. Citations of important ecological and floristic studies and publications listing local scenic areas and nature haunts are noted where appropriate.

**Western New York and Adjacent Ontario** (General works: Clinton, 1864; Day, 1883, 1897; Fox & Soper, 1952-1954; Gordon, 1940; Zenkert, 1934; Zenkert & Zander, 1975)

**Regional Municipality of Niagara** (formerly Lincoln and Welland Counties) (General works: Soper, 1949; Yaki, 1970)

*Town of Grimsby*
Beamer Memorial Conservation Area (Yaki, 1970)

*Town of Lincoln*
Ball's Falls Conservation Area (Yaki, 1970)

*City of St. Catharines*
De Cew Falls on the Niagara Escarpment (Zenkert, 1934, p. 302)

*Town of Niagara on the Lake*
Paradise Grove, just south of Fort George (Yaki, 1970)

*City of Niagara Falls*
Dufferin Islands (Yaki, 1970)
Niagara Escarpment and Bruce Trail (see the magazine *Cuesta*)
Queen Victoria Niagara Falls Park, including Niagara Falls and Gorge (Alexander, 1923; Anon., 1921; Cameron, 1895, 1896; Day, 1883, p. 71, 1888; Hamilton, 1943; Panton, 1890; Yaki, 1970; Zenkert, 1934, p. 297-300)

Willoughby Marsh Conservation Center (Yaki, 1970)

*Town of Fort Erie*
Abino Woods Provincial Park (Yaki, 1970)
Black Creek area (Day, 1883, p. 72; Yaki, 1970)
Lake Erie shore (Day, 1883, p. 71)
Niagara River (Muenscher, 1929; Zenkert, 1934, p. 303-304)
Point Abino on Lake Erie (Day, 1883, p. 71; House, 1930; Yaki, 1970; Zenkert, 1934, p. 309-312)

*Town of Pelham*
Effingham Valley Provincial Park (Yaki, 1970)
Short Hills Wilderness Area (Yaki, 1970)
St. John's Conservation Area (Yaki, 1970)
Floristics and Environmental Planning

City of Port Colborne
Abino Hills
Wainfleet Bog, minor portion

Wainfleet Township
Chippawa Creek Conservation Area
H. D. Mitchell Nature Reserve (Hall, 1968)
Long Beach Conservation Area
Wainfleet Bog, major portion

NIAGARA COUNTY

Town of Wilson
Boat Creek area near Wilson (Anon., 1921)
Twelve-mile Creek area and Wilson-Tuscarora State Park

Town of Newfane
Hopkins Creek area
Krull Park near Olcott

Town of Lewiston
Artpark
Lower River State Park
Niagara River Gorge at Devil's Hole
Niagara Escarpment
Tuscarora Indian Reservation

Town of Lockport
Niagara County Park
Niagara Escarpment

Town of Royalton
Tonawanda Wildlife Management Area

Town of Niagara
DeVeaux College Woods
Niagara River Falls and Gorge (Day, 1888, p. 71, 1888; Zenkert, 1934, p. 297-300)
Goat Island (Day, 1893)

ORLEANS COUNTY

Towns of Barre and Shelby
Oak Orchard Swamp
Sphagnum bog at Barre Center (Alexander, 1923)
GENESEE COUNTY

Town of Alabama
Hidden Lake (= "Diver's Lake") (Alexander, 1922; Anon., 1921; Thorpe, 1953)
Oak Orchard Swamp (Alexander, 1924; Anon., 1921)
Onondaga Escarpment
Tonawanda Wildlife Management Area
Tonawanda Indian Reservation

Town of Oakfield
Oak Orchard Wildlife Management Area

Town of Elba
Elba Muck area

Towns of Bergen and Byron
Bergen-Byron Swamp (Gehris, 1971; Muenscher, 1946, 1951; Prochnow, 1931; Stewart & Merrell, 1937; Thorpe, 1953; Walker, 1974; Zenkert, 1934, p. 291-297)

Town of Stafford
Falls and Glen at Morganville (Alexander, 1923)

Town of LeRoy
Onondaga Escarpment near LeRoy

Town of Pembroke
Indian Falls area (Anon., 1921; Zenkert, 1934, p. 291)
Onondaga Escarpment

Town of Darien
Darien Lakes State Park
Griswold Creek Falls and Glen (Alexander, 1922; Anon., 1921)

ERIE COUNTY (General work: Zander, 1975c)

Town of Grand Island
Buckhorn Island State Park including Burnt Ship Creek
Buffalo Ornithological Society Bird Sanctuary

Town of Amherst
LaClair-Kindel Wildlife Sanctuary

Town of Clarence
Beeman Creek Park
Limestone outcroppings at Harris Hall (Anon., 1921; Thorpe, 1953; Zenkert, 1934, p. 288-291)
Floristics and Environmental Planning

“The Palisades” above Got Creek (Alexander, 1922)
Tillman Road Swamp (Futyma, 1975)

Town of Newstead
Akron Falls Park
Counterfeiter’s Ledge on the Onondaga Escarpment (Alexander, 1922; Zenkert, 1935)
Limestone outcroppings near Akron (Alexander, 1924)
Tonawanda Indian Reservation

City of Buffalo
Forest Lawn Cemetery
Lake Erie shore (Day, 1883, p. 71)
Limestone outcroppings at “Buffalo Plains,” now built over (Day, 1883, p. 72)
Onondaga Escarpment
Squaw Island, now a dump
Tifft Farm Nature Preserve (Andrle, 1973)

Town of West Seneca (General works: Houghton, 1928; Zander, 1975c)
Lake Erie shore (Day, 1883, p. 71)
Smokes Creek area (Alexander, 1922; Johnson, 1924; Thorpe, 1953; Zenkert, 1934, p. 278-280)
Valley of Cazenovia Creek (Zenkert, 1934, p. 275-278)

Town of Elma
Elma Meadows Park
Gorge and Falls of Buffalo Creek (Alexander, 1922; Anon., 1921)
Valley of Cazenovia Creek (Zenkert, 1934, p. 275-278)

Town of Hamburg
Eighteen-mile Creek area (Alexander, 1922)
“Idlewood” bluffs on Lake Erie at Eighteen-mile Creek (Zander, 1975c)
Lake Erie shore (Day, 1883, p. 71)
Portage Escarpment

Town of Orchard Park
Chestnut Ridge Park including Shale Creek Nature Center (Bigelow, 1965; Zander, 1975b)
Freeman’s Pond area near Orchard Park (Alexander, 1922)
Portage Escarpment
Town of Aurora
Cazenovia Creek area (Alexander, 1922) including Emery Park
East Aurora High School Preserve
Hubbard Woods (Johnson, 1924)
Pipe Creek area near West Falls (Alexander, 1922)
Portage Escarpment
Sinking Ponds (Johnson, 1924; Robertson, 1932)
Knapp Hill Sanctuary at West Falls, Knapp Hill Sanctuary Society

Town of Wales
East Branch of Cazenovia Creek at South Wales (Alexander, 1922)

Town of Evans
Ayer-Stevenson Sanctuary, Buffalo Audubon Society
Eighteen-mile Creek area (Anon., 1921; Johnson, 1924)
Lake Erie shore (Day, 1883, p. 71) including Evangola State Park
and Wendt Park
Muddy Creek area (Alexander, 1922)

Town of Boston
Boston Forest
Eighteen-mile Creek area
Irish Gulch near Patchin (Alexander, 1922; Anon., 1921)
Portage Escarpment

Town of North Collins
Franklin’s Gulf (Thorpe, 1953)
“The Glen” near North Branch of Clear Creek, about 2 miles east of
Lawtons (Alexander, 1922)
South Branch of Eighteen-mile Creek near New Oregon (Alexander, 1922)

Town of Holland
Holland (Protection) Bog (Miller, 1973; Seidman, 1975)
Mabel James Conservation Trail

Town of Brant
Cattaraugus Indian Reservation (Johnson, 1924; Zenkert, 1924, p. 280-283)
Lake Erie shore (Day, 1883, p. 71) including Evangola State Park

Town of Collins
“Breakers” Gorge east of Gowanda (Anon., 1921)
Clear Creek area (Alexander, 1922, 1924)
**Floristics and Environmental Planning**

Cattaraugus Indian Reservation (Alexander, 1922; Johnson, 1924; Zenkert, 1934, p. 280-283)
Toad Hollow (Alexander, 1922; Anon., 1921)
Zoar Valley (Alexander, 1922)

**Town of Concord**
Bog north of Morton's Corners (Zenkert, 1934, p. 286)
Cascade Park near Springville (Anon., 1921; Johnson, 1924)
Concord Bogs, including Dead Man's Lake (Alexander, 1922, 1928; Blackmer, 1937; Seidman, 1975; Zenkert, 1934, p. 285-286)
Spooner Gulf near Springville (Alexander, 1922)
Sprague Brook Park
Tamarack swamp near East Concord Railway Station (Alexander, 1924)
Vail Road bog (Seidman, 1975)
Wyandale Creek area (Alexander, 1922)
Zoar Valley (Alexander, 1922)

**Town of Sardinia**
Bog south of Protection
Cattaraugus Creek area
Clifford Furman Preserve (Hall, 1968)
Sprague Brook Park

**WYOMING COUNTY**

**Town of Sheldon**
Hilltop Sanctuary of Buffalo Museum of Science
Johnson Falls (Alexander, 1922; Anon., 1921)
Varysburg and Strykersville areas

**Town of Orangeville**
Stony Brook Glen (Rosche, 1967)

**Town of Java**
Beaver Meadow Sanctuary (Almendinger, 1954; Hall, 1968)
Java Lake area (Rosche, 1967)
Rose Acres, Buffalo Audubon Society

**Town of Eagle**
Eagle Bog (Rosche, 1967)
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Town of Wethersfield
Bog south of Peedee Road

Town of Castile
Wolf Creek area (Zenkert, 1934, p. 307)

Town of Genesee Falls
Letchworth State Park (Alexander, 1923; Johnson, 1924; Miller & Ehrle, 1969; Zenkert, 1932)

CHAUTAUQUA COUNTY (General work: Burgess, 1877)

Town of Dunkirk
Canadaway Sanctuary of the Nature Conservancy

Town of Hanover
Cattaraugus Indian Reservation
Gorges of Silver and Walnut Creeks (Alexander, 1923)

Town of Arkwright
Canadaway Wildlife Management Area (Alexander, 1923)

Town of Pomfret
Bear Lake area (Burgess, 1877)
Canadaway Creek gorge at Shumla (Alexander, 1923)
Cassadaga Lake area (Burgess, 1877)
Fredonia area (Burgess, 1877)

Town of Westfield
Chautauqua Gorge (Alexander, 1923)

Town of Villenova
East and West Mud Lake Bogs (Zenkert, 1934, p. 287-288)
Rushing Stream Sanctuary of Buffalo Audubon Society

Town of Stockton
Bear Lake area (Burgess, 1877)
Cassadaga Lake area (Burgess, 1877)

Town of Charlotte
Boutwell State Forest

Town of Ellicott
Bentley Sanctuary of Jamestown Audubon Society

Town of Harmony
Panama Rocks (Burgess, 1877)
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Town of Kiantone
Gilbert Burgesson Sanctuary of Jamestown Audubon Society
(Grisez, 1973)

CATTARAUGUS COUNTY (General work: McVaugh, 1938)

Town of Persia
Deer Lick Sanctuary of Nature Conservancy (Hall, 1968)
Zoar Valley

Town of Ashford
Areas of Zoar Valley (Alexander, 1922)
Buttermilk Creek gorge (Alexander, 1922)
Connoisarauley Falls (Alexander, 1923)

Town of Machias
Lime Lake area and Machias Swamp (Alexander, 1922, 1928; Zenkert, 1934, p. 287)

Town of Napoli
Allenberg Bog and Waterman Swamp (Hall, 1968; Miller, 1978; Schick & Eaton, 1968; Zenkert, 1934, p. 287)

Town of Little Valley
Rock City area (Alexander, 1928; Day, 1888, p. 71; House & Alexander, 1927, p. 208-210)

Towns of Cold Spring, Red House and Carrollton
Areas of Allegany Indian Reservation (Smith, 1961)
Areas of Allegany State Park and surrounding river valleys (Gordon et al., 1937; p. 375-378; House & Alexander, 1927, p. 162-208; House & Gordon, 1940)
Keith's Bog and Red Pond area near Steamburg (House & Alexander, 1927, p. 159-160)

Town of Olean
Olean Rock City (Alexander, 1922)

ALLEGANY COUNTY

Town of Caneadea
Moss Lake Sanctuary of the Nature Conservancy (Cook, 1973; Hall, 1968; James, 1960)

Town of New Hudson
Hanging Bog State Game Management Area
SUMMARY

Mapping of known distribution of legally protected plants can be used to indicate areas of unusual botanical interest. Unique areas supporting many species with special habitat requirements can be identified. Species restricted to wetland situations, mainly in the southern Niagara Frontier region, are partially protected by several sanctuaries, though certain sites, long known as nature haunts, rich in such species are threatened. Species largely restricted to calcareous outcroppings and bluffs, mainly in the northern counties, are somewhat protected in parks along the Niagara River, but are threatened in many unique areas regarded by naturalists and botanists as unusually diverse in rare and attractive species. Areas identified as botanically rich through analysis of the geographic distribution of protected plants correlate well with published accounts of well known natural and scenic areas in the Niagara Frontier Region. All such significant habitats held in high regard by botanists, naturalists, educators, and outdoors people, as noted in their publications, should be considered for protection as parks or sanctuaries with emphasis on limited access, not recreation.

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(Note: “Hobbies” and “Science on the March” are published at the Buffalo Museum of Science, Buffalo, New York.)

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Total, 20 or more spp.

Wetland spp.

5 or more wetland spp.

Calciphilic spp.

5 or more calciphilic spp.

5 or more orchid spp.
Chimaphila maculata

Arisaema dracontium

Asclepias tuberosa

Campanula rotundifolia

Celastrus scandens

Chimaphila umbellata
39. *Gentiana quinquifolia*

40. *Hydrastis canadensis*

41. *Ilex montana*

42. *Ilex verticillata*

43. *Kalmia angustifolia*

44. *Kalmia latifolia*
45
Kalina polifolia

46
Lilium canadense

47
Lilium philadelphicum

48
Lilium superbm

49
Lobelia cardinalis

50
Mertensia virginica