

Vol 4

SPECIAL VEGETATION of the INDIANA DUNES NATIONAL LAKESHORE

D-92



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Research Program Report 90-02
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INDIANA DUNES NATIONAL LAKESHORE RESEARCH PROGRAM

Indiana Dunes National Lakeshore was established by the United States Congress in 1966 (PL 89-761). It was created to preserve the unique natural resources and rich cultural heritage of the Calumet Region of northern Indiana along Lake Michigan, and to provide recreational opportunities for the public. Located between Gary and Michigan City, Indiana (with outlier properties at Hoosier Prairie, Heron Rookery, and Pinhook Bog), the Lakeshore's natural resources are continually influenced by existing industrial, municipal, and residential activities in this growing urban area.

The Indiana Dunes National Lakeshore Research Program was initiated to pursue a greater understanding and provide information concerning the resources within Indiana Dunes National Lakeshore, other National Park Service areas, and the processes and conditions which influence those resources. The Research Division conducts and oversees interdisciplinary investigations dealing with the response of park resources to external and internal threats. Selected final reports resulting from these investigations are being reproduced in this program series, of which this document is a part.

**Dale B. Engquist
Superintendent**

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SPECIAL VEGETATION
of the
INDIANA DUNES NATIONAL LAKESHORE

JANUARY 1990

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INTRODUCTION

In 1979, the Indiana Dunes National Lakeshore acted on a need to determine the existence and the floristic status of the unique, exemplary, relict, threatened, or endangered native vascular plant species found within the contemporary boundaries of the Lakeshore. In addition, it was considered important to augment this determination by reviewing previous botanical surveys, and other literature which contained information pertinent to the flora of the Indiana Dunes National Lakeshore. It was also considered necessary to determine the extent to which the contemporary flora and plant communities differ from those of presettlement times, because an analysis and understanding of the relationships between the presettlement and contemporary synecological scenarios are necessary if one is to attempt responsible management of native plant communities.

Their report (Wilhelm, 1980) developed a philosophy around which certain vascular plants (the SPECIAL VEGETATION) could be viewed locally as profoundly significant from various floristic standpoints. These plants were identified and given special attention with regard to their distribution and floristic status within the Lakeshore.

An attempt was made also to identify many of the areas (Natural Areas) within the Indiana Dunes National Lakeshore which still preserve a substantial degree of presettlement integrity, and are therefore the areas most likely to provide habitats for species and locally recognized varieties regarded as floristically significant.

Since then, the National Park Service has acquired an additional 1000 acres or so, much floristic work has been done, and significant attempts at management have begun. In 1980, 238 SPECIAL VEGETATION floristic elements were known from the Indiana Dunes National Lakeshore. At this writing, we know of 297, a mind-boggling increase of twenty-five percent. In 1980, 994 native species had been recorded reliably from within the Lakeshore boundaries; currently we know of an additional 137.

This work is an updated and expanded version of "Report on the Special Vegetation of the Indiana Dunes National Lakeshore" (Wilhelm, 1980). It defines SPECIAL VEGETATION and details the methodology employed in its survey and assessment. The results include a natural area inventory and discussion of major plant communities in the Indiana Dunes National Lakeshore. The National Park is divided into twelve Survey Units. In each Unit, there is an annotated list of SPECIAL VEGETATION floristic elements, a natural area assessment, and a comprehensive flora. The last chapter is a catalogue of the flora of the entire park. The nomenclature follows that employed by Swink & Wilhelm (1979), so, except for the SPECIAL VEGETATION floristic elements in the annotated lists, the inclusion of nomenclatorial authors is omitted.

Postsettlement ecological conditions have altered the presettlement scenario through time; the ways in which these alterations have impacted Lakeshore plant communities are discussed. Since the relationships between our New World and Old World floras are inextricably tied to the nature of contemporary plant communities, these relationships are also discussed along with methods of maintaining, rehabilitating, and encouraging the development of healthy native plant communities.

SPECIAL VEGETATION DEFINED

SPECIAL VEGETATION, as applied here to vascular plants, encompasses certain specific floristic concepts considered locally important by the Indiana Dunes National Lakeshore; these recognize aspects of floristic elements which can be described as "unique," "exemplary," "relict," "threatened," or "endangered." Such concepts attempt to formulate a recognition that certain vascular plants can be viewed as singularly apart from most others by their apparent rareness or perhaps by an observed fidelity to a particular niche or set of related niches. While most plants occupy niches in an autecological sense, one view can hold that a plant can be regarded as floristically significant if its niche is one of fidelity to a stable native community, the ecological parameters of which are characteristically narrow. Where this particular native community is scarce or rare, the floristic elements (plants) faithful to such communities are concomitantly rare.

Thus, for the purpose of this report, a native plant considered very rare, or one limited here to a notably singular niche is included among the list of plants comprising the SPECIAL VEGETATION. Also included, are any of those Lakeshore plants considered to be boreal relicts or to have phytogeographic affinities to the Atlantic coastal plain by Deam (1940), Friesner (1936), Hooper (1934), McLaughlin (1932), Parker (1936), Peattie (1922), Swink & Wilhelm (1979), Trefz (1935), or Welch (1935).

Importantly, however, one must define the geographic universe within which the concept of rareness and habitat fidelity can be applied meaningfully to a given plant. It is obvious, for example, that a plant that is considered rare in Porter County, Indiana might be regarded as a common resident of nearby Berrien County, Michigan--or *vice versa*. A plant which is now common in the southern two-thirds of Indiana may well be very rare within the boundaries of the Lakeshore; and, by the same token, a plant may well be abundant at a given locality within the Lakeshore, and yet occur nowhere else in the state of Indiana. In addition, a plant which is faithful to interdunal pond margins within the Lakeshore may inhabit a number of other niches--occasionally even with wavering fidelity--elsewhere within its geographic range.

Even human factors play roles in the assessment of rareness and habitat fidelity as applied to plant taxa. "Hard-to-identify" (often also regarded as inconspicuous or unimportant) groups of plants occasionally become nonentities in the minds of those who are untrained to handle them taxonomically. Distributional and autecological knowledge on the specific members of these groups of plants often rely on chance discoveries or on incidental collections. As a result, they may be regarded as rare within a given region when in actuality they may be distributed generously throughout. Turning it around, such plants which are actually rare or even extirpated, having been collected in early times from several locations, may be held contemporaneously to be yet occasional, or at least not rare--even though those original collecting sites may long have been obliterated.

Some showy groups of plants, on the other hand, may enjoy quite different floristic considerations. A relatively inordinate amount of enthusiasm often accrues to members of these groups largely because "everybody" recognizes them, has seen or heard of them, and traditionally regards them as "rare and beautiful," when actually--their comeliness and charms notwithstanding--they may be several times less rare than certain members of the less attractive or taxonomically difficult groups of plants. While I have tried over the years to view all the local vascular plants within a context of floristic uniformity, I must confess that

my own current knowledge of the flora has not been disassociated wholly from the human tendencies outlined above.

All of these examples of geographic and artifactual aspects of plant rareness or importance can be demonstrated in actual fact for dozens of plants now growing within the Lakeshore boundaries. So, what plants should be considered among the floristic elements of the SPECIAL VEGETATION with regard to the Indiana Dunes National Lakeshore?

It is my view that the land included within the Indiana Dunes National Lakeshore must be held in context with its geographic position within the State of Indiana, as well as within the greater metropolitan region of Chicago. It is these two principal geographic units from which the Indiana Dunes National Lakeshore, as a discrete entity and National Park, draws its relative importance. Concepts of plant rarity and niche fidelity within the National Lakeshore, it seems to me, derive a certain significance within a similar context.

SPECIAL VEGETATION FLORISTIC ELEMENTS

The plants which I have chosen to comprise the SPECIAL VEGETATION of the Lakeshore are extracted from two principal sources: the plants listed by Swink & Wilhelm (1979) as rare in the Chicago Region (*i.e.*, those plants having rating coefficients of 15 or 20); and the endangered and threatened plants listed by Aldrich, Bacone & Homoya (1986) for Indiana. Plants originally included by Wilhelm (1980) are also retained with the SPECIAL VEGETATION, even though some among them no longer are carried on Indiana's state list. Remarkably, the following native species were unknown from the region in 1980: *Carex subimpressa*, *Eleocharis wolfii*, *Fraxinus americana* var. *biltmoreana*, *Juncus articulatus*, *J. diffusissimus*, *Lactuca hirsuta*, *Scirpus hallii*, and *Utricularia geminiscapa*.

The geographic universe from which concepts of rareness and habitat fidelity are here derived, therefore, combines the State of Indiana with the 22-county Chicago Region. The Chicago Region, as delineated by Swink & Wilhelm (1979), includes one county in southwestern Michigan, seven counties in northwestern Indiana, eleven counties in northeastern Illinois, and three counties in southeastern Wisconsin. The Indiana Dunes National Lakeshore is a subset of both geographic units.

For convenience of data presentation, I have divided the Indiana Dunes National Lakeshore, somewhat arbitrarily, into twelve geographic Survey Units. Figure I is a map of the Lakeshore showing the location of each Survey Unit. Figure II is a tabulation of the Lakeshore Survey Units from which each of the SPECIAL VEGETATION floristic elements is known. More detailed information about the contemporary and phytogeographic floristic status of these species is provided in the section entitled SPECIAL VEGETATION which deals with the individual Lakeshore Survey Units.

After having circumscribed a working concept of SPECIAL VEGETATION, I think it is important to acknowledge that there are certain philosophical liabilities inherent in any attempt to designate as "special" a small subset of plants from a given flora. Clearly, any number of rationales can be developed within a context of SPECIAL VEGETATION—even when such guideline concepts as "relict," "exemplary," "unique," "threatened," and "endangered" are imposed. Interpretations of such words can be numerous; and all interpretations are manifestly subjective.

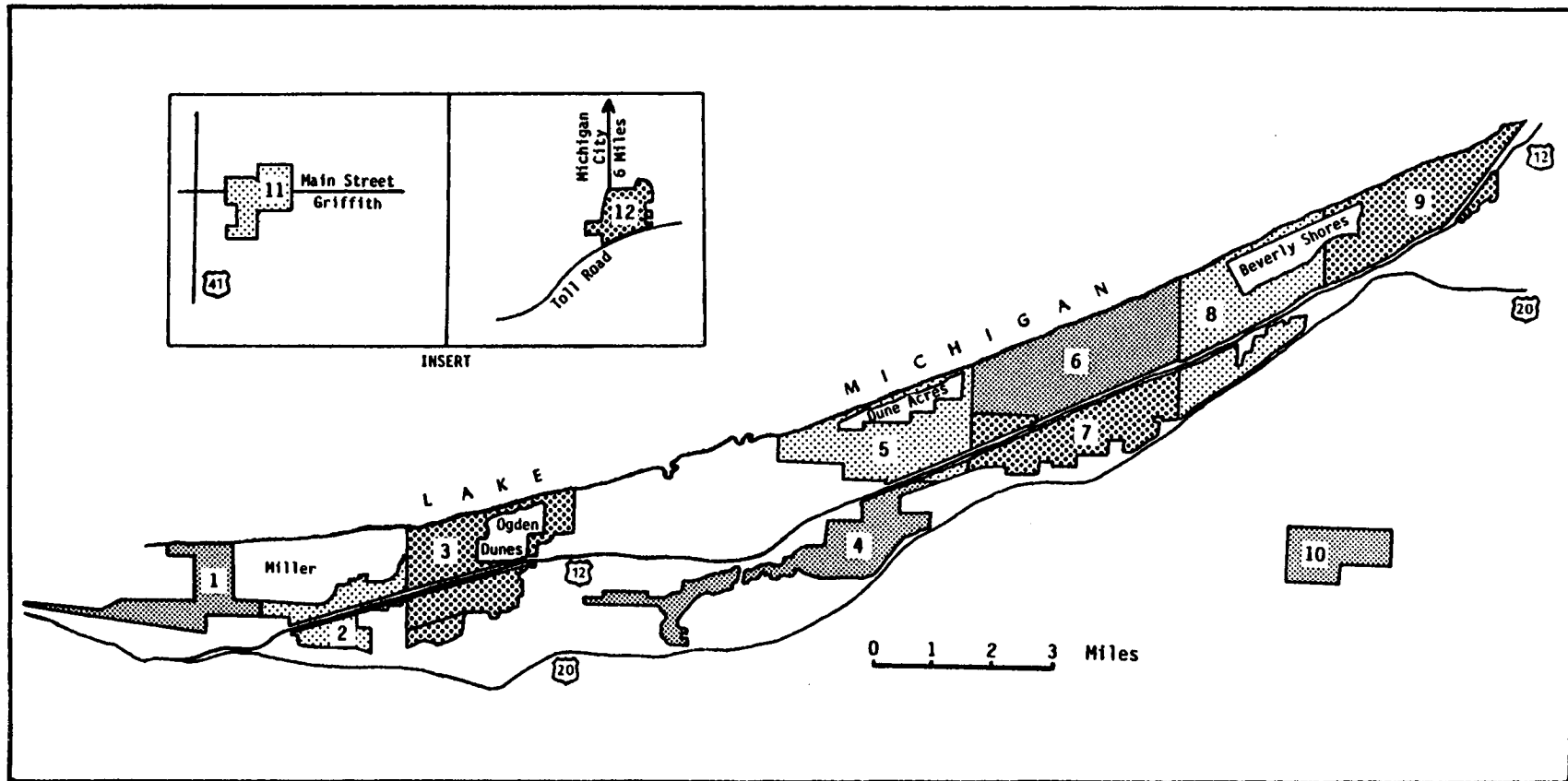


FIGURE I: Special Vegetation Survey Units of the Indiana Dunes National Lakeshore:

- | | |
|----------------------------|--------------------|
| 1 Miller | 7 Visitor Center |
| 2 Tolleston | 8 Keiser |
| 3 West Beach | 9 Tamarack |
| 4 Bailly | 10 Heron Rookery |
| 5 Dune Acres | 11 Hoosier Prairie |
| 6 Indiana Dunes State Park | 12 Pinhook Bog |

The rationale I have chosen recognizes that one of our principal goals is to preserve and maintain those natural amenities which remain within the Lakeshore boundaries; and by this I do not mean, necessarily, that large amounts of attention should accrue to the individual floristic elements comprising the aforesaid SPECIAL VEGETATION. In this regard, the concept of a SPECIAL VEGETATION can encourage a miscarriage of conservation if it is interpreted to imply that concerted emphasis should be placed on the management of a few, select, individual plant populations. Such emphasis can obliterate inadvertently these populations, and all that their presence represents.

If, on the other hand, the concept of SPECIAL VEGETATION is viewed in holistic terms, with management considerations given to maintaining and enhancing the synecological integrity of Lakeshore land in a fundamental way, populations of the individual SPECIAL VEGETATION floristic elements will thrive in an essential context, the long-term integrity of which will be more certain than if well-intentioned, but poorly conceived, attempts were made solely on the behalf of individual species. In a very real sense, it is not important whether or not a particular native plant is considered among those comprising a SPECIAL VEGETATION; what is important is that the philosophy around which the concept of SPECIAL VEGETATION, as predicated, is understood insofar as it relates overall to responsible natural land management.

FIGURE II. Special Vegetation floristic elements, their special status, geographic affinity, and known distribution among the 12 Lakeshore Survey Units.¹ The [x] symbols indicate that a recent record exists; the [0] symbols indicate records based upon older literature or herbarium records; *threat* = threatened, *endang* = endangered, *rare* = rare, *watch* = watch, *spe co* = special concern; *cp* = coastal plain, *bo* = boreal.

Survey Units												Special Status	Geo Aff	Special Vegetation Floristic Elements
1	2	3	4	5	6	7	8	9	10	11	12			
				x							x	threat		Actaea rubra
												15		Adiantum pedatum
		x		x	x	x	x					watch		Alnus rugosa americana
												threat		Amelanchier humilis
x		x		x	x			x	x			15	cp	Ammophila breviligulata
											x	threat	bo	Andromeda glaucophylla
												20		Aplectrum hyemale
				0							x	threat		Arabis glabra
		x	x	0								endang		Aralia hispida
				x		x			x	x		15		Aralia racemosa
x		x		x	x	x	x	x	X			rare	bo	Arctostaphylos uva-ursi coactilis
0		0			0				0			threat		Arenaria stricta
x	x	x								x		threat		Aristida intermedia
		x	x			0	x	x				threat	cp	Aristida tuberculosa
				x							x	15		Aristolochia serpentaria
x		x			0							15		Asclepias viridiflora
				x	x	x	x	x	0	x		15		Asimina triloba

¹In a few cases, where Aldrich *et al.* (1986) list a plant as extirpated, this "special status" designation is carried forward for the record even though the plant may since have been discovered to be extant.

Survey Units												Special	Geo	Special Vegetation
1	2	3	4	5	6	7	8	9	10	11	12	Status	Aff	Floristic Elements
				0	0							endang		Aster furcatus
x	x	x		x	0		0	0				rare		Aster junciformis
x		x								x		threat		Aster ptarmicoides
		x		0								rare		Aster sericeus
				x								15		Athyrium thelypteroides
									0			rare		Baptisia tinctoria crebra
				x	x	x	x	x		x		15	cp	Bartonia virginica
				x								15	bo	Betula lutea
				x	0		x					rare	bo	Betula papyrifera
?				?	?					?		extirp	bo	Betula populifolia
				x								15	bo	Betula pumila
					x	x	x			x		20	cp	Bidens discoidea
			x	x	x	x	x	0	x	x		15		Botrychium dissectum
				x								endang		Botrychium matricariaefolium
				x	0		x					extirp		Botrychium multifidum intermedium
				x	x	x	x		x			15		Brachyelytrum erectum
		x		x				0		x		15		Brasenia schreberi
				x	0							15		Bromus kalmii
				x								endang		Buchnera americana
										x		15		Cacalia tuberosa
x		x		x	x			x				threat	cp	Cakile edentula
								0		x		endang	bo	Calla palustris
										x		15		Callitriche heterophylla
				0				0	x	x		15		Calopogon pulchellus
		x		x	x		x	x				15	bo	Campanula rotundifolia
x		x		x	x		x	x				rare	cp	Carex alata
				x						x		endang		Carex atherodes
x		x										threat		Carex aurea
										x		threat		Carex bebbii
				x	x	x	x	0	x			15		Carex bromoides
						x				x		15		Carex canescens
										x		15		Carex careyana
										x		endang		Carex chordorrhiza
				x						x		endang		Carex conoidea
				x	x	x	x	x				threat		Carex debilis rudgei
				x	x					x		20		Carex digitalis
		x										threat	bo	Carex eburnea
				0		x						endang		Carex flava fertilis
x				x						x		20		Carex foenea
				x	0	x	x	x				endang		Carex folliculata
x		x		x								threat		Carex garberi
										x		15		Carex hitchcockiana
				0								endang		Carex howei
				x	x	x	x	x	x		x	15		Carex intumescens
									x	x		15		Carex laevivaginata
				x	x	x						15		Carex laxiculmis
				x		x	x		x	x		endang		Carex leptonervia
				x						x		endang		Carex limosa
	x	x								x		15		Carex oligosperma
				x					x			threat		Carex pedunculata

Survey Units												Special	Geo	Special Vegetation
1	2	3	4	5	6	7	8	9	10	11	12	Status	Aff	Floristic Elements
									x			20		Carex prasina
				x	x	x	x				x	threat	cp	Carex seorsa
				x								15		Carex subimpressa
x	x	x		x	x	x	x	x				15		Carex tonsa
				0							x	15		Carex trisperma
											x	15		Carya glabra
									x			15		Carya laciniosa
										x		15		Carya ovalis
x				x						x		15		Castilleja coccinea
		x		x	0							15		Celtis tenuifolia
				x				0	0		x	15	bo	Chamaedaphne calyculata angustifolia
		0		x	x	x						20		Chimaphila maculata
		0		0	x							threat		Chimaphila umbellata cisatlantica
				x	x	x	x	0				endang		Chrysosplenium americanum
								0				extirp	bo	Circaea alpina
x	x			x	x			x	0			threat	cp	Cirsium pitcheri
x	x	x		x	x							15	cp	Cladium mariscoides
							x			x		rare	bo	Comptonia peregrina
					x	x	x				x	15		Conopholis americana
				x				0				15	bo	Coptis groenlandica
				x	x	x	x					15		Corallorhiza maculata
				x	x	x	x	x		x		20		Corallorhiza odontorhiza
		0		x								endang		Cornus canadensis
x		x		x	x							threat	bo	Cornus rugosa
										x		endang		Corydalis sempervirens
		x		x						x		15		Cyperus engelmannii
0				x	0			0		x		20		Cypripedium acaule
				0	x							rare		Cypripedium calceolus parviflorum
				x	x					x		20		Cypripedium calceolus pubescens
				x	0					x		rare		Cypripedium candidum
				x								20	bo	Cypripedium reginae
				0		x				x		15		Desmodium ciliare
										x		15		Desmodium rotundifolium
x	x	x		x	x	x	x	x		x		rare	bo	Diervilla lonicera
0		0		x			x			x	x	rare	cp	Drosera intermedia
				x	x			0		x		15	cp	Drosera rotundifolia
					x	x	x		x		x	15		Dryopteris hexagonoptera
				x	x	x	x	x	x			15		Dryopteris noveboracensis
x		x		?				0				endang	cp	Eleocharis geniculata
				x								endang	cp	Eleocharis melanocarpa
		x										endang		Eleocharis microcarpa filiculmis
x		x										rare		Eleocharis pauciflora fernaldii
				x								15		Eleocharis rostellata
										x		endang		Eleocharis wolfii
				x	x	x		x				rare	bo	Epigaea repens glabrifolia
										x		15		Epilobium strictum
x												endang		Equisetum variegatum
				0								endang	cp	Eriocaulon septangulare
				0						x		threat		Eriophorum angustifolium
										0		extirp		Eriophorum spissum

Survey Units												Special	Geo	Special Vegetation
1	2	3	4	5	6	7	8	9	10	11	12	Status	Aff	Floristic Elements
											x	20		Eriophorum virginicum
				x	x	x	x	x				20		Eupatorium fistulosum
				0	0							20		Eupatorium sessilifolium brittonianum
x	x	x		x	x		x	x				threat	cp	Euphorbia polygonifolia
				x								endang	cp	Fimbristylis drummondii
							x		x			15		Fraxinus americana biltmoreana
				0								endang	cp	Fuirena pumila
					0							20		Galium brevipes
				x								15		Galium labradoricum
			x		x	x				x		15		Galium lanceolatum
				x								15		Galium trifidum
				0	0							endang		Gentiana flavida
		x								x		threat		Gentiana puberula
	x	x		x		x	x	x		x		15		Gentiana saponaria
				x						x		endang		Geranium bicknellii
										0		extirp		Gerardia auriculata
x								0				endang	bo	Glyceria borealis
					0	x						20		Glyceria pallida
					x	x	0					20		Goodyera pubescens
0				0	0					x		endang		Habenaria ciliaris
0				x	x	x	x	0		x		rare	bo	Habenaria clavellata
0					x		x			x		rare		Habenaria flava herbiola
					0							endang		Habenaria hookeri
x				0								threat	bo	Habenaria hyperborea huronensis
								x		x		watch		Habenaria lacera
x					x		x	0				rare		Habenaria psycodes
					0							threat		Habenaria viridis bracteata
	x	x		x								threat	cp	Hudsonia tomentosa
		0										endang	cp	Hydrocotyle umbellata
x		x		x	x	x		x				rare		Hypericum kalmianum
										x		threat		Isotria verticillata
				x								20		Juncus articulatus
x		x		x	x					x		watch	cp	Juncus balticus littoralis
x												20		Juncus diffusissimus
0		x		x								threat	cp	Juncus pelocarpus
x	x	x		x	0							endang	cp	Juncus scirpoides
		x		x	x		x	x				rare	bo	Juniperus communis depressa
									x			20		Lactuca hirsuta
x					x		x					endang	cp	Lathyrus japonicus glaber
x					0							threat		Lathyrus ochroleucus
			x							x		rare		Lathyrus venosus
										0		extirp		Lechea stricta
x				x						x		15		Lilium philadelphicum andinum
		0		0								extirp	bo	Linnaea borealis americana
		x		x								rare	cp	Linum striatum
				x		x						15		Linum virginianum
x		x		x	x		x			x	x	watch		Liparis loeselii
x	x	x	x	x	x	x	x	x			x	15		Lonicera dioica
x				x								endang	cp	Ludwigia sphaerocarpa deamii
				x		x				x		threat		Lycopodium clavatum

Survey Units												Special	Geo	Special Vegetation
1	2	3	4	5	6	7	8	9	10	11	12	Status	Aff	Floristic Elements
				x	0				x	x		endang	cp	<i>Lycopodium inundatum</i>
		x		x	x	x	x		x	x		15		<i>Lycopodium lucidulum</i>
				0								threat		<i>Lycopodium obscurum</i>
				x		x						endang		<i>Lycopodium tristachyum</i>
		0			x	x	x		x	x		15	bo	<i>Maianthemum canadense</i>
									x	x		endang		<i>Malaxis unifolia</i>
x				x	x			x				threat		<i>Melampyrum lineare latifolium</i>
		0						0		x		15		<i>Menyanthes trifoliata minor</i>
					x		x		x			threat		<i>Milium effusum</i>
					x				x			20		<i>Mimulus alatus</i>
				x	x	x	x		x	x		15		<i>Mitchella repens</i>
				x	x	x	x			x		15		<i>Monotropa hypopithys</i>
x				x	x		x	x				15		<i>Monotropa uniflora</i>
				0								15		<i>Morus rubra</i>
				x	x							endang	bo	<i>Myosotis laxa</i>
x												threat		<i>Myriophyllum verticillatum pectinatum</i>
				x			x			x		rare	bo	<i>Nemopanthus mucronata</i>
				x								15		<i>Oenothera tetragona longistipata</i>
				0					x			15		<i>Ophioglossum vulgatum pseudopodium</i>
				x								endang		<i>Orobanche fasciculata</i>
x				x	x							15		<i>Orobanche uniflora</i>
				0				x				endang		<i>Oryzopsis asperifolia</i>
				0								extirp		<i>Oryzopsis pungens</i>
	x											15		<i>Oryzopsis racemosa</i>
										x		15		<i>Oxalis violacea</i>
		x			x					x		15		<i>Panax quinquefolius</i>
		x	x	x	x	x	x	x	x			rare	bo	<i>Panax trifolius</i>
		x			x					x		rare		<i>Panicum boreale</i>
				x	0	x				x		20		<i>Panicum dichotomum</i>
									x			15		<i>Panicum linearifolium</i>
				x								extirp	cp	<i>Panicum lucidum</i>
				0								15	cp	<i>Panicum oligosanthos</i>
x				0								15		<i>Panicum perlongum</i>
				x								endang		<i>Panicum verrucosum</i>
				0	x							15	cp	<i>Peltandra virginica</i>
x	x	x		x	x	x						rare	bo	<i>Pinus banksiana</i>
		x		x	x	?	x	x		x		20	bo	<i>Pinus strobus</i>
				x	x				x			threat		<i>Poa alsodes</i>
				x	x	x						15		<i>Poa languida</i>
				x	x							threat	bo	<i>Poa paludigena</i>
x									x	x		rare		<i>Pogonia ophioglossoides</i>
					x							endang	bo	<i>Polygala paucifolia</i>
x	x	x		x	0			x				threat	cp	<i>Polygonella articulata</i>
		x		x	x	x	x	x		x		15		<i>Polygonum arifolium pubescens</i>
					x		x			x		endang		<i>Polygonum careyi</i>
		x		x								threat	cp	<i>Polygonum opelousanum adenocalyx</i>
				0	x			0				15		<i>Polypodium virginianum</i>
										x		endang		<i>Polytaenia nuttallii</i>
					0							endang		<i>Populus balsamifera</i>
0							x					20		<i>Populus X jackii</i>

Survey Units												Special	Geo	Special Vegetation
1	2	3	4	5	6	7	8	9	10	11	12	Status	Aff	Floristic Elements
		x		0								watch		Potamogeton diversifolius
x												endang	cp	Potamogeton pulcher
		x				x			x			endang		Potentilla anserina
x												15	bo	Potentilla fruticosa
x	x		x	0				0		x		15		Potentilla palustris
										x		rare		Prenanthes aspera
		x		x	x	x	x	x			x	rare		Prunus pensylvanica
		x		x				0				threat	cp	Psilocarya scirpoides
				x	x	x		x				rare	bo	Pyrola elliptica
		x		x	x	x						rare	bo	Pyrola rotundifolia americana
		0		0								extirp		Pyrola secunda
				x								15	bo	Rhamnus alnifolia
		x		x		x	x	x		x		15	cp	Rhexia virginica
x	x		x	x	x			x				threat		Rhus aromatica arenaria
				x	x	x	x	x		x	x	15		Rhus vernix
											x	15	cp	Rhynchospora alba
				x				0		x		endang	cp	Rhynchospora globularis recognita
0	x		x					0				rare	cp	Rhynchospora macrostachya
			x			x						rare		Ribes hirtellum
			x	x	x	x		0			x	15		Rubus pubescens
x	x		x			x						15		Sabatia angularis
		0	x									15		Sagittaria rigida
			x									15	bo	Salix candida
				0				x				15		Salix lucida
x			0					0		x		15		Salix pedicellaris hypoglaucia
		x		x	0	x		x		x		threat		Salix sericea
x	x			x								threat	bo	Salix syrticola
										x		15		Sanicula trifoliata
				x						x		15		Sarracenia purpurea
x										x		endang		Satureja arkansana
								0		0		endang		Scheuchzeria palustris americana
	x	x										20		Scirpus hallii
				0								20		Scirpus polyphyllus
		x		x			x	0				rare	cp	Scirpus purshianus
									x			endang		Scleria pauciflora caroliniana
		x		x								endang	cp	Scleria reticularis
x	x											15		Scleria verticillata
	x	x			x							threat		Selaginella rupestris
				0	x		x			x		15		Senecio plattensis
				x	0		x			x		endang		Sisyrinchium angustifolium
		x		x	0							15	cp	Sisyrinchium atlanticum
x	x		x	x	x	x	x	x			x	15		Smilax rotundifolia
x	x		x	x			x	x				threat		Solidago racemosa gillmani
x			x	x			x			x		15		Sparganium americanum
				x								15		Spiranthes lacera
				x								threat	bo	Spiranthes lucida
		x		x		x						15	cp	Stachys hyssopifolia
					x			x				endang		Stipa avenacea
										x		threat		Strophostyles leiosperma
				0								15		Stylophorum diphyllum

Survey Units												Special	Geo	Special Vegetation
1	2	3	4	5	6	7	8	9	10	11	12	Status	Aff	Floristic Elements
0	x	0										15		Talinum rugospermum
				x				0				endang	bo	Thuja occidentalis
						x						15		Tradescantia subaspera
	x	x										rare		Trichostema dichotomum
				x	x	x	x					15	bo	Trientalis borealis
							x					extirp		Trillium cernuum macranthum
				0								20		Triphora trianthophora
x		x										threat	cp	Utricularia cornuta
										x		20	cp	Utricularia geminiscapa
x		x		x				0		x		15	cp	Utricularia gibba
0				0								endang		Utricularia minor
		x		x				0				rare	cp	Utricularia purpurea
		x								x		endang		Utricularia subulata
				x	x		x	x		x		15		Vaccinium atrococcum
		0		0	0			0		x		15	bo	Vaccinium macrocarpon
										x		threat	bo	Vaccinium oxycoccos
										x		endang		Valerianella chenopodifolia
				0	0							spe co		Veronica comosa
				x								15		Viola canadensis
x						x		x		x		15		Viola fimbriatula
				0	x	x		0				15		Viola incognita forbesii
				x	x	x	x	0		x		15		Viola pallens
								0				endang	cp	Viola primulifolia
										x		15		Viola rostrata
x		x		x	x	x	x	x				15		Vitis labrusca
				x								endang		Woodwardia areolata
		x		x						x		15	cp	Woodwardia virginica
										x		threat	cp	Xyris caroliniana
		x		x	x		x	0		x		15	cp	Xyris torta
x		0		0								15	cp	Zizania aquatica

PRESETTLEMENT SCENARIO AND CONTEMPORARY NATIVE PLANT COMMUNITIES

The major plant communities are described below in the section entitled "Natural Area Vegetation," and illustrated on the Natural Area Vegetation Maps at the beginning of each chapter. They are based upon a concept of the vegetation as it is presumed to have manifested itself in the late Holocene, prior to European settlement. These plant communities are capitalized throughout the text.

It will be the maintenance and enhancement of these plant communities which best preserves healthy populations of SPECIAL VEGETATION floristic elements. The degree to which these communities remain intact today, for any given site, varies considerably; furthermore, in regard to the Natural Area Vegetation Map, the intergrading nature of plant communities is often such that it frustrates attempts to draw clear lines—even where cartographic resolution is adequate.

An understanding of contemporary native plant communities themselves, as well as an understanding of the way in which they relate to the presettlement scenario, is crucial if one is to manage responsibly natural land with the well-being of the SPECIAL VEGETATION in mind. Bacone, Campbell, & Wilhelm (1979), from which I have paraphrased freely below, discuss in fair detail the presettlement vegetation of the Lakeshore area, and in a general way its contemporary manifestation.

The Presettlement Scenario

The lakeshore region provides conditions for two principal, but intergrading, physiognomic vegetational manifestations: land upon which tree species prevailed as conspicuous features; and land which, to one degree or another, remained hostile to the successful habitation by trees. The areas characterized by trees included such general community types as Mesophytic Forest, Swamp Complex, Savanna Complex, Bog, and much of the Dune Complex--the latter two of which often intergrade insensibly into treeless tracts. The treeless general community types included numerous communities, the most general of which are the Marsh/Savanna/Mesophytic Prairie Complexes.

At least five major factors had a role in the formation and maintenance of the principal vegetational manifestations, *i.e.*, the degree to which a tract of land is inhabited by, or under the influence, of trees:

- . The geographic position of northwestern Indiana at the southern tip of Lake Michigan (see Visser, 1935).
- . The effects of regular, mostly Indian-set, probably annual fires (Cook & Jackson, 1978; Curtis, 1959; Hill, 1896; Lewis, 1980; and Vankat, 1979).
- . The predominantly sandy substrates occupying nearly all of the area north of the Valparaiso Moraine.
- . The physiographic position of northwestern Indiana and southern Lake Michigan within the eastern portions of the Prairie Province (Braun, 1950; Kuckler, 1964; and Transeau, 1935).
- . The level of the water table, combined with the degree to which it fluctuated.

Within the region of the lakeshore, treeless or partially treeless communities dominated the landscape during the presettlement times, especially in the western portions, and probably in the Dune Complex. Fires, moving eastward under the influence of the prevailing westerlies (Hill, 1896), were very influential in maintaining the openness of these communities, especially in the western portion of the Lake Michigan watershed in Indiana.

Fires apparently had a diminishing influence as they moved east, in part because of the moisture-laden winds coming off Lake Michigan. Mesophytic Forest communities were remotely interspersed along the Dune Complex as far west as the Miller area, but were best developed in the eastern sectors, with principal outliers along the Little Calumet River as far west as the Bailly area. Swamp Complex communities, for the most part, were scattered where favorable edaphic and hydrologic conditions prevailed, and where fires had little or no regular influence.

Contemporary Native Plant Communities

The degree to which a contemporary native plant community expresses itself at any given locus in the Lakeshore today is dependent upon the degree to which the fundamental floristic structure preserves synecological ties which developed at that site over the millennia prior to European settlement, the latter of which began in the early 1800's locally (Cook & Jackson, 1978). Of the five major factors (listed above) which had a profound role in the formation and maintenance of the principal vegetational manifestations, European man has had a direct and dramatic influence on at least two of them: the regular fires and the water tables.

The advent of European man, in addition, brought with it intensive logging practices and the advent of an opportunistic Old World flora, the elements of which had been evolving their autecological manifestations in the disturbed agricultural and urban soils of Europe, the Mediterranean region, and Asia—even as the floristic elements of the New World flora had been evolving their autecological character, for the most part under altogether different synecological conditions. These four fundamental ecological factors (fire suppression, water table fluctuations, logging, and the advent of Old World floristic elements), to the degree that they have had an impact in any given area, have had detrimental effects on the natural communities of the few thousand acres of contemporary National Lakeshore natural land which so far have escaped total obliteration.

Lands today, which no longer preserve those direct, fundamental floristic and synecological ties with the vegetation of their presettlement origin, are most probably likely to remain latter-day artifacts of the anthropogenics of European man, in the sense that they will no longer manifest the rich numbers of highly conservative dunes area plant species—many of which are now recognized among the floristic elements of the SPECIAL VEGETATION.

In this context, one where the changing synecological forces of the New World have recently commingled in a fundamental way with those of the Old world, two essential but intergrading types of plant community development are in operation today: natural succession, and a secondary "disturbance" succession.

Natural succession, of which the succession of Bog to Conifer Swamp is one example, takes place slowly over hundreds or even thousands of years. Such succession, whereby one recognizable plant community naturally succeeds into another, is not always the rule. Factors such as climatic, environmental, and edaphic conditions can maintain a variety of relatively stable communities within a small geographic area. The failure of the Black Oak Savanna to succeed locally according to theory into a Beech-Maple Mesophytic Forest is an example (Henderson, 1982 & 1987). The combination of edaphic, climatic, and biotic conditions, along with occasional or frequent fires, maintains these savannas as a relatively stable "intermediate" stage between the open prairie and the Mesophytic Forest.

Secondary succession, on the other hand, is far more rapid. Since secondary succession today usually follows or is maintained by a man-made disturbance, it has a profoundly different effect upon the resultant community and its species composition than would have become manifest under similar conditions, even 150 years ago. One of the most significant factors involved here is the presence of the competitive and preemptory Old World flora, as well as the severity of the disturbances. During presettlement times, "disturbances" such as tornadoes, floods, etc., occurred at random over the landscape—and the Old World flora was not present. Hence such phenomena were not fundamental disturbances, but rather, a part of a

time-honored synecological/evolutionary process--as much so as the wind and the rain, the light and the dark. "Secondary succession," in presettlement times, proceeded through long established phases into whatever "climax" could be attained, given the universe of native plants available within the synecological parameters.

Severe disturbances in today's context, however, invite the introduction of the competitive Old World floristic elements, and change fundamentally the character of succession from start to finish. Even minor disturbances, such as light selective logging, light grazing, or slight water draw-downs, can result in the drastic alteration of a plant community. Fire suppression can retard or even pervert the healing of such traumas. Today, presettlement communities are virtual islands, now remote from the areas which at one time served as refugia from which the native species, obliterated or decimated by a disturbance, could have recolonized, or commingled genetically maintaining the vital essence of a healthy, diverse gene pool. Indeed, native plant communities today are surrounded by a completely rearranged postsettlement environment. They are largely fire-starved; their genetic diversity is waning, and they are under constant threat of competition from the floristic elements of a flora which is far better adapted to the activities of "Civilized Man."

SPECIAL VEGETATION SURVEY METHODS

Several separate survey operations were necessary in order to determine the SPECIAL VEGETATION and the degree to which its specific floristic elements remain extant within the boundaries of the Indiana Dunes National Lakeshore. These operations included an herbarium search and a review of the botanical literature. Information gathered in these operations was collated to complement field surveys and Natural Area assessment.

HERBARIUM SEARCH

The herbarium search was undertaken in an effort to ascertain the specific localities within the Lakeshore at which specific floristic elements of the SPECIAL VEGETATION have been known to grow as wild populations. Clearly, it was neither necessary nor possible to visit all of the herbaria around the country which might contain specimens collected from the Lakeshore. The search was limited to several local herbaria known to house the plant collections of botanists most responsible for collecting in the dune region of Indiana.

The herbaria surveyed were those of Butler University, Indianapolis, Indiana (BUT); the Field Museum of Natural History, Chicago, Illinois (F); Indiana University, Bloomington, Indiana (IND); the Morton Arboretum, Lisle, Illinois (MOR); and the newly established herbarium at the science office of the Indiana Dunes National Lakeshore (INDU). Much of the data from these herbaria was gleaned from notes already compiled during an herbarium search conducted by John Bacone² in his effort to gather information on the rare and endangered plant species of the state of Indiana.

As one might imagine, the number of specimens representing individual plant taxa was unevenly related to plant rareness or frequency for a given area. The collection of plant specimens is an operation which is almost wholly dependent upon the whims and goals of the collector. A collector's collection rationale changes at various periods in a collecting program, depending upon the scope or purpose during any given time period. Consequently, a geographically rare but conspicuous or locally abundant plant may be represented in many herbaria by dozens of specimens; on the other hand, a rather widespread but "inconspicuous" or "hard-to-identify" plant may be poorly represented. Many other examples of unevenly represented plant collections result from collection rationales which revolve around, for example, a collector's desire to "study the Orchids" or to collect single flowering specimens in order to "voucher a floristic survey" of a particular area, or even to "get 200 different specimens to pass a local flora course" in college.

Since it was my goal to determine the geographic locations for populations of individual plant taxa considered among the floristic elements of the SPECIAL VEGETATION, I felt it necessary to select, for each plant taxon, only a single representative specimen which would testify to the plant's having grown in one of the Survey Units at some point in the past. If a plant were seen during the field survey, I felt it was unnecessary to carry, within this report, an old herbarium record of the plant. To do so would manifest clerical inconsistency, and be functionally redundant for the purposes of this report.

²Director, Division of Nature Preserves, Indianapolis, Indiana.

Importantly, I personally examined herbarium specimens from the Morton Arboretum, Field Museum, and Indiana Dunes National Lakeshore. For those few specimens filed at other herbaria, the accuracy of the specimen's collectors or its annotators will have to be relied upon.

LITERATURE SURVEY

A review of the botanical literature was necessary to compile a flora from which a SPECIAL VEGETATION selection rationale could be developed, and to determine, where possible, specific localities within the Lakeshore at which individual floristic elements of the SPECIAL VEGETATION have been known to grow as wild populations.

Numerous books, articles, reports, and studies have dealt, from one standpoint or another, with the contemporary vascular plants of the dune area of northwestern Indiana. Some of the more significant works include: Bacone, Campbell, & Wilhelm (1980); Brennan (1923); Buhl (1935); Cowles (1899, 1901); Daniel (1977); Deam (1940); Downing (1922); Fuller (1925, 1934); Hill (1896); Hull (1937b); Kologiski & Kantrand (n.d.); Krekeler (1977); Laughlin (1953); Lindsey, Schmely, & Nichols (1969); Lyon (1927, 1930); Peattie (1926, 1930); Pepoon (1927); Reshkin *et al.* (1975); Swink & Wilhelm (1979); Tryon (1936); and U.S. National Park Service (1979). From these works and others, as well as my own field surveys, it was possible to glean a catalogue of the plants known to inhabit the Indiana Dunes National Lakeshore. This catalogue (see the section: "VASCULAR FLORA OF THE INDIANA DUNES NATIONAL LAKESHORE") serves as the universe from which the specific floristic elements of the SPECIAL VEGETATION were derived.

Certain literature sources have made such unconventional claims with regard to local species presence, or presented their data in such an ambiguous way, that they have been consulted only with great circumspection. Two generally reliable sources have dealt, in a comprehensive way, specifically with the vascular flora of the Indiana dunes. These are the classic works of Lyon (1927, 1930), and Peattie (1930). Care has been taken to edit some of the other literature sources, with regard to the likelihood or validity of species presence reports, to conform to the species concepts formulated in the two principal regional treatments which detail the vascular plant flora of northwestern Indiana. These two treatments are Deam (1940), and Swink & Wilhelm (1979).

Using herbarium specimens and literature to determine specific localities within the Lakeshore at which particular plants are said to have grown requires a knowledge of exactly where the old collecting sites were situated. Most of the earlier collectors and writers described their localities either in terms of the old whistle stops and depots which were along the Chicago South Shore and South Bend Traction Line, or in relation to a nearby town or village.

The principal points of reference were designated routinely as: *Baileytown, bog 6-7 miles west of LaPorte, Chesterton, Clarke, Clarke Junction, Clarke & Pine, Coffee Creek, Cowles Bog, Cowles Tamarack Swamp, Crisman, Dune Creek, Dune Park, Fort Creek, Furnessville, Furnessville Blowout, Goose Lake, Indiana Dunes State Park, Jackman's Bog, Keiser, Keiser Blowout, Little Lake, Long Lake, Miller, Mineral Springs, Mud Lake, Oak Hill, Pine, Port Chester, Porter, Tamarack, Tolleston, Tremont, Walker Lake, Waverly Beach, Wicliffe, Wilson, and Wolf Lake*. The locations of all these areas are known, and all are within the general region of the Indiana Dunes National Lakeshore. Several of these areas, however, are no longer extant as natural areas; some of them are not specifically within the contemporary

Lakeshore boundaries. **Figure III** tabulates the location of these areas with respect to the Lakeshore boundaries, and comments briefly on their contemporary condition from a Natural Area standpoint.

FIGURE III. Locations and synonyms of historical plant collection sites and literature points of interest.

Location	Lakeshore Survey Unit	Comments
Baileytown	-	Obliterated
Bog 6-7 mi w of La Porte	Unit 12	= Pinhook Bog
Chesterton	-	Mostly obliterated
Clarke	-	Partly extant
Clarke Junction	-	Extant, in part
Clarke & Pine	-	Mostly obliterated
Coffee Creek	Units 5 & 6	= Dune Creek?
Cowles Bog	Unit 5	Extant, in part
Cowles Tamarack Swamp	Unit 5	= Cowles Bog
Crisman	-	Obliterated
Dune Creek	Units 5 & 6	Largely obliterated
Dune Park	-	Obliterated
Fort Creek	Units 5 & 6	= Dune Creek
Furnessville	Unit 6	Largely extant
Goose Lake	-	Obliterated
Indiana Dunes State Park	Unit 6	Largely extant
Jackman's Bog	Unit 12	= Pinhook Bog
Keiser	Units (6) & 8	Partly extant
Little Lake	Unit 5	Disturbed
Long Lake	Units 2 & 3	Largely extant
Miller	?	Mostly obliterated
Mineral Springs	Unit 5	Partly obliterated
Mud Lake	-	= Goose Lake
Oak Hill	-	Obliterated
Pine	-	Partly extant
Port Chester	Units 5 & 6	Partly extant
Porter	Unit 5	Obliterated, in part
Red Path Dune	Unit 9	Mount Baldy
Schererville Prairie	Unit 11	Hoosier Prairie
Tamarack	Unit 9	Largely obliterated
Tolleston	-	Obliterated
Tremont	Unit 6	Largely extant
Walker Lake	-	= Goose Lake
Waverly Beach	Unit 6	Largely extant
Wickliffe (Wickliffe)	Unit 3	Mostly obliterated
Wilson	-	Obliterated
Wolf Lake	-	Disturbed

Miller is perhaps the most nondescript of the terms used to identify specific collecting locations. Apparently, the *Miller* area known to the early collectors has been obliterated; probably, however, such phrases as "*sandy plains west of Miller*" could be interpreted as

including the Black Oak savannas in Survey Unit I. It might also be possible that some of the sag area of Survey Unit II may have been included in the *Miller* references. In some cases, references to the dune area east of *Miller* may include part of what is now within the western half of Survey Unit III. One thing, however, at least is certain: the famous bog and swamp forest of the *Miller* area have been destroyed.

Another term which has caused some confusion in recent years is *Pine*. *Pine*, rather than referring to what is now a town in northeastern Porter County, known as Town of Pines (or simply The Pines) or another locality in LaPorte County, known as "Pine," designated an area along Lake Michigan in Lake County, at the north end of Clark Road; directly north of the old town of Clarke, which town is now incorporated into Gary. This location should not be confused with Clarke Junction, which is about a mile or so west of Clark Road.³ The old *Tamarack* stop was at the western edge of what is now Town of Pines, in Survey Unit IX.

Lyon (1930) mentions that *Coffee Creek*, *Dune Creek*, and *Fort Creek* are all names for the same creek, but Cook & Jackson (1978) seem to suggest that *Coffee Creek* and *Dune Creek* are in entirely different watersheds; Lyon goes on to say that "*Furnessville Blowout* is frequently spoken of as *Drury's Blowout*, and *Big Blowout* as *Furnessville Blowout*." The famous *Goose Lake* was referred to as *Mud Lake* by Peattie, and as *Walker Lake* by Deam, and others (Swink & Wilhelm, 1979, p.317 under *Fuirena pumila*). The Tolleston bog and swamp near the intersection of 17th and Whitcomb Streets, in Gary, has now been destroyed.

Dune Park was an area well known to the earlier collectors, as well as to the Chicago naturalists and ecologists. It was not, as one might assume, a part of what is now *Indiana Dunes State Park*; but rather, it included the sag and dune area north of the Chicago South Shore and South Bend Traction Line in the vicinity of the old *Wilson* stop. This once rich area has been totally obliterated by the industrial complex which is situated between West Beach (Survey Unit III) and Dune Acres (Survey Unit V). The famous *Goose Lake* was also in this area, just west of Survey Unit V. The current "Dune Park" station is well east of the original, south of Indiana Dunes State Park.

Most other points of reference, particularly those along the traction line, were quite specific; and, inasmuch as the floristic interest, to most botanists, lay in the dune, sag, and *Great Marsh* areas north of the traction line, the direction relative to those areas was inevitably northward--even though the direction often was not specifically stated.

Plant taxa that were cited in the literature and from herbarium specimens by historical reference points from areas outside of the contemporary boundaries of the Indiana Dunes National Lakeshore have been omitted from this report--unless, of course, they were cited from within the Lakeshore boundaries as well. All of these areas, except for portions of *Clarke Junction*, *Pine*, and *Wolf Lake*, have since been obliterated; plants known exclusively from these areas are currently irrelevant with respect to Lakeshore land-use consideration.

³Note that Clarke is spelled with an "e" in both Clarke and Clarke Junction and that Clark Road, at the north end of which was the Pine stop, is spelled without an "e". In contemporary parlance, the Indiana Nature Preserve south of Pine, on the west side of Clark Road, should be rendered Clarke & Pine since one is referring to that area between Pine and the old village of Clarke.

FIELD SURVEYS AND NATURAL AREA ASSESSMENT AND MAPPING

During the growing season of 1979 a field survey of the Indiana Dunes National Lakeshore was conducted in an attempt to locate extant populations of the specific floristic elements of the SPECIAL VEGETATION within the contemporary boundaries of the Lakeshore. At the same time, a Natural Area assessment of Lakeshore lands was made in an effort to assess the degree to which the various areas preserved their presettlement integrity--representing therefore the areas most likely to provide habitats for the individual floristic elements of the SPECIAL VEGETATION.

Field Surveys

The field surveys were conducted during the growing seasons of 1979, 1987, 1988, and 1989, taking place largely over the months of May through September. The purpose of the field surveys was to locate populations of the SPECIAL VEGETATION floristic elements, wherever they might be found, within the boundaries of the Indiana Dunes National Lakeshore. The Lakeshore was divided, along more or less traditional lines, into convenient Survey Units (see Figure I). Each Survey Unit was surveyed by a series of "walk-throughs," during which the presence of all encountered plants was recorded.

While these field surveys were certainly extensive enough to develop a practical working view of the vascular vegetation which grows in the Lakeshore, they were far from adequate to assure that the contemporary conditions of all the specific floristic elements of the SPECIAL VEGETATION are wholly reflected in the data outlined in this report. The very nature of floristic surveys, indeed, is such that one's concept of "completeness" disintegrates proportionately with one's field experience. The best one realistically can hope to do, is to pursue the surveys with thoroughness and vigor, and at the same time realize that, as the months and years go by, floristic conditions change, rendering such surveys obsolescent even as they are being conducted. This is particularly true in an area as vast and physiographically complex as the Indiana Dunes National Lakeshore.

Physical survey logistics, in addition, are an important consideration when analyzing the limitations incumbent upon one who attempts to contrive the detailed floristic composition of a given piece of land. Fundamental limiting factors in any floristic survey include: the size of a survey site, combined with its physiographic diversity; the amount of time available; the year and time of year during which the survey is conducted; the botanical field acumen of the surveyor, along with his specific familiarity with the survey site; and the survey season's weather patterns, including such factors as they relate to moisture and temperature with regard to phenological optima--and even as such factors affect the surveyor himself.

It is within the context of field survey limitations that one must view survey data. If one is to work meaningfully with the concept of SPECIAL VEGETATION, as it has been defined here, emphasis should be placed not so much on the specific details of floristics, but rather on the determination of geographic areas which are most likely to provide habitats for specific plant taxa. The observed presence or evident absence of specific plants, at any given time, or during any given year, is not in itself a sound benchmark from which to derive conclusions with regard to their actual population manifestation. The apparent "frequency," "density," or "dominance" of any individual plants within a given synecological scenario, at any given time,

is only of academic importance. Any fundamental or essential ecological significance, if there is any, in the noting of such aspects is often quite apart from such anthropocentric values which often infer that the more "frequent" or "dense," or "dominant" a "rare" plant happens to appear, the better.

It is my judgment--and observations over the years bear it out--that if one visits an area which preserves a high degree of presettlement integrity (a Natural Area), year after year at various seasons, the high-fidelity plants are, while always present, often variously manifest; from appearing virtually absent to occasionally even abundant. For this reason, the emphasis in this survey of the Lakeshore has centered upon the location and evaluation of Natural Areas, the notes on the SPECIAL VEGETATION floristic elements having been made as these plants became apparent along the way.

Natural Area Assessment and Mapping

In conjunction with the field survey, data were gathered from which indices on the natural character of lands within the Indiana Dunes National Lakeshore could be derived, and maps of each Survey Unit were prepared to indicate visually which areas still retain a substantial Natural Area significance. Natural Area, as a functional concept, can be viewed as land upon which the existing vegetational assemblage approximates that of the native synecological condition which prevailed just prior to the settlement of northwestern Indiana. The presettlement vegetation of the Indiana Dunes National Lakeshore has been discussed in fair detail by Bacone, Campbell, & Wilhelm (1979).

The determination of Lakeshore lands which preserve a high degree of presettlement integrity is crucial to the consummation of a SPECIAL VEGETATION rationale, because it is these Natural Areas which still provide the healthy habitats for the SPECIAL VEGETATION floristic elements. Indices gauging the floristic integrity of natural land are important in a contemporary floristic context, because it is a reality that much of our land today is under the heavy influence of a flora, the synecological aspects of which are manifestly exogenous in their relationship to the Natural Area concept.

The plants growing wild in this region fall into two essential categories (see Swink & Wilhelm, 1979): those plants known to be native here, *i.e.*, having constellated themselves autecologically among each other during presettlement times; and those known to have entered the region since the coming of the European settlers.⁴ The two floras (native and introduced) are in severe competition with each other today. The native flora, as a healthy synecological entity, is essentially restricted to the lands which have suffered little or no serious disturbance,⁵ while it is an artifact of our times that the introduced flora thrives under disturbance conditions--whether they be man-induced, or otherwise.

The interface between the native and introduced flora is a complex one. Let it be sufficient to say here that the specific floristic elements of the SPECIAL VEGETATION are most likely to be found under conditions which have, through time to the present, remained conducive to

⁴The nativities of several plants are either unknown or in dispute.

⁵Fire is considered by this writer to be a synecological stabilizer in our biome; its absence or suppression from fire-adapted systems destabilizes them.

the growth of native vegetation. Consequently, it is important today to be able to gauge the degree to which these conditions prevail in a given area.

Natural Area Assessment

The methodology used in assessing the degree to which an area preserves its presettlement integrity is that which is described and demonstrated by Wilhelm (1977 & 1978), modified by Swink and Wilhelm (1979), and elaborated upon by Wilhelm & Ladd (1988). Briefly, the premise upon which the method is based derives from fundamental characters within the floristic elements of the Chicago Region flora itself.

Each native floristic element (plant taxon) has been assigned a "coefficient of conservatism" (Wilhelm & Ladd, 1988), which reflects two principal, but related, autecological aspects: a plant's observed fidelity to stable native plant communities in the Chicago Region; and a plant's geographic rareness locally. Considerations of these two aspects are mixed in such a way as to develop a conceptual numerical spectrum of 0-10, into which fall most of our native plants. Special rating coefficients of 15 and 20 are assigned to certain plants which are either quite limited in their local distribution and highly modal,⁶ or the local populations of which are decidedly threatened, endangered, or believed to be already fatally compromised.

For each discrete survey site, the coefficients of conservatism for each recorded plant are summed, and an arithmetic mean derived. The mean provides a relative idea of the overall floristic "quality" of the site by condensing the coefficients in the constellation into a single coefficient. An area (particularly a small one) in the dune region, can be said to exhibit significantly high quality if the derived mean is somewhere in the neighborhood of 5.5 to 6, or even higher.

To arrive at a site's relative Natural Area significance within the Chicago region, the surficial area of the site is brought into perspective by regressing the species richness, and multiplying the product by the mean. The product thus obtained can be viewed as a Natural Area Index. The philosophy around which the two factors (the mean and the species richness regression) are derived is discussed by Swink & Wilhelm (1979) and Wilhelm & Ladd (1988).

In the Chicago region, if the Natural Area Index of a given area is 40 to 50, or higher, one can be relatively certain that there is sufficient native character to be of significant environmental importance in terms of a regional Natural Area perspective. Areas which rate in the 60's and higher can be considered of paramount importance within a similar context; such areas are extremely rare from a regional standpoint, probably occupying less than 0.02 percent of the total land area in the Chicago Region. Areas of any size (an acre or more) which rate less than 35 or so can usually be assumed to have suffered significantly from abuse or degradation. As the Natural Area Index descends into the 20's and 30's, the philosophy upon which the Index is conceived begins to disintegrate--principally because the influence of exogenous floristic elements begins to bear too profoundly. Such areas should probably be evaluated from a base of criteria other than one which is predicated on purely native concepts (see Swink & Wilhelm, 1979; and Wilhelm, 1977).

⁶"Modal" is used here more or less as defined by Curtis (1959).

Natural Area Mapping

In conjunction with the field survey, and as a result of the Natural Area assessment, each of the twelve Survey Units has been mapped to indicate which areas can be viewed as significant Natural Area, *i.e.*, the areas most likely to provide habitats for the SPECIAL VEGETATION floristic elements.

The maps, included within each Survey Unit chapter (see the section SPECIAL VEGETATION SURVEY RESULTS) were redrawn from the Lakeshore segment maps provided by the National Park Service and overlaid onto tracing from the U.S.G.S. 7.5 Minute Series Topographic Maps, specifically the *Chesterton (1986)*, *Dune Acres (1980)*, *Gary (1986)*, *Highland (1986)*, *LaPorte (1969)*, *Michigan City West (1980)*, *Portage (1986)*, and *Westville (1962)* quadrangles.

Within each Survey Unit Map the significant remnant Natural Areas are drawn in depicting their approximate boundaries. Those areas which did not satisfy criteria established for Natural Area designation are depicted by a uniform pattern of horizontal lines. Several aerial photographic series were helpful in delineating the Natural Area boundaries; these series include: a 1938/39 black & white set, two black & white sets flown in 1958 and 1984, three color-print sets flown in 1977, 1979, and 1984, and a set of color obliques taken in 1978.

The Natural Areas are further codified to reflect the kinds of general plant communities present in each. The community concepts and cartographic resolution are, essentially, as outlined and depicted by Bacone, Campbell, & Wilhelm (1979). Details regarding the Natural Area significance and SPECIAL VEGETATION of each area are discussed within each Survey Unit chapter.

The portions mapped as Natural Area are not to be construed as incontestably pure, or without even severe disturbance here and there; indeed, scarcely one acre of Lakeshore land has survived into this decade without at least some disturbance or ecological perturbation. The Survey Unit Map is intended to alert the National Park Service land-use planners that the land areas codified as Natural Area, to the degree that the cartographic resolution permits, sufficiently reflect presettlement conditions to the point that great care should be exercised with regard to potential physical impacts. Such impacts might include trails, recreation areas, water level alterations, and others which might have a deleterious effect on the Natural Area and its attendant SPECIAL VEGETATION.

By the same token, the Lakeshore lands mapped as exhibiting insufficient quality to be considered Natural Area should not necessarily be construed as being devoid of environmental significance. Again we are concerned about cartographic resolution, mapping error, and the insignificant point that there are definite limiting factors incumbent upon one who attempts to survey 13,000 acres in just a few growing seasons. Nevertheless, the areas codified as highly disturbed are far less likely than those codified as Natural Area to contain the specific floristic elements of the SPECIAL VEGETATION--around which the whole point of this report revolves.

SPECIAL VEGETATION SURVEY RESULTS

The herbarium search and the literature review, combined with the field survey and Natural Area assessment, have together resulted in a body of information which has been organized to put the floristic elements of the SPECIAL VEGETATION into a functional context: the Survey Units; and the Flora of the Indiana Dunes National Lakeshore.

SURVEY UNITS

As discussed in the methods section, the Lakeshore is divided, for convenience of data presentation, into twelve Survey Units (see Figure I). Each Survey Unit is treated as a discrete chapter. Each chapter consists of three essential parts: a Survey Unit Map, an annotated list of SPECIAL VEGETATION floristic elements, and a Natural Area assessment, with data and commentary.

ANNOTATED LIST OF SPECIAL VEGETATION FLORISTIC ELEMENTS

Each Survey Unit chapter includes an annotated list of the specific floristic elements of the SPECIAL VEGETATION. The annotations comment on the historical and contemporary floristic status of each element, including an indication of whether or not representative plants of that element were recorded from contemporary populations; herbarium specimens, where they exist, are listed here following each annotation along with pertinent comments by other writers.

Following the annotated list is a summary section which provides a perspective on the degree to which that particular Survey Unit, relative to the other Survey Units, provides habitats for the individual floristic elements of the SPECIAL VEGETATION, and gives some indication of the degree to which SPECIAL VEGETATION floristic elements, known historically from that Survey Unit, are represented by extant populations today.

Almost a third (29%) of the individual floristic elements of the SPECIAL VEGETATION are known from only one Survey Unit. The degree to which a particular Survey Unit stands important in this regard is also provided in this summary. Comment is also provided here on the degree to which the Survey Unit under discussion provides habitats for SPECIAL VEGETATION floristic elements which are regarded as boreal relicts, or as having ancestral affinities to the Atlantic coastal plain.

NATURAL VEGETATION

In each of the Survey Units, certain areas were assessed from a Natural Area standpoint, using the system described in Swink & Wilhelm (1979). These areas are discussed in terms of their contemporary condition, and in terms of management techniques which might be helpful in preserving or enhancing the synecological integrity of the Survey Unit; management can serve as an important step in the safeguarding of the SPECIAL VEGETATION floristic elements.

These survey areas (some did not meet the criteria for Natural Area as defined earlier) have been codified on the Survey Unit Maps by a white circle containing a capital letter symbol. Also within each Survey Unit Map, areas are shown which still reflect a meaningful

(from a SPECIAL VEGETATION standpoint) degree of natural quality. These portions of the Survey Unit Map comprise the Natural Area Vegetation Map.

The Natural Area Vegetation Map is codified further, with patterned symbols, to depict the general plant community types present. The cartographic resolution and community concepts, with some modifications, are taken from Bacone, Campbell, & Wilhelm (1979). For the most part, cartographic resolution permitted the mapping--always with some reservation--of the following general plant community types: Aquatic, Bog, Bottomland, a Dune Complex, a Fore-dune Complex, a Marsh Complex, Mesophytic Forest, Mesophytic Prairie, Panne, a Savanna Complex, and a Swamp Complex. **Figure IV** relates these general community types to the patterned symbols used on the Natural Area Vegetation Maps; it also serves as a paradigm to illustrate the relative affiliations of the *specific* community types (see below) within and among the general community types--as they manifest themselves in the Lakeshore.

The resolution of general plant community discrimination, as mapped on the Survey Unit Maps, reflects not so much an articulate concept of fundamental native plant communities in the Lakeshore, but more an expedient contrivance employed to present an idea regarding the general floristic nature of the natural land in each Survey Unit--particularly as the vegetation relates to moisture gradients and arborescent development. Each of the eleven general plant community types listed above is a complex of intergrading plant associations, each of which has synoptic relationships with plant associations in other general plant community types. It is not our purpose here, however, to unravel or explore deeply these relationships, other than to emphasize that they exist, and to put an admonitory perspective on the interpretation of the Natural Area Vegetation portion of the Survey Unit Maps.

The following paragraphs describe briefly the general community types, and in some cases their component *specific* community types or associations. Ten plants have been selected off the cuff to characterize or typify each association type. The general community type which each floristic element of the SPECIAL VEGETATION is most likely to inhabit is tabulated in **Figure V**.

Aquatic

Naturally fluctuating water levels in the Lakeshore, where topographic depressions and sloughs filled with water in the Spring can become bone-dry in the Summer months, frustrate attempts to define the Aquatic vascular plant community in a way which would be tempting in the event water levels were more constant. Locally, then, the Aquatic vascular plant community, when set in a Marsh/Savanna Complex, can be conceptualized as one in which the vegetation is largely comprised of species, the habits of which are to complete their life cycle on or beneath the water's surface; it grades into Marsh Complex communities as emergent fuel species become dense enough to support occasional fire--given that the fire initially derived its momentum from wind-swept adjacent uplands.

Plant species which typify the Aquatic vascular plant community in the Lakeshore include:

Brasenia schreberi	Pontederia cordata
Ceratophyllum demersum	Potamogeton gramineus
Nuphar advena	Potamogeton illinoensis
Nymphaea tuberosa	Potamogeton pusillus
Polygonum coccineum	Sagittaria latifolia

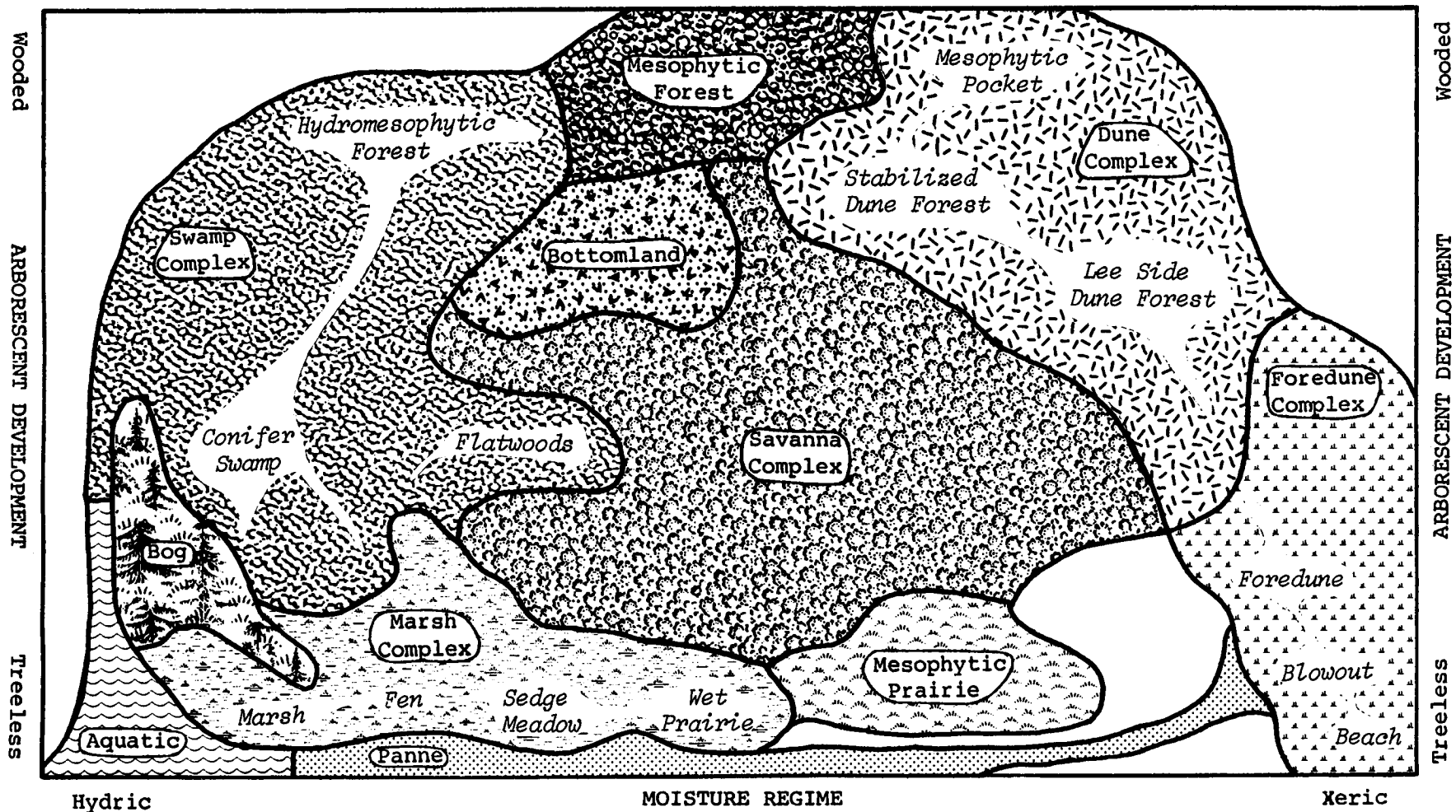


FIGURE IV: Relationships within and among the General (standard type face) and Specific (*italic type face*) community types, and the patterned symbols which codify the General community types on the Natural Area Vegetation Maps (Survey Unit Maps).

Bog

Bog, like some of the other terms used here to describe plant communities, is not a scientific word in the sense that its use always signifies a uniform, unique concept which is common and perceived standardly by all. Any place, for example, where there is a quagmire or wet, mucky, hummocky ground is likely to be termed a "bog;" hence, the expression "bogged down" derives from the difficulty one experiences when progress is retarded by some impediment--such as attempting to walk through deep, wet, hummocky places. The contemporary ecologist, on the other hand, tends to restrict the term "bog" to a hydric/edaphic vegetational scenario which is typified by acidic, usually organic substrates, and a characteristic floristic composition. The ionic and edaphic contrapositive of bog is fen--at least so far as North American ecologists are concerned (see discussion under Marsh Complex).

This writer has not been able to avoid becoming acquainted with the controversy over the application of the terms bog and fen as applied locally to Cowles Bog (Survey Unit V)⁷, nor can I offer much in the way of a solution. Importantly, however, while the terms bog and fen are conceptually each at opposite ends of a synecological spectrum, they are nevertheless profoundly and complexly related to each other within the spectrum--not to mention the affinities both communities have to certain phases of the Swamp Complex (which see). As is the case of most life systems, when taxonomic attempts are made to pigeonhole them, actual bogs and fens often do not reflect conceptual ideals. An area is identified by field botanists as fen or bog by the degree to which it contains plant species traditionally said to inhabit one community type or the other, more often than by someone who has made discrete, scientific, stratified probes into the substrate with a pH recorder.

Having a choice of only two, or perhaps three, words with which to categorize a complex, intergrading spectrum of plant community systems often results, provided a choice is considered critical, in consternation over which word to use. The choice is often as elusive as discriminating red from orange on a color spectrum.

Such problems with categorization revolve around three principal aspects fundamental to the Bog/Fen Complex. The first has to do with the fact that, as Heinselman (1970) points out, portions of a peatland may undergo transformations from one peatland to another, and that the ratio of organic matter to minerals in fen and bog peats can have profound chemical consequences. In less organic soils most of the exchange capacity is saturated by metallic cations from soil minerals, but as organic content rises, exchangeable metallic cations damp off, with hydrogen ions becoming dominant.

The second, as illustrated, for example, by Cain & Slater (1948) and Mandossian (1965) has to do with the fact that bogs have several plant species which are common to fens, and *vice versa*; and our own experience has been that species often exhibit various predilections to either community from one region to another.

Thirdly, any given substrate may have several ionic manifestations within a short distance (see Potzger, 1937), with these manifestations sometimes superimposed over other circumstances. Such ionic variation can obfuscate a meaningful determination on the alkalinity of a given substrate, because the component floristic elements can be influenced by one to several

⁷ See Hendrickson (1978) and Hendrickson & Wilcox (1979).

of these ionic manifestations depending upon the extent to which their roots penetrate the substrate. All of these factors, coupled with the fundamental nature of the original parent community, elevate a conceptually linear plant community spectrum into one more geometric in nature.

For a detailed literature understanding of the bog/fen relationship, the following references and their bibliographies might be helpful: Anderson (1943); Boelter & Verry (1977); Cain & Slater (1948); Curtis (1959); Dansereau & Segadas-Vianna (1952); Deam (1940); Frederick (1974a & 1974b); Friesner & Potzger (1946); Fuller (1925); Gordon (1933); Heinselman (1970); Hendrickson & Wilcox (1979); Kurz (1923 & 1928); Pearsall (1918); Potzger (1937); Sjors (1960); Vankat (1979); Voss (1937); Waterman (1923); White (1978); Wilson & Galloway (1937); and Zimmerman (1978).

According to this writer, plants which typify the bog condition in the Lakeshore include:

Andromeda glaucophylla	Menyanthes trifoliata minor
Carex canescens disjuncta	Nemopanthus mucronata
Carex oligosperma	Pogonia ophioglossoides
Carex trisperma	Rhynchospora alba
Chamaedaphne calyculata angustifolia	Vaccinium oxycoccos

Bottomland

A Bottomland community, as used here, is a term for those plant communities which develop in the floodplains of streams and rivers, particularly those with gentle gradients. In the Lakeshore, today at least, these communities are generally characterized by trees under which a herbaceous flora is adapted to the regular, or at least frequent, deposition of silt during the Spring floods; and adapted, as well, to the often dry conditions encountered during the Summer months.

There is a tendency on the part of some to confuse certain phases of the Swamp Complex with Bottomland, but any resemblance is mostly superficial inasmuch as the two are locally quite distinct from both the floristic and fundamental aspects.

The Bottomland Community in the Lakeshore, though it likely has changed profoundly since settlement, is presently confined to the floodplain of the Little Calumet River, where typical or characteristic plant species include:

Acer saccharinum	Floerkea proserpinacoides
Cardamine bulbosa	Fraxinus pennsylvanica
Carex amphibola turgida	Populus deltoides
Carya laciniosa	Salix nigra
Chaerophyllum procumbens	Viola striata

Dune Complex

The Dune Complex is a narrow, eclectic, east/west-oriented band of a principally wooded, cartographically subresolute plant community, which includes a more or less successional advanced *Foredune* community; a phase of the Savanna Complex; some small pockets of Mesophytic Forest; and perhaps most of all, some *Stabilized Dune Forest* or *Lee Side Dune Forest* communities--both of which have conceptual affinities to certain phases of the Savanna Complex, as well as to each other. There is a general increase in Dune Complex mesicity in

the eastern portion of the band with respect to the western portions, albeit with small, isolated *Mesophytic Pockets* known today from as far west as Miller.

The complexity of the Dune Complex is, of course, difficult upon which to generalize floristically. The central community around which the Dune Complex is conceived, however, is the forest which has developed leeward of the Foredune Complex, as well as on the nearby wooded dunes north of the Great Marsh and Baileytown Sag area. The degree to which the Dune and Foredune Complexes intergrade, in a cartographically subresolute way, with other general community types, particularly the Savanna Complex, has a lot to do with where the lines circumscribing the Dune Complex were drawn on the Natural Area Vegetation Maps; that is to say that the lines, by their very nature, generally seem to imply a profound physiographic separation from one general community type to another—even when no such separation exists.

It is, nevertheless, possible to provide a list of species which, while hardly confined to these associations, characterizes the communities around which the Dune Complex, as a cartographic entity, is conceived. The *Stabilized Dune Forests* are typified by:

<i>Acer rubrum</i>	<i>Pinus strobus</i>
<i>Aquilegia canadensis</i>	<i>Polygonatum pubescens</i>
<i>Campanula rotundifolia</i>	<i>Ptelea trifoliata mollis</i>
<i>Cornus florida</i>	<i>Quercus rubra</i>
<i>Cornus rugosa</i>	<i>Smilax rotundifolia</i>

The *Lee Side Dune Forests* are similar though, as a rule, not quite as mesic. While conceptually and floristically a line is difficult to draw between the *Stabilized Dune Forest* and the *Lee Side Dune Forest*, the latter is perhaps more typified by the following plants:

<i>Amelanchier arborea</i>	<i>Gerardia flava</i>
<i>Corallorhiza odontorhiza</i>	<i>Monotropa uniflora</i>
<i>Fraxinus americana</i>	<i>Prenanthes altissima</i>
<i>Galium pilosum</i>	<i>Quercus alba</i>
<i>Gaultheria procumbens</i>	<i>Solidago speciosa</i>

A mesophytic extreme of these two dune forests is the *Mesophytic Pocket*. The *Mesophytic Pockets*, when fully developed, are rare, somewhat thought-provoking, floristic and synecological scenarios, considering their physiographic nature. They are typified by the following plants:

<i>Acer saccharum</i>	<i>Panax quinquefolius</i>
<i>Carex eburnea</i>	<i>Quercus rubra</i>
<i>Fraxinus americana</i>	<i>Solidago caesia</i>
<i>Hamamelis virginiana</i>	<i>Tilia americana</i>
<i>Ostrya virginiana</i>	<i>Viburnum acerifolium</i>

Foredune Complex

The Foredune Complex is a relatively well-defined physiographic entity. It comprises non-forested portions of a dune which is under the direct influence of surface winds off Lake Michigan. Within the Foredune Complex, at least three *specific* plant community types can be described: the *Beach*, the *Foredune*, and the *Blowout*.

The *Beach* community is restricted to a narrow strip adjacent to the littoral zone of Lake Michigan. The *Beaches*, during presettlement times, ran the length of Indiana's border with Lake Michigan, interrupted only occasionally by the mouths of creeks and streams. The species belonging to this community are few, often consisting only of *Cakile edentula*.

The *Foredune* community, intergrading at its lower edge with the *Beach* community, occupies the windward exposure of the first line of dunes next to lake Michigan. Its size and floristic development are a function, in part, of the degree to which the dune, as a land form, is developed. The foredunes tend to become larger as one moves from west to east, so the *Foredune* community is developed accordingly, intergrading at its upper edge with the *Blowout* community in some places, and with the Dune Complex in others. Characteristic plants of the *Foredune* community include:

<i>Ammophila breviligulata</i>	<i>Cornus stolonifera baileyi</i>
<i>Andropogon scoparius</i>	<i>Lathyrus japonicus glaber</i>
<i>Artemisia caudata</i>	<i>Populus deltoides</i>
<i>Calamovilfa longifolia</i>	<i>Rhus aromatica arenaria</i>
<i>Cirsium pitcheri</i>	<i>Solidago racemosa gillmanii</i>

The *Blowout* community can be viewed as a perturbation or break in the *Foredune* community, one which opens the lee side of the dunes to the direct influences of the heavy, sand-laden winds off the shore of Lake Michigan. The *Blowout* community, in its more advanced stages, extends often for hundreds of yards inland, and in age has strong affinities to the *Foredune* community—principally because the ecological forces under which it must thrive are very similar to those of the *Foredune*. The basic differences lie in that the *Blowout* community is usually characterized by herbaceous, often annual, biennial, or short-lived perennial species suggesting a relatively recent origin, in contrast to the more stable aspects of healthy *Foredune* communities.

Interestingly enough, the original land surveyors (see Bacone, Campbell, & Wilhelm, 1979) made little or no reference concerning the blowout phenomenon. Considering their contemporary size, and fundamentally seral nature, it is reasonable to suggest that the *Blowout*, as an important community, is more an artifact of postsettlement trauma than of some presettlement synecological scenario. In fact, of the blowouts studied by Olson (1958), most were postsettlement in origin [see also the points made by Cressey (1928) and Gates (1950), and the bewilderment reflected by Pepoon (1927, p.117)]. The only blowout mentioned by the original land surveyors, although their Section lines traversed several contemporary ones, was aged by Olson as in excess of 200 years; all the other blowouts aged by Olson are interpreted as fewer than 200 years of age.

Species typifying the seral nature of the *Blowout* community include:

<i>Andropogon scoparius</i>	<i>Cirsium pitcheri</i>
<i>Arabis lyrata</i>	<i>Corispermum hyssopifolium</i>
<i>Artemisia caudata</i>	<i>Elymus canadensis</i>
<i>Asclepias syriaca</i>	<i>Euphorbia corollata</i>
<i>Calamovilfa longifolia</i>	<i>Triplasis purpurea</i>

The more stabilized *Blowout* communities are characterized by long-lived perennials, many of which are also members of the *Foredune* community; these include:

<i>Arctostaphylos uva-ursi coactilis</i>	<i>Populus deltoides</i>
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<i>Celastrus scandens</i>	<i>Prunus pumila</i>
<i>Cornus stolonifera baileyi</i>	<i>Rhus radicans</i>
<i>Euphorbia polygonifolia</i>	<i>Salix syrticola</i>
<i>Juniperus communis depressa</i>	<i>Vitis riparia syrticola</i>

Marsh Complex

"Marsh," like "bog," is not a scientific word which brings immediately to mind a discrete plant community, but rather it is more a colloquial expression which denotes a place where one is sure to get his feet wet, or perhaps a place waterfowl like to frequent. The term "Marsh" is used here only for lack of a better word to describe the intricate complex of wet, open, non-forested, cartographically subresolute plant associations which have had to be mapped together on the Natural Area Vegetation Maps.

In the Lakeshore, the Marsh Complex includes several specific community types, all of which intergrade conceptually and floristically with each other, as well as with some of the other general community types; the *specific* community types include: *Fen*, *Marsh* (in a restricted sense), and a *Wet Prairie/Sedge Meadow* complex. The Marsh Complex, its floristic integrity being derived, in part at least, from regular fires during presettlement times, is an integral phase of the prairie milieu.

Fen is a term which, in the Chicago Region, is applicable to a wide range of plant communities, but there is one denominator common to all *Fens*: each *Fen* community typically manifests itself upon a basic (to circumneutral) substrate, the latter of which is saturated by minerotrophic, usually flowing water throughout the growing season. The substrate can range in character from exposed marl to deep peat. Characteristic *Fen* conditions are rare, however, in the Lakeshore. Interestingly enough, *Fen* conditions here are present in portions of the floating mat area south of Dune Acres known as "Cowles Bog" (see Kurz, 1928). Here, the open portion of the *Fen*, which occupies a small area north of the large *Typha Marsh* area, is typified by the following plants:

<i>Bidens coronata tenuiloba</i>	<i>Pedicularis lanceolata</i>
<i>Campanula aparinoides</i>	<i>Potentilla palustris</i>
<i>Dryopteris thelypteris pubescens</i>	<i>Rhamnus alnifolia</i>
<i>Galium obtusum</i>	<i>Salix glaucophylloides glaucophylla</i>
<i>Muhlenbergia glomerata</i>	<i>Scirpus acutus</i>

The wooded portion of the *fen*, while it has some floristic affinities to Bog, is codified as Swamp Complex (with which it also has affinities) on the Natural Area Vegetation Map for Survey Unit V. This *Wooded Fen* (not shown in Figure IV) is located at the southeast edge of the *Hydromesophytic Forest* (also codified as Swamp Complex), and north of the open area of *Fen*; characteristic plants of the *Wooded Fen* include:

<i>Caltha palustris</i>	<i>Pedicularis lanceolata</i>
<i>Chelone glabra</i>	<i>Rhus vernix</i>
<i>Cicuta maculata</i>	<i>Solidago patula</i>
<i>Fraxinus nigra</i>	<i>Symplocarpus foetidus</i>
<i>Larix laricina</i>	<i>Thuja occidentalis</i>

For a more detailed literature understanding of the relationships *Fens* share with Bogs, see the comments and references cited under Bog. Within the Chicago region, "Cowles Bog" remains singular among plant associations. Standard definitions of Bog, *Fen*, and Swamp

apply to the "Cowles Bog" area only in a context which recognizes the concept of uniqueness, and in a context which understands the folly inherent in attempting to apply, in dogmatic fashion, only one of but a few descriptive terms to each of all the multifarious but related plant associations.

The *Marsh* community, in a strict sense, is a non-forested community, the substrate of which is saturated by water for all or most of the growing season. Unfortunately, this condition provides habitat for a wide range of intergrading plant associations; their composition depends upon the nature of the soil, the alkalinity, stability of the water levels, the frequency of fire, the disturbance history, and other factors. Plants which serve as fuel for the regular fires in the *Marsh* community are largely comprised of members of the plant family Cyperaceae, including such rhizomatous perennials as:

<i>Carex aquatilis altior</i>	<i>Carex lasiocarpa americana</i>
<i>Carex comosa</i>	<i>Carex sartwellii</i>
<i>Carex haydenii</i>	<i>Carex stricta</i>
<i>Carex lacustris</i>	<i>Scirpus acutus</i>
<i>Carex lanuginosa</i>	<i>Scirpus validus creber</i>

Other plants which typify healthy *Marsh* community conditions are numerous, but include:

<i>Aster puniceus firmus</i>	<i>Potentilla palustris</i>
<i>Carex tribuloides</i>	<i>Proserpinaca palustris crebra</i>
<i>Decodon verticillatus</i>	<i>Rumex orbiculatus</i>
<i>Lysimachia thyrsoiflora</i>	<i>Scutellaria epilobiifolia</i>
<i>Polygonum hydropiperoides</i>	<i>Sium suave</i>

From the standpoint of the SPECIAL VEGETATION it is important to note that *Typha* spp. dominate in many of the Lakeshore *Marsh* communities today. *Typha* (cattail) was virtually unmentioned by the original land surveyors. Such a conspicuous, easily identifiable plant is bound to have attracted attention had it been an important plant in the *Marsh* community during presettlement times. The preemptory, widespread growth of cattail today suggests that, where it grows in abundance, and often to the near exclusion of other plants, it reflects a profound degree of habitat perturbation. Evidence suggests that two of the most significant factors in cattail success over other wetland plants are unstable water levels, and a prolonged lack of fire. Cattail, in addition, is among the few plants that can re-inhabit successfully wetland on which attempts have been made to farm, or on which heavy amounts of haying have occurred.

The *Sedge Meadow/Wet Prairie* complex is the conceptual and floristic intergrade between the *Marsh* community and the Mesophytic Prairie/Savanna Complex. In heavy soil regions, this intergradation is frequently gradual to the point of being scarcely definable floristically. In the predominantly sandy, well-drained soils of the Lakeshore, the intergradation is more abrupt, though specific floristic definition is again elusive; and specific definition may in fact be quite pointless inasmuch as the complex is dependent upon the ecological health of both the communities with which it usually is associated—namely, the *Marsh* community and the Mesophytic Prairie/Savanna Complex.

On the wetter end of the moisture gradient, the *Sedge Meadow*, sedges common to the *Marsh* community provide the fuel for regular fires; at the dryer end of the gradient, the *Wet Prairie*, fuel plants are more likely to be grasses, including *Andropogon gerardii*, *Calama-*

grostis canadensis, Calamagrostis inexpansa brevior, Panicum virgatum, and Spartina pectinata. Forbs which typify the *Sedge Meadow* include:

Aster junciformis	Hypericum virginicum fraseri
Bidens comosa	Lycopus uniflorus
Dryopteris thelypteris pubescens	Mentha arvensis villosa
Eupatorium perfoliatum	Polygonum punctatum
Galium obtusum	Polygonum sagittatum

In the Lakeshore, forbs which typify *Wet Prairie* are more likely to include the following plants:

Aletris farinosa	Cladium mariscoides
Gentiana crinita	Eleocharis melanocarpa
Juncus canadensis	Rubus hispidus obovalis
Ludwigia alternifolia	Sisyrinchium atlanticum
Oxypolis rigidior	Spiranthes cernua

Mesophytic Forest

Understanding Mesophytic Forest conditions, and the degree to which these conditions are manifest in a floristically fundamental way in any particular Lakeshore plant community, is critical to the evaluation of Cowlesian theories of dune succession; and in the assessment of the essential nature of the SPECIAL VEGETATION floristic elements--and the communities to which they belong.

In the midwestern Prairie Province--to which the southern edge of Lake Michigan (see Transeau, 1935) belongs--plant communities that are physiographically, or otherwise, protected from fire, can take on the arborescent appearance of Mesophytic Forest. They soon come under the profound influence of tree species such as *Acer saccharum*, *Fagus grandifolia*, and *Tilia americana*, which provide intense shade during the growing season, serve as a buffer against drying winds, enhance a moist microclimate, and moderate extremes of temperature--all ecological conditions which, when taken together, run generally counter to those preferred by local plant communities other than Mesophytic Forest.

Where there have been fundamental physiographic conditions which have discouraged or precluded the influence of fire, the Mesophytic Forest, as a rich plant community, has developed and thrived during presettlement times in the eastern portions of the Prairie Province--even as the prairie milieu itself was developing and thriving in areas more suitable nearby. Basic to this question is that both communities, as manifest in 1800, began development concomitantly, frequently encroaching each upon the other as they developed through several climate shifts (see Bacone, 1979) since the Wisconsinan Glacier. The degree to which Mesophytic Forest communities remained at a given geographic locus in 1800 was largely, I believe, an artifact of the degree to which the physiographic nature of that locus was able to retard fire over time.

The suppression of fire during the post-settlement period has indeed encouraged the development of woody species of the Mesophytic Forest in areas which for millennia had been communities other than Mesophytic Forest. Importantly, however, the encroachment of these woody species in a given area, one which is fundamentally Savanna, for example, does not necessarily mean that the area, as has been suggested by some other authors, is "succeeding

into climax forest"--except, perhaps, in a superficial sense. There is, in the opinion of this writer, more to a healthy Mesophytic Forest community than a few obvious trees. Unpublished studies locally show that an acre of Mesophytic Forest is likely to provide habitat for 70 or more different native plant species, most of them conservative to the Mesophytic Forest condition. Similar studies have shown that a given acre of prairie has a similar component of conservative species. When mesophytic tree species begin to manifest themselves in a community other than one which is fundamentally Mesophytic Forest, the conservative species begin to retire from that community, resulting ultimately in a floristically depauperate area which is poor in species of any kind, dominated instead by a few tree species under which grows very little. The more advanced "successionally" such a woodland becomes, the less likely it is to retain those plants which today we are here regarding as the elements of the SPECIAL VEGETATION.

Physiographic conditions suitable to a phase of Mesophytic Forest community prevailed, in the Lakeshore, upon steep, particularly northeast-facing, slopes; deep ravines; and other topographically extreme conditions. All of these conditions were more successful in retarding fire in the eastern portions of the lakeshore for reasons which were discussed earlier.

Plants which typify the Mesophytic Forest community in the Lakeshore include:

<i>Acer saccharum</i>	<i>Isopyrum biternatum</i>
<i>Brachyelytrum erectum</i>	<i>Mitella diphylla</i>
<i>Carpinus caroliniana virginiana</i>	<i>Polystichum acrostichoides</i>
<i>Dryopteris hexagonoptera</i>	<i>Solidago flexicaulis</i>
<i>Fagus grandifolia</i>	<i>Trillium flexipes</i>

Plants which typify more dry-mesophytic conditions include the following:

<i>Acer rubrum</i>	<i>Hepatica acutiloba</i>
<i>Arisaema atrorubens</i>	<i>Quercus rubra</i>
<i>Aster shortii</i>	<i>Sanguinaria canadensis</i>
<i>Caulophyllum thalictroides</i>	<i>Trillium recurvatum</i>
<i>Festuca obtusa</i>	<i>Viola pubescens</i>

Mesophytic Prairie

"Prairie" is a term which brings to mind various images depending upon one's ecological and geographical experience. In a broad, regional sense, the term "Prairie" can be said to apply to any treeless or nearly treeless terrestrial vascular plant community, the synecological integrity of which is maintained, in part at least, by fire. In most cases the prairie consists of numerous forbs admixed in a matrix of fuel species, such as grasses and sedges. The specific floristic composition of prairie changes from one physiographic scenario to another (in this regard see Curtis, 1959; Curtis & McIntosh, 1951; and Rohr & Potzger, 1951), ranging in character from wet to dry, on sandy, loamy, peaty, or clayey soils, within atmospherically moist to dry provinces.

Prairie, in the National Lakeshore, tends to sort out as some manifestation of either the Marsh Complex or the Savanna Complex (*sensu* the Natural Area Vegetation Maps, at least), largely because the well-drained nature of the soils strongly limits the extent to which Mesophytic Prairie, in the traditional sense (see Curtis, 1959; and Schulenberg, 1967), can manifest itself as a discrete synecological entity. The term Mesophytic Prairie, as a car-

tographic symbol on the Natural Area Vegetation Maps, is limited here to a couple of cases where an arbitrary choice has been made to indicate areas where Mesophytic Prairie conditions are present, at least to some extent; but, in both instances, the areas could have just about as meaningfully been codified as Marsh Complex or as Savanna Complex. In each case, Mesophytic Prairie species are integral components within an essentially *Wet Prairie/Savanna* Complex.

Plant species within the Lakeshore which typify Mesophytic Prairie conditions include:

<i>Andropogon gerardii</i>	<i>Parthenium integrifolium</i>
<i>Baptisia leucantha</i>	<i>Potentilla arguta</i>
<i>Bromus kalmii</i>	<i>Pycnanthemum virginianum</i>
<i>Cacalia atriplicifolia</i>	<i>Solidago riddellii</i>
<i>Eryngium yuccifolium</i>	<i>Sorghastrum nutans</i>

Panne

The term "Panne," as used in the Chicago region, refers quite specifically to the 8 or 10 calcareous (see Kurz, 1923), wet, interdunal depressions which have formed near the water table on the lee sides of the first or second line of dunes along Lake Michigan. The Panne community is now confined largely to the Miller and West Beach Survey Units within the National Lakeshore, though a western variant of the Panne community still exists at Clarke and Pine in the "ridge & swale" region of northwestern Lake County, Indiana.

The Panne communities are plant associations which are singular both in character and in floristic composition. They contain certain plant species which now grow nowhere else in either the Chicago region or the state of Indiana. Many of the Panne plant species are also conservative members of the marly *fens*--communities which are not represented in the Lakeshore--but the nature of the substrate saturation is more like that of the *Marsh* community than that of the *Fen*. The obvious floristic relationship between the *Fen* and the Panne, however, have inspired light use of the term "fenne" among local ecologists in recent years. "Fenne" is a term which, while perhaps a little perverse linguistically, captures rather well the integration of the two community concepts: "Panne" as used by Raunkiaer (1934), and Daubenmire (1968); and "Fen" as perceived locally.

The term "Panne" was perhaps first applied locally by Downing (1922), in which he described the Panne as an initial functionary in dune formation (probably in the sense of Cowles, 1899), in the following context:

"A dune, therefore, usually starts on some low-lying area near the shore where the land is sufficiently moist to allow many cottonwood seeds to germinate, yet far enough from the storm beach so the seedlings are not uprooted by the heavy waves. Such a low, moist germination bed is known as a panne. That cottonwoods are the predominant growth in such a locality is due to the fact that these poplars are the commonest trees in the neighborhood . . . and also because their seeds are small, tufted with silky pappus that insures their ready transportation by the wind."

Our experience with the Panne suggests that Pannes can reflect a long-standing stability in their own right, characterized by numerous conservative perennial species and aging Jack Pines (*Pinus banksiana*)--the latter apparently not always serving as nuclei for future dunes. Cottonwood (*Populus deltoides*), in addition, is rarely if ever the "predominant growth" in

contemporary Pannes. This writer does not doubt for a moment that the dunes have been borne out of interdunal depressions, but an ecological dogma erected around the premise that it is the ultimate fate of all interdunal depressions to give rise to dunes deserves careful scrutiny. Take note, for example, of the Tolleston-aged pannes at Inland Marsh; these are evident on the Survey Unit III map, Survey Area E.

Plants which typify the Panne community in the Lakeshore include:

Aster ptarmicoides	Lobelia kalmii
Carex garberi	Rhynchospora capillacea
Carex viridula	Sabatia angularis
Gentiana crinita	Scleria verticillata
Liparis loeselii	Utricularia cornuta

Savanna Complex

The Savanna Complex, as a general community type, includes all of the prairie phases in which trees are conspicuous elements. The spectrum runs conceptually from *Sand Prairie* (not shown in Figure IV) sparsely inhabited by Black Oak (*Quercus velutina*), to more mesophytic communities where a conceptually extreme phase of the prairies is manifest under White Oak (*Quercus alba*) and Shagbark Hickory (*Carya ovata*). The Black Oak phase intergrades with the open Marsh Complex and Mesophytic Prairie, particularly in the western portions of the Lakeshore; but as one proceeds eastward, the significance of Black Oak gives way to White Oak and Shagbark Hickory--and in some cases even Red Oak (*Quercus rubra*) and Bitternut Hickory (*Carya cordiformis*) become important, until the prairie, as a conceptual synecological entity, evaporates among fully Mesophytic Forest conditions.

There is also a curious relationship between the Black Oak Savanna and the forest communities of the Dune Complex--the distinctions between the Savanna Complex and the Dune Complex seem manifold, yet the interfaces are difficult to describe; indeed, much of the area codified on the Natural Area Vegetation Maps as Savanna Complex, in the Tremont area and points east, has strong floristic similarity to the *Lee Side Dune Forests* of the Dune Complex. The dearth of fire in recent years has profoundly obfuscated the presettlement character of both the Savanna Complex and the Mesophytic Forest--and probably also the Dune Complex. Plants which typify the *Sand Prairies*--which, it will be recalled, are cartographically submerged within the Savanna Complex category--include:

Andropogon scoparius	Krigia biflora
Arabis lyrata	Linaria canadensis
Asclepias amplexicaulis	Opuntia humifusa
Carex muhlenbergii	Polygonum tenue
Koeleria cristata	Viola pedata lineariloba

In those areas where Black Oak becomes an important element, the following species are likely to be quite apparent:

Aquilegia canadensis	Liatris aspera
Aralia nudicaulis	Lupinus perennis occidentalis
Aster linariifolius	Maianthemum canadense interius
Carex pensylvanica	Tephrosia virginiana
Diervilla lonicera	Vaccinium angustifolium laevifolium

As Black Oak begins to give way, the following species often co-increase in importance with White Oak:

Apocynum androsaemifolium	Gerardia pedicularia ambigens
Corallorhiza odontorhiza	Lespedeza hirta
Danthonia spicata	Monotropa uniflora
Galium pilosum	Prenanthes alba
Gerardia flava	Sassafras albidum

In areas where White Oak and Hickory together become the principal trees, the Savanna Complex begins to take on a more mesophytic aspect; this developing mesicity is perhaps typified by an increase in the importance of the following plants:

Anemone quinquefolia interior	Phlox divaricata
Anemonella thalictroides	Polemonium reptans
Carex rosea	Polygonatum canaliculatum
Claytonia virginica	Smilax tamnoides hispida
Galium concinnum	Trillium recurvatum

Swamp Complex

The term "Swamp," as used here, applies to wooded wetlands in which a non-floating substrate is kept moist by ground water or rain all, or nearly all, throughout the growing season. The distinction here between Swamp Complex and Bottomland (which see) is quite clear, but the distinction between Swamp Complex and the Bog/*Fen* Complex can be far less than absolute. Generally speaking, the Bog, and certain phases of the *Fen*, are developed locally on a floating mat of peat, the vascular vegetation of which is often herbaceous or shrubby, and/or with scattered conifers—principally Tamarack (*Larix laricina*) and American Arbor-vitae (*Thuja occidentalis*). The degree to which such conditions intergrade with firmer-footed forested communities, typified by certain phases of the Swamp Complex, is the degree to which distinctions become obscure. See herein the earlier discussions under Bog and Marsh Complex, those by Curtis (1959), and those by Dansereau & Segadas-Vianna (1952), with regard to the successional relationships between Bog and Swamp.

In the Lakeshore, the Swamp Complex, as a cartographic general community type, potentially includes three essential, though often intergrading, phases: the *Hydromesophytic Forest*, the *Conifer Swamp*, and the *Pin Oak (Quercus palustris) Flat*.

The *Hydromesophytic Forest*, as the name implies, is characterized by a singular mix of Mesophytic Forest species, some of the species common to both the bogs and the *Fens*, several of the more shade-tolerant *Marsh* community species, as well as a few species which are more conservative to the boreal forests of northern Wisconsin and Michigan. Within the Lakeshore, the *Hydromesophytic Forests* are found principally along the subdunal margins of the Great Marsh and Sag areas.

Species which are more typical of the *Hydromesophytic Forest*, but are also important in the Mesophytic Forest, include:

Actaea pachypoda	Cornus alternifolia
Allium tricoccum	Dryopteris hexagonoptera
Aster macrophyllus	Fagus grandifolia

Brachyelytrum erectum
Conopholis americana

Quercus rubra
Viburnum acerifolium

Hydromesophytic Forest species which are also typical of the boreal forest, though not necessarily relict, include:

Acer rubrum
Carex crinita
Carex intumescens
Chrysosplenium americanum
Coptis groenlandica

Dryopteris noveboracensis
Habenaria clavellata
Maianthemum canadense canadense
Panax trifolius
Trientalis borealis

Hydromesophytic Forest community species which are also shade-tolerant *Marsh* community species include:

Bidens cernua
Cardamine bulbosa
Cicuta maculata
Dryopteris thelypteris pubescens
Eupatorium fistulosum

Habenaria lacera
Onoclea sensibilis
Polygonum hydropiperoides
Senecio aureus
Sium suave

Some of the species which typically inhabit *Fen* conditions in the Chicago Region, but which are also important members of the *Hydromesophytic Forest* community in the Lakeshore, include:

Aster umbellatus
Caltha palustris
Chelone glabra
Cicuta bulbifera
Fraxinus nigra

Polygonum arifolium pubescens
Saxifraga pensylvanica
Solidago patula
Symplocarpus foetidus
Viola pallens

The *Hydromesophytic Forest* community intergrades floristically and synecologically with the *Conifer Swamp*, the latter of which, in the Lakeshore, is the conceptual intergrade between the *Hydromesophytic Forest* and the Bog. Species characterizing this phase of the *Hydromesophytic Forest* locally include:

Acer rubrum
Betula lutea
Glyceria canadensis
Ilex verticillata
Osmunda regalis spectabilis

Pinus strobus
Rhus vernix
Saururus cernuus
Vaccinium atrococcum
Viola pallens

The *Conifer Swamp* is poorly developed as an entity in the Lakeshore today, probably having been nearly obliterated locally by logging and draining years ago. As perceived by this writer, the *Conifer Swamp* was, as stated above, a conceptual and floristic intergrade between the bog and the *Hydromesophytic Forest*. Plants which are usually found in wet areas where White Pines (*Pinus strobus*) are important include:

Acer rubrum
Betula lutea
Chamaedaphne calyculata angustifolia
Drosera rotundifolia
Larix laricina

Nemopanthus mucronata
Osmunda regalis spectabilis
Rhus vernix
Sarracenia purpurea
Vaccinium macrocarpon

Another phase of the Swamp Complex is the *Pin Oak Flat*. The *Pin Oak Flat* seems to be as much related to the *Hydromesophytic Forest* as it is to the certain phases of the Savanna Complex, though it does not particularly appear intermediate between the two, either conceptually or floristically. Its floristic composition, nevertheless, while today not very rich, is largely derived from species which are also members of either the more mesophytic phases of the Savanna Complex or certain phases of the *Hydromesophytic Forest*.

The *Pin Oak Flat* community usually develops in sandy depressions, often amidst Savanna, which are either low enough topographically to allow the substrate to be kept moist by ground water which is brought to the surface by capillary action, or kept moist by rain water which, unable to drain away through an impervious subsoil, lingers in the substrate. In the latter case, if the flat is bowl-shaped topographically, a pond can manifest itself in the lowest area, with the edges of the "bowl" intergrading, often imperceptibly, into the adjacent Savanna community on the higher ground.

The character of the subsoil, and perhaps also the degree to which organic matter has accumulated, determines, in part at least, the length of time water will saturate the substrate; but in most cases, the *Pin Oak Flat* becomes dry during the summer months, probably as a result of a combination of factors, including eventual drainage, evaporation, and transpiration. It is not clear to me why the contemporary *Pin Oak Flat* community is so relatively depauperate, but those few conservative species which remain from the *Pin Oak Flat* community are likely to be found on fallen logs, buttresses, and among the hummocks formed by Buttonbush (*Cephalanthus occidentalis*) colonies.

Plants which typify the *Pin Oak Flat* in the Lakeshore include:

<i>Bidens discoidea</i>	<i>Nyssa sylvatica</i>
<i>Carex virescens</i>	<i>Osmunda cinnamomea</i>
<i>Cephalanthus occidentalis</i>	<i>Quercus palustris</i>
<i>Lindera benzoin</i>	<i>Spiraea alba</i>
<i>Lycopus uniflorus</i>	<i>Vaccinium corymbosum</i>

FIGURE V: Floristic elements of the Special Vegetation and the general community type, from the Natural Area Vegetation Map, wherein they are most likely to occur. The general community types are represented by the following abbreviations: aq = aquatic, bo = bog, bf = bottomland forest, dc = dune complex, fd = foredune complex, ma = marsh complex, mf = mesophytic forest, mp = mesophytic prairie, pa = panne, sa = savanna complex, sw = swamp complex.

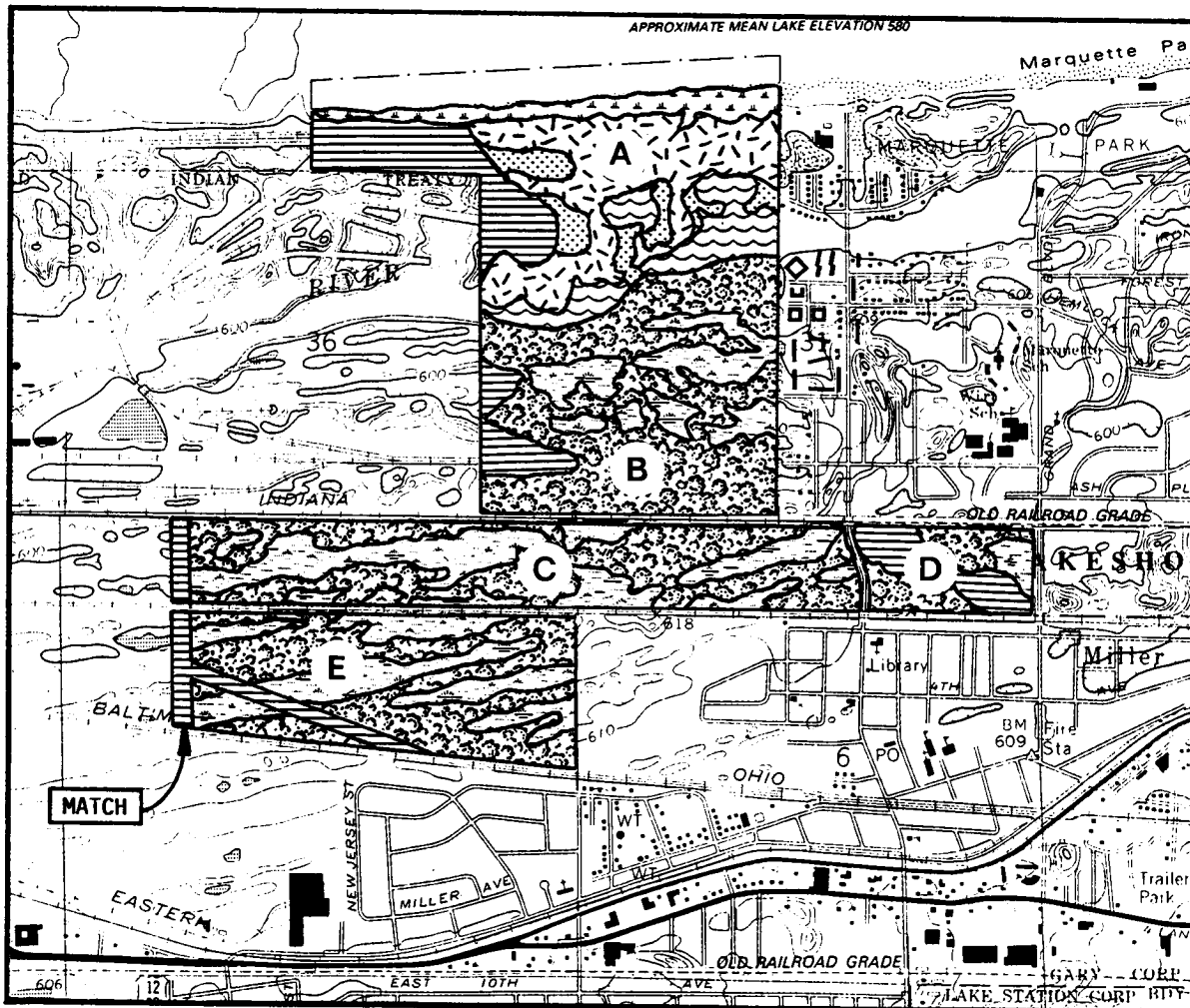
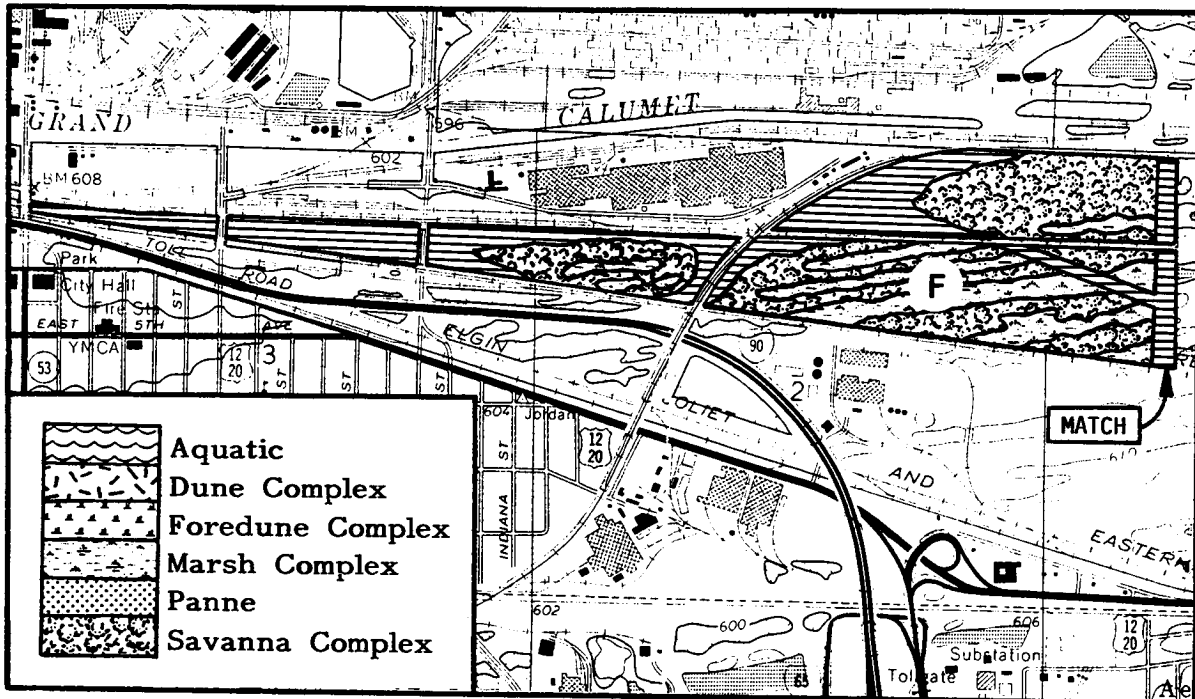
General Community Type												Special Vegetation
aq	bo	bf	dc	fd	ma	mf	mp	pa	sa	sw		Floristic Elements
						mf						<i>Actaea rubra</i>
						mf						<i>Adiantum pedatum</i>
										sw		<i>Alnus rugosa americana</i>
			dc									<i>Amelanchier humilis</i>
				fd								<i>Ammophila breviligulata</i>
	bo											<i>Andromeda glaucophylla</i>
						mf						<i>Aplectrum hyemale</i>
									sa			<i>Arabis glabra</i>
			dc									<i>Aralia hispida</i>
						mf						<i>Aralia racemosa</i>

General Community Type											Special Vegetation
aq	bo	bf	dc	fd	ma	mf	mp	pa	sa	sw	Floristic Elements
										sw	Carex intumescens
					ma						Carex laevivaginata
						mf					Carex laxiculmis
						mf					Carex leptoneuria
bo											Carex limosa
bo											Carex oligosperma
						mf					Carex pedunculata
						mf					Carex prasina
										sw	Carex seorsa
					ma						Carex subimpressa
									sa		Carex tosa
bo											Carex trisperma
									sa		Carya glabra
		bf									Carya laciniosa
									sa		Carya ovalis
							mp				Castilleja coccinea
			dc								Celtis tenuifolia
bo											Chamaedaphne calyculata angustifolia
			dc								Chimaphila maculata
			dc								Chimaphila umbellata cisatlantica
										sw	Chrysosplenium americanum
										sw	Circaea alpina
				fd							Cirsium pitcheri
								pa			Cladium mariscoides
									sa		Comptonia peregrina
										sw	Conopholis americana
										sw	Coptis groenlandica
			dc								Corallorhiza maculata
			dc								Corallorhiza odontorhiza
										sw	Cornus canadensis
			dc								Cornus rugosa
							mp				Corydalis sempervirens
					ma						Cyperus engelmannii
bo											Cypripedium acaule
					ma						Cypripedium calceolus parviflorum
										sw	Cypripedium calceolus pubescens
							mp				Cypripedium candidum
										sw	Cypripedium reginae
									sa		Desmodium ciliare
									sa		Desmodium rotundifolium
									sa		Diervilla lonicera
bo											Drosera intermedia
bo											Drosera rotundifolia
						mf					Dryopteris hexagonoptera
										sw	Dryopteris noveboracensis
								pa			Eleocharis geniculata
							mp				Eleocharis melanocarpa
					ma						Eleocharis microcarpa filiculmis
					ma						Eleocharis pauciflora fernaldii
					ma						Eleocharis rostellata

General Community Type											Special Vegetation
aq	bo	bf	dc	fd	ma	mf	mp	pa	sa	sw	Floristic Elements
					ma						Eleocharis wolffii
			dc								Epigaea repens glabrifolia
					ma						Epilobium strictum
								pa			Equisetum variegatum
										sw	Eriocaulon septangulare
					ma						Eriophorum angustifolium
bo											Eriophorum spissum
bo											Eriophorum virginicum
					ma						Eupatorium fistulosum
			dc								Eupatorium sessilifolium brittonianum
				fd							Euphorbia polygonifolia
							mp				Fimbristylis drummondii
						mf					Fraxinus americana biltmoreana
					ma						Fuirena pumila
					ma						Galium brevipes
					ma						Galium labradoricum
						mf					Galium lanceolatum
					ma						Galium trifidum
			dc								Gentiana flavida
							mp				Gentiana puberula
							mp				Gentiana saponaria
							mp				Geranium bicknellii
							mp				Gerardia auriculata
					ma						Glyceria borealis
										sw	Glyceria pallida
			dc								Goodyera pubescens
bo											Habenaria ciliaris
										sw	Habenaria clavellata
					ma						Habenaria flava herbiola
			dc								Habenaria hookeri
					ma						Habenaria hyperborea huronensis
							mp				Habenaria lacera
										sw	Habenaria psycodes
			dc								Habenaria viridis bracteata
			dc								Hudsonia tomentosa
bo											Hydrocotyle umbellata
								pa			Hypericum kalmianum
bo											Isotria verticillata
					ma						Juncus articulatus
								pa			Juncus balticus littoralis
					ma						Juncus diffusissimus
					ma						Juncus pelocarpus
					ma						Juncus scirpoides
				fd							Juniperus communis depressa
			dc								Lactuca hirsuta
				fd							Lathyrus japonicus glaber
			dc								Lathyrus ochroleucus
									sa		Lathyrus venosus
									sa		Lechea stricta
							mp				Lilium philadelphicum andinum

General Community Type											Special Vegetation
aq	bo	bf	dc	fd	ma	mf	mp	pa	sa	sw	Floristic Elements
					ma						Polygonum arifolium pubescens
					ma						Polygonum careyi
					ma						Polygonum opelousanum adenocalyx
			dc								Polypodium virginianum
								sa			Polytaenia nuttallii
			dc								Populus balsamifera
				fd							Populus X jackii
aq											Potamogeton diversifolius
aq											Potamogeton pulcher
				fd							Potentilla anserina
								pa			Potentilla fruticosa
	bo				ma						Potentilla palustris
							mp				Prenanthes aspera
			dc								Prunus pensylvanica
					ma						Psilocarya scirpoides
			dc								Pyrola elliptica
			dc								Pyrola rotundifolia americana
			dc								Pyrola secunda
					ma						Rhamnus alnifolia
					ma						Rhexia virginica
				fd							Rhus aromatica arenaria
bo										sw	Rhus vernix
bo											Rhynchospora alba
					ma						Rhynchospora globularis recognita
					ma						Rhynchospora macrostachya
										sw	Ribes hirtellum
										sw	Rubus pubescens
								pa			Sabatia angularis
					ma						Sagittaria rigida
					ma						Salix candida
					ma						Salix lucida
bo											Salix pedicellaris hypoglaucia
					ma						Salix sericea
				fd							Salix syrticola
						mf					Sanicula trifoliata
bo											Sarracenia purpurea
								pa			Satureja arkansana
bo											Scheuchzeria palustris americana
					ma						Scirpus hallii
					ma						Scirpus polyphyllus
					ma						Scirpus purshianus
					ma						Scleria pauciflora caroliniana
					ma						Scleria reticularis
								pa			Scleria verticillata
			dc								Selaginella rupestris
									sa		Senecio plattensis
					ma						Sisyrinchium angustifolium
					ma						Sisyrinchium atlanticum
			dc								Smilax rotundifolia
				fd							Solidago racemosa gillmani

General Community Type										Special Vegetation	
aq	bo	bf	dc	fd	ma	mf	mp	pa	sa	sw	Floristic Elements
					ma						Sparganium americanum
							mp				Spiranthes lacera
										sw	Spiranthes lucida
									sa		Stachys hyssopifolia
			dc								Stipa avenacea
							mp				Strophostyles leiosperma
						mf					Stylophorum diphyllum
									sa		Talinum rugospermum
										sw	Thuja occidentalis
									sa		Tradescantia subaspera
									sa		Trichostema dichotomum
										sw	Trientalis borealis
						mf					Trillium cernuum macranthum
										sw	Triphora trianthophora
								pa			Utricularia cornuta
bo											Utricularia geminiscapa
					ma						Utricularia gibba
					ma						Utricularia minor
					ma						Utricularia purpurea
								pa			Utricularia subulata
bo										sw	Vaccinium atrococcum
bo											Vaccinium macrocarpon
bo											Vaccinium oxycoccos
						mf					Valerianella chenopodifolia
					ma						Veronica comosa
			dc								Viola canadensis
									sa		Viola fimbriatula
						mf				sw	Viola incognita forbesii
										sw	Viola pallens
					ma						Viola primulifolia
						mf					Viola rostrata
			dc								Vitis labrusca
										sw	Woodwardia areolata
bo											Woodwardia virginica
										sw	Xyris caroliniana
					ma						Xyris torta
					ma						Zizania aquatica



SURVEY UNIT I MAP

SURVEY UNIT I: MILLER

This Survey Unit occupies about 870 acres north and west of Miller, west of Marquette Park (see Figure II). The Unit is divided into eight Survey Areas. Survey Area A was surveyed on the third of August 1978, during an environmental impact assessment involving the Gary Marina Project (see Swink, Schulenberg & Wilhelm, 1978). Survey Areas B - E were surveyed in 1979, on June 9, 10, 14, and 20; July 7; and September 12 and 23. Survey Area F is a recent addition to the Indiana Dunes National Lakeshore; it was surveyed on July 7 and 10, 1985, October 5, 1987, and again August 14, 1989. I was accompanied at various times during these surveys by John Bacone, Robert F. Betz, Ken Dritz, Norm Henderson, Craig Johnson, Wayne Lampa, Elizabeth Shimp, and Linda Wetstein.

The Survey Unit Map was superimposed to scale over a part of the U.S.G.S. Gary Quadrangle, 41087-E3-TF-024/7.5, 1968, photo-revised 1986. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a color oblique set flown in May, 1978; a black & white stereo-pair set (BFJ-IV: 35 & 36; 96 & 97) flown in June, 1958; a color stereo-pair set (79-117: 5-7; 102-106) flown in May, 1979; and a black & white stereo-pair set (3:1-5; 4:1-7; 5:1-9) flown May, 1984.

As mentioned earlier, older herbarium specimens from the Miller area are often difficult to place with regard to specific National Park holdings, as circumscribed in Survey Units 1, 2, and 3, all of which units are in the immediate Miller area. Many of the old Miller collection sites are now obliterated (Floyd Swink, personal communication); many others are described with considerable ambiguity.

I have excluded several potential SPECIAL VEGETATION floristic elements from the Miller Unit, perhaps too arbitrarily, because their herbarium labels render ambiguously the geographic location from which they were collected. *Arethusa bulbosa*, for example, was collected both by Bastin and by Grassly, in June of 1879 at "*Millers Station*;" and again by Umbach in 1897 at "*Millers, slough borders*." *Rhynchospora globularis* var. *recognita* was collected by Umbach August 6, 1908 in "*Swales, Millers*." *Selaginella rupestris* was collected in 1878 at "*Millers, sand hills*" by E.J. Hill; and *Gerardia grandiflora* var. *pulchra* was collected by Umbach in 1897 at "*Millers woods*." Umbach also collected *Celtis tenuifolia* at "*Dunes, Millers*" in 1899. All of these plants, and a few others, could be construed as having grown within the contemporary boundaries of the Indiana Dunes National Lakeshore, but it is simply impossible to know for certain, and the likelihood is that they did not. There is a specimen of *Clintonia borealis*¹ at the Field Museum, collected from "*Swamp, Millers*." It is likely that it was south of the Miller Unit in a now-destroyed Hydromesophytic Swamp.

There are additional Umbach specimens, collected at "Miller," of several SPECIAL VEGETATION floristic elements known from elsewhere in the Indiana Dunes National Lakeshore. These include *Calopogon pulchellus*, *Campanula rotundifolia*, *Comptonia peregrina*, *Desmodium ciliare*, *Hudsonia tomentosa*, *Juniperus communis* var. *depressa*, and *Rhexia virginica*, all in MOR. Unfortunately their label data is not specific enough to place them within this Survey Unit. Deam (1940) reported *Scleria pauciflora* var. *caroliniana* from "Miller." A report of *Eleocharis rostellata* from this Survey Unit (Wilcox & Simonin,

¹See also the comments concerning the recent discovery of this plant south of Survey Unit III.

1987) probably is based either upon a misidentification or a typographical error; there is no voucher specimen at INDU.

I have accepted, on the other hand, several other species, the specimen labels of which were just as ambiguous, because there is some contemporary evidence to suggest that they may indeed have been collected within lands held by the Lakeshore.

ANNOTATED LIST OF SPECIAL VEGETATION FLORISTIC ELEMENTS

Ammophila breviligulata Fern. Common along the upper Beach and lower Foredune communities of the Survey Area A. REPRESENTATIVE SPECIMEN: *Wilhelm & Bacone* #5198, 3 AUG 1978; east of Gary in Miller, along the dunes and around the interdunal ponds west of the U.S. Navy & Marine recruiting station. MOR. Peattie (1922), Hooper (1934), and Parker (1936) considered this species to have ancestral affinities to the Atlantic coastal plain.

Arctostaphylos uva-ursi var. ***coactilis*** Fern. & Macbr. Bearberry is occasional in Survey Areas A and B, particularly around the larger Pannes. REPRESENTATIVE SPECIMEN: *Smith* #751, 27 APR 1969; Indiana Dunes, near community of Miller, Gary, sandy flats along permanent pond of the third interdunal depression. MOR. Parker (1936) considered local populations of this species to be boreal relicts.

Arenaria stricta Michx. I have not seen this species in the Lakeshore, though it is still extant a little further west at the Clarke & Pine Nature Preserve. REPRESENTATIVE SPECIMEN: *Umbach* #5510, 28 JUN 1912; Dunes, vicinity of Millers (within the city limits of Gary). MOR.

Aristida intermedia Scribn. & Ball. False Arrow Feather was first seen locally by Umbach in 1915, and not reported again until Dritz (1989) noted having seen it in Survey Area A September 25, 1988. REPRESENTATIVE SPECIMEN: *Umbach s.n.*, SEP 1915; Millers, low sand flats. MOR.

Asclepias viridiflora Raf. This rare milkweed is known from this Survey Unit solely on the basis of the following REPRESENTATIVE SPECIMEN: *Hiebert* #524, 7 JUL 1988; along trail to beach in Miller Woods ca 75 m S of Grand Calumet Lagoon crossing, NW SW Sec.31 T37N R7W, in oak savanna along sandy dune crest, 8 individuals seen within 10 m² area, with *Carex pensylvanica*, *Ceanothus americana*, *Quercus velutina*, and *Rhus arenaria*. INDU.

Aster junciformis Rydb. Frequent in wet calcareous sands.

Aster ptarmicoides (Nees) T. & G. Bowles *et al.* (1986a) discussed the occurrence of this species in Survey Area A where it grows with *Andropogon scoparius*, *Cladium mariscoides*, *Eleocharis elliptica*, *Fragaria virginiana*, *Hypericum kalmianum*, *Juncus balticus* var. *littoralis*, *Linum medium* var. *texanum*, *Panicum implicatum*, *P. virgatum*, and *Pinus banksiana*. According to Bowles (1989), the Miller population is remaining stable. The following REPRESENTATIVE SPECIMEN is from Survey Area B: *Jones* #51, 20 AUG 1981; Indiana Dunes National Lakeshore, Miller Woods; W Sec.31 T37N R7W; common in sandy oak savanna in open areas between dunes. MOR.

Betula populifolia Marsh. The taxonomy of local populations of Gray Birch presents us with a frustrating problem. Voss (1985) pointed out that most of the Michigan specimens have the merely acuminate leaves and larger pistillate scales of **B. pendula**, an Old World birch commonly cultivated locally. This observation appears to be valid in the Chicago region as well. We have a specimen from St. Joseph County, Indiana, which appears to be genuine **B. populifolia**, and Deam (1940) believed it to be native to Lake and La Porte counties. Most of the current populations in the dunes region today, however, are young trees and appear to be referable to **B. pendula**. Until we are more certain of the taxonomy, I will regard the Gray Birch as a member of the SPECIAL VEGETATION conditionally. If, in fact, it is a European weed, then its presence at any particular site takes on a completely different significance. REPRESENTATIVE SPECIMEN: *Kjellmark #111, 10 JUN 1988; locally infrequent tree in a small stand in sand of a foredune-panne community. In sand mound between two Miller Woods pannes; SW SW Sec.31 T37N R7W; growing with **Rhus aromatica**, **Hypericum kalmianum**, **Cornus stolonifera**, **Arctostaphylos uva-ursi** var. **coactilis**, and **Ptelea trifoliata**; appears to be a spontaneous population and is reproducing.* MOR.

Cakile edentula (Bigel.) Hook. Occasional along the Beach in Survey Area A. REPRESENTATIVE SPECIMEN: *Wilhelm & Bacone #5197, 3 AUG 1978; East of Gary in Miller, along the dunes and around the interdunal ponds west of the U.S. Navy & Marine recruiting station.* MOR. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Carex alata T. & G. Occasional in wet sandy swales; seen in Survey Areas C and F. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Carex aurea Nutt. Restricted locally to the Pannes in Survey Area A. REPRESENTATIVE SPECIMEN: *Steyermark, 14 SEP 1947; dune W of Miller, N of Highway 12, near Lake Michigan, swales in dunes with **Gentiana crinita**.* F.

Carex foenea Willd. Seen locally only in Survey Area C, this species is not as rare as we (Swink & Wilhelm, 1979) once thought. We now know it to occur occasionally in sandy Black Oak savanna in northwest Indiana generally. REPRESENTATIVE SPECIMEN: *Wilhelm #6806, 10 JUN 1979; in Miller, W of Lake Street, in the savanna between the Indiana Harbor Belt Line and the Penn Central.* MOR.

Carex garberi Fern. This species is still extant in the Pannes in Survey Area A, and evidently in Survey Area C, from where was collected the following REPRESENTATIVE SPECIMEN: *O'Brien #36, 17 JUN 1985; T36N R7W NW Sec.6; found in Miller Woods Area VI.* INDU.

Carex tonsa (Fern.) Bickn. Occasional in the Black Oak Savannas and Sand Prairies of Survey Areas B and C; only known location in Lake County, Indiana. REPRESENTATIVE SPECIMEN: *Wilhelm #6793, 9 JUN 1979; in Miller, W of Lake Street, in the savanna between the Indiana Harbor Belt Line and the Penn Central.* MOR.

Castilleja coccinea (L.) Spreng. Infrequent in Survey Areas A, B, and C. REPRESENTATIVE SPECIMEN: *Hiebert & Payton #274, 14 MAY 1982; locally common in sand of oak savanna on ridge & swale, Miller Woods, T37N R7W NW SW Sec.31.* MOR.

Cirsium pitcheri (Torr.) T. & G. This species is still extant in Survey Area A, from where reported by Bowles *et al.* (1986a). They give it as occurring with **Andropogon scoparius**, **Artemisia caudata**, **Calamovilfa longifolia**, **Populus deltoides**, **Prunus pumila**, **Rhus aromatica**, and **Solidago racemosa** var. **gillmani**. This species is endemic to the sand dunes of the Great Lakes. Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain, but Loveless & Hamrick (1988) reasoned that its affinities are in the great plains.

Cladium mariscoides (Muhl.) Torr. Occasional in calcareous swales, probably throughout the Survey Unit, but particularly common in the Pannes of Survey Area A. Wilcox & Simonin (1987) also reported it from Survey Areas C and E. REPRESENTATIVE SPECIMEN: *Wilhelm & Bacone #5205, 3 AUG 1978; east of Gary in Miller, along the dunes and around the interdunal ponds west of the U.S. Navy & Marine recruiting station.* MOR. McLaughlin (1932) considered this species to have ancestral affinities to the Atlantic coastal plain.

Cornus rugosa Lam. This Survey Unit provides scarcely the mesicity preferred by this species. The report here is based on the sighting of a single sapling in Survey Area C in 1979; I was unable to relocate the plant on subsequent visits; it was growing near the base of a steep north-facing sand ridge slope. Trefz (1935), Welch (1935), and Friesner (1936) all considered this species to be a boreal relict.

Cypripedium acaule Ait. Probably now extinct in Survey Unit I, if indeed it ever actually grew within its boundaries. REPRESENTATIVE SPECIMEN: *Chase, 25 MAY, 1898; in dune region NW of Miller, moist glen.* F.

Diervilla lonicera Mill. Though absent from Survey Area A, this species is common throughout the Miller Unit in the black oak savannas. REPRESENTATIVE SPECIMEN: *Wilhelm #6790, 9 JUN 1979; in Miller, west of Lake St., in the savanna between the Indiana Harbor Belt Line and the Penn Central.* MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Drosera intermedia Hayne I have not seen this species here, but the potential habitat is here yet, suggesting that the following record might be significant. REPRESENTATIVE SPECIMEN: *Umbach s.n., 17 JUL 1896 & 4 SEP 1897; Millers, sloughs, marshes.* F. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Eleocharis geniculata (L.) R. & S. This little spike rush is known from the western-most Panne in Survey Area A. Bowles *et al.* (1985) gave the following associates: **Carex viridula**, **Cyperus rivularis**, **Eleocharis elliptica**, **Hypericum kalmianum**, **Juncus balticus** var. **littoralis**, **J. marginatus**, **Lobelia kalmii**, and **Triglochin maritima**. According to Bowles (1989), the Miller population of this species manifests no change since 1985. REPRESENTATIVE SPECIMEN: *Hess et al. #6012, 4 SEP 1984; Indiana Dunes National Lakeshore, Miller Woods & U.S.12, pannes and dunes west of beach parking lot, locally common in area at edge of panne.* MOR. Peattie (1922) considered this species to have ancestral affinities to the Atlantic coastal plain.

Eleocharis pauciflora var. **fernaldii** Svenson This very rare little spike rush is still extant in the Pannes of Survey Area A. REPRESENTATIVE SPECIMEN: *Dritz #77, 26 MAY 1980; abundant in a sandy swale ca 600' from Lake Michigan and 2000' W of Lake St., NW of Miller, NW NW Sec.31 T37N R7W. With Carex viridula, Carex garberi, Scirpus ameri-*

canus, *Eleocharis compressa*, *Juncus balticus* var. *littoralis*, *Erigeron philadelphicus*, *Eupatorium perfoliatum*, *Populus deltoides*, *Senecio pauperculus* var. *balsamitae*, *Salix syrticola*, *S. amygdaloides*, *S. interior*, *S. rigida*, *Fragaria virginiana*, *Cornus stolonifera* var. *baileyi*, *Equisetum arvense*, *Hypericum kalmianum*, *Liparis loeselii*, *Sabatia angularis*, *Lycopus americanus*, *Triglochin maritima*, and *Typha angustifolia*. MOR.

Equisetum variegatum Schleich. Bowles et al. (1985) recorded this species from an "early successional disturbed panne" in Survey Area A. There it grows with its hybrid with *Equisetum hyemale* var. *intermedium* (*E. X nelsonii*), *Eupatorium perfoliatum*, *Fragaria virginiana*, *Hypericum kalmianum*, *Juncus balticus* var. *littoralis*, *Lythrum alatum*, *Panicum virgatum*, *Scirpus americanus*, and *Senecio pauperculus* var. *balsamitae*. REPRESENTATIVE SPECIMEN: Swink s.n., 9 SEP 1947; Miller, west of Lake Street. MOR.

Euphorbia polygonifolia L. Still occasional in the Foredune Complex and Dune Complex portions of Survey Area A where one of its populations is being monitored by the Indiana Dunes National Lakeshore (Bowles et al. 1986a). According to Bowles (1989), the Miller population of this species has declined significantly. REPRESENTATIVE SPECIMEN: Schulenberg & Wilhelm s.n., 5 SEP 1974; at Miller ca 0.25 mi W of Lake Street in an interdunal depression with *Calamovilfa longifolia*, *Triplasis purpurea*, and *Helianthus petiolaris*. MOR. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Glyceria borealis (Nash) Batchelder First collected in the Unit by Umbach in 1896, it was rediscovered by Sandy O'Brien (#63, INDU) in Pond 37 of Survey Area C. It is also now known from Survey Area F, from where was collected the following REPRESENTATIVE SPECIMEN: Wilhelm #12953, 10 JUL 1985; north of Aetna, west of Miller, in the dune and swale area just west and south of the current boundaries [now within] of the Indiana Dunes National Lakeshore; growing in interdunal swale. MOR. Parker (1936) considered this species to have ancestral affinities to the northern forests.

Habenaria ciliaris (L.) R. Br. Now probably extinct within this Survey Unit, if indeed it ever actually grew here. REPRESENTATIVE SPECIMEN: Umbach #2357, 16 JUL 1908; vicinity of Millers, within city limits of Gary, swales. MOR.

Habenaria clavellata (Michx.) Spreng. Now probably extinct within this Survey Unit, if indeed it ever actually grew here. REPRESENTATIVE SPECIMEN: Umbach s.n., 20 JUL 1898; Millers, swales. F. Friesner (1936) considered this species to be a boreal relict.

Habenaria flava var. *herbiola* (R.Br.) Ames & Correll Possibly still extant somewhere within the Marsh Complex portions of this Survey Unit. REPRESENTATIVE SPECIMEN: Swink s.n., 21 JUN 1952; near the Baltimore & Ohio Railroad W of Lake Street in the Miller section of Gary, moist open ground. MOR.

Habenaria hyperborea var. *huronensis* (Nutt.) Farw. This species was recorded by Bowles et al. (1986a) as growing in a "mesic panne" in Survey Area A with *Cladium mariscoides*, *Hypericum kalmianum*, *Juncus balticus* var. *littoralis*, *Pinus banksiana*, *Populus deltoides*, *Rhynchospora capillacea*, *Salix glaucophylloides* var. *glaucophylla*, and *S. syrticola*. REPRESENTATIVE SPECIMEN: Otto #29, 18 JUN 1982; on small peninsula in panne in Miller Woods, S of pond 22; T37N R7W SW NW Sec.31. MOR. Welch (1935) considered this species to be a boreal relict.

Habenaria psycodes (L.) Spreng. This rare and comely fringed orchid is recorded from Survey Area C by Peloquin et al. (1986).

Hypericum kalmianum L. This St. John's Wort is occasional to frequent in moist sands in swales. REPRESENTATIVE SPECIMEN: *Wilhelm #1517, 5 SEP 1974; growing in a panne at the dunes in Miller, east of Gary, Indiana.* MOR.

Juncus balticus var. *littoralis* Engelm. This species is frequent throughout the Survey Unit in moist sands and swale margins. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Juncus diffusissimus Buckl. Until the remarkable discovery of this southern species by Sandy O'Brien in Survey Area C, this rush was unknown from northern Indiana (Deam, 1940) and the Chicago Region (Swink & Wilhelm, 1979). Recent attempts to locate the plant have been unsuccessful, though the single specimen upon which the record is based contains only a fraction of the rootstock. REPRESENTATIVE SPECIMEN: *O'Brien #1323, AUG 1984; in T36N R7W NW Sec.6, located in Miller Woods.* INDU. Speculations on its local nativity are bound to arise. I have no reason to believe it is allochthonous here; rushes are easily overlooked and often ignored.

Juncus pelocarpus Mey. I have not seen this species here though I and others have seen it elsewhere in the Lakeshore and at Chamberlain Lake near South Bend in St. Joseph County. Krekeler (1981) gave this species a "stratum rank" of 7 in Survey Area A, but he does not list any of the common *Junci* which are there and might be mistaken for *J. pelocarpus*. REPRESENTATIVE SPECIMEN: *Umbach s.n., 15 AUG 1896; Millers slough borders.* F. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Juncus scirpoides Lam. This species is infrequent along swales in Survey Areas B, C and F. According to Bowles et al. (1985), it grows in Survey Area B in an area of "mid-successional prairie vegetation in a sand pit" with *Andropogon scoparius*, *Aster ericoides*, *Coreopsis tripteris*, *Cyperus rivularis*, *Equisetum arvense*, *Eupatorium perfoliatum*, *Fragaria virginiana*, *Juncus effusus* var. *solutus*, *J. interior*, *Liparis loeselii*, *Panicum depauperatum*, *P. virgatum*, *Rhynchospora capillacea*, *Rudbeckia hirta*, *Sabatia angularis*, and *Salix glaucophylloides* var. *glaucophylla*. According to Bowles (1989), recent trail development appears to have obliterated the Miller population. REPRESENTATIVE SPECIMEN: *O'Brien s.n., Fall 1984; locally common in the Miller Woods area of Indiana Dunes National Lakeshore. Plants in marshy areas just W of Lake St. between the two railroad tracks.* F. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Lathyrus japonicus var. *glaber* (Ser.) Fern. Very rare, included here on the basis of a report from Survey Area A by Marlin Bowles (personal communication), who assured me of its presence there in 1978; and by Pitcher (1987a), who noted it from the "edge of the Grand Calumet lagoon." REPRESENTATIVE SPECIMEN: *Umbach s.n., 11 SEP 1897; lakeshore, Miller, Ind.* F. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Lathyrus ochroleucus Hook. This rare vetchling is recorded from Survey Area C by Peloquin et al. (1986).

Lilium philadelphicum var. **andinum** (Nutt.) Ker. Seen only in a marshy swale in Survey Area E, but it probably grows in Survey Areas B and C as well.

Liparis loeselii (L.) Rich. According to Plampin (1989b), this twayblade grows on the little peninsula in the big Panne in Survey Area A. There are also reports from Survey Areas B and C.

Lonicera dioica L. This rare little shrub is recorded from Survey Area A by Dritz (1987) and C by Peloquin et al. (1986). This latter report is documented by the following REPRESENTATIVE SPECIMEN: *O'Brien #5, 9 AUG 1984; T36N R7W NW Sec.6; found in Miller Woods.* INDU. It appeared in 4% of the quadrats sampled at Miller Woods by Henderson (1982).

Ludwigia sphaerocarpa var. **deamii** Fern. & Grisc. This rare loosestrife evidently is confined to the swale in Survey Area F near the **Glyceria borealis** population. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Melampyrum lineare var. **latifolium** Bart. Until about 15 years ago, this species was occasional beneath the Jack Pines (**Pinus banksiana**) which grow around the Pannes in Survey Area A, but I have neither seen it there in recent years nor become aware of any contemporary reports. REPRESENTATIVE SPECIMEN: *E. J. Hill s.n., 20 JUN 1893; Millers, dry open woods.* F.

Monotropa uniflora L. This species is known from Miller solely on the basis of the report by Henderson (1982), who found in 4% of his quadrats. I do not know in which Survey Area it was found, though Noel Pavlovic believes it was noted in Area B.

Myriophyllum verticillatum var. **pectinatum** Wallr. This species was unknown from northwestern Indiana until the following REPRESENTATIVE SPECIMEN was collected from a swale in Survey Area C: *Simonin #17, 20 AUG 1982; common, submerged with emergent inflorescence, in water less than 6 dm deep, pond 89, Miller Woods, T36N R8W NW NW Sec.1; with Potamogeton pusillus, Nuphar variegatum, and Nymphaea tuberosa.* MOR.

Orobanche uniflora L. Plampin (1989b) cites several recent reports of this species along the trail in Survey Area C.

Panicum perlongum Nash. This species, nowhere near as common as its close relative, **Panicum depauperatum**, is occasional in the sand savannas of Survey Area C, and probably in the other Survey Areas as well.

Pinus banksiana Lamb. Still a characteristic species of the interdunal pond borders north of the Grand Calumet River in Survey Area A. Armentano & Menges (1987) discussed the pollution effects of O₃ and SO₂ on Jack Pine at Miller. According to Menges & Armentano (1985), the dune slopes around the Pannes in Survey Area A have some of the oldest Jack Pines in the Lakeshore. REPRESENTATIVE SPECIMEN: *Wilhelm & Bacone #5180, 3 AUG 1978; E of Gary in Miller, along the dunes and around the interdunal ponds W of the U.S. Navy & Marine recruiting station.* MOR. Welch (1935) considered this species to be a boreal relict.

Pogonia ophioglossoides (L.) Ker. First discovered in 1982 by Otto, this rare orchid has been seen recently in Survey Area A by Keith Board. Plampin (1989b) reported that in some

years, hundreds of plants can be seen here. There is a Kjellmark specimen (MOR) which documented it from the same location and noted the following associates: **Cornus stolonifera**, **Pinus banksiana**, **Rhus aromatica**, **Arctostaphylos uva-ursi** var. **coactilis**, **Ptelea trifoliata**, and **Hypericum kalmianum**. REPRESENTATIVE SPECIMEN: *Otto #28, 18 JUN 1982; T37N R7W SW NW Sec.31; found on small peninsula in panne in Miller Woods south of pond 22; sandy soil; common.* INDU.

Polygonella articulata (L.) Meisn. Until recently, known from the sand dunes of Survey Area A, but it was not seen there in recent years. Peloquin *et al.* (1986) reported it from Survey Area C. Bowles *et al.* (1986a) also reported from there, growing with **Arabis lyrata**, **Aristida purpurascens**, **Artemisia caudata**, **Calamovilfa longifolia**, **Koeleria cristata**, **Krigia virginica**, **Quercus velutina**, **Solidago nemoralis**, and **Tephrosia virginiana**. According to Bowles (1989), a Miller population which supported 181 plants in 1985 had fallen to 1 individual in 1988. REPRESENTATIVE SPECIMEN: *Lansing s.n., 4 Dec 1913; Millers, sand dunes.* F. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Populus X jackii Sarg. This rare tree is known from this Unit solely, presumably from Survey Area A, on the basis of the following REPRESENTATIVE SPECIMEN: *Swink s.n., 29 JUL 1951; Miller, sandy soil.* MOR.

Potamogeton pulcher Tuckerm. Rare; this distinctive pondweed grows with **P. pusillus** in swales in Survey Areas C, E, and F. REPRESENTATIVE SPECIMEN: *Wilhelm #12995, 10 JUL 1985; N of Aetna, west of Miller, in the dune and swale just west and south of the current [now within] boundaries of the Indiana Dunes National Lakeshore; growing in interdunal swale.* MOR. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Potentilla fruticosa L. Swink and Wilhelm (1979) reported this species from Survey Area A under **Castilleja coccinea**, where they state: "... in calcareous sand flats, as in the Miller section of Gary, Lake County, Indiana, where it [**Castilleja coccinea**] associates with **Aster ptarmicoides**, **Gentiana crinita**, **Gerardia purpurea**, **Hypericum kalmianum**, **Parnassia glauca**, **Potentilla fruticosa**, and **Sabatia angularis**." Welch (1935) considered this species to be a boreal relict.

Potentilla palustris (L.) Scop. Infrequent in the Marsh communities of Survey Areas C, E, and F.

Rhus aromatica var. **arenaria** (Greene) Fern. Lyon (1927) considered this species to be "common and characteristic" on the "... open wooded dunes, particularly toward the lake-front, ..." Bowles *et al.* (1985) listed foredune blowout associates of this species as **Andropogon scoparius**, **Arabis lyrata**, **Artemisia caudata**, **Calamovilfa longifolia**, **Celastrus scandens**, **Ptelea trifoliata** [var. **mollis** ?], **Rhus radicans**, **Smilacina stellata**, and **Solidago racemosa** var. **gillmani**. REPRESENTATIVE SPECIMEN: *Wilhelm & Bacone #5187, 3 AUG 1978; E of Gary in Miller, along the dunes and around the interdunal ponds west of the U.S. Navy & Marine recruiting station.* MOR.

Rhynchospora macrostachya Torr. Swink & Wilhelm (1979) indicated that they have never seen this species in Lake County, Indiana, though it may yet occur somewhere in one of the Marsh communities in this Survey Unit. REPRESENTATIVE SPECIMEN: *Umbach s.n.,*

4 SEP 1897; *Millers, slough*. F. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Sabatia angularis (L.) Pursh Still occasional to common in the wet calcareous sands of this Survey Unit, particularly Survey Area A. REPRESENTATIVE SPECIMEN: *Wilhelm & Bacone* #5215, 3 AUG 1978; *E of Gary in Miller, along the dunes and around the interdunal ponds west of the U.S. Navy & Marine recruiting station*. MOR.

Salix pedicellaris var. **hypoglauca** Fern. This attractive willow is still extant along a swale in Survey Area F.

Salix syrticola Fern. Still occasional on the dunes in Survey Area A. This species is being monitored here by the National Park Service (Bowles *et al.* 1986a). REPRESENTATIVE SPECIMEN: *Schulenberg & Wilhelm* #74-304, 5 SEP 1974; *at Miller, 0.25 mi W of Lake Street on partly stabilized dune with Calamovilfa longifolia, Andropogon scoparius, Populus deltoides, and Solidago racemosa var. gillmani*. MOR. Trefz (1935) considered this species to be a boreal relict.

Satureja arkansana (Nutt.) Briq. This rare species is still extant in the Pannes of Survey Area A, from where reported by Bowles *et al.* (1986a) as growing with *Andropogon scoparius*, *Aster dumosus*, *Cladium mariscoides*, *Equisetum hyemale*, *Hypericum kalmianum*, *Juncus balticus* var. *littoralis*, *Linum medium* var. *texanum*, *Panicum virgatum*, *Pinus banksiana*, *Populus deltoides*, *Rhynchospora capillacea*, and *Salix glaucophylloides* var. *glaucophylla*. I have looked for this species in the Pannes of Survey Unit III, but only unsuccessfully. REPRESENTATIVE SPECIMEN: *Wilhelm & Bacone* #5216, 3 AUG 1978; *E of Gary in Miller, along the dunes and around the interdunal ponds west of the U.S. Navy & Marine recruiting station*. MOR.

Scleria verticillata Muhl. Still common, though often overlooked, in the wet calcareous sands of this Survey Unit. REPRESENTATIVE SPECIMEN: *Wilhelm* #6987, 23 SEP 1979; *just northwest of Miller, in low calcareous flat north of the Penn Central RR, in the NW NW Sec.6 T36N R7W*. MOR.

Smilax rotundifolia L. This species, characteristic and even common in the Dunes region a little farther east, was reported for Survey Area C by Peloquin *et al.* (1986). Henderson (1982) found it to have a frequency of 4% in his quadrats at Miller Woods. This is the first report of this species for Lake County, Indiana.

Solidago racemosa var. **gillmani** (Gray) Fern. Still occasional in the dunes of Survey Area A, from where reported by Bowles *et al.* (1986a) as growing with *Andropogon scoparius*, *Artemisia caudata*, *Calamovilfa longifolia*, *Cirsium pitcheri*, *Corispermum hyssopifolium*, *Elymus canadensis*, *Euphorbia corollata*, *Lithospermum croceum*, *Populus deltoides*, *Prunus pumila*, and *Solidago nemoralis*. REPRESENTATIVE SPECIMEN: *Schulenberg & Wilhelm* #74-303, 5 SEP 1974; *at Miller ca 0.25 mi W of Lake Street on a stable dune with Ammophila breviligulata, Elymus canadensis, Vitis riparia, and Calamovilfa longifolia*. MOR.

Sparganium americanum Nutt. This bur reed is still extant in a swale in Survey Area F.

Talinum rugospermum Holzinger Very rare; in fact Swink & Wilhelm (1979) pointed out that it is "... near extinction so far as the Chicago region is concerned. The senior author

recalls at least two localities in Gary, Lake County, Indiana, which have been known for many years, and which are probably now destroyed . . ." Fortunately, it is still extant in Survey Unit II, which see. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 21 JUN 1946; near the Baltimore & Ohio RR west of Lake Street in Miller section of Gary, open sandy soil. MOR.

Utricularia cornuta Michx. The Pannes of Survey Units I and III are probably the only loci in the State of Indiana where living populations of this species still survive. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 11 AUG 1946; in the dune region west of Lake Street in Miller and north of the Grand Calumet River. Very abundant, tinting the pond edges yellow in places [as it still does today]. MOR. McLaughlin (1932) considered this species to have ancestral affinities to the Atlantic coastal plain.

Utricularia gibba L. I have seen this species in Survey Area A. Simonin (#31, MOR) reported this species as an associate of **Potamogeton pusillus** in pond #39 of Survey Area C and pond #5 of Survey Area B. Wilcox & Simonin (1987) reported this species from three ponds in Survey Area A, three ponds in Survey Area B, and one pond in Survey Area C. REPRESENTATIVE SPECIMEN: *Hess et al.* #6009, 4 SEP 1984; Indiana Dunes National Lakeshore, Miller woods, 2 mi N of Millers & U.S. 12. Pannes & dunes w of beach parking lot. MOR. Peattie (1922), Hooper (1934), and Parker (1936) considered this species to have ancestral affinities to the Atlantic coastal plain.

Utricularia minor L. According to Bowles *et al.* (1985) and Bowles *et al.* (1986b), this species has been reported from the Miller Unit; they postulate that it may still be extant here.

Viola fimbriatula Sm. This rare little violet is occasional in moist sandy areas of Survey Area F and perhaps other areas. Its resemblance to *V. sagittata* may cause it to be overlooked and its presence more frequent than our observations indicate.

Vitis labrusca L. This grape, characteristic of the Dunes region, is occasional in Survey Areas C, E, and F. REPRESENTATIVE SPECIMEN: *O'Brien* #133, 22 AUG 1984; R7W NW Sec.6; located in Miller Woods, area 1 and 6 and pond 79. INDU.

Zizania aquatica L. Infrequent in the Marsh communities throughout the Survey Unit. REPRESENTATIVE SPECIMEN: *Wilhelm* #6984, 23 SEP 1979; just northwest of Miller, in slough along the north side of the Penn Central RR, near the center of the N N Sec.1 T36N R8W. MOR. According to Hooper (1934), this species has ancestral affinities to the Atlantic coastal plain.

Summary

Survey Unit I has been shown to provide the habitat for at least 70 of the Indiana Dunes National Lakeshore SPECIAL VEGETATION floristic elements. About eighty-four percent of them were either seen by this writer in recent years or reported reliably by contemporaries. It is conceivable that as many as ninety percent may yet be extant within the Survey Unit boundaries.

Twenty-five percent of the SPECIAL VEGETATION floristic elements were considered by Peattie (1922), McLaughlin (1932), and Hooper (1934) to have ancestral affinities to the Atlantic coastal plain; while Trefz (1935), Welch (1935), and Friesner (1936) considered about ten percent of the floristic elements to be boreal relicts.

About five percent of the SPECIAL VEGETATION floristic elements known from this Survey Unit are unknown from any other Lakeshore Survey Unit. These include: *Equisetum variegatum*, *Myriophyllum verticillatum* var. *pectinatum*, *Potamogeton pulcher*, and *Potentilla fruticosa*.

NATURAL AREA ASSESSMENT

Survey Unit I, as can be seen from the Natural Area Vegetation Map on page 49, consists of six general community types: Aquatic, Dune Complex, Fore-dune Complex, Marsh Complex, Pannes, and Savanna Complex.

The 171-acre tract north of and including the Grand Calumet River, Survey Area A (about 25% of which has been obliterated or seriously disturbed), is largely Dune Complex, but with a high degree of affinity to the Fore-dune Complex. The Dune Complex is fronted on the Lake by a narrow band of disturbed Fore-dune Complex, and punctuated leeward by interdunal depressions and ponds within which are intergrading complexes of the Panne and Aquatic plant communities.

The synecological integrity of the interdunal depressions and ponds is the key to the preservation of a large number of the SPECIAL VEGETATION floristic elements; and the integrity of these areas is directly related to the stability of the high dunes from which they derive their physiographic essence. Very little needs to be done here in the way of active Natural Area management, but every effort should be made to enforce the natural stability of the Survey Area.

The immediate threats in this regard now come from the highly exaggerated amounts of disconsolidated wind-blown sands originating from gaping wounds, caused by off-road-vehicles and uncontrolled foot-traffic, on the nearby dunes. Indeed, Bowles (1989) has documented significant declines of *Euphorbia polygonifolia* in the beach area. Half of the large westernmost pond, still the richest and most stable Panne in existence, has been unceremoniously obliterated by a large slag pile which remains to this day, and should probably continue to remain in place lest the activity of removal obliterate the Panne altogether.

Of no little concern is the impending Gary Marina project (U.S. Dept. Int. 1989). Alternatives 2 and 3 necessitate direct physical impact on Survey Area A, including the Pannes. Even Alternative 1 is a threat if road access must be achieved across the Miller Unit. It truly staggers the senses to think that, in 1989, civilized people are still considering vanquishing irreplaceable natural systems for a pittance in short-term economic gain. The Pannes and surrounding dunes of this Survey Area provide the habitat for 30 SPECIAL VEGETATION floristic elements, including *Carex aurea*, *Equisetum variegatum*, and *Potentilla fruticosa*, which grow nowhere else in the Lakeshore. Rosowski & Willey (1975) described an epibiotic euglenoid alga (*Colacium libellae*) from these Pannes and Willey (pers. comm.) informed me that these kinds of ponds are rare world-wide.

South of the Grand Calumet River are three large tracts (Survey Areas B, C, E, and F) of Savanna/Marsh Complex, the synecological integrity of which is still quite high, though each is laced, to one degree or another, with off-road-vehicle tracks, and each is in need of fire on a regular, annual basis.

The data used in assessing the relative Natural Area significance and integrity of each Survey Area, and the Survey Unit as a whole, are provided in Table I. The data include a

presence list of all the floristic elements (SPECIAL or otherwise) recorded from each Survey Area, along with the numerical rating coefficient as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient, and do not enter directly into the derivations of the Natural Area Rating Indices. The "R" symbol (rather than an "X" symbol), when used in Table I, indicates a record other than one to which I personally can attest; these usually are on the basis of some earlier record, such as an herbarium specimen, or on literature reports. Species listed without a Survey Area tabulation are reports from Klick *et al.* (1989).

TABLE I: Summary of species upon which are calculated the various Natural Area Indices for each Survey Area and for the Survey Unit as a whole.

A	B	C	D	E	F	
						* Abutilon theophrasti
			x			0 Acer negundo
						* Acer platanoides
					x	7 Acer rubrum
		x			x	0 Acer saccharinum
	x	x	x	x	x	* Achillea millefolium
			x			* Agropyron repens
						* Agropyron smithii
	x	x				8 Agropyron trachycaulum unilaterale
					x	* Agrostis alba
					x	1 Agrostis hyemalis
		x		x		10 Aletris farinosa
x	x	x		x	x	4 Alisma subcordatum
		x			x	4 Alisma triviale
						* Alliaria officinalis
		R				6 Allium cernuum
x		R	x	x	x	0 Ambrosia artemisiifolia elatior
			x			* Ambrosia psilostachya coronopifolia
x					x	0 Ambrosia trifida
	x	x				8 Amelanchier interior
				x		8 Amelanchier laevis
x						15 Ammophila breviligulata
x	x	x		x	x	4 Amphicarpa bracteata
x	x	x		x	x	4 Andropogon gerardii
x	x	x	x	x	x	5 Andropogon scoparius
		x				4 Anemone canadensis
	x	x		x	x	2 Anemone cylindrica
		R				6 Antennaria plantaginifolia
						* Anthriscus scandicina
	x	x		x	x	6 Apios americana
		x	x	x	x	5 Apocynum androsaemifolium
R		R				4 Apocynum cannabinum
	x				x	2 Apocynum sibiricum
	x	x		x	x	5 Aquilegia canadensis
x	x	x	x	x	x	7 Arabis lyrata
	x	x	x	x	x	8 Aralia nudicaulis
x	x					10 Arctostaphylos uva-ursi coactilis
						* Arenaria serpyllifolia
x						10 Arenaria stricta

A	B	C	D	E	F	
x						5 <i>Aristida intermedia</i>
R						* <i>Aristida oligantha</i>
		R			x	7 <i>Aristida purpurascens</i>
x	x	x	x	x	x	5 <i>Artemisia caudata</i>
		x			x	* <i>Artemisia vulgaris</i>
	x	x		x	x	10 <i>Asclepias amplexicaulis</i>
x	x	x		x	x	4 <i>Asclepias incarnata</i>
x	x	x	x		x	0 <i>Asclepias syriaca</i>
x	x	x		x	x	10 <i>Asclepias tuberosa</i>
		x			x	1 <i>Asclepias verticillata</i>
	x					15 <i>Asclepias viridiflora</i>
	x	x	x		x	* <i>Asparagus officinalis</i>
x	x	x		x	x	8 <i>Aster azureus</i>
x	x	x			x	5 <i>Aster dumosus</i>
x	x	x			x	5 <i>Aster ericoides</i>
x	x	x		x		10 <i>Aster junciformis</i>
	x					8 <i>Aster laevis</i>
		x				4 <i>Aster lateriflorus</i>
x	x	x		x	x	10 <i>Aster linariifolius</i>
x		x		x	x	4 <i>Aster novae-angliae</i>
					x	1 <i>Aster pilosus</i>
x						15 <i>Aster ptarmicoides</i>
	x	x		x		5 <i>Aster puniceus firmus</i>
	x					5 <i>Aster sagittifolius</i>
			x			2 <i>Aster sagittifolius drummondii</i>
		x			x	3 <i>Aster simplex</i>
x		x		x	x	10 <i>Aster umbellatus</i>
				x		8 <i>Baptisia leucantha</i>
		R				* <i>Barbarea vulgaris</i>
x	x	x			x	5 <i>Bidens cernua</i>
x		x			x	5 <i>Bidens comosa</i>
x						8 <i>Bidens coronata</i>
					x	2 <i>Boehmeria cylindrica</i>
				x	x	10 <i>Boltonia latisquama recognita</i>
			x			* <i>Bromus inermis</i>
					x	* <i>Bromus japonicus</i>
x		x	x		x	* <i>Bromus tectorum</i>
		x				6 <i>Bulbostylis capillaris</i>
x						15 <i>Cakile edentula</i>
x	x	x	x	x	x	3 <i>Calamagrostis canadensis</i>
x	x	x			x	10 <i>Calamovilfa longifolia</i>
					x	6 <i>Camassia scilloides</i>
x	x	x			x	7 <i>Campanula aparinoides</i>
						* <i>Capsella bursa-pastoris</i>
		x			x	10 <i>Carex alata</i>
x						15 <i>Carex aurea</i>
					x	3 <i>Carex brevior</i>
		x				5 <i>Carex comosa</i>
		x		x		8 <i>Carex emoryi</i>
		x				20 <i>Carex foenea</i>
x		x				15 <i>Carex garberi</i>
		x				6 <i>Carex haydenii</i>

A	B	C	D	E	F	
		x				8 Carex lasiocarpa americana
	x	x	x	x	x	5 Carex muhlenbergii
	x	x	x	x	x	5 Carex pensylvanica
	x	x			x	10 Carex sartwellii
	x	x	x	x	x	5 Carex stricta
	x	x				15 Carex tonsa
		x				3 Carex tribuloides
					x	10 Carex umbellata
x						10 Carex viridula
		x				5 Cassia fasciculata
	x					7 Cassia nictitans
x	x	x				15 Castilleja coccinea
	x	x		x	x	8 Ceanothus americanus
x	x	x	x	x		6 Celastrus scandens
x		x		x		0 Cenchrus longispinus
x		x		x	x	7 Cephalanthus occidentalis
x		R		x	x	* Chenopodium album
x				x	x	4 Chenopodium boscianum
	x					4 Chenopodium leptophyllum
x						8 Cicuta bulbifera
x		x			x	* Cirsium arvense
x					x	2 Cirsium discolor
		R				10 Cirsium muticum
x						20 Cirsium pitcheri
x						* Cirsium vulgare
x		R		R		15 Cladium mariscoides
	x	x	x	x	x	7 Comandra richardsiana
		x				10 Commelina erecta deamiana
	x	x			x	1 Convolvulus sepium
	x	x		x	x	7 Coreopsis lanceolata
		R				8 Coreopsis palmata
x	x	x		x	x	5 Coreopsis tripteris
x						8 Corispermum hyssopifolium
		R				5 Cornus obliqua
x		x	x	x	x	1 Cornus racemosa
		x				15 Cornus rugosa
x	x	R				6 Cornus stolonifera
x		x				10 Cornus stolonifera baileyi
						* Crepis capillaris
R						8 Cuscuta coryli
					x	4 Cuscuta gronovii
x		x	x		x	7 Cycloloma atriplicifolium
					x	3 Cyperus erythrorhizos
		x				1 Cyperus esculentus
x					x	2 Cyperus ferruginescens
x		x			x	5 Cyperus filiculmis
x	R	x				4 Cyperus rivularis
x	x	x	x		x	5 Cyperus schweinitzii
x		R				1 Cyperus strigosus
R						20 Cypripedium acaule
x		R	x	x	x	* Daucus carota
		x				* Descurainia sophia

A	B	C	D	E	F	
x		x				4 Desmodium canadense
	x					5 Desmodium paniculatum
						* Dianthus armeria
	x	x	x	x	x	10 Diervilla lonicera
					x	* Digitaria ischaemum
					x	* Digitaria sanguinalis
						* Diplotaxis muralis
						15 Drosera intermedia
				x		6 Dryopteris spinulosa
x	x	x		x	x	6 Dryopteris thelypteris pubescens
		x		x	x	10 Dulichium arundinaceum
x		R				0 Echinochloa crusgalli
		x				5 Echinocystis lobata
R	R	R		x	x	6 Eleocharis acicularis
	x	x		x		5 Eleocharis calva
R						5 Eleocharis compressa
x					x	8 Eleocharis elliptica
x						15 Eleocharis geniculata
X						8 Eleocharis intermedia
X						8 Eleocharis olivacea
x						20 Eleocharis pauciflora fernaldii
				x		5 Eleocharis smallii
R						5 Elodea canadensis
		x				7 Elodea nuttallii
x	x	x	x		x	4 Elymus canadensis
		R				3 Epilobium glandulosum adenocaulon
R	x				x	0 Equisetum arvense
		x			x	4 Equisetum hyemale affine
	x	x	x	x	x	3 Equisetum hyemale intermedium
x						9 Equisetum variegatum
R						* Eragrostis megastachya
R						0 Eragrostis pectinacea
x		x			x	3 Eragrostis spectabilis
			x			* Eragrostis trichodes
					x	2 Erechites hieracifolia
x	x				x	1 Erigeron annuus
	x	x	x		x	0 Erigeron canadensis
R		x		x	x	4 Erigeron philadelphicus
x	x	x	x	x	x	3 Erigeron strigosus
x					x	0 Eupatorium altissimum
x		R			x	5 Eupatorium maculatum
x	x	x		x	x	6 Eupatorium perfoliatum
		x			x	4 Eupatorium rugosum
x		x	x		x	1 Eupatorium serotinum
x	x	x	x	x	x	2 Euphorbia corollata
					x	* Euphorbia dentata
x			x		x	* Euphorbia maculata
x						15 Euphorbia polygonifolia
x					x	* Euphorbia supina
x	x	x	x	x	x	1 Fragaria virginiana
x						5 Fraxinus americana
		x	x			1 Galium aparine

A	B	C	D	E	F	
					x	4 Galium concinnum
	x	x				10 Galium pilosum
		x				8 Galium tinctorium
	x	x				9 Gaylussacia baccata
x		x				7 Gentiana andrewsii
x	x	x		x		10 Gentiana crinita
				x	x	4 Geranium maculatum
					x	7 Gerardia paupercula
	x	x		x	x	8 Gerardia pedicularia ambigens
x		x			x	7 Gerardia purpurea
x					x	7 Gerardia tenuifolia
						* Glechoma hederacea
						* Gleditsia triacanthos
		x			x	20 Glyceria borealis
	x	x		x		8 Glyceria septentrionalis
	x					4 Glyceria striata
		x			x	2 Gnaphalium obtusifolium
						20 Habenaria ciliaris
						15 Habenaria clavellata
				x		15 Habenaria flava herbiola
x				x		10 Habenaria hyperborea huronensis
		R				20 Habenaria psycodes
		x	x		x	8 Hamamelis virginiana
	x	x	x	x	x	8 Helianthemum canadense
x	x	x	x	x	x	5 Helianthus divaricatus
x					x	2 Helianthus grosseserratus
x		x			x	8 Helianthus laetiflorus rigidus
x		x		x	x	10 Helianthus occidentalis
x		R			x	* Helianthus petiolaris
					x	8 Heteranthera dubia
x	x	x		x	x	6 Hieracium canadense fasciculatum
	x					6 Hieracium gronovii
						* Hieracium pratense
		x				7 Hieracium scabrum
						* Hordeum jubatum
		x				8 Hypericum canadense
x		x			x	10 Hypericum kalmianum
x						8 Hypericum majus
		x		x	x	8 Hypericum virginicum fraseri
		x				5 Hystrix patula
					x	9 Ilex verticillata
x						3 Impatiens capensis
						* Iris germanica
						* Iris pseudacorus
	x	x	x	x	x	5 Iris virginica shrevei
x					x	8 Juncus acuminatus
		x				9 Juncus alpinus rariflorus
x	x	x		x	x	8 Juncus balticus littoralis
x		x				9 Juncus brachycephalus
x		x		x	x	7 Juncus canadensis
		x				20 Juncus diffusissimus
	x	x				4 Juncus dudleyi

A	B	C	D	E	F	
	R				x	7 Juncus effusus solutus
		x			x	8 Juncus greenel
	R				x	10 Juncus interior
R						10 Juncus marginatus
		x			x	6 Juncus nodosus
						20 Juncus pelocarpus
	x	x			x	20 Juncus scirpoides
		x	x		x	0 Juncus tenuis
x		x				4 Juncus torreyi
x						2 Juniperus virginiana crebra
	x	x	x	x	x	7 Koeleria cristata
	x	x	x	x	x	7 Krigia biflora
		x				6 Krigia virginica
x						4 Kuhnia eupatorioides corymbulosa
x	x	x		x	x	2 Lactuca canadensis
R						20 Lathyrus japonicus glaber
		R				15 Lathyrus ochroleucus
x						8 Lathyrus palustris
		x				7 Lechea villosa
x		x				5 Leersia oryzoides
x	x	x		x	x	0 Lepidium virginicum
					x	3 Leptoloma cognatum
		x	x	x	x	4 Lespedeza capitata
			x			4 Lespedeza virginica
x	x	x		x	x	6 Liatris aspera
	x					8 Liatris cylindracea
				x	x	6 Liatris spicata
				x		15 Lilium philadelphicum andinum
		R			x	6 Linaria canadensis
x						* Linaria vulgaris
x		x				7 Linum medium texanum
R		x		x	x	8 Liparis lilifolia
R	R	R				7 Liparis loeselii
					x	8 Lithospermum canescens
x	x	x	x	x	x	8 Lithospermum croceum
x						9 Lobelia kalmii
x		x				6 Lobelia siphilitica
R		R				15 Lonicera dioica
		R			x	* Lonicera X muendeniensis
		x		x	x	6 Ludwigia alternifolia
					x	5 Ludwigia palustris americana
		x		R	x	6 Ludwigia polycarpa
					x	20 Ludwigia sphaerocarpa deamii
	x	x		x	x	7 Lupinus perennis occidentalis
		R	x	x		* Lychnis alba
x	x	x	x	x	x	5 Lycopus americanus
	x					* Lycopus asper
x						10 Lycopus rubellus
x	x					6 Lycopus uniflorus
		x			x	6 Lycopus virginicus
					x	7 Lysimachia lanceolata
	x	x				8 Lysimachia terrestris

A	B	C	D	E	F	
	x	x			x	9 Lysimachia thyrsiflora
x	x	x		x	x	7 Lythrum alatum
x		R			x	* Lythrum salicaria
x	x	x		x	x	10 Maianthemum canadense interius
						* Medicago lupulina
R						15 Melampyrum lineare latifolium
x		x	x	x	x	* Melilotus alba
x		x	x	x	x	* Melilotus officinalis
x	x	x				5 Mentha arvensis villosa
x		R			x	6 Mimulus ringens
x	x	x				* Mirabilis nyctaginea
x					x	* Mollugo verticillata
	x	R		x	x	4 Monarda fistulosa
x	x	x	x	x	x	5 Monarda punctata villicaulis
						15 Monotropa uniflora
		R			x	* Morus alba
		x			x	5 Muhlenbergia mexicana
		x			x	* Muhlenbergia racemosa
R						* Myosotis scorpioides
x		x		R	x	7 Myriophyllum exalbescens
		x				15 Myriophyllum verticillatum pectinatum
R	x	R				6 Najas flexilis
						* Nepeta cataria
x	x	x		x		7 Nuphar advena
R	x	R		x		8 Nuphar variegatum
x	x	x		x	x	7 Nymphaea tuberosa
		R		x	x	8 Nyssa sylvatica
x		x			x	1 Oenothera biennis
x	x	x			x	7 Oenothera rhombipetala
					x	8 Onoclea sensibilis
x	x	x	x	x	x	5 Opuntia humifusa
		R				15 Orobanche uniflora
				x	x	6 Osmunda cinnamomea
		x		x	x	8 Osmunda regalis spectabilis
		R				0 Oxalis europaea
		x		x		7 Oxypolis rigidior
		x				5 Panicum agrostoides
	x	x			x	1 Panicum capillare
		x				10 Panicum columbianum
	x	x			x	10 Panicum depauperatum
x		x				0 Panicum dichotomiflorum
x						10 Panicum flexile
x	x	x	x	x	x	3 Panicum implicatum
	x	x				7 Panicum latifolium
x		x				10 Panicum lindheimeri
x	x	x	x	x	x	7 Panicum oligosanthos scribnerianum
		x				15 Panicum perlongum
	x	x		x	x	7 Panicum villosissimum
x	x	x	x	x	x	9 Panicum villosissimum pseudopubescens
x	x	x	x	x	x	5 Panicum virgatum
x						10 Parnassia glauca
				x		1 Parthenocissus inserta

A	B	C	D	E	F	
x		x				2 Parthenocissus quinquefolia
	x	x		x	x	10 Pedicularis canadensis
	x	x		x	x	5 Penthorum sedoides
	x	x		x	x	0 Phalaris arundinacea
		x				* Phleum pratense
	x					7 Phlox glaberrima interior
		R				* Phlox paniculata
	x	x	x	x	x	6 Phlox pilosa
		x		x	x	4 Phragmites communis berlandieri
		R				* Physalis pubescens
			x			1 Physalis subglabrata
	x					4 Physalis virginiana
	x					8 Physocarpus opulifolius
		R			x	2 Phytolacca americana
x						20 Pinus banksiana
		R				* Plantago major
x						0 Plantago rugelii
R						10 Platanus occidentalis
x						* Poa annua
	x	x	x	x	x	* Poa compressa
	x	x	x	x	x	* Poa pratensis
x						15 Pogonia ophioglossoides
x						* Polanisia graveolens
x						10 Polygala cruciata aquilonia
		x				10 Polygala polygama obtusata
	x	x	x	x	x	3 Polygonatum canaliculatum
R		R				15 Polygonella articulata
	x	x		x	x	5 Polygonum amphibium stipulaceum
x						* Polygonum aviculare
x	R	x		x	x	5 Polygonum coccineum
x						* Polygonum convolvulus
		x		x	x	7 Polygonum hydropiperoides
x					x	0 Polygonum lapathifolium
		x			x	0 Polygonum pensylvanicum laevigatum
x					x	* Polygonum persicaria
		x				6 Polygonum punctatum
					x	2 Polygonum scandens
		x			x	7 Polygonum tenue
x		x		x	x	10 Pontederia cordata
x	x	x			x	2 Populus deltoides
x						20 Populus X jackii
	x	x		x	x	4 Populus tremuloides
	x					10 Potamogeton amplifolius
R	R	R				7 Potamogeton foliosus
x		x		R	x	7 Potamogeton gramineus
	x	R				7 Potamogeton illinoensis
	x	R			x	7 Potamogeton natans
	x	x				7 Potamogeton nodosus
x	x	R				6 Potamogeton pectinatus
		x		x	x	15 Potamogeton pulcher
	x	x			x	7 Potamogeton pusillus
x				R		9 Potamogeton robbinsii

A	B	C	D	E	F	
x						15 Potentilla fruticosa
		x		x	x	15 Potentilla palustris
		x	x		x	* Potentilla recta
	x	x	x	x	x	4 Potentilla simplex
x	x	x	x	x	x	5 Prenanthes alba
x		x		x	x	6 Proserpinaca palustris crebra
x		R				0 Prunella vulgaris lanceolata
x		x		x	x	8 Prunus pumila
	x			x	x	1 Prunus serotina
x	x	x	x	x	x	1 Prunus virginiana
x						7 Ptelea trifoliata
x	x					7 Ptelea trifoliata mollis
	x	x		x	x	5 Pteridium aquilinum latiusculum
x	x	x		x	x	5 Pycnanthemum virginianum
		x		x	x	9 Pyrus floribunda
		R			x	7 Pyrus melanocarpa
			x			2 Pyrus ioensis
	x	x	x	x	x	4 Quercus alba
x	x	x	x	x	x	6 Quercus velutina
R		x		x	x	7 Ranunculus flabellaris
					x	6 Ranunculus sceleratus
						* Rhamnus frangula
x	x	R				9 Rhus aromatica
x					x	15 Rhus aromatica arenaria
	x	x	x	x	x	6 Rhus copallina latifolia
x	x	x	x	x	x	1 Rhus radicans
		R			x	3 Rhus typhina
x	R					10 Rhynchospora capillacea
						15 Rhynchospora macrostachya
	x	x	x			* Robinia pseudo-acacia
		x				10 Rorippa islandica hispida
x	x					5 Rosa blanda
x	x	x		x	x	5 Rosa carolina
					x	* Rosa multiflora
x					x	9 Rosa palustris
		x				10 Rotala ramosior
		x	x		x	4 Rubus flagellaris
		x	x		x	9 Rubus hispidus obovalis
			x			7 Rubus idaeus strigosus
					x	2 Rubus occidentalis
x	x	x		x	x	1 Rudbeckia hirta
	x				x	* Rumex acetosella
		R			x	2 Rumex altissimus
						* Rumex crispus
x	x	x				15 Sabatia angularis
		x			x	9 Sagittaria graminea
x		x		x	x	4 Sagittaria latifolia
R	x	x		x	x	5 Salix amygdaloides
		x		x	x	2 Salix discolor
x	x	x		x	x	7 Salix glaucophylloides glaucophylla
					x	10 Salix gracilis textoris
		x			x	6 Salix humilis

A	B	C	D	E	F	
	x	x		x	x	1 Salix interior
	x	R			x	4 Salix nigra
					x	15 Salix pedicellaris hypoglauca
R	x	x	x		x	5 Salix rigida
x						15 Salix syrticola
x						* Salsola kali tenuifolia
		x	x			1 Sambucus canadensis
		R				6 Sanguinaria canadensis
		x		x		6 Sanicula marilandica
x		R	x		x	* Saponaria officinalis
	x	x		x	x	6 Sassafras albidum
x						10 Satureja arkansana
x	x	x		x	x	6 Scirpus acutus
x	x					7 Scirpus americanus
		x				4 Scirpus atrovirens
		x		x	x	6 Scirpus cyperinus
x		x			x	5 Scirpus validus creber
		x		x		10 Scleria triglomerata
x		x				15 Scleria verticillata
				x		5 Scrophularia lanceolata
x	x	x		x	x	5 Scutellaria epilobiifolia
x		x			x	5 Scutellaria lateriflora
x	x	x		x	x	6 Senecio pauperculus balsamitae
					x	* Setaria faberii
					x	* Setaria glauca
x						* Setaria viridis
x	x	x	x	x	x	2 Silene antirrhina
x	x	x			x	* Silene cserei
		R				* Silene cucubalus
						* Sisymbrium altissimum
					x	7 Sisyrinchium albidum
x	x	x	x	x	x	7 Sium suave
x	x	x	x	x	x	2 Smilacina racemosa
x	x	x	x	x	x	5 Smilacina stellata
	x	x	x			4 Smilax lasioneura
		R				15 Smilax rotundifolia
					x	* Solanum americanum
x		x	x		x	* Solanum dulcamara
	x	x		x	x	1 Solidago altissima
x	x	x	x	x	x	7 Solidago caesia
x	x	x		x	x	3 Solidago gigantea
x					x	4 Solidago graminifolia media
x	x	x		x	x	3 Solidago graminifolia nuttallii
x	x	x		x	x	5 Solidago gymnospermoides
x				x	x	5 Solidago juncea
x						5 Solidago missouriensis fasciculata
	x	x		x	x	4 Solidago nemoralis
x						15 Solidago racemosa gillmani
		R				4 Solidago rigida
				x		6 Solidago rugosa
x	x	x	x	x	x	7 Solidago speciosa
					x	10 Solidago tenuifolia

A	B	C	D	E	F	
x					x	* Sonchus uliginosus
x		x		x	x	5 Sorghastrum nutans
					x	15 Sparganium americanum
	R	x		x	x	10 Sparganium chlorocarpum
		x		x		6 Sparganium eurycarpum
				x		5 Spartina pectinata
				x		4 Sphenopholis intermedia
x	x	x		x	x	7 Spiraea alba
					x	9 Spiraea tomentosa rosea
x		R			x	7 Spiranthes cernua
					x	* Sporobolus asper
x		x				7 Sporobolus cryptandrus
x	x	x		x	x	5 Stachys palustris homotricha
					x	5 Stachys tenuifolia hispida
	x	x	x	x	x	6 Stipa spartea
x	x					7 Strophostyles helvola
					x	* Symphoricarpos orbiculatus
				R		15 Talinum rugospermum
	x	R		x	x	* Taraxacum officinale
	x	x		x	x	8 Tephrosia virginiana
x						3 Teucrium canadense
		R				5 Thalictrum dioicum
		R				5 Tilia americana
x	x	x	x	x	x	2 Tradescantia ohiensis
						* Tragopogon major
x						* Tragopogon pratensis
x						* Trifolium hybridum
		x				* Trifolium pratense
x		x				* Trifolium repens
x						10 Triglochin maritima
x		x			x	7 Triplasis purpurea
						* Triticum aestivum
x		x		x	x	2 Typha angustifolia
x	x	x	x	x	x	1 Typha latifolia
					x	* Ulmus pumila
x						20 Utricularia cornuta
x	R	R				15 Utricularia gibba
						15 Utricularia minor
x	x	R		x	x	10 Utricularia vulgaris
	x	x	x	x	x	5 Vaccinium angustifolium laevifolium
		x			x	5 Vaccinium vacillans
x	x	R			x	7 Vallisneria americana
x	x	x			x	* Verbascum thapsus
x		R			x	4 Verbena hastata
					x	4 Verbena stricta
		x				5 Vernonia missurica
	x	x		x		9 Viburnum acerifolium
		x				5 Viburnum lentago
	x	x		x		5 Viburnum rafinesquianum
					x	15 Viola fimbriatula
		x		x	x	10 Viola pedata lineariloba
x						5 Viola pennsylvanica

A	B	C	D	E	F	
	x	x			x	7 <i>Viola sagittata</i>
		R				* <i>Viola tricolor</i>
		x		x	x	15 <i>Vitis labrusca</i>
x	x	x	x	x	x	4 <i>Vitis riparia</i>
x					x	* <i>Xanthium strumarium</i>
x		x		R	x	15 <i>Zizania aquatica</i>

Summary

The 170 acres of natural land comprising Survey Area A (surveyed August 3, 1978 and August 14, 1989) includes some of the highest quality natural land in the Survey Unit. While the Dune/Foredune Complex is largely quite disturbed, the interdunal ponds and lagoons are still quite intact floristically. During this survey, I have documented 188 native plant taxa in this Survey Unit, the Mean Quality of which was 6.35 overall, with the interdunal ponds generally rating higher. The Natural Area Index was 87. According to Board (1987), *Liparis loeselii* also grows in this area. Dritz (1987) also reports several species from this Survey Area. With an additional 22 taxa, including those now vouchered at INDU, the Mean Quality has risen to 6.70, resulting in an Index of 97. There are 21 additional reports which have come to my attention; if these can be substantiated, the Index would stand at 103.

The 165 acres, 10 of which have been obliterated, in Survey Area B (surveyed June 14, 1979 and August 14, 1989) consist of fairly high quality Black Oak Savanna/Marsh Complex. The Mean Quality is 5.64. My time in the area has been limited relative to some of the other Survey Areas, so the number of native floristic elements recorded (165) can be regarded as relatively depressed. Indeed, there are another 14 species at INDU, which raise the Mean Quality to 5.81 and yield an Index of 78. If the additional 10 reports are included, the Index would register 81.

The 135 acres in Survey Area C (surveyed June 9 and September 23, 1979, and August 14, 1989) includes some of the finest Black Oak Savanna in the Chicago region—particularly in the western portions of this tract. During the three visits to this area I catalogued 202 native floristic elements, the Mean Quality of which was 6.02. In addition to my surveys, intensive floristic and ecological work has gone on in this Survey Area; an additional 64 species have been documented, raising the Mean Quality to 6.29 and the Index to 103. If the additional 49 reports can be substantiated, the Index would stand at 112.

The 35 acres, about half of which have been obliterated, of Survey Area D (surveyed June 10, 1979 and August 14, 1989) are low-quality remnants of Black Oak Savanna/Marsh Complex. The area only scarcely qualifies as Natural Area, with a Natural Area Index of 38. The Mean Quality was 4.41. There were no SPECIAL VEGETATION floristic elements recorded among the 71 native taxa catalogued for this area. In 1988, *Stenosiphon linifolius*, an adventive species of western prairies, and undocumented from the Chicago Region, appeared along the new sidewalk east of the Paul Douglas Visitor Center (Dritz #596, 1988, MOR); it disappeared before having matured fruit. In 1989, it reappeared nearby along with *Eriogonum annuum* and *Thelesperma megapotamicum*, also adventive from the western states, probably along with some recently transported topsoil.

The 125 acres in Survey Area E were surveyed June 10 & 20, July 7, and September 12 & 23, 1979. I recorded 168 native taxa from this Survey Area. Their Mean Quality was 5.97

and the area registered an Index of 77. There are an additional 7 species reported from this Survey Area; their inclusion in the calculations would raise the Index to 81.

The 105 acres in Survey Area F (surveyed July 7 & 10, 1985 and October 5, 1987) are a recent addition to the southwestern portion of the Miller Unit; it extends the Unit westward to Broadway; it is virtually an extension of Survey Area E. During these inventories I noted 265 species with a Mean Quality of 5.73 and an Index of 93. When it is included with Survey Area E, there are 292 native species with a Mean Quality of 5.91 and an Index of 101. West of Survey Area F is a narrow, 63 acre tract which I have not surveyed; I have labeled it Survey Area H on the Survey Unit Map.

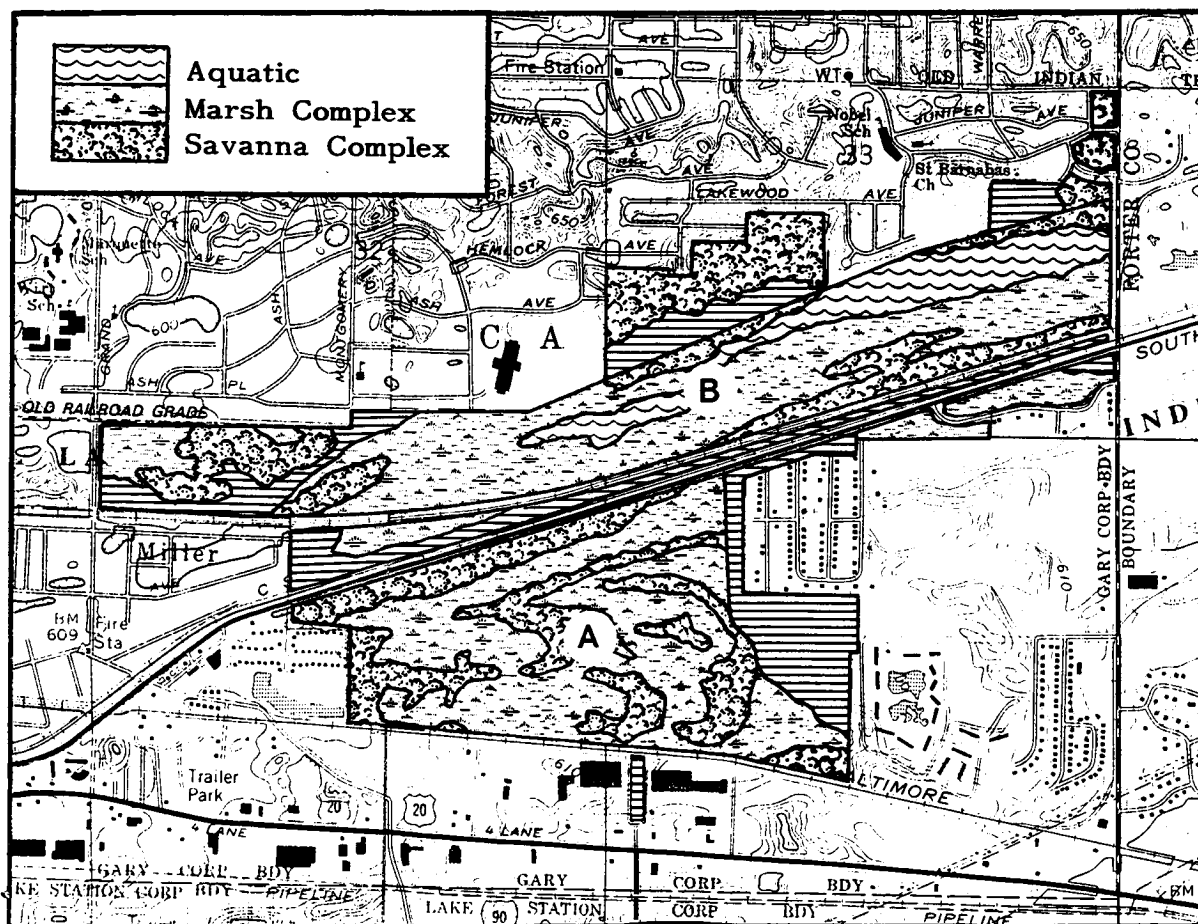
North of Survey Area F is a 70-acre extension of Survey Area C included recently within the Indiana Dunes National Lakeshore; I have labeled it Survey Area G. I visited this area in 1985 but did not make an inventory. It does not appear to be of the same quality as Survey Area C.

The Survey Unit, as a whole, has an overall Mean Quality of 6.84, with a Natural Area Rating Index of 142. I have documented, altogether, 433 native floristic elements. If the additional 21 taxa known to have grown within the boundaries of this Survey Unit were included, the Mean Quality would rise to 6.92, with a Natural Area Rating Index of 147.

SURVEY UNIT II: TOLLESTON

This Survey Unit occupies about 630 acres at the southeast edge of Miller. The Unit is divided physically by the Penn Central and Chicago South Shore & South Bend Railroads, along with the right-of-way of U.S. 12. The 20 acres between the two railroads are largely obliterated from a SPECIAL VEGETATION standpoint. I surveyed the southern half on June 10, 1979 and on July 30, 1987; the northern half was surveyed July 10, 1987 and September 27, 1988. On one occasion I was accompanied by Elizabeth Shimp, and on another by Craig Johnson.

The Survey Unit Map was superimposed to scale over combined parts of the U.S.G.S. Gary, 41087-E3-TF-024, photo-revised 1986, and the U.S.G.S. Portage Quadrangle, 41087-E2-TF-024, photo-revised 1986. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a color oblique set flown in May, 1978; one black & white aerial plate (BFP/BFJ-1:95) flown in November, 1938; a black & white stereo-pair set (BFJ-IV: 35 & 36) flown June, 1958; a black & white stereo-pair set (BFP-IV: 3 & 4) flown September, 1958; a color stereo-pair set (79-117: 8-10; 105-107) flown May, 1979; and a black & white stereo-pair set (4:8-12; 5:10-14) flown May, 1984.



ANNOTATED LIST
OF
SPECIAL VEGETATION FLORISTIC ELEMENTS

Aralia hispida Vent. Bristly Sarsaparilla is being monitored in Survey Area A by the Indiana Dunes National Lakeshore (Bowles *et al.* 1986a); it is listed as growing with ***Andropogon scoparius***, ***Artemisia caudata***, ***Cyperus filiculmis***, ***Krigia virginica***, ***Monarda punctata*** var. ***villicaulis***, ***Panicum villosissimum*** var. ***pseudopubescens***, ***Quercus velutina***, and ***Rhus copallina*** var. ***latifolia***. REPRESENTATIVE SPECIMEN: Fox #73, 10 AUG 1984; Tolleston dunes, south of sand mined area at far east end of unit, ca 0.125 mi west of Wood Lake Apartments. NE SW Sec.4 T37N R7W; rare plant in flat sandy area. MOR.

Aristida intermedia Scribn. & Ball According to Dritz (1989), this species grows along the cindery rail bed in Survey Area B.

Aristida tuberculosa Nutt. In the open sandy areas in the southwestern and far eastern sectors of Survey Area A, this species is quite abundant. Here it is being monitored by the Indiana Dunes National Lakeshore (Bowles *et al.* 1986a). It is listed as growing with ***Andropogon scoparius***, ***Artemisia caudata***, ***Asclepias syriaca***, ***Cyperus houghtonii***, ***Euphorbia corollata***, ***Krigia virginica***, ***Linaria canadensis***, ***Monarda punctata*** var. ***villicaulis***, ***Panicum villosissimum*** var. ***pseudopubescens***, ***Prunus serotina***, ***P. pumila***, ***Quercus velutina***, and ***Triplasis purpurea***. According to Bowles (1989), this population appears to have changed little since 1985. There is also a small population in the far southwestern corner of Survey Area B. REPRESENTATIVE SPECIMEN: Dritz #635, 25 SEP 1988; in a sandy savanna opening among wooded dunes on the Marquette Trail, near its western end, SW NE NW Sec.5 T36N R7W, in the Tolleston unit of the Indiana Dunes National Lakeshore; with ***Polygonella articulata***, ***Triplasis purpurea***, ***Cyperus schweinitzii***, ***Carex tonsa***, ***C. muhlenbergii***, ***Panicum oligosanthos*** var. ***scribnerianum***, ***Quercus velutina***, ***Pteridium aquilinum*** var. ***latiusculum***, ***Euphorbia corollata***, ***Rhus copallina*** var. ***latifolia***, ***Linaria canadensis***, ***Artemisia caudata***, ***Monarda punctata*** var. ***villicaulis***, ***Tephrosia virginiana***, ***Corispermum hyssopifolium***, ***Koeleria cristata***, ***Opuntia humifusa***, ***Lespedeza capitata***, ***Sassafras albidum***, ***Andropogon scoparius***, and ***Rubus flagellaris***. MOR. According to Peattie (1922) and Hooper (1934), this species has ancestral affinities to the Atlantic coastal plain.

Aster junciformis Rydb. Infrequent in wet calcareous sands, in the western and northern portions of Survey Area A.

Carex oligosperma Michx. This species is abundant in the old Tolleston Panne near the west end of Survey Area A.

Carex tonsa (Fern.) Bickn. This species is rather frequent in deep droughty sands along the old dune ridges.

Cladium mariscoides (Muhl.) Torr. Common in the old Tolleston Panne near the west end of Survey Area A. REPRESENTATIVE SPECIMEN: Fox #76, 10 AUG 1984; T36N R7W SE NE Sec.5; along old E-W utility road bisecting Tolleston Dunes. INDU. McLaughlin (1932) considered this species to have ancestral affinities to the Atlantic coastal plain.

Diervilla lonicera Mill. Bush Honeysuckle is occasional to common along the old Tolleston dune slopes in both Survey Areas. Welch (1935) considered this species to be a boreal relict.

Euphorbia polygonifolia L. This species is known from Survey Area B solely on the basis of the following REPRESENTATIVE SPECIMEN: Hess *et al.* #6006, 4 SEP 1984; Indiana Dunes National Lakeshore, 0.5 mi N of U.S. 12 off rd. to West Beach. T37N R7W Sec. 33. In dunes blowout behind foredunes. With *Rhus* and *Cyperus*. Scattered annual, locally common, flat against sand, in protected area. MOR. This location, more than 0.6 mile from the lake, is the most inland site I know of for this species. According to Peattie (1922) and Hooper (1934), this species has ancestral affinities to the Atlantic coastal plain.

Gentiana saponaria L. Barbara Plampin sent me an inflorescence of this species for confirmation. According to her (Plampin, 1989c), it was collected in October in the extreme southeast corner of Survey Area A, north of the B. & O. Railroad, in a disturbed wetland area with *Aster* sp., *Solidago* sp., *Andropogon gerardii*, *A. scoparius*, *Helianthus occidentalis*, *Rhus copallina* var. *latifolia*, *Sorghastrum nutans*, and *Spiraea tomentosa* var. *rosea*.

Hudsonia tomentosa Nutt. In the open sandy areas in the southwestern and southeastern sectors of Survey Area A, this species is quite abundant; also noted by Bowles *et al.* (1986a) and Pitcher & Plampin (1985). It is rare in Survey Area B, where it occurs as a single clump in a small blowout 19 telephone poles west of County Line Road. REPRESENTATIVE SPECIMEN: Wilhelm #14935, 10 JUL 1987; east of Miller, on property of the Indiana Dunes National Lakeshore, north of the railroad right-of-way, 19 telephone poles west of County Line Road. MOR. Bowles *et al.* (1986a) listed associates in this Survey Unit as *Andropogon scoparius*, *Aristida tuberculosa*, *Artemisia caudata*, *Cyperus houghtonii*, *Euphorbia corollata*, *Koeleria cristata*, *Krigia virginica*, *Linaria canadensis*, *Panicum villosissimum* var. *pseudopubescens*, *P. virgatum*, *Polygonella articulata*, and *Triplasis purpurea*. Bowles (1989) reported that the Tolleston population declined in frequency, but that the distribution patterns remain essentially unchanged since it was first sampled in 1985. McLaughlin (1932) regarded this species as having ancestral affinities to the Atlantic coastal plain. Trefz (1935) seemed to agree, but noted that its ties are also boreal.

Juncus scirpoides Lam. This species is known from the southeast portion of Survey Area A, at which location it grows with *Cyperus filiculmis*, *Eleocharis olivacea*, *Equisetum hyemale*, *Juncus alpinus* var. *rariflorus*, *Panicum virgatum*, *P. villosissimum*, *Populus tremuloides*, and *Salix glaucophylloides* var. *glaucophylla* in a sand pit (Bowles *et al.* 1985). REPRESENTATIVE SPECIMEN: Fox #77, 10 AUG 1984; T36N R7W SE NE Sec.5; along old E-W utility road bisecting Tolleston Dunes. INDU. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Lonicera dioica L. Rare on the northern exposures of the Black Oak sand ridges, in the western and north-central portion of Survey Area A.

Pinus banksiana Lamb. A few infrequent, young trees, along the sand ridges in the western and northern portions of Survey Area A. One might question the nativity of these trees here. Welch (1935) considered this species to be a boreal relict.

Polygonella articulata (L.) Meisn. This species is known from Survey Area A, from where first reported by Pitcher & Plampin (1985). Bowles *et al.* (1986a) listed the following

associates for this population: *Aristida tuberculosa*, *Artemisia caudata*, *Asclepias syriaca*, *Cyperus houghtonii*, *Euphorbia corollata*, *Krigia virginica*, *Linaria canadensis*, *Monarda punctata* var. *villicaulis*, *Panicum villosissimum* var. *pseudopubescens*, and *Triplasis purpurea*. Bowles (1989) reported that the frequency within a 90 m² quadrat population dropped from 100% in 1985 to 36% in 1988. It is also on a north slope of high savanna in the western portion of Survey Area B. REPRESENTATIVE SPECIMEN: Dritz #634, 25 SEP 1988; in a sandy savanna opening among wooded dunes on the Marquette Trail, near its western end, SW NE NW Sec.5 T36N R7W, in the Tolleston unit of the Indiana Dunes National Lakeshore; with *Aristida tuberculosa*, *Triplasis purpurea*, *Cyperus schweinitzii*, *Carex tosa*, *C. muhlenbergii*, *Panicum oligosanthos* var. *scribnerianum*, *Quercus velutina*, *Pteridium aquilinum* var. *latiusculum*, *Euphorbia corollata*, *Rhus copallina* var. *latifolia*, *Linaria canadensis*, *Artemisia caudata*, *Monarda punctata* var. *villicaulis*, *Tephrosia virginiana*, *Corispermum hyssopifolium*, *Koeleria cristata*, *Opuntia humifusa*, *Lespedeza capitata*, *Sassafras albidum*, *Andropogon scoparius*, and *Rubus flagellaris*. MOR.

Scirpus hallii Gray. Known elsewhere in the Chicago region only from the Dritz Pits [see Survey Unit III], this species was discovered recently by Noel Pavlovic as described in the following REPRESENTATIVE SPECIMEN: Pavlovic #167, 29 JUL 1987; in sand mined area of Tolleston Dunes east of *Talinum rugospermum* population; NW NE SW Sec.4 T36N R7W. Associates: *Bulbostylis capillaris*, *Fimbristylis autumnalis*, *Juncus* sp., and *Lythrum salicaria*. MOR. A recent reconnaissance by Ken Dritz revealed hundreds of plants. See also the discussion under Survey Unit III.

Selaginella rupestris (L.) Spring. Plampin (1989c) reported to me her recent discovery of Sand Club Moss in Survey Area A. It grows just up the slope from *Gentiana saponaria* (which see), with *Andropogon scoparius*, *Cyperus filiculmis*, *Helianthemum canadense*, *Opuntia humifusa*, *Sorghastrum nutans*, and *Viola pedata* var. *lineariloba*.

Talinum rugospermum Holzinger Known only from Survey Area A, this population may represent the only extant elements of this rare species in the Lakeshore. It is being monitored by the Indiana Dunes National Lakeshore (Bowles et al. 1986a). It is listed as growing with *Asclepias tuberosa*, *Artemisia caudata*, *Aster linariifolius*, *Cyperus filiculmis*, *Koeleria cristata*, *Liatris aspera*, *Panicum virgatum*, *Quercus velutina*, *Solidago nemoralis*, *Tephrosia virginiana*, and *Tradescantia ohiensis*. Noel Pavlovic (Bowles 1988), of the Indiana Dunes National Lakeshore, has monitored this population annually since 1985; he concludes that the population has been fairly stable in size. REPRESENTATIVE SPECIMEN: Plampin & Pitcher #5, 21 AUG 1985; Tolleston Dunes, northeast of K-Mart on east-facing slope of old dune; along path in open dry sand savanna; 24 plants in one colony; T36N R7W NE SE Sec.5. MOR.

Trichostema dichotomum L. This rare mint of Black Oak savanna is known from Survey Area A, from where first reported by Pitcher & Plampin (1985). REPRESENTATIVE SPECIMEN: Klick et al. s.n., 4 SEP 1987; north of K-Mart along the Baltimore & Ohio RR track, north side, NE NW SW Sec.4 T36N R7W. Associated with *Polanisia graveolens*, *Helianthus petiolaris*, and *Eragrostis spectabilis*. On sloping sandy ballast of north side of tracks; many plants flowering. Possibly introduced via train; B. Pitcher found population few years ago. MOR.

Summary

This Survey Unit provides the habitat for at least 18 SPECIAL VEGETATION floristic elements, all of which are currently extant and in fairly stable populations. In spite of recent attention by botanists, this Survey Unit remains orphan in the sense that the two natural area giants, Miller and West Beach, between which it lies, attract the lion's share. Only 3 SPECIAL VEGETATION floristic elements were known from the Tolleston Unit ten years ago (Wilhelm, 1980). Given the rate at which new discoveries are occurring here, it is likely that others will follow.

Twenty-eight percent of the SPECIAL VEGETATION floristic elements were considered by Peattie (1922), McLaughlin (1932), and Hooper (1934) to have ancestral affinities to the Atlantic coastal plain. Welch (1935) considered two species to be boreal relicts.

NATURAL AREA ASSESSMENT

The Natural Area Assessment data are tabulated in Table II. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from Survey Areas A and B, along with the numerical rating coefficients as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient. Results from additional surveys on Survey Area A were compiled by Emma Pitcher and Barbara Plampin (Pitcher & Plampin, 1985). Some of the species listed in this report were neither noted during my own surveys of the area nor vouchered at the INDU herbarium; these species are codified in the table below by an "R" symbol rather than an "x". Those species listed without a tabular entry under Survey Area A or B were reported by Klick *et al.* (1989).

TABLE II: Summary of species upon which are calculated the various Natural Area Indices for each Survey Area and for the Survey Unit as a whole.

A	B	
	x	0 <i>Acer negundo</i>
x	x	7 <i>Acer rubrum</i>
	x	0 <i>Acer saccharinum</i>
x	x	* <i>Achillea millefolium</i>
x	x	* <i>Agropyron repens</i>
	x	* <i>Agrostis alba</i>
R	x	* <i>Ailanthus altissima</i>
x		4 <i>Alisma subcordatum</i>
x	x	0 <i>Ambrosia artemisiifolia elatior</i>
x		* <i>Ambrosia psilostachya coronopifolia</i>
	x	0 <i>Ambrosia trifida</i>
x	x	8 <i>Amelanchier laevis</i>
x	x	4 <i>Amphicarpa bracteata</i>
x	x	4 <i>Andropogon gerardii</i>
x	x	5 <i>Andropogon scoparius</i>
x	x	2 <i>Anemone cylindrica</i>
x	x	6 <i>Antennaria plantaginifolia</i>
x	x	6 <i>Apios americana</i>
x	x	5 <i>Apocynum androsaemifolium</i>
x	x	2 <i>Apocynum sibiricum</i>
x	x	5 <i>Aquilegia canadensis</i>

A	B	
		* Aquilegia vulgaris
x	x	7 Arabis lyrata
x		15 Aralia hispida
x	x	8 Aralia nudicaulis
	x	9 Arenaria lateriflora
	x	* Arenaria serpyllifolia
	R	5 Aristida intermedia
x	x	15 Aristida tuberculosa
x	x	5 Artemisia caudata
		* Artemisia vulgaris
x		10 Asclepias amplexicaulis
x	x	4 Asclepias incarnata
x	x	0 Asclepias syriaca
x	x	10 Asclepias tuberosa
x		1 Asclepias verticillata
x		* Asparagus officinalis
x	x	8 Aster azureus
x		5 Aster dumosus
x		5 Aster ericoides
x		10 Aster junciformis
x	x	10 Aster linariifolius
	x	4 Aster novae-angliae
x	x	1 Aster pilosus
x		5 Aster puniceus firmus
	x	3 Aster simplex
x	x	10 Aster umbellatus
x		8 Baptisia leucantha
	x	5 Bidens comosa
x	x	8 Bidens coronata
x	x	2 Boehmeria cylindrica
x		10 Boltonia latisquama recognita
x	x	* Bromus tectorum
x		6 Bulbostylis capillaris
x	x	3 Calamagrostis canadensis
x		5 Calamagrostis inexpansa brevior
x	x	10 Calamovilfa longifolia
x		4 Cardamine pensylvanica
x		3 Carex brevior
x		8 Carex buxbaumii
	x	5 Carex comosa
	x	4 Carex cristatella
x	x	10 Carex lacustris
x		4 Carex lanuginosa
x	x	5 Carex muhlenbergii
x		15 Carex oligosperma
x	x	5 Carex pensylvanica
	x	7 Carex scoparia
x	x	5 Carex stricta
x	x	15 Carex tosa
x		10 Carex viridula
	x	* Catalpa speciosa
x	x	8 Ceanothus americanus

A	B	
R	6	Celastrus scandens
R	0	Cenchrus longispinus
x	7	Cephalanthus occidentalis
x	*	Cerastium vulgatum
x x	4	Chenopodium leptophyllum
x	0	Circaea quadrisulcata canadensis
x x	*	Cirsium arvense
x x	2	Cirsium discolor
R	*	Cirsium vulgare
x	15	Cladium mariscoides
x x	7	Comandra richardsiana
x	1	Convolvulus sepium
x	7	Coreopsis lanceolata
x	8	Coreopsis palmata
x x	5	Coreopsis tripteris
	x	8 Corispermum hyssopifolium
x x	1	Cornus racemosa
R	*	Crepis tectorum
	*	Croton glandulosus septentrionalis
x x	7	Cycloloma atriplicifolium
x x	5	Cyperus filiculmis
x x	5	Cyperus houghtonii
x x	5	Cyperus schweinitzii
	x	1 Cyperus strigosus
x	5	Danthonia spicata
R x	*	Daucus carota
	x	4 Desmodium canadense
x	10	Desmodium sessilifolium
x x	10	Diervilla lonicera
	x	* Digitaria ischaemum
		* Digitaria sanguinalis
x x	6	Dryopteris thelypteris pubescens
R	10	Dulichium arundinaceum
	x	5 Echinocystis lobata
R	*	Echium vulgare
x x	5	Eleocharis calva
x	8	Eleocharis elliptica
x	8	Eleocharis olivacea
x x	4	Elymus canadensis
x	10	Epilobium angustifolium
	x	3 Epilobium coloratum
R	8	Epilobium leptophyllum
x x	0	Equisetum arvense
R	4	Equisetum hyemale affine
x x	3	Equisetum hyemale intermedium
	*	Eragrostis poaeoides
x x	3	Eragrostis spectabilis
	x	2 Erechtites hieracifolia
	x	1 Erigeron annuus
R x	0	Erigeron canadensis
x	4	Erigeron philadelphicus
x x	3	Erigeron strigosus

A	B	
x	x	0 Eupatorium altissimum
x	x	5 Eupatorium maculatum
x	x	6 Eupatorium perfoliatum
	R	4 Eupatorium rugosum
x	x	1 Eupatorium serotinum
x	x	2 Euphorbia corollata
x		* Euphorbia cyparissias
	x	* Euphorbia maculata
	x	15 Euphorbia polygonifolia
	x	* Euphorbia supina
x	x	* Festuca elatior
x		10 Fimbristylis autumnalis mucronulata
x	x	1 Fragaria virginiana
	x	2 Fraxinus pennsylvanica subintegerrima
x		9 Juncus alpinus rariflorus
	R	* Froelichia gracilis
x		1 Galium aparine
x	x	5 Galium obtusum
x	x	10 Galium pilosum
x	x	9 Gaylussacia baccata
x		15 Gentiana saponaria
x		4 Geranium maculatum
R		10 Gerardia flava
x		8 Gerardia pedicularia ambigens
R		7 Gerardia purpurea
x		7 Gratiola virginiana
x		0 Hackelia virginiana
	x	8 Hamamelis virginiana
x	x	8 Helianthemum canadense
		* Helianthus annuus
x	x	5 Helianthus divaricatus
x	x	2 Helianthus grosseserratus
x		9 Helianthus mollis
x		10 Helianthus occidentalis
x	x	* Helianthus petiolaris
x		* Hesperis matronalis
x		8 Heuchera richardsonii
x		6 Hieracium canadense fasciculatum
x		6 Hieracium gronovii
	x	7 Hieracium scabrum
x		* Hordeum jubatum
x	x	15 Hudsonia tomentosa
	x	9 Hypericum boreale
x		8 Hypericum canadense
	x	8 Hypericum mutilum
x	x	* Hypericum perforatum
x	x	8 Hypericum virginicum fraseri
	x	3 Impatiens capensis
x	x	5 Iris virginica shrevei
x		8 Juncus acuminatus
x		9 Juncus alpinus rariflorus
	x	7 Juncus canadensis

A B

x	x	4	<i>Juncus dudleyi</i>
x	x	7	<i>Juncus effusus solutus</i>
x		8	<i>Juncus greenei</i>
x		6	<i>Juncus nodosus</i>
x		20	<i>Juncus scirpoides</i>
x		0	<i>Juncus tenuis</i>
x		4	<i>Juncus torreyi</i>
x	x	7	<i>Koeleria cristata</i>
x		7	<i>Krigia biflora</i>
R		6	<i>Krigia virginica</i>
	R	4	<i>Kuhnia eupatorioides corymbulosa</i>
x	x	2	<i>Lactuca canadensis</i>
x		*	<i>Lactuca scariola</i>
x		7	<i>Lechea leggettii moniliformis</i>
	x	5	<i>Leersia oryzoides</i>
x		5	<i>Lemna minor</i>
x	x	0	<i>Lepidium virginicum</i>
x	x	4	<i>Lespedeza capitata</i>
x		6	<i>Lespedeza hirta</i>
x	x	6	<i>Liatris aspera</i>
x		6	<i>Liatris spicata</i>
R	R	6	<i>Linaria canadensis</i>
R	x	*	<i>Linaria vulgaris</i>
x	x	6	<i>Lithospermum canescens</i>
x	x	8	<i>Lithospermum croceum</i>
x		15	<i>Lonicera dioica</i>
	x	*	<i>Lonicera X muendeniensis</i>
	x	7	<i>Lonicera prolifera</i>
x		6	<i>Ludwigia alternifolia</i>
x		5	<i>Ludwigia palustris americana</i>
x	x	7	<i>Lupinus perennis occidentalis</i>
x		*	<i>Lychnis alba</i>
x	x	5	<i>Lycopus americanus</i>
x		6	<i>Lycopus uniflorus</i>
	x	6	<i>Lycopus virginicus</i>
	x	9	<i>Lysimachia thyrsiflora</i>
x		7	<i>Lythrum alatum</i>
x	x	*	<i>Lythrum salicaria</i>
x	x	10	<i>Maianthemum canadense interius</i>
R		*	<i>Marrubium vulgare</i>
x		*	<i>Medicago lupulina</i>
x	x	*	<i>Melilotus alba</i>
x	x	*	<i>Melilotus officinalis</i>
	x	5	<i>Mentha arvensis villosa</i>
	x	6	<i>Mimulus ringens</i>
		*	<i>Mollugo verticillata</i>
x	x	4	<i>Monarda fistulosa</i>
x	x	5	<i>Monarda punctata villicaulis</i>
	x	*	<i>Morus alba</i>
	x	3	<i>Muhlenbergia frondosa</i>
x	x	5	<i>Muhlenbergia mexicana</i>
	x	*	<i>Muhlenbergia racemosa</i>

A	B	
		* <i>Nepeta cataria</i>
x	x	8 <i>Nyssa sylvatica</i>
x	x	1 <i>Oenothera biennis</i>
x	x	7 <i>Oenothera rhombipetala</i>
x	x	8 <i>Onoclea sensibilis</i>
x	x	5 <i>Opuntia humifusa</i>
	x	6 <i>Osmunda cinnamomea</i>
	x	8 <i>Osmunda regalis spectabilis</i>
x		0 <i>Oxalis stricta</i>
	x	1 <i>Panicum capillare</i>
x	x	10 <i>Panicum depauperatum</i>
x		3 <i>Panicum implicatum</i>
x		7 <i>Panicum latifolium</i>
x		9 <i>Panicum lindheimeri</i>
x	x	7 <i>Panicum oligosanthos scribnerianum</i>
x		7 <i>Panicum villosissimum</i>
x	x	9 <i>Panicum villosissimum pseudopubescens</i>
x	x	5 <i>Panicum virgatum</i>
x		1 <i>Parthenocissus inserta</i>
	x	2 <i>Parthenocissus quinquefolia</i>
x	x	10 <i>Pedicularis canadensis</i>
x	x	0 <i>Phalaris arundinacea</i>
	x	8 <i>Phlox bifida</i>
x		7 <i>Phlox glaberrima interior</i>
x	x	6 <i>Phlox pilosa</i>
	x	4 <i>Phragmites communis berlandieri</i>
	x	4 <i>Physalis virginiana</i>
x		8 <i>Physocarpus opulifolius</i>
x		2 <i>Phytolacca americana</i>
x		20 <i>Pinus banksiana</i>
x		0 <i>Plantago rugelii</i>
x	x	* <i>Poa compressa</i>
x	x	* <i>Poa pratensis</i>
x		* <i>Polanisia graveolens</i>
x	x	10 <i>Polygala polygama obtusata</i>
x	x	3 <i>Polygonatum canaliculatum</i>
x		7 <i>Polygonatum pubescens</i>
x	x	15 <i>Polygonella articulata</i>
x	x	5 <i>Polygonum amphibium stipulaceum</i>
x	x	5 <i>Polygonum coccineum</i>
	x	7 <i>Polygonum hydropiperoides</i>
R		* <i>Polygonum lapathifolium</i>
	x	6 <i>Polygonum punctatum</i>
	x	10 <i>Polygonum sagittatum</i>
R	x	2 <i>Polygonum scandens</i>
x	x	2 <i>Populus deltoides</i>
x	x	4 <i>Populus tremuloides</i>
	x	0 <i>Potentilla norvegica</i>
x	x	* <i>Potentilla recta</i>
x		4 <i>Potentilla simplex</i>
x	x	5 <i>Prenanthes alba</i>
	x	6 <i>Proserpinaca palustris crebra</i>

A	B	
	x	5 <i>Prunus pensylvanica</i>
x		8 <i>Prunus pumila</i>
x	x	1 <i>Prunus serotina</i>
x	x	1 <i>Prunus virginiana</i>
	x	7 <i>Ptelea trifoliata</i>
x	x	5 <i>Pteridium aquilinum latiusculum</i>
		* <i>Pyrus communis</i>
x		9 <i>Pyrus floribunda</i>
x	x	7 <i>Pyrus melanocarpa</i>
x	x	4 <i>Quercus alba</i>
x	x	8 <i>Quercus palustris</i>
x	x	6 <i>Quercus velutina</i>
	x	7 <i>Ranunculus flabellaris</i>
R		6 <i>Ranunculus pensylvanicus</i>
x	x	6 <i>Rhus copallina latifolia</i>
R		1 <i>Rhus glabra</i>
x	x	1 <i>Rhus radicans</i>
x	x	3 <i>Rhus typhina</i>
		* <i>Robinia pseudo-acacia</i>
x	x	10 <i>Rorippa islandica hispida</i>
x	x	5 <i>Rosa carolina</i>
R	x	* <i>Rosa multiflora</i>
	x	9 <i>Rosa palustris</i>
x		10 <i>Rotala ramosior</i>
x	x	4 <i>Rubus flagellaris</i>
x		9 <i>Rubus hispidus obovalis</i>
x	x	7 <i>Rubus idaeus strigosus</i>
x	x	2 <i>Rubus occidentalis</i>
x	x	3 <i>Rubus pensylvanicus</i>
x	x	1 <i>Rudbeckia hirta</i>
x	x	* <i>Rumex acetosella</i>
		* <i>Rumex crispus</i>
	x	7 <i>Rumex orbiculatus</i>
	x	6 <i>Rumex verticillatus</i>
	x	4 <i>Sagittaria latifolia</i>
	x	5 <i>Salix amygdaloides</i>
x	x	2 <i>Salix discolor</i>
x	x	7 <i>Salix glaucophylloides glaucophylla</i>
x		10 <i>Salix gracilis textoris</i>
x	x	6 <i>Salix humilis</i>
x		1 <i>Salix interior</i>
	x	4 <i>Salix nigra</i>
x	x	5 <i>Salix rigida</i>
R		* <i>Salsola kali tenuifolia</i>
x	x	1 <i>Sambucus canadensis</i>
x	x	* <i>Saponaria officinalis</i>
x	x	6 <i>Sassafras albidum</i>
x		7 <i>Scirpus americanus</i>
	x	4 <i>Scirpus atrovirens</i>
x	x	6 <i>Scirpus cyperinus</i>
	x	6 <i>Scirpus fluviatilis</i>
x		20 <i>Scirpus hallii</i>

A	B	
x		5 Scutellaria epilobiifolia
x		5 Scutellaria lateriflora
R		20 Selaginella rupestris
		* Setaria faberii
x		* Setaria viridis
x	x	2 Silene antirrhina
x		* Silene cserei
x		5 Silphium laciniatum
	x	7 Sisyrinchium albidum
	x	7 Sium suave
x	x	2 Smilacina racemosa
x	x	5 Smilacina stellata
x	x	4 Smilax lasioneura
	x	5 Smilax tamnoides hispida
x	x	* Solanum americanum
		* Solanum carolinense
x	x	* Solanum dulcamara
x	x	1 Solidago altissima
x	x	7 Solidago caesia
x	x	3 Solidago gigantea
x		4 Solidago graminifolia media
x	x	3 Solidago graminifolia nuttallii
x		5 Solidago juncea
x		5 Solidago missouriensis fasciculata
x	x	4 Solidago nemoralis
x	x	7 Solidago speciosa
		* Sonchus oleraceus
		* Sonchus uliginosus
x	x	5 Sorghastrum nutans
	x	5 Spartina pectinata
x		4 Sphenopholis intermedia
x	x	7 Spiraea alba
x		7 Spiraea tomentosa rosea
	x	* Sporobolus asper
	x	5 Stachys palustris homotricha
x	x	6 Stipa spartea
x		15 Talinum rugospermum
x	x	* Taraxacum officinale
x	x	8 Tephrosia virginiana
x		5 Thalictrum revolutum
x	x	2 Tradescantia ohienensis
x	x	* Tragopogon major
R		* Tragopogon pratensis
x		15 Trichostema dichotomum
x		* Trifolium hybridum
x		* Trifolium repens
		* Triodia flava
R	x	7 Triplasis purpurea
x		2 Typha angustifolia
x	x	1 Typha latifolia
		* Ulmus pumila
x	x	2 Urtica procera

A	B	
x	x	5 <i>Vaccinium angustifolium laevifolium</i>
	x	5 <i>Vaccinium vacillans</i>
R		* <i>Verbascum blattaria</i>
x	x	* <i>Verbascum thapsus</i>
x	x	4 <i>Verbena hastata</i>
x		4 <i>Verbena stricta</i>
x		5 <i>Vernonia altissima</i>
R		5 <i>Vernonia fasciculata</i>
x		1 <i>Veronica peregrina</i>
	x	10 <i>Viburnum recognitum</i>
x		7 <i>Viola lanceolata</i>
x	x	10 <i>Viola pedata lineariloba</i>
x		7 <i>Viola sagittata</i>
x	x	4 <i>Vitis riparia</i>
x	x	6 <i>Vulpia octoflora tenella</i>
x		7 <i>Zizia aurea</i>

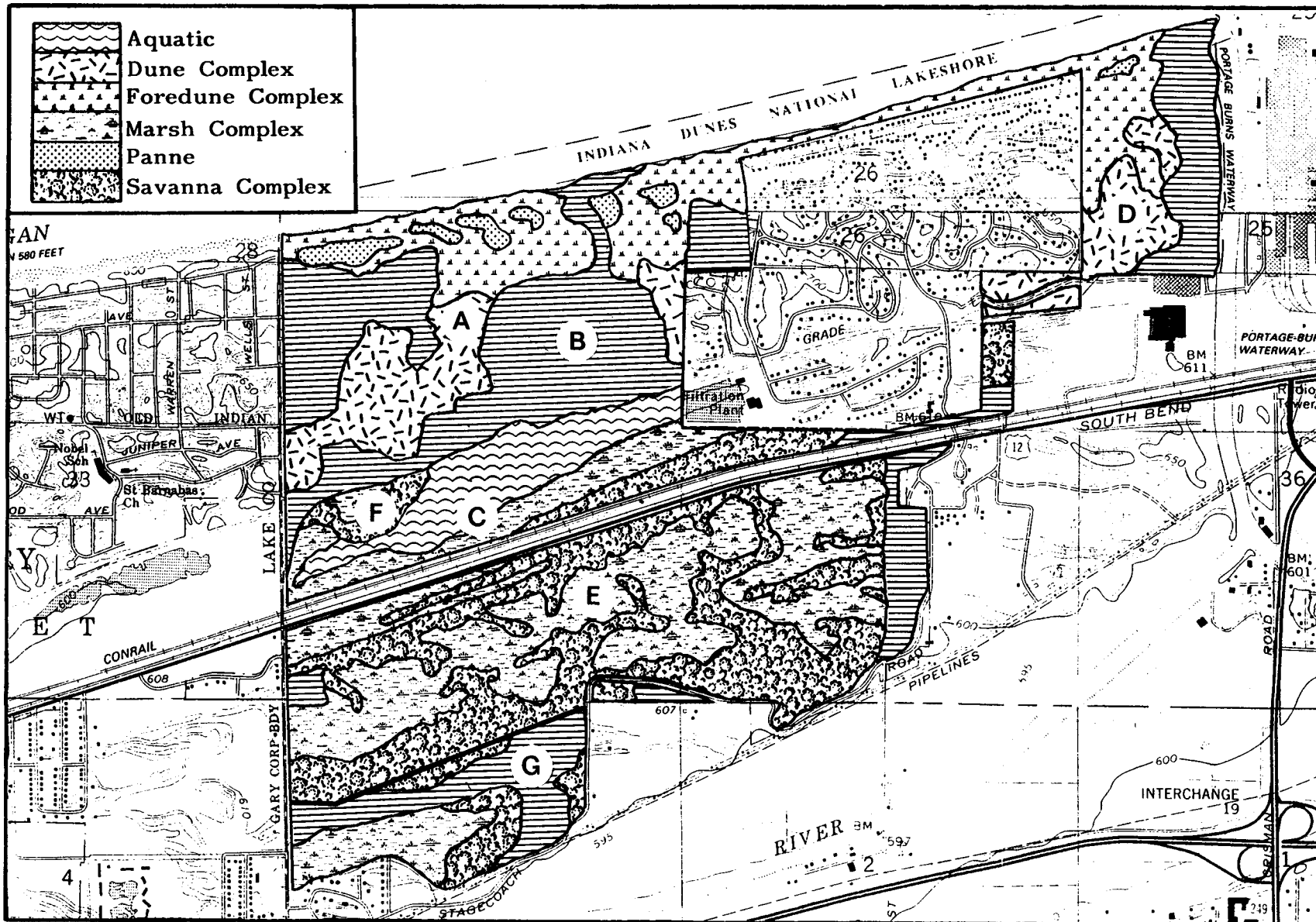
Summary

The 271 acres in Survey Area A were Surveyed June 10 and July 30, 1987. Extensive floristic work in this area was also conducted by Pitcher & Plampin, 1985. Since 1980, numerous voucher specimens from this area have been documented at INDU; these data are also included. Overall, 239 native species have been documented from this Survey Area, with a Mean Quality of 6.09 and representing an Index of 94. If the 14 additional reports can be documented, the Index would stand at 96. There are about 19 acres along the south side of Route 12 in the northeast portion of the Survey Area which, to my knowledge, no one has surveyed.

The large, 319 acre tract north of the traction line (Survey Area B) was not Surveyed in 1980. Since then, I have spent some time there: July 10, 1987 and September 27, 1988. Altogether, there have been recorded 209 native species with a Mean Quality of 5.2 and an Index of 75. It obviously deserves more time than it has been given. Dritz (1989) reported an additional five species. There is a 20 acre tract between the Conrail lines and the traction line which has not been explored.

In the Survey Unit as a whole, 298 native species have been documented. Their Mean Quality is 5.77 and they register an Index of 100. If the 11 additional reports can be substantiated, the Index would stand at 102.

SURVEY UNIT III MAP



SURVEY UNIT III: WEST BEACH

This Survey Unit occupies about 1300 acres east of Miller and around Ogden Dunes (see Figure II). It was divided into six Survey Areas, and surveyed on June 11, 12, 14, and 29; July 7 and 15; and September 12, 13, 23, and 30, 1979; May 7, 1986; July 2, 1987; July 24, 1988; and September 28, 1989. I was accompanied at various times on these surveys by John Bacone, Ken Dritz, Norm Henderson, Douglas Ladd, Elizabeth Shimp, Paul Strand, and Linda Wetstein. There is an additional tract of land currently not included within the designated boundaries of the Indiana Dunes National Lakeshore. Located south of Survey Area E west of Stage Coach Road, it is known, by a curious assonance, as the "Dritz Pits," and is designated herein as Survey Area G.

The Survey Unit Map (which appears on the next page) was superimposed to scale over a part of the U.S.G.S. Portage Quadrangle, 41087-E2-TF-024, photo-revised 1986; and the U.S.G.S. Ogden Dunes Quadrangle, 41087-F2-TF-024, photo-revised 1986. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a color oblique set flown in May, 1978; a black & white aerial plate (BFP/BFJ-1: 95) flown November, 1938; a black & white stereo-pair set (BFP-1: 3-5) flown November, 1938; a black & white stereo-pair set (BFP-1V: 3-4) flown September, 1958; a black & white stereo-pair set (BFP-2V: 48-49) flown September, 1958; a color stereo-pair set (77-157: 1-2) flown April, 1977; a color stereo-pair set (79-117: 10-15) flown May, 1979; and a black & white stereo-pair set (1:1-4, 2:1-8, 4:14-17) flown May, 1984.

The dunes northeast of Miller, in the West Beach Unit (Survey Area A), were the subject of a critical monograph on the hydrogen ion concentrations of soils and their relationships to ecological factors (Kurz, 1923). Of the 11 plants selected by Kurz to illustrate his points, 8 of them are now considered among the floristic elements of the SPECIAL VEGETATION. [Only one of these eight was recorded during this survey; much of this dune area has been obliterated.] In view of this fact it seems appropriate to include here a portion of his analysis on hydrogen ion relationships in the "Long Lake Dunes."

"Of outstanding interest is the fact that the younger sand deposits are definitely alkaline. Although in general this alkalinity is replaced by acidity as we proceed landward, it may persist in places half a mile or more from the lake. The high alkalinity (10-30) of the lake water indicates a high content of bases. Naturally enough of these bases accompany the sand washed ashore by the waves.

"Another feature is the occurrence of certain species on these alkaline sands. *Pinus banksiana*, which Fernald says 'is confined to acid soils,' occurs here in abundance. *Arctostaphylos uva-ursi* is abundant also, and grows in soils reaching a specific alkalinity of 10. *Chimaphila umbellata* is rare; one plant was found, and that one in sand of specific alkalinity of 10.

". . . the only colony of *Vaccinium macrocarpon* encountered in these dunes grew in this typically neutral spot. Off to one side a little higher under *Pinus banksiana* were found also *Pyrola secunda*, *Linnaea borealis* var. *americana*, *Arenaria stricta*, and *Maianthemum canadense*. The soils of all these plants ranged from 3 to 3 [sic!]. Locally a patch of decayed wood gave a specific acidity of 300. *Cornus canadensis* and *Linnaea borealis* var. *americana* dominated it. In view of the fact that these plants grew in alkaline sands, and that decayed wood brings into play other factors besides

acidity, the writer hesitates to attribute the dominance of the plants on the stump to H-ion concentration.

"The data . . . are meager, but the coming in of acidity is evident. With this acidity appear *Vaccinium pensylvanicum* [= *Vaccinium angustifolium laevifolium*] and *Vaccinium vacillans*."

Another study at the West Beach Unit (Hiebert *et al.* 1986) took a close look at the Pannes, those delightful, Elysian ponds around which grow forestlets of Jack Pine in the lee of the foredunes. In their study, they found 54 Panne species, of which 8 are listed as endangered or threatened in Indiana by Bacone & Hedge (1979). Eight are restricted to the Panne systems in the Chicago Region, 9 have known Atlantic coastal plain affinities, and 5 are considered boreal relicts.

Clearly, these Pannes are unique and special areas, truly like none other anywhere on earth; they are even different from those in the Miller Unit and even more so from those around Clarke Junction and Clarke & Pine. Of all the species Hiebert *et al.* (1986) encountered around the five Pannes in their study, only seventeen percent were common to each Panne. This statistic suggests that, even among the Pannes at West Beach, there are no two alike.

ANNOTATED LIST OF SPECIAL VEGETATION FLORISTIC ELEMENTS

Adiantum pedatum L. Known here only from a north-facing dune slope in the high dunes of the western portion of Survey Area A.

Alnus rugosa var. *americana* (Regel.) Fern. The low ground along Long Lake is the westernmost location for this species in the Lakeshore.

Ammophila breviligulata Fern. Fairly frequent along the Foredune Complex communities of Survey Areas A and D. REPRESENTATIVE SPECIMEN: Hiebert #81, 4 AUG 1981; Indiana Dunes National Lakeshore, NE NE Sec.34 T37N R7W. Abundant in sand of south-facing dune. MOR. Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Aralia hispida Vent. The paucity of fire in recent years may have caused the local extinction of this species. Ken Dritz (#142, MOR) listed associates for this species in the Dritz Pits as *Ailanthus altissima*, *Arabis lyrata*, *Asclepias tuberosa*, *Elymus canadensis*, *Erigeron canadensis*, *Euphorbia corollata*, *Lepidium virginicum*, *Lithospermum croceum*, *Lonicera tatarica*, *Monarda punctata* var. *villicaulis*, *Panicum oligosanthos* var. *scribnerianum*, *Pteridium aquilinum* var. *latiusculum*, *Quercus velutina*, *Rosa carolina*, *Rubus flagellaris*, *Sassafras albidum*, *Solanum americanum*, *Solidago caesia*, *Tradescantia ohiensis*, and *Vitis riparia*. The following specimen was probably collected from Survey Area E. REPRESENTATIVE SPECIMEN: Swink s.n., 30 JUN 1946; Porter County, Indiana; just east of the Lake County Line, east of Gary. MOR.

Arctostaphylos uva-ursi var. *coactilis* Fern. & Macbr. This species is frequent to common in those Survey Areas with dry sandy dunes. REPRESENTATIVE SPECIMEN:

Teuscher s.n., 28 APR 1923; Long Lake Indiana, sand dunes. MOR. Parker (1936) considered local populations of this species to be boreal relicts.

Arenaria stricta Michx. Known only from Survey Area A, the report is based solely on the citations in Kurz (1923).

Aristida intermedia Scribn. & Ball This easily overlooked grass is known only from Survey Areas A and G, discovered in both places by Ken Dritz in 1980. REPRESENTATIVE SPECIMEN: Dritz #147, 11 AUG 1980; sand pits, 0.5 N of B&O RR, 0.3 mi E of County Line Rd., SE of Gary, NE SE NW Sec.3 T36N R7W; near *Hudsonia tomentosa*. MOR.

Aristida tuberculosa Nutt. This species is known locally only on the basis of the following REPRESENTATIVE SPECIMEN: Dritz #141, 11 AUG 1980; in pure sand on the side of a small dune on the NW edge of the sand pit area 0.5 mi N of the B&O RR, 0.2 mi E of County Line Rd., SE of Gary, SE NW NW Sec.3 T36N R7W; with *Quercus velutina*, *Panicum oligosanthos* var. *scribnerianum*, *Rubus flagellaris*, *Populus deltoides*, *Rosa carolina*, *Euphorbia corollata*, *Pteridium aquilinum* var. *latiusculum*, *Monarda punctata* var. *villicaulis*, *Cyperus schweinitzii*, *Salsola kali* var. *tenuifolia*, *Lupinus perennis* var. *occidentalis*, *Arabis lyrata*, *Helianthemum canadense*, *Viola pedata* var. *lineariloba*, *Vaccinium angustifolium* var. *laevifolium*, and *Lithospermum croceum*. MOR. According to Peattie (1922) and Hooper (1934), this species has ancestral affinities to the Atlantic coastal plain.

Asclepias viridiflora Raf. Known from the Dune Complex of Survey Area A, from where vouchered by the following REPRESENTATIVE SPECIMEN: Hiebert #8b, 2 JUL 1981; Indiana Dunes National Lakeshore, along walkway in the picnic area. NE NW Sec.34 T37N R7W. Scattered in flat area of active disturbed dune complex. MOR.

Aster junciformis Rydb. Occasional to frequent in the wet calcareous sands of Survey Areas A, D, and E.

Aster ptarmicoides (Nees) T. & G. This species is characteristic of the Pannes in Survey Area A. Peattie (1930), however, apparently considered it to be common in the "... rich calcareous meadows of Long Lake." Those must have been the days! Bowles *et al.* (1986a) listed the following associates from a "late successional graminoid and savanna panne:" *Andropogon scoparius*, *Arctostaphylos uva-ursi* var. *coactilis*, *Calamovilfa longifolia*, *Hypericum kalmianum*, *Liatris cylindracea*, *Lobelia kalmii*, *Pinus banksiana*, *Sabatia angularis*, and *Solidago nemoralis*. According to Bowles (1989), the population is similar to what it was in 1985. REPRESENTATIVE SPECIMEN: Hiebert #96, 28 AUG 1981; Indiana Dunes National Lakeshore, panne SE of West Beach beach house; SE SW Sec.27 T37N R7W; locally common in wet calcareous sand. MOR.

Aster sericeus Vent. Never widely distributed in the lakeshore, this distinctive species is now confined to the Black Oak sand ridges of Survey Area C, and one small population in the southwestern portion of Survey Area D. Bowles *et al.* (1986a) listed the following associates from a dry mesic sand savanna: *Andropogon scoparius*, *Aster linariifolius*, *A. azureus*, *Carex pensylvanica*, *Comandra richardsiana*, *Euphorbia corollata*, *Helianthus divaricatus*, *Koeleria cristata*, *Liatris aspera*, *Quercus velutina*, *Rosa carolina*, *Sorghastrum nutans*, and *Viola pedata* var. *lineariloba*. REPRESENTATIVE SPECIMEN: Just & Nieuwland *s.n.*, 15 SEP 1929; Ogden Dunes. F.

Brasenia schreberi Gmel. Known only from Long Lake in Survey Area C; and perhaps the only extant population in the Lakeshore (with the possible exception of the northern half of Survey Unit II). REPRESENTATIVE SPECIMEN: Wilcox #84, 27 JUN 1985; locally abundant, floating leaves on 0.5 m rooted stem in shallow organic over sand [sic!], water 0.5 m deep on south side of Long Lake, with *Nymphaea* and *Ceratophyllum*; T37N R7W NW SE Sec.34. MOR.

Cakile edentula (Bigel.) Hook. Occasional to rare in the Fore-dune Complex communities of Survey Areas A and D. This species is often without associates on the naked sands of the fore-dune, but Bowles *et al.* (1986a) listed the following species which are usually nearby: *Ammophila breviligulata* and *Euphorbia polygonifolia*. Bowles (1989) has recorded a significant decline in the West Beach population of this vulnerable species. REPRESENTATIVE SPECIMEN: Hiebert #61, 24 JUL 1981; Indiana Dunes National Lakeshore, on edge of Smoking Dune; SE SW Sec.27 T37N R7W; common in sand in fore-dune complex at the blowout. MOR. Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Campanula rotundifolia L. Known currently only from Survey Area E, but Kurz (1923) reported it from Survey Area A, and it probably yet grows in Survey Areas C and D. REPRESENTATIVE SPECIMEN: Hiebert #56, 21 JUL 1981; Indiana Dunes National Lakeshore, in inland marsh, in sand on top of ridge, common. MOR. According to Parker (1936), this species is a boreal relict.

Carex alata T. & G. I have seen this species in the Marsh Complex communities of Survey Area E, where it is not infrequent. It is also known from Survey Area A, from where it is documented by the following REPRESENTATIVE SPECIMEN: Kjellmark #117, 7 JUL 1988; locally common graminoid in wet sandy soil in flat wet prairie-sedge meadow pocket between high dune savannas near West Beach maintenance; SE SW NW Sec.34 T37N R7W; with *Populus tremuloides*, *Calamagrostis canadensis*, *Juncus greenii*, *Spiraea alba*, *Helianthus* sp., and *Pycnanthemum virginianum*. MOR. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Carex aurea Nutt. This rare sedge, evidently is confined locally to the pannes, from where collected the following REPRESENTATIVE SPECIMEN: Dritz #81, 26 MAY 1980; southwest end of panne at West Beach, SW SW Sec.27 T37N R7W, ca 500' E of the Lake County line and 500' from Lake Michigan; with *Fragaria virginiana*, *Juncus balticus* var. *littoralis*, *Carex viridula*, *C. garberi*, *Hypericum kalmianum*, and *Populus deltoides*. MOR.

Carex eburnea Boott Very rare, perhaps one of Indiana's rarest plants. In Survey Area D, however, there are several large colonies and numerous smaller ones in the high dunes area, where Bowles *et al.* (1985) recorded it as growing with *Acer saccharum*, *Aralia nudicaulis*, *Hamamelis virginiana*, *Pinus strobus*, *Prunus serotina*, *Quercus rubra*, *Rhus radicans*, *Smilacina racemosa*, *S. stellata*, *Solidago caesia*, and *Tilia americana*. It is also known from a Panne border in the western portion of Survey Area A, from where also reported by Bowles *et al.* (1985), who listed it as growing with *Andropogon scoparius*, *Arctostaphylos uva-ursi* var. *coactilis*, *Aster ptarmicoides*, *Calamovilfa longifolia*, *Cornus obliqua*, *Equisetum arvense*, *Juniperus communis* var. *depressa*, *Liatris cylindracea*, *Panicum virgatum*, and *Pinus banksiana*. REPRESENTATIVE SPECIMEN: Wilhelm #6990, 30 SEP 1979; at the east edge of Ogden Dunes, on the lee side of an interdunal

ravine (southwest-facing slope) under Sugar Maple and Witch Hazel, in the W W W W SW Sec.25 T37N R7W. MOR. Welch (1935) considered this species to be a boreal relict.

Carex garberi Fern. Confined to the Pannes of Survey Area A (and perhaps the Panne in Survey Area D). Bowles *et al.* (1986a) listed the following associates from a Panne border: **Eleocharis elliptica**, **Equisetum hyemale**, **Gentiana crinita**, **Hypericum kalmianum**, **Juncus balticus** var. **littoralis**, and **Salix glaucophylloides** var. **glaucophylla**. Some of the specimens from these local populations appear taxonomically intermediate between this species and the closely related **Carex aurea**, a plant which to my knowledge is yet unknown from the Indiana Dunes National Lakeshore. Previous reports of **C. aurea** probably should be referred here. Some of the plants develop a yellowish perigynium, but are **C. garberi** in all other respects.

Carex oligosperma Michx. This distinctive sedge is occasional in the old Tolleston Pannes of Survey Area E, wherein it grows with **Cladium mariscoides** and **Scirpus acutus**, and in Survey Area G, from where we collected the following REPRESENTATIVE SPECIMEN: Dritz & Wilhelm #267; 20 JUN 1982; in a marsh at the eastern end of the sand pits S of West Beach, NW NE Sec.3 T36N R7W, SE of Gary, with **Carex buxbaumii** and **Polygonum amphibium** var. **stipulaceum**. MOR.

Carex tonsa (Fern.) Bickn. Not infrequent in the dry sandy prairies of the Black Oak sand ridges in Survey Areas E and G. REPRESENTATIVE SPECIMEN: Dritz & Rowlett #261, 6 JUN 1982; in a sandpile on the extreme W edge of the West Beach sand pits, along side County Line Road, SW NW Sec.3 T36N R7W, SE of Gary; also in the sand pits area to the east. MOR. Ken Dritz (pers. comm.) told me that a copse of young trees now stands on the site of the formerly barren sandpile where this sedge had been collected seven years previously.

Celtis tenuifolia Nutt. Known only from a small population in the Dune Complex area of Survey Area D. Pepoon (1927) reported that this species is ". . . common north of Long Lake, between Miller and Dune Park."

Chimaphila maculata (L.) Pursh Known only from Survey Area A, from where reported by Pepoon (1927) as growing near the "shore of Lake Michigan in hollows among the sand hills, associated with **Linnaea**, northeast of Miller." and by Peattie (1930) as growing ". . . in dune hollows at Miller, with **Linnaea borealis**." Deam (1940) excluded this species from Porter County, apparently because no herbarium record existed from this county at that time.

Chimaphila umbellata var. **cisatlantica** Blake Known only from the beleaguered Survey Area A, from where reported by Kurz (1923).

Cirsium pitcheri (Torr.) T. & G. This Great Lakes endemic is locally rare, but still extant in the Foredune Complex communities of Survey Areas A and D. REPRESENTATIVE SPECIMEN: Hiebert #180, 18 JUN 1981; T37N R7W SE SW Sec.27, found on beach dune west of the beach house at West Beach on a south-facing slope; individuals scattered within this community. INDU. According to Hooper (1934), this species has ancestral affinities to the Atlantic coastal plain, but Loveless & Hamrick (1988) reasoned that its affinities are in the Great Plains.

Cladium mariscoides (Muhl.) Torr. This handsome sedge is occasional to common in the wet sands and old Tolleston Pannes of Survey Area E, and characteristic of the Pannes of

Survey Area A. Ken Dritz also recorded it from Survey Area G. According to McLaughlin (1932), this species has ancestral affinities to the Atlantic coastal plain.

Cornus canadensis L. Kurz (1923) reported that this species, growing with **Linnaea borealis** var. **americana**, dominated a decaying stump in what is now part of Survey Area A.

Cornus rugosa Lam. Known only from Survey Areas A and D, where it is represented by healthy populations in the mesophytic hollows of the Dune Complex. Bowles *et al.* (1986a) noted that its population is nearly continuous along a 200-meter dune ridge and grows with **Aralia nudicaulis**, **Cornus florida**, **Hamamelis virginiana**, **Maianthemum canadense** var. **interius**, **Pinus strobus**, **Polygonatum canaliculatum**, **Quercus alba**, **Q. rubra**, **Q. velutina**, **Smilacina racemosa**, and **Tilia americana**. Welch (1935) considered this species to be a boreal relict.

Cyperus engelmannii Steud. This species is actually fairly frequent along the north shore of Long Lake in Survey Area C and in moist soil areas of Survey Area F. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #12310, 19 SEP 1984; near Ogden Dunes, on the property of the Indiana Dunes National Lakeshore, near the entrance to West Beach.* MOR.

Diervilla lonicera Mill. This species is known from nearly throughout the Survey Unit wherever there is halfway decent Black-Oak savanna. REPRESENTATIVE SPECIMEN: *Wilhelm #6816, 11 JUN 1979; S of US 12 between Miller and Ogden Dunes, E of County Line and N and W of Stage Coach Road and sand pits.* MOR. Welch (1935) considered this species to be a boreal relict.

Drosera intermedia Hayne Apparently once known from Survey Area E, based on the following REPRESENTATIVE SPECIMEN: *Swink, s.n., 21 JUN 1952; just E of County Line Road between Routes 12 and 20 near Ogden Dunes, moist sandy soil.* F. Peattie (1922) and Hooper (1934) both considered this species to have ancestral affinities to the Atlantic coastal plain.

Eleocharis geniculata (L.) R. & S. This species is restricted to the Pannes of Survey Areas A and D. Bowles *et al.* (1985), listed the following associates: **Carex viridula**, **Cyperus rivularis**, **Eleocharis elliptica**, **Hypericum kalmianum**, **Juncus balticus** var. **littoralis**, **J. marginatus**, **Lobelia kalmii**, **Rhynchospora capillacea**, **Scleria verticillata**, **Solidago graminifolia**, **Triglochin maritima**, and **Utricularia subulata**. According to Bowles (1989), no apparent changes were detected in the local population. REPRESENTATIVE SPECIMEN: *Wilhelm #6989, 30 SEP 1979; at the east edge of Ogden Dunes, on an interdunal flat, just south of the front complex of dunes, in the NW Sec.25 T37N R7W.* MOR. Peattie (1922) and Hooper (1934) suggested that this species has ancestral affinities to the Atlantic coastal plain.

Eleocharis microcarpa var. **filiculmis** Torr. This species is known only from the Dritz Pits, from where first noted by Ken Dritz on August 7, 1983. REPRESENTATIVE SPECIMEN: *Dritz #501, 23 AUG 1986; alongside a muddy path through a marsh bordering the sand pits 1.5 mi S of West Beach, SE SW NW Sec.3 T36N R7W, E of County Line Rd., N of Stagecoach Rd.; with Panicum spretum, Cephalanthus occidentalis, Psilocarya scirpoides, Fimbristylis autumnalis var. mucronulata, Rhynchospora capitellata, Polygonum punctatum, and Hypericum boreale; hidden in the surrounding dense vegetation and not seen since its discovery in 1983, though it has been the object of repeated searches.* MOR. According to the label on the 1983 collection, additional associates include: **Juncus cana-**

densis, *Eleocharis obtusa*, *Scirpus cyperinus*, *Ludwigia alternifolia*, *Calamagrostis canadensis*, *Viola lanceolata*, *Dryopteris thelypteris* var. *pubescens*, and *Lysimachia terrestris*. Ken Dritz (pers. comm.) wrote me that it recently has spread into new areas of the marsh in response to the disturbance of a regularly mowed trail, and its dominance in an exotic game pen that intrudes into the marsh. There he said it grows in "prodigious quantities, where the soil is churned continuously by the hooves of penned quadrupeds, and where every other species has been obliterated by grazing." The only other known location for this species in the Chicago region is the mowed fire lanes at the Jasper/Pulaski Wildlife Area near Tefft, Indiana. If one were to plot on a map of the world all of the mowed fire lanes and pens beat out by quadrupeds, and overlay a plot of known *Eleocharis microcarpa* var. *filiculmis* populations, a statistician would have to conclude that there is scant correlation between the mentioned "disturbance" and occurrence. There are numerous disturbed fire lanes and countless over-grazed areas in our region today, so, it seems to me, these must be only contributory factors in the local occurrence of this spikerush. One would be grotesquely in error to conclude that what we need more of is penned quadrupeds, or even to assume that an optimum long-term goal should be to manage for monocultures of endangered species at the expense of the synecological context which defines their overall population requirements.

Eleocharis pauciflora var. *fernaldii* Svenson This very rare spike rush is known from Survey Area A, from where was taken the following REPRESENTATIVE SPECIMEN: Dritz #80, 26 MAY 1980; extreme E end of panne at West Beach, 500' from L. Michigan and 1400' E of the Lake Co. line, SE SW Sec.27 T37N R7W; with *Carex viridula*, *Juncus balticus* var. *littoralis*, and *Rhynchospora capillacea*. MOR.

Euphorbia polygonifolia L. This species was infrequent, but nevertheless extant in the dunes of the Foredune Complex communities in Survey Areas A and D (Wilhelm, 1980). Recently, however, Bowles (1989) was unable to locate any extant populations at West Beach. Both Peattie (1922) and Hooper (1934) suggested that this species has ancestral affinities to the Atlantic coastal plain.

Gentiana puberula Michx. I last saw this gentian here in 1979 in a small prairie opening in the Savanna Complex of Survey Area D.

Gentiana saponaria L. This rare Gentian is occasional in the wet sandy prairies of the Marsh Complex in Survey Area E. REPRESENTATIVE SPECIMEN: Hiebert #150, 28 SEP 1981; Indiana Dunes National Lakeshore, in sedge marsh along east Inland Marsh trail; SW SW Sec.35 T37N R7W. MOR.

Hudsonia tomentosa Nutt. Now very rare, this species is yet known from an area of pure sand in Survey Area D, near the communication tower in Survey Area E [where it is being monitored by the Indiana Dunes National Lakeshore (Bowles et al. 1986a)], and from the Dritz Pits, Survey Area G. In the Dritz Pits, it grows in sand with *Andropogon scoparius*, *Arctostaphylos uva-ursi* var. *coactilis*, *Aristida intermedia*, *A. purpurascens*, *A. tuberculosa*, *Artemisia caudata*, *Bulbostylis capillaris*, *Calamovilfa longifolia*, *Carex tonsa*, *Cyperus houghtonii*, *Eragrostis spectabilis*, *Euphorbia corollata*, *Gnaphalium obtusifolium*, *Helianthemum canadense*, *Hieracium canadense* var. *fasciculatum*, *Lechea villosa*, *Liatris aspera*, *Linaria canadensis*, *Opuntia humifusa*, *Panicum oligosanthos* var. *scribnerianum*, *P. virgatum*, *Polygonella articulata*, *Quercus velutina*, *Rumex acetosella*, *Salix rigida*, and *Solidago speciosa*. According to Bowles et al. (1986a), additional associates include: *Carex muhlenbergii*, *Corispermum hyssopi-*

folium, *Lithospermum croceum*, *Oenothera rhombipetala*, *Panicum villosissimum* var. *pseudopubescens*, *Prunus pensylvanica*, *Pteridium aquilinum* var. *latiusculum*, and *Rhus copallina* var. *latifolia*. REPRESENTATIVE SPECIMEN: Kurth & Hiebert #1, 27 MAY 1986; Inland Marsh, SE corner, just N of Stagecoach Rd. near communication tower. MOR. Trefz (1935) considered this species to be a boreal relict and to have ancestral affinities to the Atlantic coastal plain. McLaughlin (1932) considered it a coastal-plain species.

Hydrocotyle umbellata L. Now probably extinct within the Lakeshore, Lyon (1930) reported it from "... sandy margin, east end of Long Lake." Peattie (1922) and Hooper (1934) regarded this species as having ancestral affinities to the Atlantic coastal plain.

Hypericum kalmianum L. This St. John's Wort is occasional throughout the Survey Unit where low alkaline flats are still intact. REPRESENTATIVE SPECIMEN: Hiebert #12, 2 JUL 1981; Indiana Dunes National Lakeshore, at edge of panne just E of West Beach beach house; SE SE Sec.27 T37N R7W; locally common in wet sand. MOR.

Juncus balticus var. *littoralis* Engelm. This species is occasional in wet to moist sand in most of the natural area portions of the Survey Unit. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Juncus pelocarpus Mey. This rare little rush is still extant along the north shore of Long Lake from where Pepoon, 50 years ago, reported it and implied that it was common. REPRESENTATIVE SPECIMEN: Dritz #164, 11 SEP 1980; N shore of Long Lake ca 1 mi E of Lake Co. line, S of West Beach, NE SE NE Sec.34 T37N R7W; with *Bidens cernua*, *B. comosa*, *Cyperus diandrus*, *Lythrum salicaria*, *Fimbristylis autumnalis* var. *mucronulata*, and *Eleocharis acicularis*. MOR. Peattie (1922) and Hooper (1934) considered this plant to have ancestral affinities to the Atlantic coastal plain.

Juncus scirpoides Lam. This rush is known only from Survey Area G in sand savanna. REPRESENTATIVE SPECIMEN: Dritz #145, 11 AUG 1980; along the S edge of the long E-W arm of the sand pit area 0.5 mi N of the B&O RR, 0.3 to 0.4 mi E of County Line Rd., SE of Gary, NW SE NW Sec.3 T36N R7W; with *Andropogon scoparius*, *Aster dumosus*, *Bulbostylis capillaris*, *Carex muhlenbergii*, *Coreopsis palmata*, *Cyperus filiculmis*, *C. schweinitzii*, *Eragrostis spectabilis*, *Eupatorium perfoliatum*, *Euphorbia corollata*, *E. supina*, *Fragaria virginiana*, *Gnaphalium obtusifolium*, *Helianthemum canadense*, *Helianthus occidentalis*, *Hieracium gronovii*, *Hypericum kalmianum*, *Juncus greenii*, *Lechea villosa*, *Lespedeza capitata*, *Liatris aspera*, *Linaria canadensis*, *Ludwigia alternifolia*, *Monarda punctata* var. *villicaulis*, *Nyssa sylvatica*, *Panicum oligosanthos* var. *scribnerianum*, *P. virgatum*, *Poa compressa*, *Polygala polygama* var. *obtusata*, *Polygonum convolvulus*, *P. tenue*, *Populus deltoides*, *P. grandidentata*, *P. tremuloides*, *Potentilla simplex*, *Rosa carolina*, *Rumex acetosella*, *Salix glaucophylla* var. *glaucophylloides*, and *Scirpus cyperinus*. MOR. Peattie (1922) and Hooper (1934) both considered this species to have ancestral affinities to the Atlantic coastal plain.

Juniperus communis var. *depressa* Pursh Locally, known only from Survey Areas A and D. It is frequent in the old blowout known as "Evergreen Cove." Bowles et al. (1986a) listed the following associates in Survey Area A: *Andropogon scoparius*, *Arctostaphylos uva-ursi* var. *coactilis*, *Calamovilfa longifolia*, *Pinus banksiana*, *Populus deltoides*, and *Prunus pumila*. Welch (1935) considered this species to be a boreal relict.

Linnaea borealis var. **americana** (Forbes) Rehd. Known at one time from Survey Area A, from where reported by Kurz (1923) as having grown on a decaying stump with **Cornus canadensis**; and reported by Pepoon (1927), who states: "Northeast of Miller, near Lake Michigan, in a hollow in the sand dunes . . . thousands of plants extending for one-fourth of a mile. Will eventually be covered by a moving dune (1926), which at present is about seventy-five feet distant." Welch (1935) considered this species to be a boreal relict.

Linum striatum Walt. Known only from the Pannes in Survey Area A, from where vouchered by the following REPRESENTATIVE SPECIMEN: *Vanderkamp s.n.*, 10 AUG 1976; near the center of south edge of southwest quarter of Sec.27 T37N R7W; ca 1 mi W of Ogden Dunes, growing in the interdunal ponds. MOR. Parker (1936) considered this species to have ancestral affinities to the Atlantic coastal plain.

Liparis loeselii (L.) Rich. This orchid is known locally from the Panne communities in Survey Area A. REPRESENTATIVE SPECIMEN: *Hess et al.* #5940, 13 JUN 1984; Indiana Dunes St. Pk. [sic!], West Beach, 1 mi N of U.S. 12; sandy dunes with Black Oak woods [sic!] & interdunal pannes; sandy wet areas with *Carex* sp., *Eleocharis*, *Scirpus*, *Potentilla*. MOR.

Lonicera dioica L. Rare, in a few of the more mesophytic portions of the Savanna Complex of Survey Area C, and in the Dune Complex of Survey Areas A and D.

Lycopodium lucidulum Michx. First discovered at West Beach by Diana Horton, this club moss is known locally only from Survey Area A. REPRESENTATIVE SPECIMEN: *Pavlovic & Kjellmark* #179, 7 JUL 1988; growing on north-facing dune slope along West Beach Trail, NE of maintenance facility; mesic forest, 5 clumps; with *Quercus rubra*, *Q. alba*, *Q. velutina*, *Asplenium platyneuron*, *Hamamelis virginiana*, *Amelanchier* sp., *Pedicularis canadensis*, *Lonicera dioica*, *Prenanthes alba*, *Carex pensylvanica*, *Vaccinium vacillans*, and carpets of moss. INDU.

Maianthemum canadense Desf. var. **canadense** A plant of very mesophytic sites, this species was reported by Kurz (1923) from what is now Survey Area A, but it is possible that he could have been dealing with the variety *interius*, which is quite common in this area in a wide variety of shaded communities. Friesner (1936) suggested that this species is a boreal relict; while Welch (1935) agreed, she also speculated that it might well have entered this area from the state of Ohio.

Menyanthes trifoliata var. **minor** Raf. Known only from Survey Area C, based upon an early collection by Charles Deam, and upon the following statement by Lyon (1930): ". . . many plants along the marshy edge of Long Lake." REPRESENTATIVE SPECIMEN: *Deam* #49826, 16 SEP 1930; border of Long Lake, ca 1 mi E of Lake County Line. IND.

Oryzopsis racemosa (Sm.) Ricker The scattered population of this species in the Dune Complex communities of Survey Area D represents the only location for this species in Porter County. Bowles *et al.* (1985) listed the following associates: *Carex pensylvanica*, *Galium circaeans* var. *hypomalacum*, *Hamamelis virginiana*, *Juniperus virginiana*, *Parthenocissus quinquefolia*, *Pinus strobus*, *Polygonatum canaliculatum*, *Quercus rubra*, *Rhus radicans*, *Smilacina stellata*, *Solidago caesia*, and *Tilia americana*. REPRESENTATIVE SPECIMEN: *Wilhelm* #6991, 30 SEP 1979; near the east edge of Ogden Dunes, in scrub savanna, near the center of the SW SW Sec.25 T37N R7W. (Also in mesophytic ravine just to the west.) MOR.

Panax quinquefolius L. Rare, one small colony in the Mesophytic Pocket in the Dune Complex portion of Survey Area D.

Panicum boreale Nash This easily overlooked grass is apparently rare to infrequent in the Savanna Complex portions of Survey Areas C and E. REPRESENTATIVE SPECIMEN: *Wilhelm #6825, 11 JUN 1979; S of US 12 between Miller and Ogden Dunes, E of County Line and N and W of Stage Coach Road and sand pits.* MOR.

Pinus banksiana Lamb. Locally known only from Survey Areas A and D, where it grows in and around the Pannes. According to Menges & Armentano (1985), the oldest Jack Pine at Ogden Dunes was 64 years, but they speculate that most of the trees are much younger. REPRESENTATIVE SPECIMEN: *Hiebert #37, 14 JUL 1981; Indiana Dunes National Lakeshore, in blowout 200 m SW of Beach House; SE SE Sec.27 T37N R7W; common in sand in depression.* MOR. Welch (1935) considered this species to be a boreal relict; indeed Peattie (1930) points out that the Lakeshore area is the southernmost extent of its range.

Pinus strobus L. This handsome pine is still occasional in Survey Areas A and D, though it was probably far more common at one time (see the comments under this species in Survey Unit V). Welch (1935) considered this species to be a boreal relict.

Polygonella articulata (L.) Meisn. Interestingly enough, the only place I recorded this species was in the mined area of Survey Area B, where a few good colonies have come in just north of Long Lake. Ken Dritz (pers. comm.) told me that it is abundant in Survey Area G. It probably also grows yet in Survey Areas A and D. According to Peattie (1922) and Hooper (1934), this species has affinities to the Atlantic coastal plain.

Polygonum arifolium var. *pubescens* (Keller) Fern. This species is known only from Survey Area G, from where reported by Ken Dritz.

Polygonum opelousanum var. *adenocalyx* Stanford This coastal plain element is known locally only from the Dritz Pits, from where vouchered by the following REPRESENTATIVE SPECIMEN: *Dritz #323, 25 SEP 1983; few plants in a marsh bordering the sand pits 1.5 mi S of West Beach, E of County Line Rd., N of Stagecoach Rd., NW SW NE Sec.3 T36N R7W.* MOR. Swink & Wilhelm (1979) noted the coastal-plain affinities of Chicago region populations.

Potamogeton diversifolius Raf. This little pondweed is confined to the Panne areas of Survey Area A, which are deep enough to retain water for most of the growing season.

Potentilla anserina L. In the Lakeshore, this species is confined to the wet sands around the interdunal ponds of Survey Area A. Bowles *et al.* (1985) listed the following associates from a "disturbed marsh/panne:" *Asclepias incarnata*, *Aster junciformis*, *Carex viridula*, *Juncus balticus* var. *littoralis*, *Liparis loeselii*, *Scirpus validus* var. *creber*, and *Triglochin maritima*. REPRESENTATIVE SPECIMEN: *Hess et al. #5941; 13 JUN 1984; West Beach, 1 mi N of US 12; sandy dunes with black oak woods & interdunal pannes; sandy wet areas with Carex, Scirpus, and Eleocharis.* MOR. Deam (1940) remarks that in Indiana this species is ". . . found only in beach pools along Lake Michigan."

Potentilla palustris (L.) Scop. Locally, this species is apparently confined to the shores of Long Lake in Survey Area C. REPRESENTATIVE SPECIMEN: *Wilhelm #6834, 12 JUN 1979; Marsh/Savanna area between Miller and Ogden Dunes, between the Indiana Harbor Belt Line and the Penn Central Railroad.* MOR.

Prunus pensylvanica L.f. In addition to the Dritz Pits, this species is known only from the Savanna Complex portions of Survey Areas C and E.

Psilocarya scirpoides Torr. This very rare sedge is known locally only from the Dritz Pits in Survey Area G, from where vouchered by the following REPRESENTATIVE SPECIMEN: Dritz & Rowlett #310, 7 AUG 1983; *alongside a muddy path through a marsh bordering the sand pits 1.5 mi S of West Beach, SE SW NW Sec.3 T36N R7W, E of County Line Rd., N of Stagecoach Rd.; in great abundance, with Rhynchospora capitellata, Juncus canadensis, Spiraea tomentosa* var. *rosea*, *Solidago graminifolia*, *Eleocharis obtusa*, *Viola lanceolata*, *Lycopus uniflorus*, *Calamagrostis canadensis*, *Fimbristylis autumnalis* var. *mucronulata*, *Hypericum virginicum*, *H. boreale*, and *Ludwigia alternifolia*. MOR.

Pyrola rotundifolia var. *americana* (Sweet) Fern. Known only from the deep dune hollows in the western portion of Survey Area A. Friesner (1936) considered this species to be a boreal relict.

Pyrola secunda L. This little shinleaf is very possibly extinct, not only in the Chicago Region, but also in the State of Indiana. Though Deam (1940) does not mention it, Kurz (1923) reported it from the Long Lake Dunes, which I am construing now as part of Survey Area A.

Rhexia virginica L. This beautiful species is known from the Dritz Pits and from Survey Area E, from where documented by the following REPRESENTATIVE SPECIMEN: Klick #2762, 11 AUG 1987; *inland Marsh, south of Route 12, central portion of tract; in wet prairie along marsh border with Calamagrostis canadensis and Eupatorium perfoliatum*. MOR. It is also known from the Dritz Pits. According to Parker (1936), this species has ancestral affinities to the Atlantic coastal plain.

Rhus aromatica var. *arenaria* (Greene) Fern. This variety of Fragrant Sumac is still extant on the high dunes in Survey Areas A and D. The Indiana Dunes National Lakeshore is monitoring a population in Survey Area A (Bowles *et al.* 1985); they listed the following associates: *Andropogon scoparius*, *Euphorbia corollata*, *Prunus serotina*, *Rhus radicans*, *Tilia americana*, *Tradescantia virginiana* [sic!], and *Vitis* sp. Lyon (1927) considered this species to be "common and characteristic" on the "... open wooded dunes, particularly toward the lake front ..." REPRESENTATIVE SPECIMEN: Hiebert #468, 15 MAY 1986; *along boardwalk just N of small panne at West Beach; SE SE Sec.27*. MOR.

Rhynchospora macrostachya Torr. This distinctive sedge is known from Survey Area E, from where documented by the following REPRESENTATIVE SPECIMEN: Klick #2757, 11 AUG 1987; *Inland Marsh, south of Route 12 in north-central portion of the tract; in wet depression with Scirpus acutus, Utricularia purpurea, Ludwigia palustris* var. *americana*, and *Proserpinaca palustris* var. *crebra*. MOR. It is also known from the Dritz Pits. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Sabatia angularis (L.) Pursh This attractive species is confined to the wet calcareous sands of the Panne communities in Survey Area A. REPRESENTATIVE SPECIMEN: Hiebert #63, 24 JUL 1981; *Indiana Dunes National Lakeshore, edge of interdunal pond just E of path to the beach house; SE SE Sec.27 T37N R7W; scattered in wet sand, common to most of the pond areas*. MOR.

Sagittaria rigida Pursh This species was reported from Long Lake by Peattie (1930), but apparently no specimens were preserved to testify to the validity of this report. Both Deam (1940) and Swink & Wilhelm (1979) excluded this species from Lake and Porter Counties.

Salix sericea Marsh. This attractive willow is infrequent in the Marsh Complex portions of Survey Area E.

Salix syrticola Fern. This highly distinctive willow is still occasional on the high dunes, and in and around the Pannes in Survey Area A. REPRESENTATIVE SPECIMEN: *Hiebert #61, 24 JUL, 1981; T37N R7W SE Sec.27; found at West Beach next to interdunal pond just east of path to the beach house; growing in a foredune community, sandy soil.* INDU. Trefz (1935) considered this species to be a boreal relict.

Scirpus hallii Gray Ever since its Chicago region discovery by Ken Dritz, in Survey Area G in August 9, 1981, this very rare annual sedge has fluctuated in quantity. The six plants observed in 1983 were not only the most seen in any year but also the last, until this species made a surprising comeback by producing three plants in 1989. REPRESENTATIVE SPECIMEN: *Dritz et al., #231, 9 AUG 1981; about 5 plants growing in a 3 m X 3 m excavation in sand in old sand pits S of West Beach, S of US 12, N of US 20, ca 0.25 mi E of the Lake Co. line, SW NE NW Sec.3 T36N R7W; with Juncus marginatus, J. scirpoides, Eleocharis engelmannii, E. elliptica, Fimbristylis autumnalis var. mucronulata, Hemicarpha micrantha, Panicum oligosanthos var. scribnerianum, Agrostis hyemalis, Hypericum canadense, Rotala ramosior, Ludwigia alternifolia, and Lindernia anagallidea.* MOR. In a similar but much larger mined depression in wet sand about a mile to the west, in Lake County, Noel Pavlovic discovered this same **Scirpus** in 1987 [see Survey Unit II]; the population at that site in 1989 was much larger than the one here, numbering hundreds of plants.

Scirpus purshianus Fern. A population of this rare sedge was discovered September 1, 1986 along the north shore of Long Lake by Ken Dritz (Dritz, 1987). Both this species and **Scirpus smithii**, with which it is often confused, are considered by both Peattie (1922) and Hooper (1934) to be coastal-plain elements.

Scleria reticularis Michx. This rare sedge is known from Survey Area E, from where collected by Klick (#2759, MOR) and from the Dritz Pits, REPRESENTATIVE SPECIMEN: *Dritz #322, 25 SEP 1983; very abundant in a marsh bordering the sand pits 1.5 mi S of West Beach, E of County Line Rd., N of Stagecoach Rd., NW SW NE Sec.3 T36N R7W.* MOR. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Scleria verticillata Muhl. Confined, apparently, to the Panne communities of Survey Areas A and D, though the habitat, it seems, is also present in Survey Areas C and E. REPRESENTATIVE SPECIMEN: *Wilhelm #6830, 11 JUN 1979; at the east edge of Ogden Dunes, on an interdunal flat, just south of the front complex of dunes, in the NW Sec.25 T37N R7W.* MOR.

Selaginella rupestris (L.) Spring The Sand Club Moss, one of our region's rarest plants, was recently discovered in Survey Area E. In addition to the discussion by Bowles (1988) its location and habitat are documented well by the following REPRESENTATIVE SPECIMEN: *Dritz #480; 19 JUN 1986; twelve or more plants in a vegetated lane between bare-sand tracks climbing up the W side of a steep, semi-wooded dune, in sun, just N of Stagecoach Rd. (at a*

wide bend in the road), NE NE NW NW Sec.2 T36N R7W, 1.4 mi S of Ogden Dunes; with *Rhus copallina* var. *latifolia*, *R. radicans*, *Koeleria cristata*, *Stipa spartea*, *Cyperus filiculmis* var. *macilentus*, *Panicum oligosanthos* var. *scribnerianum*, *P. depauperatum*, *P. villosissimum* var. *pseudopubescens*, *Monarda punctata* var. *villicaulis*, *Euphorbia corollata*, *Artemisia caudata*, *Lepidium virginicum*, *Bromus tectorum*, *Rosa carolina*, *Krigia virginica*, *Vulpia octoflora* var. *tenella*, *Opuntia humifusa*, *Poa compressa*, *Tradescantia ohimensis*, *Sporobolus cryptandrus*, *Rumex acetosella*, *Arabis lyrata*, *Coreopsis palmata*, *Quercus velutina*, *Q. rubra* [sic!], *Tephrosia virginiana*, *Erigeron strigosus*, *Asclepias tuberosa*, *Fragaria virginiana*, *Viola pedata* var. *lineariloba*, *Phlox pilosa*, *Campanula rotundifolia*, *Lupinus perennis* var. *occidentalis*, *Helianthus decapetalus*, *Liatris aspera*, *Oenothera rhombipetala*, and *Solidago speciosa*. Observed in sporulation on this date, and also on JUL 5 and JUL 13, 1986. On JUL 13, with Marlin Bowles, a larger population of plants was found growing in a wooded path at the base of the dune, on its NW side, in shade. MOR. According to Bowles (1989), though the populations remained extant, plants appeared to be reduced in size and fewer in number.

Sisyrinchium atlanticum Bickn. Known only from the wet sands of the Marsh Complex in Survey Area E. REPRESENTATIVE SPECIMEN: Wilhelm #6830, 11 JUN 1979; S of US 12 between Miller and Ogden Dunes, E of County Line and N and W of Stage Coach Road and sand pits. MOR. Peattie (1922) and Hooper (1934) both suggested that this species has ancestral affinities to the Atlantic coastal plain.

Smilax rotundifolia L. Frequent on the Black Oak sand ridges of Survey Areas C, D and E, and probably elsewhere.

Solidago racemosa var. **gillmani** (Gray) Fern. This species is not infrequent along the dunes in the Fore-dune Complex in Survey Areas A and D. REPRESENTATIVE SPECIMEN: Hiebert #153, 29 SEP 1981; Indiana Dunes National Lakeshore, next to West Beach beach house, from east side of panne; SE SW Sec.27 T37N R7W; common in sand dunes. MOR.

Stachys hyssopifolia Michx. Known only from Survey Area E, from where vouchered by the following REPRESENTATIVE SPECIMEN: Hiebert #53, 21 JUL 1981; Indiana Dunes National Lakeshore, in inland marsh on trail; NW SW Sec.35 T37N R7W; scattered in sand of oak savanna. MOR.

Talinum rugospermum Holzinger The report for Survey Unit III is based solely on the following specimen, the label of which, if at all, attributes this species to Survey Area E. REPRESENTATIVE SPECIMEN: Tryon #13, AUG 1935; 0.5 mi N of B & O RR, just E of Lake County Line, open sand. F.

Trichostema dichotomum L. This rare mint is known only from Survey Area G, where, according to Ken Dritz, the population has been declining--though it was still extant in 1989.

Utricularia cornuta Michx. This species is confined to the Pannes of Survey Area A, where it is still quite common. The Pannes of Survey Units I and III are probably the only loci in the State of Indiana where living populations of this species still survive. Bowles et al. (1986) listed the following associates from a Panne border: *Carex viridula*, *Cornus stolonifera* var. *baileyi*, *Eleocharis elliptica*, *Hypericum kalmianum*, *Juncus alpinus* var. *rariflorus*, *Juncus balticus* var. *littoralis*, *Pinus banksiana*, *Populus deltoides*, *Rhynchospora capillacea*, and *Salix glaucophylloides* var. *glaucophylla*. REPRESENTATIVE SPECIMEN: Dritz & Levins #150, 12 SEP 1981; abundant in and around little pools

behind the foredunes . . . at West Beach. MOR. McLaughlin (1932) considered this species to have ancestral affinities to the Atlantic coastal plain.

Utricularia gibba L. This species was only recently discovered along the north shore of Long Lake, where it was actually common on July 24, 1988. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Utricularia purpurea Walt. This attractive species is still extant in the fifth marsh west of Stage Coach Road in Survey Area E. Lyon (1930) reported it from Long Lake in Survey Area C. REPRESENTATIVE SPECIMEN: *Wilhelm #14972, 2 JUL 1987; south of Ogden Dunes, south of Route 12, east of County Line Road, in the east end of the fifth marsh west of Stagecoach Road; growing with **Cladium mariscoides**.* MOR. Peattie (1922) regarded this species as having ancestral affinities to the Atlantic coastal plain.

Utricularia subulata L. Since Ken Klick's remarkable discovery of this tiny plant at the Hoosier Prairie in 1984, which prompted Ken Dritz to look for it and find it at one site south of Tefft in Jasper County, its known distribution in the Chicago Region has astounded us all. It since has been recorded from no fewer than five Pannes in Survey Area A at West Beach, several other sites south of Tefft, and at Warren Dunes State Park in Berrien County, Michigan. With the exception of a few plants at Warren Dunes, our plants have only cleistogamous flowers. Some have suggested that it only recently has entered our area, adventive from farther south where it is common in the moist sands of the Gulf and Atlantic coasts; they cite the "disturbed" habitats where it is found. Such a hypothesis would explain gracefully how botanists for a century have overlooked it, but my own instincts are that it is as autochthonous here as so many other of the coastal-plain disjunct elements for which this dunes area is renowned. It is also well known that people like Ken Klick and Ken Dritz see things that few other people see. . . . One *ken*not be sure, but perhaps such *ken* is peculiar to botanists with monosyllabic surnames and given names that begin with glottal stops. Bowles *et al.* (1984) listed associates for this species in a Panne as **Aster ptarmicoides**, **Carex viridula**, **Gentiana crinita**, **Hypericum kalmianum**, **Juncus balticus** var. **littoralis**, **Rhynchospora capillacea**, and **Triglochin maritima**. REPRESENTATIVE SPECIMEN: *Klick #2738, 9 SEP 1986; West Beach Unit; SW SW SW Sec.27 T37N R7W; growing in wet sand associating with **Rhynchospora capillacea**, **Scleria verticillata**, **Hypericum kalmianum**, **Triglochin maritima**, and **Utricularia cornuta**.* INDU.

Vaccinium macrocarpon Ait. Known only from Survey Area A, based solely on a report by Kurz (1923). Trefz (1935) considered this species to be a boreal relict and to have ancestral affinities to the Atlantic coastal plain!

Vitus labrusca L. Apparently known only from the Dritz Pits as well as Survey Areas C and E, from where recorded during this survey by the following REPRESENTATIVE SPECIMEN: *Wilhelm #6829, 11 JUN 1979; S of US 12 between Miller and Ogden Dunes, E of county line and N and W of Stage Coach Road and sand pits.* MOR.

Woodwardia virginica (L.) Sm. This rare fern is known only from Survey Area G, from where reported by Ken Dritz.

Xyris torta Sm. Known from Survey Area C, according to a report by Lyon (1930); Ken Dritz has seen it in recent years in Survey Area G. Peattie (1922) considered local populations to have ancestral affinities to the Atlantic coastal plain.

***Zizania aquatica* L.** Known only from Survey Area C, based solely on a report by Lyon (1930), in which he states that this was the only location on the Lakeshore from which he recorded this species. Hooper (1934) considered this species to be an Atlantic coastal-plain element.

Summary

Survey Unit III has been shown to provide the habitat for at least 94 of the Indiana Dunes National Lakeshore SPECIAL VEGETATION floristic elements. Of these, 79 (eighty-five percent) were seen during this Survey. Ten of these (eleven percent), however, are confined to Survey Area G, which area is not under the curatorial aegis of the Indiana Dunes National Lakeshore. With a Natural Area Index of 101, it certainly should be! It is likely that about fifteen to eighteen percent of the SPECIAL VEGETATION floristic elements known from this area have been extirpated.

Twenty-seven percent of the SPECIAL VEGETATION floristic elements known from this Survey Unit are among the species considered by Hooper (1934), McLaughlin (1932), Parker (1936), Peattie (1922), and Swink & Wilhelm (1979) to have ancestral affinities to the Atlantic coastal plain, while fourteen percent are considered to be boreal relicts by Friesner (1936), Parker (1936), Trefz (1935), or Welch (1935).

About four percent of the SPECIAL VEGETATION floristic elements known from this Survey Unit are unknown from any other Lakeshore Survey Unit. These include: ***Carex eburnea***, ***Eleocharis microcarpa* var. *filiculmis***, ***Hydrocotyle umbellata***, and ***Oryzopsis racemosa***.

NATURAL AREA ASSESSMENT

Survey Unit III, as can be seen from the Natural Area Vegetation Map, consists of six General community types: Aquatic, Dune Complex, Foredune Complex, Marsh Complex, Pannes, and Savanna Complex.

About twenty percent of the West Beach Unit has been obliterated, with much of the destruction having occurred in the area once known as "Long Lake Dunes." Very little of this dunes area remains, and even it continues to suffer great abuse. On the whole, however, the 1000 or so acres which are mapped as Natural Area on the Survey Unit Map still preserve a high degree of synecological integrity.

The areas which are in the most imminent peril, and indeed are at this moment being systematically degraded, include the area mapped as Foredune Complex in Survey Areas A and D. Bowles (1989) noted, for example, that ***Euphorbia polygonifolia*** has disappeared since it was first sampled in 1985.

The Foredune Complex is under nearly constant abuse by the foot traffic of hordes of rampaging visitors who wander randomly throughout the area, opening gaping wounds in the skin of the dune system. Such activity keeps the sands in a highly exaggerated state of aeolian erosion and accretion, the magnitude of which is beyond anything with which our native life systems have had to cope during presettlement times. A foundation which eats away at its own principle for ephemeral gratification eats itself; it perishes as a result. The principle of the Indiana Dunes National Lakeshore, of course, is its flora, fauna, and primal land forms. At this moment in time, and in spite of all that we have done, it is yet one of

the most highly endowed tracts of natural land on earth. How will posterity regard our curatorship?

Numerous learned books, papers, and popular articles over the years, since the inchoate but classic works of Cowles at the turn of the century, have viewed, with an inexplicably reverent awe and a staggering lack of sensitivity, the "advance" of massive denuded dunes upon the delicate life systems which developed under relatively stable conditions over literally thousands of years. The remarkable assumption, apparently, has been that the natural order of things is for an enormous destructive force to be constantly obliterating, at a geologically rapid pace, a very limited area which took millennia to become synecologically manifest! If, in addition, one truly thinks that these obliterated areas will "grow back" as they were if we "just wait long enough for 'nature to take its course'," then one must certainly have, it seems to me, a very shallow concept of the meaning of "growing back."

It is my feeling, of course, that this "rapidly advancing dune" stuff is more an obvious artifact of the thoughtless activity of postsettlement human habitation than of some wondrous, mysterious "way of nature." Everything, needless to say, is "natural" in an ultimate sense, and certainly there is nothing "unnatural" about us or the things we do, but if one of our goals is to safeguard the Natural Areas [as defined earlier] and their incumbent SPECIAL VEGETATION floristic elements, then we must take a fresh, objective look at the fundamental nature of dunes ecology in northwestern Indiana, and accept the fact that some of the things we do accelerate or exaggerate some of the natural forces to levels far beyond anything the native life systems which developed here can tolerate.

The Marsh/Savanna Complex in Survey Areas C, D, and E need very little in the way of active management other than the assurance that they receive fire on a regular, preferably annual basis. The suppression of fire in these communities is perhaps more insidious, as a disturbance, than the mechanical destruction taking place in Survey Area A, because the effects of fire suppression are more subtle and take longer to become apparent to the untrained observer.

The data used in assessing the relative Natural Area significance and integrity as a whole are provided in Table III. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from each Survey Area, along with the numerical rating coefficient as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient, and do not enter directly into the derivations of the Natural Area Indices. The "R" symbol (rather than an "x" symbol), when used in Table III, indicates a record other than one to which I personally can attest—usually one on the basis of some earlier record, such as a herbarium specimen or a literature citation. Species listed without a Survey Area tabulation are reports from Klick *et al.* (1989).

TABLE III: Summary of species upon which are calculated the various Natural Area Indices for each Survey Area and for the Survey Unit as a whole.

A	B	C	D	E	F	G	
							* <i>Abutilon theophrasti</i>
x		x		x		x	7 <i>Acer rubrum</i>
		x				x	0 <i>Acer saccharinum</i>
x			x				5 <i>Acer saccharum</i>
x	x	x	x	x	x		* <i>Achillea millefolium</i>
x							15 <i>Adiantum pedatum</i>

A	B	C	D	E	F	G
x	R					* Agropyron cristatum
x						* Agropyron desertorum
x						* Agropyron repens
				x		* Agropyron smithii
		x				8 Agropyron trachycaulum unilaterale
x						* Agrostis alba
					x	1 Agrostis hyemalis
				x		1 Agrostis perennans
					x	* Ailanthus altissima
				x		10 Aletris farinosa
		x		x		4 Alisma subcordatum
		x				4 Alisma triviale
		x				8 Alnus rugosa americana
x	x	x	x	x	x	0 Ambrosia artemisiifolia elatior
					x	* Ambrosia psilostachya coronopifolia
x			x			8 Amelanchier arborea
		x				8 Amelanchier laevis
x			x			15 Ammophila breviligulata
				x		4 Amphicarpa bracteata comosa
	x	x		x		4 Andropogon gerardii
x	x	x	x	x	x	5 Andropogon scoparius
x	x	x	x	x		2 Anemone cylindrica
				x		7 Anemonella thalictroides
x		x		x	x	6 Antennaria plantaginifolia
						* Anthemis cotula
		x		x	x	6 Apios americana
x				x	x	5 Apocynum androsaemifolium
		x			x	2 Apocynum sibiricum
x		x	x	x		5 Aquilegia canadensis
						x * Arabidopsis thaliana
x					x	10 Arabis canadensis
x	x	x	x	x	x	7 Arabis lyrata
				?		x 15 Aralia hispida
x		x	x	x	x	8 Aralia nudicaulis
x	x		x			x 10 Arctostaphylos uva-ursi coactilis
						* Arenaria serpyllifolia
R						10 Arenaria stricta
x						x 5 Aristida intermedia
				x		x 7 Aristida purpurascens
						x 15 Aristida tuberculosa
x	x	x	x	x	x	5 Artemisia caudata
	x				x	* Artemisia vulgaris
x					x	10 Asclepias amplexicaulis
x		x				x 4 Asclepias incarnata
x	x	x	x		x	0 Asclepias syriaca
x		x	x	x	x	10 Asclepias tuberosa
x	x			x		1 Asclepias verticillata
x						15 Asclepias viridiflora
		x	x	x		* Asparagus officinalis
x			x			6 Asplenium platyneuron
x		x	x	x	x	8 Aster azureus
x						5 Aster cordifolius

A	B	C	D	E	F	G	
x			x	x		x	5 Aster dumosus
	x			x			5 Aster ericoides
x			x	x			10 Aster junciformis
x		x	x	x	x		10 Aster linariifolius
		x	x	x		x	4 Aster novae-angliae
x	x			x			1 Aster pilosus
				x			10 Aster praealtus
x		R					15 Aster ptarmicoides
				x			5 Aster puniceus firmus
x		x					5 Aster sagittifolius
		x	x				15 Aster sericeus
				x		x	3 Aster simplex
		x		x		x	10 Aster umbellatus
				x			8 Baptisia leucantha
							* Barbarea vulgaris
x			x				* Berberis thunbergii
		x		x			5 Bidens cernua
		x		x			5 Bidens comosa
		x		x		x	8 Bidens coronata
						x	1 Bidens frondosa
		x					15 Brasenia schreberi
	x				x		* Bromus inermis
						x	* Bromus japonicus
			x				5 Bromus purgans
	x			R			* Bromus tectorum
						x	6 Bulbostylis capillaris
x			x				8 Cacalia atriplicifolia
x			x				15 Cakile edentula
x		x		x	x	x	3 Calamagrostis canadensis
				x	x	x	5 Calamagrostis inexpansa brevior
x	x		x	x		x	10 Calamovilfa longifolia
			x				7 Campanula aparinoides
R				x			15 Campanula rotundifolia
							* Capsella bursa-pastoris
x				x			10 Carex alata
					x		8 Carex albolutescens
						x	7 Carex annectens xanthocarpa
			x		x		5 Carex aquatilis altior
			x				10 Carex artitecta
x							15 Carex aurea
						x	3 Carex brevior
			x			x	8 Carex buxbaumii
		x			x		5 Carex comosa
		x			x		4 Carex cristatella
x			x				15 Carex eburnea
x							15 Carex garberi
		x			x		10 Carex lacustris
x							1 Carex laxiflora
x		x	x	x	x	x	5 Carex muhlenbergii
				x		x	15 Carex oligosperma
x		x	x	x	x	x	5 Carex pennsylvanica
					x		7 Carex scoparia

A	B	C	D	E	F	G	
x		x		x			5 Carex stricta
				x		x	15 Carex tosa
x		x				x	3 Carex tribuloides
						x	10 Carex umbellata
x			x				10 Carex viridula
						x	2 Carex vulpinoidea
x		x	x	x	x	x	8 Ceanothus americanus
x		x	x	x	x		6 Celastrus scandens
			x				3 Celtis occidentalis
			x				15 Celtis tenuifolia
x	x			x		x	0 Cenchrus longispinus
				x			* Centaurea maculosa
						x	* Centaurium pulchellum
x		x		x		x	7 Cephalanthus occidentalis
		x					* Cerastium vulgatum
		x					5 Ceratophyllum demersum
							* Chaenorrhinum minus
	x						* Chenopodium album
				x	x		4 Chenopodium leptophyllum
R							20 Chimaphila maculata
R							20 Chimaphila umbellata cisatlantica
	x					x	* Chrysanthemum leucanthemum pinnatifidum
x		x				x	* Cirsium arvense
x		x	x			x	2 Cirsium discolor
x			x				20 Cirsium pitcheri
	x						* Cirsium vulgare
x				x		x	15 Cladium mariscoides
		x	x	x		x	7 Comandra richardsiana
		x		x			10 Commelina erecta deamiana
							* Convolvulus arvensis
				x		x	7 Coreopsis lanceolata
		x		x		x	8 Coreopsis palmata
x		x	x	x	x		5 Coreopsis tripteris
x			x			x	8 Corispermum hyssopifolium
R							20 Cornus canadensis
x				x			10 Cornus florida
x		x				x	1 Cornus racemosa
x			x				15 Cornus rugosa
x		x					6 Cornus stolonifera
			x				10 Cornus stolonifera baileyi
						x	* Croton glandulosus septentrionalis
x	x		x	x	x	x	7 Cycloloma atriplicifolium
		x					10 Cyperus diandrus
		x				x	15 Cyperus engelmannii
		R		x			3 Cyperus erythrorhizos
		x		x			2 Cyperus ferruginescens
x	x			x		x	5 Cyperus filiculmis
				x		x	5 Cyperus houghtonii
x		x		x		x	4 Cyperus rivularis
x	x			x	x	x	5 Cyperus schweinitzii
				x		x	1 Cyperus strigosus
	x			x			* Dactylis glomerata

A	B	C	D	E	F	G	
			x				5 <i>Danthonia spicata</i>
					x		* <i>Daucus carota</i>
						x	10 <i>Desmodium sessilifolium</i>
							* <i>Dianthus armeria</i>
x		x	x	x	x	x	10 <i>Diervilla lonicera</i>
	x			x		x	* <i>Digitaria sanguinalis</i>
				R			15 <i>Drosera intermedia</i>
x		x		x	x	x	6 <i>Dryopteris thelypteris pubescens</i>
		x		x		x	10 <i>Dulichium arundinaceum</i>
				X			0 <i>Echinochloa crusgalli</i>
							* <i>Elaeagnus umbellata</i>
		x					6 <i>Eleocharis acicularis</i>
		x		x			5 <i>Eleocharis calva</i>
x							5 <i>Eleocharis compressa</i>
x						x	8 <i>Eleocharis elliptica</i>
						x	9 <i>Eleocharis engelmanni</i>
x			x				15 <i>Eleocharis geniculata</i>
		x			x		8 <i>Eleocharis intermedia</i>
						x	20 <i>Eleocharis microcarpa filiculmis</i>
				x		x	5 <i>Eleocharis obtusa</i>
		x					8 <i>Eleocharis olivacea</i>
x							20 <i>Eleocharis pauciflora fernaldii</i>
				x			5 <i>Eleocharis smallii</i>
x	x		x	x	x	x	4 <i>Elymus canadensis</i>
		x					3 <i>Epilobium coloratum</i>
x							* <i>Epilobium hirsutum</i>
				x			8 <i>Epilobium leptophyllum</i>
x							0 <i>Equisetum arvense</i>
x							7 <i>Equisetum fluviatile</i>
x			x				4 <i>Equisetum hyemale affine</i>
					x	x	3 <i>Equisetum hyemale intermedium</i>
		x		x		x	0 <i>Eragrostis pectinacea</i>
							* <i>Eragrostis poaeoides</i>
x	x	x	x	x	x	x	3 <i>Eragrostis spectabilis</i>
							* <i>Eragrostis trichodes</i>
		x					2 <i>Erechtites hieracifolia</i>
		x		x			1 <i>Erigeron annuus</i>
x	x	x	x	x			0 <i>Erigeron canadensis</i>
x							4 <i>Erigeron philadelphicus</i>
x	x	x	x	x		x	3 <i>Erigeron strigosus</i>
		x					9 <i>Eryngium yuccifolium</i>
							* <i>Erysimum repandum</i>
			x				8 <i>Euonymus atropurpureus</i>
x				x			0 <i>Eupatorium altissimum</i>
		x				x	5 <i>Eupatorium maculatum</i>
x		x	x	x	x	x	6 <i>Eupatorium perfoliatum</i>
			x				4 <i>Eupatorium rugosum</i>
			x	x		x	1 <i>Eupatorium serotinum</i>
x	x	x	x	x	x	x	2 <i>Euphorbia corollata</i>
						x	* <i>Euphorbia dentata</i>
	x						* <i>Euphorbia maculata</i>
x			x				15 <i>Euphorbia polygonifolia</i>

A	B	C	D	E	F	G	
	x					x	* Euphorbia supina
					x		* Festuca elatior
	x						* Festuca ovina
		x		x		x	10 Fimbristylis autumnalis mucronulata
x	x	x	x	x		x	1 Fragaria virginiana
x			x				5 Fraxinus americana
		x					2 Fraxinus pennsylvanica subintegerrima
	x	x					1 Galium aparine
x			x				7 Galium circaezans hypomalacum
x							4 Galium concinnum
		x	x				5 Galium obtusum
			x	x			10 Galium pilosum
x		x	x	x		x	9 Gaylussacia baccata
x				x			10 Gentiana crinita
			x				10 Gentiana puberula
				x			15 Gentiana saponaria
		x		x			10 Gerardia flava
x							7 Gerardia paupercula
				x		x	8 Gerardia pedicularia ambigens
x				x		x	7 Gerardia purpurea
							* Gleditsia triacanthos
		x					8 Glyceria septentrionalis
		x	x			x	2 Gnaphalium obtusifolium
						x	10 Habenaria lacera
x			x				8 Hamamelis virginiana
x		x	x	x	x	x	8 Helianthemum canadense
				R			5 Helianthus decapetalus
x		x	x	x	x		5 Helianthus divaricatus
		x		x			2 Helianthus grosseserratus
					x	x	10 Helianthus occidentalis
x	x				x		* Helianthus petiolaris
							* Hemerocallis fulva
		R		x		x	9 Hemicarpha micrantha
x		x		x		x	8 Heuchera richardsonii
					x	x	6 Hieracium canadense fasciculatum
		x		x		x	6 Hieracium gronovii
			x	x		x	15 Hudsonia tomentosa
		R					20 Hydrocotyle umbellata
						x	9 Hypericum boreale
		x	x			x	8 Hypericum canadense
						x	7 Hypericum gentianoides
x		x	x	x		x	10 Hypericum kalmianum
							* Hypericum perforatum
x		x		x		x	8 Hypericum virginicum fraseri
				x			10 Hypoxis hirsuta
		x					3 Impatiens capensis
							* Iris germanica
x		x		x	x		5 Iris virginica shrevei
						x	8 Juncus acuminatus
x			x	x		x	8 Juncus balticus littoralis
R		x				x	8 Juncus brachycarpus
x							9 Juncus brachycephalus

A	B	C	D	E	F	G	
						x	5 Juncus bufonius
		x		x		x	7 Juncus canadensis
						x	4 Juncus dudleyi
		x				x	7 Juncus effusus solutus
		x		x		x	8 Juncus greenei
						x	10 Juncus interior
						x	10 Juncus marginatus
x		x					6 Juncus nodosus
		x					20 Juncus pelocarpus
						x	20 Juncus scirpoides
		x		x		x	0 Juncus tenuis
x			x	x		x	4 Juncus torreyi
x			x				10 Juniperus communis depressa
			x				2 Juniperus virginiana crebra
							* Kochia scoparia
x	x	x	x	x	x	x	7 Koeleria cristata
x		x	x	x			7 Krigia biflora
				x		x	6 Krigia virginica
x			x				4 Kuhnia eupatorioides corymbulosa
		x	x	x			2 Lactuca biennis
		x					* Lactuca scariola
		x					6 Lathyrus palustris myrtifolius
				x			7 Lechea leggettii moniliformis
			x				7 Lechea minor
				x		x	7 Lechea villosa
		x		x			5 Leersia oryzoides
x		x					5 Lemna minor
							* Leonurus cardiaca
		x					* Lepidium campestre
							* Lepidium densiflorum
x	x	x		x	x	x	0 Lepidium virginicum
x	x	x	x	x	x	x	4 Lespedeza capitata
				x	x		6 Lespedeza hirta
x	x	x	x	x	x	x	6 Liatris aspera
x			x		x		8 Liatris cylindracea
				x			6 Liatris spicata
		x		x		x	6 Linaria canadensis
x	x	x					* Linaria vulgaris
				x		x	6 Lindernia anagallidea
R							15 Linnaea borealis americana
x							15 Linum striatum
x							7 Liparis loeselii
				x			6 Lithospermum canescens
x	x	x	x	x	x	x	8 Lithospermum croceum
x			x	x			9 Lobelia kalmii
x		x	x				15 Lonicera dioica
R							7 Lonicera prolifera
						x	* Lonicera tatarica
				x		x	6 Ludwigia alternifolia
				x			5 Ludwigia palustris americana
				x		x	6 Ludwigia polycarpa
x		x	x	x	x	x	7 Lupinus perennis occidentalis

A	B	C	D	E	F	G	
		x		x			5 Luzula multiflora
	x						* Lychnis alba
x							15 Lycopodium lucidulum
x		x		x		x	5 Lycopus americanus
x		x				x	6 Lycopus uniflorus
				x			7 Lysimachia lanceolata
				x		x	8 Lysimachia terrestris
x		x		x	x	x	* Lythrum salicaria
R							15 Maianthemum canadense
x		x	x	x			10 Maianthemum canadense interius
							* Medicago lupulina
		x				x	* Medicago sativa
x	x	x				x x	* Melilotus alba
x	x					x x	* Melilotus officinalis
		x		x	x		5 Mentha arvensis villosa
		R					15 Menyanthes trifoliata minor
				x			6 Mimulus ringens
		x					* Mirabilis nyctaginea
						x	* Mollugo verticillata
		x	x	x	x		4 Monarda fistulosa
x	x	x	x	x	x	x	5 Monarda punctata villicaulis
				x			* Morus alba
							5 Muhlenbergia mexicana
		x					7 Myriophyllum exalbescens
		x					6 Najas flexilis
							* Nepeta cataria
		x					7 Nuphar advena
		x					7 Nymphaea tuberosa
x		x		x		x	8 Nyssa sylvatica
x	x	x	x	x	x	x	1 Oenothera biennis
x			x	x	x	x	7 Oenothera rhombipetala
		x		x		x	8 Onoclea sensibilis
x	x	x	x	x		x	5 Opuntia humifusa
			x				15 Oryzopsis racemosa
			x				3 Osmorhiza claytoni
x		x		x		x	6 Osmunda cinnamomea
x							7 Osmunda claytoniana
x		x		x		x	8 Osmunda regalis spectabilis
x			x				5 Ostrya virginiana
	x						0 Oxalis stricta
			x				15 Panax quinquefolius
						x	5 Panicum agrostoides
		x		x			15 Panicum boreale
	x						1 Panicum capillare
				R		x	10 Panicum columbianum
x		x	x	x		x	10 Panicum depauperatum
x		x	x	x		x	3 Panicum implicatum
x		x	x		x		7 Panicum latifolium
x						x	9 Panicum lindheimeri
x	x	x	x	x	x	x	7 Panicum oligosanthos scribnerianum
				R		x	8 Panicum sphaerocarpon
						x	9 Panicum spretum

A	B	C	D	E	F	G	
		x	x	x			7 Panicum villosissimum
x		x	x	x	x	x	9 Panicum villosissimum pseudopubescens
x	x	x	x	x	x	x	5 Panicum virgatum
	x				x		1 Parthenocissus inserta
x			x				2 Parthenocissus quinquefolia
R						x	6 Paspalum ciliatifolium muhlenbergii
		x					* Pastinaca sativa
x		x	x	x			10 Pedicularis canadensis
				x			5 Penthorum sedoides
					x		0 Phalaris arundinacea
	x				x		* Phleum pratense
		x		x			7 Phlox glaberrima interior
							* Phlox paniculata
x		x	x	x	x	x	6 Phlox pilosa
x		x		x			4 Phragmites communis berlandieri
		x		x	x		4 Physalis virginiana
		x					8 Physocarpus opulifolius
					x		2 Phytolacca americana
x			x				20 Pinus banksiana
x			x				20 Pinus strobus
							* Pinus sylvestris
	x						* Plantago lanceolata
							* Plantago major
	x			x			0 Plantago rugelii
x	x	x	x	x	x	x	* Poa compressa
x	x	x	x	x	x	x	* Poa pratensis
x		x					5 Podophyllum peltatum
							* Polanisia graveolens
				x		x	10 Polygala cruciata aquilonia
		x				x	10 Polygala polygama obtusata
x		x	x	x	x		3 Polygonatum canaliculatum
			x				7 Polygonatum pubescens
	x					x	15 Polygonella articulata
		x		x	x	x	5 Polygonum amphibium stipulaceum
						x	15 Polygonum arifolium pubescens
		x		x			5 Polygonum coccineum
						x	* Polygonum convolvulus
				x			7 Polygonum hydropiperoides
						x	10 Polygonum opelousanum adenocalyx
				x			* Polygonum persicaria
		x		x		x	6 Polygonum punctatum
				x			2 Polygonum scandens
						x	7 Polygonum tenue
		x					10 Pontederia cordata
x	x	x	x	x	x	x	2 Populus deltoides
						x	6 Populus grandidentata
x		x	x	x	x		4 Populus tremuloides
		x					10 Potamogeton amplifolius
x							8 Potamogeton diversifolius
x		x					7 Potamogeton gramineus
		x					7 Potamogeton illinoensis
x		x					7 Potamogeton natans

A	B	C	D	E	F	G	
		x					6 Potamogeton pectinatus
		x					7 Potamogeton pusillus
		x					8 Potamogeton zosteriformis
x							6 Potentilla anserina
	x						0 Potentilla norvegica
		x					15 Potentilla palustris
x	x				x		* Potentilla recta
x		x	x	x		x	4 Potentilla simplex
x		x	x	x			5 Prenanthes alba
				x			6 Proserpinaca palustris crebra
		x		x		x	5 Prunus pensylvanica
x	x		x	x			8 Prunus pumila
x	x	x	x	x	x		1 Prunus serotina
x	x	x	x	x	x	x	1 Prunus virginiana
						x	20 Psilocarya scirpoides
x							7 Ptelea trifoliata
x		R	x				9 Ptelea trifoliata mollis
x	x	x	x	x	x	x	5 Pteridium aquilinum latiusculum
					x		8 Pycnanthemum tenuifolium
		x	x	x			5 Pycnanthemum virginianum
x							15 Pyrola rotundifolia americana
R							20 Pyrola secunda
		x		x		x	9 Pyrus floribunda
		x					2 Pyrus ioensis
		x		x	x	x	7 Pyrus melanocarpa
x		x	x	x			4 Quercus alba
				x		x	8 Quercus palustris
x			x	R			7 Quercus rubra
x	x	x	x	x	x	x	6 Quercus velutina
				x		x	15 Rhexia virginica
x	x						9 Rhus aromatica
x			x				15 Rhus aromatica arenaria
x		x		x	x	x	6 Rhus copallina latifolia
x	x	x	x	x	x		1 Rhus radicans
x	x	x	x	x	x	x	3 Rhus typhina
x			x				10 Rhynchospora capillacea
x						x	8 Rhynchospora capitellata
				x		x	15 Rhynchospora macrostachya
x			x				5 Ribes cynosbati
x					x		* Robinia pseudo-acacia
			x				5 Rosa blanda
x	x	x	x	x	x	x	5 Rosa carolina
x	x						* Rosa multiflora
x		x		x			9 Rosa palustris
						x	10 Rotala ramosior
				x			3 Rubus allegheniensis
x		x	x	x		x	4 Rubus flagellaris
		x		x		x	9 Rubus hispidus obovalis
		x		x		x	7 Rubus idaeus strigosus
x		x			x	x	3 Rubus pensylvanicus
x		x		x	x		1 Rudbeckia hirta
	x	x		x		x	* Rumex acetosella

A	B	C	D	E	F	G	
					x		* Rumex crispus
		x					7 Rumex orbiculatus
x							15 Sabatia angularis
		x		x			9 Sagittaria graminea
x		x		x			4 Sagittaria latifolia
		R					15 Sagittaria rigida
		x		x			2 Salix discolor
x		x	x	x	x	x	7 Salix glaucophylloides glaucophylla
x		x		x	x		10 Salix gracilis textoris
		x		x		x	6 Salix humilis
x	x	x		x	x	x	1 Salix interior
		x		x			4 Salix nigra
x		x		x			5 Salix rigida
				x			15 Salix sericea
x			x				15 Salix syrticola
x	x					x	* Salsola kali tenuifolia
x		x					1 Sambucus canadensis
x							6 Sanicula marilandica
x	x	x	x		x		* Saponaria officinalis
x	x	x	x	x	x	x	6 Sassafras albidum
x		x		x			6 Scirpus acutus
x		x					7 Scirpus americanus
					x		4 Scirpus atrovirens
		x		x		x	6 Scirpus cyperinus
						x	20 Scirpus hallii
		x					20 Scirpus purshianus
x		x					5 Scirpus validus creber
				x		x	20 Scleria reticularis
				x		x	10 Scleria triglomerata
x			x				15 Scleria verticillata
				x		x	5 Scrophularia lanceolata
		x		x			4 Scrophularia marilandica
				x			5 Scutellaria epilobiifolia
				R			* Sedum album
				x			20 Selaginella rupestris
x							7 Senecio aureus
x				x		x	6 Senecio pauperculus balsamitae
							* Setaria faberii
							* Setaria glauca
							* Setaria italica
	x						* Setaria viridis
		x		x			2 Silene antirrhina
x		x					* Silene cserei
					x		6 Silene stellata
		x					* Sisymbrium altissimum
				x			15 Sisyrinchium atlanticum
		x					7 Sium suave
x		x	x	x	x	x	2 Smilacina racemosa
x	x	x	x	x	x		5 Smilacina stellata
x		x	x				3 Smilax ecirrhata
x		x			x		4 Smilax lasioneura
		x	x		x		15 Smilax rotundifolia

A	B	C	D	E	F	G	
x			x				5 Smilax tamnoides hispida
					x	x	* Solanum americanum
							* Solanum carolinense
		x			x		* Solanum dulcamara
x	x	x	x	x	x		1 Solidago altissima
x	x	x	x		x	x	7 Solidago caesia
		x		x	x		3 Solidago gigantea
x	x	x	x	x	x	x	3 Solidago graminifolia nuttallii
		x	x	x	x	x	5 Solidago gymnospermoides
		x		x			5 Solidago juncea
x	x		x				5 Solidago missouriensis fasciculata
x	x	x	x	x	x		4 Solidago nemoralis
x			x				15 Solidago racemosa gillmani
		x		x	x	x	6 Solidago rugosa
x	x	x	x	x	x	x	7 Solidago speciosa
				x		x	10 Solidago tenuifolia
						x	9 Solidago uliginosa
							* Sonchus oleraceus
							* Sonchus uliginosus
		x	x	x	x	x	5 Sorghastrum nutans
				x	x		5 Spartina pectinata
				x			4 Sphenopholis intermedia
		x	x	x	x	x	7 Spiraea alba
		x		x		x	9 Spiraea tomentosa rosea
x			x	x		x	7 Spiranthes cernua
	x			x			7 Sporobolus cryptandrus
						x	2 Sporobolus vaginiflorus
				x			15 Stachys hyssopifolia
x		x		x	x		5 Stachys palustris homotricha
x		x		x	x		6 Stipa spartea
							* Syringa vulgaris
				R			15 Talinum rugospermum
						x	* Taraxacum erythrospermum
x	x	x			x	x	* Taraxacum officinale
x		x	x	x	x	x	8 Tephrosia virginiana
x			x				5 Tilia americana
x	x	x	x	x	x	x	2 Tradescantia ohiensis
	x				x		* Tragopogon major
							* Tragopogon pratensis
						x	15 Trichostema dichotomum
							* Trifolium pratense
				x	x		* Trifolium repens
x							10 Triglochin maritima
x	x	x	x	x		x	7 Triplasis purpurea
x		x	x	x			2 Typha angustifolia
x		x		x	x		1 Typha latifolia
							* Ulmus pumila
		x					2 Urtica procera
x							20 Utricularia cornuta
		x					15 Utricularia gibba
		R		x			20 Utricularia purpurea
x							20 Utricularia subulata

A	B	C	D	E	F	G	
x		x		x			10 Utricularia vulgaris
x		x	x	x	x	x	5 Vaccinium angustifolium laevifolium
R							15 Vaccinium macrocarpon
R		x		x	x	x	5 Vaccinium vacillans
		x					7 Vallisneria americana
	x	x				x	* Verbascum thapsus
							* Verbena bracteata
				x	x		4 Verbena hastata
x							5 Vernonia missurica
x		x	x	x		x	9 Viburnum acerifolium
x		x					5 Viburnum lentago
x			x				5 Viburnum rafinesquianum
				x		x	7 Viola lanceolata
		x		x		x	10 Viola pedata lineariloba
x							10 Viola pubescens
			x			x	7 Viola sagittata
			x				10 Vitis aestivalis
		x		x		x	15 Vitis labrusca
x	x	x	x	x	x	x	4 Vitis riparia
				x		x	6 Vulpia octoflora tenella
						x	15 Woodwardia virginica
							* Xanthium strumarium
		R				x	15 Xyris torta
		R					15 Zizania aquatica
		x					7 Zizia aurea

Summary

Survey Area A (surveyed June 14 and 19; July 7 and 15; September 12, 23, and 30, 1979; and July 24, 1988) includes all of the 320 acres north of Long Lake which lies between County Line Road and Ogden Dunes--exclusive of the contiguous disturbed area which is designated as Survey Area B on the Survey Unit Map. The area mapped as Fore-dune Complex in this Survey Area is heavily abused. A look at the aerial photograph number 12 [in the 79-117 series], for example, reveals quite dramatically the countless scars, wounds, and local perturbations which the fore-dune system has sustained from the thousands of aimless wanderings by visitors. Such activity has seriously compromised the synecological integrity of the Pannes, not to mention the fore-dune system itself. This Fore-dune Complex is mapped as Natural Area because of the geomorphological character from which the Panne communities derive their physiographic essence; and, that which is left of it still provides the unique habitat for many SPECIAL VEGETATION floristic elements including: *Solidago racemosa* var. *gillmani*, *Ammophila breviligulata*, *Cirsium pitcheri*, *Euphorbia polygonifolia*, *Salix syrticola*, and others.

The area mapped as Dune Complex in Survey Area A is still largely intact, though logging and fire suppression have disturbed it in most portions. On the whole, the Natural Area portion (probably 250 acres) of this Survey Area stands as enormously significant from a Natural Area standpoint. In this regard, I catalogued 221 native floristic elements, with a Mean Quality of 6.88, and a Natural Area Index of 102! If the additional 13 reports (designated "R" in Table III) are included, the Mean Quality rises to 7.30, with an Index of 111. Several of the reports from this area are from Dritz (1987).

Survey Area B (surveyed concomitantly with Survey Area A) largely includes the old sand mine area, in addition to the parking area and pavilion, 155 acres altogether. As one would expect, this Survey Area is relatively low in quality. I recorded 63 native floristic elements, in addition to numerous introduced taxa, the Mean Quality of which (excluding the weeds) was 4.03, with a Natural Area Index of 33--too low to be very meaningful from a Natural Area rationale.

Survey Area C (surveyed June 12 and September 13) occupies about 165 acres, including Long Lake along the adjacent Marsh/Savanna Complexes north of the railroads and U.S. 12. In this Area, 238 native floristic elements have been documented. Their Mean Quality is 6.16, resulting in a Natural Area Index of 95. Ten additional floristic elements have been reported from the Long Lake area, those codified as "R" in Table III. If these are included, the Mean Quality rises to 6.28, with an Index of 99. There is a good possibility that many of these additional floristic elements, as well as others yet unknown, are still extant in this Survey Area. Several of the reports from this area are from Dritz (1987).

Survey Area D occupies the 180 Survey Unit acres which lie east of Ogden Dunes. I was able to spend only a couple of hours in this rich, high-quality area on September 30, 1979 and again on May 7, 1987, but those cursory visits turned up 163 native floristic elements, with a Mean Quality of 6.94, and a Natural Area Index of 89. It is likely that a more complete survey of this area would yield an Index as high as 95, or even higher. The Mesophytic Pocket community (see page 28) in the western portion of the area mapped as Dune Complex is quite singular in character, as is the "evergreen cove" portion of the old blowout in the southeastern portion of the area mapped as Foredune Complex. In a sandy interdunal prairie south of the main blowout, there is a lichen, *Peltigera lepidophora* (Nyl.) Vain., which grows nowhere else in Indiana or the region. It grows primarily to the far west and north of our region.

Survey Area E, known as Inland Marsh (surveyed June 11 and September 23, 1979, and July 2, 1987), is an enormous, largely high quality (albeit fire-starved) Marsh and Savanna Complex. It occupies about 500 acres (nearly 75 of which have been obliterated) south of U.S. 12, east of County Line Road, and north of Stage Coach Road. There have been 255 native floristic elements recorded, with a Mean Quality of 6.29, and a Natural Area Index of 100. Several of the reports from this Area are from Dritz (1987).

Survey Area F is a 20-acre tract of Savanna and Marsh Complex which lies south of the entrance road in the vicinity of the admission gate. It is not really distinct from Survey Area C, but I surveyed it nevertheless on July 2, 1987 and recorded 115 native species. Their Mean Quality was 5.23. The Index stands at 56, but intensive survey would probably raise it to 65 or so, which is not bad for a small tract, not even in the context of the Indiana Dunes. Indices in the 90's and 100's are remarkably routine in the Lakeshore, but, in our region as a whole, an Index of 60 is regarded as fairly special.

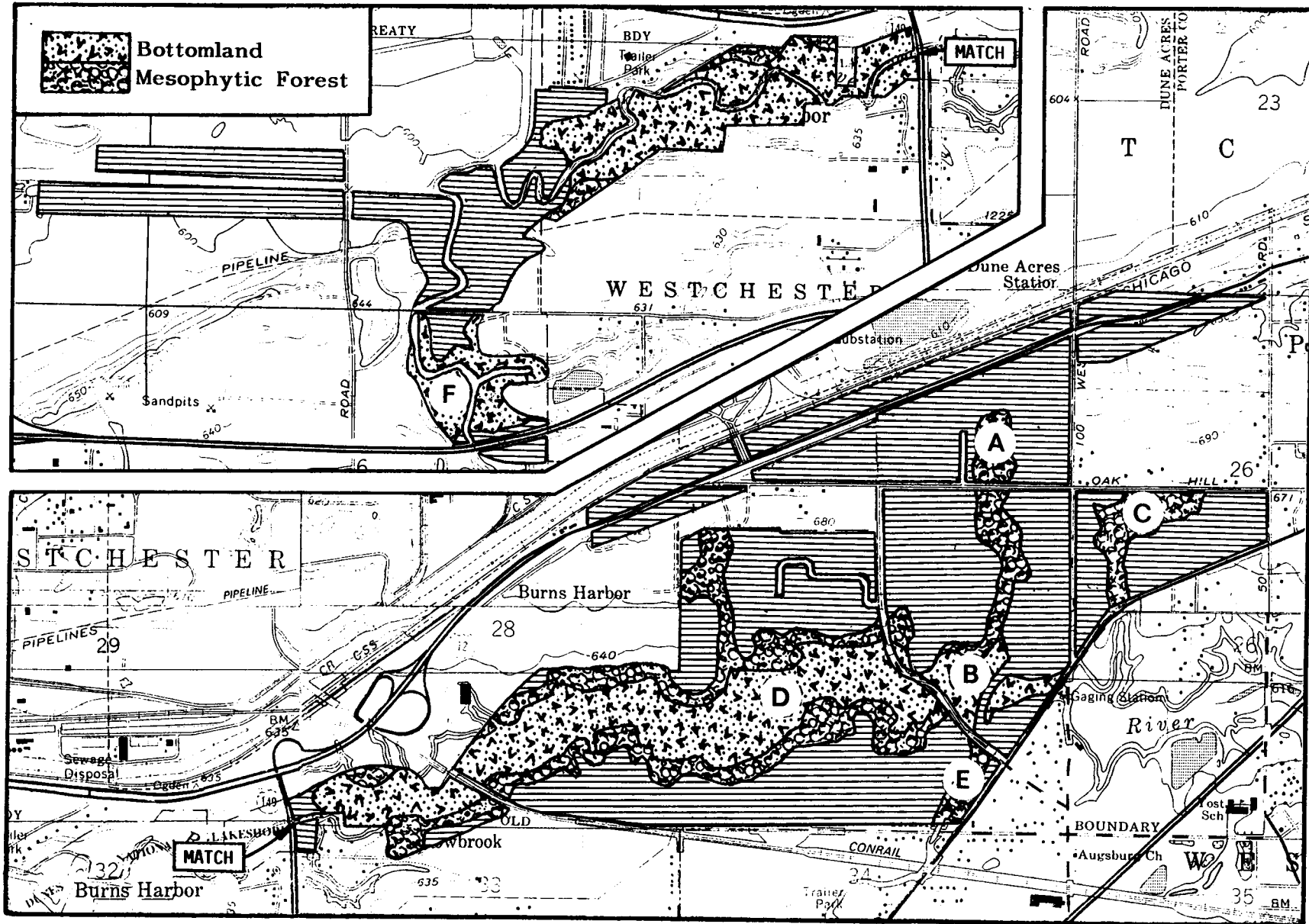
Survey Area G was discovered by the intrepid Ken Dritz, who wandered in there a few years ago in his indefatigable search for various Chicago region species to photograph. Since then he has discovered and recorded 205 native species there, with a Mean Quality of 7.06 and an Index of 101. Some of this area has been mined, hence the epithet "Dritz Pits," and there are some SPECIAL VEGETATION floristic elements in that area. There are also fairly intact savannas and interdunal marshes and wet prairies, also with their share of rare species. Given its store of special species, some of which grow only here, its very high Natural Area

Index, and its proximity to the the West Beach Unit, this 130-acre area seems an obligate addition to the Indiana Dunes National Lakeshore. Its uniqueness is demonstrated by the fact that fully 25% of its native flora (49 species) grows nowhere else in the Survey Unit.

Just south of Survey Area G, along the toe of the bluff of the Little Calumet River, Marlin Bowles (1989) recently discovered *Clintonia borealis*. He describes it as growing in a "high quality forested fen," occupying a seepage slope on the north bluff of the Calumet River valley. It grows with *Acer rubrum*, *Aralia nudicaulis*, *Carex pensylvanica* [sic!], *Maianthemum canadense* [var. *interius?*], *Nyssa sylvatica*, *Osmunda cinnamomea*, *Parthenocissus quinquefolia*, *Prenanthes* sp., *Quercus alba*, *Sassafras albidum*, *Smilacina racemosa*, *Solidago caesia*, *Symplocarpus foetidus*, and *Viburnum acerifolium*. Hull (1941) described in detail the old bog that once existed here, and Floyd Swink remembers that Bluebead Lily grew on either side of County Line Road. The two sites Floyd remembers have perished, that on the Lake County side having been replaced now by a "Go-Go" house. Alas!

In the West Beach Unit as a whole, but excluding the Dritz Pits, there are 434 documented native species, with a Mean Quality of 6.92 and an Index of 144. If the 16 species reported historically from this Unit are included, the Mean rises to 7.12 and the Index would stand at 151; but the trauma visited upon Survey Area A probably forecloses such optimism.

SURVEY UNIT IV MAP



SURVEY UNIT IV: BAILLY

This Survey Unit occupies about 1195 acres, principally along the Little Calumet River and its adjacent ravines and uplands northwest and west of Chesterton (see figure II). It is divided into six Survey Areas, and was surveyed on May 26 and 28, and September 12 and 22, 1979, and May 13, 1987. I was accompanied at various times on these surveys by John Bacone, Robert F. Betz, and Ken Dritz.

The Survey Unit Map (which appears on the next page) was superimposed to scale over combined parts of the U.S.G.S Portage 41087-E2-TF-024, photo-revised 1986; U.S.G.S Chesterton Quadrangle, 41087-E1-TF-024, photo-revised 1986; the U.S.G.S. Dune Acres Quadrangle, N4137.5-W8700/7.5, photo-revised 1980; and the U.S.G.S. Ogden Dunes Quadrangle, 41087-F2-TF-024, photo-revised 1986. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a color oblique set flown in May, 1978; a black & white stereo pair set (BFP 2: 9-10, 16-18, and 54) flown in November, 1938; a black & white stereo-pair set (BFP-2V: 56-58, 109-111, and 119-122) flown in September, 1958; a color stereo-pair set (79-117: 67-74 and 108-116) flown in May, 1979; and a black & white stereo-pair set (8:4-12 and 9:1-5) flown in May, 1984.

For a rather detailed discussion of the Bailly area, especially with regard to the effects of postsettlement anthropogenics, see the fine monograph by Cook & Jackson (1978). As is mentioned therein, most of the natural amenities of the Bailly Area have been permanently compromised; in fact, they have been compromised to the point that populations of only seven SPECIAL VEGETATION floristic elements were recorded during this survey. Consequently, a summary to the Annotated List has been omitted. We have a specimen of *Betula pendula* (Kjellmark #46, MOR) from "one small tree . . . [at the] border of a pasture" in Survey Area B. See the discussion of *Betula populifolia* in Survey Unit I. Barbara Plampin (1989b) wrote me that she recollects having seen *Corallorhiza maculata* off the side of the Little Calumet River Trail in July, 1981, but advises me not to include it in the annotated list because of the vagueness of the account.

ANNOTATED LIST OF SPECIAL VEGETATION FLORISTIC ELEMENTS

Aralia racemosa L. Rare, in the little ravine northwest of the Bailly Homestead, in Survey Area B.

Aristolochia serpentaria L. Rare, except for an extensive colony in the woods along the north bluff of the Little Calumet River in Survey Area D, not far from Howe Road. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #6752, 28 MAY 1979; ca 0.5 mi E of Burns Harbor, in the floodplain and along the N bluff of the Little Calumet River, W of Howe Rd, in the N N Sec.34 T37N R6W. MOR.

Asimina triloba (L.) Dunal This small tree is known from Survey Area A on the basis of the following REPRESENTATIVE SPECIMEN: *Kjellmark* #52, 22 JUN 1987; T37N R6W SW SE NE Sec.27; found in woods behind headquarters, oak-hickory forest, clay-loam soil, infrequent. INDU.

Botrychium dissectum Spreng. Occasional in the Mesophytic Forest portion of Survey Area B, and probably elsewhere.

Galium lanceolatum Torr. Rare, in Survey Area E. This floristic element remains yet undocumented from Porter County, Indiana (see Swink & Wilhelm, 1979), because I failed to secure a voucher specimen during the survey. A voucher specimen in this particular case is quite important because this species is superficially similar to **Galium circaeans** var. **hypomalacum**, which is frequent in the wooded portions of the Bailly area.

Lathyrus venosus Muhl. Ken Dritz and I noted this rare pea at the Chellberg Farm June 30, 1979. I have not been back to look for it since.

Lonicera dioica L. According to Plampin (1989b), she noted this species in bloom "on the higher side of [the] trail on a wooded dune," in Survey Area D on May, 1988.

Panax trifolius L. Barbara Plampin (1989b) noted Dwarf Ginseng on May 20, 1988 in Survey Area D. Welch (1935) considered populations of this species to be boreal relicts.

NATURAL AREA ASSESSMENT

Survey Unit IV, as can be seen from the Natural Area Vegetation Map, consists of two General community types: the Mesophytic Forest and the Bottomland. Nearly all of the upland areas in this Survey Unit (about 50% of the Unit), and much of the floodplain area itself, have been obliterated. Much of the area that remains is mapped as Natural Area only because this Survey Unit is the only one in which a riparian community with forested mesophytic bluffs is intact to any degree at all.

The areas codified as Mesophytic Forest on the Natural Area Vegetation Map are principally dry-mesophytic, with strong fundamental affinities to the more mesophytic phases of savanna. These forests are relatively low in quality in comparison with what they must have been at one time, though, sadly, they are nevertheless significant in comparison with what little remains in the Chicago region today. Currently, these forested communities now are restricted to the steep slopes of ravines and bluffs, the meat of the upland forests having been obliterated years ago. In this regard, Cook & Jackson (1978) pointed out:

"Further west, in inland Porter and Lake Counties, Oak was predominant. Oak forest originally crowned the hills around the Bailly Homestead, interspersed with elm, ash, and walnut. The road north of the homestead was 'Oak Hill Road.' Solon Robinson wanted Indiana west of LaPorte County and north of the Kankakee 'Oakland County' in honor of the principal timber on it. . . . Lumbering was one cause of permanent change to the inland landscape in the nineteenth century. In only a few decades, lumbering changed thick forests into open fields and second growth trees."

It can be inferred from the original land survey notes that much of what is now codified as Bottomland on the Natural Area Vegetation Map was at that time (ca 1830) prairie marsh, particularly in the western portion of the Unit (Bacone *et al.* 1980); thus the Bottomland areas, now more or less wooded, are largely low in quality, with the possible exceptions of some of those in Survey Area D. Fire deprivation, sedimentation, stream channelization, and upland mismanagement have had a tremendous negative impact. In Survey Area D, the Bottomland, while not really high quality, nevertheless represents some of the finer of the Bottomland communities of this type remaining in the Chicago region today.

The low number of SPECIAL VEGETATION floristic elements recorded from this Survey Unit, along with the chronically low quality prevailing generally throughout, were discouraging given the investment of survey time. Consequently, I did not specifically catalogue plant species west of Survey Area D (which ends near the river bend east of the New York Central Railroad bridge over the Little Calumet River). An exception to this is the new acquisition along Salt Creek south and west of the west end of Boo Road in what is labeled Survey Area F on the Survey Unit Map. The data used, however, in the assessment of the relative Natural Area significance and integrity of each of the six Survey Areas which I did evaluate, and of the Survey Unit as a whole, are provided in Table IV. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from each Survey Area, along with the numerical rating coefficient as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient, and do not enter directly into the derivations of the Natural Area Indices. Several species are listed from the Survey Unit as a whole, but not listed from any particular Survey Area; these are from roadsides, old residential areas, or other areas outside of delineated Survey Areas.

Most of the reports (R) listed below are from associate lists on herbarium specimens collected since 1980; some are from Klick *et al.* (1989). Though I have not surveyed areas A - E since 1980, there are numerous additional documented records based upon recently collected specimens filed at INDU and MOR. Reports of *Aesculus glabra*, *Pinus sylvestris*, *Pyrus malus*, and *Taxus cuspidata* appear to have been based upon planted specimens. Both *Pinus banksiana* and *Pinus strobus* are known from the Unit as either planted trees or adventive populations in old fields. None of the trees alive today appear to me to be autochthonous at the Bailly Unit.

TABLE IV: Summary of species upon which are calculated the various Natural Area Indices for each Survey Area and for the Survey Unit as a whole.

A	B	C	D	E	F	
x	R					* <i>Abutilon theophrasti</i>
x	x		x	x	x	0 <i>Acer negundo</i>
x	x	x	x	x		7 <i>Acer rubrum</i>
x	x		x		x	0 <i>Acer saccharinum</i>
x	x	x	x	x		5 <i>Acer saccharum</i>
		x		x		* <i>Achillea millefolium</i>
			x			7 <i>Acorus calamus</i>
			x			7 <i>Actaea pachypoda</i>
	x		x		x	5 <i>Actinomeris alternifolia</i>
					x	5 <i>Agastache scrophulariaefolia</i>
x	x		x	x	x	2 <i>Agrimonia gryposepala</i>
	x					8 <i>Agrimonia parviflora</i>
			x			5 <i>Agrimonia pubescens</i>
	R					* <i>Agropyron repens</i>
R	R					* <i>Agrostis alba</i>
						* <i>Ailanthus altissima</i>
						* <i>Ajuga reptans</i>
			x			4 <i>Alisma subcordatum</i>
					x	* <i>Alliaria officinalis</i>
x	x		x	x	x	1 <i>Allium canadense</i>
x	x		x			6 <i>Allium tricoccum burdickii</i>

A	B	C	D	E	F	
					x	* Allium vineale
x						* Amaranthus powellii
	R					* Amaranthus retroflexus
x	x					0 Ambrosia trifida
x						* Andropogon virginicus
x	x		x	x		8 Amelanchier arborea
	x					8 Amelanchier laevis
	x		x			4 Amphicarpa bracteata
		x				4 Andropogon gerardii
x	x		x			7 Anemone quinquefolia interior
x	x		x	x		7 Anemonella thalictroides
			x			5 Angelica atropurpurea
			x			6 Antennaria neglecta
	x		x	x		6 Antennaria plantaginifolia
x						* Anthriscus scandicina
				x		6 Apios americana
			x			5 Apocynum androsaemifolium
			x	x		5 Aquilegia canadensis
			x		x	3 Arabis laevigata
x				x		8 Aralia nudicaulis
	x					15 Aralia racemosa
x	x	x			x	* Arctium minus
					x	9 Arenaria lateriflora
x	x		x			5 Arisaema atrorubens
x	x		x			8 Arisaema dracontium
			x			15 Aristolochia serpentaria
	x		x			5 Asarum canadense
x						15 Asimina triloba
		x		x		5 Aster cordifolius
	x	x	x		x	4 Aster lateriflorus
				x		10 Aster linariifolius
	x					10 Aster macrophyllus
	x	x			x	1 Aster pilosus
					x	6 Aster puniceus
x				x		5 Aster sagittifolius
					x	2 Aster sagittifolius drummondii
	x	x	x			8 Aster shortii
			x		x	3 Aster simplex
	x		x	x		6 Athyrium filix-femina michauxii
x						* Avena sativa
x					x	* Barbarea vulgaris
x	x	x	x	x	x	* Berberis thunbergii
			x			5 Bidens cernua
			x			5 Bidens comosa
			x			8 Bidens coronata
	x		x			7 Blephilia hirsuta
	x		x			2 Boehmeria cylindrica
	x					15 Botrychium dissectum
x	x		x	x		6 Botrychium virginianum
	R					* Bromus inermis
						* Bromus tectorum
					x	5 Caltha palustris

A	B	C	D	E	F	
	x	x	x			6 Camassia scilloides
x	x					2 Campanula americana
						* Campanula rapunculoides
						* Capsella bursa-pastoris
	x		x	x		5 Cardamine bulbosa
	x		x			6 Cardamine douglassii
			x	x		4 Cardamine pensylvanica
x	x	x	x		x	2 Carex amphibola turgida
	R					10 Carex annectens
R						5 Carex aquatilis altior
x						3 Carex brevior
x	x			x	x	2 Carex cephalophora
				x		10 Carex crinita
			x			10 Carex gracilescens
	x		x			7 Carex grayii
x						4 Carex hirsutella
	x					5 Carex jamesii
x	x	x	x	x		1 Carex laxiflora
			x			8 Carex lupulina
x			x	x		5 Carex pensylvanica
x	x		x	x	x	1 Carex rosea
R						7 Carex scoparia
		x	x			3 Carex sparganioides
x						10 Carex squarrosa
	x		x	x	x	2 Carex stipata
			x			9 Carex tetanica
x						2 Carex vulpinoidea
			x			8 Carpinus caroliniana virginiana
x	x	x	x			7 Carya cordiformis
x	x		x	x	x	5 Carya ovata
					x	* Catalpa speciosa
x						* Celastrus orbiculatus
	x					6 Celastrus scandens
x		x	x	x	x	3 Celtis occidentalis
			x	x		7 Cephalanthus occidentalis
						* Cerastium vulgatum
	x					10 Cercis canadensis
	x		x	x	x	5 Chaerophyllum procumbens
			x	x		8 Chelone glabra
	R					* Chenopodium album
x						* Chrysanthemum leucanthemum pinnatifidum
	x					* Cichorium intybus
			x	x	x	6 Cicuta maculata
	x		x		x	5 Cinna arundinacea
x	x	x	x	x	x	0 Circaea quadrisulcata canadensis
					x	* Cirsium arvense
					x	* Cirsium vulgare
x	x		x		x	2 Claytonia virginica
	x		x			4 Clematis virginiana
x		x				* Convallaria majalis
			x	x	x	5 Cornus obliqua
x	x	x	x	x	x	1 Cornus racemosa

A	B	C	D	E	F	
x	x	x	x	x		2 Corylus americana
			x		x	1 Crataegus crus-galli
x						5 Crataegus macrosperma
R	x		x		x	2 Crataegus mollis
x	x					6 Crataegus pruinosa
	x		x			1 Crataegus punctata
x	x	x	x	x	x	0 Cryptotaenia canadensis
	x					* Datura stramonium
x					x	* Daucus carota
	x		x	x		5 Dentaria laciniata
	x					8 Desmodium glutinosum
	x					5 Desmodium paniculatum
				x		5 Dioscorea villosa
x						* Dipsacus sylvestris
			x			6 Dodecatheon meadia
			x	x		6 Dryopteris spinulosa
						0 Echinochloa crusgalli
					x	5 Echinocystis lobata
	x		x			5 Elymus villosus
			x		x	4 Elymus virginicus
	x					10 Epifagus virginiana
			x		x	3 Epilobium coloratum
			x	x	x	0 Equisetum arvense
			x		x	4 Equisetum hyemale affine
					x	1 Erigeron annuus
R	x		x	x		4 Erigeron philadelphicus
	R					3 Erigeron strigosus
	x		x	x		7 Euonymus obovatus
			x	x		5 Eupatorium maculatum
			x		x	6 Eupatorium perfoliatum
	x	x	x			7 Eupatorium purpureum
	x	x	x			4 Eupatorium rugosum
x						* Euphorbia esula
x	x	x	x			10 Fagus grandifolia
R	R					* Festuca elatior
	x		x	x	x	5 Festuca obtusa
	x		x			8 Floerkea proserpinacoides
x	x	x	x		x	1 Fragaria virginiana
x	x	x	x	x	x	5 Fraxinus americana
	x		x			8 Fraxinus nigra
	x		x			7 Fraxinus pennsylvanica
	x	x	x	x	x	2 Fraxinus pennsylvanica subintegerrima
x	x	x	x	x	x	1 Galium aparine
	x	x		x	x	7 Galium circaezans hypomalacum
x	x		x	x	x	4 Galium concinnum
				x		15 Galium lanceolatum
			x			5 Galium obtusum
x	x		x			5 Galium triflorum
x	x		x	x	x	4 Geranium maculatum
x	x	x	x	x	x	0 Geum canadense
x			x			1 Geum laciniatum trichocarpum
x	x				x	* Glechoma hederacea

A	B	C	D	E	F	
		x	x	x	x	4 Glyceria striata
x					x	0 Hackelia virginiana
x	x	x	x	x		8 Hamamelis virginiana
					x	5 Helenium autumnale
						* Helianthus annuus
					x	5 Helianthus divaricatus
	x					2 Helianthus grosseserratus
x						* Hemerocallis fulva
x	x		x	x		6 Hepatica acutiloba
			x			10 Hepatica americana
			x			5 Heracleum maximum
					x	* Hesperis matronalis
			x	x		* Hieracium aurantiacum
x						* Hieracium pratense
	x					* Hordeum vulgare
			x			9 Houstonia caerulea
					x	* Humulus japonicus
	x					8 Hydrophyllum appendiculatum
x			x			5 Hydrophyllum virginianum
x						* Hypericum perforatum
			x			4 Hypericum punctatum
		x	x			5 Hystrix patula
x	x	x	x	x	x	3 Impatiens capensis
x	x					6 Impatiens pallida
	R		x	x		5 Iris virginica shrevei
			x			8 Isopyrum bitermum
x						8 Juglans cinerea
	x		x		x	5 Juglans nigra
x	R					7 Juncus effusus solutus
x						10 Juncus interior
x	x	x			x	0 Juncus tenuis
			x			2 Juniperus virginiana crebra
			x	x		7 Krigia biflora
					x	2 Lactuca canadensis
					x	* Lamium purpureum
	x		x	x		3 Laportea canadensis
	x					8 Lathyrus venosus
			x			5 Leersia oryzoides
	x	x	x			7 Leersia virginica
			x			5 Lemna minor
x					x	* Leonurus cardiaca
		x				* Lepidium campestre
						0 Lepidium virginicum
x	x		x	x		6 Lilium michiganense
						6 Linaria canadensis
R	x	x	x	x		7 Lindera benzoin
	x	x	x			6 Lobelia siphilitica
			x			15 Lonicera dioica
x	x	x	x	x	x	* Lonicera X muendeniense
			x			6 Lonicera prolifera
x	x		x	x		5 Luzula multiflora
	x					10 Lycopodium complanatum flabelliforme

A	B	C	D	E	F	
			x			5 Lycopus americanus
			x			4 Lysimachia ciliata
	R	x	x		x	* Lysimachia nummularia
			x			9 Lysimachia thyrsiflora
	x					* Malva neglecta
x						* Melilotus officinalis
			x			5 Mentha arvensis villosa
x						* Mentha spicata
R						5 Mertensia virginica
		x		x		10 Mitella diphylla
x						* Morus alba
x						* Nepeta cataria
	x		x	x		8 Onoclea sensibilis
x	x	x	x	x		3 Osmorhiza claytoni
x			x		x	3 Osmorhiza longistylis
x					x	7 Osmunda claytoniana
	x				x	5 Ostrya virginiana
x			x	x		0 Oxalis europaea
			x			15 Panax trifolius
x	x		x			3 Panicum implicatum
x						1 Parthenocissus inserta
x	x	x	x	x	x	2 Parthenocissus quinquefolia
					x	0 Phalaris arundinacea
	x					* Phleum pratense
	x	x	x	x		5 Phlox divaricata
x			x		x	3 Phryma leptostachya
					x	2 Phytolacca americana
	x	x	x		x	5 Pilea pumila
x						* Pinus banksiana (adventive locally)
x						* Pinus strobus (adventive locally)
						* Plantago rugelii
						* Poa annua
						* Poa compressa
x					x	* Poa pratensis
					x	* Poa trivialis
x	x		x	x	x	5 Podophyllum peltatum
					x	5 Polemonium reptans
x	x	x	x	x	x	3 Polygonatum canaliculatum
x	x	x	x	x		7 Polygonatum pubescens
	x					* Polygonum aviculare
					x	* Polygonum convolvulus
x						* Polygonum cuspidatum
			x			7 Polygonum hydropiperoides
x						0 Polygonum pensylvanicum laevigatum
	x					* Polygonum persicaria
			x			6 Polygonum punctatum
	x				x	2 Populus deltoides
			x			4 Populus tremuloides
						* Potentilla recta
x	x	x	x	x		4 Potentilla simplex
	x		x			5 Prenanthes alba
	x					10 Prenanthes altissima

A	B	C	D	E	F	
x	x	x	x	x		0 Prunella vulgaris lanceolata
	x					* Prunus avium
x	x	x	x	x	x	1 Prunus serotina
x	x	x	x	x	x	1 Prunus virginiana
			x			7 Ptelea trifoliata
x						5 Pteridium aquilinum latiusculum
x	x				x	2 Pyrus ioensis
						* Pyrus malus
x	x	x	x	x	x	4 Quercus alba
	R		x			8 Quercus bicolor
	x		x	x		10 Quercus imbricaria
	x		x			4 Quercus macrocarpa
x	x	x	x	x	x	7 Quercus rubra
x	x				x	6 Quercus velutina
x	x	x	x	x	x	0 Ranunculus abortivus
			x	x	x	6 Ranunculus fascicularis
			x			7 Ranunculus flabellaris
x	x			x	x	5 Ranunculus recurvatus
	x	x	x	x	x	4 Ranunculus septentrionalis
	x					6 Rhus copallina latifolia
x	x	x	x	x	x	1 Rhus radicans
					x	3 Rhus typhina
			x	x		7 Ribes americanum
x	x	x	x	x		5 Ribes cynosbati
						* Robinia hispida
x					x	* Robinia pseudo-acacia
x						5 Rorippa islandica fernaldiana
						* Rosa canina
R		x	x		x	* Rosa multiflora
			x	x		9 Rosa palustris
	x		x	x	x	3 Rubus allegheniensis
x						4 Rubus flagellaris
x	x		x		x	2 Rubus occidentalis
			x	x	x	3 Rudbeckia laciniata
						* Rumex acetosella
					x	2 Rumex altissimus
x						* Rumex crispus
x						* Rumex obtusifolius
			x	x	x	7 Rumex orbiculatus
			x			6 Rumex verticillatus
					x	2 Salix discolor
			x	x		4 Salix nigra
					x	5 Salix rigida
x	x	x	x	x	x	1 Sambucus canadensis
x	x	x	x			6 Sanguinaria canadensis
x	x	x	x	x		2 Sanicula gregaria
x						* Saponaria officinalis
		x		x		6 Sassafras albidum
			x			8 Saxifraga pensylvanica
R			x			6 Scirpus cyperinus
	x	x	x			4 Scrophularia marilandica
			x			5 Scutellaria lateriflora

A	B	C	D	E	F	
x						* Sedum sarmentosum
						7 Senecio aureus
						* Setaria glauca
		x				8 Seymeria macrophylla
			x	x		6 Silene stellata
x						10 Silene virginica
					x	5 Silphium perfoliatum
			x			5 Silphium terebinthinaceum
			x			7 Sium suave
x	x	x	x	x	x	2 Smilacina racemosa
x						5 Smilacina stellata
		x	x	x		3 Smilax ecirrhata
		x	x	x		4 Smilax lasioneura
x	x	x	x			5 Smilax tamnoides hispida
						* Solanum carolinense
x			x		x	* Solanum dulcamara
x	x				x	1 Solidago altissima
		x	x	x	x	7 Solidago caesia
			x	x		6 Solidago flexicaulis
		x				3 Solidago gigantea
R						5 Solidago juncea
x	x		x			5 Solidago ulmifolia
						* Sonchus uliginosus
			x			6 Sparganium eurycarpum
				x		5 Stachys palustris homotricha
x					x	* Stellaria media
			x			10 Swertia caroliniensis
				x	x	6 Symplocarpus foetidus
						* Syringa vulgaris
		x		x		8 Taenidia integerrima
x					x	* Taraxacum officinale
			x			4 Thalictrum dasycarpum
x	x		x	x	x	5 Thalictrum dioicum
x	x	x	x	x		5 Tilia americana
x	x	x	x	x	x	2 Tovarva virginiana
						* Tragopogon pratensis
		x				* Trifolium agrarium
						* Trifolium hybridum
						* Trifolium pratense
						* Trifolium repens
x	x		x	x		5 Trillium recurvatum
			x			5 Triosteum aurantiacum
						* Triticum aestivum
			x			2 Typha angustifolia
			x			1 Typha latifolia
x	x	x	x	x	x	3 Ulmus americana
x						* Ulmus pumila
x	x					4 Ulmus rubra
			x		x	2 Urtica procera
					x	7 Uvularia grandiflora
			x			5 Vaccinium angustifolium laevifolium
x						* Verbascum blattaria

A	B	C	D	E	F	
						* Verbena bracteata
						4 Verbena stricta
	x					5 Verbena urticifolia
	x					5 Vernonia altissima
x						* Veronica arvensis
x						* Veronica peregrina
x						* Veronica serpyllifolia
x	x	x	x	x		9 Viburnum acerifolium
			x			5 Viburnum lentago
x						* Viburnum opulus
x	x			x		5 Viburnum rafinesquianum
x		x				* Vinca minor
x						5 Viola missouriensis
x						* Viola odorata
x	x		x		x	0 Viola papilionacea
	x				x	5 Viola pensylvanica
	x		x			10 Viola pubescens
x	x	x	x	x	x	3 Viola sororia
	x		x			6 Viola striata
	x				x	10 Vitis aestivalis
x	x	x	x	x	x	4 Vitis riparia
						* Xanthium strumarium
	x		x			7 Zizia aurea

Summary

Survey Area A, wherein is situated the Lakeshore Headquarters, includes the 90-acre area south of U.S. 12, north of Oak Hill Road, and was sampled May 26, 1979. The area codified as Mesophytic Forest on the Natural Area Vegetation Map is of marginal Natural Area quality. Since 1979, when I recorded 76 native species, another 31 have been documented, bringing the Mean Quality to 4.00 and the Natural Area Index to 41. The 8 additional reports would put the Index at 43.

Survey Area B (surveyed May 26 and September 22, 1979) includes the ravine forest which flanks the Chellberg farm and the bluffs and bottoms around the Bailly homestead site, east of Howe Road, south of Oak Hill Road, and west of 100W Road. It occupies about 165 acres. Including the recent herbarium records, 155 native floristic elements, with a Mean Quality of 4.66, have been recorded. The Natural Area Index is 58, and not likely to rise much higher than the low 60's. The ecological problems in this Survey Area are similar to those in Survey Area D (which see).

Survey Area C (surveyed September 22, 1979) is a 70-acre tract which includes the ravine forest and upland woods codified as Mesophytic Forest on the Natural Area Vegetation Map. Here, in the late summer, I recorded 67 native floristic elements, with a Mean Quality of 4.00, reflecting a Natural Area Index for the area of 33. A survey in the spring of the year probably would not improve the Mean Quality measurements substantially, but the discovery of additional plant taxa could raise the Natural Area Index as high as 40, or perhaps a little higher; I spent very little time in the northern portion of this area, however, so a few surprises might be in store.

Survey Area D (surveyed May 28 and September 12, 1979) contains some of the finest riparian vegetation in the Chicago region. The whole of the area is 415 acres. In the Bottomland and along the adjacent bluffs, the latter codified as Mesophytic Forest on the Natural Area Vegetation Map, I catalogued 205 native floristic elements, the Mean Quality of which was 4.90. The Natural Area Index was 70, ranking this area [which is that portion codified as Natural Area, Bottomland and Mesophytic Forest symbols, between the New York Central Railroad bridge and Howe Road on the Natural Area Vegetation Map] among the more significant Natural Areas, from a regional perspective. The ecological problems here are complex, the remedies of which are perhaps largely outside of National Park Service jurisdiction. The Little Calumet River carries heavy amounts of silt from eroded and row-cropped uplands within its watershed. The abrasive character and deposition of such silts during flood events maintain a fundamentally low (albeit comparatively high) Mean Quality. The fact that the forests along the bluffs are now confined to steep slopes, the upper edges of which interface with open, highly disturbed, often artificial habitats, probably does much to discourage both stability in ground-cover vegetation and tendencies toward moderation of the mesophytic microclimate. These problems and others, nevertheless, are chronic in the midwest today, so only a very few contemporary riparian life systems are any less affected by them.

Though only 10 acres, Survey Area E (surveyed May 28, 1979) is probably the finest Mesophytic Forest ravine *per se* in the Lakeshore. On only one short visit, I recorded 109 native floristic elements, the Mean Quality of which was 4.62. The lower slopes and bottomland area are, in places, quite fen-like in character, making it also one of the most interesting ravines in the Survey Unit. The Natural Area Index now stands at 48, but it is likely that this small Survey Area could be shown to rate as high as 60 if it were surveyed again in the late summer or fall.

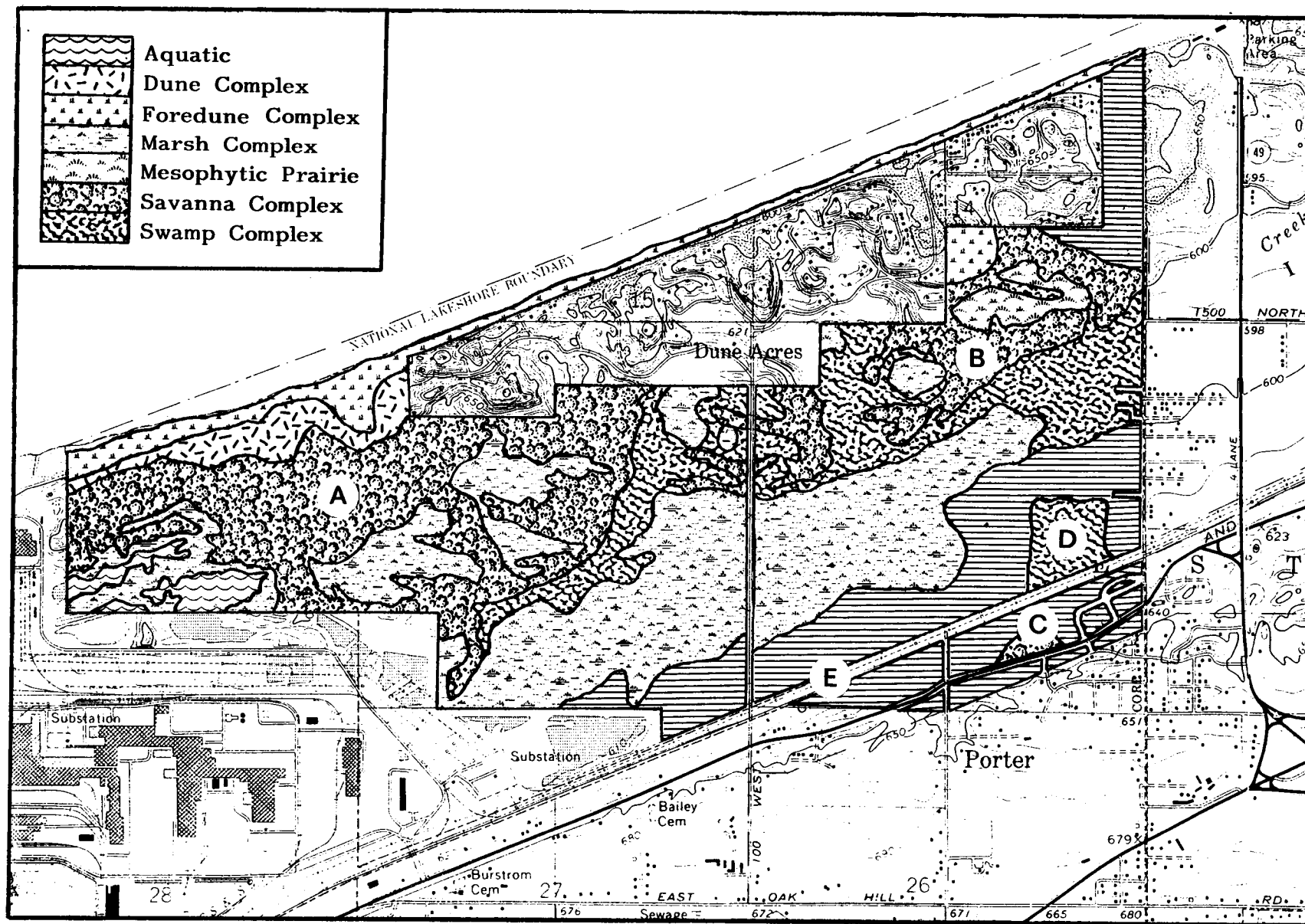
There is a 45-acre extension of Survey Area D between Route 149 and the New York Central Railroad, but I have not been in there. West of Route 149, along the Little Calumet River bottomlands and bluffs to Samuelson Road, south to the section line off of Boo Road, is a large (195 acres) tract which I have not surveyed; Plampin (1989b), however, noted *Silphium terebinthinaceum* from a degraded prairie remnant in this vicinity—a notable find inasmuch as it is the first and only known record for Prairie Dock in the Lakeshore.

Survey Area F is a 501-acre area which includes Bottomland and Mesophytic Forest areas along Salt Creek. I Surveyed it May 13, 1987. One hundred one native species were recorded, with a Mean Quality of 3.30 and representing a Natural Area Index of 33.

West of Samuelson Road, along the south side of the channelized Little Calumet River, is a 40-acre tract; along the north side, a 30-acre tract. I have not been in either of these two areas. There are about 80 acres altogether along U.S. 12, most of which have been heavily disturbed. I surveyed the central portion in 1979 and found them so poor in quality that it made no sense at all to map them as Natural Area. Even if the pines, which were probably planted there, were included in the calculations, the Natural Area Index would go no higher than 22, with a Mean Quality of 3.4.

I have recorded for the entire Survey Unit 298 native floristic elements, the Mean Quality of which was 5.05. The Natural Area Index is 87, and probably not apt to rise much higher than 90 as a result of more intensive examination. There are 4 additional reports, which if included raise the Index to 88.

SURVEY UNIT V MAP



SURVEY UNIT V: DUNE ACRES

This Survey Unit occupies about 1420 acres around the village of Dune Acres (see figure II). The area west of Mineral Springs Road (Survey Area A) occupies approximately 740 acres, about 20% of which is a highly disturbed remnant of the famous Great Marsh area. The area east of Mineral Springs Road (primarily Survey Area B) includes about 555 acres, nearly 45% of which has been obliterated, including the once floristically rich Great Marsh region. Most of the Lakeshore area south of the Chicago South Shore & South Bend Traction Line (about 75 acres) has been obliterated, except for a small, disturbed, 5-10 acre woodlot, Survey Area C, along the north side of U.S. 12 (see the Survey Unit Map which appears on the next page). North of the traction line in the southeastern portion of the Unit is a fairly intact Hydromesophytic Forest (Survey Area D). The right-of-way along the traction line and the bike trail from Mineral Springs Road to Waverly Road is designated Survey Area E. This Survey Unit was surveyed on May 27, June 12 and 29, July 15, August 29, and September 8, 10, 11, and 15, in 1979; May 7, July 11, and August 5 and 11, 1987; August 30, 1988; May 24, July 21, and August 31, 1989. I was accompanied at various times during these surveys by John Bacone, Robert F. Betz, Marlin Bowles, Lee Casebere, Ken Dritz, Norm Henderson, Mike Homoya, Lois Howes, Emma Pitcher, Elizabeth Shimp, Art Spingarn, Paul Strand, Floyd Swink, and Linda Wetstein.

The Survey Unit Map was superimposed to scale over a part of the U.S.G.S. Dune Acres Quadrangle, N4137.5-W8700/7.5, photo-revised 1980. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a color oblique set flown in May, 1978; a black & white stereo-pair set (BFP-2:16 & 54) flown in November, 1938; a black & white stereo-pair set (BFP-2V: 56, 111, and 119-120) flown in September, 1958; a color stereo-pair set (77-157: 8-12) flown in April, 1977; a color stereo-pair set (79-117: 21-27 and 73-76) flown in May, 1979; and a black & white stereo-pair set (6:1-6; 7:1-6) flown in May, 1984.

There are several areas within this Survey Unit which are of particular interest in the sense that historically they have been known to provide the habitat for numerous floristic elements which we now regard as members of the SPECIAL VEGETATION. These areas include Little Lake and Cowles Bog both in Survey Area A; the Lois Howes Prairie, in Survey Area B; and a portion of the Great Marsh, which is common to Survey Areas A and B. Immediately to the west of this Survey Unit, and perhaps even yet partially extant, was the large wetland complex known as Goose Lake.

LITTLE LAKE

Little Lake, located about one mile west of Mineral Springs Road, and bisected by the section line about one half mile south of Lake Michigan, was one of the very few interdunal depressions in which open water was apt to remain throughout the growing season on a regular basis. Lyon (1927), lamenting the then recent drainage of Little Lake, regarded it as "... a very interesting pond." Cook & Jackson (1978) describe in some detail the drainage of Little Lake and its subsequent use, by the people of Dune Acres, as a golf course. Apparently, according to Cook & Jackson, after about 10 years of use the golf course remained abandoned, but the drainage ditch to Little Lake remained partially functional until the late 1960's, at which time "Little Lake ... became a year round pond as it had been before 1924. It was changed, however, in that it now had a direct outlet into the Great Marsh ..." Today, probably because the nearby Goose Lake region survived as a synecological entity into the late

1950's, a significant number of the SPECIAL VEGETATION floristic elements remain extant through populations in Little Lake, these having re-established themselves in the moist soils of Little Lake before the destruction of Goose Lake in the early 1960's.

The destruction of the Goose Lake area more than decimated the populations of some of the Lakeshore SPECIAL VEGETATION floristic elements. Several species of plants were, indeed, known locally only from Goose Lake, including *Fuirena pumila* and *Juncus militaris*. About *Juncus militaris*, for example, Swink & Wilhelm (1979) write:

"Now extinct in our area. Many hundreds of these plants were discovered . . . in the shallow waters of Goose Lake in Porter County before the destruction of that lake. . . . This was the only station in the Chicago area, and according to Gleason, the nearest colony is in northern Michigan. At Goose Lake the Soldier Rush grew with *Cladium mariscoides*, *Dulichium arundinaceum*, *Hypericum boreale*, *Hypericum virginicum* var. *fraseri*, *Ludwigia alternifolia*, *Polygonum coccineum*, *Pontederia cordata*, *Rhynchospora capitellata*, *Sagittaria graminea*, and *Utricularia purpurea*."

The likelihood that these species are still extant locally is not so remote as we once thought (Wilhelm, 1980). Since 1980, precious Goose Lake denizens such as *Panicum lucidum*, *P. verrucosum*, and *Scleria reticularis* have been discovered in Little Lake along with other interesting species such as *Psilocarya scirpoides* and *Polygonum opelousanum* var. *adenocalyx*, all of which see. Cook & Jackson (1978) point out, in fact, that "... a tiny fragment, recently termed 'pond 6' remains." Certainly the rich associations described by Lyon, Pepoon, Swink & Wilhelm, and others, are now extinct, the only extant remnants perhaps being those which are now manifest at Little Lake and the "NIPSCO ponds." In 1979, when this initial survey was conducted, Little Lake was inundated throughout most of its area. Over the last four years, a sustained draw-down condition has prevailed which has allowed us to explore the lake more freely and has opened up habitat for a number of SPECIAL VEGETATION annuals and short-lived perennials. During this time, about twenty SPECIAL VEGETATION floristic elements have been recorded from this remarkable little lake:

<i>Brasenia schreberi</i>	<i>Psilocarya scirpoides</i>
<i>Chamaedaphne calyculata angustifolia</i>	<i>Rhexia virginica</i>
<i>Cladium mariscoides</i>	<i>Rhynchospora macrostachya</i>
<i>Cyperus engelmannii</i>	<i>Sagittaria rigida</i>
<i>Drosera intermedia</i>	<i>Scirpus purshianus</i>
<i>Eleocharis geniculata</i> ?	<i>Scleria reticularis</i>
<i>Juncus pelocarpus</i>	<i>Sparganium americanum</i>
<i>Ludwigia sphaerocarpa deamii</i>	<i>Utricularia gibba</i>
<i>Panicum verrucosum</i>	<i>Utricularia purpurea</i>
<i>Polygonum opelousanum adenocalyx</i>	<i>Vitis labrusca</i>

Neither *Eriocaulon septangulare* nor *Potamogeton diversifolius* was reported from Little Lake by Lyon (1927). *Eleocharis geniculata* has been attributed to this Survey Unit solely on the basis of an unceremonious report as an associate of *Psilocarya scirpoides* at Little Lake in Bowles *et al.* (1986a).¹ Nevertheless, 88 native species have been inventoried in

¹Neither *Eleocharis olivacea* nor *E. obtusa* were mentioned, even though they are frequent locally with *Psilocarya scirpoides*.

recent years at Little Lake; it, alone, has a Natural Area Index of 81! It is inevitable that it will fill with water again for a time. The lake bed is now being invaded by vast and solid stands of *Calamagrostis canadensis* in some areas, by *Cephalanthus occidentalis* in some others. Most of the vegetation would sustain a fire. It would be best if Little Lake and its purlieus were burned over to open up the area for exploitation by the numerous annual components of the SPECIAL VEGETATION. This would result in a significant seed rain from the annuals so that there would be a well-stocked seed bank to re-inhabit the lake during subsequent draw-downs.

COWLES BOG

There has been no single area within the Lakeshore about which more has been written than the famous Cowles Bog area--located in and around the southwestern portion of the Hydromesophytic Swamp Forest community of Survey Area A. Though I considered Cowles Bog a "fen" (Wilhelm, 1980), and Wilcox *et al.* (1986) appear to agree, there has been controversy over the appropriateness of the term "bog" as applied to Cowles Bog. Regardless of what one calls it, however, Cowles Bog has long been known to contain literally dozens of plant species we now consider to be among the SPECIAL VEGETATION floristic elements. Even today a number of these elements still survive in the Cowles Bog area.

This Cowles Bog section is located in the southeastern portion of the area mapped as Marsh and Swamp Complex in Survey Area A. It is of uneven quality (with Mean Quality ratings ranging from 4.0 to 8.5, depending upon the disturbance histories of the particular sampling sites); the disturbances are largely due to fire suppression, logging, light cattle grazing, and water fluctuations. I have taken the heart of the Cowles Bog section to include the area inhabited by Arbor Vitae (*Thuja occidentalis*) and American Tamarack (*Larix laricina*), along with the Marsh and Swamp Complex communities in the immediate vicinity--an area which encompasses 10 to 15 acres. This relatively small tract still provides the habitat for representatives of at least 41 SPECIAL VEGETATION floristic elements! These elements include:

Aster junciformis	Linnaea borealis americana
Bartonia virginica	Lonicera dioica
Betula lutea	Mitchella repens
Betula papyrifera	Myosotis laxa
Betula pumila	Nemopanthus mucronata
Carex atherodes	Pinus strobus
Carex bromoides	Poa paludigena
Carex limosa	Polygonum arifolium pubescens
Carex seorsa	Potentilla palustris
Coptis groenlandica	Rhamnus alnifolia
Cornus canadensis	Rhus vernix
Cypripedium acaule	Ribes hirtellum
Cypripedium calceolus pubescens	Rubus pubescens
Cypripedium candidum	Salix candida
Cypripedium reginae	Salix sericea
Eleocharis rostellata	Sarracenia purpurea
Galium labradoricum	Thuja occidentalis
Galium trifidum	Trientalis borealis
Habenaria clavellata	Vaccinium atrococcum
Habenaria hyperborea huronensis	Viola pallens

These 40 SPECIAL VEGETATION floristic elements, combined with the 136 additional elements known to live in association with them in the Cowles Bog section of Survey Area A, represent a Natural Area of the highest order. In terms of Natural Area significance these few acres reflect an overall Mean Rated Quality of 7.89, and a Natural Area Rating Index of 104!

The conservative species surviving in Cowles Bog do not suggest to me a wetland characterized (Wilcox et al., 1984) as one of "... very dynamic systems that show the effects of ecological alterations in relatively short periods of time." Rather, I see a system, the synecological degradation of which is proportional to the amount of water fluctuation. I also strongly disagree with Wilcox et al. (1984) when they appear to sanction the idea of water level fluctuation as a means of discouraging the latter-day invasion of cattail; though they suggested it would be an impractical remedy, its mere contemplation seems to reflect a misunderstanding of the natural dynamic in midwestern wetlands. Much of what scientists think they know about wetlands comes from data collected during experiments on artificial or already highly disturbed systems. Attention to the response of conservative species is almost never a criterion; indeed, the awareness of such a phenomenon is scarcely manifest.

Other remedies in their proposal are just as disturbing: hand cutting and herbicides. The idea that "species richness appears to have increased" in the cattail marshes surrounding Cowles Bog flies in the face of historical and present fact. The only saving grace in their conclusions on this matter is that all of the remedies are considered either impractical or illegal.

What they did not emphasize is regular, controlled fire. With regular fire, the cattails will begin to wane as conservative native sedges and forbs begin to wax. As that primal rhythm is reestablished, then the significant native diversity, which still lingers here and there in the Great Marsh, can reassert itself. It is true that the traumas of drainage attempts have taken their toll. It is probable that the once vast "cranberry marshes" which were there in 1830 (Meyer, 1952) will never come back, but we can begin to rehabilitate a fairly rich and stable sedge meadow/wet prairie matrix in the purlieus of Cowles Bog. Regular fire and stable water levels should be our touchstones here.

The early findings of Hendrickson & Wilcox (1979) are fairly lucid with respect to the understanding of some of the essential aspects of Cowles Bog. They recognized, for example, the absence of cattails in the early 1920's. They infer from Kurz (1923) that prominent species seen in a transect run from the lake to the "old floating mat of Cowles Bog" were *Carex* sp., *Sarracenia purpurea*, *Parnassia glauca*, and *Gentiana crinita*. "Specifically, Kurz was silent on *Typha* species even though they were recognized in other of the bogs studied by him. The species he did mention for Cowles Bog are there today, but the last three especially are now overwhelmed by the cattail." They go on to say:

"As is the case with the reduction in the tamarack, the replacement of the sedge/grass by cattail can be hypothesized to relate to less frequent fire in the last 5 or 6 decades. The cattail now present produces generous amounts of dry litter, potential fuel, suggesting that it could burn at some time. For that prospect, we can predict that fire control within the cattail itself will not be possible. . . . it is likely that a single burning will not cause the cattail to revert to the earlier grass/sedge stage. Frequent burns would be required to accomplish the latter."

Another reason controlled fire should be administered regularly to the Cowles Bog area, indeed the whole of the combustible land around Dune Acres, is to avoid the kind of holocausts which befell the Peshtigo, Wisconsin area (Wells, 1968) in 1871 or Yellowstone National Park in 1988 (Monastersky, 1988). When amounts of fixed carbon are allowed to accumulate, season after season, they can catch fire either by vandals or by inadvertent means; during an extremely dry period, with a steady wind, they can become virtually uncontrollable. If, on the other hand, the system is burned under controllable conditions and regularly so that fuel loadings are kept low, such disasters can be avoided. The Indians never could have risked allowing such a thing; they and the whole of their existence were flammable. The early diaries and journals are replete with reports of the Indians and their annual burning of the landscape. Such was the context in which our conservative native species evolved their survival autecology through most of the Holocene. When we change drastically that regime, species "knowledgeable" of that regime give over to those few which endure constantly our postsettlement anthropogenics.

The Great Marsh area, also referred to on many of the older herbarium specimens as ". . . sedge meadow northwest of Mineral Springs Stop," was once rich in SPECIAL VEGETATION floristic elements, not to mention literally hundreds of other species of plants. Now the Great Marsh is, for the most part, little more than a pathetic desert of cattail populated in some areas by uniform, solid stands of cattail alone! Haying, pasturage, drainage, fire deprivation—all have done much to depauperate the Great Marsh, but apparently the principal matrix and fuel species were still grasses and sedges until relatively recently. Floyd Swink (personal communication) remembers only few, if any, cattails in the area as late as the 1950's. Cook & Jackson (1978) discuss the agricultural uses of the Great Marsh in some detail on pages 54-57 of their fine historical monograph; but they apparently had difficulty correlating what is now all but solid cattail marsh with the descriptions given by the original land surveyors, as well as with those even of the turn-of-the-century inhabitants and later observers.

I mapped most of the Great Marsh area as highly disturbed or obliterated on the Survey Unit Map (which see), because the apparent attempts at agriculture and fluctuating water levels of recent years, combined with a chronic lack of fire, have driven out all but the cattails and a relatively few other species. The Great Marsh area, while certainly highly disturbed, nevertheless still contains, here and there, small, remote populations of a number of species, most of which could proliferate and coalesce into relatively rich associations if water levels were stabilized and fires again became regular fall occurrences.

Apfelbaum (1984) noted that as much as 90% of the Great Marsh has experienced changes in vegetation and in land use since the 1920's and seem to concur with Wilhelm (1980) that fire-suppression and water level irregularities have taken their toll. Since they purport to follow the nomenclature of Swink & Wilhelm (1979) and Wilhelm (1980), and abort this convention frequently and inconsistently, some confusion arises. Their report of *Ribes triste*, a boreal element, would be of SPECIAL VEGETATION significance if one could believe it.

LOIS HOWES PRAIRIE

The area codified as Mesophytic Prairie in Survey Area B includes about 50 acres, east of Pepoon Ridge and south of Hamilton Slide (Bergendahl, 1982). Its vegetation has been mapped by Cole & Pavlovic (n.d.) and consists of some of the finest prairie in the region.

Indeed, John Bacone [*Indiana Division of Nature Preserves*] took one look at the prairie on July 15, 1979, and, awe-struck, muttered simply: "This is the best prairie in the state!" Actually, the significance of this area has been appreciated for many years, though perhaps the first one to recognize it as a distinctive, unique area was Lois Howes, who brought it to the attention of Floyd Swink many years ago when she discovered there the rare *Buchnera americana*. Since then, the area has been referred to in field notes and on herbarium specimens as the "Lupine Lane Prairie," the "Pine Lane Prairie," the "Dune Acres Prairie," and the "Howes Prairie." To me the Lois Howes Prairie seems the most appropriate. Early references to the "interdunal meadow, Mineral Springs" or the "interdunal meadow, Port Chester" likely refer to this area.

Though it has not received the notoriety of Cowles Bog, it is fully as significant from a natural area standpoint in that it contains staggering numbers of SPECIAL VEGETATION floristic elements.

<i>Arabis glabra</i>	<i>Geranium bicknellii</i>
<i>Aster junciformis</i>	<i>Habenaria ciliaris</i>
<i>Bartonia virginica</i>	<i>Juncus balticus littoralis</i>
<i>Botrychium multifidum intermedium</i>	<i>Lilium philadelphicum andinum</i>
<i>Bromus kalmii</i>	<i>Linum virginianum</i>
<i>Buchnera americana</i>	<i>Lycopodium clavatum</i>
<i>Calopogon pulchellus</i>	<i>Monotropa hypopithys</i>
<i>Campanula rotundifolia</i>	<i>Monotropa uniflora</i>
<i>Carex foenea</i>	<i>Oenothera tetragona longistipata</i>
<i>Castilleja coccinea</i>	<i>Orobanche fasciculata</i>
<i>Chamaedaphne calyculata angustifolia</i>	<i>Pinus banksiana</i>
<i>Chimaphila maculata</i>	<i>Polygonum arifolium pubescens</i>
<i>Cladium mariscoides</i>	<i>Rhexia virginica</i>
<i>Desmodium ciliare</i>	<i>Rhynchospora globularis recognita</i>
<i>Drosera intermedia</i>	<i>Sabatia angularis</i>
<i>Eleocharis melanocarpa</i>	<i>Sisyrinchium atlanticum</i>
<i>Epigaea repens glabrifolia</i>	<i>Smilax rotundifolia</i>
<i>Fimbristylis drummondii</i>	<i>Spiranthes lacera</i>
<i>Gentiana flavida</i>	<i>Stachys hyssopifolia</i>
<i>Gentiana saponaria</i>	<i>Xyris torta</i>

When these 40 species are included with another 97 species known from the prairie, the Mean Quality is 8.83, and the Index registers 103. Qualitatively it is equivalent to Cowles Bog. Also, like Cowles Bog, several of the SPECIAL VEGETATION floristic elements once known from this area have disappeared in recent years. According to Mrs. Howes, this is because the prairie has not burned for quite some time. She pointed out to us in the early 1970's that shrubs and trees have proliferated dramatically--a phenomenon that has corresponded to the demise of many prairies in recent years. Cole (1987) discusses the importance of both fire and water table in the maintenance of the prairie ecosystem. Recently (Cole, 1986) prescribed burning and research on its effects began here.

ANNOTATED LIST
OF
SPECIAL VEGETATION FLORISTIC ELEMENTS

Actaea rubra (Ait.) Willd. This species, which is not infrequent in nearby Illinois, is as rare as hen's teeth in Indiana, even though the habitat, as we think we understand it, seems to be common. It was unknown from the Lakeshore until it was discovered by Ursula Rowlatt in 1982 just west of Cowles Bog. Bowles *et al.* (1986a) listed the associates of a single plant as: **Carex pensylvanica**, **Poa pratensis**, **Prunus serotina**, **Sassafras albidum**, **Vaccinium angustifolium** var. **laevifolium**, and **V. vacillans**. Bowles (1988) noted the same genet in 1987, and seeds were collected for *ex situ* propagation. Sadly, however, Marlin Bowles and I visited this locale in August, 1988, where it grew along the trail to Little Lake, but the trail had been mowed, and the plant was gone. Barbara Plampin (1989b), however, told me that it reappeared in 1989 after the trail was rerouted. I do not know if this was the same plant from which was collected the following REPRESENTATIVE SPECIMEN: *Rowlatt #1312, 6 JUN 1982; Cowles Bog. MOR.*

Adiantum pedatum L. Rare, in one of the more mesophytic phases of the savanna in Survey Area B. Pitcher (1988a) reported it from Survey Area A at "WRD" which was probably Lois' designation for West Road.

Alnus rugosa var. **americana** (Regel) Fern. Speckled Alder is frequent in the Swamp Complex portions of Survey Areas A and B and along the north side of the NIPSCO right-of-way in Survey Area E. REPRESENTATIVE SPECIMEN: *Wilhelm & Shimp #14774, 7 MAY 1987; southeast of Dune Acres, along the NIPSCO right-of-way near the old Tremont stop west of Waverly Road. MOR.*

Ammophila breviligulata Fern. Frequent to abundant along the Foredune portion of the Foredune Complex. REPRESENTATIVE SPECIMEN: *Greenman s.n., 31 JUL 1909; on sand, dunes, Mineral Springs. F.* Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Arabis glabra (L.) Bernh. Very rare, possibly no longer extant here from where reported by Lyon (1927) as growing in a ". . . wet subdunal meadow, Mineral Springs."

Aralia hispida Vent. Very rare, and probably locally extirpated. REPRESENTATIVE SPECIMEN: *Deam #21220, 25 AUG 1916; base of wooded sand dune and the border of a tamarack swamp just N of the Mineral Springs Stop on South Shore traction line. IND.*

Arctostaphylos uva-ursi var. **coactilis** Fern. & Macbr. Bearberry is occasional in the Dune Complex portions of Survey Areas A and B. Parker (1936) considered local populations of this species to be boreal relicts.

Asimina triloba (L.) Dunal Rare, reported by Peattie from ". . . low marshy woods from Mineral Springs to Tamarack Sta., except along Dune Creek, . . ." Pepon reported a ". . . small patch near Port Chester." It still grows in the Hydromesophytic Forest area of Survey Area D, and Plampin (1987a) reported several small trees east of the Dune Acres guard house in Survey Area B.

Aster junciformis Rydb. Still not infrequent in wet calcareous meadows and interdunal depressions, in both Survey Areas A and B. REPRESENTATIVE SPECIMEN: *Klick #2803, 4 OCT 1988; in "fen" portion of the raised mound located due north of Thuja-Larix, easternmost*

edge of Cowles Bog; with *Typha angustifolia*, *Dryopteris thelypteris* var. *pubescens*, *Eleocharis rostellata*, *Muhlenbergia glomerata*, *Solidago uliginosa*, *Parnassia glauca*, and *Carex leptalea*. MOR

Aster sericeus Vent. Very rare, and possibly extirpated locally. Lyon (1927), in reference to an area in the West Beach Unit, mentioned that he had not noticed this species further east. My experience was the same; nevertheless, there are two specimens from points further east, one from the Goose Lake area, and the following REPRESENTATIVE SPECIMEN: Umbach s.n., 12 SEP, 1899; Dune Acres, dunes. F.

Bartonia virginica (L.) BSP. Still occasional in the acid sands of both Survey Areas A and B. Parker (1936) considered this species to have affinities to the Atlantic coastal plain.

Betula lutea Michx.f. Frequent in the Swamp Complex region of Survey Area A. REPRESENTATIVE SPECIMEN: Swink s.n., 18 MAY 1947; near Porter Station, some trees remaining in the Mineral Springs bog, but much less common there than in former years. MOR. Welch (1935) considered this species to be a boreal relict.

Betula papyrifera Marsh. Rare, but still extant in the Swamp Complex region of Survey Area A. Lyon (1927) implies that, while this species was then common in the tamarack swamp [Cowles Bog], it was "... destroyed by fire," where it grew in an interdunal meadow. Pepon was also under the impression that one of the "swamps" south of Miller had been destroyed by fire, stating on page 131 that it was "... largely destroyed by fire, drainage, and sewage. A second ... is nearly destroyed by cutting and pasturage." It is my feeling that, if the drainage had not occurred, fire could not have had any deleterious effect on the swamp life system--had it been able to burn at all! It is now well known that when peat lands are drained, the living portions of the life system then become exposed to fires, and of course the effects are disastrous. Every effort must be made to keep water levels in a stable condition, because it is very important, if indeed our Natural Areas are to remain rich and healthy, to burn the communities which naturally yield high amounts of fuel in the fall--including communities which lie adjacent to swamps and bogs. It is simplistic and misleading to assume that fire, regardless of the context in which it occurs, is a "destructive" agent; indeed, quite the contrary is true. The Indiana Dunes National Lakeshore is monitoring this population (Bowles et al., 1986a); it is listed as growing with *Acer rubrum*, *Amelanchier* sp., *Aralia nudicaulis*, *Maianthemum canadense* [var. *interius?*], *Quercus rubra*, *Sassafras albidum*, *Smilax herbacea* [sic!], and *Symplocarpus foetidus*. REPRESENTATIVE SPECIMEN: Kjellmark #86, 3 MAY 1988; medium to large tree in a long narrow band between the swamp and the trail; in organic sand on a south-facing slope at the edge of a shrub swamp, south of Cowles Bog Trail, 0.5 mile west of Mineral Springs Road; T37N R6W NW NW SE Sec.22; with *Betula lutea*, *Acer rubrum*, *Cornus stolonifera*, and *Nyssa sylvatica*. MOR. Deam (1932) implies that this species is a boreal relict when he states that this species "... is another example of a northern form finding its southern limit near Lake Michigan."

Betula populifolia Marsh. Gray Birch has been reported from the NIPSCO ponds area in Survey Area A, at which location it is being monitored by the Indiana Dunes National Lakeshore (Bowles et al., 1985); they listed the following associates: *Cephalanthus occidentalis*, *Juncus effusus* var. *solutus*, *Polygonum amphibium* var. *stipulaceum*, *P. hydropiperoides*, *Rubus* sp., *Scirpus cyperinus*, and *Spiraea tomentosa* var. *rosea*. I

have not seen specimens from this population, but I suspect that the caveats expressed under this species in the Miller Unit are valid here as well.

Betula pumila L. Still occasional among the tamaracks in the Swamp Complex portion of Survey Area A; rare in a swampy slough in Survey Area B. Near Cowles Bog, Kjellmark (#119, MOR) listed the following associates: **Carex haydenii**, **C. hystericina**, **Typha latifolia**, **T. angustifolia**, **Larix laricina**, **Rhus vernix**, and **Cornus stolonifera**. REPRESENTATIVE SPECIMEN: *Wilhelm & Bacone* #6738, 27 MAY 1979; just S and W of Dune Acres W of 100W Rd., in the National Lakeshore holding of Secs.21 & 22 T37N R6W. MOR. Trefz (1935) and Parker (1936) consider this species to be a boreal relict.

Botrychium dissectum Spreng. Still rare to occasional in Survey Areas A and B.

Botrychium multifidum var. **intermedium** (D. C. Eat.) Farw. This rare fern is known from Survey Area B solely on the basis of the following report by Pitcher (1988a): "S. of INDTR. E. of Lupine Ln. Tr." According to Plampin (1987c), INDTR is Lois Howes' designation for Indian Trail.

Brachyelytrum erectum (Schreb.) Beauv. Occasional in the Swamp Complex portion of Survey Areas B and D.

Brasenia schreberi Gmel. Rare in the Lakeshore, but locally occasional in Little Lake; Lyon (1927) mentions that "... late in the wet season of 1924 a few leaves were collected in the mud of an interdunal meadow, Mineral Springs."

Bromus kalmii Gray Very rare; with Lois Howes' guidance, I saw but one or two plants on a dry sand ridge in Survey Area B in 1979. It is evidently more frequent than that, to wit the following REPRESENTATIVE SPECIMEN: *Pavlovic* #36, 11 AUG 1983; T37N R6W SW SE Sec.14; plot 7-1-4-1-3, Howes Prairie; with **Liatris spicata** and **Fragaria virginiana**; black oak woodland, gently sloping, aspect SW, locally frequent. MOR.

Buchnera americana L. One of our rarest plants, this species is known yet from three small populations in the Howes Prairie region of Survey Area B. REPRESENTATIVE SPECIMEN: *Schulenberg et al.*, #76-989, 9 OCT 1976; *Indiana Dunes National Lakeshore near Dune Acres*, ca 2100 feet from Lake Michigan in swale just landward of the dunes, in SW SE Sec.14 T37N R6W; low sandy prairie, with **Andropogon gerardii**, **A. scoparius**, **Anemone cylindrica**, **Aristida purpurascens**, **Artemisia caudata**, **Aster azureus**, **A. dumosus**, **A. ericoides**, **Comandra richardsiana**, **Coreopsis tripteris**, **Eryngium yuccifolium**, **Fragaria virginiana**, **Lechea villosa**, **Lespedeza capitata**, **Liatris cylindracea**, **Lithospermum croceum**, **Populus tremuloides**, **Pteridium aquilinum** var. **latiusculum**, **Quercus velutina**, **Rudbeckia hirta**, **Salix humilis**, **Solidago nemoralis**, **S. speciosa**, and **Sorghastrum nutans**. MOR. The following additional associates were listed by Bowles *et al.* (1985) during their sampling of the Howes Prairie population: **Castilleja coccinea**, **Coreopsis lanceolata**, **Hypericum kalmianum**, **Juncus brachycarpus**, **Liatris spicata**, **Panicum virgatum**, **Scleria triglomerata**, **Tradescantia ohimensis**, and **Viola sagittata**. Since then, Bowles (1988) sampled this population in 1986 and 1987 and found that it appears to be declining. Alas, Plampin (1989b) was unable to find any plants in 1989.

Cakile edentula (Bigel.) Hook. Rare to frequent along the upper edge of the Beach community in the Foredune Complex of Survey Area A, and probably Survey Area B. Bowles *et al.* (1986a) listed the following associates: **Ammophila breviligulata**, **Euphorbia**

polygonifolia, **Populus deltoides**, and **Prunus pumila**. When Bowles (1989) resampled the population, a severe decline was apparent. REPRESENTATIVE SPECIMEN: Jones s.n., 16 AUG 1975; beach N of Cowles Bog, common along beach area. INDU. Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Calopogon pulchellus (Salisb.) R. Br. This beautiful orchid has been reported from both Survey Areas A and B, though I did not see it in either area during this survey. I have no doubt, however, that if fire returns to this Survey Unit on a regular basis, so will the Grass Pink Orchid again become manifest. Lyon (1927) considered this orchid locally common at Mineral Springs.

Campanula rotundifolia L. Still occasional in the dry dunes and sandy prairies of Survey Areas A and B. Parker (1936) considered this species to be a boreal relict.

Carex alata T. & G. This very rare sedge is known from Cowles Bog, from where collected in 1976 by Ursula Rowlett (MOR). Recently, a population has been discovered along the bike trail in Survey Area E, as documented by the following REPRESENTATIVE SPECIMEN: Dritz & Wilhelm #346, 24 JUN 1987; 5 or 6 plants on the N side of the Calumet Bike Trail, in a sedge meadow W of Waverly Rd., SW NE SE Sec.23 T37N R6W; with *Panicum clandestinum*, *Carex crinita*, *C. stipata*, *C. bromoides*, *C. swanii*, *C. tribuloides*, *Calamagrostis canadensis*, *Helianthus strumosus*, *Poa compressa*, *P. pratensis*, *Phalaris arundinacea*, *Agrostis alba*, *Fraxinus pennsylvanica*, *Rubus idaeus* var. *strigosus*, *Juncus effusus* var. *solutus*, *Geum canadense*, *Cornus obliqua*, *Acer rubrum*, *Populus tremuloides*, *Lycopus americanus*, *Quercus rubra*, *Arisaema atrorubens*, *Iris virginica* var. *shrevei*, and *Dryopteris thelypteris* var. *pubescens*. MOR. The Indiana Dunes National Lakeshore is monitoring the population along the NIPSCO right-of-way (Bowles et al. 1986a). Peattie (1922) and Hooper (1934) both considered this species to have ancestral affinities to the Atlantic coastal plain.

Carex atherodes Spreng. This sedge is known from Survey Area A only through documentation by the following REPRESENTATIVE SPECIMEN: Kjellmark #118, 8 JUL 1988; infrequent graminoid in wet organic peat mat in a small remnant of sedge-rush meadow in cattails near Cowles Bog; NE NE SE Sec.22 T37N R6W; with *Rhus vernix*, *Carex haydenii*, *C. hystericina*, *Scirpus acutus*, *Typha latifolia*, and *Cornus stolonifera*. MOR.

Carex bromoides Schkuhr This handsome sedge is occasional in the Swamp Complex portion of Survey Areas A and D, and probably also occurs in similar habitats in Survey Area B.

Carex conoidea Schkuhr This species was first collected along the South Shore Traction Line by Bennett (F) in 1956; it was recently collected in the same spot as documented by the following REPRESENTATIVE SPECIMEN: Dritz #61, 18 MAY 1980; common in a wet meadow along the NIPSCO r.o.w. just W of the Dune Acres Station of the South Shore Line, NE NE Sec.27 T37N R6W; with *Carex buxbaumii*, *C. lanuginosa*, *Poa pratensis*, *Iris virginica* var. *shrevei*, *Dryopteris thelypteris* var. *pubescens*, *Houstonia caerulea*, *Viola sagittata*, *Comandra richardsiana*, *Luzula multiflora*, and *Eleocharis intermedia*. MOR. The Indiana Dunes National Lakeshore is monitoring this population (Bowles et al., 1986a).

Carex debilis var. **rudgei** Bailey I have noted this species along the Bike Trail in Survey Area E, and Dritz (1987) reported having seen this species in the Hydromesophytic Swamp Forest of Survey Area D, August 8, 1981.

Carex foenea Willd. Evidently rare, this species was discovered at Howes Prairie, from where vouchered by the following REPRESENTATIVE SPECIMEN: *Pavlovic #140, 27 JUN 1985; T37N R6W, NW SE Sec.14; growing in sand prairie N of Howes Prairie; infrequent.* INDU.

Carex folliculata L. There is still a large colony of this conspicuous sedge in the Swamp Complex region of Survey Area B as well as along the South Shore Railroad in Survey Area E. Bowles *et al.* (1985) gave the following associates from Survey Area B: *Acer rubrum*, *Maianthemum canadense* [var. *interius?*], *Nyssa sylvatica*, *Osmunda cinnamomea*, *O. regalis* var. *spectabilis*, *Physocarpus opulifolius*, *Pinus strobus*, *Rhus vernix*, *Solidago patula*, and *Symplocarpus foetidus*. REPRESENTATIVE SPECIMEN: *Swink s.n., 1983; in moist meadow W of Waverly Ave., between Dune Acres and Tremont, adjacent to the South Shore RR.* MOR.

Carex howei Mack. Deam (1940) stated in regard to this species ". . . in Indiana from a single collection by M.W. Lyon, Jr.: 'moist woods on dunes at Mineral Springs, Porter County, June 17 1923.'" This little sedge is a member of the section *Stellulatae*, and closely related to **Carex interior**, a sedge which I determined as, albeit rare, among the tamaracks at Cowles Bog; thinking little of it at the time, I failed to preserve a specimen. I do not mean to suggest that I think Deam's report (which was recognized by Swink & Wilhelm, 1979) was based on a misidentified **Carex interior**, indeed he also recognized that the latter species was ". . . frequent to common, . . . in tamarack bogs and swamps and on springy banks." I only mention it to point out that I have no specimen by which to confirm my earlier determination, so it is possible that I actually saw this rare species and did not realize it.

Carex intumescens Rudge This sedge is still occasional in the Swamp Complex regions of Survey Areas B and D, and along the bike trail, from where we collected the following REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #17417, 31 JUL 1989; Dune Acres, east of Mineral Springs Road, along the bike trail.* MOR.

Carex laxiculmis Schwein. Ken Dritz noted this species at Waverly Station (Dritz, 1987) on May 9, 1982; this is probably Survey Area D.

Carex leptoneuria Fern. This species is rare in beech forests of northern Porter County and eastward in northwestern Indiana. Curiously, our specimen comes from along the bike trail, south of the Hydromesophytic Swamp where it probably is also present. REPRESENTATIVE SPECIMEN: *Dritz #460, 30 MAY 1986; several plants growing along the S edge of the Calumet Bike Trail, on the N edge of the sedge meadow lying between the bike trail and the South Shore RR, 850' W of Waverly Road, NE SE Sec.23, T37N R6W; with C. amphibola var. turgida, C. crinita, Rubus idaeus, Poa compressa, P. pratensis, and Dryopteris thelypteris var. pubescens.* MOR.

Carex limosa L. This very rare sedge is known from Cowles Bog, from where documented by the following REPRESENTATIVE SPECIMEN: *Dritz #92, 15 JUN 1980; on the N edge of Cowles Bog, NW SE Sec.22 T37N R6W; with Eleocharis rostellata, Typha angustifolia, and Galium labradoricum.* MOR.

Carex seorsa Howe This attractive, albeit inconspicuous, member of the Stellulatae is yet quite common in the Swamp Complex portions of Survey Areas A, B and D. Bowles *et al.* (1985) gave the following associates for it in Survey Areas A and B: **Acer rubrum**, **Alnus rugosa** var. **americana**, **Betula lutea**, **Hamamelis virginiana**, **Maianthemum canadense** [var. **interius?**], **Osmunda cinnamomea**, **O. regalis** var. **spectabilis**, **Quercus bicolor**, **Rhus vernix**, **Symplocarpus foetidus**, and **Ulmus americana**; I have never seen it growing without **Carex bromoides**. REPRESENTATIVE SPECIMEN: *Hiebert #295, 27 MAY 1982; common in muck of marsh W of Dune Acres guard station, T37N R6W SE Sec.14.* MOR. Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Carex subimpressa Clokey This extremely rare sedge is known from the Chicago region solely on the basis of the following REPRESENTATIVE SPECIMEN: *Dritz #228, 27 JUN 1981; 100' X 20', calcareous sedge meadow bordering wet woods N of the Calumet Bike Tr. on the NIPSCO r.o.w. N of US 12, 0.3 mi E of Mineral Springs Rd., N SW SE SW Sec.23 T37N R6W; with Phalaris arundinacea, Poa pratensis, P. compressa, Calamagrostis canadensis, Agrostis alba, Juncus effusus var. solutus, Scirpus atrovirens, Carex stipata, C. hystrixina, C. intumescens, C. crinita, Osmunda regalis var. spectabilis, Onoclea sensibilis, Dryopteris thelypteris var. pubescens, Symplocarpus foetidus, Typha angustifolia, Pyrus floribunda, Corylus americana, Iris virginica var. shrevei, Impatiens sp., and Spiraea tomentosa var. rosea.* MOR.

Carex tonsa (Fern.) Bickn. This early-fruited sedge becomes quite inconspicuous by June, and even in May the fruits are concealed in the dense tufts of harsh, stiff leaves, so it is often overlooked. Actually, it is quite uncommon in the xeric sands of the western portion of Survey Area A. REPRESENTATIVE SPECIMEN: *Wilhelm & Bacone #6737, 27 MAY 1979; just S and W of Dune Acres, W of 100W Rd., in the National Lakeshore holdings of Secs.21 & 22 T37N R6W.* MOR.

Carex trisperma Dew. According to Peattie (1930), this species grew at "Tamarack bog at Mineral Springs, and westward in swamps and woods to Pine." I did not see this species anywhere but in Survey Unit XII.

Castilleja coccinea (L.) Spreng. This beautiful Indian Paint Brush still grows here and there in the Howes Prairie. REPRESENTATIVE SPECIMEN: *Jones s.n., 30 JUL 1976; not too common, found in low sandy prairie area east of Dune Acres.* INDU.

Celtis tenuifolia Nutt. This rare shrub is actually quite common in the village of Dune Acres itself, but I was able to find only one plant within the boundaries of the Lakeshore, and this was along the subdunal trail about 230 feet west of Mineral Springs Road, in Survey Area A. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6727, 27 MAY 1979; just S and W of Dune Acres W of 100W Rd., in the National Lakeshore holdings of Secs. 21 & 22 T37N R6W.* MOR.

Chamaedaphne calyculata var. **angustifolia** (Ait.) Rehd. Remarkably enough, this rare shrub still grows in large numbers in a swale south of Lupine Lane, in Survey Area B; Dritz (1987) reported having seen this species at Little Lake in Survey Area A, on August 25, 1984. Peattie (1930) reported that it grew at Mineral Springs, and even added that it was "... frequent in the high dune country," a habitat which is hard to imagine. Barbara Plampin of Dune Acres, knows of several populations east of the Studebaker Trail (Plampin, 1989b). REPRESENTATIVE SPECIMEN: *Klick s.n., AUG 1987; wet prairie/pin oak woods*

margin in the Lupine Lane Prairie Area; just east of Mineral Springs Road; acid, organic sand; forms thickets along marsh border; NE NW NW Sec.23 T37N R6W. INDU. Welch (1935) considered this species to be a boreal relict.

Chimaphila maculata (L.) Pursh Plampin (1987a) noted, in Survey Area B, "three plants . . . on side of dune in dry oak woods near swale with the official plot of *Lycopodium clavatum*." This is a new stand, not the one in Howes Prairie, which in 1989 consisted of 40 plants (Plampin, 1989b). The "old" one is probably the one referred to by Pitcher (1988a) from Pine Lane. Plampin (1989b), sadly, noted that there was a small population north of Little Lake in Survey Area A, but that it disappeared in 1988 when the trail was "improved."

Chimaphila umbellata var. *cisatlantica* Blake This species was reported from Mineral Springs by Lyon (1927), who stated that it grew in ". . . rich wooded dunes, Tremont, Mineral Springs, found twice." It is still extant at Tremont (see Survey Unit VI).

Chrysosplenium americanum Schwein. There are a few populations of this species in the low swales of the swamp forest of Survey Area D, and Plampin (1989b) noted a population along the bike trail in Survey Area E between pylons 8409 and 8408.

Cirsium pitcheri (Torr.) T. & G. This rare thistle is now rare to infrequent on the dunes of the Foredune Complex. Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Cladium mariscoides (Muhl.) Torr. Not infrequent in wet calcareous depressions and swales in both Survey Areas A and B. REPRESENTATIVE SPECIMEN: *Klick* #2748; 2 JUL 1987; wet prairie at Howes Prairie; flat loamy sand, with *Calamagrostis canadensis*, *Spiraea tomentosa* var. *rosea*, *S. alba*, *Populus tremuloides*, and *Dryopteris thelypteris* var. *pubescens*; SW SE Sec.14 T37N R6W. INDU. McLaughlin (1932) considered this species to have ancestral affinities to the Atlantic coastal plain.

Coptis groenlandica (Oeder) Fern. This regionally rare species is still occasional in the Swamp Complex region of Survey Area A. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 23 MAY 1947; near Porter station, in the Mineral Springs bog. MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Corallorhiza maculata Raf. Very rare, known locally from several small colonies (Plampin, 1989b), one of which is along the subdunal trail about one-half mile west of Mineral Springs Road, Survey Area A, at which location we felt it was too rare in 1979 to sacrifice a specimen. Pitcher (1988a) reported it from Survey Area B along the "Lupine Stud. Tr." According to Plampin (1987c), "Stud." is Lois Howes' designation for Studebaker Trail. REPRESENTATIVE SPECIMEN: *Hiebert* #24, 9 JUL 1981; T37N R6W NE NW Sec.22; ca 0.5 miles west of N Mineral Springs Road along old Golf Course Road; mesophytic forest, south slope; soil a sandy loam; very rare. INDU.

Corallorhiza odontorhiza (Willd.) Fern. Very rare in this Survey Unit, but a few specimens were noted from Survey Area B by Lois Howes. Plampin (1987a) saw about 15 plants in August of 1985 and reported that they did not reappear in 1986, but she noted (Plampin, 1989b) four stalks near the same spot in 1989. This location is east of the Dune Acres guardhouse along the Indian Trail where she reported that *Smilax* is becoming invasive.

Cornus canadensis L. This delightful little plant is represented in the Chicago region today by a small population in Cowles Bog, Survey Area A. In reference to this population,

Lyon (1927) stated: ". . . tamarack swamp, Mineral Springs, not common nor found elsewhere." Bowles *et al.* (1985) recounted how, guided by Ken Dritz, they located two colonies about 10 meters apart; there were four plants in one and thirty-seven in the other. These plants grow in moss and organic matter among elevated roots of mature trees of *Acer rubrum* near the transition zone between the more firmly supported Hydromesophytic Swamp and the more unstable shrub and sedge community. Additional associates include: *Betula lutea*, *Carex seorsa*, *Maianthemum canadense* [var. *interius?*], *Osmunda cinnamomea*, *Salix nigra*, and *Symplocarpus foetidus*. Bowles (1988) indicated that the population is stable, and I noted that, though not in flower, these plants were still there May 24, 1989. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 31 MAY 1952; *Mineral Springs bog near Dune Acres, in wet shady bog.* F.

Cornus rugosa Lam. This distinctive shrub is rare, but nevertheless still extant among the dunes in the Dune Complex region of Survey Area A. REPRESENTATIVE SPECIMEN: *Lyon s.n.*, 29 AUG 1925; *Dune at Mineral Springs, 1 m shrub, first line of wooded dunes.* IND. Welch (1935) considered local populations of this species to be boreal relicts.

Cyperus engelmannii Steud. This species is known from Survey Area A, solely on the basis of the following REPRESENTATIVE SPECIMEN: *Buchholz #4*, 22 AUG 1985; *scarce (1%) in sandy mud flats with Carex at Little Lake; SE Sec.21 T37N R6W.* INDU.

Cypripedium acaule Ait. Lyon (1927) reported this species from the ". . . outer edge, tamarack swamp, Mineral Springs." Ken Dritz photographed one plant in bloom on May 27, 1989. It was growing in the Hydromesophytic Swamp north of the tamaracks; Ken Klick saw two non-flowering plants in this vicinity May 24, 1989. REPRESENTATIVE SPECIMEN: *Friesner s.n.*, 29 MAY 1932; *wooded portion of the Mineral Springs bog.* BUT.

Cypripedium calceolus var. *parviflorum* (Salisb.) Fern. Now very rare locally, and probably extirpated from this Survey Unit. REPRESENTATIVE SPECIMEN: *Friesner s.n.*, 12 JUN 1936; *open meadow at Mineral Springs.* BUT.

Cypripedium calceolus var. *pubescens* (Willd.) Correll Very rare, but it is nevertheless still extant in a dogwood thicket just east of the tamaracks in Survey Area A, and in the Howes Prairie region of Survey Area B. Plampin (1987a) reported that the population on the north-facing side of the dune in the mesic woods may be spreading. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 18 MAY 1946; *near Porter Station; Mineral Springs . . . one plant seen in the swamp.* MOR.

Cypripedium candidum Muhl. According to Lyon (1927), this species grew at the ". . . outer edge of the tamarack swamp, Mineral Springs." REPRESENTATIVE SPECIMEN: *Deam #20008*, 3 JUN 1916; *in dead cattail swamp on the S side of the large tamarack swamp, ca 2 mi NW of Porter.* IND. This orchid was seen, in 1951, as evidenced by a letter from a Mr. Segal to Charles Deam, in which Segal wrote that he had noted *Thuja occidentalis*, *Betula lutea*, *Coptis groenlandica*, *Cypripedium candidum*, *Cypripedium reginae*, *Parnassia glauca*, and *Gentiana procera*. Ken Dritz saw it at Cowles Bog May 31, 1980; Bowles *et al.* (1986a), listed the following associates: *Betula lutea*, *Cornus stolonifera*, *Decodon verticillatus*, *Dryopteris thelypteris* var. *pubescens*, *Lysimachia thyrsiflora*, *Rhus vernix*, and *Typha angustifolia*. Bowles (1988) confirmed its tenure, but noted that only a single plant persisted, and that it was likely to succumb to shrub invasion without fire.

Plampin (1989b) reported a colony discovered by Keith Board, who noted about 20 plants, all in a *Cornus racemosa* thicket southeast of *Sarracenia purpurea*.

Cypripedium reginae Walt. Very rare; this species was rediscovered at Cowles Bog. Bowles (1988) described one single-rameted sterile genet, and observed that "... prescribed burning has stimulated expansion of the *C. reginae* population at Shell Nature Preserve ... This management treatment should be implemented at Cowles Bog, where also it would benefit the remaining *C. candidum* population." REPRESENTATIVE SPECIMEN: *Friesner s.n.*, 12 JUN 1936; *shrubby border of tamarack swamp at Mineral Springs*. BUT. Both Friesner (1936) and Welch (1935) considered local populations of this species to be boreal relicts.

Desmodium ciliare (Muhl.) DC. Known here only on the basis of a report by Lyon (1927), who stated that it grew at the "... edge of the woods, Mineral Springs."

Diervilla lonicera Mill. Bush Honeysuckle is frequent to common in those areas of the Survey Unit dominated by Black Oak. Welch (1935) considered local populations of this species to be boreal relicts.

Drosera intermedia Hayne This species is still extant in Survey Area A, where it grows in a low swale at the east edge of Little Lake. Lyon (1927) recorded it from an "interdunal meadow" at Mineral Springs, which meadow may refer to what we now call Howes Prairie, in Survey Area B. Lois Howes was kind enough to take me to a living population south of Lupine Lane, where it was growing with *Chamaedaphne calyculata* var. *angustifolia*, *Bartonia virginica*, and *Rubus hispidus* var. *obovalis*. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #12312*, 19 SEP 1984; *just west of Dune Acres, on the property of the Indiana Dunes National Lakeshore, in the vicinity of Little Lake*. MOR. Both Peattie (1922) and Hooper (1934) regarded this species as having ancestral affinities to the Atlantic coastal plain.

Drosera rotundifolia L. This species was reported by Lyon (1927) from the "Dunes at Port Chester, ditch by railroad ..." where it is still extant along the traction line. REPRESENTATIVE SPECIMEN: *Dritz & Wilhelm #270*, 20 JUN 1982; *in a small, boggy depression in a sedge meadow under the NIPSCO r-o-w, N of the South Shore Line, W of Waverly Road, E of Dune Acres, SE Sec.23 T37N R6W; with Lycopodium inundatum, Aletris farinosa, Panicum lucidum, Panicum latifolium, and Sphagnum*. MOR. McLaughlin (1932) considered this species to have ancestral affinities to the Atlantic coastal plain.

Dryopteris noveboracensis (L.) Gray There are a few populations of this delicate fern in the swampy woods of Survey Area D.

Eleocharis melanocarpa Torr. This rare spike rush is still extant in the wet acid sands in at least ten locations within the Howes Prairie in Survey Area B. It also is known from the fly ash pond area in Survey Area A, where Bowles *et al.* (1985) recorded five small colonies in the eastern part of a lake basin. REPRESENTATIVE SPECIMEN: *Fox #2*, 14 OCT 1983; *NIPSCO fly ash seepage ponds now dry*. MOR. Peattie (1922) and Hooper (1934) both considered this species to have ancestral affinities to the Atlantic coastal plain; indeed, Swink & Wilhelm (1979) pointed out that "Except for isolated areas in Indiana and Michigan, this species is found only in states bordering the Atlantic Ocean and the Gulf of Mexico."

Eleocharis rostellata Torr. This conservative species of fens was unknown from the Lakeshore until the remarkable discovery by Ken Dritz at Cowles Bog. REPRESENTATIVE SPECIMEN: *Dritz #90*, 15 JUN 1980; *along the N edge of Cowles Bog, extending into a cattail*

marsh, NW SE Sec.22 T37N R6W; with *Typha angustifolia*, *Dryopteris thelypteris* var. *pubescens*, *Sarracenia purpurea*, *Rhus vernix*, *Parnassia glauca*, *Scirpus americanus*, *Eupatorium perfoliatum*, *Rosa palustris*, *Larix laricina*, *Galium labradoricum*, *Betula pumila*, *Cicuta bulbifera*, *Carex limosa*, *C. seorsa*, and *Salix candida*. MOR.

Epigaea repens var. **glabrifolia** Fern. This rare little subshrub is still extant in both Survey Areas A and B. I was guided to one population in Survey Area B by Lois Howes and another by Barbara Plampin; Plampin (1989b) confirms their tenure, along with several other small populations. Though I did not personally witness the population in Survey Area A, Lois assured me that it was yet extant there and Plampin (1989b) saw it as recently as August 8, 1989. REPRESENTATIVE SPECIMEN: *Lansing s.n.*, 29 MAY 1914; Mineral Springs, sand ridges. F. Friesner (1936) considered local populations of this species to be boreal relicts.

Eriocaulon septangulare With. This rare little plant is known from this Survey Unit on the basis of a report by Lyon (1927), in which he noted that it grew along the edges of Little Lake and Goose Lake. Goose Lake, of course, was destroyed about 1960, and Little Lake was drained in the 1920's, so the likelihood that this species has survived into this decade is remote. Peattie (1922) considered this species to have ancestral affinities to the Atlantic coastal plain.

Eriophorum angustifolium Honckeney Known from this Survey Unit, and the Lakeshore, only from the report by Lyon (1927), in which he noted that it grew in the "... subdunal marsh, Port Chester" and from the following REPRESENTATIVE SPECIMEN: *Deam #20017*, 3 JUN 1916; in swamp between wooded dunes ca 2 mi NW of Porter. IND.

Eupatorium fistulosum Barratt Though I have yet to record this beautiful species west of Mineral Springs Road, it is frequent eastward nearly to the town of Pines. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #17405*, 31 JUL 1989; Dune Acres, east of Mineral Springs Road, along the bike trail. MOR.

Eupatorium sessilifolium var. **brittonianum** Porter Known from this Survey Unit solely on the basis of the following report by Lyon (1927): "... open wooded dunes, Mineral Springs ... not common."

Euphorbia polygonifolia L. This little plant is still occasional in among dunes, particularly those of the Foredune and Dune Complexes in Survey Areas A and B. Bowles *et al.* (1986a) recorded the following associates from Survey Area A: **Ammophila breviligulata**, **Cakile edentula**, and **Corispermum hyssopifolium**. Bowles (1989) resampled this population and noted a sharp reduction in plant frequency and density. In Survey Area B, Barbara Plampin (pers. comm.) noted that in 1989 there were sixteen or so plants growing south of the **Cirsium pitcheri** population, north of the northwest end of Howes Prairie, about one-fourth mile south of the Lake, with **Corispermum hyssopifolium**, **Salsola kali** var. **tenuifolia**, **Artemisia caudata**, **Andropogon scoparius**, and **Prunus pumila**. REPRESENTATIVE SPECIMEN: *Lansing s.n.*, 16 SEP 1911; Mineral Springs, lake strand. F. Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Fimbristylis drummondii Boeckl. This delightful little sedge is still extant and occasional in the Howes Prairie region of Survey Area B. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 23 AUG 1952; near Howes property in Dune Acres, moist sandy soil. F. Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Fuirena pumila Torr. This species, though recently discovered at Chamberlain Lake in St. Joseph County, continues to remain unknown from the Lakeshore region, having most likely gone the way of *Juncus militaris*, and others, when Goose Lake was obliterated in 1960. It is possible that the "sedge marsh" mentioned in the following specimen was in what is now included within the Lakeshore boundaries. REPRESENTATIVE SPECIMEN: *Deam* #21186, 25 AUG 1916; in sedge marsh between wooded dunes ca 1 mi NW Mineral Springs Stop on South Shore Line with *Scleria*. IND. Peattie (1922) and Hooper (1934) regarded this species as having ancestral affinities to the Atlantic coastal plain.

Galium labradoricum Wieg. Lyon (1927) first reported this rare Bedstraw from the "quaking bog" at Mineral Springs, where it is still extant at Cowles Bog. REPRESENTATIVE SPECIMEN: *Dritz* #91, 15 JUN 1980; on the N edge of Cowles Bog, NW SE Sec.22 T37N R6W; with *Eleocharis rostellata*, *Typha angustifolia*, *Rhus vernix*, *Dryopteris thelypteris* var. *pubescens*, *Larix laricina*, *Salix candida*, and *Carex limosa*. MOR.

Galium trifidum L. Previously unknown from Porter County, Indiana, I found this species growing in the open portion of the Fen, just south of the tamaracks in Survey Area A. REPRESENTATIVE SPECIMEN: *Wilhelm* #7002, 8 SEP 1979; in high quality marsh, ca 0.5 mi NW of the Dune acres stop of the South Shore Line, in the SE Sec.22. T37N R6W. MOR.

Gentiana flavida Gray Until recently this beautiful gentian grew in the Howes Prairie region of Survey Area B, from where it had long been observed by Mrs. Howes; she believed, however, that its disappearance in recent years was due to a chronic lack of fire. Lyon (1927) was aware of the same population, describing it as in the "... woods at edge of interdunal meadow, Mineral Springs, a few plants ..."

Gentiana saponaria L. This species is still extant in the moist sandy flats and prairies in Survey Areas A, B and E.

Geranium bicknellii Britt. Ken Klick (personal communication, 1987) discovered this species in Howes Prairie, presumably a result of the controlled burn of 1986. Bowles (1988) laid out a permanent quadrat and mapped the location of six flowering genets.

Habenaria ciliaris (L.) R.Br. Lyon (1927) regarded this showy orchid as "... locally common for about 1000 feet along the dune edge of the subdunal marsh, Port Chester; rare in an interdunal meadow, Port Chester, a few plants in ditch by railroad, Port Chester." Until recently it grew in the Howes Prairie region of Survey Area B, from where it had long been observed by Lois Howes. The plant is probably now extirpated from the Survey Unit; Howes believed that its disappearance in recent years was due to a chronic lack of fire. It is my feeling, and I believe also hers, that if fire were returned to the area soon, on a regular basis, *Habenaria ciliaris* would probably manifest itself--along with dozens of other species which are on the wane. REPRESENTATIVE SPECIMEN: *Lyon s.n.*, 8 AUG 1926; dunes at Port Chester, ditch by railroad. BUT.

Habenaria clavellata (Michx.) Spreng. Lyon (1927), in his 1930 revision, mentioned that in 1927 this orchid was "... regarded as rare, but in 1929, next to *Spiranthes cernua* [which Howes told me has also disappeared from the Howes Prairie with the cessation of fire] it seemed to be the commonest orchid ... subdunal and interdunal meadows ... Mineral Springs, Port Chester, ..." While scarcely common, this species still occurs in the Swamp Complex portion of Survey Areas A and B, and along the NIPSCO right-of-way in Survey Area E, at which location Bowles *et al.* (1986a) listed the following associates: *Aletris farinosa*,

Andropogon gerardii, **A. scoparius**, **Calamagrostis canadensis**, **Solidago graminifolia** var. **media**, and **Sorghastrum nutans**; they give the following associates for the Swamp Complex: **Acer rubrum**, **Carex folliculata**, **Ilex verticillata**, **Maianthemum canadense** [var. **interius?**], **Pinus strobus**, **Quercus palustris**, **Rubus hispidus** var. **obovalis**, and **Symplocarpus foetidus**. REPRESENTATIVE SPECIMEN: *Pearsall s.n.*, 1 AUG 1941; Port Chester between Mineral Springs and Dunes State Park. F. Friesner (1936) considered local populations of this species to be boreal relicts.

Habenaria hyperborea var. **huronensis** (Nutt.) Farw. Known locally from a report by Lyon (1927), in which he states that it grew at the ". . . tamarack swamp, Mineral Springs, found but once." Pitcher (1988a) indicated that Lois Howes saw it "W of Cowles Bog" on June 1, 1963. Welch (1935) considered local populations of this species to be boreal relicts.

Hudsonia tomentosa Nutt. Very rare; to this end Lyon (1927) pointed out: ". . . dry open inland places, fairly common around Wilson and Baileytown [both stations are now destroyed]; a few plants at Mineral Springs, not found elsewhere." Lois Howes guided me to a small, still extant population near the south edge of the Foredune Complex in Survey Area B; Pitcher (1987) reported having seen it as recently as 1984, but Plampin (1989b), who visits the site annually, wrote me that, of the 7 or 8 plants known there in 1987, only one or two were apparent there in 1989; further, she noted that deer "trample through the plot with enthusiasm." Trefz (1935) considered local populations of this species to be boreal relicts, but, interestingly enough, she also regards them as having ancestral affinities to the Atlantic coastal plain; McLaughlin (1932) attributed it to the coastal plain.

Hypericum kalmianum L. Kalm's St. John's Wort is occasional in low alkaline swales and ponds in Survey Areas A and B. REPRESENTATIVE SPECIMEN: *Podrasky & Sherman #7*, 17 JUL 1984; NIPSCO fly ash ponds, behind Bethlehem Steel, off of Rt.12; dry pond bottoms of sand and peat; with **Spiraea tomentosa** var. **rosea**. MOR.

Juncus articulatus L. This species was unknown from the Chicago region until the summer of 1989, when on July 20 Ken Dritz discovered a small colony east of Mineral Springs Road, along the bike trail at pylon 8404; there it grows with **Agrostis alba**, **Andropogon gerardii**, **Centaureum pulchellum**, **Cyperus strigosus**, **Daucus carota**, **Juncus tenuis**, **J. torreyi**, **Lycopus uniflorus**, **Panicum virgatum**, **Poa compressa**, **P. pratensis**, **Salix discolor**, **S. nigra**, and **Solidago altissima**. A few days later Ken found several colonies of it on the Illinois side of Wolf Lake, where one of its associates was the closely related **Juncus alpinus** var. **rariflorus**.

Juncus balticus var. **littoralis** Engelm. This species is rare in low swales at the Howes Prairie in Survey Area B. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Juncus pelocarpus Meyer This species was unknown from this Survey Unit until Bowles et al. (1986a) first recorded it from Little Lake; they listed the following associates: **Cephalanthus occidentalis**, **Cladium mariscoides**, **Dulichium arundinaceum**, **Hypericum boreale**, **Juncus brachycephalus**, **Ludwigia sphaerocarpa** var. **deamii**, and **Psilocarya scirpoides**. REPRESENTATIVE SPECIMEN: *Edwards #7*, 1 OCT 1987; scarce, with **Juncus canadensis** and **Dulichium arundinaceum**, at Little Lake in experimental plot NT-10-10-10 on south side of ditch; NW NW SW Sec.22 T37N R6W. INDU. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Juncus scirpoides Lam. This species is occasional in wet sands throughout the Unit. Bowles *et al.* (1985) recorded the following associates from the NIPSCO right-of-way in the vicinity of tower 8804: *Asclepias incarnata*, *Carex intumescens*, *C. lanuginosa*, *C. scoparia*, *Cirsium muticum*, *C. vulgare*, *Dryopteris thelypteris* var. *pubescens*, *Eupatorium perfoliatum*, *Juncus canadensis*, *J. interior*, *Lycopus americanus*, *Onoclea sensibilis*, *Oxalis europaea*, *Panicum agrostoides*, *P. clandestinum*, *P. virgatum*, *Solidago altissima*, *S. graminifolia* var. *nuttallii*, and *Stachys palustris* var. *homotricha*. REPRESENTATIVE SPECIMEN: Dritz #140, 11 AUG 1980; moist sandy sedge meadow along the NIPSCO r.o.w. ca 0.2 mi E of Mineral Springs Rd., SW SW SW Sec.23 T37N R6W; with *Eleocharis obtusa*, *Panicum agrostoides*, *Fimbristylis autumnalis* var. *mucronulata*, and *Rhynchospora capitellata*. MOR. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Juniperus communis var. *depressa* Pursh This species is still extant in Survey Area A, particularly in the Foredune and Dune Complex regions. Welch (1935) considered local populations of this variety to be boreal relicts.

Lilium philadelphicum var. *andinum* (Nutt.) Ker Lyon (1927) reported "... few dozen plants in an interdunal meadow at Port Chester." This interdunal meadow is what is now known as the Howes Prairie, and the plants are still there. Later, in his 1930 revision, he reported another population "... on a wooded dune at Mineral Springs." Presumably this population was somewhere in Survey Area A. REPRESENTATIVE SPECIMEN: Hiebert #7, 1 JUL 1981; Indiana Dunes National Lakeshore, SE SE Sec.14 T37N R6W; scattered throughout open mesophytic prairie. MOR.

Linnaea borealis var. *americana* (Forbes) Rehd. Known from Survey Area A solely on the basis of Lyon's (1927) report, in which he states that it was rare in the tamarack swamp at Mineral Springs, and on the following REPRESENTATIVE SPECIMEN: Deam #21226, 25 AUG 1916; in tamarack marsh 0.5 mi N of Mineral Springs stop on South Shore line, with *Larix laricina*, *Thuja occidentalis*, *Myosotis laxa*, *Cornus canadensis*, and *Osmunda cinnamomea*. IND. The associates listed by Deam for this species are still extant in the Cowles Bog area. Welch (1935) considered local populations for this species to be boreal relicts.

Linum striatum Walt. Closely related to the following species, this element is frequent along the NIPSCO right-of-way in Survey Area E. REPRESENTATIVE SPECIMEN: Wilhelm & Dritz #17416, 31 JUL 1989; Dune Acres, east of Mineral Springs Road, along the bike trail. MOR. Parker (1936) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Linum virginianum L. This rare little flax is still extant, though not common, in the Howes Prairie of Survey Area B and along the Bike Trail in Survey Area E.

Liparis loeselii (L.) Richard This little orchid is still extant, though rare, in wet calcareous sands and swampy woods of both Survey Areas A and B. Curiously, Plampin (1987a) reported that Lois Howes attributed the loss of the Survey Area A population to ants!

Lonicera dioica L. This attractive, though often inconspicuous, native honeysuckle is still extant in the Black Oak Savanna regions of both Survey Areas A and B. It is known from the cedar mound portion of Cowles Bog, where, according to Plampin (1988), it grows with *Ilex verticillata*, *Rhus vernix*, *Ribes americanum*, *Isopyrum biternatum*, *Caltha*

palustris, *Prunus serotina*, *Cornus stolonifera*, *Betula lutea*, *Viola pallens*, *Symplocarpus foetidus*, etc. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 18 MAY 1946; Mineral Springs area near Dune Acres. MOR.

Ludwigia sphaerocarpa var. *deamii* Fern. & Grisc. This species is known from Little Lake, where it is quite common, and in the nearby NIPSCO ponds in Survey Area A. Bowles *et al.* (1986a) reported the following associates from Little Lake: *Calamagrostis canadensis*, *Cephalanthus occidentalis*, *Cladium mariscoides*, *Dulichium arundinaceum*, *Eleocharis smallii*, *Hypericum boreale*, *Juncus canadensis*, and *Proserpinaca palustris* var. *crebra*. REPRESENTATIVE SPECIMEN: *Deam #21191*, 25 AUG 1916; in a wet place between wooded dunes ca 0.5 mi NW of Mineral Springs stop on South Shore line. IND. Peattie (1922) and Hooper (1934) both considered this species to have ancestral affinities to the Atlantic coastal plain.

Lycopodium clavatum L. Bowles *et al.* (1985) found this little club moss in an ecotone between a "dry-mesic dune forest" and in a sand prairie, growing among *Polytrichum* mosses with *Comandra richardsiana*, *Pyrus melanocarpa*, *Quercus alba*, *Q. velutina*, *Sassafras albidum*, and *Vaccinium corymbosum*. *Vaccinium myrtilloides* is also listed as an associate, a report which will have to remain doubtful until more substantial records are available. Plampin (1989b) reported 4 plants south of Lupine Lane associating with *Gaultheria procumbens*, *Quercus velutina*, and *Sassafras albidum*, and growing on a north slope in 1984. By 1988 and 1989, no plants were apparent. REPRESENTATIVE SPECIMEN: *Howes s.n.*, 13 MAR 1971; at Dune Acres, Chesterton, growing at the edge of a dune swale east of Lupine Lane. MOR. I would not have been able to find this population without the help of Lois Howes.

Lycopodium inundatum L. Known from Survey Area B solely on the strength of a report by Lyon (1927) in which he states that it grew in an "... interdunal meadow at Mineral Springs." Lyon (1927) also mentions that it grew in a "... ditch by railroad, Port Chester, rare." This latter location is probably in Survey Area E, wherein Ken Dritz showed me a population he discovered August 9, 1981 (see also the association list under *Panicum lucidum*) 875 feet west of Waverly Road. Bowles *et al.* (1985) recorded a population along the NIPSCO right-of-way just west of Waverly Road, where it grows among *Sphagnum* mosses with *Acer rubrum*, *Aletris farinosa*, *Drosera rotundifolia*, *Dryopteris thelypteris* var. *pubescens*, *Liatris spicata*, *Habenaria clavellata*, *Rubus flagellaris*, and *Spiraea tomentosa* var. *rosea*. REPRESENTATIVE SPECIMEN: *Rowlatt & Dritz #1281*, 13 AUG 1983; Waverly Road. MOR. McLaughlin (1932) considered this species to be a coastal plain element.

Lycopodium lucidulum Michx. This species is still extant in the Swamp Complex region of Survey Area B.

Lycopodium tristachyum Pursh Lois Howes led me to a small colony of this rare club moss on a ridge top in Survey Area A. The Indiana Dunes National Lakeshore is monitoring this population (Bowles *et al.*, 1985). The following REPRESENTATIVE SPECIMEN is from the same colony: *Dritz #44*, 20 APR 1980; top of a knoll in black sandy soil and leaf litter, ca 200 ft N of Cowles Bog trail, 0.5 mi W of Mineral Springs Road, Dune Acres, NW SE Sec.22 T37N R6W, with *Sassafras albidum*, *Gaultheria procumbens*, *Vaccinium angustifolium* var. *laevifolium*, *Viola pedata*, *Phlox bifida*, *Quercus velutina*, and *Quercus rubra*.

MOR. Marlin Bowles and I tried to relocate this population in both 1987 (Bowles, 1988) and 1988; sadly, it is no longer apparent.

Melampyrum lineare var. **latifolium** Bart. This species is still extant in both Survey Areas A and B. The population in Survey Area B is in the area codified as Savanna Complex on the Natural Area Vegetation Map (which see). REPRESENTATIVE SPECIMEN: *Dritz #104, 13 JUL 1980; on a knoll in sandy Black Oak woods N of the Cowles Bog Tr. in Dune Acres, ca 0.5 mi W of Mineral Springs Rd., NW SE Sec.22 T37N R6W; with Euphorbia corollata, Carex pensylvanica, Vaccinium angustifolium* var. *laevifolium*, *V. vacillans*, *Koeleria cristata*, *Gaultheria procumbens*, *Quercus velutina*, *Q. alba*, *Lupinus perennis* var. *occidentalis*, *Aster linariifolius*, *Aralia nudicaulis*, *Hieracium gronovii*, *Prunus virginiana*, *Smilacina stellata*, *Phlox bifida*, *Maianthemum canadense* var. *interius*, *Rosa carolina*, *Asclepias tuberosa*, *Sassafras albidum*, *Hamamelis virginiana*, and *Tephrosia virginiana*. MOR.

Mitchella repens L. This delightful little plant is still occasional to common in the Swamp Complex portions of Survey Areas A, B and D. REPRESENTATIVE SPECIMEN: *Hess et al. #5950, 13 JUN 1984; Indiana Dunes Nat'l Lakeshore, Cowles Bog, 1.5 mi W of Porter & N of U.S. 12; trail W with slope of Black Oak-Sassafras & bog of Red Maple, Birch, & Salix, common on hummocks in bog. MOR*

Monotropa hypopithys L. This species is still extant in the Savanna Complex region of Survey Area B; it is also occasional along the subdunal trail in Survey Area A, where it grows at the edge of the swamp with **Monotropa uniflora**, which see. REPRESENTATIVE SPECIMEN: *Plampin #3-88, 31 JUL 1988; SW SW Sec.14 T37N R6W; 15 feet south of Pine Lane in Dune Acres in new house site & 300 feet west of Howes Prairie; black oak forest, gentle slope, infrequent and local, will be destroyed by house construction; with Quercus velutina, Parthenocissus quinquefolia, Geranium maculatum, Cornus racemosa, Sassafras albidum, Pteridium aquilinum* var. *latiusculum*, *Prunus serotina*, and *Osmunda regalis* var. *spectabilis*. INDU.

Monotropa uniflora L. This species is still extant in the Savanna Complex regions of Survey Area B. On July 11, 1987, this species was actually common and coming into bloom along the subdunal trail in Survey Area A. REPRESENTATIVE SPECIMEN: *Pavlovic #80, 14 SEP 1983; SW SE SE Sec.14; Howes Prairie, Plot #7-1-5-2-3; associates: Andropogon gerardii, Fragaria virginiana; prairie/clumped and infrequent. INDU.*

Myosotis laxa Lehm. This species is very rare, both in the Chicago region and the state of Indiana. Deam wrote that it was "Frequent in the Mineral Springs Bog in Porter County and also reported from Lake County by Pepoon as occurring on the banks of a cold brook near Miller and on the margin of the Little Calumet River. Probably restricted to these two counties." Swink & Wilhelm, nearly forty years later, write: "In our area known only from Lake and Porter Counties in Indiana." Curiously, the plant is still rather frequent in the rills and swampy woods of Survey Area A. The Indiana Dunes National Lakeshore is monitoring three colonies, two in Cowles Bog and another along the NIPSCO right-of-way just east of Wagner Road (Bowles et al., 1985); they listed associates at Dune Acres as: **Calamagrostis canadensis**, **Carex vulpinoidea**, **Impatiens** sp., **Leersia oryzoides**, **Phalaris arundinacea**, **Typha angustifolia**, and **T. latifolia**. Deam listed it as an associate of **Linnaea** (which see), but **Linnaea** was absent from all the places at which I made note of it. REPRESENTATIVE SPECIMEN: *Wilhelm #6956, 8 SEP 1979; in wooded swamp ca 0.5 mi*

NW of the Dune Acres stop of the South Shore line, in the SE Sec.22 T37N R6W. MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Nemopanthus mucronata (L.) Trel. This rare shrub is still occasional locally in the Swamp Complex region of Survey Area A. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 18 MAY 1947; from Dune Acres on the South Shore Railroad, to Mineral Springs Bog, one shrub found in the tamarack-alder association at the bog. MOR. Barbara Plampin collected it recently (#1, INDU), and listed the following associates: **Symplocarpus foetidus**, **Caltha palustris**, **Typha** sp., **Cornus stolonifera**, **Onoclea sensibilis**, **Vaccinium corymbosum**, **Betula lutea**, **Osmunda regalis** var. **spectabilis**, **Carex** sp., and **Viola cucullata**. Plampin (1989b) found 4 or 5 shrubs in Survey Area B east of Mineral Springs Road, north of NIPSCO pole #957/772. Welch (1935) considered local populations of this species to be boreal relicts.

Oenothera tetragona var. **longistipata** (Pennell) Munz There is a small population of this species in the Howes Prairie region of Survey Area B. REPRESENTATIVE SPECIMEN: *Wilhelm* #6943, 15 JUL 1979; at the SE edge of Dune Acres, in prairie area in south half of SE Sec.14 T37N R6W. MOR.

Ophioglossum vulgatum var. **pseudopodium** (Blake) Farw. Possibly known from this Unit, as reported by Peattie: ". . . to Miller [sic] Springs." Pitcher (1988a) cited the following note from Lois Howes: "Just outside N. Park & Lupine, 1950's," which area Pitcher indicates is in Survey Area B. Plampin (1989b) reported it from two places in Howes Prairie.

Orobanche fasciculata Nutt. According to Lois Howes, this species grew until very recently at one location in the Savanna Complex portion of Survey Area B. Its apparent disappearance recently may be an artifact of its own natural autecology. There is some reason to anticipate that it will "show up" again at another location locally. It is often parasitic on **Artemisia caudata**, a species which is yet frequent to common in Survey Area B. See the comments by Pepoon, page 471.

Orobanche uniflora L. Pitcher (1988a) cites the following note by Lois Howes: "Tr. from Lupine to Studebaker Tr., 5/30/79" in Survey Area B.

Panax trifolius L. Dwarf Ginseng is frequent on beech hummocks in the swamp forest of Survey Area D. Welch (1935) considered populations of this species to be boreal relicts.

Panicum dichotomum L. This inconspicuous little grass is infrequent to occasional in the Savanna Complex portion of Survey Area B and along the Bike Trail in Survey Area E.

Panicum lucidum Ashe Prior to its remarkable discovery by Ken Dritz in 1982, this species was known from the Chicago region solely on the basis of an Umbach specimen from *Dune Park*, which location was destroyed long ago. REPRESENTATIVE SPECIMEN: *Dritz & Wilhelm* #269, 20 JUN 1982; in a sedge meadow on the N side of the South Shore Line, W of Waverly Road, E of Dune Acres, SE Sec.23 T37N R6W; in a small boggy depression, with **Panicum latifolium**, **Lycopodium inundatum**, **Drosera rotundifolia**, **Aletris farinosa**, and **Danthonia spicata**; in **Sphagnum**. MOR. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Panicum verrucosum Muhl. This species, rare to the interior United States, is actually common at Little Lake, particularly when the water levels are low and extensive mud flats are exposed. Bowles *et al.* (1985) give the following associates at Little Lake: **Calamagrostis canadensis**, **Cephalanthus occidentalis**, **Dulichium arundinaceum**, **Eleocharis smallii**,

Hypericum boreale, **Juncus canadensis**, **Proserpinaca palustris** var. **crebra**, and **Psilocarya scirpoides**. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #12317, 19 SEP 1984; just west of Dune Acres, on the property of the Indiana Dunes National Lakeshore, in the vicinity of Little Lake.* MOR.

Peltandra virginica (L.) Schott & Endl. This species was reported from Survey Area A by Swink (1964). Peattie (1922) and Hooper (1934) regard this species as having ancestral affinities to the Atlantic coastal plain.

Pinus banksiana Lamb. This tree is still extant in both Survey Areas A and B. Peattie (1930), page 37, pointed out that the Lakeshore populations represent the southernmost extension of its natural range. Swink & Wilhelm (1979) write that "In our area this species seldom occurs as a wild plant far from Lake Michigan. In its most characteristic association it occupies areas that have had a history of fire, growing with **Amelanchier arborea**, **Arctostaphylos uva-ursi** var. **coactilis**, and **Juniperus communis** var. **depressa**. Outliers of Jack Pine occur in the foredune association near the lake with **Andropogon scoparius**, **Arabis lyrata**, **Artemisia caudata**, **Calamovilfa longifolia**, **Lithospermum croceum**, **Monarda punctata** var. **villicaulis**, **Panicum virgatum**, **Populus deltoides**, **Prunus pumila**, and **Solidago racemosa** var. **gillmani**. It also occurs in the shrub zone farther from the lake (and higher above the lake), with **Celastrus scandens**, **Cornus stolonifera**, **Juniperus virginiana** var. **crebra**, **Prunus virginiana**, **Ptelea trifoliata**, **Rhus aromatica**, **Rhus radicans**, **Smilacina stellata**, and **Vitis riparia**. It is also found in the high dune country, here and there in the dry woodland that is dominated by **Quercus velutina**." Peattie felt that it was "... rapidly becoming exterminated at its western border by smoke, cinders, dust of cement mills, and cutting off, as well as by frequent fires." This latter comment on fire is interesting, because as Peattie points out the cones rarely open fully unless charred by fire--though in this part of its range Jack Pine cones are likely not to be serotinous as they are further north. REPRESENTATIVE SPECIMEN: *Schulenberg, Howes, & Kropp #76-991, 9 OCT 1976; at Dune Acres, near the Howes residence (19 Lupine Lane) in the S SE SW Sec.14 T37N R6W. On the northwest-facing dune slope in savanna with Quercus velutina, Andropogon scoparius, Calamovilfa longifolia var. magna, Aster azureus, A. linariifolius, Tephrosia virginiana, Solidago speciosa, Lithospermum croceum, Panicum virgatum, Sassafras albidum, Galium pilosum, and Liatris aspera. The Howes family was among the first to move to Dune Acres, and Mrs. Howes assures us that this population of Pinus banksiana was here (spontaneous) before roads or houses were built.* MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Pinus strobus L. This species is still extant in both Survey Areas A and B. About this species, Swink & Wilhelm (1979) write: "This species has a significant history in our area. At one time it was very common in the dune country in Lake, Porter, La Porte, and Berrien counties. Most of this timber was cut for lumber, and only a tiny remnant survives from its former abundance. Black Oak . . . has occupied many of its former sites, and in some of these woodlands, especially in winter, one can still spot a few of the pines growing with the oaks . . . Local historical accounts provide interesting stories of the various lumber camps in the Indiana dunes set up in the 19th century to provide White Pine timber." By the time Peattie wrote in 1930 there were no commercial stands of this species in the area. See also Brennan (1923), page 211--I am not too sure about his theories of acorns lying dormant for long periods at a time. According to Menges & Armentano (1985): "A complete age distribution for white pine is available from . . . a mesic pocket site on the lake front [Survey Area

A). This population includes the largest (75.1 cm dbh) and oldest (162 years) white pines sampled. The latter individual has a fire scar dating from about 1879, the approximate date that the five next largest pines were established. All other white pines [here], with one exception, are 68-111 years old; the number present slowly declines in younger age classes. Only one living tree originated within the last 64 years--a 19-year-old tree established on an encroaching dune. Welch (1935) considered the southern Lake Michigan populations of this species to be boreal relicts.

Poa alsodes Gray Dritz (1987) noted having seen this rare Blue Grass in Survey Area D on May 3, 1987.

Poa languida Hitchc. This very rare Blue Grass is known from Survey Area E solely on the basis of the following REPRESENTATIVE SPECIMEN: Dritz & Rowlett #265, 6 JUN 1982; in a sedge meadow on the N side of the South Shore Line, W of Waverly Road, E of Dune Acres, SE Sec.23 T37N R6W. MOR.

Poa paludigena Fern. & Wieg. This species was discovered new to the Indiana Dunes National Lakeshore by Mike Homoya (1988) during his now legendary stroll through Dune Acres and Indiana Dunes State Park in June of 1988. On May 24, 1989, Mike guided me to the area of Cowles Bog, where it grows along the southern edge of the Hydromesophytic Swamp. There, in the partly shaded ecotone, it grows on hummocks and along old, saturated logs of *Betula lutea* with *Aster puniceus*, *A. umbellatus*, *Cardamine bulbosa*, *Carex seorsa*, *Cornus stolonifera*, *Dryopteris thelypteris* var. *pubescens*, *Fraxinus americana*, *F. nigra*, *Glyceria striata*, *Habenaria clavellata*, *Ilex verticillata*, *Larix laricina*, *Lindera benzoin*, *Myosotis laxa*, *Onoclea sensibilis*, *Osmunda cinnamomea*, *Parthenocissus quinquefolia*, *Rhus vernix*, *Rubus pubescens*, *Solidago patula*, *Symplocarpus foetidus*, *Typha angustifolia*, *Ulmus americana*, and *Vaccinium atrococcum*. REPRESENTATIVE SPECIMEN: Wilhelm, Homoya, *et al.*, #17054, 24 MAY 1989; South of Dune Acres, at the north edge of Cowles Bog, on old log of *Betula lutea*. MOR. Ken Dritz examined the population three days later and noted scattered plants, but this weak little grass was no longer in evidence when Ken revisited the site eight days hence. Welch (1935) considered local populations of this species to be boreal relicts.

Polygonella articulata (L.) Meisn. This delicate species, albeit rare, is nevertheless still extant in both Survey Areas A and B. REPRESENTATIVE SPECIMEN: Bennett *s.n.*, 22 SEP 1957; Dune Acres, sand in open black oak woods. F. Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Polygonum arifolium var. *pubescens* (Keller) Fern. This species is frequent in Marsh and Swamp Complexes of Survey Area A, and probably Survey Area B.

Polygonum opelousanum var. *adenocalyx* Stanford Known from Little Lake in Survey Area A, from where documented by the following REPRESENTATIVE SPECIMEN: Dritz #364, 25 AUG 1984; local, on the exposed drying bottom of Little L., SW NW SW Sec.22, T37N R6W; with *Scirpus purshianus*, *Nuphar advena*, *Pontederia cordata*, and *Dulichium arundinaceum*. MOR. It is also known from the Howes Prairie, from where it was collected by Ken Klick (#2752, INDU).

Polypodium virginianum L. Known only on the basis of the statement by Peattie (1930), page 28, which reads: "Rare and local, as in woods at Mineral Springs, at Tamarack Sta., . . ."

Potamogeton diversifolius Raf. Known from Survey Area on the basis of a report by Lyon (1927), in which he attributes it to Little Lake. It could still be at Little Lake.

Potentilla palustris (L.) Scop. This interesting cinquefoil is still frequent in the area codified as Marsh Complex (see Natural Area Vegetation Map) south of the Swamp Complex in Survey Area A.

Prunus pensylvanica L. f. This shrub is still occasional to frequent in the areas codified as Savanna Complex in Survey Area A, and probably also in Survey Area B. REPRESENTATIVE SPECIMEN: Wilhelm & Dritz #6730, 27 MAY 1979; just S and W of Dune Acres, W of 100W Road, in the National Lakeshore holdings of Secs.21 & 22 T37N R6W. MOR.

Psilocarya scirpoides Torr. This rare little sedge is actually frequent in the area of Little Lake and the NIPSCO ponds in Survey Area A. The population at Little Lake is being monitored by the Indiana Dunes National Lakeshore (Bowles *et al.*, 1986a). REPRESENTATIVE SPECIMEN: Dritz #365, 25 AUG 1984; local, on the drying bottom of Little Lake, NE SE NE SE Sec.21 T37N R6W; with *Juncus canadensis*, *Sagittaria graminea*, *Nuphar advena*, *Dulichium arundinaceum*, *Cephalanthus occidentalis*, *Hypericum canadense*, *H. boreale*, *Fimbristylis autumnalis* var. *mucronulata*, *Ludwigia alternifolia*, and *Calamagrostis canadensis*. MOR. Interestingly, Bowles *et al.* (1986a), listed a few of the same associates but add *Eleocharis geniculata*! Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Pyrola elliptica Nutt. Lois Howes was kind enough to guide me to the small population of this species which is still extant in Survey Area A. It is still extant in Survey Area B south of Pine Lane (Plampin, 1987a) and off of Pine Lane, from where it was documented by the following REPRESENTATIVE SPECIMEN: Hiebert #8a, 1 JUL 1981; Indiana Dunes National Lakeshore, just off Lupine Lane; SE SE Sec.14 T37N R6W; scattered in savanna/mesophytic forest complex, in sandy loam under *Quercus velutina* and *Acer rubrum*. MOR. Friesner (1936) considered local populations of this species to be boreal relicts.

Pyrola rotundifolia var. *americana* (Sweet) Fern. This little shinleaf is still extant in the Savanna Complex portion of both Survey Areas A and B. Friesner (1936) considered local populations of this species to be boreal relicts.

Pyrola secunda L. Known from this Survey Unit only from the comments by Lyon (1927) and Peattie (1930), both of whom reported it from Mineral Springs. Lyon (1927) implied there is a specimen in the Nieuwland Herbarium, which is at Notre Dame.

Rhamnus alnifolia L'Her. This native buckthorn, now regionally quite rare, is still occasional in the Cowles Bog area. REPRESENTATIVE SPECIMEN: Wilhelm & Dritz #6734, 27 MAY 1979; just S and W of Dune Acres W of 100W Road, in the National Lakeshore holdings of Sec.21 & 21 T37N R6W. MOR. Parker (1936) considered local populations of this species to be boreal relicts.

Rhexia virginica L. Lyon (1927) reported this species from Mineral Springs, which was presumably Survey Area A; Plampin (1987a) said it grew by the hundreds at Little Lake. It is still extant in the Howes Prairie region of Survey Area B, and along the bike trail east of

Mineral Springs Road. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 24 AUG 1946; common locally in low ground, Porter, Indiana. MOR. Parker (1936) considered local populations of this species to be coastal plain elements.

Rhus aromatica var. **arenaria** (Greene) Fern. This shrub is still extant in both Survey Areas A and B. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6719*, 27 MAY 1979; just S and W of Dune Acres W of 100W Road, in the National Lakeshore holdings of Secs.21 & 22 T37N R6W. MOR.

Rhus vernix L. This species is still quite common in the Cowles Bog area of Survey Area A; it is rare in a low swale with *Betula pumila* in Survey Area B. There is also a small colony along the north and south sides of the bicycle path about 100 yards east of Mineral Springs Road in Survey Area E. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #17418*, 31 JUL 1989; Dune Acres, east of Mineral Springs Road, along the bike trail. MOR.

Rhynchospora globularis var. **recognita** Gale Known from Survey Area B, the Howes Prairie region, where it was first discovered by Floyd Swink in 1952 (*s.n.*, F). It has been rediscovered and is vouchered by the following REPRESENTATIVE SPECIMEN: *Klick #2745*, 21 JUL 1987; wet prairie near plot HHPR2 in Howes Prairie, in flat level sandy loam prairie with *Juncus marginatus*, *Eleocharis melanocarpa*, *Aletris farinosa*, *Calamagrostis canadensis*, and *Panicum virgatum*; SE SW Sec.14 T37N R6W. INDU. Peattie (1922) considered the rare local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Rhynchospora macrostachya Torr. Deam collected a specimen of this very rare sedge about 2 miles northwest of Porter, probably in the Goose Lake area from where exist specimens collected by Swink and by Bennett. Lyon collected it in the early 1920's at Little Lake, where it was rediscovered by Ken Dritz in 1980; there are later collections from the NIPSCO ponds, and it was frequent at Little Lake along our transect in 1988. REPRESENTATIVE SPECIMEN: *Dritz #105*, 13 JUL 1980; N border of Little Lake in Dune Acres; NW SW Sec.22 T37N R6W; with *Lysimachia terrestris*, *Cladium mariscoides*, *Calamagrostis canadensis*, *Dulichium arundinaceum*, *Proserpinaca palustris* var. *crebra*, *Cephalanthus occidentalis*, *Hypericum canadense*, *Spiraea tomentosa* var. *rosea*, *Cicuta bulbifera*, and *Bidens* sp. MOR. Bowles *et al.* (1986a) record two populations and listed the following associates: *Hypericum boreale*, *Juncus canadensis*, *Juncus effusus* var. *solutus*, *Psilocarya scirpoides*, *Sagittaria graminea*, *Scirpus cyperinus*, and *Sparganium* sp. Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Ribes hirtellum Michx. This species was collected first by Deam in 1913; I saw a gooseberry in 1979 (Wilhelm, 1979) in the Cowles Bog area which had weak nodal spines, but the specimen was small and vegetative, so I could not be sure that it was not *R. missouriense*, but neither could I be sure that it was not *R. hirtellum*. Its contemporary existence has been documented by the following REPRESENTATIVE SPECIMEN: *Klick #2795*, 9 JUN 1988; in Cowles Bog, the raised portion of the fen (east side); frequent in *Eleocharis rostellata*/*Typha angustifolia* fen, with *Parnassia glauca*, *Rhus vernix*, *Carex leptalea*, *Lysimachia thyrsiflora*, *Cypripedium candidum*, *Sarracenia purpurea*, and *Carex prairea*. INDU.

Rubus pubescens Raf. This little raspberry is still quite frequent in the Swamp Complex portions of Survey Areas A, B and D. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 12 MAY 1947; Mineral Springs near Porter. MOR.

Sabatia angularis (L.) Pursh Lyon (1927) reported that this species was rather rare in an interdunal meadow at Mineral Springs, presumably Survey Area A. When referring to the interdunal meadow now known as Howes Prairie, he usually related it to Port Chester. Lois Howes told me that this species grew in Howes Prairie, Survey Area B, until recently, suggesting that the lack of fire in recent years has caused it to disappear. It is my feeling that with a return of regular fall fires, we would witness the return of Rose Gentian as well as dozens of other prairie species.

Sagittaria rigida Pursh Dritz (1987) reported this species from Little Lake, where he noted it on September 19, 1984.

Salix candida Flügge This distinctive willow, in the Lakeshore, is known only from this Unit--in Survey Area A, at which place I noted only two or three plants in the open area around the edge of the tamaracks in the Cowles Bog area. It grew here among the cattails with **Sarracenia purpurea** and **Parnassia glauca**. Parker (1936) considered local populations of this species to be boreal relicts.

Salix pedicellaris var. **hypoglauca** Fern. This attractive willow is known from this Survey Unit solely on the basis of a report by Peattie (1930), in which he stated it grew in tamarack and other bogs at Mineral Springs, and elsewhere.

Salix sericea Marsh. This willow is occasional in the area codified as Marsh Complex (see the Natural Area Vegetation Map) south of the Swamp Complex in Survey Area A. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6739*, 27 MAY 1979; just S and W of Dune Acres W of 100W Road, in the National Lakeshore holdings of Secs.21 & 22 T37N R6W. MOR.

Sarracenia purpurea L. Lyon (1927) reported that this species was in the "quaking bog" at Mineral Springs, but that it was not common there nor was it found elsewhere. We saw only a clump of Pitcher Plant in the cattail marsh area north of where the tamaracks extend eastward into the Great Marsh area; here it was associated with **Parnassia glauca** and **Salix candida**, species which are usually thought of as Fen indicators. We selected a single pitcher as a REPRESENTATIVE SPECIMEN to voucher its presence: *Wilhelm & Dritz #6733*, 27 MAY 1979; just S and W of Dune Acres W of 100W Road, in the National Lakeshore holdings of Secs.21 & 22 T37N R6W. MOR. This species is threatened by over-collection. I must report, for the record, that an entire clump was senselessly removed (in 1985) by a "professional" botanist . . . for what purpose can only be imagined. I have been told that several seedlings remained where the parents were removed, and that about eleven mature plants now survive in the vicinity. The future of this rare species at Cowles Bog hangs on the success of this senselessly diminished population. Hendrickson & Wilcox (1979) pointed out, however, that: "While still sparsely present in a few locations in the cattail mat, Pitcher Plant is clearly threatened in Cowles Bog National Natural Landmark; cattails increasingly overtop it/shade it with each passing year."

Scirpus polyphyllus Vahl Deam (1940) excluded this species from the northern half of the state. Swink & Wilhelm (1979) excluded it from the Indiana portion of the Chicago region. Peattie (1930), however, reported it from Mineral Springs and even went on to say that it was occasional eastward from there. I would postulate that his reports were based upon misiden-

tified variants of *Scirpus atrovirens*, but his own descriptions lead one to suspect that he may actually have seen the species about which we are concerned. If he secured any specimen, they have either been referred to some other species, or they remain remote from the major herbaria. Without a specimen one simply cannot be certain about what he had. Peattie may have been paraphrasing Pepon, who had made similar comments about this species three years earlier.

Scirpus purshianus Fern. This species is actually frequent at Little Lake and the NIPSCO ponds in Survey Area A. It is closely related to *Scirpus smithii* Gray, with which it has been confused by local practitioners; Lyon (1927) reported it from Goose Lake, [not in the Lakeshore, and long ago obliterated] and numerous specimens from the Lakeshore have been named *S. smithii*. All of the Lakeshore material which I have seen, however, has the stout bristles and sculptured achenes of *S. purshianus*, to which element I am referring our material. The only place in the Chicago region where we have determined *S. smithii* is at Beulah Bog in Walworth County, Wisconsin. REPRESENTATIVE SPECIMEN: *Dritz* #363, 25 AUG 1984; locally abundant on the exposed drying bottom of Little Lake, SW NW SW Sec.22 T37N R6W; with *Nuphar advena*, *Juncus canadensis*, *Eleocharis obtusa*, *Dulichium arundinaceum*, *Cephalanthus occidentalis*, *Pontederia cordata*, *Polygonum opelousanum* var. *adenocalyx*, *Proserpinaca palustris* var. *crebra*, and *Typha angustifolia*. MOR. Its relative, *Scirpus smithii*, is considered by both Peattie (1922) and Hooper (1934) to have ancestral affinities to the Atlantic coastal plain.

Scleria reticularis Michx. This species was known locally only from Goose Lake until its rediscovery at Little Lake by the indefatigable discoverer of rare plants, Ken Dritz, on September 19, 1984. Bowles et al. (1985) listed associates from Little Lake and two NIPSCO ponds: *Cephalanthus occidentalis*, *Drosera rotundifolia*, *Dulichium arundinaceum*, *Eleocharis smallii*, *Hypericum boreale*, *Juncus canadensis*, *Proserpinaca palustris* var. *crebra*, *Psilocarya scirpoides*, *Rhynchospora capillacea*, and *Rhynchospora macrostachya*. The fact that *Drosera intermedia* and *Rhynchospora capitellata* are so frequent with *Scleria reticularis* at Little Lake causes me to question the authenticity of their respective cousins in the preceding association list. REPRESENTATIVE SPECIMEN *Pavlovic* #107, 25 SEP 1984; in mud flat of Little Lake growing with *Hypericum boreale* and *Panicum verrucosum*, south [sic!] of Dune Acres; SE SW SW Sec.22 T37N R6W; scattered in mud and sand on ephemeral mud flat. MOR. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Senecio plattensis Nutt. This species was reported from the Mineral Springs area by Lyon (1927); while I did not happen to run upon any populations, I assume that it is still extant here, probably in Survey Area A, in the areas codified as Savanna Complex.

Sisyrinchium angustifolium Mill. Lyon (1927) reported this species from "... subdunal woods, Tremont, Mineral Springs," and it is still extant in several locations across the Survey Unit. It grows along the subdunal trail north of Cowles Bog in Survey Area A; Bowles et al. (1985) recorded it from two locations along the NIPSCO right-of-way east of Mineral Springs Road and from an abandoned homesite area west of Waverly Road, from where came the following REPRESENTATIVE SPECIMEN: *Otto* #76, 2 AUG 1982; not common, in disturbed area/razed homesite #15-118 along Waverly Rd. just N of old cottage sites; T37N R6W SE NE Sec.23. MOR.

Sisyrinchium atlanticum Bickn. Lyon (1927) reported this species from "... subdunal woods, Mineral Springs;" it is still extant in the Howes Prairie in Survey Area B. REPRESENTATIVE SPECIMEN: Hess et al. #5937, 13 JUN 1984; Howes Prairie, 1 mi N of Porter off W edge of St. Pk., Indiana Dunes National Lakeshore; sandy soil with *Pedicularis*, *Salix humilis*, *Carex* spp, *Comandra richardsiana*, and *Oenothera*. Peattie (1922) and Hooper (1934) regarded local populations of this species as having ancestral affinities to the Atlantic coastal plain.

Smilax rotundifolia L. This species is very common throughout the Survey Unit, and indeed throughout the eastern portions of the Lakeshore, but it is rare to absent just a little further south and west.

Solidago racemosa var. *gillmani* (Gray) Fern. This species is still occasional on the dunes of the Foredune and Dune Complex in Survey Area A. REPRESENTATIVE SPECIMEN: Bennett s.n., 28 SEP 1958; Dune Acres, sand along high dune facing Lake Michigan. F.

Sparganium americanum Nutt. This species was unknown from the Survey Unit until its discovery in 1984 at Little Lake during that now famous dry period when a mother lode of SPECIAL VEGETATION Floristic Elements was discovered. This species and *S. androcladum* are very closely related. The following voucher specimen has pistillate lateral branches and dull achene bodies less than 5 mm long. It is somewhat aberrant in that the leaves are not as notably flat, broad, and flaccid as is seen on some specimens collected from the southern United States. Some individuals in the population are without lateral branches and have somewhat larger achenes than is typical for the species. Indeed, one could convince himself in the field that *S. androcladum* is also at Little Lake, inasmuch as none of the specimens from Little Lake dried with tan, glossy achene bodies and wrinkled beak bases, I have concluded that there is only one species present locally. REPRESENTATIVE SPECIMEN: Dritz #378, 23 SEP 1984; in a large stand along the NE shore of Little Lake; NE NW SW Sec.22. MOR.

Spiranthes lacera Raf. Though very rare, this delicate orchid is still extant in the Howes Prairie region of Survey Area B. REPRESENTATIVE SPECIMEN: Hiebert #369, 2 SEP 1982; a few scattered plants, Pine Lane Prairie, west of Waverly Rd. MOR.

Spiranthes lucida (H. H. Eat.) Ames This species was seen alive in the Chicago region 15 years ago at the Sand Ridge Nature Center in Cook County, Illinois. In 1980, Ken Dritz photographed it in LaPorte County, Indiana; these plants disappeared in 1981. I had heard of no more recent reports, until Ken Klick found it at Shell Nature Preserve (Lake County, Indiana) in 1986, where it has not been seen since. Remarkably, it has turned up at the Indiana Dunes National Lakeshore. Its appearance is described by Ken Klick, who sent me the following letter (Klick, 1988): On MAY 13, 1987, Ron Hiebert, Ken Klick, Linda Lobik, and Sandy O'Brien observed a blooming *Spiranthes lucida* . . . in a razed homesite area (15-108), NE SE NE Sec.23 T37N R6W. The area is part of the Dune Acres Area, Survey V. . . . Marlin Bowles, several days later, confirmed the identification and photographed the plant. The species occurred in an abandoned gravel driveway that had not been used for approximately eight years. The gravel was interspersed with moist sand from which grew *Poa pratensis*, *Plantago lanceolata*, *Medicago lupulina*, *Melilotus alba*, *Arenaria serpyllifolia*, *Taraxacum officinale*, *Daucus carota*, *Aster lateriflorus*, and *Festuca elatior*. Bowles' slide is filed in the herbarium at MOR. In the slide, there is a seedling elm growing

within an inch of the orchid, a fact which suggests that the life of this *Spiranthes* is doomed without fairly frequent fire in her land. Welch (1935) considered local populations of this species to be boreal relicts.

***Stachys hyssopifolia* Michx.** Once rare in the Howes Prairie region of Survey Area B, the recent controlled burning has brought them back by the thousands, according to Plampin (1989b). REPRESENTATIVE SPECIMEN: *Swink s.n.*, 24 AUG 1946; a good-sized colony in one of the swamps north of the Mineral Springs Bog, Porter, Indiana. MOR. The previous specimen was taken from Survey Area A where the population, given its alleged size, may still be extant. Peattie (1922) and Hooper (1934) considered local populations to have ancestral affinities to the Atlantic coastal plain.

***Stylophorum diphyllum* (Michx.) Nutt.** Peattie (1930) reported this species from Mineral Springs, at which place he apparently noted only a few plants, but he went on to say that it was a plant of ". . . limestone and prairies," a statement which is inexplicable, inasmuch as it is actually restricted to deep woods.

***Thuja occidentalis* L.** This species is still extant among the tamaracks in the Swamp Complex portion of Survey Area A; it is the only living population in the state of Indiana. The population today is at least as extensive as the one described by Deam (1932), about which he wrote: "In Porter County it is known only in a large tamarack bog north of the Mineral Springs stop on the Traction line, and about a mile from Lake Michigan. Here about 100 trees are scattered over an area of less than two acres. The largest specimen measured 70 cm in circumference. This species is doomed to early extinction in our area. No doubt it already has vanished from Lake County, and it is probable that the colony north of Mineral Springs is the last of the species in Indiana." Bowles *et al.* (1985) estimate that most of the Arbor Vitae regeneration is vegetative from the branches of fallen older trees. In a detailed sampling on May 19, 1987, Bowles (1988) recorded 135 genets, in a 0.92 ha area, with an average of 2 ramets per genet; he found more than half over 1 dm (dbh) and 4 ramets in excess of 3 dm. According to Wilcox *et al.* (1986), these trees are restricted to the most well-drained portion of the peat mound. REPRESENTATIVE SPECIMEN: *Hiebert #187*, 22 OCT 1981; T37N R6W NW SE Sec.22; on cedar mound at Cowles Bog; the 100 or so individuals all appear to be root sprouts and badly wind thrown. INDU. Welch (1935) considered the local populations of this species to be boreal relicts.

***Trientalis borealis* Raf.** This species is still extant in the Swamp Complex region of Survey Area A. Plampin (1987a) reported 15 plants at the bottom of a north-facing slope in Survey Area B, and it is occasional on Beech hummocks in Survey Area D. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 18 MAY 1946; frequent in the swamp at Mineral Springs. MOR. Welch (1935) considered the local populations of this species to be boreal relicts.

***Utricularia gibba* L.** Lyon (1927) reported this species from Little Lake, and it is still there. REPRESENTATIVE SPECIMEN: *Wilhelm #6983*, 15 SEP 1979; near the northeastern end of Little Lake, ca 1 mi NW of the Dune Acres stop of the South Shore line, in the NW SW Sec.22 T37N R6W. MOR. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

***Utricularia minor* L.** Known from this Survey Unit only on the basis of the following REPRESENTATIVE SPECIMEN: *Hebert #2277*, JUL 1930; Mineral Springs. BUT.

Utricularia purpurea Walt. Lyon (1927) reported this species from Little Lake, where Plampin (1987a) reported it still occurs; I saw one individual there in August, 1988 during the now infamous drought. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Vaccinium atrococcum (Gray) Heller This species is still extant in both Survey Areas A and B, in the regions codified as Swamp Complex, as well as occasionally elsewhere. REPRESENTATIVE SPECIMEN: *Kjellmark #150, 29 JUL 1988; NW SE Sec.22 T37N R6W; young red maple swamp south of Cowles Bog Trail and northwest of mound; with Osmunda cinnamomea, O. regalis var. spectabilis, Acer rubrum, Betula lutea, Glyceria striata, Polygonum arifolium var. pubescens, and Symplocarpus foetidus.* INDU.

Vaccinium macrocarpon Ait. Lyon (1927) reported this species from "... quaking bog; edge of Little Lake, rather rare." Cook & Jackson (1978) referred to a large "cranberry marsh" south of Little Lake, and Meyer (1952) characterized the entire Great Marsh area as cranberry marsh. Apparently the marsh was ditched and drained along with Little Lake during the construction of the Dune Acres golf course, at which time the cranberries were destroyed; they apparently have not been able to reestablish themselves. Cook & Jackson discussed at great length the gathering and use of cranberries in the Great Marsh area. At one point they mentioned that most of the cranberries were the large "native" variety [this would be **Vaccinium macrocarpon**], but that there were here and there small amounts of the "European" variety as well; this "European" variety was alleged to be smaller, so I assume that they were referring to **Vaccinium oxycoccos**--which is native to North America, as well as to Europe. Trefz (1935) considered the local populations of **Vaccinium macrocarpon** to be boreal relicts.

Veronica comosa Richter This species is known from this Survey Unit based upon the following REPRESENTATIVE SPECIMEN: *Swink s.n., 24 AUG 1946; Porter, Indiana, in the ditch along the road going north to Dune Acres.* MOR.

Viola incognita var. **forbesii** Brainerd This species is known from Survey Area A, only on the basis of the following REPRESENTATIVE SPECIMEN: *Swink s.n., 18 MAY 1946; Porter Station; Mineral Springs.* MOR. I believe it is still there, but that we have overlooked it.

Viola pallens (Banks) Brainerd This little violet, sometimes confused with the previous species, is frequent in the Swamp Complex regions of Survey Areas A, B and D.

Vitis labrusca L. This species is still extant, though rare, in the Swamp Complex portions of both Survey Areas A and B. It also is occasional along the wooded border of the NIPSCO right-of-way in Survey Area E.

Woodwardia areolata (L.) Moore Imagine my shock when I first received the phlegmatic missive from Mike Homoya that he had seen this fern on a casual visit to the Dunes in the spring of 1988. There is only one other record from the Midwest north of the January -4.5°C isotherm (Cranfill, 1983); it was collected by Liberty Hyde Bailey, Van Buren County, in 1880 in southwestern Michigan (Billington, 1952). After receiving the location information provided by Homoya (1988), Marlin Bowles and I searched for the fern and lucked upon it. Bowles (1989) details the location and recorded the following associates: *Acer rubrum, Betula lutea, Bidens connata, Boehmeria cylindrica, Carex seorsa, Dryopteris thelypteris var. pubescens, Glyceria striata, Ilex verticillata, Impatiens capensis, Lindera benzoin,*

***Maianthemum canadense* var. *interius*, *Nyssa sylvatica*, *Onoclea sensibilis*, *Osmunda cinnamomea*, *Parthenocissus quinquefolia*, *Quercus rubra*, *Rubus pensylvanicus*, *Sassafras albidum*, *Symplocarpus foetidus*, *Ulmus americana*, and *Vaccinium atrococcum*.** According to Cranfill (1983) "No stations are known in the limestone regions of the Interior Low Plateaus or in the calcareous Black Belt region of Alabama and Mississippi. Absence of the species from glaciated areas in southern Illinois and southeastern Ohio can be ascribed to the predominance of calcareous glacial drift in these areas." He goes on to say that [acidic] seep and bog habitat are necessary for the species. Some have suggested that this fern is adventive here, but I think it is autochthonous. It is growing with conservative species in a top-quality natural area. Billington considered the Michigan population to be native. The Indiana Dunes National Lakeshore is a virtual repository of coastal plain disjuncts, and the clump that Marlin and I monitored appears to be long-established: 14 genets, 114 ramets. REPRESENTATIVE SPECIMEN: *Kjellmark & Homoya #100, 8 JUN 1988; SW NE Sec.22 T37N R6W; red maple swamp forest N of Cowles Bog Trail near open cattail sedge marsh pocket (west of pocket); with *Osmunda cinnamomea*, *Symplocarpus foetidus*, *Festuca obtusa*, *Acer rubrum*, *Betula lutea*, *Rhus vernix*, and *Ulmus rubra*; rare, only 1 plant seen.* INDU.

***Woodwardia virginica* (L.) Sm.** Very rare, this fern is known only by a small colony at the edge of a shrubby swale in the Marsh Complex portion of Survey Area A, and from another small colony in Survey Area B. Parker (1936) considered local populations of this species to be boreal relicts.

***Xyris torta* Sm.** This species is still extant in an acid swale south of Pine Lane in Survey Area B, and Plampin (1989b) noted that it also grew in the southeast end of Howes Prairie. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Zizania aquatica* L.** This species is recorded for this Survey Unit because of the following statement by Cook & Jackson (1978): "Blag Slough (Pond B) lay just northeast of Mud Lake across a low ridge. It was named for Civil War veteran George Blag, who lived around the turn of the century as a hermit in a shack along the trail between the slough and Lake Michigan. The slough and the Wild Rice that grew nearby attracted ducks and geese, . . ." Wilcox *et al.* (1985) mapped the vegetation of Blag Slough from 1982-1984; Wild Rice was not mentioned. The identity of their reports of ***Polygonum hydropiper and ***Eleocharis olivacea***, in the context they described must be regarded with circumspection. Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Summary

Survey Unit V has been shown to provide the habitat for at least 165 of the Indiana Dunes National Lakeshore SPECIAL VEGETATION floristic elements. Of these, nearly eighty percent of them have been noted over the last decade or so. It is likely that about ten to fifteen percent of the SPECIAL VEGETATION floristic elements known from this Unit have been extirpated.

Populations of twenty-three percent of the SPECIAL VEGETATION floristic elements known from this Survey Unit are among those considered by Peattie (1922) McLaughlin (1932), Hooper (1934), and Parker (1936) to have ancestral affinities to the Atlantic coastal plain,

while seventeen percent were considered to be boreal relicts by Deam (1932), Trefz (1935), Welch (1935), Friesner (1936), Parker (1936) or Deam (1940).

About fifteen percent of the SPECIAL VEGETATION floristic elements known from the Cowles Bog Unit are unknown from any other Survey Unit. These include: *Betula lutea*, *B. pumila*, *Buchnera americana*, *Carex howei*, *C. subimpressa*, *Cypripedium reginae*, *Eleocharis melanocarpa*, *E. rostellata*, *Eriocaulon septangulare*, *Fimbristylis drummondii*, *Fuirena pumila*, *Galium labradoricum*, *G. trifidum*, *Juncus articulatus*, *Oenothera tetragona* var. *longistipata*, *Orobanche fascicularis*, *Panicum lucidum*, *P. verrucosum*, *Rhamnus alnifolia*, *Salix candida*, *Scirpus polyphyllus*, *Sparganium americanum*, *Spiranthes lacera*, *S. lucida*, and *Stylophorum diphyllum*.

NATURAL AREA ASSESSMENT

Survey Unit V, as can be seen from the Natural Area Vegetation Map, consists of seven of the eleven General community types; no other Survey Unit is that physiographically diverse. These General community types include: Aquatic communities; an extensive Foredune Complex; an area of Dune Complex; a Marsh Complex in which locally there are some affinities to the Panne; an area which has been mapped as Mesophytic Prairie--though only for a lack of a better term; an extensive and varied Savanna Complex; and a large, variously manifest Swamp Complex. Then there is the NIPSCO right-of-way.

No other Natural Area in the Lakeshore--or, for that matter, the Chicago region--is yet so rich in flora, and so profound in its Natural Area significance. There are, for example, about 1550 native vascular plant taxa known from the 22-county Chicago region, a region which occupies about 7,350,000 acres; more than 700 native vascular plant taxa have been recorded from the Dune Acres Unit, an area which now contains fewer than 1000 acres of Natural Area. Taken together, Survey Units V and VI probably comprise some of the most significant contiguous Natural Area in the eastern United States.

Survey Unit V owes its apparently unique floristic wealth, which despite repeated abuse over the years is still largely extant, in part to its topographic and physiographic diversity, and its relative significance from a Natural Area standpoint to the reality that most of the natural land in Indiana and the Chicago region either has been rubbed out, or is so compromised as to be scarcely recognizable as such.

Of the 1420 acres comprising this Survey Unit, about 35% either has been obliterated or seriously disturbed. Much of this disturbed area occupies that which was once the floristically rich Great Marsh, about which Cook & Jackson (1978) have written extensively with regard to the degree to which it has been drained, pastured, hayed, and so forth. Their treatment of the Great Marsh, and the Bailly area in general, is so well researched and well written that it would be redundant and presumptuous of me to attempt a condensation of even the more directly related portions. If, indeed, one's goal is to manage responsibly the natural amenities of the Indiana Dunes National Lakeshore, then a fundamental knowledge of the presettlement scenario and subsequent anthropogenics is critical; so the Cook & Jackson monograph, among other sources, is requisite reading anyway.

This Survey Unit, along with Survey Unit VI, contains the finest examples of the Foredune Complex communities remaining in Indiana; that portion west of the village of Dune Acres is particularly impressive, both visually and floristically, as are the adjacent and related areas

which are mapped as Dune Complex on the Natural Area Vegetation Map. With the exceptions of the Foredune Complex and the Swamp Complex [see also notes under *Betula papyrifera*], all of the lands in Survey Area A and B which generate graminoid fuels in the fall of the year have suffered profoundly from a chronic lack of fire. If one of our goals is to preserve, maintain, and protect our Natural Areas--and their attendant SPECIAL VEGETATION--then fires must soon return to this Survey Unit on a regular basis.

Even the massive marsh land areas of Survey Areas A and B, which I felt painfully necessary to map as highly disturbed on the Survey Unit Map, would benefit greatly from regular fires. An area which was similar in character, though not nearly so large (*i.e.*, without as much potential), is the West DuPage Woods Forest Preserve, DuPage County, Illinois. It was noted in 1977 (Wayne Lampa, pers. comm.) to contain about 20 to 25 low-quality wetland species. After a burn in the fall of that year, and one again the next year, the species richness was noted to have increased nearly six times, with quantum increases in manifest quality as well; the area now rates as a Natural Area. Such results now have become commonplace when fire is applied frequently, but it is critical, when firing wetland communities, to insure that water levels at the time of the burn are high enough to saturate the entire organic substrate.

I have spent quite a lot of time out in the cattail marsh, particularly the one in Survey Area A; and I found out that, while it is largely depauperate in species in any given area, it nevertheless contains scores of species represented by small, remote, and anemic populations here and there throughout the entire 350 acres. Regular fire and stable water levels would provide the constancy and dependability of conditions in which the many disparate populations could coalesce and admix in such a way as to turn what is bogus wetland into a diverse and healthy Natural Area.

Midwestern wetlands, while invariably abused, can be more forgiving with respect to recoverability than many of the more mesophytic or xerophytic areas. This is true partly because the Old World floristic elements are mostly weeds of arable soils and as a rule are not competitive with the New World wetland species, and partly because drainage is hard to achieve totally in large wetland tracts, thus making these tracts poor candidates for total destruction by the plow--relegating them instead to land uses such as haying, pasturage, and ultimate abandonment. Haying and pasturage are serious disturbances, but they are not as ultimate in their effect as would be the actual turning of the soil, such as occurs under the plow.

The data used in assessing the relative Natural Area significance and integrity of each Survey Area, and the Survey Unit as a whole, are provided in Table V. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from each Survey Area, along with the numerical rating coefficient as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient, and do not enter directly into the derivations of the Natural Area Indices. The "R" symbol (rather than an "x" symbol), when used in Table V, indicates a record other than the one to which I can personally attest--usually a report on the basis of some earlier record, such as a herbarium specimen or literature citation. Some of the species in the table are known from the Survey Unit, but not specifically from one of the five delineated Survey Areas, so they are listed without a tabular symbol; most of the weeds in that category are reports by Klick *et al.* (1989).

TABLE V: Summary of species upon which are calculated the various Natural Area Indices for each Survey Area and for the Survey Unit as a whole.

A	B	C	D	E	
			x	x	* Abutilon theophrasti
		x	x	x	0 Acer negundo
x	x	x	x	x	7 Acer rubrum
		x			5 Acer saccharum
x	x			x	* Achillea millefolium
x			x		7 Actaea pachypoda
x					10 Actaea rubra
R	x				15 Adiantum pedatum
x	x			x	2 Agrimonia gryposepala
x					8 Agrimonia parviflora
				x	* Agropyron repens
R					8 Agropyron trachycaulum unilaterale
x				x	* Agrostis alba
	x				1 Agrostis hyemalis
x	x			x	1 Agrostis perennans
				x	* Ailanthus altissima
					* Ajuga reptans
R	x			x	10 Aletris farinosa
x					4 Alisma subcordatum
	x				* Alliaria officinalis
			x		1 Allium canadense
			x		7 Allium tricoccum
x	x			x	8 Alnus rugosa americana
					* Amaranthus graecizans
x				x	0 Ambrosia artemisiifolia elatior
x					0 Ambrosia trifida
x	x	x	x		8 Amelanchier arborea
x					8 Amelanchier interior
x					15 Ammophila breviligulata
x					4 Amphicarpa bracteata
x	x			x	4 Andropogon gerardii
x	x			x	5 Andropogon scoparius
				x	* Andropogon virginicus
x	x				2 Anemone cylindrica
			x		7 Anemone quinquefolia interior
x				x	2 Anemone virginiana
			x		7 Anemonella thalictroides
x				x	5 Angelica atropurpurea
	R				6 Antennaria neglecta
x	x				6 Antennaria plantaginifolia
					* Anthriscus scandicina
x	x	x		x	6 Apios americana
x	x				5 Apocynum androsaemifolium
		x			4 Apocynum cannabinum
				x	2 Apocynum sibiricum
x	x				5 Aquilegia canadensis
x					10 Arabis canadensis
R					6 Arabis glabra

A	B	C	D	E	
x	x				7 Arabis lyrata
R					15 Aralia hispida
x	x	x	x		8 Aralia nudicaulis
					* Arctium minus
x	x				10 Arctostaphylos uva-ursi coactilis
x			x	R	5 Arisaema atrorubens
	x				7 Aristida purpurascens
x	x				5 Artemisia caudata
R					* Artemisia vulgaris
	R				5 Asarum canadense
	x				10 Asclepias amplexicaulis
x	x			x	4 Asclepias incarnata
R					10 Asclepias sullivantii
x	x			x	0 Asclepias syriaca
x	x				10 Asclepias tuberosa
	x				1 Asclepias verticillata
	R		x		15 Asimina triloba
	x			x	* Asparagus officinalis
x	R				6 Asplenium platyneuron
x	x				8 Aster azureus
			x		5 Aster cordifolius
x	x				5 Aster dumosus
	x				5 Aster ericoides
x	x				10 Aster junciformis
x	x				4 Aster lateriflorus
x	x				10 Aster linariifolius
x	x				10 Aster macrophyllus
x	x				4 Aster novae-angliae
				x	1 Aster pilosus
x				x	10 Aster praealtus
x					6 Aster puniceus
x	x				5 Aster puniceus firmus
		x			5 Aster sagittifolius
R					15 Aster sericeus
x	x			x	3 Aster simplex
x	x			x	10 Aster umbellatus
			x		6 Athyrium filix-femina michauxii
R					* Atriplex patula
	x				8 Baptisia leucantha
x					* Barbarea vulgaris
x	x				15 Bartonia virginica
x			x		* Berberis thunbergii
x					15 Betula lutea
x					15 Betula papyrifera
R					10 Betula populifolia
x	x				15 Betula pumila
x	x				5 Bidens comosa
R					8 Bidens connata
x					8 Bidens coronata
x	x				2 Boehmeria cylindrica
x					3 Boehmeria cylindrica drummondiana
x	R				15 Botrychium dissectum

A	B	C	D	E	
	R				20 Botrychium multifidum intermedium
x	R		x		6 Botrychium virginianum
	x		x		15 Brachyelytrum erectum
x					15 Brasenia schreberi
R					9 Bromus ciliatus
					* Bromus commutatus
					* Bromus inermis
	x				15 Bromus kalmii
R			x		* Bromus tectorum
	x				20 Buchnera americana
x			x		6 Bulbostylis capillaris
x	x				8 Cacalia atriplicifolia
x					1 Cakile edentula
x	x		x		3 Calamagrostis canadensis
R			x		5 Calamagrostis inexpansa brevior
x	x				10 Calamovilfa longifolia
R	R				15 Calopogon pulchellus
x	R		x		5 Caltha palustris
x					7 Campanula aparinoides
x	x				15 Campanula rotundifolia
					* Cannabis sativa
	x				* Capsella bursa-pastoris
x	x		x		5 Cardamine bulbosa
			x		6 Cardamine douglassii
x			x		4 Cardamine pensylvanica
x			x		10 Carex alata
x					8 Carex albolutescens
			R		2 Carex amphibola turgida
x	x				5 Carex aquatilis altior
x					15 Carex atherodes
			R		3 Carex bebbii
x			x		15 Carex bromoides
x	x		R		8 Carex buxbaumii
x					5 Carex comosa
x					15 Carex conoidea
			x	x	10 Carex crinita
			R		4 Carex cristatella
			x	x	20 Carex debilis rudgei
x			x	R	10 Carex emmonsii
			R		10 Carex festucacea
	x				20 Carex foenea
	x		x		20 Carex folliculata
R					10 Carex gracilescens
	x		x		10 Carex gracillima
R					6 Carex haydenii
R					20 Carex howei
x					4 Carex hystricina
x					10 Carex interior
	x		x	x	15 Carex intumescens
x			x		10 Carex lacustris
x	x		x		4 Carex lanuginosa
x	x				8 Carex lasiocarpa americana

A	B	C	D	E	
			R		15 Carex laxiculmis
x			x		1 Carex laxiflora
x			x		10 Carex leptalea
				x	20 Carex leptoneuria
x					10 Carex limosa
			R		8 Carex lupulina
			x		8 Carex lurida
x	x				5 Carex muhlenbergii
x	x	x	x		5 Carex pennsylvanica
R					10 Carex prairea
	x				1 Carex rosea
R					10 Carex rostrata utriculata
x					10 Carex sartwellii
x				x	7 Carex scoparia
x	x		x		20 Carex seorsa
x					10 Carex squarrosa
x				x	2 Carex stipata
x	x		x		5 Carex stricta
				x	20 Carex subimpressa
x	x			x	10 Carex swanii
				R	8 Carex tenera
R					9 Carex tetanica
x					15 Carex tonsa
				R	3 Carex tribuloides
R					15 Carex trisperma
x			R		10 Carex typhina
	x				10 Carex vesicaria monile
x			R	x	2 Carex vulpinoidea
				x	8 Carpinus caroliniana virginiana
	x				7 Carya cordiformis
		x	x		5 Carya ovata
	x				15 Castilleja coccinea
R					8 Caulophyllum thalictroides
x	x				8 Ceanothus americanus
x	x				6 Celastrus scandens
x					15 Celtis tenuifolia
					0 Cenchrus longispinus
x				x	* Centaurium pulchellum
x	x				7 Cephalanthus occidentalis
					* Cerastium vulgatum
				x	* Chaenorrhinum minus
R	x				15 Chamaedaphne calyculata angustifolia
x	x		x		8 Chelone glabra
x				x	* Chenopodium album
x					* Chenopodium botrys
x					4 Chenopodium leptophyllum
	R				20 Chimaphila maculata
R					20 Chimaphila umbellata cisatlantica
					* Chrysanthemum leucanthemum pinnatifidum
					* Chrysanthemum parthenium
		x	R		15 Chrysosplenium americanum
x					8 Cicuta bulbifera

A	B	C	D	E	
x	x		x	x	6 Cicuta maculata
x					5 Cinna arundinacea
x		x	x		0 Circaea quadrisulcata canadensis
R					6 Cirsium altissimum
x				x	* Cirsium arvense
	x			x	2 Cirsium discolor
x	x			x	10 Cirsium muticum
x					20 Cirsium pitcheri
x				x	* Cirsium vulgare
x	x				15 Cladium mariscoides
x			x		2 Claytonia virginica
x					4 Clematis virginiana
x	x	x		x	7 Comandra richardsiana
				x	* Commelina communis
	x				10 Commelina erecta deamiana
		x			* Convallaria majalis
					* Convolvulus arvensis
x				x	1 Convolvulus sepium
x					15 Coptis groenlandica
x	R				15 Corallorhiza maculata
	R				20 Corallorhiza odontorhiza
	x				7 Coreopsis lanceolata
R	x				8 Coreopsis palmata
x	x				5 Coreopsis tripteris
x					20 Cornus canadensis
	x		x		10 Cornus florida
x				x	5 Cornus obliqua
x	x	x	x		1 Cornus racemosa
x					15 Cornus rugosa
x					6 Cornus stolonifera
x	x				10 Cornus stolonifera baileyi
x	x	x	x	x	2 Corylus americana
		x			6 Crataegus pruinosa
x		x			2 Cryptotaenia canadensis
x					4 Cuscuta gronovii
x					7 Cycloloma atriplicifolium
x					15 Cyperus engelmannii
x					3 Cyperus erythrorhizos
				x	1 Cyperus esculentus
x					2 Cyperus ferruginescens
x	x				5 Cyperus filiculmis
x					5 Cyperus houghtonii
				x	7 Cyperus inflexus
x					5 Cyperus schweinitzii
x				x	1 Cyperus strigosus
x					20 Cypripedium acaule
	R				20 Cypripedium calceolus parviflorum
x	x				20 Cypripedium calceolus pubescens
x					20 Cypripedium candidum
x					20 Cypripedium reginae
x					* Dactylis glomerata
	x				5 Danthonia spicata

A	B	C	D	E	
				x	* Daucus carota
x					8 Decodon verticillatus
R	x				4 Desmodium canadense
R					15 Desmodium ciliare
x	x				10 Desmodium nudiflorum
x	x				5 Desmodium paniculatum
x	x				10 Desmodium sessilifolium
x					* Dianthus armeria
x	x	x			10 Diervilla lonicera
				x	* Digitaria ischaemum
				x	* Digitaria sanguinalis
			x	x	5 Dioscorea villosa
x	x				15 Drosera intermedia
				x	15 Drosera rotundifolia
			R	x	10 Dryopteris cristata
			x		15 Dryopteris noveboracensis
x	x		x		6 Dryopteris spinulosa
R			x		10 Dryopteris spinulosa intermedia
x	x			x	6 Dryopteris thelypteris pubescens
x	x				10 Dulichium arundinaceum
				x	0 Echinochloa crusgalli
					* Elaeagnus angustifolia
	x			x	5 Eleocharis calva
				x	8 Eleocharis elliptica
x					9 Eleocharis engelmannii
?					15 Eleocharis geniculata
x	x				15 Eleocharis melanocarpa
x				R	5 Eleocharis obtusa
x					8 Eleocharis olivacea
x					5 Eleocharis palustris major
x					15 Eleocharis rostellata
x	x				5 Eleocharis smallii
				x	* Eleusine indica
x	x				4 Elymus canadensis
				x	4 Elymus virginicus
			x		10 Epifagus virginiana
x	x				15 Epigaea repens glabrifolia
x					3 Epilobium coloratum
x					* Epilobium hirsutum
x					8 Epilobium leptophyllum
R					15 Epilobium strictum
x					* Epipactis helleborine
x	x	x	x		0 Equisetum arvense
	x				4 Equisetum hyemale affine
x	x				3 Equisetum hyemale intermedium
				x	* Eragrostis megastachya
				x	* Eragrostis pectinacea
				x	* Eragrostis poaeoides
x	x				3 Eragrostis spectabilis
x				x	2 Erechites hieracifolia
R				x	1 Erigeron annuus
x				x	0 Erigeron canadensis

A	B	C	D	E	
x	x				4 Erigeron philadelphicus
R					10 Erigeron pulchellus
R	x		x		3 Erigeron strigosus
R					20 Eriocaulon septangulare
R					15 Eriophorum angustifolium
R	x				9 Eryngium yuccifolium
R			x		7 Euonymus obovatus
			x		20 Eupatorium fistulosum
x	x		x		5 Eupatorium maculatum
x	x		x		6 Eupatorium perfoliatum
x	x				4 Eupatorium rugosum
x					1 Eupatorium serotinum
R	R				20 Eupatorium sessilifolium brittonianum
x	x	x		x	2 Euphorbia corollata
				x	* Euphorbia dentata
	x			x	* Euphorbia maculata
x	R				15 Euphorbia polygonifolia
				x	* Euphorbia supina
		x	x		10 Fagus grandifolia
x				x	* Festuca elatior
x	x				5 Festuca obtusa
x					* Festuca ovina
x				x	10 Fimbristylis autumnalis mucronulata
	x				20 Fimbristylis drummondii
x	x	x	x	x	1 Fragaria virginiana
x	x	x	x	x	5 Fraxinus americana
x			x		8 Fraxinus nigra
				x	2 Fraxinus pennsylvanica subintegerrima
R					20 Fuirena pumila
x		x	x		1 Galium aparine
x	x				7 Galium circaeans hypomalacum
x			x		4 Galium concinnum
x					15 Galium labradoricum
x	x				5 Galium obtusum
x	x				10 Galium pilosum
x					8 Galium tinctorium
x					15 Galium trifidum
x		x	x		5 Galium triflorum
x	x	x			10 Gaultheria procumbens
x	x	x			9 Gaylussacia baccata
	R			x	10 Gentiana crinita
	R				15 Gentiana flavida
x					9 Gentiana procera
x	x			x	15 Gentiana saponaria
	x				7 Geranium bicknellii
x			x		4 Geranium maculatum
x	x				10 Gerardia flava
x	x				8 Gerardia pedicularia ambigens
	x			x	7 Gerardia purpurea
x			x	R	0 Geum canadense
x			x		1 Geum laciniatum trichocarpum
			x		* Glechoma hederacea

A	B	C	D	E	
x	x			x	10 Glyceria canadensis
	x				8 Glyceria septentrionalis
x	x	x	x		4 Glyceria striata
x	x				2 Gnaphalium obtusifolium
R	R				20 Habenaria ciliaris
x	x			x	15 Habenaria clavellata
R					10 Habenaria hyperborea huronensis
R	R				10 Habenaria lacera
x		x			0 Hackelia virginiana
x	x	x	x		8 Hamamelis virginiana
					* Hedera helix
x	x				8 Helianthemum canadense
				x	* Helianthus annuus
x	x	x		x	5 Helianthus divaricatus
x				R	7 Helianthus giganteus
x				x	2 Helianthus grosseserratus
R	x				10 Helianthus occidentalis
R					* Helianthus petiolaris
				R	5 Helianthus strumosus
					* Hemerocallis fulva
x					6 Hepatica acutiloba
x					* Hesperis matronalis
	x				8 Heuchera richardsonii
	x			x	6 Hieracium canadense fasciculatum
x	x				6 Hieracium gronovii
x					* Hieracium pratense
	x				7 Hieracium scabrum
					* Holcus lanatus
					* Hordeum jubatum
	x				9 Houstonia caerulea
R	x				15 Hudsonia tomentosa
x					9 Hypericum boreale
x					8 Hypericum canadense
R					7 Hypericum gentianoides
x	x				10 Hypericum kalmianum
				R	8 Hypericum majus
	x				8 Hypericum mutilum
					* Hypericum perforatum
				x	4 Hypericum punctatum
x					10 Hypericum virginicum
x	x				8 Hypericum virginicum fraseri
	R				10 Hypoxis hirsuta
x			x		9 Ilex verticillata
x			x	x	3 Impatiens capensis
					* Ipomoea purpurea
x					* Iris pseudacorus
x	x	x	x	x	5 Iris virginica shrevei
				R	9 Juncus alpinus rariflorus
				x	20 Juncus articulatus
	x				8 Juncus balticus littoralis
x				R	9 Juncus brachycephalus
x	x				7 Juncus canadensis

A	B	C	D	E	
				x	4 Juncus dudleyi
x	x		x	x	7 Juncus effusus solutus
	x			R	8 Juncus greenei
	x			x	10 Juncus marginatus
				x	6 Juncus nodosus
x					20 Juncus pelocarpus
	x			x	20 Juncus scirpoides
x	x				0 Juncus tenuis
				x	4 Juncus torreyi
x					10 Juniperus communis depressa
x	x				2 Juniperus virginiana crebra
x	x				7 Koeleria cristata
x	x	x			7 Krigia biflora
x	x				6 Krigia virginica
x	x				4 Kuhnia eupatorioides corymbulosa
x	x	x		x	2 Lactuca canadensis
x				x	* Lactuca scariola
			x		3 Laportea canadensis
x					10 Larix laricina
x					8 Lathyrus palustris
x	x				7 Lechea leggettii moniliiformis
	x				7 Lechea minor
	R				7 Lechea tenuifolia
x	x				7 Lechea villosa
x	x				5 Leersia oryzoides
	x				7 Leersia virginica
x					5 Lemna minor
					* Leonurus cardiaca
x					* Lepidium campestre
				x	3 Leptoloma cognatum
x	x			x	4 Lespedeza capitata
	x				* Lespedeza cuneata
x	x				6 Lespedeza hirta
x	x				6 Liatris aspera
x	x				8 Liatris cylindracea
R	x			x	6 Liatris spicata
x			x		6 Lilium michiganense
R	x				15 Lilium philadelphicum andinum
x	x				6 Linaria canadensis
x	x		x		7 Lindera benzoin
				R	5 Lindernia dubia
R					15 Linnaea borealis americana
				x	15 Linum striatum
	x			R	15 Linum virginianum
	x				8 Liparis lilifolia
x	x				7 Liparis loeselii
		x	x		10 Liriodendron tulipifera
x	x				8 Lithospermum croceum
				x	7 Lobelia cardinalis
x				R	4 Lobelia inflata
R					9 Lobelia kalmii
x				x	6 Lobelia siphilitica

A	B	C	D	E	
	R				6 Lobelia spicata
	x				* Lonicera X bella
x	x		x		15 Lonicera dioica
					* Lonicera japonica
R	x			x	6 Ludwigia alternifolia
R			x		5 Ludwigia palustris americana
x					20 Ludwigia sphaerocarpa deamii
					* Lunaria annua
x	x				7 Lupinus perennis occidentalis
R		x		R	5 Luzula multiflora
	x				15 Lycopodium clavatum
				x	15 Lycopodium inundatum
	x				15 Lycopodium lucidulum
x					15 Lycopodium tristachyum
x				x	5 Lycopus americanus
x					10 Lycopus rubellus
x				x	6 Lycopus uniflorus
x	x			x	6 Lycopus virginicus
R			x		4 Lysimachia ciliata
	x			R	7 Lysimachia lanceolata
R					9 Lysimachia quadriflora
R	x			x	8 Lysimachia terrestris
x					9 Lysimachia thyrsiflora
x	R				7 Lythrum alatum
x	x	x	x		10 Maianthemum canadense interius
				x	* Malva neglecta
x	x		x		10 Medeola virginiana
x	x				15 Melampyrum lineare latifolium
x				x	* Melilotus alba
	x				6 Menispermum canadense
x					5 Mentha arvensis villosa
x				x	6 Mimulus ringens
x	x		x		15 Mitchella repens
R			x		10 Mitella diphylla
x					* Mollugo verticillata
x	x	x		x	4 Monarda fistulosa
x	x				5 Monarda punctata villicaulis
x	x				15 Monotropa hypopithys
x	x				15 Monotropa uniflora
					* Morus alba
x					7 Muhlenbergia glomerata
R				R	5 Muhlenbergia mexicana
x	x				0 Muhlenbergia schreberi
x					20 Myosotis laxa
x					* Nasturtium officinale
x	x				15 Nemopanthus mucronata
				x	* Nepeta cataria
x	x				7 Nuphar advena
x					7 Nymphaea tuberosa
x	x	x			8 Nyssa sylvatica
				x	1 Oenothera biennis
	x				15 Oenothera perennis

A	B	C	D	E	
x	x				7 <i>Oenothera rhombipetala</i>
	x				15 <i>Oenothera tetragona longistipata</i>
x	x		x	x	8 <i>Onoclea sensibilis</i>
	R				15 <i>Ophioglossum vulgatum pseudopodium</i>
x	x				5 <i>Opuntia humifusa</i>
	R				15 <i>Orobanche fasciculata</i>
	R				15 <i>Orobanche uniflora</i>
x	x	x	x		3 <i>Osmorhiza claytoni</i>
x					3 <i>Osmorhiza longistylis</i>
x	x	x	x		6 <i>Osmunda cinnamomea</i>
R					7 <i>Osmunda claytoniana</i>
x	x	x	x	x	8 <i>Osmunda regalis spectabilis</i>
			x		5 <i>Ostrya virginiana</i>
x				x	0 <i>Oxalis europaea</i>
				x	0 <i>Oxalis stricta</i>
x	x		x	x	7 <i>Oxypolis rigidior</i>
			x		15 <i>Panax trifolius</i>
	x			x	5 <i>Panicum agrostoides</i>
x				x	1 <i>Panicum capillare</i>
x	x	x		x	7 <i>Panicum clandestinum</i>
	x				10 <i>Panicum columbianum</i>
	x				10 <i>Panicum depauperatum</i>
x				x	0 <i>Panicum dichotomiflorum</i>
	x			x	20 <i>Panicum dichotomum</i>
				x	10 <i>Panicum flexile</i>
x	x			x	3 <i>Panicum implicatum</i>
x	x		x		7 <i>Panicum latifolium</i>
x	x				9 <i>Panicum lindheimeri</i>
			x		20 <i>Panicum lucidum</i>
	x				6 <i>Panicum meridionale</i>
x	x				7 <i>Panicum oligosanthos scribnerianum</i>
	x				8 <i>Panicum sphaerocarpon</i>
x	x				9 <i>Panicum spretum</i>
x					10 <i>Panicum verrucosum</i>
	x				7 <i>Panicum villosissimum</i>
x	x				9 <i>Panicum villosissimum pseudopubescens</i>
x	x			x	5 <i>Panicum virgatum</i>
x					10 <i>Parnassia glauca</i>
			x		1 <i>Parthenocissus inserta</i>
x	x	x	x	x	2 <i>Parthenocissus quinquefolia</i>
x	x				10 <i>Pedicularis canadensis</i>
x					7 <i>Pedicularis lanceolata</i>
R					15 <i>Peltandra virginica</i>
R				x	4 <i>Penstemon digitalis</i>
x					5 <i>Penthorum sedoides</i>
x	x			x	0 <i>Phalaris arundinacea</i>
				x	* <i>Phleum pratense</i>
x					8 <i>Phlox bifida</i>
	x		x		5 <i>Phlox divaricata</i>
				x	* <i>Phlox paniculata</i>
x	R				6 <i>Phlox pilosa</i>
x				x	4 <i>Phragmites communis berlandieri</i>

A	B	C	D	E	
		x			3 Phryma leptostachya
			x		3 Physalis heterophylla
R					4 Physalis virginiana
	x				8 Physocarpus opulifolius
			x		5 Physostegia virginiana
			x		2 Phytolacca americana
x					7 Pilea fontana
R					5 Pilea pumila
x	x				20 Pinus banksiana
					* Pinus nigra
x	x				20 Pinus strobus
					* Plantago lanceolata
x					* Plantago major
R			x		0 Plantago rugelii
			R		15 Poa alsodes
	x				* Poa annua
x	x	x		x	* Poa compressa
				x	15 Poa languida
x					20 Poa paludigena
x				x	* Poa pratensis
x			x		5 Podophyllum peltatum
x	x				10 Polygala cruciata aquilonia
x	x				10 Polygala polygama obtusata
			x		6 Polygala sanguinea
x	x	x			3 Polygonatum canaliculatum
x		x	x		7 Polygonatum pubescens
x	x				15 Polygonella articulata
x	x				5 Polygonum amphibium stipulaceum
x					15 Polygonum arifolium pubescens
x	x				5 Polygonum coccineum
					* Polygonum cuspidatum
x					7 Polygonum hydropiperoides
x	x				10 Polygonum opelousanum adenocalyx
R			x		0 Polygonum pensylvanicum laevigatum
			x		* Polygonum persicaria
x					6 Polygonum punctatum
x			x		10 Polygonum sagittatum
x			x		2 Polygonum scandens
	x				7 Polygonum tenue
R					15 Polypodium virginianum
R	x		x		10 Polystichum acrostichoides
x					10 Pontederia cordata
					* Populus alba
x	x	x	x		2 Populus deltoides
x					6 Populus grandidentata
x					* Populus nigra italica
x	x	x			4 Populus tremuloides
R					8 Potamogeton diversifolius
					* Potentilla argentea
					* Potentilla norvegica
x					15 Potentilla palustris
x	x				* Potentilla recta

A	B	C	D	E	
x	x	x	x		4 <i>Potentilla simplex</i>
x	x		x		5 <i>Prenanthes alba</i>
x	x			x	8 <i>Prenanthes racemosa</i>
x					6 <i>Proserpinaca palustris crebra</i>
					* <i>Prunella vulgaris</i>
x	x				0 <i>Prunella vulgaris lanceolata</i>
			x		5 <i>Prunus americana</i>
x					5 <i>Prunus pensylvanica</i>
x	x				8 <i>Prunus pumila</i>
x	x	x	x		1 <i>Prunus serotina</i>
x	x	x	x		1 <i>Prunus virginiana</i>
x					20 <i>Psilocarya scirpoides</i>
x	x				9 <i>Ptelea trifoliata mollis</i>
x	x	x		x	5 <i>Pteridium aquilinum latiusculum</i>
x	x			x	5 <i>Pycnanthemum virginianum</i>
x	x				10 <i>Pyrola elliptica</i>
x	x				15 <i>Pyrola rotundifolia americana</i>
R					20 <i>Pyrola secunda</i>
x	x	x		x	9 <i>Pyrus floribunda</i>
x		x			2 <i>Pyrus ioensis</i>
x	x	x		x	7 <i>Pyrus melanocarpa</i>
x	x	x		x	4 <i>Quercus alba</i>
			x	x	8 <i>Quercus bicolor</i>
x			x	x	8 <i>Quercus palustris</i>
R		x	x	R	7 <i>Quercus rubra</i>
x	x	x			6 <i>Quercus velutina</i>
x		x	x		0 <i>Ranunculus abortivus</i>
x					6 <i>Ranunculus pensylvanicus</i>
x					5 <i>Ranunculus recurvatus</i>
R					6 <i>Ranunculus sceleratus</i>
			x		4 <i>Ranunculus septentrionalis</i>
x					15 <i>Rhamnus alnifolia</i>
	x				* <i>Rhamnus frangula</i>
x	x			x	15 <i>Rhexia virginica</i>
x	x				15 <i>Rhus aromatica arenaria</i>
x	x	x		x	6 <i>Rhus copallina latifolia</i>
x	x	x	x		1 <i>Rhus radicans</i>
x				x	3 <i>Rhus typhina</i>
x	x			x	15 <i>Rhus vernix</i>
R					10 <i>Rhynchospora capillacea</i>
x	x			x	8 <i>Rhynchospora capitellata</i>
	x				20 <i>Rhynchospora globularis recognita</i>
x					15 <i>Rhynchospora macrostachya</i>
x					7 <i>Ribes americanum</i>
			x		5 <i>Ribes cynosbati</i>
R					20 <i>Ribes hirtellum</i>
		x			* <i>Robinia pseudo-acacia</i>
					* <i>Robinia viscosa</i>
x					5 <i>Rorippa islandica fernaldiana</i>
x	x	x		x	5 <i>Rosa carolina</i>
x			x	x	* <i>Rosa multiflora</i>
x	x				9 <i>Rosa palustris</i>

A	B	C	D	E	
R					10 <i>Rotala ramosior</i>
x	x			x	3 <i>Rubus allegheniensis</i>
x				x	4 <i>Rubus flagellaris</i>
x	x				9 <i>Rubus hispidus obovalis</i>
x	x	x		x	7 <i>Rubus idaeus strigosus</i>
x		x		x	2 <i>Rubus occidentalis</i>
	x	x		x	3 <i>Rubus pensylvanicus</i>
x	x		x		15 <i>Rubus pubescens</i>
x	x			x	1 <i>Rudbeckia hirta</i>
				x	9 <i>Rudbeckia subtomentosa</i>
x					* <i>Rumex acetosella</i>
					* <i>Rumex crispus</i>
R					* <i>Rumex obtusifolius</i>
x	x				7 <i>Rumex orbiculatus</i>
R	R				15 <i>Sabatia angularis</i>
x					9 <i>Sagittaria graminea</i>
x					4 <i>Sagittaria latifolia</i>
R					15 <i>Sagittaria rigida</i>
x				x	5 <i>Salix amygdaloides</i>
x				x	8 <i>Salix bebbiana</i>
x					15 <i>Salix candida</i>
x	x			x	2 <i>Salix discolor</i>
x				x	* <i>Salix fragilis</i>
x	x			x	7 <i>Salix glaucophylloides glaucophylla</i>
x					10 <i>Salix gracilis textoris</i>
	x	x			6 <i>Salix humilis</i>
x	x				1 <i>Salix interior</i>
x				x	4 <i>Salix nigra</i>
R					15 <i>Salix pedicellaris hypoglaucia</i>
x				x	5 <i>Salix rigida</i>
x					15 <i>Salix sericea</i>
x	x	x	x	x	1 <i>Sambucus canadensis</i>
R					10 <i>Sambucus pubens</i>
R					6 <i>Samolus parviflorus</i>
x				x	* <i>Saponaria officinalis</i>
x					15 <i>Sarracenia purpurea</i>
x	x	x		x	6 <i>Sassafras albidum</i>
R					* <i>Satureja hortensis</i>
x	x				10 <i>Saururus cernuus</i>
			x		8 <i>Saxifraga pensylvanica</i>
x					6 <i>Scirpus acutus</i>
R					7 <i>Scirpus americanus</i>
R	x			x	4 <i>Scirpus atrovirens</i>
x	x			x	6 <i>Scirpus cyperinus</i>
x					6 <i>Scirpus fluviatilis</i>
R					4 <i>Scirpus lineatus</i>
?					20 <i>Scirpus polyphyllus</i>
x					20 <i>Scirpus purshianus</i>
R					5 <i>Scirpus validus creber</i>
x					20 <i>Scleria reticularis</i>
R	x				10 <i>Scleria triglomerata</i>
x					4 <i>Scrophularia marilandica</i>

A	B	C	D	E	
x					5 Scutellaria epilobiifolia
x	x			x	5 Scutellaria lateriflora
					* Sedum sarmentosum
x	R				7 Senecio aureus
R					15 Senecio plattensis
			x		* Setaria faberii
			x		* Setaria glauca
			x		* Setaria italica
	x		x		* Setaria viridis
x					5 Silene antirrhina
x	x			R	10 Sisyrinchium angustifolium
	x				15 Sisyrinchium atlanticum
x	x				7 Sium suave
x	x	x	x		2 Smilacina racemosa
x	x	x	x		5 Smilacina stellata
x		x			3 Smilax ecirrhata
x	x				4 Smilax lasioneura
x	x	x	x	x	15 Smilax rotundifolia
x	x				5 Smilax tamnoides hispida
R					* Solanum americanum
					* Solanum carolinense
x				x	* Solanum dulcamara
x	x			x	1 Solidago altissima
x	x	x	x		7 Solidago caesia
x	x			x	3 Solidago gigantea
x				R	4 Solidago graminifolia media
x	x			x	3 Solidago graminifolia nuttallii
x	x			x	5 Solidago gymnospermoides
	x			x	5 Solidago juncea
x	x				4 Solidago nemoralis
R					8 Solidago ohioensis
x	x		x		8 Solidago patula
x					15 Solidago racemosa gillmani
x					7 Solidago riddellii
	x				4 Solidago rigida
x	x	x		x	6 Solidago rugosa
x	x				7 Solidago speciosa
R					10 Solidago tenuifolia
R					9 Solidago uliginosa
	x				5 Solidago ulmifolia
					* Sonchus oleraceus
				x	* Sonchus uliginosus
x	x				5 Sorghastrum nutans
x					15 Sparganium americanum
			x		5 Spartina pectinata
x				R	4 Sphenopholis intermedia
x	x			x	7 Spiraea alba
x	x			x	9 Spiraea tomentosa rosea
x	R			x	7 Spiranthes cernua
			x		15 Spiranthes lacera
x					15 Spiranthes lucida
			x		7 Sporobolus cryptandrus

A	B	C	D	E	
x	x				15 Stachys hyssopifolia
				x	5 Stachys palustris homotricha
				R	5 Stachys tenuifolia hispida
R					* Stellaria longifolia
					8 Stellaria media
R	x				6 Stipa spartea
x					7 Strophostyles helvola
R					15 Stylophorum diphyllum
x	x		x		6 Symplocarpus foetidus
x				x	* Taraxacum officinale
x	x				8 Tephrosia virginiana
				x	3 Teucrium occidentale
x					4 Thalictrum dasycarpum
x				x	5 Thalictrum dasycarpum hypoglaucum
x					5 Thalictrum revolutum
x					15 Thuja occidentalis
x			x	x	5 Tilia americana
			x		2 Tovararia virginiana
x	x	x		x	2 Tradescantia ohiensis
					* Tragopogon major
x	R		x		15 Trientalis borealis
					* Trifolium dubium
R					* Trifolium hybridum
					* Trifolium pratense
					* Trifolium repens
R					10 Triglochin maritima
			x		6 Trillium flexipes
	x				8 Trillium grandiflorum
			x		5 Trillium recurvatum
				x	* Triodia flava
x	x				2 Typha angustifolia
x	x			x	1 Typha latifolia
x	x		x		3 Ulmus americana
					* Ulmus pumila
			x		4 Ulmus rubra
x		x			2 Urtica procera
x					15 Utricularia gibba
R					15 Utricularia minor
x					20 Utricularia purpurea
x					10 Utricularia vulgaris
			x		7 Uvularia grandiflora
x	x	x			5 Vaccinium angustifolium laevifolium
x	x				15 Vaccinium atrococcum
x	x				8 Vaccinium corymbosum
R					15 Vaccinium macrocarpon
x	x	x			5 Vaccinium vacillans
				x	* Verbascum thapsus
x	x			x	4 Verbena hastata
				x	5 Verbena urticifolia
x					5 Vernonia altissima
	x				5 Vernonia fasciculata
	x		x		5 Vernonia missurica

A	B	C	D	E	
R					10 <i>Veronica comosa</i>
	x				1 <i>Veronica peregrina</i>
x					10 <i>Veronica scutellata</i>
x	x		x		9 <i>Viburnum acerifolium</i>
x	x		x		5 <i>Viburnum lentago</i>
				x	* <i>Viburnum opulus</i>
			x		4 <i>Viburnum prunifolium</i>
x	R	x			5 <i>Viburnum rafinesquianum</i>
					* <i>Vicia villosa</i>
	x				10 <i>Viola conspersa</i>
R			x		6 <i>Viola cucullata</i>
R					15 <i>Viola incognita forbesii</i>
	x				7 <i>Viola lanceolata</i>
x	x		x		15 <i>Viola pallens</i>
x	x				10 <i>Viola pedata lineariloba</i>
			x		5 <i>Viola pensylvanica</i>
	x			x	7 <i>Viola sagittata</i>
x					3 <i>Viola sororia</i>
x	x				10 <i>Vitis aestivalis</i>
x	x			x	15 <i>Vitis labrusca</i>
x	x	x	x	x	4 <i>Vitis riparia</i>
x	x				6 <i>Vulpia octoflora tenella</i>
x					20 <i>Woodwardia areolata</i>
x	x				15 <i>Woodwardia virginica</i>
R					* <i>Xanthium strumarium</i>
R	x				15 <i>Xyris torta</i>
					* <i>Zea mays</i>
R					15 <i>Zizania aquatica</i>
			x		7 <i>Zizia aurea</i>

Summary

Survey Area A (surveyed May 27, June 29, September 8, 10, 11, and 15, 1979; July 11, 1987; and August 30, 1988) includes all of the Lakeshore area west of Mineral Springs Road and north of the Chicago South Bend and South Shore traction line, an area of about 735 acres. About 20% of Survey Area A is mapped as highly disturbed; this disturbed section largely includes the Great Marsh area south of the ditch which was used to drain Little Lake (see Cook & Jackson, 1978, pages 10 and 11). Little Lake itself, and the one-time cranberry marsh to the south, were mapped as Natural Area on the Survey Unit Map even though they have been drained. The fact that Little Lake was only partially drained, coupled with the proximity of both Little Lake and the cranberry marsh later shared with the floristically rich Goose Lake region for nearly 25 years after having been abandoned, has made the recovery of the area quite remarkable [the disturbance history of the Great Marsh is more complicated and less fortunate]. It is reasonable to speculate, with respect to recovery potentials in the future, however, that if drained permanently, both Little Lake and the "cranberry marsh" (into which cranberries have not returned) will lose forever the rich assortment of vascular plants by which they are currently vegetated.

On the whole, 452 native floristic elements have been documented from Survey Area A; their Mean Quality is 7.53, and they represent a Natural Area Index of 160. If the 98

additional floristic elements (those codified by an "R" symbol in Table V) which have been reported reliably from the area are included in the calculations, the Mean Quality becomes 7.96, with an overall Natural Area Index of 186--mind boggling.

It is possible that a few of those 101 additional reports for Survey Area A were actually based upon records from Survey Unit B. This possibility exists because I have routinely, in my literature research, interpreted reports referencing locations in terms of "Mineral Springs" as referring to the area west of Mineral Springs Road; it is my judgment that this was usually their intention. Reports from the eastern side of Mineral Springs Road were usually referenced in relation to "Port Chester." In a few instances, nevertheless, it is likely that the term "Mineral Springs" referred to an area in Survey Area B.

Survey Area B (surveyed July 15, August 29, and September 15, 1979) includes all of the Lakeshore area east of Mineral Springs Road and north of the Chicago South Bend and South Shore traction line (including the area shown as Survey Area D on the Survey Unit Map); this area includes about 580 acres. Nearly forty-five percent of Survey Area B is mapped as highly disturbed on the Survey Unit Vegetation Map. In terms of overall relative importance, Survey Area B currently stands as virtually equivalent to Survey Area A in Natural Area significance.

On the whole, 399 native floristic elements have been documented from Survey Area B; their Mean Quality is 7.50, and they represent a Natural Area Index of 150. If the 28 additional floristic elements (those codified by an "R" symbol in Table V) which have been reported from the area are included in the calculations, the Mean Quality becomes 7.88, with an overall Natural Area Index of 163

Survey Area C (surveyed June 12, 1979) consists of the 5-10 acre tract of wooded area between U.S. 12 and the Chicago South Bend and South Shore traction line, as mapped on the Natural Area Vegetation Map. I mapped it as Savanna Complex; but it is a mesophytic phase of Savanna Complex which in recent years has taken on the superficial aspect of Mesophytic Forest as described by Wilhelm (1987). The dearth of fire has encouraged the development of such trees as Sugar Maple (*Acer saccharum*) and Beech (*Fagus grandifolia*). The successful manifestations of both trees warns of the fact that in not too many years their shade will make conditions hostile to the few modal Savanna Complex species which yet remain in these woods. Already the relatively low Mean Quality (4.73) and Index of 42 suggest that this trend may be quite advanced. The important point to emphasize here is that Survey Area C is not "succeeding" to Mesophytic Forest in the holistic sense of the term; rather, it is becoming anemic Savanna as a result of the onset of a traumatic trend toward mesicity caused by the cessation of fire.

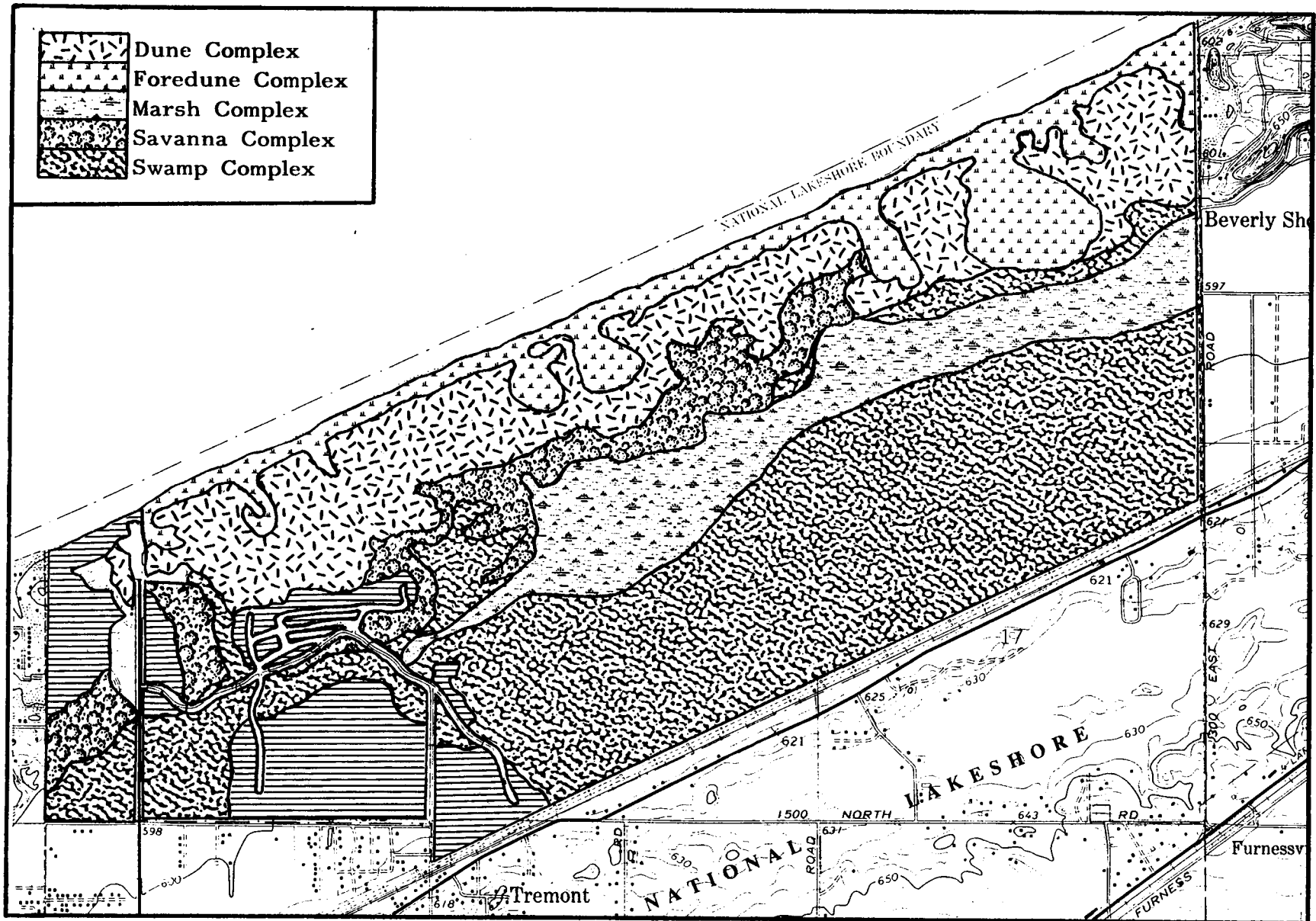
Survey Area D is 25 acres of a fairly intact tract of Mesophytic Forest. I visited it only once, on May 7, 1987, but turned up 124 native species, including several elements of the SPECIAL VEGETATION. The Mean Quality of the species is 6.92, rendering an Index of 77. It is probable that intensive surveys would yield an Index close to 90, so it is deserving of additional attention.

Survey Area E is the 25 acres of NIPSCO right-of-way, mostly between Mineral Springs Road and Waverly Road. We are still trying to figure out why this right-of-way is so blessed with native vegetation, including several SPECIAL VEGETATION floristic elements which grow nowhere else in the Survey Unit. It is a curious mixture of conservative Mesophytic Prairie, Fen, Hydromesophytic Swamp, and Bog species. Whatever its fundamental origin and

contemporary ontogeny, we know of at least 187 native species with a Mean Quality of 6.01. The Natural Area Index is 83. There are an additional 28 reports, mostly by Ken Dritz, which yield an Index of 89! It rivals Little Lake in terms of floristic significance.

Survey Unit V, as a whole, is a leviathan among natural areas. I can testify to the existence of 620 species altogether. Their Mean Quality is 7.63, and they render a Natural Area Index of 190. When the additional 87 native floristic elements reported reliably to have grown within the boundaries of this Survey Unit are included in the Natural Area Assessment, the Mean Quality rises to 8.15, with a Natural Area Index of 217. Where else in the north temperate United States can such immense conservatism exist across so small an area? This 1400 acre tract represents a world-class natural area.

SURVEY UNIT VI MAP



SURVEY UNIT VI: INDIANA DUNES STATE PARK

This Survey Unit occupies about 2180 acres (2050 excluding roads) north of Tremont between Dune Acres and Beverly Shores (see Figure II). About 15% of this Survey Unit has been disturbed to the point where SPECIAL VEGETATION floristic elements are no longer likely to be found (see Survey Unit Map). As a result of certain bureaucratic and logistic circumstances, I have spent nowhere nearly as long in the State Park as I have in other areas. I devoted a couple of hours on June 28, 1979, during which investigation I was accompanied by John Bacone and Norm Henderson; in May of 1986, I surveyed the woody plants of the Park with Floyd Swink and Ross Clark; I surveyed the prairie along Trail 3 with Noel Pavlovic July 2, 1987, during which survey we added numerous prairie species to the State Park inventory. On April 29, 1987 with Robert F. Betz and Eric Kjellmark, and August 11, 1987 with Elizabeth Shimp, I surveyed portions of the Swamp Complex west of Route 49 and west of Kemil Road. On October 2, 1989, Linda Wetstein and I spent a half day in the park and added numerous new records, including *Corallorhiza odontorhiza* and *Bidens discoidea*. I have, of course, led several field trips over the years, during which I have made desultory recordings. Given the immensity of the State Park and its consummate floristic richness, I have depended largely upon the sleuthing of others to turn up the hidden delights. These individuals include: Norman Bergendahl, Keith Board, Ken Dritz, Ray Grow, Emma Pitcher, Barbara Plampin, and Valdemar Schwarz. On other occasions, I have been accompanied by Dianne Butkovich, Marilyn Halperin, Noreen Hannon, and Rita Hassert.

On May 25, 1989, I joined a team of botanists, led by Mike Homoya, from the Indiana Division of Nature Preserves: Lee Casebere, Cloyce Hedge, Sheryl LeBlanc, Tom Post, and Art Spingarn. Divided into four teamlets, we combed the park eastward along Trail 10 and northward through the Dune Complex, lunched at The Pinery, and returned through the Hydromesophytic Swamp. Each teamlet had radios with which we could share our discoveries. We saw numerous individuals and populations of SPECIAL VEGETATION floristic elements, including *Carex laxiculmis*, *C. seorsa*, *Chrysosplenium americanum*, *Cypripedium calceolus* var. *pubescens*, *Juniperus communis* var. *depressa*, *Oryzopsis asperifolia*, *Poa alsodes*, *Polygala paucifolia*, *Pyrola elliptica*, and *P. rotundifolia* var. *americana* to name just a few. This was a long but rewarding day. I know of no time in the recorded floristic history of Indiana Dunes State Park when so many have gathered to explore specifically the botanical treasures of this magnificent area.

The Survey Unit Map was superimposed to scale over a part of the U.S.G.S. Dune Acres Quadrangle, N4137.5-W8700/7.5, photo-revised 1980. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a color oblique set flown in May, 1978; a black & white stereo-pair set (BFP-2: 51-53) flown in November, 1939; a black & white stereo-pair set (BFP-5: 3-5) flown in June, 1939; a black & white stereo-pair set (BFP-1V: 25-27) flown in September, 1958; a black & white stereo-pair set (BFP-2V: 119, 152 & 153) flown in September, 1958; a color stereo-pair set (77-157: 13-19) flown in April, 1977; a color stereo-pair set (79-117: 27-33 and 77-82) flown in May, 1979; a black & white stereo-pair (6:9 - 6:17 and 7:7 - 7:16) flown in May, 1984; and a color stereo-pair (4:7 - 4:10) flown in May, 1984.

Several authors have dealt specifically with the flora of this Survey Area. Lyon (1927) compiled a fairly comprehensive list of the vascular plants of "Dunes State Park and Vicinity." Peattie (1930), in his *Flora of the Indiana Dunes*, made numerous references to Indiana Dunes State Park. Both Pepoon (1927) and Swink & Wilhelm (1979) made frequent references to the

various interesting plants of this Survey Unit in their regional treatments of the Chicago Region flora. Laughlin (1953) compiled a comprehensive catalogue of the trees and shrubs of Indiana Dunes State Park. Numerous other short notes and articles also refer to the plants of Indiana Dunes State Park.

Had I never even set foot in Survey Unit VI, it would have been possible to glean from the literature a substantial record of the vascular plants which are known to have grown there. It is reasonable to assume that most of the floristic elements known from this Survey Unit, if validly reported in the first place, are still represented by extant populations somewhere within the boundaries of the park; it is also reasonable to assume that there are many more which have yet to make their way into the literature. Indeed, when I first did this survey in 1979 (Wilhelm, 1980), I bore witness to 278 native floristic elements and gleaned an additional 210 reports from reliable sources. Ten years later, I am able to say that I have seen 432 elements and am aware of an additional 136. Where will it end?

Laughlin (1953) reported that two woody species, known from the park, had become extinct in his time. One was Bladdernut (*Staphylea trifolia*), about which he wrote: "In 1938 W.F. Durno showed me a colony of Bladdernuts west of Tremont Road and south of the creek. They seemed to be suffering from some sort of blight or fungus. I have seen no specimens of the species since 1941, and a search of the locality in 1951 failed to reveal any."

Later, Laughlin (1955) reported that he had learned of numerous Bladdernuts a short distance west of Tremont Road and south of the east fork of Dunes Creek. Board (1987) noted that he found a healthy population in the "exact" location described by Laughlin.

Another species, far more interesting, was American Chestnut (*Castanea dentata*). There is a controversy surrounding the nativity and persistence of this tree at Indiana Dunes State Park. Laughlin (1953) wrote that:

"There was a small colony of Chestnuts on the east bank of the east fork of Dunes Creek about 150 feet north of the railroad. In 1942 the largest tree had a diameter of 28", a circumference of 7'9" and a height of 54'. In 1944 this tree was found to be dead from the Asiatic chestnut blight. Another tree 16" in diameter continued to live until 1947, when it succumbed. Feeble second-generation sprouts from the bases of two of the dead trunks persisted until the winter of 1951-52, when the last of the sprouts died."

Laughlin (1955) amended his conclusions by reporting that there was one sapling Chestnut with a diameter of 3 inches and height of about 20 feet a few feet west of the east fork of Dunes Creek and a short distance northwest of the old colony; he noted that it was a perfectly healthy tree. Swink & Wilhelm (1979), in reference to Laughlin's comment, add that:

"The senior author saw a different Chestnut sapling in the same park in 1950; it was seen south of Trail 2 in a thicket of *Sassafras albidum*. Since Deam cites Chestnut only in southern Indiana, it is questionable that any specimens found in our counties are to be considered native."

Bergendahl (1988) wrote to Floyd Swink and enclosed a map which describes the location of a Chestnut 2 feet in diameter, 68 feet west of Dune Creek, 45 feet north of the cyclone fence which marks the park boundary. He mentions also that "... in the 1940's, there were about a dozen planted Chestnut trees in a north & south row about 100 feet east of Dune Creek,"

perhaps 80 feet north of the cyclone fence. These latter trees may have been the trees which Floyd saw in 1950. The following remarks of Bergendahl are of no little interest:

"I am fascinated by an American Chestnut tree at Indiana Dunes State Park. It is a vigorous tree 2'-0" dia. B.H. and is at least 50'-0" high. Inasmuch as this tree has existed for probably 40 years or more since the advent of the blight, it would appear to be blight resistant. October 17 [1988], a visit to the tree was made with the intention of obtaining some nuts. I did not find any as the squirrels beat me to it. However, while looking for nuts, 26 seedling trees were found. There are probably more that escaped my eye, as the understory is dense with spicebush. In 1945, after a hike on the Appalachian trail, I planted many nuts at the park. The nuts that were planted came from basal shoots from tall gray trunks of blight affected trees."

This writer does not know really quite what to think about the nativity of American Chestnut in this region. A 28" Chestnut, recorded in 1942, began growing prior to the plantings of Norman Bergendahl, and it or its progeny just might have preceded European settlement. Certainly, the trees noted by Laughlin (1955) may have been planted. We have several records of large Chestnuts from similar habitats in nearby Berrien County, Michigan. If, indeed, the American Chestnut is native here, then it should certainly be a cardinal element of SPECIAL VEGETATION.

Another Appalachian species, *Rubus odoratus*, about whose nativity I was skeptical in 1980, is now known to have been planted under the white pines off of Trail 10. I was told by Barbara Plampin (1989b) that *Clintonia borealis*, Bluebead, also has been planted in the Pinery. Ken Dritz noted (pers. comm.) that *Monarda didyma* has been planted south of the boardwalk near the east end of Trail 10.

This business of tucking rare, usually pretty plants into natural areas is, of course, well-intentioned, but it confuses our understanding of the autecology of these species and obfuscates the synecology and genuine uniqueness of the natural areas, wherein we find them. The only location in the region, for example, where *Polygala paucifolia* grows natively is in the dune complex of Indiana Dunes State Park—not Dune Acres, or Keiser, or anywhere else. Just exactly why, no one knows. But its singular presence there should point up the imperative need to safeguard and manage well the dune complex of the park itself, for clearly there is more to that special place than our inchoate understandings can comprehend. If we were to regard the preservation of *Polygala paucifolia* as something so trivial as transplanting it to some other place, we might as well put specimens of all our native species in pots in the greenhouse and call it a day. It serves no rational purpose to spend good intentions and energies tucking in pretty plants—indeed it is a philosophically superficial, even insidious expenditure of resources. While it certainly is more difficult, our energies should be spent understanding and managing our natural systems as a whole, for these systems, when healthy, will assure the indefinite survival of all their plants, animals, and land forms.¹

¹Deam (1940) expressed similar sentiments under *Coreopsis grandiflora*, which had been introduced into Indiana from the west. "The seed may have been scattered here along the highway by some sentimental, trans-continental tourists who acted upon the ill advice published in a magazine a few years ago. It was recommended that tourists should scatter seeds of conspicuous flowers along the roadsides from coast to coast and from the Gulf of Mexico northward."

ANNOTATED LIST
OF
SPECIAL VEGETATION FLORISTIC ELEMENTS

Adiantum pedatum L. This delicate fern is still extant on shaded slopes within the Dune Complex, and Plampin (1987d) reported two plants west of Kemil Road near a beech mound.

Alnus rugosa var. **americana** (Regel) Fern. This alder is frequent in and along the margins of the Hydromesophytic Swamp. REPRESENTATIVE SPECIMEN: *Wilhelm #6931, 29 JUN 1979; at Indiana Dunes State Park, along subdunal trail.* MOR.

Amelanchier humilis Wieg. This comely shrub is rare to infrequent in the Dune Complex and Savanna Complex, particularly in the eastern end of the park.

Ammophila breviligulata Fern. This important grass is still occasional to common along the Foredune Complex. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain. REPRESENTATIVE SPECIMEN: *Tryon, 3 AUG 1935; shore dune 0.5 mile W of E end of Dunes State Park, dry, sunny.* F.

Aplectrum hyemale (Muhl.) Torr. Valdemar Schwarz first reported "more than 50 plants" of this species in The Pinery, November 7, 1981. He was able to demonstrate the existence of about a half dozen plants from this population to Floyd Swink May 21, 1989; these were located just south of the boardwalk along Trail 10 in the vicinity of The Pinery. Plampin (1989b) reported "100+ plants at this location and farther east earlier in the year. She noted that most of them grew near *Liriodendron tulipifera* and *Senecio aureus*.

Aralia racemosa L. According to Plampin (1987d), there is one plant of Spikenard west of Kemil Road, south of a beech mound, between the beeches and the fence.

Arctostaphylos uva-ursi var. **coactilis** Fern. & Macbr. Bearberry is frequent in the Dune and Foredune Complex portions of the park. REPRESENTATIVE SPECIMEN: *Podrasky & Sherman #8, 17 JUL 1984; Dunes State Park, foredune close to beach; creeping on side of dunes.* MOR. According to Parker (1936), local populations of this species are boreal relicts.

Arenaria stricta Michx. Known from this Survey Unit only on the basis of the following REPRESENTATIVE SPECIMEN: *Deam #20997, 3 JUL 1916; wooded dunes near Waverly Beach, along Lake Michigan north of Chesterton.* IND.

Aristida tuberculosa Nutt. According to Floyd Swink, this species is still extant at the Pavlovic Prairie. One might question the validity of the locality on the following REPRESENTATIVE SPECIMEN inasmuch as the habitat on the label is not that of this species: *Deam #38785, 8 JUN 1923; frequent in moist and boggy woods 2 miles E of Tremont.* IND. Both Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Asclepias viridiflora Raf. Known from this Survey Unit only on the basis of the following comment by Lyon (1927): ". . . very open wooded dune, Port Chester, found but once."

Asimina triloba (L.) Dunal This tree is still extant in the Dune Complex not far from Trail 10, and Plampin (1989b) noted it from the Hydromesophytic Swamp west of the Beech mound west of Kemil Road.

Aster furcatus Burgess Known from this Survey Unit based only on the following comment by Lyon (1927): "... subdunal woods, Tremont. Specimen in Blake Herbarium."

Aster junciformis Rydb. Probably still extant in the Marsh Complex, from where reported by Lyon (1927).

Athyrium thelypteroides (Michx.) Desv. Ken Dritz noted this rare fern along Trail 2, July 13, 1980 (Dritz, 1987).

Bartonia virginica (L.) BSP. This species is still extant in the Marsh and Swamp Complexes, though Lyon (1927) regarded it as "rather rare." Bowles (1987) listed it as an associate of **Habenaria clavellata**, which see. Parker (1936) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Betula papyrifera Marsh. Known from this Survey Unit first on the basis of Laughlin's (1953) report, in which he cites two trees "... about 75 feet south of No. 2 trail in the east central part." Second, Bergendahl (1983) noted that it grows in the swampy woods north of tower #8818. Deam (1932) considered Indiana populations of this species to be boreal relicts.

Betula populifolia Marsh. Laughlin reported one tree "11 feet south of No.2 trail and about 400 feet west of its junction with No.5." Swink & Wilhelm (1979) suggested strongly, however, that reports for Porter County, Indiana are based upon naturalized specimens. Peattie (1930) mentions that in his time it had been "... repeatedly reported from our region ... though generally as second-hand information. It may yet be found in this region, but has probably been confused with **Populus tremuloides** saplings." Deam (1940) excluded this species from Porter County, Indiana, suggesting that some reports for this species may be based on planted specimens. Bowles *et al.* (1985) monitored a Gray Birch population along the NIPSCO right-of-way, but did not voucher it with a specimen. Until I see a *bona fide* specimen from the State Park, I will refer the reader to the discussion of this species under the Miller Unit.

Botrychium dissectum Spreng. This fern (f. **obliquum** and f. **dissectum**) is still extant along Trail 2, and Pepoon cited it from Mt. Tom. At the Field Museum (F) there is a specimen of **B. dissectum** f. **oneidense**, collected by Tryon (24 SEP 1932) and **B. dissectum** f. **obliquum**, also collected by Tryon (25 SEP 1932); both were from "damp woods." Bowles *et al.* (1985) discovered **B. dissectum** var. **oneidense** along Trail 2 in what they describe as "mid-successional mesic sand forest." They listed it as growing with **Acer saccharum**, **Allium tricoccum**, **Cornus alternifolia**, **Cryptotaenia canadensis**, **Fraxinus americana**, **Galium aparine**, **Lindera benzoin**, **Osmorhiza longistylis**, **Prunus serotina**, **Quercus alba**, **Q. rubra**, **Sanicula** sp., **Smilacina stellata**, and **Tovara virginiana**. The following REPRESENTATIVE SPECIMEN, referable to the forma **obliquum**, may have been collected in the Dune Acres Unit: Bennett *s.n.*, 6 NOV 1960; in moist soil in thicket at north edge of swamp; 0.25 mile west of road and 0.5 mile north from South Shore line station at Port Chester. F.

Botrychium matricariaefolium A. Br. Certainly one of our rarest ferns; it was first discovered at Indiana Dunes State Park. Recently it was rediscovered along Trail 2; Bowles *et*

al. (1985) sampled the population and recorded the following associates: *Acer saccharum*, *Allium tricoccum*, *Cornus alternifolia*, *Cryptotaenia canadensis*, *Galium aparine*, *Lactuca* sp., *Lindera benzoin*, *Osmorhiza longistylis*, *Prunus serotina*, *Sanicula* sp., *Smilacina stellata*, and *Tovara virginiana*. Bowles (1987) noted a second colony near the one he sampled in 1984. REPRESENTATIVE SPECIMEN: *Armstrong & Schwarz s.n.*, 23 MAY 1965; at Indiana Dunes State Park, on right side of Trail #2, south side, ca 200 feet before turning north. MOR.

Botrychium multifidum* var. *intermedium (D.C.Eat.) Farw. This rare fern is apparently known from this Survey Unit only on the basis of the following REPRESENTATIVE SPECIMEN: *Tryon s.n.*, 20 MAR 1932; Dunes State Park, dry black oak woods. F.

Brachyelytrum erectum (Schreb.) Beauv. This delicate grass is still extant on shaded slopes of the Dunes Complex. REPRESENTATIVE SPECIMEN: *Hess et al.* #6004, 4 SEP 1984; Indiana Dunes Natn'l Lakeshore, Indiana Dunes State Park, 1-1.5 mi from Nature Center on Trail 10 in "The Pines" with *Lindera*, *Pinus strobus*, *Hamamelis*, *Aster*, *Liriodendron*. MOR.

Bromus kalmii Gray Known locally only on the basis of the following comment by Lyon (1927): "... open wooded dunes, Furnessville."

Cakile edentula (Bigel.) Hook. Still extant, and in places even common along the Beach community of the Fore dune Complex. Bowles *et al.* (1986a) sampled a population of this species at the east end of the Park, and recorded the following associates: *Ammophila breviligulata*, *Euphorbia polygonifolia*, *Prunus pumila*, and *Populus tremuloides*. Bowles (1989) noted that at Indiana Dunes State Park, overall numbers dropped 40% in the original transects. REPRESENTATIVE SPECIMEN: *Hiebert* #343, 20 JUL 1982; locally common in sand of fore dune, Indiana Dunes State Park, at the edge of Big Blowout; T37N R6W SW NW Sec.8. MOR. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Campanula rotundifolia L. This species is still occasional to frequent in the Fore dune and Dune Complexes of this Survey Unit. Parker (1936) considered local populations of this species to be boreal relicts.

Carex alata T. & G. This species is occasional at points along the Bike Trail in the eastern portion of Survey Unit. REPRESENTATIVE SPECIMEN: *Hiebert* #457, 24 JUN 1981; T37N R5W NE NE Sec.17; along bike trail west of Kemil Rd; flat disturbed marshy area; soil muck over sand; scattered. INDU. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Carex bromoides Schkuhr This species, a consistent associate of *Carex seorsa*, is frequent in the Hydromesophytic Swamp west of Kemil Road.

Carex debilis* var. *rudgei Bailey While I did not see this rare sedge within the Park, I did see it on the east side of Kemil Road, its eastern border, in the Swamp Complex of the Keiser Unit; so I feel certain that it is still extant from the Swamp Complex of this Unit, from where cited by Lyon (1927).

Carex digitalis Willd. Dritz (1987) reported this species from along Trail 2; he noted it there May 20, 1980.

Carex flava var. **fertilis** Peck Peattie (1930) stated that Lyon (1927) reported this species from Tremont, but I can find no such reported by Lyon (1927). It is known from just east of here in the Keiser Unit along the Bike Trail, so it may show up along the same trail west of Kemil Road.

Carex folliculata L. This sedge is still extant in the Swamp Complex not far from Kemil Road. The following associates listed by Bowles (1987) are typical of the species in the Hydromesophytic Swamp: **Acer rubrum**, **Aster umbellatus**, **Carex seorsa**, **Carpinus caroliniana** var. **virginiana**, **Fagus grandifolia**, **Habenaria clavellata**, **Hamamelis virginiana**, **Lindera benzoin**, **Liriodendron tulipifera**, **Osmunda cinnamomea**, **Solidago patula**, and **Symplocarpus foetidus**. REPRESENTATIVE SPECIMEN: Hill s.n., 14 JUL 1903; Furnessville, peaty border of wet woods. F.

Carex garberi Fern. Dritz (1987) noted this species at the Panne in Big Blowout June 20, 1982.

Carex intumescens Rudge This conspicuous sedge is still occasional in the Swamp Complex. REPRESENTATIVE SPECIMEN: Wilhelm et al. #2392, 19 JUN 1976; at Indiana Dunes State Park, along hiking trail number 2 north of where it turns sharply to the north, east of the Wilson picnic area; with **Quercus rubra**, **Acer rubrum**, **Sassafras albidum**, **Podophyllum peltatum**, and **Maianthemum canadense**. MOR.

Carex laxiculmis Schwein. This easily overlooked sedge is still extant in the Swamp Complex, from where reported by Lyon (1927); Dritz (1987) has reported it from along Trail 2. REPRESENTATIVE SPECIMEN: Wilhelm & Homoya #17057, 25 MAY 1989; at Indiana Dunes State Park, along the south side of Trail 2. MOR.

Carex pedunculata Willd. This species evidently is confined to a small Beech Hummock in the Hydromesophytic Swamp Forest west of Kemil Road. There it grows with **Actaea pachypoda**, **Allium tricoccum**, **Brachyelytrum erectum**, **Cardamine douglassii**, **Caulophyllum thalictroides**, **Claytonia virginica**, **Euonymus obovatus**, **Fagus grandifolia**, **Hamamelis virginiana**, **Hepatica americana**, **Lindera benzoin**, **Maianthemum canadense** var. **canadense**, **Panax quinquefolius**, **P. trifolius**, **Podophyllum peltatum**, **Polystichum acrostichoides**, **Quercus rubra**, **Smilacina racemosa**, **Uvularia grandiflora**, and **Viburnum acerifolium**. This is a very conservative association of species. The little hammock, by itself, registers a Natural Area Index of 41! REPRESENTATIVE SPECIMEN: Kjellmark #24, 29 APR 1987; in flat ground west of Kemil Road in State Park; T37N R6W NW SE Sec.8; Hydromesophytic Forest in muck soil. MOR.

Carex seorsa Howe This attractive, but easily overlooked, sedge is still occasional to common in the Swamp Complex. Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Carex tonsa (Fern.) Bickn. This species is occasional in droughty sands at the west end of the park in the vicinity of Pageant Blowout.

Celtis tenuifolia Nutt. Known from this Survey Unit solely on the basis of the report by Laughlin (1953). None of our other authors cited this species from any farther east than Dune Acres, but Laughlin probably had the right plant because he makes a point of the fact that its relative, **Celtis occidentalis**, is curiously absent from the park--an observation which is apparently true.

Chimaphila maculata (L.) Pursh Board (1987) noted that he has seen this species at Indiana Dunes State Park, and Plampin (1987e) noted that she also has seen it recently.

Chimaphila umbellata var. **cisatlantica** Blake Pipsissewa is still extant in the northeast corner of the park, where it was discovered in 1986 by Keith Board. REPRESENTATIVE SPECIMEN: Bowles #663, 15 SEP 1986; Indiana Dunes State Park; NE NE Sec.8 T37N R5W; level pocket on north slope of high forested dune near the lake shore; with *Pinus strobus*. MOR.

Chrysosplenium americanum Schwein. This inconspicuous species is still extant in the Swamp Complex near Kemil Road. Bowles *et al.* (1985) recorded that its population is nearly continuous along the seepage line which follows the 600' contour, and they listed the following associates: *Alnus rugosa* var. *americana*, *Fraxinus nigra*, *Impatiens* sp., *Lycopus* sp., *Sambucus canadensis*, and *Symplocarpus foetidus*. REPRESENTATIVE SPECIMEN: Swink *s.n.*, 7 April 1946; Indiana Dunes State Park near Tremont, shallow water in a moist woodland. F.

Cirsium pitcheri (Torr.) T. & G. This rare thistle is still common in and around the blowouts of the Foredune Complex, particularly in Big Blowout north of the Pinery, where Bowles *et al.* (1986a) listed it with the following associates: *Andropogon scoparius*, *Arabis lyrata*, *Calamovilfa longifolia*, *Corispermum hyssopifolium*, and *Solidago racemosa* var. *gillmani*. REPRESENTATIVE SPECIMEN: Bachmann *s.n.*, 11 AUG 1973; in Indiana Dunes State Park, in the large blowout near east end of park. MOR. According to Hooper (1934), this species has ancestral affinities to the Atlantic coastal plain, but Loveless & Hamrick (1988) reasoned that its affinities are in the Great Plains.

Cladium mariscoides (Muhl.) Torr. This species was unknown east of Dune Acres in the Lakeshore, until it was listed as an associate of *Potentilla anserina* (which see) at the Panne at Beach House Blowout by Bowles *et al.* (1985). McLaughlin (1932) considered this species to be a coastal plain element.

Conopholis americana (L.) Wallr. This species is still extant in the Swamp Complex.

Corallorhiza maculata Raf. Lyon (1927) reported this rare orchid from "... subdunal woods, Tremont." Pepoon (1927) cited it as follows: "... bluffs of Fort Creek near Mt. Tom, rare. An abundant species as one goes eastward toward Michigan." Pepoon's comment is interesting in view of the fact that the plant is as rare as hen's teeth today, and that *Corallorhiza odontorhiza*, a species which he does not mention in his flora, is not infrequent in the Lakeshore at points eastward from Indiana Dunes State Park. Curiously, neither Lyon (1927) nor Peattie (1930) mention *C. odontorhiza* either. Ken Dritz noted *C. maculata* along Trail 2 on July 25, 1981 (Dritz 1987); the blooming date pretty much confirms the identification, and it now has been vouchered by the following REPRESENTATIVE SPECIMEN: Hiebert #341, 20 AUG 1982; 3 populations of 3-5 individuals seen, in rich humus over sand, in oak woodland cove, Indiana Dunes State Park, along trail 9, ca 0.5 mi E of Nature Center; T37N R6W NW SW Sec.8. MOR. Plampin (1987d) noted: "Dick Brannon saw a dead stalk north of Trail 2 on 3/4/86 just east of *Conopholis americana*. (I saw the stalk later.) I saw eleven and a half [sic!] plants at various sites off Trail 10 on 8/17/86. Several grow near Keith Board's 1986 discovery of *Chimaphila umbellata* var. *cisatlantica* at the east end of the Park. Others grow to the north of the Pinery at the base of the dune. Still others seen in 1986 by park personnel."

Corallorhiza odontorhiza (Willd.) Fern. Several plants of this species were discovered for the first time ever at Indiana Dunes State Park on October 2, 1989. Linda Wetstein showed them to me along the east side of Trail 8, just north of Wilson Shelter. This is a rather remarkable discovery in view of the fact that Trail 8 long has been one of the more travelled by botanists, since it leads to both Trail 9 and Trail 10. See also the comments under *C. maculata*.

Cornus rugosa Lam. This tree is still frequent on shaded slopes in the Dune Complex. Bowles *et al.* (1986a) listed the following associates: **Acer saccharum**, **Aralia nudicaulis**, **Aster macrophyllus**, **Fraxinus americana**, **Dryopteris noveboracensis**, **Hamamelis virginiana**, **Lindera benzoin**, **Liriodendron tulipifera**, **Maianthemum canadense** [var. *interius?*], **Parthenocissus quinquefolia**, **Prunus serotina**, **Pyrola elliptica**, **Quercus rubra**, **Smilacina racemosa**, and **Tilia americana**. Welch (1935) considered local populations of this species to be boreal relicts.

Cypripedium acaule Ait. Known from this Survey Unit, to my knowledge, only on the basis of the following REPRESENTATIVE SPECIMEN: *Pearsall s.n., JUL 1939; Dunes State Park near Tremont.* F. Cain's specimen, collected in May of 1927 from "Furnessville, Ind." was probably also collected in the park, at the eastern end; his specimen is in the Butler Herbarium.

Cypripedium calceolus var. **parviflorum** (Salisb.) Fern. Lyon (1927) reported this rare orchid from "... Dunes at Furnessville ... Tremont, ... subdunal woods," and Keith Board (1987) noted that he has seen it recently at the State Park. Plampin (1989b) reported that Keith had seen more than a hundred plants in 1987, but that their number had dropped to six or seven in 1989. Bowles (1988), in a study of the Board population, noted four flowering stems growing with **Equisetum arvense**, **Fraxinus pennsylvanica**, **Galium aparine**, **Geranium maculatum**, **Lindera benzoin**, **Osmorhiza claytoni**, **Parthenocissus quinquefolia**, **Podophyllum peltatum**, **Quercus bicolor**, **Sanicula** sp., **Smilacina stellata**, **Symplocarpus foetidus**, **Ulmus rubra**, and **Viburnum prunifolium**. There are several plants just off the south side of Trail 10, at the west end of the board walk near the Pinery. REPRESENTATIVE SPECIMEN: *Deam #40490, 4 JUL 1924; frequent in low border between dune and marsh ca 2 mi NE of Tremont.* IND.

Cypripedium calceolus var. **pubescens** (Willd.) Correll Lyon (1927) reported this variety from "damp woods" at Furnessville, and there is a specimen in the Field Museum Herbarium, collected by Sherff in 1912, from "among or near the dunes" at Furnessville. Ken Dritz saw it in the Pinery May 24, 1981 (Dritz, 1987). REPRESENTATIVE SPECIMEN: *Cain s.n., 1926; Furnessville Dunes.* BUT.

Cypripedium candidum Muhl. Apparently known from this Survey Unit only on the basis of the following REPRESENTATIVE SPECIMEN: *Pearsall s.n., JUL 1939; Dune State Park near Tremont.* F.

Diervilla lonicera Mill. Our native Bush Honeysuckle is frequent with Black Oak, nearly or quite throughout the park. REPRESENTATIVE SPECIMEN: *Otto #8, 4 JUN 1982; occasional, ca 1 mi E on trail #10 (head-in parking lot), Indiana Dunes State Park, T37N R5W NE NW Sec.18.* MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Drosera rotundifolia L. Known from this Survey Unit on the basis of the following comment by Lyon (1927): "... Furnessville, subdunal meadow, the latter being the only place where we have found sundew within the State Park." According to Plampin (1989b), the "sundews" to which Bergendahl (1983) refers along the Bike Trail are this species. McLaughlin (1932) considered this species to be a coastal plain element.

Dryopteris hexagonoptera (Michx.) Christens. The Broad Beech Fern is rare, but still extant in the Hydromesophytic Swamp west of Kemil Road.

Dryopteris noveboracensis (L.) Gray This delicate fern is still extant and even frequent in portions of the Swamp Complex.

Epigaea repens var. **glabrifolia** Fern. According to the late Ray Grow, of Gary, Indiana and Lois Howes, this species is still extant in at least two areas in the western portion of the park, one of which is just north of where trails 8, 9, and 10 converge SSE of Mt. Jackson; Bowles *et al.* (1986a) map three populations for the State Park, and they listed the following associates: **Acer rubrum**, **Amelanchier arborea**, **Hamamelis virginiana**, **Maianthemum canadense** [var. *interius?*], **Pinus strobus**, **Prunus virginiana**, **Pteridium aquilinum** var. **latiusculum**, **Quercus alba**, **Q. rubra**, **Q. velutina**, **Sassafras albidum**, **Smilacina racemosa**, and **Vaccinium vacillans**; see also the association list under **Poa languida**. Plampin (1987d) warned that "... the stands south of Trail 2 near the dam are endangered by trippers and campers plunging down the dune." REPRESENTATIVE SPECIMEN: *Hess & Bowles #5898, 8 MAY 1984; Indiana Dunes St. Park, 2 mi N of Porter, on Trail 8 to Mt. Jackson from Nature Center; with Viburnum, Amelanchier, Hamamelis, Vaccinium; perennial in Black Oak woods, ground cover trailer, common on slope, several branches from origin.* MOR. Friesner (1936) considered local populations of this species to be boreal relicts.

Eupatorium fistulosum Barratt This huge Joe Pye Weed is actually frequent in open wet areas in the Furnessville area generally, and along the Bike Trail at Indiana Dunes State Park.

Eupatorium sessilifolium var. **brittonianum** Porter Known from this Survey Unit solely on the basis of the report by Lyon (1927).

Euphorbia polygonifolia L. Bowles *et al.* (1986a) described the local population of this species as discontinuous along the lakeshore; they listed the following associates: **Ammophila breviligulata**, **Cakile edentula**, **Populus deltoides**, and **Prunus serotina**. When Bowles (1989) resampled this population, no plants were found. REPRESENTATIVE SPECIMEN: *Hiebert #344, 20 AUG 1982; locally common near crest of dune, on steep edge, Indiana Dunes State Park, west edge by Big Blowout; T37N R6W SW NW Sec.8.* MOR. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Galium brevipes Fern. & Wieg. This rare species is known from this Survey Unit only on the basis of the following comments by Swink & Wilhelm (1979): "In our area known only from the following Porter County collection: Swampy ground near Lake Michigan, Forsythe, September, 1879, collected by E.J. Hill. Iltis (1957) pointed out that although the herbarium label says Lake County, the station is actually in Porter County, near the site of present Beverly Shores. This species is now certainly extinct in our flora." Mulrenan (1980) clarified the location: he reported that Forsythe was a railroad siding just west of the Tremont Stop

on the Chicago South Bend & South Shore traction line; this suggests that Hill was probably in Survey Unit VI.

Galium lanceolatum Torr. This species is infrequent on shaded slopes of the Dune Complex, as well as in the more mesophytic phases of the Swamp Complex.

Gentiana flavida Gray Known from the State Park on the basis of the following comment by Lyon (1927): ". . . open inland shrub-covered duneside, Mt. Green, Tremont."

Glyceria pallida (Torr.) Trin. Known from this Survey Unit solely on the basis of the following comment by Lyon (1927): ". . . Tremont, edge of Dune Creek, in open woods."

Goodyera pubescens (Willd.) R. Br. Lyon (1927) regarded this species as "rather rare" in the rich wooded dunes at Tremont; while Pepoon (1927) considered it to be ". . . very common on bluffs of Fort Creek near Mt. Tom." According to Ray Grow, of Gary, Indiana, and Lois Howes, this orchid is still extant south of Mt. Tom, not too far off of trail #2. Board (1987) noted that he is aware of four locations for it.

Habenaria ciliaris (L.) R. Br. Peattie (1930) reported this orchid from "Tremont," a location which implies Indiana Dunes State Park, but I think he might well have been referring to the well-known populations just to the west in the vicinity of Port Chester.

Habenaria clavellata (Michx.) Spreng. This little orchid is still extant in a wetland at the edge of the bike trail, at which location Ron Hiebert noted 30 individuals on August 16, 1982. Bowles (1987) recorded it from its typical habitat in the Hydromesophytic Swamp, with *Acer rubrum*, *Aster umbellatus*, *Bartonia virginica*, *Carex folliculata*, *C. seorsa*, *Carpinus caroliniana* var. *virginiana*, *Fagus grandifolia*, *Hamamelis virginiana*, *Impatiens capensis*, *Leersia virginica*, *Lindera benzoin*, *Liriodendron tulipifera*, *Maianthemum canadense* [var. *canadense* ?], *Onoclea sensibilis*, *Osmunda cinnamomea*, and *Symplocarpus foetidus*. It also grows intermittently west of Kemil Road in the Hydromesophytic Swamp. REPRESENTATIVE SPECIMEN: Jones #14, 9 JUL 1981; Indiana Dunes National Lakeshore, 400-450 ft. west of State Park Rd. south of bike trail; SE NE NE Sec.17 T37N R5W; only 9 plants seen, in sandy-peaty wetland; plants ca 1 dm tall, area disturbed. MOR. Friesner (1936) considered local populations of this species to be boreal relicts.

Habenaria flava var. *herbiola* (R. Br.) Ames & Correll Lyon (1927) reported this species from: ". . . subdunal woods at Tremont." Ken Dritz rediscovered this species recently as documented by the following REPRESENTATIVE SPECIMEN: Dritz #113, 19 JUL 1980; in low swampy woods N of Tr 2, ca 0.25 mi E of Wilson Shelter, Indiana Dunes State Park; SW NE SW Sec.18 T37N R5W; with *Lindera benzoin*, *Fraxinus pennsylvanica* var. *subintegerrima*, *Arisaema atrorubens*, *Rhus radicans*, *Betula lutea*, *Onoclea sensibilis*, *Carex stricta*, *Acer rubrum*, *Quercus palustris*, *Q. bicolor*, *Parthenocissus inserta*, and *P. quinquefolia*. MOR. Bowles (1987) mapped another population and noted the following associates: *Acer rubrum*, *Cicuta maculata*, *Fraxinus americana*, *F. nigra*, *Hamamelis virginiana*, *Impatiens* sp., *Lindera benzoin*, *Liriodendron tulipifera*, *Onoclea sensibilis*, *Parthenocissus inserta*, *Quercus alba*, *Rhus radicans*, *Sanicula* sp., *Scutellaria lateriflora*, and *Urtica procera*.

Habenaria hookeri Torr. Lyon (1927) reported this species from two locations within the park: ". . . rich wooded dune, Tremont. A single flowering plant found. Three or four times

non-flowering plants, apparently of this species² have been found, . . . a few plants . . . in the subdunal woods at Furnessville." Swink & Wilhelm (1979) reported that it grew at the east end of the park with *Pinus strobus*, but it has not been seen in recent years. REPRESENTATIVE SPECIMEN: *Pearsall s.n.*, 14 JUN 1941; *Indiana Dunes State Park*. F.

Habenaria psycodes (L.) Spreng. First reported by Lyon (1927) from ". . . wet subdunal woods, Tremont," it was rediscovered by Ken Dritz and documented by the following REPRESENTATIVE SPECIMEN: *Dritz #114*, 19 JUL 1980; *in low swampy woods N of Tr. 2, ca 0.25 mi E of Wilson Shelter, Indiana Dunes St. Park, SW NE SW Sec.18 T37N R5W; with Lindera benzoin, Rhus radicans, Onoclea sensibilis, Glyceria striata, Betula lutea, Quercus bicolor, Lysimachia ciliata, Geranium maculatum, Cicuta maculata, Hamamelis virginiana, Iris virginica var. shrevei, Parthenocissus quinquefolia, Arisaema atropurpureum, Caulophyllum thalictroides, Lilium michiganense, Dryopteris spinulosa, and Tilia americana*. MOR. Plampin (1989b) noted that this orchid grows in three locations in the State Park: 1) east of Wilson Shelter; 2) east of bridge at west end of Trail 2; 3) and in Hydromesophytic Swamp west of the Beech mound west of Kemil Road. About the second location she wrote (Plampin, 1987d): "I found three plants on the 'peninsula' in Fort Creek north of Trail 2 with *Lysimachia* sp., *Asarum canadense*, *Symplocarpus foetidus*, *Asimina triloba*, *Hamamelis virginiana*, and *Quercus* sp. . . . the plant nearest the trail increased to two stalks [from 1984 to 1985]."

Habenaria viridis var. *bracteata* (Muhl.) Gray Known from the Lakeshore only on the basis of the following report by Lyon (1927): ". . . rich wooded dunes, Tremont."

Hypericum kalmianum L. Kalm's St. John's Wort is rare in the park, confined to the few calcareous swales and Pannes.

Juncus balticus var. *littoralis* Engelm. This species is occasional in open sandy areas near the water table. It is listed as an associate of *Potentilla anserina* (which see) at the Panne at Beach House Blowout (Bowles *et al.* 1985). Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Juncus scirpoides Lam. The only record for this species locally is the following REPRESENTATIVE SPECIMEN: *Bennett s.n.*, 25 AUG 1957; *damp sandy open ground on interdune flat NW of Duneside Inn, Indiana Dunes State Park*. F. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Juniperus communis var. *depressa* Pursh This variety is still occasional to frequent in the Foredune Complex. Peattie (1930) reported a specimen of erect habit, which he identified as typical *J. communis*, from Mt. Tom, at which location he said that it grew with *Opuntia humifusa* on open dunes. Laughlin (1953) also reported the typical variety, stating that it had a trunk 3" in diameter, and going a bit further to mention that it was ". . . the largest native tree of its kind in the United States." Swink & Wilhelm (1979) pointed out that Deam (1940) excluded Indiana from the geographic range of the typical variety, but acknowledged that ". . . specimens of tree proportions have been reported from . . . Porter County in Indiana." Bowles *et al.* (1986a) listed the following associates for the var. *depressa*: *Andropogon scoparius*, *Arabis lyrata*, *Artemisia caudata*, *Calamovilfa longifolia*,

²*Habenaria orbiculata*, with which it could be confused, is unknown from this part of Indiana (Deam, 1940).

Corispermum hyssopifolium, **Euphorbia polygonifolia**, **Lithospermum croceum**, **Pinus banksiana**, **Populus deltoides**, **Prunus pumila**, **Quercus velutina**, and **Solidago racemosa** var. **gillmani**. Welch (1935) considered local populations of **Juniperus communis** var. **depressa** to be boreal relicts.

Lathyrus japonicus var. **glaber** (Ser.) Fern. Lyon (1927) reported it from the park in "open sand of rear foredune area or lake face of first line of dunes . . ." Beach Pea is still extant in Big Blowout, where it is being monitored by the Indiana Dunes National Lakeshore (Bowles et al. 1985). REPRESENTATIVE SPECIMEN: *Dritz & Wilhelm #268, 20 JUN 1982; high on the NE edge of Big Blowout in Indiana Dunes State Park; NW SW NE Sec.8 T37N R5W; with Asclepias syriaca, Salix humilis, Ammophila breviligulata, Artemisia caudata, Cirsium pitcheri, Vitis riparia* var. *syrticola*, *Equisetum hyemale* var. *affine*, *Tradescantia ohioensis*, *Ptelea trifoliata* var. *mollis*, and *Lithospermum croceum*. MOR. Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Lathyrus ochroleucus Hook. Known from this Survey Unit only on the basis of the report by Pepoon, page 129, where he states that it was one of ". . . the strikingly interesting species . . ." which grew on the bluffs of Fort Creek.

Liparis loeselii (L.) Richard Keith Board (1987) noted that he has seen this species recently at Indiana Dunes State Park, and Bowles et al. (1985) listed it as an associate of **Potentilla anserina** (which see) at the Panne at Beach House Blowout. Bergendahl (1983) reported it from the Bike Trail near tower #8424.

Lonicera dioica L. This rare native honeysuckle is still extant, and even frequent here and there, within the Dune Complex.

Lycopodium inundatum L. Known from this Survey Unit solely on the basis of the report by Lyon (1927), in which he stated that it grew in a subdunal meadow at Furnessville. McLaughlin (1932) considered local populations of this species to be coastal plain elements.

Lycopodium lucidulum Michx. Until recently, known in the park only from a report by Pepoon in which he states: "On the bluffs of Fort Creek Near Mt. Tom," where Plampin (1987d) has seen it recently. Plampin (1989a) saw it even more recently at the other end of the Park, where it ". . . grows on a steep, north-facing slope . . . [along] the north loop of Trail 10." According to Plampin (1989b), there is a large clump south of the Beech mound west of Kemil Road. Yet another site is documented by the following REPRESENTATIVE SPECIMEN: *Hess & Bowles #5897, 8 MAY 1984; Indiana Dunes St. Park, 2 mi N of Porter, on Trail 8 to Mt. Jackson from Nature Center; with Viburnum, Amelanchier, Hamamelis, Vaccinium*. MOR.

Lycopodium obscurum L. Known from this Survey Unit only on the basis of the following statement by Lyon (1927): ". . . subdunal woods, Tremont, rare."

Maianthemum canadense Desf. var. **canadense** This species is rare in the Hydromesophytic Swamps west of Kemil Road, where it grows with **Carex pedunculata** and **Carex intumescens**, both of which see. Friesner (1936) considered local populations of this species to be boreal relicts, while Welch (1935) suggested it may have entered Indiana by way of Ohio.

Melampyrum lineare var. **latifolium** Bart. Cow Wheat is still extant in at least two places in the Dune Complex, one near Wilson Shelter, the other near the head of Trail 2.

Bowles *et al.* (1986a) listed the following associates: *Acer rubrum*, *Amelanchier arborea*, *Aralia nudicaulis*, *Carex pensylvanica*, *Cornus florida*, *Hamamelis virginiana*, *Maianthemum canadense* [var. *interius* ?], *Mitchella repens*, *Nyssa sylvatica*, *Pinus strobus*, *Prenanthes alba*, *Pyrola rotundifolia* var. *americana*, *Quercus alba*, *Q. rubra*, *Smilacina racemosa*, *Trientalis borealis*, *Vaccinium angustifolium* var. *laevifolium*, *V. vacillans*, and *Viburnum acerifolium*.

Milium effusum L. This rare grass is still extant in the Hydromesophytic Swamp west of Kemil Road, and it is known from along Trail 2 (Dritz, 1987), where it is being monitored by Bowles *et al.* (1986a), who recorded the following associates: *Acer saccharum*, *Amphicarpa bracteata*, *Carpinus caroliniana* var. *virginiana*, *Carya ovata*, *Cornus florida*, *Fraxinus americana*, *Geranium maculatum*, *Hamamelis virginiana*, *Hystrix patula*, *Lindera benzoin*, *Parthenocissus inserta*, *Podophyllum peltatum*, *Prenanthes alba*, *Prunus serotina*, *Quercus alba*, *Q. rubra*, *Sanicula gregaria*, *Sassafras albidum*, and *Smilacina racemosa*. Bowles (1988) indicates that this species and *Poa alsodes* are well mixed along the Trail 2 transect. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 18 MAY 1970; *Indiana Dunes State Park, near Chesterton, Ind.* MOR.

Mimulus alatus Ait. According to Plampin (1987d), this extremely rare Monkey Flower grows in ". . . two stands found by Doug Hibshman near the dam at the west end of Trail 2; two with *Myosotis laxa*; four about twenty-five yards beyond on the north side of Trail 2 in the swamp." These are remarkable new discoveries for the Indiana Dunes National Lakeshore. See also under Survey Unit 10.

Mitchella repens L. This species is still extant here and there throughout the Swamp Complex. REPRESENTATIVE SPECIMEN: *Umbach #6400*, 26 OCT 1912; *vicinity of Mt. Tom, in Indiana Dunes State Park, on shaded dunes.* MOR.

Monotropa hypopithys L. First recorded by Lyon (1927) from shaded slopes in the Dune Complex; Board (1987) noted that it is still extant.

Monotropa uniflora L. This species is still extant, and even frequent among the dune slopes of the Dune Complex and the Savanna Complex. REPRESENTATIVE SPECIMEN: *Hiebert #342*, 20 AUG 1982; *scattered in sandy soil in oak woodland at bottom of cove, Indiana Dunes State Park along Trail 9, ca 0.3 mi W of Nature Center; T37N R6W NW SW Sec.8.* MOR.

Morus rubra L. This tree is known from the Lakeshore solely on the basis of the report by Laughlin (1953).

Myosotis laxa Lehm. According to Plampin (1989b), this rare aquatic grows in the swamp complex near the dam at the west end of Trail 2, along the north side of the peninsula in Fort Creek. Bergendahl (1983) reported that it grows along the Bike Trail between towers #8421 and #8422 opposite Teale Road. REPRESENTATIVE SPECIMEN: *Lyon s.n.*, 18 JUN 1922; *dunes near Tremont in shallow water.* BUT. Welch (1953) considered local populations of this species to be boreal relicts.

Orobanche uniflora L. Swink & Wilhelm (1979) reported that they recorded this species ". . . in a thicket of *Sassafras albidum* in Indiana Dunes State Park in Porter County." Lyon (1927) reported it from ". . . subdunal woods, Tremont." It is also known from along the bike trail, from where documented by the following REPRESENTATIVE SPECIMEN: *Pavlovic*

#158, 30 MAY 1986; *E of drainage ditch which is E of Tremont Road, S of the Calumet Bike Trail and N of the South Shore tracks; with Box Elder, Sassafras, and Tall Goldenrod in mesic meadow rich with humus; rare but locally dense; SW SW SW Sec.8. MOR.*

Oryzopsis asperifolia Michx. This rare grass was first reported from Indiana Dunes State Park by Lyon (1927), who noted it as rare, on a rich wooded Dune at Tremont. During our foray of May 25, 1989, Mike Homoya spotted it along the north side of the east Beach House Blowout extension of Trail 9. REPRESENTATIVE SPECIMEN: *Post & Klick #530, 9 JUN 1989; at Indiana Dunes State Park, along Trail 9, ca 500 plants, with Lycopodium lucidulum; SE SE SW Sec.7 T37N R5W. INDU.*

Oryzopsis pungens (Torr.) Hitchc. Very rare, though possibly still extant. Lyon (1927) wrote, in 1927, that it grew ". . . along side of dune about 0.25 mile east of Waverly Beach, Dunes State Park. May 22, 1926 [he cited Weatherwax's specimen #538, which is in Bloomington]. Identified by Agnes Chase who credits it with being the first report for Indiana, and the most southern station recorded to date." Fourteen years later Deam wrote: "A few tufts of this species have been found in Porter County over a limited area about 0.25 mile east of Waverly Beach in the Dunes State Park. This is the only locality now known in Indiana." Swink & Wilhelm (1979) pointed out that Potzger later collected a specimen in nearby La Porte County. REPRESENTATIVE SPECIMEN: *Deam #46637, 29 MAY 1929; in an interdunal flat 0.25 mi east of Waverly Beach in Dunes State Park, with Quercus velutina and Panicum depauperatum. IND.*

Panax quinquefolius L. Lyon (1927) noted only a single plant during his study of the dunes area, on a ". . . rich wooded dune, Tremont." I also noted a single plant growing with **Carex pedunculata**, which see, on a beech hammock west of Kemil Road; Plampin (1987d) indicates that there are eleven plants in this same vicinity. Plampin (1989b) wrote: "These eleven plants are decreasing, I fear. I think the collecting for a herbarium specimen may not have been helpful." Since Deam already had documented this plant at the park, there is not much excuse for having "documented" it again. Some "professional" botanists behave more like stamp collectors than like scientists who do their homework and follow a collection ethic. REPRESENTATIVE SPECIMEN: *Deam #56058, 30 MAY 1935; in Dunes State Park, just east of Mt. Tom on the wooded slope of a dune. IND.*

Panax trifolius L. This species is still extant in the Swamp Complex west of Kemil Road. REPRESENTATIVE SPECIMEN: *Swink s.n., 4 MAY 1946; at Tremont; in Indiana Dunes State Park. MOR.* Welch (1935) considered local populations of this species to be boreal relicts.

Panicum boreale Nash This rare little grass is still extant on the north side of Trail 10 in one of the more savanna-like phases of the Dune Complex.

Panicum dichotomum L. This taxonomically complicated species is probably still extant somewhere among the dunes of the Savanna Complex or Dune Complex, from where cited by Lyon (1927).

Panicum oligosanthos Schultes We have never seen this plant in the Chicago region; it is known solely on the basis of the following report by Lyon (1927), in which he stated: ". . . rich wooded dune, subdunal meadow, Tremont." Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Panicum perlongum Nash This species is probably still extant within the Dune Complex or the Savanna Complex, from where cited by Lyon (1927) as growing on a very open wooded dune near Tremont.

Peltandra virginica (L.) Schott & Endl. This species is still extant in the Marsh and Swamp Complexes, from where reported by Lyon (1927) and documented by the following REPRESENTATIVE SPECIMEN: *Otto #15, 4 JUN 1982; very common in standing water of swamp below bridge at start of Trail 10, Indiana Dunes State Park; T37N R5W SW NW Sec.18.* MOR. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Pinus banksiana Lamb. Jack Pine is still extant here and there among the dunes, particularly those of the Dune and Foredune Complexes. See also the comments under the Dune Acres Unit. REPRESENTATIVE SPECIMEN: *Tryon s.n., 3 AUG 1935; Dunes State Park, shore dune.* F. Welch (1935) considered the local populations of this species to be boreal relicts.

Pinus strobus L. This handsome pine is still extant, though not nearly as common as it once was [see comments by Brennan (1923) on page 185], among the dunes in the Foredune and Dune Complexes. There is a population of fairly old trees at the eastern end of the park in an area known as the "Pinery" on park maps. Menges & Armentano (1985) reported that this area is the only location in the Indiana Dunes National Lakeshore. They believe there is evidence that White Pine is competing successfully with oaks, but Haney (1986a) cited evidence to suggest that even here the lack of small size classes is apparent. Welch (1935) considered local populations of this species to be boreal relicts.

Poa alsodes Gray This rare grass is still extant in a mesophytic portion of the Swamp Complex east of Wilson Shelter. REPRESENTATIVE SPECIMEN: *Dritz #60, 18 MAY 1980; Indiana Dunes State Park, common along Trail #2 between 0.5-1 mi E of Wilson Shelter, N SE Sec.18 T37N R5W, with Caulophyllum thalictroides, Euonymus obovatus, Panax trifolius, Galium pilosum, Botrychium virginianum, Lindera benzoin, Podophyllum peltatum, Mitella diphylla, Ribes cynosbati, Trillium flexipes, Hepatica americana, Smilax ecirrhata, Hamamelis virginiana, Prenanthes alba, Maianthemum canadense var. interius, Geranium maculatum, Arisaema atrorubens, Tilia americana, Carpinus caroliniana var. virginiana, and Ostrya virginiana.* MOR. Bowles *et al.* (1986a) began monitoring this population, and recorded some additional associates: *Amphicarpa bracteata, Liriodendron tulipifera, Quercus alba, Q. rubra, Sanicula gregaria, and Sassafras albidum.* Bowles (1988) indicated that this species is well mixed with *Milium effusum* along Trail 2.

Poa languida Hitchc. First reported from this Survey Unit by Lyon (1927) from: "... Tremont, subdunal woods," it recently has been seen by Ken Dritz at Mt. Jackson. REPRESENTATIVE SPECIMEN: *Dritz #215, 31 MAY 1981; high on the N face of Mt. Jackson, Dunes St. Park; NE SW NE NE Sec.13 T37N R6W; with Hepatica americana, Aquilegia canadensis, Polygonatum pubescens, Aralia nudicaulis, Hamamelis virginiana, Polygonatum canaliculatum, Quercus velutina, Carex pensylvanica, Krigia biflora, Gaultheria procumbens, Prunus virginiana, Epigaea repens var. glabrifolia, Acer rubrum, Solidago caesia, Rubus allegheniensis, Muhlenbergia schreberi, Viburnum acerifolium, Parthenocissus quinquefolia, and Aster macrophyllus.* MOR.

Poa paludigena Fern. & Wieg. Homoya (1988) reported having seen this grass in the Swamp Complex in an area about 0.25 mile north of the old Furnessville Station, evidently off of the west side of the boardwalk along Trail 2. Welch (1935) considered local populations of this species to be boreal relicts.

Polygala paucifolia Willd. Known from nowhere else in either the state of Indiana or the Chicago region (an old record for Cook County, Illinois notwithstanding), this attractive little plant is still thriving in several locations within this Survey Unit. Two of these are mapped by Bowles *et al.* (1985); they recorded one growing with *Amelanchier arborea*, *Aralia nudicaulis*, *Campanula rotundifolia*, *Hepatica americana*, *Lycopodium lucidulum*, *Pedicularis canadensis*, *Prenanthes* sp., *Prunus virginiana*, *Quercus velutina*, *Smilacina racemosa*, *Thalictrum dioicum*, and *Vaccinium vacillans*; the other with *Amelanchier arborea*, *Aster linariifolius*, *Hamamelis virginiana*, *Krigia virginica*, *Quercus velutina*, *Sassafras albidum*, *Smilacina racemosa*, *S. stellata*, *Vaccinium vacillans*, and *Vitis* sp. With the help of a map provided by Mr. Ray Grow of Gary, Indiana, Ken Dritz secured the following REPRESENTATIVE SPECIMEN: Dritz #58, 18 MAY 1980; many 100's to 1000 on N slope of steep wooded ridge in 2 colonies, 340' and 640' E of a N-S trail in Indiana Dunes State Park, SE SE Sec.12 T37N R6W; with *Hamamelis virginiana*, *Diervilla lonicera*, *Rhus radicans*, *Carex pensylvanica*, *Amelanchier humilis*, *Prunus virginiana*, *Gaultheria procumbens*, *Aralia nudicaulis*, *Viburnum acerifolium*, *Solidago caesia*, *Sassafras albidum*, *Aster linariifolius*, *Quercus velutina*, *Arabis lyrata*, *Smilacina stellata*, and *Tradescantia ohiensis*. MOR. Mike Homoya, on the foray of May 25, 1989, noted another population. It is in the southwest quarter of Section 7, where it grows with *Aquilegia canadensis*, *Aralia nudicaulis*, *Aster macrophyllus*, *Circaea quadrisulcata* var. *canadensis*, *Hamamelis virginiana*, *Hepatica americana*, *Maianthemum canadense* var. *interius*, *Polystichum acrostichoides*, *Smilacina racemosa*, *S. stellata*, *Trillium grandiflorum*, and *Viola pubescens*. According to Ken Dritz (pers. comm.), there is a population of white-flowered plants on Mt. Jackson. Welch (1935) considered local populations of this species to be boreal relicts.

Polygonella articulata (L.) Meisn. This species is probably extant somewhere in the Foredune or Dune Complex. REPRESENTATIVE SPECIMEN: Deam #29794, 13 SEP 1919; in almost pure sand ca 0.5 mi E Waverly Beach, back from lake ca 0.25 mi and between the dunes or rather just back from the high dunes. IND. Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Polygonum arifolium var. *pubescens* (Keller) Fern. This species is still extant in the Marsh and Swamp Complexes, particularly those in the eastern portion of the park. REPRESENTATIVE SPECIMEN: Hiebert #502, 5 SEP 1986; State Park, just west of Kemil Road, approx 200 m north of Rte. 12; hydromesophytic woods; flat area; hummocks around trees. Soil: organic over sand, high water table; scattered abundance; NW NE NE Sec.17 T37N R5W. MOR.

Polygonum careyi Olney This very rare knotweed grows in moist prairie along the north side of the Bike Trail, opposite Hadenfeld Road, between Towers #8818 and 8819.

Polypodium virginianum L. Polypody was unknown from the State Park until its recent discovery on Mt. Jackson by Delano Arvin. According to Keith Board, this population is very near the Mt. Jackson population of *Polygala paucifolia*. REPRESENTATIVE SPECIMEN:

Arvin s.n., 17 MAY 1981; high on the N face of Mt. Jackson, Dunes State Park; NE SW NE NE Sec.13 T37N R6W. MOR.

Populus balsamifera L. Possibly still extant. Both Laughlin (1953) and Deam (1940) reported small trees of this species from Dunes State Park. Deam (1932) for many years regarded the small trees which he encountered along the lake front in low places as escapes, but later, after having conferred with Dr. Cowles, came to the conclusion that they were native. REPRESENTATIVE SPECIMEN: Deam #40489, 4 JUN 1924; shrub up to 6 feet high at base of dune facing Lake Michigan, 2 mi NE of Tremont. IND.

Potentilla anserina L. According to Bowles et al. (1985), this cinquefoil grows in a 5-meter wide zone, forming a 40-meter long crescent-shaped band around the Panne at Beach House Blowout off of Trail 9; they listed the following associates: **Carex rostrata** var. **utriculata**, **Carex stricta**, **Cornus stolonifera**, **Equisetum hyemale** var. **affine**, **Juncus balticus** var. **littoralis**, **Liparis loeselii**, **Pinus banksiana**, **Salix glaucophylloides** var. **glaucophylla**, **Solidago graminifolia** var. **?**, **S. nemoralis**, and **Typha angustifolia**.

Potentilla palustris (L.) Scop. This species is probably still extant in the Marsh Complex, from where reported by Lyon (1927).

Prunus pensylvanica L. f. This shrub is still occasional to frequent in the Savanna and Dune Complexes. REPRESENTATIVE SPECIMEN: Otto s.n., 27 JUL 1983; 80 m east on bike trail from Tremont Road intersection; scattered in flat area along power line right-of-way; NW NW Sec.19 T37N R5W. MOR.

Pyrola elliptica Nutt. According to Dritz (1987), this little shinleaf is still extant in the Pinery. Bowles et al. (1986a) listed it as an associate of **Cornus rugosa** (which see) just southeast of the Pinery along Trail 10, where they noted that it grows throughout the pine groves; they listed the following associates: **Aralia nudicaulis**, **Arisaema atrorubens**, **Cornus rugosa**, **Hamamelis virginiana**, **Liriodendron tulipifera**, **Maianthemum canadense** [var. **interius?**], **Medeola virginiana**, **Osmorhiza claytoni**, **Parthenocissus quinquefolia**, **Pinus strobus**, **Quercus rubra**, **Smilax lasioneura**, and **Viburnum acerifolium**. REPRESENTATIVE SPECIMEN: Lyon s.n., 1922; dunes, near Tremont, woods. BUT. Friesner (1936) considered local populations to be boreal relicts.

Pyrola rotundifolia var. **americana** (Sweet) Fern. This species is still extant along Trail 10 northeast of the Wilson Shelter where Bowles et al. (1986a) recorded the following associates: **Acer rubrum**, **Amelanchier arborea**, **Carex pensylvanica**, **Fraxinus americana**, **Hamamelis virginiana**, **Quercus velutina**, **Smilacina racemosa**, **Smilax bona-nox** [sic! almost certainly **S. rotundifolia**], and **Vaccinium angustifolium** var. **laevifolium**; they also recorded it from the head of Trail 2, where it grows with **Acer rubrum**, **Hamamelis virginiana**, **Pinus strobus**, **Quercus alba**, and **Q. rubra**. West of Route 49, there is a small colony on a steep south-facing slope at the north edge of the Swamp Complex. Friesner (1936) considered local populations of this species to be boreal relicts.

Rhus aromatica var. **arenaria** (Greene) Fern. This shrub is still extant in the Foredune Complex area, particularly in the neighborhood of Big Blowout and Furnessville Blowout.

Rhus vernix L. Evidently rare at Indiana Dunes State Park, there are several plants scattered here and there in the Swamp Complex and also just east of Route 49 along the bike

trail. Laughlin (1953) indicated that there was a specimen of tree stature, with a trunk diameter of 5 inches.

Rubus pubescens Raf. This species is still extant in the Swamp Complex portions of this Survey Unit.

Salix lucida Muhl. Known from this Survey Unit on the basis of the report by Laughlin (1953), in which he states that there were ". . . several bushy specimens on the prairie just west of the east fork of Dunes Creek."

Salix sericea Marsh. Known from this Survey Unit solely on the basis of the report by Laughlin (1953), in which he states that it was rare.

Salix syrticola Fern. This willow is still extant in the neighborhood of Big Blowout, from which region it was reported by Lyon (1927), and collected by Bennett. Bowles *et al.* (1986a) indicated that it is throughout the dune area of Beach House Blowout, where they listed it as growing with **Ammophila breviligulata**, **Calamovilfa longifolia**, and **Populus deltoides**. REPRESENTATIVE SPECIMEN: Bennett *s.n.*, 20 MAY 1961; Indiana Dunes State Park, moist sandy soil in bottom of Big Blowout. F. Trefz (1935) considered local populations of this species to be boreal relicts.

Selaginella rupestris (L.) Spreng. Noel Pavlovic (1988a) reported the rare sand club moss from the dry sand prairie off of Trail 3; he pointed out that it was discovered by Cynthia Keck during a bryophyte survey. It is ". . . found at the base of the northwest facing dune amongst black oak and Scotch pines. It occurs in at least half a dozen clumps in small openings with mosses and lichens." I visited this area with Noel later and noted that among the numerous species of terricolous lichens was **Cladonia robbinsii**, a species which is very rare in the Chicago region.

Senecio plattensis Nutt. First reported by Lyon (1927), this species is rare, but extant along Trail 9 in the Dune Complex.

Sisyrinchium angustifolium Mill. This species was first reported by Lyon (1927), and probably is still extant somewhere within the Savanna Complex.

Sisyrinchium atlanticum Bickn. Known from this Survey Unit solely on the basis of the following comment by Peattie (1930): "A rare and pretty plant, wet swales, Tremont and elsewhere back of the high dunes." Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Smilax rotundifolia L. This species is still quite common in the Savanna and Dune Complex portions of this Survey Unit. REPRESENTATIVE SPECIMEN: Swink *s.n.*, 2 NOV 1946; Indiana Dunes State Park near Tremont. MOR.

Solidago racemosa var. **gillmani** (Gray) Fern. This species is still frequent to common, particularly in the areas of the Fore-dune Complex. REPRESENTATIVE SPECIMEN: Tryon *s.n.*, 16 SEP 1939; east end of Indiana Dunes State Park, blowout. F.

Sparganium americanum Nutt. This Bur Reed was reported from Indiana Dunes State Park by Peattie (1930), in which he stated that it was rare in Dune Creek. Holly Bennett collected a Bur Reed, perhaps technically in the Dune Acres Unit, and identified his specimen as **Sparganium androcladum**, but it has the smaller heads and dull achenes of **S. americanum**, so I am referring it here. REPRESENTATIVE SPECIMEN: Bennett *s.n.*, 15 AUG

1953; in ditch along west side of road, 0.5 mi north of the South Shore Line Station at Port Chester. F.

Stipa avenacea L. This rare grass is still extant along the north side of Trail 10, in a savanna-like portion of the Dune Complex. Bowles (1987) mapped another population from sand dune talus at the base of the Foredune Complex along Trail 10; there he noted the following associates: **Hamamelis virginiana**, **Prunus serotina**, **Quercus alba**, **Q. velutina**, **Rhus radicans**, **Sassafras albidum**, **Smilacina stellata**, and **Solidago caesia**.

Trientalis borealis Raf. This species is still occasional to common in the Swamp Complex portions, particularly those in the region west of Kemil Road. Welch (1935) considered local populations of this species to be boreal relicts.

Triphora trianthophora (Sw.) Rydb. This rare orchid was reported from this Survey Unit by Lyon (1927), in which report he stated: ". . . subdunal woods, Tremont, found once."

Vaccinium atrococcum (Gray) Heller This species is occasional in the Hydromesophytic Swamp forest west of Kemil Road.

Vaccinium macrocarpon Ait. This species, reported from the Furnessville area by Peattie (1930), has probably been extirpated from the State Park as a result of water level fluctuations and fire suppression. Trefz (1935) considered local populations of this species to be boreal relicts, and [sic!] to have ancestral affinities to the Atlantic coastal plain, though McLaughlin (1932) pointed only to its coastal-plain affinities.

Veronica comosa Richter This species may still be extant somewhere within the Marsh Complex portions of this Survey Unit; it was reported from the mouth of Dunes Creek by Lyon (1927), and is documented by the following REPRESENTATIVE SPECIMEN: *Haynie s.n., 25 MAY 1929; Tremont, very wet ground.* F.

Viola canadensis L. This species was first reported from the State Park on the basis of the following comment by Peattie (1930): "Rare, in beech woods from Tremont eastward." It is still present along Trail 10, just northeast of the wooden bridge north of Wilson shelter, though evidently rare.

Viola incognita var. **forbesii** Brainerd Often confused with **Viola pallens**, this little violet is not infrequent in the Hydromesophytic Swamp. REPRESENTATIVE SPECIMEN: *Hiebert & Payton #229, 24 APR 1982; local, in ecotone between oak woods and red maple swamp, State Park, just S of Nature Center along trail 8; T37N R6W SE NE Sec.13; only one population seen, on gradual S-facing slope.* MOR.

Viola pallens (Banks) Brainerd This species is still extant in the Swamp Complex portions of this Survey Unit.

Vitis labrusca L. This species was first reported from the Park by Laughlin (1953); it is occasional in the Swamp Complex west of Route 49, and Pitcher (1987b) indicates that it is frequent along the Bike Trail.

Xyris torta Sm. First recorded from this Survey Unit on the basis of reports by both Lyon (1927) and Peattie (1930), this species was rediscovered by Ron Hiebert along the Bike Trail, from where documented by the following REPRESENTATIVE SPECIMEN: *Hiebert #330, 16 AUG 1982; scattered in wet marshy area at Bike Trail W of Kemil Rd, T37N R5W SW NE*

Sec.17. MOR. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Summary

Survey Unit VI has been shown to provide the habitat for at least 132 of the Indiana Dune National Lakeshore SPECIAL VEGETATION floristic elements. Of these, seventy percent have been seen in the last ten years or so. Very likely, as many as seventy-five to eighty percent of all the SPECIAL VEGETATION floristic elements reported from this Survey Unit are still extant somewhere within its boundaries.

Populations of thirteen percent of the SPECIAL VEGETATION floristic elements known from this Survey Unit are among those considered by Peattie (1922), McLaughlin (1932), Hooper (1934), and Parker (1936) to have ancestral affinities to the Atlantic coastal plain. Another fourteen percent were considered to be boreal relicts by Deam (1932), Trefz (1935), Welch (1935), Friesner (1936), or Parker (1936).

A little over ten percent of the SPECIAL VEGETATION floristic elements known from Indiana Dunes State Park are unknown from any other Survey Unit. These include: *Aplectrum hyemale*, *Athyrium thelypteroides*, *Botrychium matricariaefolium*, *Galium brevipes*, *Habenaria hookeri*, *H. viridis* var. *bracteata*, *Lycopodium obscurum*, *Morus rubra*, *Oryzopsis pungens*, *Panicum oligosanthos*, *Polygala paucifolia*, *Populus balsamifera*, *Triphora trianthophora*, and *Viola canadensis*.

NATURAL AREA ASSESSMENT

Survey Unit VI, as can be seen from the Natural Area Vegetation Map, consists of five General community types; these include an extensive Foredune Complex, a large and variously manifest Dune Complex, a large Marsh Complex, a Savanna Complex, and an extensive and varied Swamp Complex.

The Dune Complex is quite broad in its community character locally, ranging conceptually from Savanna to Mesophytic Forest in aspect. This broad spectrum of floristic and synecological diversity in the Dune Complex of Indiana Dunes State Park was the outdoor laboratory in which Henry Cowles began his pioneer studies on plant succession. For this reason the Indiana Dunes have become known as the "birthplace of American ecology" (see Lindsey, Schmelz & Nichols, 1969).

It seemed clear to Cowles, apparently, that the natural order of things, in the Indiana Dunes, was for denuded dunes to "succeed" by a floristic progression into a Black Oak dominated "woods" and to go on from there ultimately into a Beech-Maple forest community. Cowles' hypothesis is, while perhaps attractive and even replete with a kind of Darwinian concept of ecological evolution, as Lindsey *et al.* (1969) put it ". . . so much of an oversimplification as to be an actual fallacy."

Lindsey *et al.* (1969) pointed to the work of Olson (1958), in which it had been discovered that Black Oak-dominated dunes become progressively leached and acidic with time, rendering inaccurate the orthodox view which holds that Beech-Maple communities are the natural "climax" in such areas inaccurate. Kurz (1923) compiled data which--while also demonstrating that the calcareous sandy soils of the dunes become leached and acidic over time--suggested, in addition, that a replenishment of calcareous ions by the deposition of wind-blown calcareous

sands takes place in certain areas of the Beach and Foredune Complex near the lake. Olson (1958) adds that fire history probably helped keep Black Oak in some areas that could otherwise have supported a richer forest and noted that "... the independent variable of abrupt topographic relief tends to isolate the rich dune pockets from spread of fire as well as to make their forest floor moister and less flammable."

Henderson (1987) did a fairly good job of summarizing the evolution of thinking on succession and dunes ecology from Cowles (1899) to Cottam (1949) and Sauer (1950), and he provides compelling evidence for the role of fire locally. I am not yet willing, however, to accept completely his conclusion that fire was "quickly attenuated" eastward around the southern tip of Lake Michigan, and that this attenuation in fire is what accounts for the profound vegetational differences we see between Miller and Tamarack.

It is my view that, while the nature of the fire which consummated this eastern area may well have been quite different from that in western areas, it was nevertheless a regular and controlling context within which our conservative plant communities evolved in Holocene times. Flame lengths, running times, and behavior were likely modified by the changing dune and sag morphology apparent as one moves along the lakeshore. Microclimates set up by extremes of exposure and autochthonous fuel species are inextricably linked to that geomorphology. Henderson's conclusions, while a step forward, could lead one to believe that fire in our eastern sector is not significant, and therefore not an urgent management protocol. We cannot relax with the idea that the continued fire suppression at Indiana Dunes State Park and points farther east is ecologically acceptable, because the land simply will succeed to Beech/Maple. Outside of the Swamp Complex and the Foredune Complex, the thousands of years of synecological experience which has accrued in the genes of these native species cannot deal with a sudden, headlong change toward complete shade and mesicity. Such a "succession," if allowed to proceed, will depauperate the dunes forever of their ground-cover vegetation and open the soil to excessive erosion and perpetual destabilization. Try as we might, we cannot genuinely turn the Indiana Dunes into the Shenandoah Valley nor even nearby Warren Woods. Our special location here on the earth, at the southern tip of a Great Lake in a great continent, places us in a different world, so why don't we respect our *Genius Loci* and glory in her?

Years without fire have indeed encouraged a general synecological trend toward mesophytic conditions throughout the Dune Complex and Savanna Complex. While Beech and Maple themselves are still quite limited in the Dune Complex portions of the Indiana Dunes State Park, a woody canopy in general has developed nevertheless over those areas which must at one time have been quite savanna-like in character. Such a trend, if allowed to continue over the long term, will ultimately compromise the floristic integrity of Indiana Dunes State Park. Most of the modal species of truly dry-mesophytic forest are fundamentally missing from this Survey Unit, and are not therefore likely to "come in" to replace the species which will vanish with the disappearance of the savanna conditions. The integrity of the Indiana Dunes National Lakeshore over the millennia to come is dependent on the wisdom of present day curators. If we compromise the conservative life system here at the Indiana Dunes, we lose forever and for all time the essential, fundamental basis of the SPECIAL VEGETATION. There are no constellations of species on the face of the globe with more experience here than this present one.

The Foredune Complex along much of the lakefront is in magnificent condition, but in some areas the Foredune Complex communities have been brutally abused, as is evidenced by several massive Blowouts which pockmark the Foredune area along the lake at Indiana Dunes State Park. Brennan (1923) pointed out that:

"... the Dunes were originally covered with giant white pines which were still in existence when the white people came in the early days, and when these pines disappeared, mainly from the lumbering in the first half of the century, other trees, principally the oak, sprang up in their places.

"The dunes, disturbed by the fall of these trees, began in places of great disturbance to crumble, and under the influence of wind, to drift and eventually form great moving dunes which cover forests and marshes."

The degree to which these "moving dunes" moved has yet to be demonstrated to this writer [the major Blowouts as photographed from the air in 1939 have not changed their morphology noticeably in the past 40 years, as is evidenced by comparing the early photographs with those taken in 1979], but the local perturbations of dunes topography and vegetation in the Blowout areas were profound--whatever the geophysical processes are or might have been.

The Marsh Complex portions of Indiana Dunes State Park, like the Dune Complex, have been fire-starved to the point where woody species have begun to invade to a substantial degree, though in some areas rapid water level changes recently seem to have had a reverse effect. The accumulations of enormous amounts of graminoid duff in the Marsh Complex are bound to be taking the toll on dozens of forbs and weak-stemmed sedges which at one time were everywhere apparent in the open wetlands of Indiana Dunes State Park. As is true of most of the Lakeshore Marsh Complex communities, the open wetlands of this Survey Unit are in need of regular fire and stable water levels.

The Savanna Complex was somewhat arbitrarily delineated from the Dune Complex on the Natural Area Vegetation Map, the rationale being that the former was a generally consistent, cartographically resolute savanna-like phase of the latter; so the cartographic discrimination between these two General community types, as depicted on the Natural Area Vegetation Map, should not be construed as synecologically profound. At the risk of sounding like Johnny-One-Note, the Savanna Complex portions of this Survey Unit, clearly, are in need of regular fire.

The Swamp Complex, which occupies a large portion of Indiana Dunes State Park, is still largely intact; it is composed mostly of various phases of the Hydromesophytic Swamp Forest community and provides the habitat for a large number of SPECIAL VEGETATION floristic elements. Every effort should be made to insure that water level fluctuations do not exceed those which are naturally manifest within a growing season. Fire is not a concern in the Swamp Complex, because if water levels are maintained, the Swamp Complex communities will not burn; the production of graminoid fuels in these communities is insufficient to sustain fire.

Like Survey Unit V, Indiana Dunes State Park is exceptionally rich floristically, with a very high proportion of designated SPECIAL VEGETATION floristic elements. Over the last ten years I have been able personally to attest to the presence of 482 native floristic elements, the Mean Quality of which 7.31. The Natural Area Index, at that richness, stands incredibly at 160. An additional 117 species have been reported reliably from Indiana Dunes State Park, and I suspect that as many as 100 of them are still extant. When these additional taxa are included in the calculations, the Mean Quality stands at 7.92, with a Natural Area Index of

194! I am confident that continued surveys will find this Survey Unit to have a contemporary Index in the area of 200 or so.

Indiana Dunes State Park is a vegetational unit, so I have not subdivided it into Survey Areas, as has been my tendency in other areas. Recently, though, a sort of dry/mesic sand prairie/savanna west of Trail 3 was discovered by Noel and Sarah Pavlovic, and we have come to refer to it specifically as the "Pavlovic Prairie." It has not been surveyed extensively but, combining what I saw with what Pavlovic (1987) recorded, there are 113 species known with a Mean Quality of 6.24 and an Index of 66. Perhaps the most interesting thing about it is that it has species like *Baptisia leucantha* and *Eryngium yuccifolium*, which, while typical of mesophytic prairies in the Chicago region generally, are rare in the sandy milieu of the Indiana Dunes.

The data used in assessing the relative Natural Area significance and integrity of Indiana Dunes State Park are provided in Table VI. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from the park, along with the numerical rating coefficients as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient, and do not enter directly into the derivations of the Natural Area Index. Many of the taxa listed in Table VI are followed by an "R" symbol, indicating that the taxon after which it occurs was reported on some basis other than one for which I have contemporary personal knowledge; but I want to emphasize that my survey time in the park has been embarrassingly brief, so most of the native taxa codified by an "R" symbol in Table VI are thought to be extant--perhaps as many as 85 to 90 percent. Many of the reports of adventive species are based upon Klick *et al.* (1989).

TABLE VI: Summary of species upon which are calculated the various Natural Area Indices for Indiana Dunes State Park.

0 <i>Acalypha rhomboidea</i>	8 <i>Amelanchier arborea</i>
0 <i>Acer negundo</i>	9 <i>Amelanchier humilis</i>
* <i>Acer platanoides</i>	8 <i>Amelanchier laevis</i>
7 <i>Acer rubrum</i>	15 <i>Ammophila breviligulata</i>
0 <i>Acer saccharinum</i> (R)	4 <i>Amphicarpa bracteata</i>
5 <i>Acer saccharum</i>	4 <i>Andropogon gerardii</i>
* <i>Achillea millefolium</i>	5 <i>Andropogon scoparius</i>
7 <i>Acorus calamus</i> (R)	4 <i>Anemone canadensis</i> (R)
7 <i>Actaea pachypoda</i>	2 <i>Anemone cylindrica</i>
15 <i>Adiantum pedatum</i>	7 <i>Anemone quinquefolia interior</i>
2 <i>Agrimonia gryposepala</i>	2 <i>Anemone virginiana</i>
8 <i>Agrimonia parviflora</i>	7 <i>Anemonella thalictroides</i>
5 <i>Agrimonia pubescens</i>	6 <i>Antennaria plantaginifolia</i>
* <i>Agropyron repens</i> (R)	6 <i>Apios americana</i>
8 <i>Agropyron trachycaulum unilaterale</i>	20 <i>Aplectrum hyemale</i>
1 <i>Agrostis perennans</i> (R)	5 <i>Apocynum androsaemifolium</i>
10 <i>Aletris farinosa</i> (R)	4 <i>Apocynum cannabinum</i> (R)
4 <i>Alisma subcordatum</i>	5 <i>Aquilegia canadensis</i>
* <i>Alliaria officinalis</i>	10 <i>Arabis canadensis</i>
1 <i>Allium canadense</i>	7 <i>Arabis lyrata</i>
7 <i>Allium tricoccum</i>	8 <i>Aralia nudicaulis</i>
8 <i>Alnus rugosa americana</i>	15 <i>Aralia racemosa</i> (R)
0 <i>Ambrosia artemisiifolia elatior</i>	* <i>Arctium minus</i> (R)

- | | |
|----------------------------------------------------|------------------------------------------|
| 10 <i>Arctostaphylos uva-ursi</i> <i>coactilis</i> | 5 <i>Bromus purgans</i> |
| 9 <i>Arenaria lateriflora</i> (R) | * <i>Bromus tectorum</i> |
| * <i>Arenaria serpyllifolia</i> | 8 <i>Cacalia atriplicifolia</i> |
| 10 <i>Arenaria stricta</i> (R) | 15 <i>Cakile edentula</i> |
| 5 <i>Arisaema atrorubens</i> | 3 <i>Calamagrostis canadensis</i> |
| 8 <i>Arisaema dracontium</i> (R) | 10 <i>Calamovilfa longifolia</i> |
| 7 <i>Aristida purpurascens</i> (R) | 5 <i>Caltha palustris</i> |
| 15 <i>Aristida tuberculosa</i> (R) | 15 <i>Campanula rotundifolia</i> |
| 5 <i>Artemisia caudata</i> | * <i>Capsella bursa-pastoris</i> (R) |
| * <i>Artemisia vulgaris</i> (R) | 5 <i>Cardamine bulbosa</i> |
| 5 <i>Asarum canadense</i> | 6 <i>Cardamine douglassii</i> |
| 10 <i>Asclepias exaltata</i> | 4 <i>Cardamine pennsylvanica</i> |
| 4 <i>Asclepias incarnata</i> | 10 <i>Carex alata</i> |
| 10 <i>Asclepias purpurascens</i> (R) | 10 <i>Carex albursina</i> |
| 0 <i>Asclepias syriaca</i> | 2 <i>Carex amphibola turgida</i> |
| 10 <i>Asclepias tuberosa</i> | 15 <i>Carex bromoides</i> |
| 1 <i>Asclepias verticillata</i> | 5 <i>Carex comosa</i> |
| 15 <i>Asclepias viridiflora</i> (R) | 1 <i>Carex convoluta</i> |
| 15 <i>Asimina triloba</i> | 10 <i>Carex crinita</i> |
| 6 <i>Asplenium platyneuron</i> | 4 <i>Carex cristatella</i> (R) |
| 8 <i>Aster azureus</i> | 20 <i>Carex debilis rudgei</i> (R) |
| 5 <i>Aster cordifolius</i> | 20 <i>Carex digitalis</i> (R) |
| 5 <i>Aster dumosus</i> (R) | 10 <i>Carex emmonsii</i> |
| 5 <i>Aster ericoides</i> (R) | 15 <i>Carex flava fertilis</i> (R) |
| 20 <i>Aster furcatus</i> (R) | 20 <i>Carex folliculata</i> |
| 10 <i>Aster junciformis</i> (R) | 15 <i>Carex garberi</i> (R) |
| 4 <i>Aster lateriflorus</i> | 10 <i>Carex gracillima</i> |
| 10 <i>Aster linariifolius</i> | 5 <i>Carex granularis</i> |
| 10 <i>Aster macrophyllus</i> | 7 <i>Carex grayii</i> |
| 1 <i>Aster pilosus</i> (R) | 15 <i>Carex intumescens</i> |
| 6 <i>Aster puniceus</i> | 10 <i>Carex lacustris</i> |
| 5 <i>Aster puniceus firmus</i> | 4 <i>Carex lanuginosa</i> |
| 5 <i>Aster sagittifolius</i> | 15 <i>Carex laxiculmis</i> |
| 3 <i>Aster simplex</i> | 1 <i>Carex laxiflora</i> |
| 10 <i>Aster umbellatus</i> | 8 <i>Carex lupulina</i> |
| 6 <i>Athyrium filix-femina michauxii</i> | 8 <i>Carex lurida</i> |
| 15 <i>Athyrium thelypteroides</i> (R) | 5 <i>Carex muhlenbergii</i> |
| 8 <i>Baptisia leucantha</i> | 5 <i>Carex normalis</i> |
| * <i>Barbarea vulgaris</i> (R) | 15 <i>Carex pedunculata</i> |
| 15 <i>Bartonia virginica</i> (R) | 5 <i>Carex pennsylvanica</i> |
| * <i>Berberis thunbergii</i> (R) | 1 <i>Carex rosea</i> |
| 15 <i>Betula papyrifera</i> | 10 <i>Carex rostrata utriculata</i> (R) |
| 8 <i>Bidens aristosa</i> (R) | 20 <i>Carex seorsa</i> |
| 20 <i>Bidens discoidea</i> | 2 <i>Carex stipata</i> |
| 1 <i>Bidens frondosa</i> | 5 <i>Carex stricta</i> |
| 2 <i>Boehmeria cylindrica</i> | 10 <i>Carex swanii</i> |
| 15 <i>Botrychium dissectum</i> | 15 <i>Carex tonsa</i> |
| 20 <i>Botrychium matricariaefolium</i> | 10 <i>Carex virescens</i> (R) |
| 20 <i>Botrychium multifidum intermedium</i> | 2 <i>Carex vulpinoidea</i> |
| 6 <i>Botrychium virginianum</i> | 8 <i>Carpinus caroliniana virginiana</i> |
| 15 <i>Brachyelytrum erectum</i> | 7 <i>Carya cordiformis</i> |
| 9 <i>Bromus ciliatus</i> | 5 <i>Carya ovata</i> |
| 15 <i>Bromus kalmii</i> (R) | ? <i>Castanea dentata</i> |

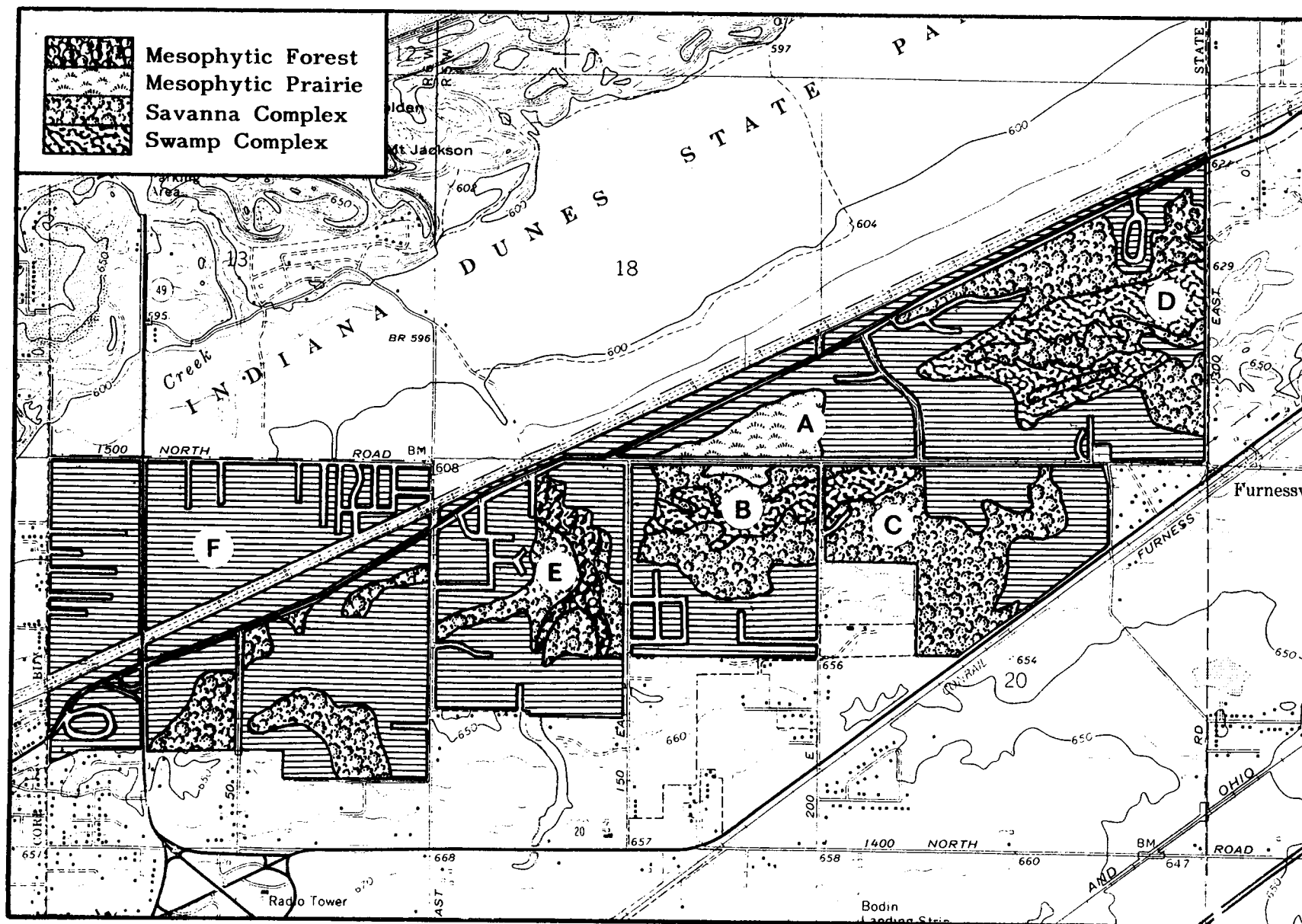
- * *Catalpa speciosa* (R)
- 8 *Caulophyllum thalictroides*
- 8 *Ceanothus americanus*
- * *Celastrus orbiculatus*
- 6 *Celastrus scandens*
- 15 *Celtis tenuifolia* (R)
- 7 *Cephalanthus occidentalis*
- * *Cerastium vulgatum*
- 15 *Chamaedaphne calyculata angustifolia* (R)
- 8 *Chelone glabra*
- * *Chenopodium album*
- 4 *Chenopodium leptophyllum*
- 20 *Chimaphila maculata* (R)
- 20 *Chimaphila umbellata cisatlantica*
- * *Chrysanthemum leucanthemum pinnatifidum*
- * *Chrysanthemum parthenium*
- 15 *Chrysosplenium americanum*
- 6 *Cicuta maculata*
- 5 *Cinna arundinacea*
- 0 *Circaea quadrisulcata canadensis*
- 6 *Cirsium altissimum* (R)
- * *Cirsium arvense*
- 2 *Cirsium discolor*
- 10 *Cirsium muticum*
- 20 *Cirsium pitcheri*
- * *Cirsium vulgare*
- 15 *Cladium mariscoides* (R)
- 2 *Claytonia virginica*
- 4 *Clematis virginiana*
- 7 *Comandra richardsiana*
- * *Commelina communis* (R)
- 15 *Conopholis americana*
- 1 *Convolvulus sepium*
- 15 *Corallorhiza maculata*
- 20 *Corallorhiza odontorhiza*
- 7 *Coreopsis lanceolata*
- 5 *Coreopsis tripteris*
- 8 *Corispermum hyssopifolium*
- 9 *Cornus alternifolia*
- 10 *Cornus florida*
- 5 *Cornus obliqua*
- 1 *Cornus racemosa*
- 15 *Cornus rugosa*
- 6 *Cornus stolonifera*
- 10 *Cornus stolonifera baileyi*
- 2 *Corylus americana*
- 5 *Crataegus calpodendron* (R)
- 1 *Crataegus crus-galli* (R)
- 5 *Crataegus macrosperma* (R)
- 6 *Crataegus pruinosa* (R)
- 1 *Crataegus punctata* (R)
- 0 *Cryptotaenia canadensis*
- 4 *Cuscuta gronovii*
- 5 *Cyperus houghtonii*
- 4 *Cyperus rivularis*
- 5 *Cyperus schweinitzii*
- 20 *Cypripedium acaule*
- 20 *Cypripedium calceolus parviflorum*
- 20 *Cypripedium calceolus pubescens*
- 20 *Cypripedium candidum*
- 6 *Cystopteris fragilis*
- * *Dactylis glomerata*
- 5 *Danthonia spicata*
- * *Daucus carota*
- 5 *Dentaria laciniata*
- 8 *Desmodium glutinosum*
- 10 *Desmodium nudiflorum* (R)
- 5 *Desmodium paniculatum*
- * *Dianthus armeria* (R)
- 6 *Dicentra cucullaria*
- 10 *Diervilla lonicera*
- * *Digitaria ischaemum*
- * *Digitaria sanguinalis*
- 5 *Dioscorea villosa*
- 15 *Drosera rotundifolia* (R)
- 10 *Dryopteris cristata*
- 15 *Dryopteris hexagonoptera*
- 15 *Dryopteris noveboracensis*
- 6 *Dryopteris spinulosa*
- 10 *Dryopteris spinulosa intermedia*
- 6 *Dryopteris thelypteris pubescens*
- 5 *Echinocystis lobata* (R)
- * *Elaeagnus angustifolia* (R)
- * *Elaeagnus umbellata*
- 6 *Eleocharis acicularis* (R)
- 8 *Eleocharis elliptica*
- 5 *Eleocharis palustris major* (R)
- * *Eleusine indica*
- 4 *Elymus canadensis*
- 4 *Elymus virginicus*
- 10 *Epifagus virginiana*
- 15 *Epigaea repens glabrifolia*
- 3 *Epilobium coloratum*
- 0 *Equisetum arvense*
- 4 *Equisetum hyemale affine*
- 1 *Erigeron annuus*
- 4 *Erigeron philadelphicus*
- 3 *Erigeron strigosus*
- 9 *Eryngium yuccifolium*
- 8 *Erythronium americanum*
- 7 *Euonymus obovatus*
- 20 *Eupatorium fistulosum*
- 5 *Eupatorium maculatum*
- 6 *Eupatorium perfoliatum*
- 4 *Eupatorium rugosum*
- 20 *Eupatorium sessilifolium brittonianum* (R)

- 2 *Euphorbia corollata*
- * *Euphorbia cyparissias*
- 15 *Euphorbia polygonifolia*
- * *Euphorbia supina*
- 10 *Fagus grandifolia*
- * *Festuca elatior*
- 5 *Festuca obtusa*
- 8 *Floerkea proserpinacoides*
- 1 *Fragaria virginiana*
- 5 *Fraxinus americana*
- 8 *Fraxinus nigra*
- 7 *Fraxinus pennsylvanica*
- 2 *Fraxinus pennsylvanica subintegerrima*
- 1 *Galium aparine*
- 10 *Galium brevipes* (R)
- 7 *Galium circaeazans hypomalacum*
- 4 *Galium concinnum*
- 15 *Galium lanceolatum*
- 5 *Galium obtusum*
- 10 *Galium pilosum*
- 8 *Galium tinctorium*
- 5 *Galium triflorum*
- 10 *Gaultheria procumbens*
- 9 *Gaylussacia baccata*
- 7 *Gentiana andrewsii* (R)
- 10 *Gentiana crinita* (R)
- 15 *Gentiana flavida* (R)
- 3 *Geranium carolinianum* (R)
- 4 *Geranium maculatum*
- 10 *Gerardia flava*
- 8 *Gerardia pedicularia ambigens*
- 7 *Gerardia tenuifolia* (R)
- 0 *Geum canadense*
- 1 *Geum laciniatum trichocarpum*
- 10 *Glyceria canadensis* (R)
- 20 *Glyceria pallida* (R)
- 8 *Glyceria septentrionalis* (R)
- 4 *Glyceria striata*
- 2 *Gnaphalium obtusifolium*
- 20 *Goodyera pubescens* (R)
- 5 *Gratiola neglecta*
- 20 *Habenaria ciliaris* (R)
- 15 *Habenaria clavellata*
- 15 *Habenaria flava herbiola*
- 20 *Habenaria hookeri*
- 20 *Habenaria psycodes*
- 15 *Habenaria viridis bracteata* (R)
- 0 *Hackelia virginiana*
- 8 *Hamamelis virginiana*
- 8 *Helianthemum canadense*
- 5 *Helianthus divaricatus*
- 6 *Hepatica acutiloba*
- 10 *Hepatica americana*
- 10 *Hibiscus palustris*
- 6 *Hieracium canadense fasciculatum*
- 6 *Hieracium gronovii*
- 8 *Hydrophyllum appendiculatum*
- 10 *Hypericum kalmianum*
- 8 *Hypericum mutilum*
- * *Hypericum perforatum*
- 4 *Hypericum punctatum* (R)
- * *Hypochaeris radicata* (R)
- 5 *Hystrix patula*
- 9 *Ilex verticillata*
- 3 *Impatiens capensis*
- 6 *Impatiens pallida*
- * *Inula helenium* (R)
- * *Iris germanica*
- 5 *Iris virginica shrevei*
- 8 *Juglans cinerea*
- 8 *Juncus acuminatus* (R)
- 8 *Juncus balticus littoralis*
- 7 *Juncus effusus solutus*
- 20 *Juncus scirpoides* (R)
- 0 *Juncus tenuis*
- 10 *Juniperus communis* (sensu lato)
- 2 *Juniperus virginiana crebra*
- 7 *Koeleria cristata*
- 7 *Krigia biflora*
- 6 *Krigia virginica*
- 4 *Kuhnia eupatorioides corymbulosa*
- * *Lactuca scariola*
- 3 *Laportea canadensis*
- 20 *Lathyrus japonicus glaber*
- 15 *Lathyrus ochroleucus* (R)
- 6 *Lathyrus palustris myrtifolius*
- 7 *Lechea villosa* (R)
- 5 *Leersia oryzoides*
- 7 *Leersia virginica*
- 5 *Lemna minor*
- * *Lepidium campestre*
- 0 *Lepidium virginicum*
- 4 *Lespedeza capitata*
- 6 *Lespedeza hirta*
- 6 *Liatris aspera*
- 8 *Liatris cylindracea*
- 6 *Liatris spicata*
- 6 *Lilium michiganense*
- 7 *Lindera benzoin*
- 7 *Linum medium texanum* (R)
- 8 *Liparis lilifolia* (R)
- 7 *Liparis loeselii* (R)
- 10 *Liriodendron tulipifera*
- 8 *Lithospermum croceum*
- 7 *Lobelia cardinalis*
- 4 *Lobelia inflata* (R)

- * *Lonicera X bella*
- 15 *Lonicera dioica*
- * *Lonicera X muendeniense*
- 6 *Ludwigia alternifolia*
- 5 *Ludwigia palustris americana*
- 7 *Lupinus perennis occidentalis*
- 5 *Luzula multiflora*
- 15 *Lycopodium inundatum* (R)
- 15 *Lycopodium lucidulum* (R)
- 15 *Lycopodium obscurum* (R)
- 5 *Lycopus americanus*
- 10 *Lycopus rubellus*
- 6 *Lycopus uniflorus* (R)
- 4 *Lysimachia ciliata*
- 7 *Lysimachia lanceolata* (R)
- 7 *Lythrum alatum* (R)
- * *Lythrum salicaria* (R)
- 15 *Maianthemum canadense*
- 10 *Maianthemum canadense interius*
- * *Marrubium vulgare* (R)
- 10 *Medeola virginiana*
- 15 *Melampyrum lineare latifolium* (R)
- 6 *Menispermum canadense*
- 5 *Mentha arvensis villosa* (R)
- 15 *Milium effusum*
- 20 *Mimulus alatus* (R)
- 15 *Mitchella repens*
- 10 *Mitella diphylla*
- 4 *Monarda fistulosa*
- 5 *Monarda punctata villicaulis*
- 15 *Monotropa hypopithys* (R)
- 15 *Monotropa uniflora*
- * *Morus alba* (R)
- 15 *Morus rubra* (R)
- 0 *Muhlenbergia schreberi*
- 9 *Muhlenbergia tenuiflora* (R)
- 20 *Myosotis laxa* (R)
- 7 *Nuphar advena*
- 8 *Nyssa sylvatica*
- 1 *Oenothera biennis*
- 7 *Oenothera rhombipetala*
- 8 *Onoclea sensibilis*
- 5 *Opuntia humifusa*
- 15 *Orobanche uniflora*
- 20 *Oryzopsis asperifolia*
- 20 *Oryzopsis pungens* (R)
- 3 *Osmorhiza claytoni*
- 3 *Osmorhiza longistylis*
- 6 *Osmunda cinnamomea*
- 7 *Osmunda claytoniana*
- 8 *Osmunda regalis spectabilis*
- 5 *Ostrya virginiana*
- 0 *Oxalis europaea*
- 7 *Oxypolis rigidior*
- 15 *Panax quinquefolius*
- 15 *Panax trifolius*
- 15 *Panicum boreale*
- 7 *Panicum clandestinum*
- 10 *Panicum depauperatum*
- 20 *Panicum dichotomum* (R)
- 3 *Panicum implicatum*
- 7 *Panicum latifolium*
- 9 *Panicum lindheimeri*
- 15 *Panicum oligosanthos* (R)
- 7 *Panicum oligosanthos scribnerianum*
- 15 *Panicum perlongum* (R)
- 7 *Panicum villosissimum*
- 9 *Panicum villosissimum pseudopubescens*
- 5 *Panicum virgatum*
- 1 *Parthenocissus inserta*
- 2 *Parthenocissus quinquefolia*
- 10 *Pedicularis canadensis*
- 7 *Pedicularis lanceolata*
- 15 *Peltandra virginica*
- 4 *Penstemon calycosus*
- 5 *Penthorum sedoides* (R)
- 0 *Phalaris arundinacea*
- 5 *Phlox divaricata*
- 6 *Phlox pilosa*
- 4 *Phragmites communis berlandieri*
- 4 *Physalis virginiana*
- 8 *Physocarpus opulifolius*
- 5 *Physostegia virginiana*
- 2 *Phytolacca americana*
- 5 *Pilea pumila*
- 20 *Pinus banksiana*
- * *Pinus nigra* (R)
- 20 *Pinus strobus*
- * *Pinus sylvestris*
- * *Plantago lanceolata*
- * *Plantago major*
- 0 *Plantago rugelii*
- 10 *Platanus occidentalis*
- 15 *Poa alsodes*
- * *Poa annua*
- * *Poa bulbosa* (R)
- * *Poa compressa*
- 15 *Poa languida*
- 20 *Poa paludigena* (R)
- 9 *Poa palustris* (R)
- * *Poa pratensis*
- 5 *Podophyllum peltatum*
- 20 *Polygala paucifolia*
- 10 *Polygala polygama obtusata* (R)
- 6 *Polygala sanguinea*
- 3 *Polygonatum canaliculatum*

- 7 *Polygonatum pubescens*
- 15 *Polygonella articulata* (R)
- 15 *Polygonum arifolium pubescens*
- * *Polygonum aviculare*
- 15 *Polygonum careyi*
- * *Polygonum cespitosum longisetum*
- 7 *Polygonum hydropiperoides*
- 10 *Polygonum sagittatum*
- 15 *Polypodium virginianum*
- 10 *Polystichum acrostichoides*
- 20 *Populus balsamifera* (R)
- 2 *Populus deltoides*
- 6 *Populus grandidentata*
- 4 *Populus tremuloides*
- 6 *Potentilla anserina*
- 15 *Potentilla palustris* (R)
- * *Potentilla recta* (R)
- 4 *Potentilla simplex*
- 5 *Prenanthes alba*
- 10 *Prenanthes altissima*
- 0 *Prunella vulgaris lanceolata*
- 5 *Prunus pensylvanica*
- 8 *Prunus pumila*
- 1 *Prunus serotina*
- 1 *Prunus virginiana*
- 7 *Ptelea trifoliata* (R)
- 9 *Ptelea trifoliata mollis*
- 5 *Pteridium aquilinum latiusculum*
- 10 *Pyrola elliptica*
- 15 *Pyrola rotundifolia americana*
- 3 *Pyrus coronaria* (R)
- 9 *Pyrus floribunda*
- 2 *Pyrus ioensis*
- * *Pyrus malus*
- 7 *Pyrus melanocarpa*
- 4 *Quercus alba*
- 8 *Quercus bicolor*
- 8 *Quercus palustris*
- 7 *Quercus rubra*
- 6 *Quercus velutina*
- 0 *Ranunculus abortivus*
- 6 *Ranunculus pensylvanicus*
- 5 *Ranunculus recurvatus*
- 4 *Ranunculus septentrionalis*
- 4 *Ratibida pinnata*
- 9 *Rhus aromatica*
- 15 *Rhus aromatica arenaria*
- 6 *Rhus copallina latifolia*
- 1 *Rhus radicans*
- 3 *Rhus typhina*
- 15 *Rhus vernix*
- 8 *Rhynchospora capitellata*
- 7 *Ribes americanum*
- 5 *Ribes cynosbati*
- * *Ribes sativum* (R)
- * *Robinia pseudo-acacia*
- * *Robinia viscosa* (R)
- 5 *Rosa blanda*
- 5 *Rosa carolina*
- * *Rosa multiflora*
- 9 *Rosa palustris*
- 3 *Rubus allegheniensis*
- 4 *Rubus flagellaris*
- 9 *Rubus hispidus obovalis*
- 7 *Rubus idaeus strigosus*
- 2 *Rubus occidentalis*
- 3 *Rubus pensylvanicus*
- 15 *Rubus pubescens*
- 1 *Rudbeckia hirta*
- 3 *Rudbeckia laciniata*
- * *Rumex acetosella*
- 2 *Rumex altissimus*
- * *Rumex crispus*
- * *Rumex obtusifolius*
- 7 *Rumex orbiculatus*
- 6 *Rumex verticillatus*
- 4 *Sagittaria latifolia*
- 5 *Salix amygdaloides*
- 8 *Salix bebbiana* (R)
- 2 *Salix discolor*
- 7 *Salix glaucophylloides glaucophylla*
- 10 *Salix gracilis textoris* (R)
- 6 *Salix humilis*
- 1 *Salix interior*
- 15 *Salix lucida* (R)
- 4 *Salix nigra*
- 5 *Salix rigida*
- 15 *Salix sericea* (R)
- 15 *Salix syrticola*
- * *Salsola kali tenuifolia* (R)
- 1 *Sambucus canadensis*
- 10 *Sambucus pubens*
- 6 *Sanguinaria canadensis*
- 9 *Sanicula canadensis*
- 2 *Sanicula gregaria*
- 6 *Sanicula marilandica*
- * *Saponaria officinalis*
- 6 *Sassafras albidum*
- 10 *Saururus cernuus*
- 8 *Saxifraga pensylvanica*
- 4 *Scirpus atrovirens*
- 6 *Scirpus fluviatilis*
- 4 *Scirpus lineatus*
- 5 *Scirpus validus creber* (R)
- 5 *Scutellaria lateriflora*
- 20 *Selaginella rupestris*

- 7 *Senecio aureus*
- 15 *Senecio plattensis*
- * *Silene armeria*
- * *Silene noctiflora* (R)
- 7 *Sisyrinchium albidum*
- 10 *Sisyrinchium angustifolium* (R)
- 15 *Sisyrinchium atlanticum* (R)
- 7 *Sium suave*
- 2 *Smilacina racemosa*
- 5 *Smilacina stellata*
- 3 *Smilax ecirrhata*
- 4 *Smilax lasioneura*
- 15 *Smilax rotundifolia*
- 5 *Smilax tamnoides hispida*
- * *Solanum americanum*
- * *Solanum dulcamara*
- 1 *Solidago altissima*
- 7 *Solidago caesia*
- 3 *Solidago gigantea*
- 4 *Solidago nemoralis*
- 8 *Solidago patula*
- 15 *Solidago racemosa gillmani*
- 6 *Solidago rugosa*
- 7 *Solidago speciosa*
- 9 *Solidago uliginosa* (R)
- 5 *Solidago ulmifolia*
- 5 *Sorghastrum nutans*
- 15 *Sparganium americanum* (R)
- 6 *Sparganium eurycarpum*
- 4 *Sphenopholis intermedia*
- 7 *Spiraea alba*
- 9 *Spiraea tomentosa rosea*
- 7 *Spirodela polyrhiza*
- 5 *Stachys palustris homotricha*
- 5 *Stachys tenuifolia hispida* (R)
- 7 *Staphylea trifolia* (R)
- 8 *Stellaria longifolia*
- * *Stellaria media*
- 15 *Stipa avenacea*
- 6 *Stipa spartea*
- 7 *Strophostyles helvola* (R)
- 6 *Symplocarpus foetidus*
- * *Tanacetum vulgare* (R)
- * *Taraxacum officinale*
- 8 *Tephrosia virginiana*
- 3 *Teucrium canadense* (R)
- 4 *Thalictrum dasycarpum* (R)
- 5 *Thalictrum dioicum*
- 8 *Thaspium barbinode* (R)
- 7 *Thaspium trifoliatum flavum* (R)
- 5 *Tilia americana*
- 2 *Tovara virginiana*
- 2 *Tradescantia ohiensis*
- * *Tragopogon major*
- 15 *Trientalis borealis*
- * *Trifolium hybridum* (R)
- * *Trifolium repens*
- 6 *Trillium flexipes*
- 8 *Trillium grandiflorum*
- 5 *Trillium recurvatum*
- * *Triodia flava*
- 20 *Triphora trianthophora* (R)
- * *Triticum aestivum* (R)
- 2 *Typha angustifolia*
- 1 *Typha latifolia*
- 3 *Ulmus americana*
- 4 *Ulmus rubra* (R)
- 2 *Urtica procera*
- 7 *Uvularia grandiflora*
- 5 *Vaccinium angustifolium laevifolium*
- 15 *Vaccinium atrococcum*
- 8 *Vaccinium corymbosum*
- 15 *Vaccinium macrocarpon* (R)
- 5 *Vaccinium vacillans*
- * *Verbascum thapsus*
- * *Verbena bracteata* (R)
- 4 *Verbena hastata*
- 5 *Vernonia altissima* (R)
- 5 *Vernonia fasciculata*
- 10 *Veronica comosa* (R)
- 10 *Veronica scutellata* (R)
- * *Veronica serpyllifolia*
- 9 *Viburnum acerifolium*
- 5 *Viburnum lentago*
- * *Viburnum opulus*
- 4 *Viburnum prunifolium*
- 5 *Viburnum rafinesquianum*
- 2 *Viola affinis*
- 15 *Viola canadensis*
- 6 *Viola cucullata*
- 15 *Viola incognita forbesii*
- 15 *Viola pallens*
- 0 *Viola papilionacea*
- 10 *Viola pedata lineariloba*
- 5 *Viola pensylvanica*
- 10 *Viola pubescens*
- 3 *Viola sororia*
- 6 *Viola striata*
- 10 *Vitis aestivalis*
- 15 *Vitis labrusca*
- 4 *Vitis riparia*
- 6 *Vulpia octoflora tenella*
- 7 *Wolffia columbiana*
- 1 *Xanthoxylum americanum* (R)
- 15 *Xyris torta*



SURVEY UNIT VII: VISITOR CENTER

This Survey Unit occupies about 1300 acres, including internal roads, in the Tremont area, south of Indiana Dunes State Park, between Porter and Furnessville (see Figure II). I was, for one reason or another, unable to survey adequately the western half of this Survey Unit, but instead devoted the time allotted for this Unit to the eastern half, where I assessed five Survey Areas. Aside from desultory visits, these areas (see the Survey Unit Map on the next page) were surveyed systematically May 19 and 28, and September 9, 13, and 22, 1979; 7, 13, and May 20; and September 9, 1987. I was accompanied at various times on these surveys by Robert F. Betz, Ken Dritz, Emma Pitcher, and Elizabeth Shimp. Since 1979, Emma Pitcher and others have spent extensive periods of time botanizing the western portion of the Unit, particularly that portion designated Survey Area F on the Survey Unit Map.

The Survey Unit Map was superimposed to scale over a part of the U.S.G.S. Dune Acres Quadrangle, N4137.5-W8700/7.5, photo-revised 1980. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a black & white stereo-pair set (BFP-2: 52-53) flown in November, 1938; a black & white stereo-pair set (BFP-5: 4-5) flown in June, 1939; a black & white stereo-pair set (BFP-1V: 24-25) flown in September, 1958; a black & white stereo-pair set (BFP-2V: 119-120 and 152-154) flown in September, 1958; a color stereo-pair set (19-117: 76-81 and 118-123) flown in May, 1979; a color stereo-pair set (5:9 - 5:13) and a black & white stereo-pair set (8:14 - 8:20 and 10:1 - 10:4), both flown in May, 1984.

Prior to 1979, this Survey Unit had been largely unexplored floristically by previous botanists—at least very little data on this area have made their way into literature. From what we can tell from the literature, the older botanists tended to trek north from the South Shore line into the heart of the Dunes Region, so that even such herbarium labels as have "Furnessville" on them probably signify collections made north of this district. Such orientations, if we are correct in interpreting them, appear to have disenfranchised a significant and impressive complex of Natural Area. With only contemporary data to inform us, we nevertheless can see that this Survey Unit provides the habitat for substantial numbers of SPECIAL VEGETATION floristic elements. Indeed, the vaunted Miller Unit has only a comparable number and is virtually equivalent in overall quality; and it is clear to me that additional SPECIAL VEGETATION floristic elements are likely to be found here.

Many of the SPECIAL VEGETATION floristic elements which I have recorded for Survey Areas A and B (see the Survey Unit Map on the next page) were brought to my attention by Emma "Bickie" Pitcher—without whom our knowledge of these areas would be sorely anemic. Emma Pitcher, who once owned a house on Veden Road, has been interested in the vegetation of Survey Areas A and B for many years, particularly the portions mapped as Mesophytic Prairie on the Natural Area Vegetation Map (which see). She is compiling a comprehensive flora of this portion (Pitcher, 1987b), from the notes of which many of the reports in this inventory are obtained.

Survey Areas A and B are too small and too awkwardly situated to be given unique names in relation to towns or streets. I recommend that these interesting areas, for ease of identity and to honor Emma Pitcher, be called the Emma Pitcher Prairies, North and South, respectively. I at least have chosen to do so in other parts of this chapter on Survey Unit VII.

ANNOTATED LIST
OF
SPECIAL VEGETATION FLORISTIC ELEMENTS

Adiantum pedatum L. This species is still extant along the edge of the Swamp Complex in Survey Area C.

Alnus rugosa var. **americana** (Regel) Fern. Speckled Alder is occasional along the Bike Trail in the western portion of the Survey Unit, and in the Swamp Complex portions of Survey Areas B and C.

Arctostaphylos uva-ursi var. **coactilis** Fern. & Macbr. Bearberry is known locally only from the Black Oak dunes of Survey Area B. Parker (1936) considered local populations of this species to be boreal relicts.

Aristida tuberculosa Nutt. This rare grass is known from Survey Area A on the basis of the following REPRESENTATIVE SPECIMEN: *Dritz #42, 18 APR 1980; north of Furnessville Road, south of US 12, west of 200E Road, in pure sand, west of Furnessville.* MOR. Bowles et al. (1986a) reported that it was "local throughout blowout area," and listed the following associates: **Andropogon scoparius**, **Cyperus schweinitzii**, **Panicum villosissimum** var. **pseudopubescens**, **Prunus pumila**, **P. serotina**, **Quercus velutina**, and **Triplasis purpurea**. Bowles (1989) reported that the population he sampled in 1985 is still doing well. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Asimina triloba (L.) Dunal There is a rather large colony of this tree in the Swamp Complex of Survey Area C, and Pitcher (1988b) reported several trees on the east side of Waverly Road in Survey Area F.

Aster furcatus Burgess I am interpreting the following REPRESENTATIVE SPECIMEN to have been collected in the far western portion of the Survey Unit: *Peattie, 16 AUG 1920; Port Chester, roadsides in sand.* F. It probably is no longer extant here.

Bartonia virginica (L.) BSP. This inconspicuous little plant is still extant in a moist, acid, sandy swale in the Pitcher Prairie, both North and South. REPRESENTATIVE SPECIMEN: *Pitcher & Plampin #6, 28 AUG 1985; T37N R6W SE SE Sec.18; growing in east end of fern marsh, north of Furnessville Rd., south of large open sand areas; hydromesophyte.* INDU. Parker (1936) considered local populations of this species to be coastal-plain relicts.

Bidens discoidea (T. & G.) Britt. This species is occasional to frequent in the Swamp Complex portions of Survey Areas C and D. REPRESENTATIVE SPECIMEN: *Wilhelm #6960, 13 SEP 1979; in stabilized dune forest just S of the Visitor Center, W of Kemil Rd, ca 0.6 mi N of Furnessville, in the SE NE Sec.17 T37N R5W, in buttonbush swamp.* MOR. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Botrychium dissectum Spreng. This little fern is occasional in the Savanna Complex portions of Survey Areas C and E, and in Survey Area F, from where was collected the following REPRESENTATIVE SPECIMEN: *Hiebert #105, 31 AUG 1981; T37N R6W NE NW Sec.24; mesophytic woods just south of building removal sites off of East State Park Boundary Rd.; area is flat, with sandy soil humus layer; one plant of this variety [f. **dissectum**]; however, specimens of **B. dissectum** f. **obliquum** are numerous.* INDU.

Brachyelytrum erectum (Schreb.) Beauv. This species is frequent in the Swamp Complex portions of Survey Areas C, D and E.

Carex bromoides Schkuhr This handsome sedge is frequent nearly throughout the Swamp Complex portions of this Survey Unit.

Carex canescens L. This sedge is rare in the remarkable Swamp Complex of Survey Area B, from where comes the following REPRESENTATIVE SPECIMEN: *Wilhelm & Betz #14790, 13 MAY 1987; ca 1 mi west of Furnessville, in red maple swamp area west of 200 E Road.* MOR. This specimen is referable to var. *subloliacea* Laestad.

Carex debilis var. *rudgei* Bailey This species is occasional to frequent in the Swamp Complex portions of Survey Areas D and E.

Carex digitalis Willd. Evidently rare, this species is known from a mesic hummock in the Swamp Complex of Survey Area D.

Carex folliculata L. This conspicuous species is frequent in the Swamp Complex of Survey Area D.

Carex intumescens Rudge This species is frequent in the Swamp Complex portions of Survey Areas C and D and in similar habitat in Survey Area F. REPRESENTATIVE SPECIMEN: *Otto #66, 19 JUL 1982; common in muck in disturbed razed house site 16-129 off of Waverly Rd, in T37N R6W NW NW Sec.24.* MOR.

Carex laxiculmis Schwein. This very rare sedge is known locally only from a mesophytic hummock in the Swamp Complex of Survey Area E.

Carex leptoneuria Fern. This rare sedge is occasional on mesophytic hammocks in the Swamp Complex of Survey Areas B and D. REPRESENTATIVE SPECIMEN: *Wilhelm & Betz #14789, 13 MAY 1987; ca 1 mi W of Furnessville, in red maple swamp area west of 200 E Road.* MOR.

Carex seorsa Howe This easily overlooked sedge is frequent in the Swamp Complex portions of Survey Areas B, C, and D. REPRESENTATIVE SPECIMEN: *Wilhelm #6593, 19 MAY 1979; ca 1 mi S of Beverly Shores, W of 300E Road, ca 0.25 mi S of US 12; swamp and dune, near the center of the E E Sec.17 T37N R5W.* MOR. Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Carex tonsa (Fern.) Bickn. This species is confined to sandy woods in the Savanna Complex of Survey Area D.

Chimaphila maculata (L.) Pursh This very rare species was first reported for this area by Mr. Mike Madany (see Swink & Wilhelm, 1979, p.187); it is still extant in several areas not far off the trail in Survey Area D. REPRESENTATIVE SPECIMEN: *Wilhelm #6961, 13 SEP 1979; in stabilized dune forest just south of the Visitor Center, W of Kemil Road, ca 0.6 mi N of Furnessville, in the SE NE Sec.17 T37N R5W.* MOR.

Chrysosplenium americanum Schwein. Rare locally, there is a nice colony of Golden Saxifrage in the Swamp Complex of Survey Area E.

Conopholis americana (L.) Wallr. This species is occasional in the Swamp Complex portions of Survey Areas C and B, and Pitcher (1987b) noted several colonies along the horse

trail at the east end of the burn area in Survey Area A. Plampin (1989b) noted 18 plants in Survey Area C on January 11, 1988.

Corallorhiza maculata Raf. Plampin (1989b) noted one plant in Survey Area D in 1984 and again, at the same spot, in 1985.

Corallorhiza odontorhiza (Willd.) Fern. This little orchid is rare along the trail in Survey Area D. REPRESENTATIVE SPECIMEN: *Wilhelm #6958, 13 SEP 1979; in stabilized dune forest just S of the Visitor Center, W of Kemil Road, ca 0.6 mi N of Furnessville, in the SE NE Sec.17 T37N R5W. MOR.*

Desmodium ciliare (Muhl.) DC. This rare legume is known only from Survey Area A, from where was collected the following REPRESENTATIVE SPECIMEN: *Jones #32, 6 AUG 1981; T37N R5W SW SW Sec.17, along Ly-co-ki-we Trail north of Furnessville Rd. and 30 yards west of Teale Rd., found in an open area surrounded by woods; soil sandy; plants common. INDU.*

Diervilla lonicera Mill. Curiously, my only record of this species in the Visitor Center Unit is from Black Oak savanna in Survey Area C. Welch (1935) considered local populations of this species to be boreal relicts.

Dryopteris hexagonoptera (Michx.) Christens. This little fern is rare to occasional in the Swamp Complex portions of Survey Area C.

Dryopteris noveboracensis (L.) Gray This delicate little fern is frequent in the Swamp Complex portions of Survey Areas C, D, E, and probably B.

Epigaea repens var. **glabrifolia** Fern. This very rare little subshrub was pointed out to me by Emma Pitcher as growing in Survey Areas A and B. Ken Dritz, also with the help of Mrs. Pitcher, secured the following REPRESENTATIVE SPECIMEN: *Dritz #49, 4 MAY 1980; in acid sandy soil in a burned-over oak savanna S of 1500N Rd, W of 200E Rd, NW NE Sec.19 T37N R5W, E of Tremont, with Gaultheria procumbens, Hypericum kalmianum, Vaccinium angustifolium var. laevifolium, Carex pensylvanica, Quercus palustris, Sorghastrum nutans, and Pyrus melanocarpa. MOR. Bowles et al. (1986a), for the colony in Survey Area B, listed the following associates: Gaylussacia baccata, Nyssa sylvatica, Populus grandidentata, P. tremuloides, Pyrus melanocarpa, Quercus alba, Q. velutina, Rhus copallina var. latifolia, Rubus hispidus var. obovalis, Sassafras albidum, and Vaccinium angustifolium var. laevifolium. Friesner (1936) considered local populations of this species to be boreal relicts.*

Eupatorium fistulosum Barratt This species is occasional to common in sunny swampy ground in the Furnessville area, particularly along the Bike Trail and along Kemil Road south of U.S. 12. REPRESENTATIVE SPECIMEN: *Hiebert #417, 24 AUG 1983; T37N R6W SW NW Sec.24, Waverly Rd. old home site; 4-year abandoned lawn, flat, organic over sand. INDU.*

Galium lanceolatum Torr. This rare species is occasional in the Swamp Complex of Survey Area C. See also the comments under the Bailly Unit.

Gentiana saponaria L. This beautiful gentian is still frequent in both the Emma Pitcher Prairies in Survey Areas A and B. Pitcher (1988b) reported one plant, possibly introduced, near her driveway in Survey Area F.

Glyceria pallida (Torr.) Trin. This extremely rare grass is known locally solely on the basis of the following REPRESENTATIVE SPECIMEN: *Dritz #393, 2 JUN 1985; swamp; S side of Furnessville Rd., 0.1 mi W of Teale Rd., 0.15 mi E of Veden Rd.; NE NW NW Sec.20 T37N R5W; with Glyceria septentrionalis, G. striata, Lemna minor, L. trisulca, Alopecurus aequalis, Ranunculus flabellaris, R. septentrionalis, Rosa palustris, and Cephalanthus occidentalis.* MOR.

Goodyera pubescens (Willd.) R. Br. Pavlovic (1988b) describes the tenuous odyssey of this rare orchid: "Last March . . . the Dune Park Station . . . wanted to expand their parking lot. We discovered a large [doomed] population of **Goodyera pubescens** . . . On September 10, Barbara Plampin went to the site and removed over a dozen . . . plants and also discovered and removed a large clump of **Lycopodium lucidulum**. . . [Later, we] transplanted the plants to a similar area to the east in the park." Plampin (1989a) reported that the transplant survives. The original colony was located at what is now the southwest corner of the new parking lot for the Dune Park Station. The transplant is about 750 feet northeast, about 300 feet north by northeast of the end of 50 East Road. Pavlovic (1988b) also reported an extant autochthonous colony just opposite 50 East Road, off the north side of U.S. 12. Pitcher (1988b) noted a colony within 100 meters east of Ditch A on a line with Ditch B.

Habenaria clavellata (Michx.) Spreng. The only record for this species in this Survey Unit is from along the Bike Trail (Bergendahl, 1983), 20 ft. west of tower #8416, with **Gentiana crinita**, **Xyris torta**, and **Sabatia angularis**. Friesner (1936) considered local populations of this species to be boreal relicts.

Hypericum kalmianum L. This St. John's Wort is rare but widespread in the eastern portion of the Survey Unit.

Linum virginianum L. This little yellow flax is rare in the Pitcher Prairie portion of Survey Area B.

Lonicera dioica L. This honeysuckle is rare in the Swamp Complex of Survey Area E, and Pitcher (1987b) noted one plant along the north edge of Furnessville Road in Survey Area A.

Lycopodium clavatum L. The running ground pine is known locally solely on the basis of the following REPRESENTATIVE SPECIMEN: *Bowles & DeMauro s.n., 15 JUL 1985; T37N R5W SW SE SE Sec.18; found 14 m S of Horse Trail at Furnessville Rd; flat mesic sand forest; one small colony.* INDU. Bowles (1988) mapped and described this population and noted that it is one of only two populations in the entire Lakeshore.

Lycopodium lucidulum Michx. This little club moss is occasional in the Swamp Complex portions of Survey Areas B and D; it has also been reported from Survey Area F. REPRESENTATIVE SPECIMEN: *Wilhelm #6587, 19 MAY 1979; ca 1 mi S of Beverly Shores, W of 300E Rd, ca 0.25 mi S of US 12; swamp and dune, near the center of the E E Sec.17 T37N R5W.* MOR.

Lycopodium tristachyum Pursh The ground cedar is known locally solely on the basis of the following REPRESENTATIVE SPECIMEN: *Bowles & DeMauro s.n., 15 JUL 1985; T37N R5W SW SE SE Sec.18; found 14 m S of Horse Trail at Furnessville Rd.; flat mesic sand prairie.* INDU. Bowles (1988) recorded 7 live ramets in 1987, possibly the only live population in the Lakeshore; see also Dune Acres, Survey Unit V.

Maianthemum canadense Desf. var. **canadense** This rare variety of Mayflower is occasional on mesophytic hummocks in the Swamp Complex of Survey Area D. Friesner (1936) considered local populations of this species to be boreal relicts, though Welch (1935) postulated that it may have entered Indiana by way of Ohio.

Mitchella repens L. The Partridge Berry is occasional to frequent in the Swamp Complex portions of Survey Areas B, D and E.

Monotropa hypopithys L. This little plant is very rare in the Savanna Complex portion of Survey Area D. REPRESENTATIVE SPECIMEN: *Wilhelm #6957, 13 SEP 1979; in stabilized dune forest just S of the Visitor Center, W of Kemil Road, ca 0.6 mi N of Furnessville, in the SE NE Sec.17 T37N R5W. MOR.*

Panax trifolius L. Dwarf Ginseng is occasional in the Hydromesophytic Swamps of Survey Areas D and E. Welch (1935) considered local populations of this species to be boreal relicts.

Panicum dichotomum L. In 1979, I took note of a single clump of this species along a trail at the north edge of the Swamp Complex in Survey Area B; I made a field identification, but felt there was not enough material to sacrifice a specimen. I also noted a small clump in Survey Area A. There is a larger colony in Survey Area D, from where I collected the following REPRESENTATIVE SPECIMEN: *Wilhelm & Shimp #14858, 21 MAY 1987; near Furnessville, west of Kemil Road, north of Route 20, in sandy ground around pistol range. MOR.*

Pinus banksiana Lamb.¹ Emma Pitcher led me to a young specimen of this rare tree in the eastern portion of the North Pitcher Prairie, Survey Area A; she also noted (Pitcher, 1988b) that it grows in Survey Area F. Welch (1935) considered local populations of this species to be boreal relicts.

Poa languida Hitchc. This rare grass is occasional on mesophytic hummocks in the Swamp Complex of Survey Area B. REPRESENTATIVE SPECIMEN: *Wilhelm & Betz #14786, 13 MAY 1987; ca 1 mi W of Furnessville, in red maple swamp area west of 200 E Road. MOR.*

Polygonum arifolium var. **pubescens** (Keller) Fern. This species is occasional in the Swamp Complex portion of Survey Area C, and is probably also extant within similar habitats in Survey Areas B and D.

Prunus pensylvanica L.f. This little shrub is still occasional in Survey Areas A, B, and D.

Pyrola elliptica Nutt. First noted in 1979 by Emma Pitcher, the colony was later documented by the following REPRESENTATIVE SPECIMEN: *von Oettingen #311, 9 JUL 1982; on large patch on roadside bank, Furnessville Road ca 100 m W of jct with 200E; T37N R5W NE NW Sec.19. MOR.* Plampin (1989b) reported a pink form in Survey Area D. Friesner (1936) considered local populations of this species to be boreal relicts.

¹Autochthonous specimens of *Pinus strobus* are unknown to me in this Survey Unit. Pitcher (1988b) reports "several large, beautiful ones. All planted?" in Survey Area F east of Route 49, south of State Park Boundary Road. Bergendahl (1983) notes that the pines near the intersection of Route 49 and U.S. 12 were planted by Gus Olson in the 1950's.

Pyrola rotundifolia var. **americana** (Sweet) Fern. First discovered by Emma Pitcher, it has been documented by the following REPRESENTATIVE SPECIMEN: *von Oettingen* #313, 9 JUL 1982; large patch in oak savanna with much bracken fern in "hole" in burn area along US park horse trail ca 100 m N of Furnessville Rd; T37N R5W SE SE Sec.18. MOR. Bowles et al. (1986a) mapped and described its location, and listed the following associates: **Carex pensylvanica**, **Comandra richardsiana**, **Gaultheria procumbens**, **Hamamelis virginiana**, **Poa compressa**, **Pteridium aquilinum** var. **latiusculum**, **Quercus alba**, **Q. velutina**, **Sassafras albidum**, and **Vaccinium vacillans**. Friesner (1936) considered local populations of both species of **Pyrola** to be boreal relicts.

Rhexia virginica L. This beautiful species is occasional in an acid swale in the eastern end of the North Pitcher Prairie. Parker (1936) considered this species a coastal-plain element.

Rhus aromatica var. **arenaria** (Greene) Fern. The only known report of this species for Survey Unit VII is by Pitcher (1987b), who noted that it grew along the "shoulder of Furnessville Road, near its highest point" in Survey Area B.

Rhus vernix L. The only site I know of in this Survey Unit is a small colony along the north side of the Bike Trail, just east of Route 49 near tower #8811.

Ribes hirtellum Michx. The rare Northern Gooseberry is occasional in the Swamp Complex of Survey Area B.

Rubus pubescens Raf. This delicate Raspberry is occasional to common in the Swamp Complex portions of Survey Areas B, C, D and E. REPRESENTATIVE SPECIMEN: *Wilhelm* #6580, 19 MAY 1979; ca 1 mi S of Beverly Shores, W of 300E Rd, ca 0.25 mi S of US 12; swamp and dune, near the center of the E E Sec.17 T37N R5W. MOR.

Sabatia angularis (L.) Pursh The only known report of this species from this Unit is along the Bike Trail, where Bergendahl (1983) reported it as growing near tower #8415, and 20 feet west of tower #8416 with **Gentiana crinita**, **Xyris torta**, and **Habenaria clavellata** [August 4, 1982].

Salix sericea Marsh. This willow is occasional in the Swamp Complex portions of Survey Areas B and D. REPRESENTATIVE SPECIMEN: *Wilhelm* #6959, 13 SEP 1979; in stabilized dune forest just S of the Visitor Center, W of Kemil Rd, ca 0.6 mi N of Furnessville, in the SE NE Sec.17 T37N R5W, in buttonbush swamp. MOR.

Smilax rotundifolia L. This species is occasional to common nearly throughout the Savanna Complex.

Stachys hyssopifolia Michx. This species is known locally only from the following REPRESENTATIVE SPECIMEN: *Jones* #28, 5 AUG 1981; 0.25 mi S of US 12, 150 feet W of Rd. 50E along trail to E. E. Center; T37N R6W NE SW Sec.24; sandy area through hardwood forest. MOR. Both Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Tradescantia subaspera Ker. This distinctive Spiderwort was first noted by Emma Pitcher in August of 1982 near Hadenfeld Road at an "old house site." Was it planted there? According to Deam (1940), it is rather more frequent in Indiana just south of our region. He indicated that it was never common, and almost always on shaded slopes and in ravines.

There is an old record from as near as Newton County. REPRESENTATIVE SPECIMEN: *Pitcher s.n.*, 8 SEP 1983; junction of Hadenfeld Road and Furnessville Road, just 0.5 block from Rte. 12, E of Tremont. MOR. According to Pitcher (1987b), this location is in Survey Area B.

***Trientalis borealis* Raf.** This species is occasional on mesophytic hummocks in the Swamp Complex of Survey Area D, and Pitcher (1987b) noted that it is at the south end of the boardwalk that starts at Furnessville Road, in Survey Area C. Welch (1935) considered local populations of this species to be boreal relicts.

***Viola fimbriatula* Sm.** This species, a weak segregate of *Viola sagittata*, is apparently quite rare within the Lakeshore; here it is rare in the South Pitcher Prairie.

***Viola incognita* var. *forbesii* Brainerd** I have recorded this white violet as frequent to common in the Swamp Complex portions of Survey Areas B and D, but it is probably more widespread, certainly more common than the following species.

***Viola pallens* (Banks) Brainerd** This little white violet is frequent in the Swamp Complex portions of Survey Area D, and somewhat less frequent in Survey Area C; it is also reported from Survey Area E. The populations of this species in Survey Area D contain individuals which have a few scattered hairs on the upper surfaces of some of the leaves, this feature suggesting that *Viola incognita* var. *forbesii* may also be present. REPRESENTATIVE SPECIMEN: *Wilhelm #6548*, 19 MAY 1979; ca 1 mi S of Beverly Shores, W of 300E Rd, ca 0.25 mi S of US 12; swamp and dune, near the center of the E E Sec.17 T37N R5W. MOR.

***Vitis labrusca* L.** Emma Pitcher led me to an extensive colony of this species; it was growing in pure sand in the northern portion of the Survey Area A; there are also reports from survey area C.

Summary

Survey Unit VII has been shown to provide the habitat for at least 69 the Indiana Dunes National Lakeshore SPECIAL VEGETATION floristic elements, nearly all of which were seen during this survey for the reasons outlined earlier. Only *Tradescantia subaspera* is known from this Survey Unit alone.

Seven percent of the SPECIAL VEGETATION floristic elements were considered by Peattie (1922), Hooper (1934), or Parker (1936) to have ancestral affinities to the Atlantic coastal plain, while Welch (1935) and Friesner (1936) considered about thirteen percent to be boreal relicts.

NATURAL AREA ASSESSMENT

As can be seen from the Natural Area Vegetation Map, this Survey Unit is composed largely of Savanna Complex and Swamp Complex, with a small area of Mesophytic Forest, and an area which has been codified as Mesophytic Prairie. Nearly 60% of this Survey Unit has been disturbed or modified to the point that SPECIAL VEGETATION floristic elements, with rare exceptions, are no longer apt to be found. Most of the disturbance was caused by the modification of land for the purposes of agriculture or residential development.

The re-establishment of vegetation on abandoned land and razed homesites has received a lot of attention by the National Park Service (Hiebert, 1983; and Hiebert and Pavlovic, 1987).

Naturally, most of the species which occupy heavily abused areas are weeds, but the Indiana Dunes region is so rich in healthy populations of conservative species that the land is far more forgiving than most other midwestern regions.

The Natural Area portions of the Survey Unit which have been mapped as Savanna Complex are, for the most part, still generating enough fuel so that small fires can be induced regularly. Some of the Savanna Complex areas, however, have gone so long without fire that the fine fuels have been all but shaded out by the proliferation of Blueberry bushes and the closing over of the canopy. In some other areas the graminoid fuels have been nearly grazed away. In all of the areas designated as Savanna Complex, attempts nevertheless should be made to burn, otherwise the current trend toward mesicity will continue to have a deleterious effect on the SPECIAL VEGETATION and that which the SPECIAL VEGETATION represents.

The Swamp Complex portions, while they have been thinned for timber and even clear-cut in years past, nevertheless contain still a large number of SPECIAL VEGETATION floristic elements; this is particularly true of the Hydromesophytic Forest portions of Survey Areas B, C, D and E. The maintenance of current drainage patterns is crucial to the long-term health of the Swamp Complex.

I codified the little wooded ravine in Survey Area E as Mesophytic Forest. In the north branch of it however, there is a small but significant fen-like woods with many of the species known from the Hydromesophytic Swamp. A brief review of Table VII reveals that the area is extremely rich in SPECIAL VEGETATION floristic elements.

The portions of Survey Areas A and B codified as Mesophytic Prairie are actually Sand Prairie/Savannas. They were mapped as Mesophytic Prairie in order to point up the fact that these areas are substantially different from the adjacent Savanna Complex areas. About fifteen years ago, according to Emma Pitcher, these Sand Prairies/Savannas burned after having endured for a very long time without fire. The accumulation of fuel had apparently been extensive, and large Black Oaks were mortally wounded during the fire. The expiration of Oaks in a prairie milieu is not particularly serious, but the proliferation of coppice sprouts from such trees is another matter. These prairies have not burned since, so the coppice sprouts (which usually sprout about ten sprouts for each expired tree) have become quite dense and preemptory with respect to competition with other prairie plants for light and space. Fires will have to return to these areas, as well as the adjacent Savannas, on a regular basis if the development of stable healthy plant communities is to be encouraged in the Savanna Complex.

The data used in assessing the relative Natural Area significance and integrity of each Survey Area, and the Survey Unit as whole, are provided in Table VII. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from each Survey Area, along with the numerical rating coefficient as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient, and do not enter directly into the derivations of the Natural Area Rating Indices. Some of the species in the Table VII are known from the Survey Unit, but not specifically from one of the five delineated Survey Areas, so they are listed without a tabular symbol; most of the weeds in that Category are reports by Klick et al. (1989).

TABLE VII: Summary of species upon which are calculated the various Natural Area Indices for each Survey Area and for the Survey Unit as a whole.

A	B	C	D	E	F	
					x	0 Acalypha rhomboidea
					x	* Acer platanoides
x	x	x	x	x	x	7 Acer rubrum
			x		R	0 Acer saccharinum
x	x		x		R	* Achillea millefolium
					x	0 Acnida altissima
	x	x	x	x		7 Actaea pachypoda
					x	5 Actinomeris alternifolia
		x				15 Adiantum pedatum
	x	x		x		2 Agrimonia gryposepala
				x		5 Agrimonia pubescens
				x	x	* Agropyron repens
	x					* Agrostis alba
x						1 Agrostis hyemalis
	x	x	x			1 Agrostis perennans
x	x					10 Aletris farinosa
				x		1 Allium canadense
		x				6 Allium tricoccum burdickii
					R	* Allium vineale
	x	x			R	8 Alnus rugosa americana
		x				6 Alopecurus aequalis
					x	* Amaranthus retroflexus
x	x	x	x	x	x	0 Ambrosia artemisiifolia elatior
					R	* Ambrosia trifida
		x	x	x		8 Amelanchier arborea
	x					8 Amelanchier laevis
		x	x	x		4 Amphicarpa bracteata
	x		x	x		4 Amphicarpa bracteata comosa
x	x					4 Andropogon gerardii
x	x		x	x		5 Andropogon scoparius
	x					2 Anemone cylindrica
x		x	x	x		7 Anemone quinquefolia interior
					R	2 Anemone virginiana
		x		x		7 Anemonella thalictroides
					R	5 Angelica atropurpurea
x	x		x			6 Antennaria plantaginifolia
x			x			6 Apios americana
	R	x	x			5 Apocynum androsaemifolium
x						4 Apocynum cannabinum
	x	x				5 Aquilegia canadensis
			x			* Arabidopsis thaliana
R			x		x	7 Arabis lyrata
	x	x	x	x		8 Aralia nudicaulis
	x					10 Arctostaphylos uva-ursi coactilis
			x			* Arenaria serpyllifolia
	x	x	x	x		5 Arisaema atrorubens
	x					7 Aristida purpurascens
x						15 Aristida tuberculosa

A	B	C	D	E	F	
				x		5 Artemisia caudata
					R	5 Asarum canadense
x						10 Asclepias amplexicaulis
	x					10 Asclepias exaltata
					R	4 Asclepias incarnata
					R	10 Asclepias purpurascens
R			x		R	0 Asclepias syriaca
R	x					10 Asclepias tuberosa
		x			R	15 Asimina triloba
						* Asparagus officinalis
				x		6 Asplenium platyneuron
x	x		x			8 Aster azureus
		x				5 Aster cordifolius
x	x					5 Aster dumosus
					?	20 Aster furcatus
x	x	x	x	x		4 Aster lateriflorus
x	x					10 Aster linariifolius
		x	x	x		10 Aster macrophyllus
		x		x		1 Aster pilosus
				x	x	10 Aster praealtus
		x				10 Aster umbellatus
		x	x	x		6 Athyrium filix-femina michauxii
						* Avena sativa
	x					8 Baptisia leucantha
			x		x	* Barbarea vulgaris
x	x					15 Bartonia virginica
	x	x		x		* Berberis thunbergii
		x	x			20 Bidens discoidea
	x					7 Blephilia hirsuta
	x			x	x	2 Boehmeria cylindrica
		x		x	x	15 Botrychium dissectum
	x			x		6 Botrychium virginianum
		x	x	x		15 Brachyelytrum erectum
					R	* Brassica kaber pinnatifida
		x		x		5 Bromus purgans
					x	* Bromus tectorum
x		x	x			3 Calamagrostis canadensis
				x		10 Calamovilfa longifolia
	x	x	x	x		5 Caltha palustris
					x	* Campanula rapunculoides
					x	* Campsis radicans
	x	x	x	x	R	5 Cardamine bulbosa
	x			x		4 Cardamine pensylvanica
x						8 Carex albolutescens
			x			10 Carex albursina
					x	2 Carex amphibola turgida
	x	x	x	x		15 Carex bromoides
	x					15 Carex canescens
	x					2 Carex cephalophora
			x			5 Carex comosa
			x	x		1 Carex convoluta
	x			x		10 Carex crinita

A	B	C	D	E	F	
			x	x		20 Carex debilis rudgei
			x			20 Carex digitalis
			x			10 Carex emmonsii
			x			20 Carex folliculata
	x	x	x			10 Carex gracillima
				x		5 Carex granularis
				x		4 Carex hirtifolia
		x	x		x	15 Carex intumescens
	x	R				10 Carex lacustris
				x		15 Carex laxiculmis
		x	x	x		1 Carex laxiflora
	x		x			20 Carex leptoneura
				x		8 Carex lurida
x	x		x			5 Carex muhlenbergii
		x				5 Carex normalis
R	x	x	x	x		5 Carex pennsylvanica
		x				1 Carex rosea
	x	x	x			20 Carex seorsa
	x		x	x		2 Carex stipata
	x			x		5 Carex stricta
			x			10 Carex swanii
				x		8 Carex tenera
			x			15 Carex tonsa
			x			3 Carex tribuloides
				x		2 Carex vulpinoidea
			R			8 Caulophyllum thalictroides
		x	x	x		8 Carpinus caroliniana virginiana
		x				7 Carya cordiformis
R	x		x	R		5 Carya ovata
			x	x		* Catalpa speciosa
						* Celastrus orbiculatus
		x				6 Celastrus scandens
			x			3 Celtis occidentalis
				x		* Cenchrus longispinus
				x		* Centaurium pulchellum
		x	x	R		7 Cephalanthus occidentalis
			x			* Cerastium vulgatum
				x		* Chaenorrhinum minus
		x	x	x		8 Chelone glabra
				x		* Chenopodium album
				x		3 Chenopodium hybridum gigantospermum
		x				20 Chimaphila maculata
x						* Chrysanthemum leucanthemum pinnatifidum
				x		15 Chrysosplenium americanum
				x		* Cichorium intybus
	x		x	x	R	6 Cicutula maculata
	x	x	x			5 Cinna arundinacea
	x	x	x	x		0 Circaea quadrisulcata canadensis
			x			* Cirsium arvense
				x		* Cirsium vulgare
	x	x	x	x	R	2 Claytonia virginica
	x		x	x	x	4 Clematis virginiana

A	B	C	D	E	F	
x	x					7 Comandra richardsiana
					x	* Commelina communis
R	x	x				15 Conopholis americana
					R	* Convallaria majalis
			R			15 Corallorhiza maculata
			x			20 Corallorhiza odontorhiza
x	x					5 Coreopsis tripteris
	x		x	x		9 Cornus alternifolia
	x	x	x	x		10 Cornus florida
	x		x	x		1 Cornus racemosa
	x					6 Cornus stolonifera
	x	x	x	x	R	2 Corylus americana
		x				5 Crataegus coccinea
				x		0 Cryptotaenia canadensis
				x		4 Cuscuta gronovii
					x	3 Cyperus erythrorhizos
x	x					5 Cyperus filiculmis
				x		5 Cyperus houghtonii
x				x		5 Cyperus schweinitzii
	x					1 Cyperus strigosus
					R	* Dactylis glomerata
	x		x			5 Danthonia spicata
			x		R	* Daucus carota
x						15 Desmodium ciliare
		x		x		8 Desmodium glutinosum
x						10 Desmodium marilandicum
	x	x				10 Desmodium nudiflorum
	x	x	x			5 Desmodium paniculatum
x						10 Desmodium sessilifolium
x	R					* Dianthus armeria
		x				10 Diervilla lonicera
x				x		* Digitaria sanguinalis
	x	x	x	x		5 Dioscorea villosa
				x		10 Dryopteris cristata
		x				15 Dryopteris hexagonoptera
		x	x	x		15 Dryopteris noveboracensis
		x	x	x		6 Dryopteris spinulosa
	x		x	x		10 Dryopteris spinulosa intermedia
x	x	x	x		R	6 Dryopteris thelypteris pubescens
	x					4 Elymus canadensis
				x		5 Elymus villosus
x	x					15 Epigaea repens glabrifolia
					x	3 Epilobium coloratum
	x	x		x		0 Equisetum arvense
				x		4 Equisetum hyemale affine
				x		3 Equisetum hyemale intermedium
x	x					3 Eragrostis spectabilis
	x	x	x	x		2 Erechites hieracifolia
			x		R	1 Erigeron annuus
x	x			x		0 Erigeron canadensis
			x			4 Erigeron philadelphicus
			x		R	3 Erigeron strigosus

A	B	C	D	E	F	
						* Euonymus alatus
	x					8 Euonymus atropurpureus
	x	x	x	x		7 Euonymus obovatus
		x	x		x	20 Eupatorium fistulosum
	x		x		R	5 Eupatorium maculatum
	x		x		R	6 Eupatorium perfoliatum
	x		x	x		4 Eupatorium rugosum
			x			1 Eupatorium serotinum
x	x		x		R	2 Euphorbia corollata
				x		* Euphorbia dentata
				x		* Euphorbia maculata
			x	x	R	10 Fagus grandifolia
	x	x	x	x		5 Festuca obtusa
						* Festuca ovina
	x					10 Fimbristylis autumnalis mucronulata
x	x		x	x		1 Fragaria virginiana
	x	x	x			5 Fraxinus americana
	x	x		x		8 Fraxinus nigra
x		x				7 Fraxinus pennsylvanica
			x		R	2 Fraxinus pennsylvanica subintegerrima
					x	* Galinsoga ciliata
	x	x	x	x	R	1 Galium aparine
	x	x	x	x		7 Galium circaezans hypomalacum
	x	x	x	x		4 Galium concinnum
		x				15 Galium lanceolatum
			x			5 Galium obtusum
	x					10 Galium pilosum
	x	x	x	x		5 Galium triflorum
x	x	x	x	x		10 Gaultheria procumbens
	x		x			9 Gaylussacia baccata
x	x				R	15 Gentiana saponaria
					x	3 Geranium carolinianum
	x	x	x	x	R	4 Geranium maculatum
					x	* Geranium pusillum
	x	x				10 Gerardia flava
	x		x			8 Gerardia pedicularia ambigens
x						7 Gerardia purpurea
	x	x	x	x	R	0 Geum canadense
				x	x	1 Geum laciniatum trichocarpum
				x	x	* Glechoma hederacea
		x				20 Glyceria pallida
	x	R				8 Glyceria septentrionalis
	x	x	x	x		4 Glyceria striata
x	x		x			2 Gnaphalium obtusifolium
					R	20 Goodyera pubescens
					R	15 Habenaria clavellata
x	x	x	x	x		8 Hamamelis virginiana
					x	5 Helenium autumnale
					x	* Helenium nudiflorum
	x		x			8 Helianthemum canadense
	x	x	x		R	5 Helianthus divaricatus
					x	2 Helianthus grosseserratus

A	B	C	D	E	F	
	x					10 Helianthus occidentalis
				x		5 Helianthus strumosus
				x		* Hemerocallis fulva
	x	x				6 Hepatica acutiloba
		x		x		10 Hepatica americana
	x		x		x	* Hesperis matronalis
	x					6 Hieracium canadense fasciculatum
x	x	x	x			6 Hieracium gronovii
			x			* Hieracium pratense
	x		x			7 Hieracium scabrum
					x	* Holcus lanatus
	x					9 Houstonia caerulea
					R	8 Hydrophyllum appendiculatum
					R	5 Hydrophyllum virginianum
	x					8 Hypericum canadense
x	x		x			10 Hypericum kalmianum
					x	8 Hypericum mutilum
R					x	* Hypericum perforatum
					x	4 Hypericum punctatum
		x			R	5 Hystrix patula
	x		x			9 Ilex verticillata
	x	x	x	x	R	3 Impatiens capensis
			x		R	6 Impatiens pallida
	x	x	x	x	R	5 Iris virginica shrevei
					R	8 Juglans cinerea
					x	7 Juncus canadensis
					x	4 Juncus dudleyi
		x	x			7 Juncus effusus solutus
x						8 Juncus greenii
	x		x			0 Juncus tenuis
x	x		x			7 Koeleria cristata
x	x		x			7 Krigia biflora
x			x			6 Krigia virginica
x	x		x	x		2 Lactuca canadensis
	x			x		3 Laportea canadensis
					x	* Lathyrus latifolius
	x					7 Lechea leggettii moniliiformis
	x					7 Lechea minor
x	x					7 Lechea villosa
	x	x	x			5 Leersia oryzoides
				x		7 Leersia virginica
	x	x	x			5 Lemna minor
		x				7 Lemna trisulca
		x				* Leontodon leysleri
				x	x	* Leonurus cardiaca
x			x		x	* Lepidium campestre
			x			0 Lepidium virginicum
x	x		x			4 Lespedeza capitata
x	x		x			6 Lespedeza hirta
x						4 Lespedeza virginica
x	x		x			6 Liatris aspera
	x					* Ligustrum vulgare

A	B	C	D	E	F	
	x	x		x	R	6 <i>Lilium michiganense</i>
	x	x	x	x	R	7 <i>Lindera benzoin</i>
	x					15 <i>Linum virginianum</i>
					R	8 <i>Liparis lilifolia</i>
		x	x	x		10 <i>Liriodendron tulipifera</i>
x						8 <i>Lithospermum croceum</i>
R					x	7 <i>Lobelia cardinalis</i>
R					x	4 <i>Lobelia inflata</i>
				x		6 <i>Lobelia siphilitica</i>
	R					* <i>Lolium multiflorum</i>
R				x		15 <i>Lonicera dioica</i>
						* <i>Lonicera tatarica</i>
x						6 <i>Ludwigia alternifolia</i>
					x	* <i>Lunaria annua</i>
x	x					7 <i>Lupinus perennis occidentalis</i>
			x	x		5 <i>Luzula multiflora</i>
						* <i>Lychnis alba</i>
					x	* <i>Lychnis coronaria</i>
x						15 <i>Lycopodium clavatum</i>
	x					10 <i>Lycopodium complanatum flabelliforme</i>
	x		x		R	15 <i>Lycopodium lucidulum</i>
x						15 <i>Lycopodium tristachyum</i>
	x					6 <i>Lycopus uniflorus</i>
x			x			6 <i>Lycopus virginicus</i>
	x			x		4 <i>Lysimachia ciliata</i>
					x	* <i>Lysimachia nummularia</i>
x	R					9 <i>Lysimachia thyrsiflora</i>
						* <i>Lythrum salicaria</i>
			x			15 <i>Maianthemum canadense</i>
x	x	x	x	x		10 <i>Maianthemum canadense interius</i>
	x	x	x	x		10 <i>Medeola virginiana</i>
			x		x	* <i>Medicago lupulina</i>
				x	x	* <i>Melilotus alba</i>
	x					6 <i>Menispermum canadense</i>
	x			x		5 <i>Mentha arvensis villosa</i>
					R	6 <i>Mimulus ringens</i>
					x	* <i>Mirabilis nyctaginea</i>
	x		x	x		15 <i>Mitchella repens</i>
	x			x		10 <i>Mitella diphylla</i>
					x	* <i>Mollugo verticillata</i>
	x		x		R	4 <i>Monarda fistulosa</i>
x	x		x	x		5 <i>Monarda punctata villicaulis</i>
			x			15 <i>Monotropa hypopithys</i>
				x	x	* <i>Morus alba</i>
			x			3 <i>Muhlenbergia frondosa</i>
					R	* <i>Nasturtium officinale</i>
					x	* <i>Nepeta cataria</i>
	x	x	x	x		8 <i>Nyssa sylvatica</i>
			x	x	R	1 <i>Oenothera biennis</i>
					x	10 <i>Oenothera pilosella</i>
x				x		7 <i>Oenothera rhombipetala</i>
x	x	x	x	x	R	8 <i>Onoclea sensibilis</i>

A	B	C	D	E	F	
x						5 Opuntia humifusa
					x	* Ornithogalum umbellatum
	x	x	x	x		3 Osmorhiza claytoni
	x					3 Osmorhiza longistylis
	x	x	x	x		6 Osmunda cinnamomea
				x		7 Osmunda claytoniana
x	x	x	x	x		8 Osmunda regalis spectabilis
				x		5 Ostrya virginiana
	x		x			0 Oxalis europaea
			x			0 Oxalis stricta
	x	x	x	x		7 Oxypolis rigidior
			x	x		15 Panax trifolius
x						5 Panicum agrostoides
					x	1 Panicum capillare
x		x	x	x		7 Panicum clandestinum
			x			10 Panicum columbianum
x			x			10 Panicum depauperatum
x	x		x			20 Panicum dichotomum
	x	x	x			3 Panicum implicatum
	x		x	x		7 Panicum latifolium
			x			9 Panicum lindheimeri
	x		x			7 Panicum oligosanthos scribnerianum
			x			8 Panicum sphaerocarpon
x			x	x		9 Panicum villosissimum pseudopubescens
x	x		x			5 Panicum virgatum
				x	x	4 Parietaria pensylvanica
	x	x	x		R	2 Parthenocissus quinquefolia
	x		x		R	10 Pedicularis canadensis
					x	7 Pedicularis lanceolata
R					x	4 Penstemon digitalis
				x	R	5 Phlox divaricata
				x		2 Phytolacca americana
x					R	20 Pinus banksiana
					x	* Plantago lanceolata
	x		x			0 Plantago rugelii
				x	R	10 Platanus occidentalis
					x	* Poa annua
R	x		x			* Poa compressa
	x					15 Poa languida
					x	9 Poa palustris
			x	x		* Poa pratensis
	x	x	x	x	R	5 Podophyllum peltatum
x	R					10 Polygala polygama obtusata
	x					6 Polygala sanguinea
	x		x			3 Polygonatum canaliculatum
	x	x	x	x	R	7 Polygonatum pubescens
		x				15 Polygonum arifolium pubescens
		x				7 Polygonum hydropiperoides
	x					0 Polygonum pensylvanicum laevigatum
	x	x				6 Polygonum punctatum
				x	x	10 Polygonum sagittatum
				x		2 Polygonum scandens

A	B	C	D	E	F	
x	x					7 Polygonum tenue
		x		x		10 Polystichum acrostichoides
				x		10 Pontederia cordata
x	x		x		R	2 Populus deltoides
R	R		x			6 Populus grandidentata
x	x		x			4 Populus tremuloides
					x	* Potentilla argentea
					x	* Potentilla norvegica
	x			x		* Potentilla recta
	x	x	x			4 Potentilla simplex
	x		x	x		5 Prenanthes alba
	x	x	x			10 Prenanthes altissima
			x			6 Proserpinaca palustris crebra
	x					0 Prunella vulgaris lanceolata
x	x		x			5 Prunus pensylvanica
x				x		8 Prunus pumila
R	x	x	x	x		1 Prunus serotina
	x	x	x	x	R	1 Prunus virginiana
					R	7 Ptelea trifoliata
					R	10 Pteretis pensylvanica
R	x	x	x	x	R	5 Pteridium aquilinum latiusculum
					x	8 Pycnanthemum tenuifolium
	x		R			10 Pyrola elliptica
x						15 Pyrola rotundifolia americana
	x	x	x	x		9 Pyrus floribunda
x	x			x		2 Pyrus ioensis
	x			x		7 Pyrus melanocarpa
R	x	x	x	x	R	4 Quercus alba
	x	x			R	8 Quercus bicolor
x	x	x	x	x	R	8 Quercus palustris
	x	x	x	x	R	7 Quercus rubra
x	x	x	x	x	R	6 Quercus velutina
	x	x	x	x		0 Ranunculus abortivus
	x	R				7 Ranunculus flabellaris
	x		x			5 Ranunculus recurvatus
		R				6 Ranunculus sceleratus
	x	x		x	R	4 Ranunculus septentrionalis
x						15 Rhexia virginica
	R					15 Rhus aromatica arenaria
x	x		x		R	6 Rhus copallina latifolia
x	x	x	x	x	R	1 Rhus radicans
	x		x		R	3 Rhus typhina
					x	15 Rhus vernix
x						8 Rhynchospora capitellata
		x	x	x		7 Ribes americanum
	x	x	x	x		5 Ribes cynosbati
	x					20 Ribes hirtellum
			x	x	R	* Robinia pseudo-acacia
	x		x	x		5 Rosa carolina
	x		x	x	R	* Rosa multiflora
	x	R	x	x		9 Rosa palustris
	x	x	x			3 Rubus allegheniensis

A	B	C	D	E	F	
x	x		x			4 Rubus flagellaris
x	x	x	x	x		9 Rubus hispidus obovalis
	x	x	x		R	7 Rubus idaeus strigosus
	x		x	x	R	2 Rubus occidentalis
				x		3 Rubus pensylvanicus
	x	x	x	x		15 Rubus pubescens
x					R	1 Rudbeckia hirta
					x	3 Rudbeckia laciniata
					x	3 Rudbeckia triloba
					R	10 Ruellia humilis
x	x		x		R	* Rumex acetosella
			x			* Rumex crispus
	x				x	* Rumex obtusifolius
					R	15 Sabatia angularis
x			x			2 Salix discolor
					x	10 Salix gracilis textoris
x						6 Salix humilis
					x	1 Salix interior
	x		x			15 Salix sericea
	x		x	x	R	1 Sambucus canadensis
	R					10 Sambucus pubens
		x				6 Sanguinaria canadensis
	x					9 Sanicula canadensis
			x	x		2 Sanicula gregaria
				x	x	* Saponaria officinalis
x	x	x	x	x	R	6 Sassafras albidum
				x	x	10 Saururus cernuus
	x		x	x	R	8 Saxifraga pensylvanica
				x		5 Scrophularia lanceolata
	x		x			5 Scutellaria lateriflora
			x	x	R	7 Senecio aureus
					x	* Setaria glauca
				x		* Setaria viridis
					R	* Silene cserei
	x	x	x		R	7 Sium suave
	x	x	x			2 Smilacina racemosa
R	x		x	x	R	5 Smilacina stellata
					R	3 Smilax ecirrhata
		x	x			4 Smilax lasioneura
x	x	x	x			15 Smilax rotundifolia
				x	x	* Solanum americanum
					R	* Solanum carolinense
		x	x			* Solanum dulcamara
x	x		x			1 Solidago altissima
	x	x	x	x		7 Solidago caesia
				x		6 Solidago flexicaulis
				x		3 Solidago gigantea
x	x		x			3 Solidago graminifolia nuttallii
x	x		x			4 Solidago nemoralis
	x	x	x	x		8 Solidago patula
x	x		x			6 Solidago rugosa
					x	* Solidago sempervirens

A	B	C	D	E	F	
x	x		x			7 Solidago speciosa
				x		5 Solidago ulmifolia
					R	* Sonchus uliginosus
x	x		x			5 Sorghastrum nutans
					x	6 Specularia perfoliata
			x			7 Spiraea alba
x						9 Spiraea tomentosa rosea
x	x					7 Spiranthes cernua
					x	15 Stachys hyssopifolia
x						5 Stachys palustris homotricha
					x	* Stellaria media
	R					6 Stipa spartea
	x	x	x	x	R	6 Symplocarpus foetidus
	x		x			* Taraxacum officinale
	x		x			8 Tephrosia virginiana
					x	3 Teucrium canadense
				x		5 Thalictrum dioicum
	x			x		5 Thalictrum revolutum
		x	x	x		5 Tilia americana
	x		x	x	R	2 Tovarva virginiana
x	x		x	x	R	2 Tradescantia ohienensis
	x					15 Tradescantia subaspera
		R	x			15 Trientalis borealis
			x			* Trifolium repens
					R	6 Trillium flexipes
				x	R	8 Trillium grandiflorum
	x	x			R	5 Trillium recurvatum
						* Triodia flava
R						7 Triplasis purpurea
	x	x	x	x	R	3 Ulmus americana
					R	2 Urtica procera
		x		x		7 Uvularia grandiflora
x	x	x	x	x		5 Vaccinium angustifolium laevifolium
R						8 Vaccinium corymbosum
R	x			x		5 Vaccinium vacillans
x			x	x	R	* Verbascum thapsus
					x	5 Verbena urticifolia
					R	5 Vernonia fasciculata
					x	5 Vernonia missurica
			x			* Veronica arvensis
					x	6 Veronicastrium virginicum
	x	x	x	x		9 Viburnum acerifolium
	x		x	x	x	5 Viburnum lentago
				x	x	* Viburnum opulus
				x		4 Viburnum prunifolium
	x					5 Viburnum rafinesquianum
			x			* Vinca minor
					x	* Viola arvensis
				x		10 Viola conspersa
	x	x	x	x		6 Viola cucullata
	x					15 Viola fimbriatula
	x		x			15 Viola incognita forbesii

A	B	C	D	E	F	
x						7 Viola lanceolata
		x	x		R	15 Viola pallens
	x			x	R	0 Viola papilionacea
	x		x			10 Viola pedata lineariloba
	x	x	x	x	R	5 Viola pensylvanica
	x					10 Viola pubescens
x	x		x			7 Viola sagittata
	x	x	x	x		3 Viola sororia
	x					6 Viola striata
	x	x	x	x		10 Vitis aestivalis
x		R				15 Vitis labrusca
	x	x	x		R	4 Vitis riparia
x						* Vulpia myuros
x			x			6 Vulpia octoflora tenella
					x	1 Xanthoxylum americanum
					R	7 Zizia aurea

Summary

Survey Area A, about 75 acres (surveyed under the helpful guidance of Emma Pitcher on September 9, 1979), essentially includes the 25-acre tract codified as Mesophytic Prairie on the Natural Area Vegetation Map, which area is equivalent to the Pitcher Prairie, North. During the survey I catalogued a list of 96 native floristic elements and found another 11 vouchered at INDU and MOR. Their Mean Quality, 7.04, represents a Natural Area Index of 73. I visited the site only once, but Emma Pitcher (1987b) has discovered several additional species over the years and provided me with the information. These are codified as "R" in Table VII; when included in the calculations, the Natural Area Index rises to 77.

Survey Area B was surveyed on September 9, 1979 with Emma Pitcher, and on May 13, 1987. The whole of the area is about 145 acres, of which Natural Area occupies about 85, including the Pitcher Prairie, South. During the field and herbarium survey, I made noted of 247 native floristic elements, the Mean Quality of which was 6.38; these data represent a Natural Area Index of 100. This Survey Area rates notably higher than Survey Area A because it includes two additional General Community types, and has been taken to include a substantially greater area. The Savanna Complex portions of this Survey Area, however, have been both heavily grazed and long unburned, so its individual Mean Quality is substantially lower than that of the Pitcher Prairie, South. Pitcher (1987b) noted an additional 7 species, which elevates the Index to 102.

Survey Area C (surveyed May 19 and September 22, 1979) occupies about 95 acres of Swamp and Savanna Complex, both of which General Community types are very high in quality, though the latter is relatively the lowest and in need of regular fire. During the survey I catalogued a list of 151 native floristic elements, the Mean Quality of which was 6.91, representing a Natural Area Index of 85. There are an additional 7 reports, most of them by Ken Dritz (1987), which raises the Index to 89.

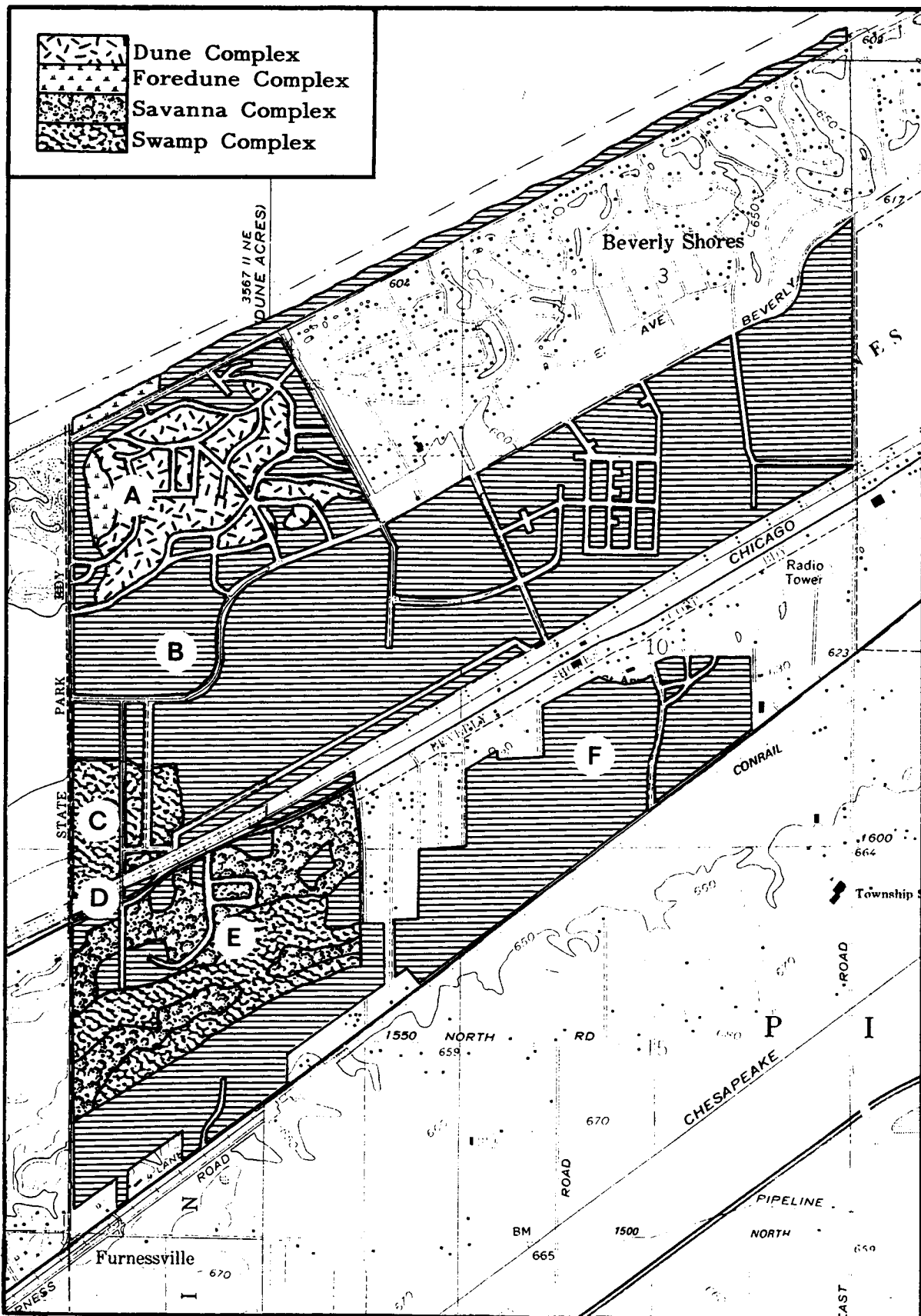
Survey Area D was surveyed May 19 and 28 and September 13 and 22, 1979, and May 20, 1987. It occupies 285 acres, about 155 of which consist of natural area Swamp and Savanna Complex, both of which complexes have areas of high and low quality. Overall, however, I have registered 233 native floristic elements, with a Mean Quality of 6.60. They represent a

Natural Area Index of 101. There is a 42" DBH Pin Oak along the north edge of the Swamp Complex, certainly the largest I have seen in the Lakeshore.

Survey Area E, about 180 acres, was surveyed May 7 and September 9, 1987. The 60-acre Natural Area portion consists of Savanna Complex, with Mesophytic Forest and ravine. At the north end of the ravine, there is a swampy fen rich in SPECIAL VEGETATION floristic elements. I recorded 189 native species, with a Mean Quality of 6.07 and an Index of 83.

The records from Survey Area F all have been obtained from modern herbarium specimens, most of them collected either by Bickie Pitcher or Barbara Plampin (the "BP Patrol" as it has come to be known). Most of the reports are from Pitcher (1988b). Altogether, these 147 records render a Mean Quality of 5.67 and an Index of 69. The whole of this area has been seriously wounded by logging, farming, and residential development, so much of the remnant species conservatism resides in disturbed swamps, marshes, ditches, and droughty sands where agricultural weeds are not as competitive. Using the data provided in Tables 1 and 2 of Hiebert & Pavlovic (1987) to index floristic quality, one finds that after nine years of "succession" on old home sites in upland areas, the Mean Quality is 2.8 ± 0.4 and the Natural Area Index is 8.5 ± 0.6 ; in razed home sites in lower areas the Mean Quality is 4.0 ± 0.1 and the Index is 12.0 ± 2.2 .

For Survey Unit VII, as a whole, I can attest to 417 native species, with a Mean Quality of 6.79, which data represent a combined Natural Area Index of 139. When the additional 26 reports are included, the Index stands at 144.



SURVEY UNIT VIII MAP

SURVEY UNIT VIII: KEISER

This Survey Unit occupies about 1415 acres, about seventy-five percent of which have been obliterated, in the west Beverly Shores region east of Kemil Road. This region is more or less equivalent to the region identified by earlier botanists as Keiser, in reference to the Keiser Stop area along the Chicago South Shore & South Bend traction line. The 520-acre tract south of U.S. 12 includes about 125 acres of Savanna and Swamp Complex. This southern tract evidently was unexplored by the early botanists, and I have made only a couple of serious sojourns into its interior. The floristics of the region north of U.S. 12 has been treated to some extent in the literature. Overall, the Survey Unit has been surveyed by me on May 21 and 26, June 13 and 15, and September 9, 12 and 22, 1979; May 14 and 20, and August 5, 1987; July 24, August 29, and September 9, 1988; January 19 and September 28, 1989. At various times during these surveys I was accompanied by Marlin Bowles, Ross Clark, Ken Dritz, Craig Johnson, Douglas Ladd, Barbara Plampin, Elizabeth Shimp, Floyd Swink, and Linda Wetstein.

The Survey Unit Map was superimposed to scale over combined parts of the U.S.G.S. Dune Acres Quadrangle, N4137.5-W8700/7.5, photo-revised 1980; and the U.S.G.S. Michigan City West Quadrangle, N4137.5-W8652.5/7.5, photo-revised 1980. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series (the southern half was drawn without the benefit of ground truth): a black & white stereo-pair set (BFP-3: 53-56) flown in November, 1938; a black & white stereo-pair set (BFP-1V: 24-27) flown in September, 1958; a color stereo-pair set (77-157: 19-23) flown in April, 1977; a color stereo-pair set (79-117: 32-36 and 81-87) flown in May, 1979; a color stereo-pair set (4:11 - 4:14 and 5:14 - 5:18) flown in May, 1984; and a black & white stereo-pair set (6:18 - 6:22, 7:17 - 7:21, 8:21 - 8:26) flown in May, 1984.

Early botanists referred to such habitats as "interdunal ponds" and "moist open subdunal ground" at Keiser. What and where these areas were cannot be determined, but much of the vegetation reported from them now can be found along the moist sands of the Bike Trail east and west of Kemil Road. Because of the substantial numbers of SPECIAL VEGETATION floristic elements which grow in these moist meadows, I have surveyed it briefly and labeled it Survey Area D, though the area is scarcely more than an open ecotone along the south edge of the Hydromesophytic Swamps of Survey Area C; these Hydromesophytic Swamps appear to be all that remains of the "subdunal woods" at Keiser.

ANNOTATED LIST OF SPECIAL VEGETATION FLORISTIC ELEMENTS

Adiantum pedatum L. First reported by Lyon (1927), the Maidenhair Fern is still extant in Survey Area C. REPRESENTATIVE SPECIMEN: *Otto #23, 11 JUN 1982; T37N R5W NW SW Sec.9; found on old home site on east side of 300E Rd., about half way down "tree tunnel" in hydromesophytic forest; uncommon.* INDU.

Alnus rugosa var. **americana** Mill. This species is frequent in the Hydromesophytic Swamps and their remnants north of the traction line.

Amelanchier humilis Wieg. This attractive shrub is locally frequent in the Furnessville area, and it is occasional in the Dune Complex portions of Survey Area A. REPRESENTA-

TIVE SPECIMEN: *Wilhelm* #6618, 21 MAY 1979; at the NW edge of Beverly Shores in dune area E of parking area S of Lake Shore Dr. and E of 300E Rd. MOR.

***Ammophila breviligulata* Fern.** Though the Foredune and Beach communities are profoundly disturbed in this Survey Unit, this hardy grass is still extant here and there along the lake front, sometimes in substantial populations. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

***Aralia racemosa* L.** This rare species is known only from the report by Lyon (1927), but it is possible that it might yet be extant somewhere in Survey Area C.

***Arctostaphylos uva-ursi* var. *coactilis* Fern. & Macbr.** This species, common farther west in the Lakeshore, becomes rare eastward. Locally, I know it only from the top of a high dune above the marsh, east of Kemil Road, in Survey Area A. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 7 APR 1946; Beverly Shores. MOR. Parker (1936) considered local populations of this species to be boreal relicts.

***Aristida intermedia* Scribn. & Ball** A relative of the perennial *A. purpurascens*, this rare annual is occasional in moist sand north of the Swamp Complex in Survey Area E.

***Aristida tuberculosa* Nutt.** This species is occasional in the sandy blowout area east of Kemil Road, between U.S. 12 and the Swamp Complex in Survey Area E. Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

***Asimina triloba* (L.) Dunal** This tree is occasional at the north end of the old growth portion of Survey Area C.

***Aster junciformis* Rydb.** This species may well have been extirpated from this Survey Unit during the massive drainage and land modification efforts years ago.

***Bartonia virginica* (L.) BSP.** This inconspicuous little plant is still extant in Survey Area C. According to Parker (1936), local populations of this species have ancestral affinities to the Atlantic coastal plain.

***Betula papyrifera* Marsh.** This rare birch, once reported from a "subdunal field" at Keiser, is still represented by a small but magnificent population in the rich wooded Swamp Complex of Survey Area C. Bowles *et al.* (1986a) recorded 21 trees in less than one hectare, with an average dbh of 22 centimeters. REPRESENTATIVE SPECIMEN: *Wilhelm* #6954, 12 SEP 1979; ca 0.25 mi E of Kemil Road, in wooded swamp just N of the South Shore RR, in the SW SE SW Sec.9 T37N R5W. Growing with *Acer rubrum*, *Carex debilis* var. *rudgei*, *C. folliculata*, *C. intumescens*, *C. seorsa*, *C. virescens*, *Dryopteris noveboracensis*, *Habenaria clavellata*, *Ilex verticillata*, *Lindera benzoin*, *Maianthemum canadense* var. *interius*, *Mitchella repens*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *O. regalis* var. *spectabilis*, *Quercus rubra*, *Rubus hispidus* var. *obovalis*, and *Saururus cernuus*. MOR. Deam (1932) considered Indiana populations of this species to be boreal relicts.

***Bidens discoidea* (T. & G.) Britt.** This species is still frequent in Survey Area C. Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Botrychium dissectum Spreng. This little fern is still extant, though rare in the wooded swamps of Survey Areas C and E.

Botrychium multifidum var. **intermedium** (D.C. Eat.) Farw. This rare fern was frequent in Survey Area C on September 28, 1989, particularly near the north edge of the old growth trees. REPRESENTATIVE SPECIMEN: *Wilhelm et. al.*, 28 SEP 1989; East of Kemil Road, north of the bike trail, in hydromesophytic swamp. MOR.

Brachyelytrum erectum (Schreb.) Beauv. This grass is still frequent in Survey Area C, and even in the low open ground at the edge of the Hydromesophytic Swamp along the Bike Trail. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #16362, 27 JUL 1988; Kemil Road, Keiser Unit, along Bike Trail with *Stachys palustris* var. *homotricha*, *Rubus occidentalis*, *R. hispidus* var. *obovalis*, *Prunus serotina*, *Eupatorium fistulosum*, *Aster umbellatus*, *Solidago graminifolia* var. *nuttallii*, *Osmunda cinnamomea*, *Solidago rugosa*, *Dryopteris thelypteris* var. *pubescens*, *Carex folliculata*, *Calamagrostis canadensis*, *Vitis labrusca*, *Polygonum careyi*, and *P. sagittatum*. MOR.

Campanula rotundifolia L. This species is still occasional in the Dune Complex portion of Survey Area A.

Carex alata T. & G. First reported by Lyon (1927), who noted it from "... moist open subdunal (ground), Keiser," we have recently discovered that it is not infrequent along the Bike Trail east of Kemil Road. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #16360, 27 JUL 1988; Kemil Road, Keiser Unit, along the Bike Trail with *Glyceria canadensis*, *G. striata*, *Spiraea tomentosa* var. *rosea*, *Galium tinctorium*, *Juncus canadensis*, *Eleocharis obtusa*, *Dryopteris thelypteris* var. *pubescens*, *Mimulus ringens*, *Salix discolor*, *Solidago rugosa*, *Alisma subcordatum*, *Calamagrostis canadensis*, *Typha latifolia*, *Juncus effusus* var. *solutus*, and *Eupatorium perfoliatum*. MOR. Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Carex bromoides Schkuhr This often overlooked species is frequent in the swales, usually growing near **Carex seorsa** and **Carex crinita**, of the Hydromesophytic Forest of the Swamp Complex in Survey Area C and in remnants of the subdunal woods in Survey Area B. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #6709, 26 MAY 1979; ca 0.5 mi S of Beverly Shores between Broadway (defunct subdivision road) and 300E Rd, in the SW SW Sec.9 T37N R5W. MOR.

Carex debilis var. **rudgei** Bailey This sedge is rare among the Paper Birches in the southeastern portion of Survey Area C and even along the Bike Trail in Survey Area D. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #6947, 9 SEP 1979; ca 0.25 mi E of Kemil Rd, in wooded swamp just N of the South Shore RR, in the SW SE SW Sec.9 T37N R5W. Growing with *Acer rubrum*, *Betula papyrifera*, *Carex folliculata*, *C. intumescens*, *C. seorsa*, *C. virescens*, *Dryopteris noveboracensis*, *Habenaria clavellata*, *Ilex verticillata*, *Lindera benzoin*, *Maianthemum canadense* var. *interius*, *Mitchella repens*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *O. regalis* var. *spectabilis*, *Quercus rubra*, *Rubus hispidus* var. *obovalis*, and *Saururus cernuus*. MOR.

Carex flava var. **fertilis** Peck Lyon (1927) first noted this species from a "... subdunal ditch, Keiser." It is still extant at Keiser along the Bike Trail, from where was taken the following REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #16364, 27 JUL 1988; Keiser

Unit, east of Kemil Road along the Bike Trail, with *Hypericum canadense*, *Osmunda regalis* var. *spectabilis*, *Lindernia dubia*, *Spiraea tomentosa* var. *rosea*, *Calamagrostis canadensis*, *Agrostis scabra*, *Rhynchospora capitellata*, *Viola lanceolata*, *Fimbristylis autumnalis* var. *mucronulata*, *Eleocharis elliptica*, *Eupatorium perfoliatum*, *Juncus canadensis*, *J. marginatus*, *Carex folliculata*, and *Dryopteris thelypteris* var. *pubescens*. MOR.

Carex folliculata L. This very rare sedge is actually frequent in places among the Paper Birches in Survey Area C. Bowles et al. (1986a) mapped this population and recorded 3 plants per square meter, 12 culms per plant. REPRESENTATIVE SPECIMEN: Wilhelm & Dritz #6946, 9 SEP 1979; ca 0.25 mi E of Kemil Road, in wooded swamp just N of the South Shore RR, in the SW SE SW Sec.9 T37N R5W. Growing with *Acer rubrum*, *Betula papyrifera*, *Carex debilis* var. *rudgei*, *C. intumescens*, *C. seorsa*, *C. virescens*, *Dryopteris noveboracensis*, *Habenaria clavellata*, *Ilex verticillata*, *Lindera benzoin*, *Maianthemum canadense* var. *interius*, *Mitchella repens*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *O. regalis* var. *spectabilis*, *Quercus rubra*, *Rubus hispidus* var. *obovalis*, and *Saururus cernuus*. MOR.

Carex intumescens Rudge This sedge is frequent in the Swamp Complex portion of Survey Area C.

Carex leptoneuria Fern. This rare sedge is occasional on mesophytic hummocks in the Hydromesophytic Swamp east of Kemil Road. REPRESENTATIVE SPECIMEN: Wilhelm & Dritz #6707, 26 MAY 1979; ca 0.5 mi S of Beverly Shores between Broadway (defunct subdivision road) and 300E Rd, in the SW SW Sec.9 T37N R5W; *Acer rubrum* swamp forest. MOR.

Carex seorsa Howe This attractive, though often overlooked, sedge is actually quite common in the Swamp Complex portion of Survey Area C and D, and in the remnant subdunal woods of Survey Area B. Locally, it is almost always associated with *Carex bromoides*. Bowles et al. (1985) noted the following associates: *Acer rubrum*, *Caltha palustris*, *Carex folliculata*, *Fraxinus americana*, *F. pennsylvanica*, *Lilium michiganense*, *Liriodendron tulipifera*, *Quercus alba*, *Q. rubra*, and *Symplocarpus foetidus*. REPRESENTATIVE SPECIMEN: Wilhelm & Dritz #6703, 26 MAY 1979; ca 0.25 mi S of Beverly Shores between Broadway (defunct subdivision road) and 300E Rd, in the SW SW Sec.9 T37N R5W. MOR. Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Carex tonsa (Fern.) Bickn. This species is occasional in the deep droughty sands of blowout areas in Survey Areas E and F.

Chamaedaphne calyculata var. *angustifolia* (Ait.) Fern. It is not clear from the herbarium label whether Floyd Swink collected his specimen in the Keiser Unit or the Tamarack Unit; though most of Beverly Shores is included here, we do know that Floyd was between Broadway and Mt. Baldy. Its rediscovery anywhere in this district would be a great event, and it would probably key us in to a plant community which no longer is known to exist locally. REPRESENTATIVE SPECIMEN: Swink s.n., 4 MAY 1947; found in the low ground south of the high dunes at Beverly Shores. MOR. According to Welch (1935), local populations of this species are boreal relicts.

Chrysosplenium americanum Schwein. This rare species is still frequent in the wooded swamps of Survey Area C. One of the densest colonies of this species in the Lakeshore is in the ditch at the far eastern end of the Survey Unit along Lakeshore County Road. Bowles *et al.* (1985) indicated that the population is nearly continuous along an 8,250 meter long seepage line (which line includes Indiana Dunes State Park); they recorded the following associates: **Acer rubrum**, **Caltha palustris**, **Fraxinus pennsylvanica**, **Quercus bicolor**, and **Symplocarpus foetidus**. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 7 APR 1946; *Beverly Shores*. MOR.

Cirsium pitcheri (Torr.) T.& G. First reported from this Survey Unit on the basis of the following comment by Lyon (1927): "... blowouts and lake face of dunes, fairly common at Keiser, rare elsewhere." It is still rare locally, but, according to Marlin Bowles (pers. comm.), there is a small population east of the parking lot in the vicinity of Keiser Blowout. Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain, but Loveless & Hamrick (1988) reasoned that its affinities are in the great plains.

Comptonia peregrina (L.) Coult. Lyon (1927) recorded Sweet Fern from the "... inland edge of subdunal woods, Keiser; rare." This delightful shrub is still extant along the south side of the traction line east of Kemil Road. REPRESENTATIVE SPECIMEN: *Wilhelm #13073*, 26 AUG 1985; *just northeast of the intersection of Kemil Road and U.S. 12, along the south side of the Chicago South Bend and South Shore RR; very large colony*. MOR. Welch (1935) considered local populations of this species to be boreal relicts, while Trefz (1935) suggested that they have ancestral affinities to the Atlantic coastal plain.

Conopholis americana (L.) Wallr. This unusual plant is still frequent in the wooded swamps of Survey Area C. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6708*, 26 MAY 1979; *ca 0.25 mi S of Beverly Shores between Broadway (defunct subdivision road) and 300E Rd, in the SW SW Sec.9 T37N R5W; Acer rubrum swamp forest*. MOR.

Corallorhiza maculata Raf. According to Plampin (1989b), there are two plants in Survey Area C, east of the **Adiantum pedatum** site, west of **Asimina triloba**.

Corallorhiza odontorhiza (Willd.) Fern. This orchid is occasional in the Dune Complex portions of Survey Area A, and according to Dritz (1987), it grew in Survey Area C on August 18, 1985. Barbara Plampin showed me several plants south of the parking area, east of Kemil Road, in Survey Area D. REPRESENTATIVE SPECIMEN: *Klick #1599*, 25 AUG 1987; *T37N R5W NE NW NW Sec.9; found in Beverly Shores W [sic!] of Kemil Road, in prescribed burn area; mesic oak savanna community, sandy soil; rare*. INDU.

Diervilla lonicera Mill. The Dwarf Honeysuckle is occasional in the Dune Complex portions of Survey Area A. Welch (1935) considered local populations of this species to be boreal relicts.

Drosera intermedia Hayne This species is known from this Survey Unit solely on the basis of the following comment by Lyon (1927): "... one season at an interdunal pond between Tamarack and Keiser, but destroyed by fire in 1922." Bergendahl (1983) reported "sundew" from just east of Kemil Road along the Bike Trail. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Dryopteris hexagonoptera (Michx.) Christens. This little fern, reported first from the Keiser area by Lyon (1927), is still extant in the Hydromesophytic Forest of the Swamp Complex in Survey Area C.

Dryopteris noveboracensis (L.) Gray This delicate fern is still frequent in the Swamp Complex portion of Survey Area C and occasional in subdunal woods remnants of Survey Area B. REPRESENTATIVE SPECIMEN: Wilhelm #6953, 12 SEP 1979; ca 0.25 mi E of Kemil Rd, in wooded swamp just N of the South Shore RR, in the SW SE SW Sec.9 T37N R5W; growing with *Acer rubrum*, *Betula papyrifera*, *Carex debilis* var. *rudgei*, *C. folliculata*, *C. intumescens*, *C. seorsa*, *C. virescens*, *Habenaria clavellata*, *Ilex verticillata*, *Lindera benzoin*, *Maianthemum canadense* var. *interius*, *Mitchella repens*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *O. regalis* var. *spectabilis*, *Quercus rubra*, *Rubus hispidus* var. *obovalis*, and *Saururus cernuus*. MOR.

Eupatorium fistulosum Barratt This impressive and obvious fall-blooming species has been discovered to be frequent along the Bike Trail and in open low ground east of Kemil Road. REPRESENTATIVE SPECIMEN: Wilhelm & Dritz #16363, 27 JUL 1988; Kemil Road, Keiser Unit, along Bike Trail with *Stachys palustris* var. *homotricha*, *Rubus occidentalis*, *R. hispidus* var. *obovalis*, *Prunus serotina*, *Aster umbellatus*, *Brachyelytrum erectum*, *Solidago graminifolia* var. *nuttallii*, *Osmunda cinnamomea*, *Solidago rugosa*, *Dryopteris thelypteris* var. *pubescens*, *Carex folliculata*, *Calamagrostis canadensis*, *Vitis labrusca*, *Polygonum sagittatum*, and *P. careyi*. MOR.

Euphorbia polygonifolia L. This little plant is still extant, though in very small numbers, in the Keiser blowout section of Survey Area A. Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Fraxinus americana var. *biltmoreana* (Beadle) J. Wright This variety of White Ash is rare in Survey Area C. See also the comments for this species in Survey Unit X.

Gentiana saponaria Michx. This is the only gentian known from the Survey Unit, and its presence is based upon the following REPRESENTATIVE SPECIMEN: Hiebert #377, 23 AUG 1983; T37N R5W NW NW Sec.16; scattered (ca 100 seen) in small prairie pocket ca 0.6 mi E of Kemil Road and 0.2 mi S of Rte. 12. MOR.

Goodyera pubescens (Willd.) R. Br. This rare orchid is known from this Survey Unit solely on the basis of the following comment by Lyon (1927): ". . . rare plant or two found in the Keiser and Tamarack subdunal woods." Inasmuch as Tamarack Stop was in the extreme southwestern portion of Survey Unit IX, I am supposing that Lyon (1927)'s sightings for this species locally were in Survey Unit VIII.

Habenaria clavellata (Michx.) Spreng. This little orchid is still extant, though quite rare, in the Swamp Complex of Survey Area C. REPRESENTATIVE SPECIMEN: Wilhelm & Dritz #6948, 9 SEP 1979; ca 0.25 mi E of Kemil Road, in wooded swamp just N of the South Shore RR, in the SW SE SW Sec.9 T37N R5W. Growing with *Acer rubrum*, *Betula papyrifera*, *Carex debilis* var. *rudgei*, *C. folliculata*, *C. intumescens*, *C. seorsa*, *C. virescens*, *Dryopteris noveboracensis*, *Ilex verticillata*, *Lindera benzoin*, *Maianthemum canadense* var. *interius*, *Mitchella repens*, *Nyssa sylvatica*, *Osmunda cinnamomea*, *O. regalis* var. *spectabilis*, *Quercus rubra*, *Rubus hispidus* var. *obovalis*, and *Saururus*

cernuus. MOR. Friesner (1936) considered local populations of this species to be boreal relicts.

Habenaria flava var. **herbiola** (R. Br.) Ames & Correll This very rare orchid is known from this Survey Unit solely on the basis of the following REPRESENTATIVE SPECIMEN: *Lyon s.n., 13 JUL 1924; dunes at Keiser, in water in wet woods.* BUT. Plampin (1987g) noted that she "found 30-40 seedlings of an orchid, mostly one-leaved, some two, and one plant with flowers past prime near the **H. psycodes** I saw earlier in the week . . . We [Keith Board and Barbara Plampin] are both pretty sure that it is **H. flava** var. **herbiola** . . ." Plampin (1989b) informed me that the colony did not emerge during the drought year of 1988, but that 35 or more non-blooming plants appeared in 1989.

Habenaria psycodes (L.) Spreng. This rare orchid, which often associates with **Habenaria flava** var. **herbiola**, was first reported from the Keiser stop by Lyon (1927). It remained unheralded until Barbara Plampin saw it on July 22, 1987. She writes (Plampin, 1987f): "I saw one . . . at the northeast end of the hydromesophytic forest about 500-750 feet east of Kemil . . . free-standing with the following associates nearby: **Onoclea sensibilis**, **Aralia nudicaulis**, **Ribes** sp., **Arisaema**, **Prunus** sp., **Symplocarpus foetidus**, **Ulmus americana**, **Podophyllum peltatum**, . . ." She later reported (Plampin, 1989b) that Alan Resetor saw **H. psycodes** near the methane well in Survey Area C.

Juniperus communis var. **depressa** Pursh This rare shrub is still present, but infrequent, in the Dune Complex portion of Survey Area A. REPRESENTATIVE SPECIMEN: *Wilhelm #6627, 21 MAY 1979; at the NW edge of Beverly Shores, in dune area; E of parking area S of Lake Shore Dr. and E of 300E Rd.* MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Lathyrus japonicus var. **glaber** (Ser.) Fern. This rare plant is known from this Survey Unit solely on the basis of the following report by Lyon (1927): ". . . open sand of rear foredune area or lake face of first line of dunes, Keiser . . . rather rare." Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Lonicera dioica L. According to Noel Pavlovic (pers. comm.), this species grows along a road west of Derby Ditch in Survey Area C.

Lycopodium lucidulum Michx. First reported from this Survey Unit by Lyon (1927), it is evidently very rare but still extant in the Swamp Complex of Survey Area C.

Liparis loeselii (L.) Richard. According to Plampin (1989b), this orchid grows along the bike trail, east of pylon #8425.

Maianthemum canadense Desf. var. **canadense** The typical variety of this species, though far less common than the variety **interius**, is still occasional in the Swamp Complex of Survey Area C. Friesner (1936) considered local populations of this species to be boreal relicts; while Welch (1935) agreed, she also suggested that they might have ancestral affinities to the Atlantic coastal plain.

Milium effusum L. First reported by Lyon (1927), this comely grass has been rediscovered and documented from Survey Area C by the following REPRESENTATIVE SPECIMEN: *Evert #14082, 21 MAY 1988; Keiser Woods, IDNL, ca 12 plots (flowering culms) along 1st paved road E of St Pk Boundary Rd & 0.25 mi N of bike path & RR on E side of old road along ditch in*

wet soil with *Onoclea sensibilis*, *Equisetum arvense*, *Symplocarpus foetidus*, and *Lindera benzoin*, T37N R5W Sec.9 SW. MOR.

Mitchella repens L. This little plant is still frequent on the hummocks in the Swamp Complex of Survey Area C. REPRESENTATIVE SPECIMEN: von Oettingen #393, 30 SEP 1982; T37N R5W SW Sec.9; growing in hydromesophytic woods at NW end of service road, ca 0.2 mi E of jct with S Lakeshore Dr; white birch, red maple, flat organic soil, prostrate, common. INDU.

Monotropa hypopithys L. First reported from Keiser by Lyon (1927), Dritz (1987) noted that it is still extant in Survey Area C, where he recorded it in bloom on August 9, 1981.

Monotropa uniflora L. Indian Pipe is rare near the north edge of the old growth portion of Survey Area C.

Nemopanthus mucronata (L.) Trel. Though rare, this northern shrub is in the Hydromesophytic Swamps of Survey Area C. Welch (1935) considered local populations of this species to be boreal relicts.

Panax trifolius L. This little plant is still quite frequent on the hummocks in the Swamp Complex of Survey Area C and in subdunal woods remnants of Survey Area B. REPRESENTATIVE SPECIMEN: Hiebert #233, 30 APR 1982; locally common in hydromesophytic forest at corner of S Lake Shore Dr. and service road; T37N R5W NW NW Sec.9. MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Pinus strobus L. This handsome pine is still occasional in the more stable portions of the Dune Complex in Survey Area A. Concerning this population, Menges & Armentano (1985) noted: "The history of [this population], the only other white pine population available for aging, was similar in history to [those in Dune Acres]. The oldest tree was 132 years old; peak recruitment occurred between 80 and 110 years ago; and only two trees sampled were younger than 60 years. While seedlings exist in this population, poor recruitment of canopy trees since 1900 suggest that high seedling mortality has prevailed." There is a tree with a 31" bole at the far eastern edge of the Survey Unit in Swamp Forest just west of Lakeshore County Road. Welch (1935) considered local populations of this species to be boreal relicts.

Polygonum arifolium var. **pubescens** (Keller) Fern. This species is still frequent in the swales of the Swamp Complex in Survey Area C and even along the Bike Trail in Survey Area D.

Polygonum careyi Olney This rare knotweed is occasional along the Bike Trail east of Kemil Road. REPRESENTATIVE SPECIMEN: Wilhelm & Dritz #16361, 27 JUL 1988; Keiser Unit, east of Kemil Road along Bike Trail, with *Osmunda regalis* var. *spectabilis*, *Prunus americana*, *Vitis labrusca*, *Juncus marginatus*, *Eleocharis obtusa*, *Hypericum canadense*, *Spiraea tomentosa* var. *rosea*, *Solidago graminifolia* var. *nuttallii*, *Lycopus uniflorus*, *Carex folliculata*, and *Eupatorium perfoliatum*. MOR.

Populus X jackii Sarg. Heretofore unknown from this district until its discovery by Ken Klick. Bowles *et al.* (1985), described this population as "... a small colony of three or four small trees that were multiple-stemmed and approximately four to five meters tall. They were mostly on the foredunes in between Lake Michigan and Lake Front Drive in Beverly Shores. We identified these trees as **Populus X jackii**, which is thought to be a hybrid between **P. deltoides** and **P. balsamifera**. Whether or not the small trees Deam saw [at Indiana Dunes

State Park, which see] were similar to these is conjecture. We doubt that *P. balsamifera* occurs in the Lakeshore. We include remarks here because trees that contain at least a part of the genotype are still present in the Lakeshore, even though the origin of these trees is also quite speculative." Part of this population since has been destroyed due to revetment work. REPRESENTATIVE SPECIMEN: *Pavlovic* #119, 7 AUG 1984; between Lake Front Drive and Lake Michigan; NE SE NE Sec.3 T37N R5W; three trees 25 ft tall in sandy soil on NW sloping foredune to lake. MOR.

Prunus pensylvanica L.f. This shrub is infrequent in the area once known as the Great Marsh which is now, largely, an old-field and depauperate Marsh Complex; it is occasional in other areas throughout the Survey Unit. REPRESENTATIVE SPECIMEN: *Hiebert* #242, 2 MAY 1982; scattered in disturbed area of mesophytic forest, along service road, just W of Derby Ditch, T37N R5W SE SW Sec.9. MOR.

Rhexia virginica L. This species is occasional in moist sandy ground along the Bike Trail east of Kemil Road. REPRESENTATIVE SPECIMEN: *Jones s.n.*, 17 AUG 1975; NIPSCO right-of-way, US 12 and Kemil Road. INDU. Parker (1936) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Rhus vernix L. Poison sumac is known locally solely on the basis of a map sent to me by Barbara Plampin (1987h). She noted that it grows 0.25 mile east of Kemil Road, north of the 600' contour near the northeast edge of Survey Area C as I have it delimited on the Survey Unit Map.

Rubus pubescens Raf. This little Raspberry is still frequent on the hummocks in the Swamp Complex portions of Survey Area C and E. REPRESENTATIVE SPECIMEN: *Hiebert* #254, 10 MAY 1982; at side of abandoned road, in hydromesophytic forest, ca 0.25 mi S of Beverly Dr. along S Lakeshore Dr., T37N R5W SW SW Sec.9; only a few plants seen. MOR.

Scirpus purshianus Fern. There is a small population of this species right along the south side of the Bike Trail in Survey Area D. *Scirpus smithii*, with which this species is sometimes included taxonomically, was considered by Peattie (1922) and Hooper (1934) to have ancestral affinities to the Atlantic coastal plain.

Senecio plattensis Nutt. This species, which is sometimes confused with *Senecio pauperculus* var. *balsamitae*, is rare but still extant on a dune crest in the Dune Complex of Survey Area A. REPRESENTATIVE SPECIMEN: *Wilhelm* #6619, 21 MAY 1979; at the NW edge of Beverly Shores, in dune area; E of parking area, S of Lake Shore Dr, and E of 300E Rd. MOR.

Sisyrinchium angustifolium Mill. According to Bergendahl (1983), this species grows along the Bike Trail east of Kemil Road near tower #8427.

Smilax rotundifolia L. This species is occasional nearly throughout the Survey Unit.

Solidago racemosa var. *gillmani* (Gray) Fern. This species is still occasional in the Keiser blowout portion of Survey Area A.

Sparganium americanum Nutt. This species is known locally, from Survey Area B solely on the basis of the following REPRESENTATIVE SPECIMEN: *Pavlovic* #1179, 28 JUL 1985; T37N R5W NW SW SE Sec.4; growing in Derby Ditch S of Fairwater Rd. Aquatic, common. INDU.

Trientalis borealis Raf. This species is still frequent, growing with **Mitchella repens**, **Panax trifolius**, and **Rubus pubescens** on the hummocks in the Swamp Complex of Survey Area C. REPRESENTATIVE SPECIMEN: *Hiebert #499, 23 MAY 1986; T37N R5W SE SW SW Sec.9; found N of service Rd, 200 m E of S Lakeshore Dr., hydromesophytic forest, muck over sand; locally scattered.* INDU. Welch (1953) considered local populations of this species to be boreal relicts.

Trillium cernuum var. **macranthum** Wieg. This rare white trillium is known from a small population in Survey Area E, from where it was documented by the following REPRESENTATIVE SPECIMEN: *Wilhelm & Shimp #14863, 21 MAY 1987; just NE of Furnessville, ca 50 yards W of 375E Road, off the side of old roadway, ca 2 m south of Carex gracillima colony; under Hamamelis virginiana, Cornus alternifolia, and Sassafras albidum, with Parthenocissus quinquefolia, Prunus virginiana, and Smilacina racemosa.* MOR. Bowles (1988) studied the population and recorded two flowering ramets and five sterile genets.

Vaccinium atrococcum (Gray) Heller This rare shrub normally grows in ombrotrophic bogs, but it is occasional here in the Hydromesophytic Woods of Survey Area C.

Viola pallens (Banks) Brainerd This little white Violet is still frequent among the hummocks in the Swamp Complex in Survey Area C. REPRESENTATIVE SPECIMEN: *Swink s.n., 7 APR 1946; Beverly Shores.* MOR.

Vitis labrusca L. This Grape, while rare, is still extant in the southeastern portion of the Swamp Complex in Survey Area C and in low open ground along the Bike Trail.

Xyris torta Sm. This species was first reported by Lyon (1927), who noted it from this Survey Unit as growing in the ditch along the railroad. It is still occasional along the Bike Trail in Survey Area C. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Summary

Survey Unit VIII has been shown to provide the habitat for at least 74 of the Indiana Dunes National Lakeshore SPECIAL VEGETATION floristic elements. Of these more than ninety percent were seen during this survey; most of those were seen in Survey Areas C and D. Only **Trillium cernuum** var. **macranthum** is known from this Survey Unit and no other.

Sixteen percent of the SPECIAL VEGETATION floristic elements were considered by Peattie (1922), Hooper (1934), and Parker (1936) to have ancestral affinities to the Atlantic coastal plain. Trefz (1935), Welch (1935), Deam (1932), Friesner (1936), and Parker (1936) considered another sixteen percent to represent boreal relict populations.

NATURAL AREA ASSESSMENT

As can be seen from the Natural Area Vegetation Map, this Survey Unit is composed largely of Dune Complex, Swamp Complex, and a small area of Foredune Complex, the latter being the remains of the easternmost portion of the Keiser Blowout. South of U.S. 12 are tracts of Savanna and Swamp Complex of moderate quality, but on the whole, the area has received severe trauma.

Virtually all of that which was once known as part of the Great Marsh has been obliterated by drainage, cultivation, and fluctuating water levels. Currently the land is "marsh-like" in character, dominated exclusively by cattail, giant reed, wool grass in some areas, or by "dog-hair" woody growth in other areas. It is a good bet that SPECIAL VEGETATION floristic elements remain here and there throughout the vast area, but their occurrences are so remote, and their associates so vulgar, as to disaffect the area from Natural Area status. This is not to say, however, that the stabilization of water levels and the restoration of regular fire into the life system would not do great things for the general ecological health of the Great Marsh (see the comments under the Dune Acres Unit); indeed such management would probably manifest so profound a change as to elevate the area to Natural Area significance.

The Dune Complex is largely fire-starved and heavily dissected by paved and unpaved roads, and it is pockmarked by dwellings and old homesites. There are pockets, nevertheless, of floristic interest yet here and there to the point where, taken as a whole, it merits recognition as Natural Area.

The Swamp Complex, as a fully functioning life system, is now restricted to the 40-acre area designated as Survey Area C on the Survey Unit Map. This is one of the most remarkable areas in the Chicago Region. It is old growth forest of very high fundamental quality. It contains at its southeastern edge one of the largest and healthiest Paper Birch (*Betula papyrifera*) populations in the Chicago Region, and certainly the finest one in the Lakeshore. There are 75 species of deciduous woody plants in this Survey Area alone. This seems to be an exceptional diversity for north temperate interiors. It is a sad fact that the few wooded tracts in our region today have 75 species all together, even when grasses and forbs are included. Its curious inhabitation by species typical of both minerotrophic and ombrotrophic conditions is unique locally, to wit: *Fraxinus nigra*, *Cornus alternifolia*, and *Quercus bicolor* with *Nemopanthus mucronata*, *Rhus vernix*, and *Vaccinium atrococcum*.

Evidently, attempts to drain this section were failures, and it somehow escaped clear-cut logging. Since it does not produce fine fuels, and won't burn, postsettlement fire suppression has been inconsequential. It is one of the most interesting remnant Natural Areas I have ever experienced. Every effort must be made to insure that fundamental changes in local hydrologic conditions do not occur. The horrible effects of such changes can be seen in the wooded area of Survey Unit IX which was at one time the floristically rich Tamarack Stop (see Survey Unit IX).

The area south of U.S. 12 and east of Kemil Road has suffered numerous insults and, over much of its area, catastrophic disturbances. Logging, fire suppression, grading, water level alterations, and ancillary effects from these impacts are some of the more significant disturbances. It is probable that Swamp Complex of Survey Area E will yield a bit more, but it is not of the same remnant quality as its counterpart west of Kemil Road. There is an interesting area just east of Kemil Road, opposite the Visitor Center on the sparsely vegetated east-facing sandy grade south of the blowout area. Here, there is a field of terricolous lichens where an uncommonly diverse population of *Cladoniae* holds forth. It is dominated by *Cladonia cristatella*, but occasional to frequent also are *C. rei*, *C. grayi*, *C. polycarpoides*, *C. pleurota*, *C. piedmontensis*, *C. strepsilis*, *C. robbinsii*, *C. cervicornis* ssp. *verticillata*, and *Cladina subtenuis*. *Cladonia chlorophaea* and *C. coniocraea* are also present on old stumps and logs. I realize that lichens generally are unappreciated, but a dispassionate assessment would have to allow as how such a site is quite an amenity for this region where

lichens are rare and populations are comprised primarily of corticolous weeds such as *Candelaria concolor*, *Physcia millegrana*, *P. stellaris*, and *Arthonia caesia*.

A portion of Survey Area F is an abandoned golf course, with all of the associated abrasions and contusions. During the survey, however, I did collect *Veronica verna*, a curious little speedwell which was heretofore unknown from the Chicago Region; Ken Klick collected *Capsella gracilis* nearby, another little weed new to our flora.

The data used in assessing the relative Natural Area significance and integrity of each Survey Area, and the Survey unit as a whole, are provided in Table VIII. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from each Survey Area, along with the numerical rating coefficient as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient, and do not enter directly into the derivations of the Natural Area Indices. The "R" symbol (rather than an "X" symbol), when used in Table VIII, indicates a record other than one to which I personally can attest. Most of these reports are from Ken Dritz or Barbara Plampin; a few are from early literature and old herbarium records. Species listed without a Survey Area tabulation are reports from Klick *et al.* (1989).

TABLE VIII: Summary of species upon which are calculated the various Natural Area Indices for each Survey Area, and for the Survey Unit as a whole.

A	B	C	D	E	F	
x				x	x	0 <i>Acer negundo</i>
x	x	x	x	x	x	7 <i>Acer rubrum</i>
		x				5 <i>Acer saccharum</i>
	x					0 <i>Acer saccharinum</i>
	x		x		x	* <i>Achillea millefolium</i>
		x		x		7 <i>Actaea pachypoda</i>
		x				15 <i>Adiantum pedatum</i>
				x		2 <i>Agrimonia gryposepala</i>
				x		8 <i>Agrimonia parviflora</i>
	x					* <i>Agropyron repens</i>
	x		x	x		* <i>Agrostis alba</i>
	x			x		1 <i>Agrostis hyemalis</i>
		x				1 <i>Agrostis perennans</i>
			x			5 <i>Agrostis scabra</i>
						* <i>Ailanthus altissima</i>
			R			10 <i>Aletris farinosa</i>
	x		x			4 <i>Alisma subcordatum</i>
	x	x				* <i>Alliaria officinalis</i>
		x				7 <i>Allium tricoccum</i>
		x				6 <i>Allium tricoccum burdickii</i>
	x	x	x			8 <i>Alnus rugosa americana</i>
						* <i>Alopecurus carolinianus</i>
	x		x	x	x	0 <i>Ambrosia artemisiifolia elatior</i>
	x					0 <i>Ambrosia trifida</i>
x		x				8 <i>Amelanchier arborea</i>
x						9 <i>Amelanchier humilis</i>
x				x	x	8 <i>Amelanchier interior</i>
		x	x	x		8 <i>Amelanchier laevis</i>

A	B	C	D	E	F	
x						15 <i>Ammophila breviligulata</i>
x	x	x				4 <i>Amphicarpa bracteata</i>
			x			4 <i>Andropogon gerardii</i>
x			x	x	x	5 <i>Andropogon scoparius</i>
					x	* <i>Andropogon virginicus</i>
		x				7 <i>Anemone quinquefolia interior</i>
x						6 <i>Antennaria plantaginifolia</i>
		x	x			6 <i>Apios americana</i>
x				x		5 <i>Apocynum androsaemifolium</i>
	x			x	x	2 <i>Apocynum sibiricum</i>
x		x				5 <i>Aquilegia canadensis</i>
						* <i>Arabidopsis thaliana</i>
x				x		7 <i>Arabis lyrata</i>
x		x		x		8 <i>Aralia nudicaulis</i>
		R				15 <i>Aralia racemosa</i> .
	x			x		* <i>Arctium minus</i>
x						10 <i>Arctostaphylos uva-ursi coactilis</i>
						* <i>Arenaria serpyllifolia</i>
	x	x		x		5 <i>Arisaema atrorubens</i>
				x		5 <i>Aristida intermedia</i>
				x		7 <i>Aristida purpurascens</i>
				x		15 <i>Aristida tuberculosa</i>
x						5 <i>Artemisia caudata</i>
			x			4 <i>Asclepias incarnata</i>
x	x				x	0 <i>Asclepias syriaca</i>
				x		10 <i>Asclepias tuberosa</i>
		R				15 <i>Asimina triloba</i>
						* <i>Asparagus officinalis</i>
x				x		8 <i>Aster azureus</i>
		x				5 <i>Aster cordifolius</i>
	R					10 <i>Aster junciformis</i>
		x				4 <i>Aster lateriflorus</i>
x		x		x		10 <i>Aster macrophyllus</i>
			R			4 <i>Aster novae-angliae</i>
			x			10 <i>Aster praealtus</i>
	x		x			3 <i>Aster simplex</i>
		x	x	x	x	10 <i>Aster umbellatus</i>
		x				5 <i>Aster vimineus</i>
	x	x				6 <i>Athyrium filix-femina michauxii</i>
	x	x	x			* <i>Barbarea vulgaris</i>
		x				15 <i>Bartonia virginica</i>
x	x					* <i>Berberis thunbergii</i>
		x				6 <i>Betula nigra</i>
		x				15 <i>Betula papyrifera</i>
		x				5 <i>Bidens cernua</i>
		x				20 <i>Bidens discoidea</i>
	x	x	x			1 <i>Bidens frondosa</i>
	x	x		x		2 <i>Boehmeria cylindrica</i>
		x		x		15 <i>Botrychium dissectum</i>
x	x			x		6 <i>Botrychium virginianum</i>
		x	x			15 <i>Brachyelytrum erectum</i>
x						* <i>Bromus inermis</i>

A	B	C	D	E	F	
	x					* Bromus japonicus
	R					* Bromus secalinus
			x			* Bromus squarrosus
	x				x	* Bromus tectorum
	x		x	x		3 Calamagrostis canadensis
x			x	x		10 Calamovilfa longifolia
	x	x				5 Caltha palustris
		x				2 Campanula americana
	R					* Campanula aparinoides
x						15 Campanula rotundifolia
x						* Capsella bursa-pastoris
					x	* Capsella gracilis
	x	x		x		5 Cardamine bulbosa
		R				6 Cardamine douglassii
					x	* Cardamine hirsuta
	x	x				4 Cardamine pensylvanica
			x			10 Carex alata
			x		x	8 Carex albolutescens
	R					5 Carex aquatilis altior
	x	x				15 Carex bromoides
	x					5 Carex comosa
				x		1 Carex convoluta
	x	x		x		10 Carex crinita
	x					4 Carex cristatella
		x	x			20 Carex debilis rudgei
		x		x	x	10 Carex emmonsii
			x			15 Carex flava fertilis
		x	x			20 Carex folliculata
		x		x		10 Carex gracillima
		x				15 Carex intumescens
				x		10 Carex lacustris
	x	x		x		1 Carex laxiflora
		x				20 Carex leptoneura
	R					8 Carex lupulina
			x			8 Carex lurida
x			x	x	x	5 Carex muhlenbergii
				x	x	5 Carex pensylvanica
	x	x	x			20 Carex seorsa
			x	x		10 Carex swanii
				x	x	15 Carex tosa
			x			3 Carex tribuloides
		x				10 Carex virescens
			x			2 Carex vulpinoidea
		x				8 Carpinus caroliniana virginiana
		x		x	x	7 Carya cordiformis
						* Catalpa speciosa
		R				8 Caulophyllum thalictroides
		x				* Celastrus orbiculatus
x	x			x		6 Celastrus scandens
				x		0 Cenchrus longispinus
		x		x		7 Cephalanthus occidentalis
		x		x		* Cerastium vulgatum

A	B	C	D	E	F	
		x				5 Chaerophyllum procumbens
	?					15 Chamaedaphne calyculata angustifolia
	x	x				8 Chelone glabra
					x	* Chrysanthemum leucanthemum pinnatifidum
	x	x				15 Chrysosplenium americanum
						* Cichorium intybus
		x				8 Cicuta bulbifera
	x	x		x		6 Cicuta maculata
	x	x				5 Cinna arundinacea
x	x			x		0 Circaea quadrisulcata canadensis
						* Cirsium arvense
R						20 Cirsium pitcheri
	x		x			* Cirsium vulgare
		x				2 Claytonia virginica
	x				x	4 Clematis virginiana
x				x		7 Comandra richardsiana
						* Commelina communis
			x			10 Comptonia peregrina
		x				15 Conopholis americana
x						* Convallaria majalis
		R				15 Corallorhiza maculata
x		x	x			20 Corallorhiza odontorhiza
			x	x		5 Coreopsis tripteris
x						8 Corispermum hyssopifolium
		x		x	x	9 Cornus alternifolia
x		x				10 Cornus florida
	x			x	x	5 Cornus obliqua
x	x	x	x	x	x	1 Cornus racemosa
x	x	x			x	6 Cornus stolonifera
x						10 Cornus stolonifera baileyi
	x	x	x		x	2 Corylus americana
		R				5 Crataegus coccinea
		x		x		0 Cryptotaenia canadensis
	x					7 Cuscuta glomerata
		x				4 Cuscuta gronovii
				x		5 Cyperus filiculmis
x						5 Cyperus schweinitzii
			x			1 Cyperus strigosus
		x				6 Cystopteris fragilis
						* Dactylis glomerata
			x		x	5 Danthonia spicata
						* Datura stramonium
	x		x		x	* Daucus carota
		x				5 Dentaria laciniata
						* Dianthus armeria
						* Dianthus barbatus
x						10 Diervilla lonicera
						* Digitaria sanguinalis
	x	x	x	x		5 Dioscorea villosa
			R			15 Drosera intermedia
		x				10 Dryopteris cristata
		x				15 Dryopteris hexagonoptera

A	B	C	D	E	F	
	x	x				15 Dryopteris noveboracensis
		x		x		6 Dryopteris spinulosa
	x					10 Dryopteris spinulosa intermedia
		x	x	x		6 Dryopteris thelypteris pubescens
	x					5 Echinocystis lobata
			x			5 Eleocharis calva
			x			8 Eleocharis elliptica
			x			5 Eleocharis obtusa
	x					5 Eleocharis smallii
x						4 Elymus canadensis
		R				5 Elymus villosus
		x				10 Epifagus virginiana
	x					3 Epilobium coloratum
						* Epipactis helleborine
	x	x	x			0 Equisetum arvense
			x			3 Equisetum X ferrissii
x					x	0 Eragrostis pectinacea
				x		* Eragrostis poaeoides
				x	x	3 Eragrostis spectabilis
			x			2 Erechtites hieracifolia
				x		1 Erigeron annuus
		x			x	0 Erigeron canadensis
	x					4 Erigeron philadelphicus
		x				8 Erythronium americanum
	x	x	x	x		20 Eupatorium fistulosum
		x				5 Eupatorium maculatum
		x	x	x	x	6 Eupatorium perfoliatum
			x	x		2 Euphorbia corollata
						* Euphorbia dentata
			x			* Euphorbia maculata
x						15 Euphorbia polygonifolia
				x		* Euphorbia supina
		x		x		10 Fagus grandifolia
	x					* Festuca elatior
	x	x				5 Festuca obtusa
				x	x	* Festuca ovina
			x			10 Fimbristylis autumnalis mucronulata
x			x	x		1 Fragaria virginiana
x	x	x		x	x	5 Fraxinus americana
		x				15 Fraxinus americana biltmoreana
		x	x		x	8 Fraxinus nigra
		x	x		x	7 Fraxinus pennsylvanica
		x	x	x	x	2 Fraxinus pennsylvanica subintegerrima
			x			* Galinsoga ciliata
x	x	x		x	x	1 Galium aparine
x				x		7 Galium circaezans hypomalacum
x						4 Galium concinnum
	x					5 Galium obtusum
x						10 Galium pilosum
			x			8 Galium tinctorium
x		x		x		5 Galium triflorum
		x				9 Gaylussacia baccata

A	B	C	D	E	F	
				x		15 <i>Gentiana saponaria</i>
	x	x				4 <i>Geranium maculatum</i>
				x		8 <i>Gerardia pedicularia ambigens</i>
			x			7 <i>Gerardia purpurea</i>
			x			7 <i>Gerardia tenuifolia</i>
	x	x		x		0 <i>Geum canadense</i>
	x			x		1 <i>Geum laciniatum trichocarpum</i>
x						* <i>Glechoma hederacea</i>
		x	x			10 <i>Glyceria canadensis</i>
	x	x	x	x		4 <i>Glyceria striata</i>
					x	2 <i>Gnaphalium obtusifolium</i>
		R				20 <i>Goodyera pubescens</i>
			x			5 <i>Gratiola neglecta</i>
		R				7 <i>Gratiola virginiana</i>
		x				15 <i>Habenaria clavellata</i>
		R				15 <i>Habenaria flava herbiola</i>
		x				10 <i>Habenaria lacera</i>
		R				20 <i>Habenaria psycodes</i>
	x					0 <i>Hackelia virginiana</i>
x	x	x		x	x	8 <i>Hamamelis virginiana</i>
	R					5 <i>Helenium autumnale</i>
	x					* <i>Helenium nudiflorum</i>
					x	8 <i>Helianthemum canadense</i>
x				x		5 <i>Helianthus divaricatus</i>
	x		x			2 <i>Helianthus grosseserratus</i>
						* <i>Helianthus petiolaris</i>
				x		* <i>Hemerocallis fulva</i>
x						10 <i>Hepatica americana</i>
						* <i>Hesperis matronalis</i>
			x	x		6 <i>Hieracium gronovii</i>
						* <i>Holosteum umbellatum</i>
				x		5 <i>Humulus lupulus</i>
			x			8 <i>Hypericum canadense</i>
			x			8 <i>Hypericum mutilum</i>
			x			* <i>Hypericum perforatum</i>
	R					4 <i>Hypericum punctatum</i>
		x				5 <i>Hystrix patula</i>
x		x		x		9 <i>Ilex verticillata</i>
	x	x		x		3 <i>Impatiens capensis</i>
						* <i>Iris pseudacorus</i>
	x	x		x		5 <i>Iris virginica shrevei</i>
				x		5 <i>Juglans nigra</i>
			x			8 <i>Juncus acuminatus</i>
	R					8 <i>Juncus brachycarpus</i>
					x	5 <i>Juncus bufonius</i>
			x			7 <i>Juncus canadensis</i>
			x			4 <i>Juncus dudleyi</i>
		x	x	x		7 <i>Juncus effusus solutus</i>
			x			10 <i>Juncus marginatus</i>
			x			6 <i>Juncus nodosus</i>
			x	x		0 <i>Juncus tenuis</i>
x						10 <i>Juniperus communis depressa</i>

A	B	C	D	E	F	
x						2 Juniperus virginiana crebra
				x	x	6 Krigia virginica
x	x				x	2 Lactuca canadensis
	x					* Lamium purpureum
		x				3 Laportea canadensis
	R					10 Larix laricina
R						20 Lathyrus japonicus glaber
	x					6 Lathyrus palustris myrtifolius
	x	x				5 Leersia oryzoides
		x				7 Leersia virginica
	x			x		5 Lemna minor
				x		7 Lemna trisulca
						* Lepidium densiflorum
x					x	0 Lepidium virginicum
x						3 Leptoloma cognatum
				x	x	4 Lespedeza capitata
				x		6 Liatris aspera
x	x			x		* Ligustrum vulgare
	x	x	x			6 Lilium michiganense
					x	6 Linaria canadensis
	x	x		x		7 Lindera benzoin
			x			5 Lindernia dubia
R		R				8 Liparis lilifolia
				R		7 Liparis loeselii
	x	x		x		10 Liriodendron tulipifera
				x		6 Lithospermum canescens
x				x		8 Lithospermum croceum
		x	x			7 Lobelia cardinalis
			x			4 Lobelia inflata
		x	x			6 Lobelia siphilitica
				x	x	* Lonicera X bella
		R				15 Lonicera dioica
		x				* Lonicera japonica
				x		* Lonicera X muendeniense
			x			* Lonicera X muscaviensis
				x		* Lonicera tatarica
			x			6 Ludwigia alternifolia
			x			5 Ludwigia palustris americana
		x				* Lunaria annua
x				x		7 Lupinus perennis occidentalis
	x					* Lychnis alba
		x				15 Lycopodium lucidulum
	x		x			5 Lycopus americanus
		x	x		x	6 Lycopus uniflorus
			x			6 Lycopus virginicus
				x		4 Lysimachia ciliata
			x			8 Lysimachia terrestris
		x				9 Lysimachia thyrsiflora
						* Lythrum salicaria
		x				15 Maianthemum canadense
x	x	x		x	x	10 Maianthemum canadense interius
		x				10 Medeola virginiana

A	B	C	D	E	F	
			x			* Medicago lupulina
	x		x			* Melilotus alba
	x					* Melilotus officinalis
x		R				6 Menispermum canadense
	x					5 Mentha arvensis villosa
		x				15 Milium effusum
			x			6 Mimulus ringens
x		x				15 Mitchella repens
		x				10 Mitella diphylla
		x				* Monarda didyma
x						4 Monarda fistulosa
x				x	x	5 Monarda punctata villicaulis
		R				15 Monotropa hypopithys
		x				15 Monotropa uniflora
				x		* Morus alba
		x				3 Muhlenbergia frondosa
		x				5 Muhlenbergia mexicana
				x		0 Muhlenbergia schreberi
					x	* Myosotis stricta
	x					* Nasturtium officinale
		x				15 Nemopanthus mucronata
	R					7 Nymphaea tuberosa
	x	x		x	x	8 Nyssa sylvatica
	x		x			1 Oenothera biennis
R						3 Oenothera laciniata
x				x		7 Oenothera rhombipetala
	x	x	x	x		8 Onoclea sensibilis
				x	x	5 Opuntia humifusa
				x		* Ornithogalum umbellatum
x	x	x		x		3 Osmorhiza claytoni
x	x					3 Osmorhiza longistylis
	x	x	x	x		6 Osmunda cinnamomea
	x	x	x	x	x	8 Osmunda regalis spectabilis
		x				5 Ostrya virginiana
	x			x		0 Oxalis europaea
					x	0 Oxalis stricta
		x	x			7 Oxypolis rigidior
	x	x				15 Panax trifolius
			x			5 Panicum agrostoides
	x	x	x		x	7 Panicum clandestinum
					x	10 Panicum depauperatum
		x	x			3 Panicum implicatum
x		x		x	x	7 Panicum latifolium
x			x			7 Panicum oligosanthos scribnerianum
			x			8 Panicum sphaerocarpon
			x			9 Panicum spretum
					x	7 Panicum villosissimum
x					x	9 Panicum villosissimum pseudopubescens
x			x			5 Panicum virgatum
x	x		x			1 Parthenocissus inserta
x	x	x		x	x	2 Parthenocissus quinquefolia
				x		10 Pedicularis canadensis

A	B	C	D	E	F	
	R					5 Penthorum sedoides
						* Petunia X hybrida
	x		x			0 Phalaris arundinacea
						* Philadelphus coronarius
	x					* Phleum pratense
		x				5 Phlox divaricata
						* Phlox paniculata
x						6 Phlox pilosa
	x		x			4 Phragmites communis berlandieri
				x		3 Physalis heterophylla
x						2 Phytolacca americana
		x				5 Pilea pumila
x	x					20 Pinus strobus
	x					* Plantago lanceolata
				x		* Plantago major
	x				x	0 Plantago rugelii
		x				10 Platanus occidentalis
				x		* Poa annua
x			x	x	x	* Poa compressa
x	x		x	x	x	* Poa pratensis
	x	x		x		5 Podophyllum peltatum
			x			0 Polanisia graveolens
				x		10 Polygala polygama obtusata
			x			6 Polygala sanguinea
x	x			x	x	3 Polygonatum canaliculatum
	x	x		x		7 Polygonatum pubescens
		x	x			15 Polygonum arifolium pubescens
			x			15 Polygonum careyi
	x					5 Polygonum coccineum
		x				7 Polygonum hydropiperoides
				x		0 Polygonum pennsylvanicum laevigatum
		x				6 Polygonum punctatum
	x	x	x			10 Polygonum sagittatum
			x			2 Polygonum scandens
		x				10 Polystichum acrostichoides
x						* Populus alba
x	x	x		x		2 Populus deltoides
		x		x		6 Populus grandidentata
x						15 Populus X jackii
	x	x	x	x	x	4 Populus tremuloides
R						* Potentilla argentea
	x					0 Potentilla norvegica
	x				x	* Potentilla recta
		x	x	x	x	4 Potentilla simplex
x	x			x		5 Prenanthes alba
x		x				10 Prenanthes altissima
			x			0 Prunella vulgaris lanceolata
		x	x	x	x	5 Prunus americana
	x	x	x	x		5 Prunus pensylvanica
x						8 Prunus pumila
x	x	x	x	x	x	1 Prunus serotina
x	x	x		x		1 Prunus virginiana

A	B	C	D	E	F	
x						7 Ptelea trifoliata
x						9 Ptelea trifoliata mollis
x	x	x		x	x	5 Pteridium aquilinum latiusculum
	x	x		x	x	9 Pyrus floribunda
						* Pyrus malus
			x	x		7 Pyrus melanocarpa
x		x		x	x	4 Quercus alba
		x		x		8 Quercus bicolor
	x	x		x	x	8 Quercus palustris
x	x	x	x			7 Quercus rubra
x		x		x	x	6 Quercus velutina
x	x	x		x		0 Ranunculus abortivus
				x		7 Ranunculus flabellaris
		x				8 Ranunculus hispidus
	x	x				5 Ranunculus recurvatus
	R					6 Ranunculus sceleratus
	x	x				4 Ranunculus septentrionalis
						* Rhamnus cathartica
					x	* Rhamnus frangula
			x			15 Rhexia virginica
x						9 Rhus aromatica
		x	x	x	x	6 Rhus copallina latifolia
x	x	x		x	x	1 Rhus radicans
x	x	x	x		x	3 Rhus typhina
		R				15 Rhus vernix
			x			8 Rhynchospora capitellata
		x				7 Ribes americanum
x	x	x		x		5 Ribes cynosbati
	x	x				5 Ribes missouriense
x						* Robinia hispida
					x	* Robinia pseudo-acacia
	R					5 Rorippa islandica fernaldiana
x			x		x	5 Rosa carolina
	x			x		* Rosa multiflora
	x			x		9 Rosa palustris
	x	x		x		3 Rubus allegheniensis
			x	x	x	4 Rubus flagellaris
	x	x	x	x		9 Rubus hispidus obovalis
x	x	x	x	x		7 Rubus idaeus strigosus
		x	x	x		2 Rubus occidentalis
	x	x	x	x	x	3 Rubus pensylvanicus
		x		x		15 Rubus pubescens
			x			1 Rudbeckia hirta
				x	x	* Rumex acetosella
	x			x		* Rumex crispus
	x					* Rumex obtusifolius
	x					7 Rumex orbiculatus
	R					6 Rumex verticillatus
		x	x			5 Salix amygdaloides
		x				8 Salix bebbiana
	x	x	x	x		2 Salix discolor
			x			7 Salix glaucophylloides glaucophylla

A	B	C	D	E	F	
			x			10 Salix gracilis textoris
					x	6 Salix humilis
			x			1 Salix interior
		x	x			4 Salix nigra
x	x	x	x	x		1 Sambucus canadensis
		R				10 Sambucus pubens
		x				2 Sanicula gregaria
x	x					* Saponaria officinalis
x	x	x	x	x	x	6 Sassafras albidum
x						10 Satureja vulgaris neogaea
		x	x			10 Saururus cernuus
		x				8 Saxifraga pensylvanica
			x		x	6 Scirpus acutus
			x			4 Scirpus atrovirens
	x		x			6 Scirpus cyperinus
	x					6 Scirpus fluviatilis
			x			20 Scirpus purshianus
		x				5 Scirpus validus creber
					x	* Scleranthus annuus
		R				5 Scrophularia lanceolata
	x					5 Scutellaria epilobiifolia
		x				5 Scutellaria lateriflora
x						* Sedum sarmentosum
	x	x				7 Senecio aureus
x						15 Senecio plattensis
				x		* Setaria viridis
x			x			2 Silene antirrhina
						* Silene armeria
			R			10 Sisyrinchium angustifolium
	x			x		7 Sium suave
x	x	x		x	x	2 Smilacina racemosa
x	x	x		x	x	5 Smilacina stellata
x		x		x		3 Smilax ecirrhata
x		x		x		4 Smilax lasioneura
x	x	x		x		15 Smilax rotundifolia
x						5 Smilax tamnoides hispida
				x		* Solanum carolinense
x	x			x		* Solanum dulcamara
	x		x			1 Solidago altissima
x		x		x		7 Solidago caesia
	x	x		x		3 Solidago gigantea
x			x		x	3 Solidago graminifolia nuttallii
			x	x		5 Solidago juncea
x					x	4 Solidago nemoralis
		x	x			8 Solidago patula
x						15 Solidago racemosa gillmani
		x	x	x		6 Solidago rugosa
			x			9 Solidago uliginosa
		x	x			5 Solidago ulmifolia
			x		x	5 Sorghastrum nutans
	x					15 Sparganium americanum
	x					10 Sparganium chlorocarpum

A	B	C	D	E	F	
			x			5 <i>Spartina pectinata</i>
		x				4 <i>Sphenopholis intermedia</i>
	x		x			7 <i>Spiraea alba</i>
	x		x		x	9 <i>Spiraea tomentosa rosea</i>
		x	x			7 <i>Sporobolus cryptandrus</i>
				x	x	2 <i>Sporobolus vaginiflorus</i>
		x	x	x		5 <i>Stachys palustris homotricha</i>
			x			5 <i>Stachys tenuifolia hispida</i>
	x					* <i>Stellaria graminea</i>
	x					8 <i>Stellaria longifolia</i>
				x		* <i>Stellaria media</i>
	x	x		x		6 <i>Symplocarpus foetidus</i>
						* <i>Syringa vulgaris</i>
					x	* <i>Taraxacum erythrospermum</i>
x	x			x	x	* <i>Taraxacum officinale</i>
			x			* <i>Thlaspi arvense</i>
x		x		x		5 <i>Tilia americana</i>
	x					2 <i>Tovara virginiana</i>
x			x		x	2 <i>Tradescantia ohienensis</i>
x	x		x		x	* <i>Tragopogon major</i>
						* <i>Tragopogon pratensis</i>
		x				15 <i>Trientalis borealis</i>
						* <i>Trifolium agrarium</i>
						* <i>Trifolium pratense</i>
					x	* <i>Trifolium repens</i>
				x		20 <i>Trillium cernuum macranthum</i>
		R				6 <i>Trillium flexipes</i>
		R		x		5 <i>Trillium recurvatum</i>
x						7 <i>Triplasis purpurea</i>
	x					* <i>Triticum aestivum</i>
	x		x			2 <i>Typha angustifolia</i>
	x		x			1 <i>Typha latifolia</i>
	x	x		x		3 <i>Ulmus americana</i>
x						* <i>Ulmus pumila</i>
		x		x		4 <i>Ulmus rubra</i>
	x	x		x		2 <i>Urtica procera</i>
				x		10 <i>Utricularia vulgaris</i>
x		x		x		7 <i>Uvularia grandiflora</i>
x					x	5 <i>Vaccinium angustifolium laevifolium</i>
		x				15 <i>Vaccinium atrococcum</i>
		x				8 <i>Vaccinium corymbosum</i>
					x	* <i>Verbascum blattaria</i>
x	x		x			* <i>Verbascum thapsus</i>
			x			4 <i>Verbena hastata</i>
	x					* <i>Veronica arvensis</i>
	R					10 <i>Veronica scutellata</i>
					x	* <i>Veronica verna</i>
		x				9 <i>Viburnum acerifolium</i>
	x	x				5 <i>Viburnum lentago</i>
				x		* <i>Viburnum opulus</i>
		x				10 <i>Viola conspersa</i>
		x		x		6 <i>Viola cucullata</i>

A	B	C	D	E	F	
			x		x	7 <i>Viola lanceolata</i>
		x				15 <i>Viola pallens</i>
		x		x		0 <i>Viola papilionacea</i>
				x		10 <i>Viola pedata lineariloba</i>
	x	x				5 <i>Viola pensylvanica</i>
					x	7 <i>Viola sagittata</i>
	x					3 <i>Viola sororia</i>
x	x	x		x	x	10 <i>Vitis aestivalis</i>
		x	x			15 <i>Vitis labrusca</i>
x	x	x	x	x	x	4 <i>Vitis riparia</i>
						* <i>Wisteria macrostachya</i>
	x					* <i>Xanthium strumarium</i>
		R				1 <i>Xanthoxylum americanum</i>
			x			15 <i>Xyris torta</i>
			x			* <i>Yucca smalliana</i>

Summary

Survey Area A (surveyed May 21 and September 22, 1979) occupies about 100 acres of mostly wooded dunes west of Beverly Shores. During the two surveys I catalogued 113 native floristic elements, their Mean Quality being 6.29 and representing a Natural Area Index of 67. At least 6 additional taxa have been recorded from this area by others. If these taxa are included in the calculations, the Mean Quality rises to 6.54, and the Natural Area Index becomes 71. Most of the Dune Complex area is quite savanna-like in character, so it would benefit greatly over the long term if fire were restored regularly into the life system.

Survey Area B (surveyed June 13 and 15, 1979 and May 20, 1988), over 750 acres, occupies all of that area once known as the Great Marsh and includes large degraded tracts of what once were "subdunal woods at Keiser." This contemporary survey recorded 146 native floristic elements (and numerous weeds), the Mean Quality of which is 5.02, resulting in an Index of 61. My survey time in this area has been brief, because it only infrequently yields SPECIAL VEGETATION floristic elements, and the relatively low Mean Quality suggests that few are left to be found. The literature records 14 additional taxa which I assume are from this area, but there most certainly were literally hundreds more in early times before the era of ditches and plows. If these few additional taxa were still extant, the Mean Quality would rise to 5.19 and represent a Natural Area Index of 66, but the full floristic history of the Great Marsh has been lost forever; one can only imagine what it must have been like.

Though Survey Area C was surveyed formally on May 26 and September 9, 1979 and September 27, 1988, I have made desultory pleasure trips here because it is absolutely one of my favorite tracts. These 40 acres preserve some of the finest Hydromesophytic Swamp Forest in the region. The briefest periods during which Ken Dritz and I surveyed the area in 1979 yielded 171 native floristic elements with a Mean Quality of 7.01 representing a Natural Area Index of 92. Since that first period, I have noted another 48 species which raise the Mean Quality to 7.41 and the Index to 110. An additional 20 species have been reported reliably and most if not all are likely extant; with these, the Index stands at 118. In terms of regional Natural Area significance, this rating reflects that Survey Area C is in league with other small areas such as Cowles Bog (sensu stricto), Pinhook Bog, Howes Prairie, and the Pannes at Miller.

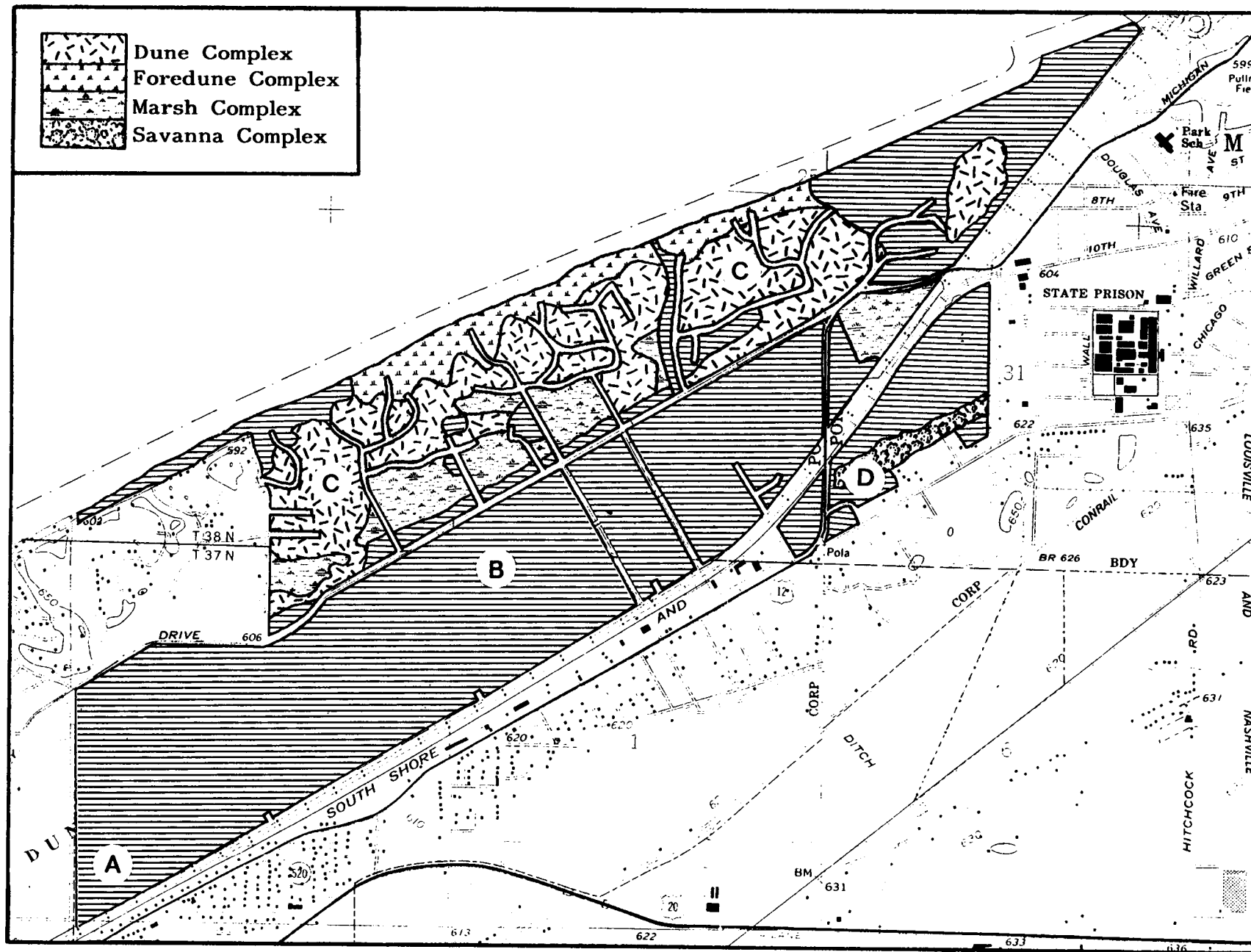
Survey Area D is a short tract of moist meadow along the Bike Trail east of Kemil Road between towers 8427 and 8428. I surveyed it July 24 and 27, and August 30, 1988. Though I am certain that there are numerous treasures yet to be discovered earlier in the year, we are nevertheless aware of 155 native species, the Mean Quality of which is 6.08 and which represent a Natural Area Index of 76! This Survey Area is essentially an extension of Survey Area C, combined with which the overall Index is 117.

Survey Area E occupies 325 acres east of Kemil Road, though about half of the tract has been seriously disturbed. I surveyed it May 14, May 20, and August 5, 1987. Over the whole of the area I noted 171 native species with a Mean Quality of 5.73 and an Index of 75. It is likely that future surveys will turn up numerous additional species, but this area is not of the same ilk as less disturbed areas in the Visitor Center Unit just to the west.

Survey Area F is the 195-acre tract between 375 East Road and 475 East Road. It has been fairly well blitzed. I surveyed it on May 20, 1987 and cursorily on January 18, 1989, and turned up only 82 species; the Mean Quality was 4.96, rendering an Index of 45. Except for *Carex tonsa* no SPECIAL VEGETATION floristic elements were noted, so intensive visits were obviated.

The Survey Unit, as whole, has an over-all Mean Quality of 6.50 representing a Natural Area Index of 137. Altogether, 441 native species have been recorded. If the additional 39 native floristic elements reported from within the boundaries of this Survey Unit were included in the Natural Area assessment, the Mean Quality would stand at 6.75, with a Natural Area Index of 149.

SURVEY UNIT IX MAP



SURVEY UNIT IX: TAMARACK

This Survey Unit occupies about 1345 acres, nearly 60% of which have been highly disturbed or obliterated. The southwestern portion of this Unit is more or less equivalent to the region identified by earlier botanists and writers as Tamarack, in reference to the Tamarack Stop along the Chicago South Bend & South Shore traction line. The stop no doubt received its name from the bog to which Cressey (1928) referred "...just north of Tamarack, ..." Much of the rest of the Unit, apparently, was ignored by earlier botanists, presumably because it marked the eastern extent of the "Indiana Dunes and vicinity." In comparison with some of the Units farther west, I have spent relatively little time in this Survey Unit, but did survey portions of the area June 9, and on September 10 and 30, 1979; in the spring of 1980 not long after a burn in the western half of Survey Area C, I made a fairly extensive inventory. I spent much of August 25, 1987 in the vicinity of Kintzele Ditch, also in Survey Area C. The newly acquired East Unit Transit Area was surveyed October 5, 1987, and May 20 and July 24, 1988. I was accompanied at various times by John Bacone, Ken Dritz, Norm Henderson, Craig Johnson, Douglas Ladd, Elizabeth Shimp, Floyd Swink, and Linda Wetstein.

The Survey Unit Map was superimposed to scale over combined parts of the U.S.G.S Michigan City West Quadrangle, N4137.5-8652.5/7.5, photo-revised 1980. Most of the Unit is in Porter County, but Mount Baldy and the East Unit Transit Area are in La Porte County. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a black & white stereo-pair set (BFP-3: 53-55) flown in November, 1938; a black & white stereo-pair set (BFK-2: 3,4, & 6) flown in June, 1939; a black & white stereo-pair set (BFK-IV: 34-36) flown in September, 1958; a black & white stereo-pair set (BFP-IV: 35-36) flown in September, 1958; a color stereo-pair set (77-157: 23-29) flown in April, 1977; a set of color obliques, flown in May 1978; a color stereo-pair set (79-117: 37-40 & 87-92) flown in May of 1979; a color stereo-pair set (4:15-4:17) flown in May, 1984; and a black & white stereo-pair set (6:23-6:30, 7:22-7:29) flown in May 1984.

ANNOTATED LIST OF SPECIAL VEGETATION FLORISTIC ELEMENTS

Alnus rugosa* var. *americana (Regel) Fern. This alder is frequent in the low wooded tracts along the traction line. REPRESENTATIVE SPECIMEN: *Wilhelm* #6784, 9 JUN 1979; north of Town of Pines, in disturbed area between Beverly Drive and the South Shore Railroad, west of Central Ave., in the Brown Ditch area. MOR.

Ammophila breviligulata Fern. Though the Foredune Complex communities are profoundly disturbed in this Survey Unit, this hardy grass is still extant here and there along the lake front, sometimes in substantial populations. REPRESENTATIVE SPECIMEN: *Wilhelm et al.* #15236, 25 AUG 1987; northwest of Michigan City in the vicinity of the parking area for Mt. Baldy, just east of the county line, on the grounds of the Indiana Dunes National Lakeshore. MOR. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Arabis glabra (L.) Bernh. There were a few plants of this rare crucifer along the South Shore Railroad in the Town of Pines, from where was collected the following REPRESENTA-

TIVE SPECIMEN: *Wilhelm* #6776, 9 JUN 1979; in *The Pines*, along the north side of the South Shore Railroad, just west of where it is crossed by Central Avenue. MOR.

***Aralia racemosa* L.** Remarkably enough, this rare plant still grows in the ditch along the east side of the road which marks the western edge of Survey Area A.

***Arctostaphylos uva-ursi* var. *coactilis* Fern. & Macbr.** According to Noel Pavlovic, Bearberry grows at the top of a dune at Kansas Avenue in Survey Area C. Parker (1936) considered local populations of this species to be boreal relicts.

***Arenaria stricta* Michx.** Wayne Lampa (pers. comm.) reported this plant from Survey Area C, where it grows near the center of the E E Sec.35 T38N R5W with *Stipa spartea*, *Andropogon scoparius*, *Pedicularis canadensis*, *Asclepias tuberosa*, *Lithospermum croceum*, *Phlox pilosa*, *Panicum virgatum*, and *Anemone cylindrica*.

***Asimina triloba* (L.) Dunal** Known from Survey Area A on the basis of a report by Peattie (1930). It has almost certainly been extirpated from the area.

***Aster junciformis* Rydb.** Once known from the Great Marsh area of Survey Area B, this species has probably been extirpated locally.

***Bartonia virginica* (L.) BSP.** Once known from Survey Area A as per the report by Lyon (1927), this species no doubt has been extirpated there. It is, however, occasional in moist mossy acid grounds in Survey Area D, and, according to Plampin (1989b), along the traction line where it grows in *Sphagnum* in three sites west of pylon #8435.

***Botrychium dissectum* Spreng.** First reported by Lyon (1927) from the "... rich subdunal woods, ..." at Tamarack, this species might possibly have survived the tremendous degradation which has occurred there.

***Brasenia schreberi* Gmel.** Reported by Lyon (1927) from the Survey Area B, this species almost certainly has been extirpated locally.

***Cakile edentula* (Bigel.) Hook.** This species is still extant in the Beach and Fore-dune areas along the shore of Lake Michigan. REPRESENTATIVE SPECIMEN: *Wilhelm et al.* #15230, 25 AUG 1987; northwest of Michigan City in the vicinity of the parking area for Mt. Baldy, just west of the county line, on the grounds of the Indiana Dunes National Lakeshore. MOR. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

***Calla palustris* L.** This faithful bog species, now certainly extinct locally, is known from this Survey Unit on the basis of the following report by Peattie (1930): "In cold bogs, at Tamarack Sta. acc. to Nieuwland, rare." Welch (1935) considered local populations of this species to be boreal relicts.

***Calopogon pulchellus* (Salisb.) R. Br.** Reported by Lyon (1927) as having grown along the ditch by the railroad near Survey Area A, this beautiful orchid is now certainly locally extinct.

***Campanula rotundifolia* L.** This species is still occasional among the dunes in Survey Area C. Parker (1936) considered local populations of this species to be boreal relicts.

***Carex alata* T. & G.** Winged sedge was recently discovered in Survey Area D and documented by the following REPRESENTATIVE SPECIMEN: *Kjellmark* #132, 18 JUL 1988;

SW SW NW Sec.31 T38N R4W; cattail-*Scirpus* marsh E of Rt.12 & N of Bike Trail parking lot; with *Calamagrostis canadensis*, *Salix interior*, *Rosa palustris*, *Solanum dulcamara*, *Typha latifolia*, *Scirpus cyperinus*, *Ludwigia palustris* var. *americana*, and *Alisma subcordatum*. MOR. Both Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Carex bromoides Schkuhr This handsome sedge, reported from Survey Area A, may still be somewhere in degraded remnants of the Swamp Complex.

Carex debilis var. **rudgei** Bailey This species is extant in the acid swamps of the East Unit Transit Area of Survey Area D, and may yet be discovered in the Swamp Complex remnants of Survey Area A.

Carex folliculata L. This striking sedge, first reported from Survey Area A by Peattie (1930), no longer can be found there. It is still extant, however, in the East Unit Transit Area, from where was documented by the following REPRESENTATIVE SPECIMEN: Bowles #665, 19 OCT 1986; SW NW T38N R4W; Indiana Dunes National Lakeshore, East Unit Transit Area; in successional sedge meadow in abandoned roadbeds, with *Juncus canadensis*, *Solidago graminifolia*, *Eupatorium perfoliatum*, and *Dryopteris thelypteris* var. *pubescens*. MOR.

Carex intumescens L. Like most of its Hydromesophytic Swamp Forest associates, this conspicuous sedge has almost certainly been extirpated from Survey Area A, from where reported by Peattie (1930). REPRESENTATIVE SPECIMEN: Pavlovic #176, 28 JUN 1988; scattered in flat sedge meadow in open spots along power line in east central end of proposed East Unit Transit Center Site; SE NW SW Sec.31 T38N R4W; with *Sphagnum* sp., *Panicum clandestinum*, *Osmunda cinnamomea*, and *Calamagrostis canadensis*. MOR.

Carex laevivaginata (Kukenth.) Mack. This rare relative of *Carex stipata* is occasional in moist, partly shaded sands of Survey Area D.

Carex tonsa (Fern.) Bickn. This species is occasional in droughty sands of the East Unit Transit Area.

Chamaedaphne calyculata var. **angustifolia** (Ait.) Rehd. Lyon (1927) reported this rare shrub from the subdunal marsh at Tamarack, from which place it has certainly been extirpated. According to Plampin (1989b), it is extant outside of the Lakeshore boundaries in the village of Beverly Shores. Welch (1935) considered local populations of this species to be boreal relicts.

Chrysosplenium americanum Schwein. This rare little plant, having been reported from Survey Area A by Lyon (1927), may still be extant there inasmuch as the ditch along the west side of Lakeshore County Road, just opposite Survey Area A, is choked with it.

Circaea alpina L. The local reports for this rare species have been based on the following REPRESENTATIVE SPECIMEN: Deam #8816, 17 JUN 1911; in wet woods at Tamarack Stop on the South Shore Electric Line. IND. Welch (1935) considered local populations of this species to be boreal relicts.

Cirsium pitcheri (Torr.) T. & G. Wayne Lampa (pers. comm.) reported having seen this rare thistle in the Foredune Complex areas of Survey Area C as late as 1978, but it has not

been seen here since. Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Coptis groenlandica (Oeder) Fern. About this rare little plant, Lyon (1927) made the following observations: ". . . fairly common in Cowles' Tamarack Swamp, Mineral Springs, and in subdunal woods at Tamarack; not found elsewhere." He preserved the following REPRESENTATIVE SPECIMEN: *Lyon s.n., 16 AUG 1925; moist subdunal woods, Tamarack.* BUT. Welch (1935) considered local populations of this species to be boreal relicts.

Corallorhiza odontorhiza (Willd.) Fern. This little orchid is still extant among the wooded dunes of the Dune Complex in the eastern portion of Survey Area C.

Cypripedium acaule Ait. Lyon (1927) reported ". . . about a dozen plants in the woods at Tamarack Station . . ." which area corresponds to Survey Area A, and has since been obliterated by drainage and logging.

Diervilla lonicera Mill. The dwarf honeysuckle is occasional to frequent in the Dune Complex of Survey Area C. Welch (1935) considered local populations of this species to be boreal relicts.

Drosera rotundifolia L. This little plant was reported by Lyon (1927) as having grown along the ditch by the railroad at Tamarack. Peattie (1930) implied that this species is rather common in such habitats, but quite the opposite is now true. REPRESENTATIVE SPECIMEN: *Lyon s.n., 29 AUG 1925; dunes at Tamarack, ditch by railroad.* BUT. McLaughlin (1932) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Dryopteris noveboracensis (L.) Gray This delicate little fern, remarkably, has survived the degradation of Survey Area A, and hangs on yet in the wet woods just north of the railroad.

Eleocharis geniculata (L.) R. & S. This little spike rush was reported by Lyon (1927) as having grown along the ditch by the railroad at Tamarack, from which place it may well have been extirpated. Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Epigaea repens var. **glabrifolia** Fern. This rare little shrub was known originally from this Survey Unit solely on the basis of the following REPRESENTATIVE SPECIMEN: *Swink s.n., 4 MAY 1947; two plants were found in bloom growing on the east-facing slope of an old dune associated with black oak and blueberry. This was not far from the lake and was the second hill west of the creek at the east end of Beverly Shores.* MOR. Ken Dritz tried to relocate this population during the spring of 1980, but was unable to find it. Ken Klick recently discovered "many plants [which] cover a north-facing, recently burned-over savanna just west of Montana Avenue." It also has been discovered in the newly acquired East Unit Transit Area, where it grows with *Andropogon scoparius*, *Apios americana*, *Aster dumosus*, *Carex pensylvanica*, *Gerardia purpurea*, *Habenaria lacera*, *Hypericum gentianoides*, *Krigia biflora*, *Polygala sanguinea*, *Populus tremuloides*, *Potentilla simplex*, *Rhus copallina* var. *latifolia*, *Rubus flagellaris*, *Solidago juncea*, *Sorghastrum nutans*, *Vaccinium vacillans*, *Vernonia missurica*, and *Viola sagittata*. Friesner (1936) considered local populations of this species to be boreal relicts.

Eupatorium fistulosum Barratt The Hollow Joe Pye Weed is occasional in moist to wet open ground nearly throughout the Unit.

Euphorbia polygonifolia L. Though rare, this little spurge is still extant in the open sands of the Foredune Complex in Survey Area C. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Gentiana saponaria L. This gentian is frequent in the moist acid sands of Survey Area D. REPRESENTATIVE SPECIMEN: Bowles #664, 19 OCT 1986; SW NW Sec.1 T38N R4W; Indiana Dunes National Lakeshore, East Unit Transit Area. MOR.

Glyceria borealis (Nash) Batchelder Once known from Survey Area B, from where reported by Lyon (1927), this rare grass is now almost certainly extinct. Parker (1936) considered local populations of this species to be boreal relicts.

Habenaria clavellata (Michx.) Spreng. This little orchid was reported by Lyon (1927) as having grown along the ditch by the railroad at Tamarack, a distinct possibility inasmuch as it grows along the bike trail at Indiana Dunes State Park. REPRESENTATIVE SPECIMEN: Lyon s.n., 16 AUG 1925; Dunes at Tamarack. BUT. Friesner (1936) considered local populations of this species to be boreal relicts.

Habenaria lacera (Michx.) Lodd. I saw one stem of this orchid in a mound of **Sphagnum** in the East Unit Transit Area, where it grew with **Epigaea repens** var. **glabrifolia**, which see.

Habenaria psycodes (L.) Spreng. Known from this Survey Unit solely on the basis of the following comment by Lyon (1927): "... Tamarack, subdunal woods, a single plant." This showy orchid's chances of having survived the degradation are slim.

Hypericum kalmianum L. Kalm's St. John's Wort is known from moist sandy open ground in Survey Area D.

Juniperus communis var. **depressa** Pursh Apparently this species is now restricted in the Tamarack Unit to a few populations along the edge of the foredunes west of Mt. Baldy. REPRESENTATIVE SPECIMEN: Wilhelm #15255, 25 AUG 1987; northwest of Michigan City in the vicinity of the parking area for Mt. Baldy, just east of the county line, on the grounds of the Indiana Dunes National Lakeshore. MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Lactuca hirsuta Muhl. Heretofore, this species was unknown from Indiana, and only recently discovered in the Chicago region at Bridgman Dunes in Berrien County, Michigan. It grows in a small sandy opening west of Mount Baldy with species of sand prairie and black oak savanna. This population has the smooth stems of the variety **sanguinea** (Bigel.) Fern., but the involucre and pappus clearly discriminate it from **Lactuca canadensis**. Evidently a poorly known species, its native range is east and south, mostly in the Atlantic and Gulf coast regions. REPRESENTATIVE SPECIMEN: Wilhelm et al. #15224, 25 AUG 1987; northwest of Michigan City in the vicinity of the parking area for Mt. Baldy, just west of the county line, on the grounds of the Indiana Dunes National Lakeshore. MOR.

Lonicera dioica L. This species is still extant in Survey Area B, in the neighborhood of Brown Ditch.

Melampyrum lineare var. **latifolium** Bart. Previously unknown from the Tamarack Unit, it was recently discovered and documented by the following REPRESENTATIVE SPECIMEN: Pavlovic #99, 28 JUN 1984; black oak savanna west of Kansas Avenue in Beverly Shores. Growing with *Gerardia pedicularia* var. *ambigens*, *Euphorbia corollata*, and *Vaccinium angustifolium* var. *laevifolium*; locally common in sand on SW gentle slope at base of dune; healthy, undisturbed area, was burned several years ago; NE SW SE Sec.35 T38N R5W. MOR. Bowles et al. (1986a) reported that it is restricted to a 400 meter square area in a level pocket in the Dune Complex of Survey Area C, and they listed the following associates: *Andropogon scoparius*, *Carex pensylvanica*, *Comandra richardsiana*, *Hamamelis virginiana*, *Helianthemum canadense*, *Koeleria cristata*, *Liatris aspera*, *Quercus velutina*, *Sorghastrum nutans*, *Stipa avenacea*, and *Vaccinium vacillans*.

Menyanthes trifoliata var. **minor** Raf. Known from Survey Area B solely on the basis of the following report by Lyon (1927): ". . . subdunal marsh, Tamarack, only a few plants at only one place . . .," which place is probably now destroyed.

Monotropa uniflora L. This little plant is still occasional among the wooded dunes of the Dune Complex, particularly in the eastern portion of Survey Area C.

Oryzopsis asperifolia Michx. This very rare grass was unknown from this Survey Unit until its remarkable discovery by Ken Dritz, as witnessed by the following REPRESENTATIVE SPECIMEN: Dritz #53, 10 MAY 1980; in dune woods high on the east slope of the second hill W of Kintzele Ditch on the E end of Beverly Shores, 150' from Lake Michigan, NE NW Sec.36 T38N R5W with *Sassafras albidum*, *Hamamelis virginiana*, *Prunus virginiana*, *Aquilegia canadensis*, *Aster macrophyllus*, *Solidago caesia*, *Viburnum acerifolium*, *Rhus radicans*, *Aralia nudicaulis*, *Hepatica americana*, *Vaccinium angustifolium* var. *laevifolium*, and *Prenanthes alba*. MOR. Sadly, however, Bowles (1988) writes: "Initial sampling in 1984 found 11 plants, which at that time were located sufficiently close to the Lake Michigan Bluff line so as to be threatened by ongoing lakeshore erosion (Bowles et al. 1985). By 1987, the bluff had receded to the population location, destroying 9 of the original 11 plants; each of the 2 remaining plants were situated only a few meters from the new bluff line. These plants were removed, placed in planters, and transplanted to an inland ravine bluff. Subsequent to Bowles' report, this species was discovered at Indiana Dunes State Park by Mike Homoya.

Panax trifolius L. This species is rare, but still extant nevertheless, in Survey Area A. REPRESENTATIVE SPECIMEN: Deam #8051, 4 MAY 1911; frequent in marshes near Tamarack Stop of South Shore Line. IND. Welch (1935) considered local populations of this species to be boreal relicts.

Panicum linearifolium Scribn. This species is rare, but extant, in the dry savannas of Survey Area C west of Mount Baldy.

Polygonella articulata (L.) Meisn. According to Noel Pavlovic (pers. comm.), Jointweed grows at the top of a dune at Kansas Avenue in Survey Area C. Both Peattie (1922) and Hooper (1934) considered this species to have ancestral affinities to the Atlantic coastal plain.

Polygonum arifolium var. **pubescens** (Keller) Fern. This species is still occasional in Survey Area B.

Polypodium virginianum L. This little fern is known from this Survey Unit solely on the basis of the following report by Peattie (1930): "Rare and local, as in woods at . . . Tamarack Sta., acc. to Nieuwland, . . ."

Potentilla anserina L. Bowles *et al.* (1985) mapped a population of this species from a ". . . disturbed lakeshore sand seep east of Mount Baldy." They listed the following associates: **Cornus stolonifera**, **Equisetum arvense**, **Populus deltoides**, **Salix interior**, and **Solidago altissima**. Alas, according to Ken Klick (1987), this site was destroyed by NIPSCO in June, 1987.

Potentilla palustris (L.) Scop. Once known from the Great Marsh region of Tamarack, it has not been reported in recent years.

Prunus pensylvanica L.f. This species is infrequent in Survey Area B, and, according to Plampin (1989b), it grows along the bike trail west of pylon #8437.

Psilocarya scirpoides Torr. This rare sedge is known locally solely on the basis of the following comment by Lyon (1927): ". . . wet interdunal meadow, Tamarack." Both Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Pyrola elliptica Nutt. Previously unrecorded for this Survey Unit, Wayne Lampa (pers. comm.) collected the following REPRESENTATIVE SPECIMEN: *Lampa s.n.*, 4 MAY 1980; ca 50 m S of the Mount Baldy dune parking area, with **Quercus velutina**, **Q. alba**, **Smilax rotundifolia**, **Hamamelis virginiana**, **Rubus flagellaris**, **Prunus serotina**, and **Amelanchier arborea**. MOR. Bowles *et al.* (1986a) mapped another population farther west in Survey Area C, and noted the following associates: **Cornus stolonifera**, **Pedicularis canadensis**, **Poa pratensis**, **Prenanthes alba**, **Prunus serotina**, **Pteridium aquilinum** var. **latiusculum**, **Quercus alba**, **Q. velutina**, **Sassafras albidum**, and **Smilacina racemosa**. Friesner (1936) considered local populations of this species to be boreal relicts.

Rhexia virginica L. Reported by Lyon (1927) from Survey Area B, where this species has most likely since been extirpated. It is still frequent, however, in the moist acid sands of the East Unit Transit Area, and Plampin (1989b) noted that it grows along the bike trail west of pylon #8437. Parker (1936) considered local populations of this species to be coastal plain.

Rhus aromatica var. **arenaria** (Greene) Fern. There is a small but healthy colony of this plant along the wooded foredune ridges west of Mount Baldy. REPRESENTATIVE SPECIMEN: *Wilhelm et al.* #15234, 25 AUG 1987; northwest of Michigan City in the vicinity of the parking area for Mt. Baldy, just west of the county line, on the grounds of the Indiana Dunes National Lakeshore. MOR.

Rhus vernix L. According to Noel Pavlovic, Poison Sumac is "fairly common" along Beverly Drive in Survey Area B.

Rhynchospora globularis var. **recognita** Gale This little sedge was reported from this Survey Unit by Peattie (1930), but its chances of having survived the degradation are remote. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Rhynchospora macrostachya Torr. This handsome sedge was reported from Survey Area B by Lyon (1927), but it has almost certainly become extirpated locally. Peattie (1922) and

Hoover (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Rubus pubescens Raf. Reported by Lyon (1927) from Survey Area A, this species is now probably locally extinct.

Salix lucida Muhl. This extremely rare willow was discovered in the Tamarack Unit recently for the first time, and documented by the following REPRESENTATIVE SPECIMEN: Kjellmark #137, 19 JUL 1988; SE SE NW Sec.2 T37N R5W; marsh 150 yards S of Beverly Dr. & Montana Avenue; with *Phragmites communis* var. *berlandieri*, *Typha latifolia*, *Calamagrostis canadensis*, *Rosa palustris*, *Polygonum coccineum*, *Carex lacustris*, and *Rumex orbiculatus*. MOR.

Salix pedicellaris var. *hypoglauca* Fern. This attractive and distinctive little willow was once known from the Great Marsh region of the Tamarack Unit, but it evidently has gone the way of a regular associate, *Potentilla palustris*.

Salix sericea Marsh. This distinctive willow is occasional in the partly shaded swamps of the East Unit Transit Area.

Scheuchzeria palustris var. *americana* Fern. Known from this Survey Unit solely on the basis of the report by Peattie (1930). It is undoubtedly now locally extinct.

Scirpus purshianus Fern. Reported from Survey Area B by Lyon (1927), this rare sedge is now undoubtedly locally extinct. **Scirpus smithii**, with which this species is frequently included, was considered by both Peattie (1922) and Hoover (1934) to have coastal plain affinities.

Scleria pauciflora var. *caroliniana* (Willd.) Wood This distinctive little sedge was unknown¹ from the Lakeshore until its remarkable discovery in the East Unit Transit Area by Marlin Bowles. REPRESENTATIVE SPECIMEN: Bowles s.n., 14 OCT 1986; 0.25 mile east of intersection of Rt.12 & South Shore RR, SW Sec.31 T38N R4W; disturbed mesic sand prairie with *Sorghastrum nutans*, *Andropogon scoparius*, *Liatris aspera*, *Solidago rugosa*, and *Gentiana saponaria*. MOR.

Smilax rotundifolia L. This species is still quite common on the wooded dunes of Survey Area C and in the Hydromesophytic Swamps of Survey Area A.

Solidago racemosa var. *gillmani* (Gray) Fern. This species is still occasional in the Foredune Complex areas of Survey Area C.

Stipa avenacea L. This rare grass was discovered in the burned-over portion of Survey Area C, from where it was documented by the following REPRESENTATIVE SPECIMEN: Henderson #17, 25 JUN 1982; infrequent, black oak woodland, Beverly Shores, just W of Kansas Avenue on Hyde Park Avenue; T38N R5W SE SE Sec.35. MOR. Bowles et al. (1985), mapped this population and listed the following associates: *Carex pensylvanica*, *Comandra richardsiana*, *Lactuca* sp., *Prunus serotina*, *Pteridium aquilinum* var. *latiusculum*, *Quercus alba*, *Q. velutina*, *Sassafras albidum*, *Smilacina racemosa*, and *Solidago* sp. See also association list under *Melampyrum*.

¹See Deam (1940), page 210, where he noted it from "Miller." See also the discussion under Survey Unit I.

Thuja occidentalis L. Now undoubtedly extinct, this tree is known from this Survey Unit solely on the basis the following report by Lyon (1927): "... two or three trees, subdunal woods at Tamarack." Welch (1935) considered local populations of this species to be boreal relicts.

Utricularia gibba L. Reported by Lyon (1927) from Survey Area B, this species is now undoubtedly locally extinct. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Utricularia purpurea L. Like the preceding species, this plant was reported by Lyon (1927) from Survey Area B, and it is almost certainly locally extinct. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Vaccinium atrococcum (Gray) Heller This downy relative of **Vaccinium corymbosum** is frequent in the partly shaded swamps of Survey Area D.

Vaccinium macrocarpon Ait. This plant is known from this Survey Unit solely on the basis of the following comment by Lyon (1927): "... 5 mi west of Michigan City and Tamarack, Nieuwland Herbarium." It is certainly locally extinct as are all of its bog associates. Trefz (1935) considered local populations of this species to be boreal relicts, though McLaughlin (1932) pointed to its Atlantic coastal plain affinities.

Viola fimbriatula Sm. This obscure relative of **Viola sagittata** is frequent in moist sandy open grounds of the East Unit Transit Unit.

Viola incognita var. **forbesii** Brainerd Reported from this Survey Unit by Peattie (1930), this little violet might have escaped the degradation of Survey Area A, but I saw no sign of it during my visit.

Viola pallens (Banks) Brainerd Like the preceding species, and sometimes confused with it, this little violet might have escaped the degradation of Survey Area A, but I saw no sign of it during my visit.

Viola primulifolia L. Lyon (1927) first reported this species in 1927, saying that it was rare along the railroad at Tamarack; in 1930 he amended his annotation to include "... the subdunal woods . . ." as well. In any case it is doubtful that the plant is still extant. Parker (1936) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Vitis labrusca L. This species is still extant in Survey Area A.

Xyris torta Sm. Lyon (1927) reported this species from the ditch along the railroad at Tamarack, from which place it has almost certainly been extirpated. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Summary

Survey Unit VIII has been shown to provide the habitat, at least at one time, for no fewer than 86 of the Indiana Dunes National Lakeshore SPECIAL VEGETATION floristic elements. Of these, however, only 48 have been seen in the modern era. The remarkable Hydromesophytic Swamp Forests, Bogs, and Marshes of Survey Areas A and B have been degraded to the degree that their once rich floras are now extinct.

Nineteen percent (16) of the SPECIAL VEGETATION floristic elements were considered by Peattie (1922), McLaughlin (1932), Hooper (1934), or Parker (1936) to have ancestral affinities to the Atlantic coastal plain, while Welch (1935), Friesner (1936), Parker (1936), and Trefz (1935) considered about nineteen percent to represent boreal relicts.

Six percent of the SPECIAL VEGETATION floristic elements have been recorded from this Survey Unit and no other; they include *Circaea alpina*, *Lactuca hirsuta*, *Panicum linearifolium*, *Scleria pauciflora* var. *caroliniana*, and *Viola primulifolia*.

NATURAL AREA ASSESSMENT

As can be seen from the Natural Area Vegetation Map, the Natural Area portions of this Survey Unit are composed largely of a Foredune Complex, a Dune Complex, a degraded Marsh Complex, and a severely damaged Swamp Complex. The bike trail, considered as a separate Survey Area in Survey Units V and VIII, has not received much attention aside from the records kept by Barbara Plampin and Emma Pitcher--the "BP patrol."

Survey Area A, once the magnificent "subdunal woods at Tamarack," is now a pathetic bunch of second-growth trees growing on a drained and traumatized substrate. Little of the original community is left. A review of the Natural Area Assessment data is all that one needs to appreciate how fundamentally devastating drainage and cutting can be.

Survey Area B, which once contained magnificent marshes, ponds, and even a Bog, is now a depauperate, fire-starved, wettish community which has had to react to wildly fluctuating water levels. Each trauma has taken its toll in SPECIAL VEGETATION floristic elements. The area, nevertheless, is vast; many species are no doubt still present here and there. Proper management would probably manifest a floristic resilience beyond anything which contemporary pessimism can visualize. Improper management will see the synecological integrity deteriorate at its imperceptible, yet steady pace.

The Foredune Complex is largely abused and pockmarked by dwellings, young Blowouts, and various other anthropogenic disturbances. I have mapped it, nevertheless, as a Natural Area because it still provides the only habitat for certain SPECIAL VEGETATION floristic elements and because there are desultory Foredune and Savanna areas which are still fairly tight qualitatively.

The Dune Complex portion of Survey Area C is quite variable in Natural Area significance. Those areas which have received fire in recent years are, for the most part, Black Oak Savanna and Sand Prairie in character, with a substantial degree of presettlement integrity. Other areas have gone for many decades without fire, and the effects have been traumatic. In the Spring of 1980 a fire swept over the western portion of Survey Area C. In those areas where the dearth of fire had not been quite so manifest, the results were remarkable. Dense, ostensibly sterile, Black Oak scrub land bloomed into floristically rich Black Oak savanna. In those areas for which the dearth of fire had been more chronic, the results were also quite dramatic. Years of increasing shade and duff development obliterated the original savanna species so completely that scarcely 10 or 15 widely scattered species could be noted "coming back." This was not the result of the fire; rather the fire dramatized that which had been going on in those fire-starved areas over the years. The graminoid fuels have been shaded away, so that which served as fuel was mostly leaf litter from the flush of young trees. Many

of these trees were killed or wounded and have produced sprouts which create even greater shades.

Infrequent fires can be more disastrous in these systems than no fire. The synecological "comeback" of these areas, even under optimum conditions, will be forever retarded and incomplete. Such is the result when fires are withheld from communities, the fundamental integrities of which revolve around fire. That is the way a savanna can die, ". . . not with a bang, but a whimper." Once the root mass of the ground cover vegetation has been annihilated, of course, the system is rendered vulnerable to exaggerated soil erosion, associated depletion of seed bank, and ultimate collapse and irrecoverability.

Those areas on the Natural Area Vegetation Map codified as Marsh Complex are under strains analogous to those under which the Dune Complex communities prevail. The dearth of fire has manifest itself to varying degrees. There is a lot of Natural Area significance and potential remaining in Survey Area B, far more even than I was able to register during my brief surveys, but even short hiatuses between fires can take their gradual, insidious, recondite toll on the Marsh/Savanna Complexes.

The eastern portion of this Survey Unit includes an ecological monstrosity known affectionately by the locals as "Mount Baldy." It is not clear to me how "Mount Baldy" came to be, but it does seem clear that it was the result of some profound post-settlement trauma. When the original land surveyors went through they classified the "Mount Baldy" area as "barrens," a term which translates today into "savanna." Today, by contrast, nothing grows on "Mount Baldy." To take the notion that this contemporary sterile pile of sand is some presettlement natural oddity is, I think, to misunderstand the fragile fundamental synecology of the Indiana Dunes.

The East Unit Transit Area, Survey Area D, is a recent and valuable addition to the Indiana Dunes National Lakeshore. Several SPECIAL VEGETATION floristic elements once known from the old Tamarack Stop are yet alive and healthy here. In addition, *Scleria pauciflora* var. *caroliniana* is known from nowhere else in the Lakeshore. It is a curious assemblage of moist acid sands with rises of xeric sand prairie and swales of shaded and partly shaded swamps. It deserves additional study.

The data used in assessing the relative Natural Area significance and integrity of each Survey Area, and the Survey Unit as a whole, are provided in Table IX. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from each Survey Area, along with the numerical conservatism coefficient as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a coefficient, and do not enter directly into the derivations of the Natural Area Indices. The "R" symbol (rather than an "X" symbol), when used in Table IX, indicates a record other than one to which I can personally attest--usually a report on the basis of some earlier record, such as an herbarium specimen or literature citation. A few of the reports for Survey Area A are from Plampin (1989b) and were listed as having been seen along the bike trail. Following Table IX is a summary which calculates the various Natural Area Indices for each Survey Area, and for the Survey Area as a whole. Species listed without a Survey Area tabulation are reports from Klick *et al.* (1989).

TABLE IX: Summary of species upon which are calculated the various Natural Area Indices for each Survey Area, and for the Survey Unit as a whole.

A	B	C	D	
		x		0 <i>Acalypha rhomboidea</i>
x	x	x		0 <i>Acer negundo</i>
x	x	x	x	7 <i>Acer rubrum</i>
x	x	x		0 <i>Acer saccharinum</i>
	x	x	x	* <i>Achillea millefolium</i>
		x		2 <i>Agrimonia gryposepala</i>
	x		x	8 <i>Agrimonia parviflora</i>
	R	x		* <i>Agropyron repens</i>
x	x	x		* <i>Agrostis alba</i>
			x	1 <i>Agrostis hyemalis</i>
x				1 <i>Agrostis perennans</i>
	x			5 <i>Agrostis scabra</i>
		x		* <i>Ailanthus altissima</i>
			x	4 <i>Alisma subcordatum</i>
				* <i>Alliaria officinalis</i>
		x		* <i>Allium vineale</i>
x	x	x		8 <i>Alnus rugosa americana</i>
x	x	x		0 <i>Ambrosia artemisiifolia elatior</i>
x	x			0 <i>Ambrosia trifida</i>
		x		8 <i>Amelanchier arborea</i>
		x		8 <i>Amelanchier interior</i>
	x			8 <i>Amelanchier laevis</i>
		x		15 <i>Ammophila breviligulata</i>
x		x	x	4 <i>Amphicarpa bracteata</i>
x				4 <i>Amphicarpa bracteata comosa</i>
		x	x	5 <i>Andropogon scoparius</i>
		x	x	* <i>Andropogon virginicus</i>
		x		2 <i>Anemone cylindrica</i>
		x		2 <i>Anemone virginiana</i>
		x	x	6 <i>Antennaria plantaginifolia</i>
	x			* <i>Anthemis cotula</i>
x	x	x	x	6 <i>Apios americana</i>
	x	x		5 <i>Apocynum androsaemifolium</i>
R		x		4 <i>Apocynum cannabinum</i>
	x			2 <i>Apocynum sibiricum</i>
		x		5 <i>Aquilegia canadensis</i>
		x		10 <i>Arabis canadensis</i>
	x			6 <i>Arabis glabra</i>
		x		3 <i>Arabis laevigata</i>
		x		3 <i>Arabis lyrata</i>
		x		8 <i>Aralia nudicaulis</i>
x				15 <i>Aralia racemosa</i>
		x		* <i>Arctium minus</i>
	R			10 <i>Arctostaphylos uva-ursi coactilis</i>
				* <i>Arenaria serpyllifolia</i>
	R			10 <i>Arenaria stricta</i>
x				5 <i>Arisaema atrorubens</i>
		x		7 <i>Aristida purpurascens</i>

A	B	C	D	
		x		* Artemisia absinthium
		x		5 Artemisia caudata
		x		4 Asclepias incarnata
	x	x		0 Asclepias syriaca
		x		10 Asclepias tuberosa
		x		1 Asclepias verticillata
R				15 Asimina triloba
				* Asparagus officinalis
		x		6 Asplenium platyneuron
		x	x	8 Aster azureus
			x	5 Aster dumosus
		x		5 Aster ericoides
	R			10 Aster junciformis
x				4 Aster lateriflorus
		x		10 Aster linariifolius
x		x		10 Aster macrophyllus
	x		x	1 Aster pilosus
	R			6 Aster puniceus
			x	5 Aster puniceus firmus
	R			3 Aster simplex
		x	x	10 Aster umbellatus
x				6 Athyrium filix-femina michauxii
x	x	x		* Barbarea vulgaris
R			x	15 Bartonia virginica
		x		* Berberis thunbergii
	R			5 Bidens comosa
	R			8 Bidens connata
	R			8 Bidens coronata
x	x	x		2 Boehmeria cylindrica
R				15 Botrychium dissectum
	x	x		6 Botrychium virginianum
	R			15 Brasenia schreberi
				* Brassica kaber pinnatifida
	x			* Bromus japonicus
	x	x		* Bromus tectorum
		x		8 Cacalia atriplicifolia
		x		15 Cakile edentula
	x	x	x	3 Calamagrostis canadensis
			x	5 Calamagrostis inexpansa brevior
		x		10 Calamovilfa longifolia
	R			15 Calla palustris
R				15 Calopogon pulchellus
x		x		5 Caltha palustris
x				2 Campanula americana
		x		15 Campanula rotundifolia
		x		* Campsis radicans
x			x	5 Cardamine bulbosa
x		x		4 Cardamine pensylvanica
			x	10 Carex alata
			x	8 Carex albolutescens
			x	7 Carex annectens xanthocarpa
x				15 Carex bromoides

A	B	C	D	
	R			5 Carex comosa
x				10 Carex crinita
	x			4 Carex cristatella
		x		20 Carex debilis rudgei
		x		10 Carex emmonsii
R		x		20 Carex folliculata
R		x		15 Carex intumescens
	x			10 Carex lacustris
		x		15 Carex laevivaginata
x				1 Carex laxiflora
	x			8 Carex lupulina
	R			8 Carex lurida
		x	x	5 Carex muhlenbergii
		x		5 Carex normalis
		x	x	5 Carex pensylvanica
		x		4 Carex projecta
			x	10 Carex rostrata utriculata
	x			2 Carex stipata
R	x		x	10 Carex swanii
			x	15 Carex tonsa
	x			3 Carex tribuloides
		x		10 Carex umbellata
R				10 Carex virescens
		x		8 Ceanothus americanus
		x		* Celastrus orbiculatus
		x		6 Celastrus scandens
		x		3 Celtis occidentalis
	x	x		0 Cenchrus longispinus
	x	x		* Cerastium vulgatum
	R			15 Chamaedaphne calyculata angustifolia
		x		4 Chenopodium leptophyllum
R				15 Chrysosplenium americanum
	R		x	8 Cicuta bulbifera
	R		x	6 Cicuta maculata
x				5 Cinna arundinacea
R				15 Circaea alpina
x		x		0 Circaea quadrisulcata canadensis
		x		* Cirsium arvense
	x	x		2 Cirsium discolor
		R		20 Cirsium pitcheri
	x	x		* Cirsium vulgare
x	x	x	x	4 Clematis virginiana
		x	x	7 Comandra richardsiana
		x		* Commelina communis
		x		* Convallaria majalis
R				15 Coptis groenlandica
		x		20 Corallorhiza odontorhiza
		x		8 Corispermum hyssopifolium
		x		5 Cornus florida
	x	x	x	5 Cornus obliqua
	x	x	x	1 Cornus racemosa
x	x	x	x	6 Cornus stolonifera

A	B	C	D	
		x		10 Cornus stolonifera baileyi
x				2 Corylus americana
				* Croton capitatus
				* Croton glandulosus septentrionalis
x	x	x		0 Cryptotaenia canadensis
x				7 Cuscuta glomerata
	R			4 Cuscuta gronovii
	R			10 Cuscuta pentagona
		x		7 Cycloloma atriplicifolium
	x	R		* Cynoglossum officinale
			x	5 Cyperus houghtonii
		x		5 Cyperus schweinitzii
R				20 Cypridium acaule
	x	x		* Dactylis glomerata
	x	x	x	* Daucus carota
		x	x	5 Danthonia spicata
	x	x		5 Desmodium paniculatum
		x		10 Desmodium sessilifolium
				* Dianthus armeria
		x		10 Diervilla lonicera
	x	x	x	* Digitaria ischaemum
x			x	5 Dioscorea villosa
	R			15 Drosera rotundifolia
x				15 Dryopteris noveboracensis
x				10 Dryopteris spinulosa intermedia
	R	x	x	6 Dryopteris thelypteris pubescens
	x			5 Echinocystis lobata
				* Elaeagnus angustifolia
	R			15 Eleocharis geniculata
	R			5 Eleocharis obtusa
	R			5 Eleocharis palustris major
		x		4 Elymus canadensis
		x		4 Elymus virginicus
			x	15 Epigaea repens glabrifolia
	R			3 Epilobium coloratum
	x			* Epilobium hirsutum
		x		* Epipactis helleborine
x	x	x	x	0 Equisetum arvense
		x		4 Equisetum hyemale affine
		x		* Eragrostis megastachya
	x			0 Eragrostis pectinacea
		x		3 Eragrostis spectabilis
	x		x	1 Erigeron annuus
			x	0 Erigeron canadensis
	x	x	x	3 Erigeron strigosus
		x		* Euonymus alatus
		x		7 Euonymus obovatus
x	x	x		20 Eupatorium fistulosum
x		x	x	6 Eupatorium perfoliatum
x		x		4 Eupatorium rugosum
		x		1 Eupatorium serotinum
		x	x	2 Euphorbia corollata

A	B	C	D	
		x		15 Euphorbia polygonifolia
				* Euphorbia supina
	R	x		* Festuca elatior
x				5 Festuca obtusa
				* Festuca ovina
	R			10 Fimbristylis autumnalis mucronulata
	x	x	x	1 Fragaria virginiana
x		x		5 Fraxinus americana
x				8 Fraxinus nigra
x			x	2 Fraxinus pennsylvanica subintegerrima
x	x	x	x	1 Galium aparine
		x		7 Galium circaezans hypomalacum
x		x		4 Galium concinnum
		x		5 Galium obtusum
		x		10 Galium pilosum
	R			8 Galium tinctorium
	x		x	5 Galium triflorum
		x		10 Gaultheria procumbens
x				9 Gaylussacia baccata
			x	15 Gentiana saponaria
		x		10 Gerardia flava
	R			7 Gerardia pauperula
		x		8 Gerardia pedicularia ambigens
			x	7 Gerardia purpurea
x	x	x		0 Geum canadense
			x	1 Geum laciniatum trichocarpum
		x		* Glechoma hederacea
R				3 Gleditsia triacanthos
	R			20 Glyceria borealis
	R			10 Glyceria canadensis
x	x	x		4 Glyceria striata
		x		2 Gnaphalium obtusifolium
	x			5 Gratiola neglecta
R				15 Habenaria clavellata
R			x	10 Habenaria lacera
R				20 Habenaria psycodes
x		x		0 Hackelia virginiana
x		x		8 Hamamelis virginiana
		x		8 Helianthemum canadense
				* Helianthus annuus
		x		5 Helianthus divaricatus
		R		* Helianthus petiolaris
		x		* Hemerocallis fulva
		x		10 Hepatica americana
		x		* Hesperis matronalis
		x		* Hibiscus trionum
	x	x	x	6 Hieracium gronovii
	R			9 Hypericum boreale
		x	x	7 Hypericum gentianoides
			x	10 Hypericum kalmianum
	R			8 Hypericum majus
x	x			* Hypericum perforatum

A	B	C	D	
		x		4 <i>Hypericum punctatum</i>
	R			10 <i>Hypericum virginicum</i>
		x		5 <i>Hystrix patula</i>
x		x		9 <i>Ilex verticillata</i>
x	x	x	x	3 <i>Impatiens capensis</i>
x	x	x		5 <i>Iris virginica shrevei</i>
			x	9 <i>Juncus alpinus rariflorus</i>
			x	10 <i>Juncus biflorus</i>
	R			7 <i>Juncus canadensis</i>
	x		x	7 <i>Juncus effusus solutus</i>
			x	10 <i>Juncus marginatus</i>
	x			0 <i>Juncus tenuis</i>
		x		10 <i>Juniperus communis depressa</i>
		x		7 <i>Koeleria cristata</i>
		x	x	7 <i>Krigia biflora</i>
		x	x	6 <i>Krigia virginica</i>
		x		4 <i>Kuhnia eupatorioides corymbulosa</i>
		x		4 <i>Lactuca biennis</i>
x	x	x		2 <i>Lactuca canadensis</i>
		x		20 <i>Lactuca hirsuta</i>
				* <i>Lactuca scariola</i>
x		x		1 <i>Laportea canadensis</i>
	R			10 <i>Larix laricina</i>
	R			6 <i>Lathyrus palustris myrtifolius</i>
			x	7 <i>Lechea villosa</i>
x				5 <i>Leersia oryzoides</i>
R				7 <i>Leersia virginica</i>
	R			5 <i>Lemna minor</i>
		x		0 <i>Lepidium virginicum</i>
		x	x	4 <i>Lespedeza capitata</i>
		x		6 <i>Lespedeza hirta</i>
			x	8 <i>Lespedeza intermedia</i>
		x	x	6 <i>Liatris aspera</i>
		x		* <i>Ligustrum vulgare</i>
R				5 <i>Lilium michiganense</i>
		x		6 <i>Linaria canadensis</i>
x				7 <i>Lindera benzoin</i>
		x		8 <i>Liparis lilifolia</i>
		x		8 <i>Lithospermum croceum</i>
R				7 <i>Lobelia cardinalis</i>
	x			* <i>Lonicera X bella</i>
	x			15 <i>Lonicera dioica</i>
		x		* <i>Lonicera X muendeniensis</i>
				* <i>Lonicera tatarica</i>
		x		* <i>Lonicera X xylosteoides</i>
			x	6 <i>Ludwigia alternifolia</i>
	R		x	5 <i>Ludwigia palustris americana</i>
	x	x	x	7 <i>Lupinus perennis occidentalis</i>
			x	5 <i>Luzula multiflora</i>
		x		* <i>Lychnis alba</i>
	x		x	5 <i>Lycopus americanus</i>
R				10 <i>Lycopus rubellus</i>

A	B	C	D	
	R			6 <i>Lycopus uniflorus</i>
		x		8 <i>Lysimachia terrestris</i>
	R			9 <i>Lysimachia thyrsiflora</i>
	R			* <i>Lythrum salicaria</i>
x		x		10 <i>Maianthemum canadense interius</i>
		x		* <i>Matricaria matricarioides</i>
		x		15 <i>Melampyrum lineare latifolium</i>
	x	x		* <i>Melilotus alba</i>
	x	x		* <i>Melilotus officinalis</i>
	R			15 <i>Menyanthes trifoliata minor</i>
		x		6 <i>Mimulus ringens</i>
R				10 <i>Mitella diphylla</i>
	x			* <i>Mollugo verticillata</i>
	x	x		4 <i>Monarda fistulosa</i>
		x		5 <i>Monarda punctata villicaulis</i>
		x		15 <i>Monotropa uniflora</i>
				* <i>Morus alba</i>
x				3 <i>Muhlenbergia frondosa</i>
		x		5 <i>Muhlenbergia mexicana</i>
		x		0 <i>Muhlenbergia schreberi</i>
	R			7 <i>Nymphaea tuberosa</i>
x	x	x	x	8 <i>Nyssa sylvatica</i>
x	x	x		1 <i>Oenothera biennis</i>
		x		7 <i>Oenothera rhombipetala</i>
x	x	x	x	8 <i>Onoclea sensibilis</i>
			x	20 <i>Oryzopsis racemosa</i>
x	x	x		3 <i>Osmorhiza claytoni</i>
x	x	x	x	6 <i>Osmunda cinnamomea</i>
x		x	x	8 <i>Osmunda regalis spectabilis</i>
x	x	x		0 <i>Oxalis europaea</i>
		x		0 <i>Oxalis stricta</i>
			x	7 <i>Oxypolis rigidior</i>
x				15 <i>Panax trifolius</i>
			x	5 <i>Panicum agrostoides</i>
	x			1 <i>Panicum capillare</i>
x	x	x	x	7 <i>Panicum clandestinum</i>
	x		x	10 <i>Panicum depauperatum</i>
x	x	x	x	3 <i>Panicum implicatum</i>
		x		7 <i>Panicum latifolium</i>
		x		15 <i>Panicum linearifolium</i>
	x			6 <i>Panicum meridionale</i>
		x	x	7 <i>Panicum oligosanthos scribnerianum</i>
			x	8 <i>Panicum sphaerocarpon</i>
			x	7 <i>Panicum villosissimum</i>
		x	x	9 <i>Panicum villosissimum pseudopubescens</i>
		x	x	5 <i>Panicum virgatum</i>
		x		4 <i>Parietaria pensylvanica</i>
		x		1 <i>Parthenocissus inserta</i>
x	x	x		2 <i>Parthenocissus quinquefolia</i>
		x		10 <i>Pedicularis canadensis</i>
	x			0 <i>Phalaris arundinacea</i>
		x		8 <i>Phlox bifida</i>

A	B	C	D	
			x	* Phlox paniculata
		x		6 Phlox pilosa
x	x	x		4 Phragmites communis berlandieri
		x		4 Physalis virginiana
	x	x		2 Phytolacca americana
x				5 Pilea pumila
	x	x		* Plantago lanceolata
				* Plantago major
	x	x		0 Plantago rugelii
	x	x	x	* Poa compressa
	x			9 Poa palustris
x	x	x	x	* Poa pratensis
			x	* Poa trivialis
x		x		5 Podophyllum peltatum
		x		10 Polygala cruciata aquilonia
R			x	6 Polygala sanguinea
x	x	x		3 Polygonatum canaliculatum
		x		7 Polygonatum pubescens
		R		15 Polygonella articulata
		x	x	5 Polygonum amphibium stipulaceum
	x			15 Polygonum arifolium pubescens
	x			* Polygonum aviculare
	R			5 Polygonum coccineum
				* Polygonum convolvulus
				* Polygonum persicaria
x	x	x	x	10 Polygonum sagittatum
	R	x		2 Polygonum scandens
		R		15 Polypodium virginianum
		x		10 Polystichum acrostichoides
	R			10 Pontederia cordata
	x	x		2 Populus deltoides
			x	6 Populus grandidentata
	x			* Populus nigra italica
	x	x	x	4 Populus tremuloides
		R		6 Potentilla anserina
		x		* Potentilla argentea
	R			15 Potentilla palustris
	x			* Potentilla recta
	x	x	x	4 Potentilla simplex
x		x		5 Prenanthes alba
	R			6 Proserpinaca palustris crebra
		x		0 Prunella vulgaris lanceolata
	x			5 Prunus pensylvanica
x	x	x	x	1 Prunus serotina
x	x	x	x	1 Prunus virginiana
	R			20 Psilocarya scirpoides
		x		7 Ptelea trifoliata
		x		9 Ptelea trifoliata mollis
		x		5 Pteridium aquilinum latiusculum
		x		10 Pyrola elliptica
x	x		x	9 Pyrus floribunda
			x	7 Pyrus melanocarpa

A	B	C	D	
x		x		4 Quercus alba
		x		4 Quercus ellipsoidalis
	x		x	8 Quercus palustris
x		x		7 Quercus rubra
	x	x	x	6 Quercus velutina
x				0 Ranunculus abortivus
			x	6 Ranunculus pensylvanicus
x				5 Ranunculus recurvatus
		x		* Rhamnus davurica nipponica
		x	x	* Rhamnus frangula
	R		x	15 Rhexia virginica
		x		9 Rhus aromatica
		x		15 Rhus aromatica arenaria
	x	x	x	6 Rhus copallina latifolia
x	x	x		1 Rhus radicans
	x	x		3 Rhus typhina
	R			15 Rhus vernix
			x	8 Rhynchospora capitellata
	R			20 Rhynchospora globularis recognita
	R			20 Rhynchospora macrostachya
x		x		5 Ribes cynosbati
		x		* Robinia pseudo-acacia
		x		5 Rorippa islandica fernaldiana
			x	8 Rorippa sessiliflora
		x		5 Rosa carolina
	x	x	x	* Rosa multiflora
	x	x	x	9 Rosa palustris
x	x	x		3 Rubus allegheniensis
	x	x	x	4 Rubus flagellaris
			x	9 Rubus hispidus obovalis
x	x	x		7 Rubus idaeus strigosus
	x	x		2 Rubus occidentalis
	x	x	x	3 Rubus pensylvanicus
R				15 Rubus pubescens
	x	x	x	1 Rudbeckia hirta
		x		3 Rudbeckia triloba
		x	x	* Rumex acetosella
x	x			* Rumex obtusifolius
	x	x		7 Rumex orbiculatus
	R		x	9 Sagittaria graminea
			x	* Salix alba
	R			5 Salix amygdaloides
	x			8 Salix bebbiana
	x	x	x	2 Salix discolor
	x	x		7 Salix glaucophylloides glaucophylla
	R			10 Salix gracilis textoris
	R	x		6 Salix humilis
	x	x	x	1 Salix interior
	x			15 Salix lucida
	x		x	4 Salix nigra
	R			15 Salix pedicellaris hypoglauca
	x	x		5 Salix rigida

A	B	C	D	
		x	15	<i>Salix sericea</i>
		x	*	<i>Salsola kali tenuifolia</i>
x	x	x	x	1 <i>Sambucus canadensis</i>
R			10	<i>Sambucus pubens</i>
		x	9	<i>Sanicula canadensis</i>
x		x	*	<i>Saponaria officinalis</i>
x	x	x	6	<i>Sassafras albidum</i>
R			10	<i>Saururus cernuus</i>
	R		20	<i>Scheuchzeria palustris americana</i>
	x	x	x	6 <i>Scirpus cyperinus</i>
		x	6	<i>Scirpus fluviatilis</i>
	R		20	<i>Scirpus purshianus</i>
x		x	5	<i>Scirpus validus creber</i>
		x	20	<i>Scleria pauciflora caroliniana</i>
		x	*	<i>Sedum sarmentosum</i>
x	x	x	7	<i>Senecio aureus</i>
		x	*	<i>Setaria faberii</i>
		x	*	<i>Setaria viridis</i>
	x	x	2	<i>Silene antirrhina</i>
		x	*	<i>Silene armeria</i>
x	x	x	2	<i>Smilacina racemosa</i>
	x	x	5	<i>Smilacina stellata</i>
		x	3	<i>Smilax ecirrhata</i>
		x	4	<i>Smilax lasioneura</i>
x		x	15	<i>Smilax rotundifolia</i>
	x	x	*	<i>Solanum americanum</i>
	x	x	*	<i>Solanum carolinense</i>
	x	x	x	* <i>Solanum dulcamara</i>
	x	x	1	<i>Solidago altissima</i>
x		x	7	<i>Solidago caesia</i>
x	x	x	3	<i>Solidago gigantea</i>
		x	3	<i>Solidago graminifolia nuttallii</i>
		x	5	<i>Solidago gymnospermoides</i>
		x	5	<i>Solidago juncea</i>
		x	x	4 <i>Solidago nemoralis</i>
	x	x	8	<i>Solidago patula</i>
		x	15	<i>Solidago racemosa gillmani</i>
	x	x	x	6 <i>Solidago rugosa</i>
		x	7	<i>Solidago speciosa</i>
	R		9	<i>Solidago uliginosa</i>
R			5	<i>Solidago ulmifolia</i>
			*	<i>Sonchus oleraceus</i>
		x	x	5 <i>Sorghastrum nutans</i>
	x		4	<i>Sphenopholis intermedia</i>
	x	x	x	7 <i>Spiraea alba</i>
			x	9 <i>Spiraea tomentosa rosea</i>
		x	7	<i>Sporobolus cryptandrus</i>
	x	x	5	<i>Stachys palustris homotricha</i>
	x		*	<i>Stellaria graminea</i>
x	x		*	<i>Stellaria media</i>
		x	15	<i>Stipa avenacea</i>
		x	6	<i>Stipa spartea</i>

A	B	C	D	
x		x		6 Symplocarpus foetidus
	x	x		* Taraxacum officinale
		x		8 Tephrosia virginiana
		x		4 Thalictrum dasycarpum
	R			15 Thuja occidentalis
		x		5 Tilia americana
x				2 Tovarva virginiana
		x		2 Tradescantia ohienensis
x	x			* Tragopogon major
				* Trifolium pratense
			x	2 Triodia flava
	x	x		2 Typha angustifolia
	x	x	x	1 Typha latifolia
x	x	x		3 Ulmus americana
		x		* Ulmus pumila
	x			4 Ulmus rubra
x	x	x		2 Urtica procera
	R			15 Utricularia gibba
	R			20 Utricularia purpurea
x	x	x		5 Vaccinium angustifolium laevifolium
			x	15 Vaccinium atrococcum
x				8 Vaccinium corymbosum
	R			20 Vaccinium macrocarpon
		x	x	5 Vaccinium vacillans
		x		* Verbascum thapsus
x	x	x		4 Verbena hastata
	R			5 Verbena urticifolia
			x	5 Vernonia missurica
		x		* Veronica arvensis
	x			* Veronica peregrina
		x		9 Viburnum acerifolium
x	x			5 Viburnum lentago
x	x			* Viburnum opulus
x				4 Viburnum prunifolium
x				5 Viburnum rafinesquianum
		x		* Vinca minor
R				6 Viola cucullata
			x	15 Viola fimbriatula
R				15 Viola incognita forbesii
			x	7 Viola lanceolata
R				15 Viola pallens
		x		10 Viola pedata lineariloba
x		x		5 Viola pensylvanica
	R			10 Viola primulifolia
			x	7 Viola sagittata
x	x	x		10 Vitis aestivalis
x	R			15 Vitis labrusca
x	x	x		4 Vitis riparia
		x	x	6 Vulpia octoflora tenella
				* Xanthium strumarium
	R			15 Xyris torta
		x		* Yucca smalliana

Summary

Survey Area A (surveyed September 10, 1979 and May 20, 1987) occupies roughly 100 acres of the area once known as the "wet woods at Tamarack." Knowing that at one time the area resembled Survey Area C in Survey Unit VIII, I find it depressing to visit the area. While there, I catalogued 101 native floristic elements with a Mean Quality of 5.17, representing a Natural Area Index of 52. The literature recorded at least an additional 26 native taxa [actually, there were probably 126]. If just these 26 taxa are included among the contemporary data, the Mean Quality jumps to 6.57, and represents a Natural Area Index of 74. Note that Survey Area VIII-C has a contemporary index of at least 92. Obviously the degradation in Survey Area A has been profound. Its general physiognomy is redeveloping, but the conservatism which abounds just two miles to the west has not "blown in" to rehabilitate this remnant. Without the players, one cannot produce a play.

Survey Area B (surveyed June 9, 1979) occupies the vast area once known to include the Bog and the Great Marsh with all its ponds and sloughs, marshy prairies and sedge meadows. It is the same tragic story as in Survey area A. I catalogued 127 native floristic elements from my own survey and from herbarium records at INDU. They render a Mean Quality of 4.44 and represent a Natural Area Index of 50. The literature and associate lists from herbarium specimens record at least 64 additional native taxa [there probably totaled over 300 at one time]. If these additional taxa are included among the contemporary data, the Mean Quality rises to 6.41 and represents a Natural Area Index of 89.

Survey Area C (surveyed September 30, 1979, May 7, 1980, July 30, 1987, and August 25, 1987) is of mixed Natural Area significance, with very high quality areas phasing in and out of lesser areas, but overall I have catalogued from my own surveys and from herbarium records 254 native floristic elements with a Mean Quality of 5.63; together, they represent a Natural Area Index of 90. Six additional native species are known from the area, and I suspect that they [and others yet unknown] are still extant. Their inclusion brings the Mean Quality to 5.84 and the Index to 95. Wayne Lampa (pers. comm.) reported to me that *Pinus strobus* (White Pine) is also in the area, but without actually having seen it I could not satisfy myself that it was spontaneous; Menges and Armentano (1985) studied no populations here, though I am quite sure that White Pine grew here as a wild species in presettlement times.

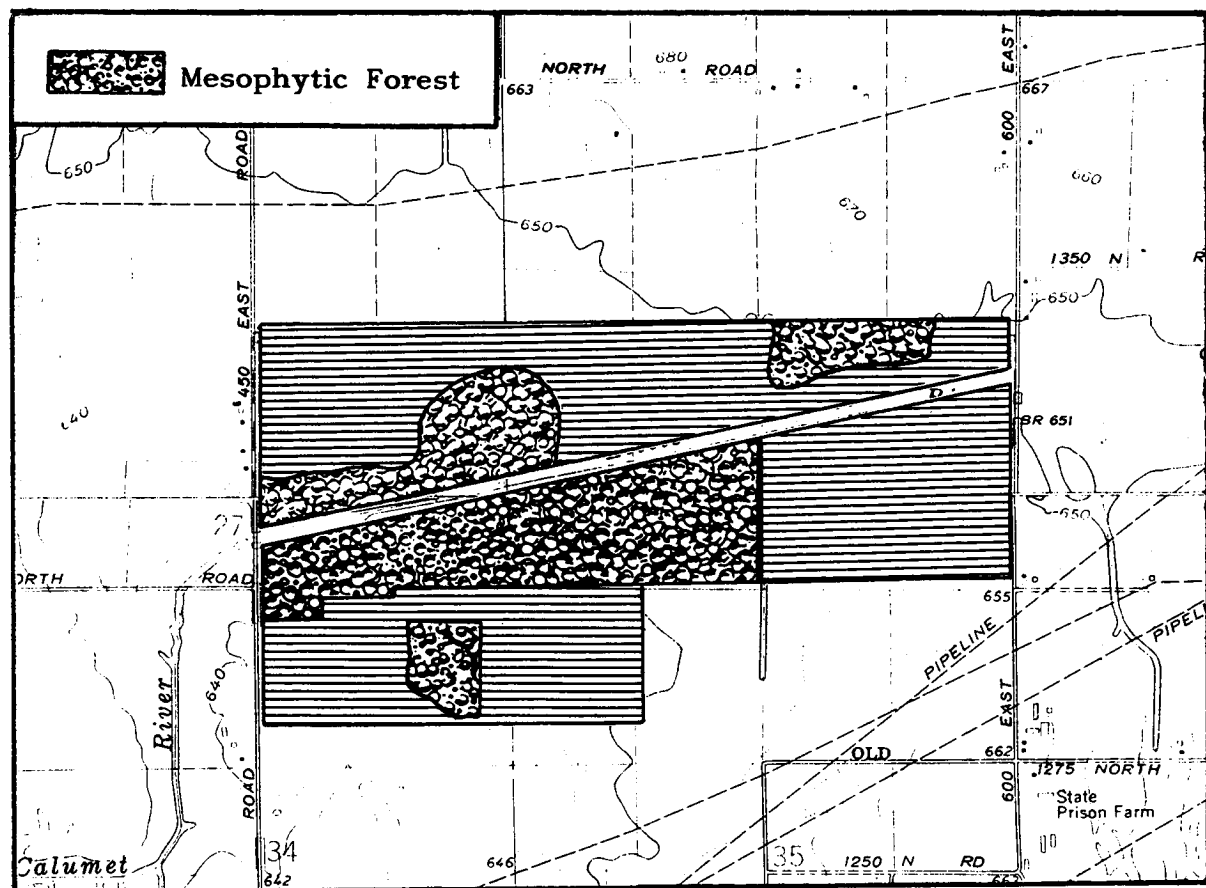
I inventoried Survey Area D October 5, 1987 and May 20 and July 24, 1988. Through these visits and from INDU herbarium specimens, I have recorded 144 native species with a Mean Quality of 6.60 and representing an Index of 79.

The Survey Unit as a whole, has an overall Mean Quality of 6.21 representing a Natural Area Index of 122. I catalogued altogether 383 native floristic elements. If the additional 76 native floristic elements known to grow or to have grown within the boundaries of this Survey Unit were to be included in the Natural Area assessment, the Mean Quality would jump to 7.01, and represent a Natural Area Index of 150.

SURVEY UNIT X: HERON ROOKERY

This Survey Unit occupies approximately 590 acres, about 65% of which have been highly disturbed by grazing, or logging, or a combination of both. I surveyed the area on June 16 and 20, and October 29, 1979, and on April 28, 1987. On one occasion I was accompanied by Wayne Lampa; on another I was accompanied by Ron Hiebert, Emma Pitcher, and Barbara Plampin. Though the Heron Rookery has received some attention since, prior to Wilhelm (1980) no floristic work had been done in this area, so there were no early publications or herbarium specimens upon which to draw for historical information. The area deserves far more time than I have been able to devote to it over the years. Future surveys will no doubt discover many more interesting plants, and better insights into the ecology of the area.

The Survey Unit Map was superimposed to scale over combined parts of the U.S.G.S. Michigan City West Quadrangle, N4137.5-W8652.5/7.5, photo-revised 1980; and the Westville Quadrangle, N4130-W8652.5/7.5, 1962. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a black & white photograph (BFP-3: 57) flown in November, 1938; a black & white stereo-pair set (BFP-1V: 23 & 24 and 39 & 40) flown in September 1958; another black and white stereo-pair set (INDU 11-1 through 11-6) flown May 11, 1984; a set of color obliques flown in May, 1978; a color stereo-pair set (79-117: 130-133) flown in May, 1979; and a black & white stereo-pair (11:1-11:6) flown in May, 1984.



ANNOTATED LIST
OF
SPECIAL VEGETATION FLORISTIC ELEMENTS

Asimina triloba (L.) Dunal There are several colonies of Papaw in the Beech/Maple woods south of the Little Calumet River.

Botrychium dissectum Spreng. Both forms of this little fern are occasional in the cut-over forest south of the Little Calumet River.

Brachyelytrum erectum (Schreb.) Beauv. This delicate grass is frequent in the woods south of the river.

Carex bromoides Schkuhr This handsome sedge is frequent in the wetter depressions in the cut-over forest south of the Little Calumet River. REPRESENTATIVE SPECIMEN: *Hiebert #1444, 28 APR 1987; T37N R5W SE SE Sec.27; found in Heron Rookery 200 m S of Little Calumet River; beech-maple floodplain forest, silt-clay soil; rare. INDU.*

Carex hitchcockiana Dew. This inconspicuous sedge is locally rare; it grows in the very mesophytic areas among the Beeches.

Carex intumescens Rudge This handsome sedge is frequent in the wetter portions of the forest south of the river.

Carex leptoneura Fern. This rare sedge is occasional on the beech hummocks south of the Little Calumet River.

Carex pedunculata Willd. This rare sedge is occasional on the raised hummocks at the bases of old-growth trees of *Fagus grandifolia*. REPRESENTATIVE SPECIMEN: *Klick #2778, 14 MAY 1988; in Heron Rookery, north of the Little Calumet River; T37N R5W SE NW SW Sec.26; observed one patch 1 meter square in size, in organic hummocky area of glacial origin; with Fagus grandifolia, Acer rubrum, Viola rostrata, Asarum canadense, and Panax trifolius. MOR.*

Carex prasina Wahlenb. This rare sedge is occasional in the cut-over beech forest south of the Little Calumet River, and the following REPRESENTATIVE SPECIMEN represents a Porter County record: *Wilhelm #6863, 20 JUN 1979; ca 3.5 mi S of Town of Pines, in Beech/Maple forest along the Little Calumet River, E of 450E Rd., 0.5 mi S of 1400N Rd., W of 600E Rd. MOR.*

Carya laciniosa (Michx.) Loud. There are a few magnificent trees in the southwest sector of the Survey Unit. REPRESENTATIVE SPECIMEN: *Wilhelm #6896, 17 OCT 1979; ca 3.5 mi S of Town of Pines, in Beech/Maple forest along the Little Calumet River, E of 450E Rd., 0.5 mi S of 1400N Rd., W of 600E Rd. MOR.*

Dryopteris hexagonoptera (Michx.) Christens. Apparently locally rare, this little fern is known only from a small colony along the northern edge of an old oxbow, south of the Little Calumet River.

Dryopteris noveboracensis (L.) Gray This delicate fern is occasional in the wetter portions of the Beech/Maple forest. REPRESENTATIVE SPECIMEN: *Wilhelm #6862, 20 JUN 1979; ca 3.5 mi S of Town of Pines, in Beech/Maple forest along the Little Calumet River, E of 450E Rd., 0.5 mi S of 1400N Rd., W of 600E Rd. MOR.*

Fraxinus americana var. **biltmoreana** (Beadle) J. Wright This variety of White Ash, insofar as our records show, is known from nowhere else in the Chicago region outside of the Lakeshore. There are occasional specimens of *F. americana* from throughout our region which have hairs along the main veins and even scattered over the lamina; but these trees here at the Heron Rookery are downy pubescent over the whole lower leaflet surfaces, rachises, petioles, and twigs. Deam (1940) cites records of Biltmore Ash as near as Montgomery and Wells counties in central Indiana. REPRESENTATIVE SPECIMEN: *Wilhelm & Ware #6997, 17 OCT 1979; ca 3.5 mi S of the Town of Pines, in Beech/Maple forest along the Little Calumet River, E of 450E Rd, 0.5 mi S of 1400N Rd, W of 600E Rd.* MOR.

Lycopodium lucidulum Michx. This club moss is known locally solely on the basis of the following REPRESENTATIVE SPECIMEN: *Hiebert #507, 28 APR 1987; beechmaple in Heron Rookery ca 200 m S. of Little Calumet River; T36N R5W SE SE Sec.27; on N facing slope up to shelf or 2 m above floodplain; on ledge in sand/silt; 2 clumps about 1 m in diameter.* MOR.

Maianthemum canadense Desf. var. **canadense** This smooth variety of the Canada Mayflower is the only one I have seen in these woods, though the variety *interius* is far more likely to be found in woodlands dominated by oak. Both Friesner (1936) and Parker (1936) considered local populations of this species to be boreal relicts, but Welch (1935) speculated it may have entered Indiana by way of Ohio.

Milium effusum L. This grass is occasional in the low swales and depressions in among the beeches south of the Little Calumet River. Bowles *et al.* (1986a) have sampled one of the populations and recorded the following associates: *Acer saccharum*, *Fagus grandifolia*, *Fraxinus americana*, *Hamamelis virginiana*, *Lindera benzoin*, *Osmorhiza claytoni*, *Parthenocissus inserta*, *Prunus serotina*, *Sanguinaria canadensis*, *Sanicula gregaria*, *Solidago caesia*, *Ulmus americana*, and *Viola pensylvanica*.

Mimulus alatus Ait. Though it was subsequently discovered at Indiana Dunes State Park, this Monkey Flower was unknown in the Chicago Region in the modern era until its discovery here by Christy Fox. She documented its presence with the following REPRESENTATIVE SPECIMEN: *Fox #112, 1 AUG 1985; old flat field north of Little Calumet River, off of 600 East Road; T37N R5W NE SE Sec.26.* MOR.

Mitchella repens L. This little plant is common, particularly on and around the hummocks caused by the expanded bases of the older stumps and trees.

Panax trifolius L. This species is infrequent among the beeches north and south of the Little Calumet River. REPRESENTATIVE SPECIMEN: *Payton #8, 4 MAY 1982; common on Heron Rookery trail to blind; sandy beech/maple forest in T37N R5W NW NE Sec.26.* MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Poa alsodes Gray This species is occasional to frequent locally, particularly along the slopes of the oxbows and margins of depressions. Bowles *et al.* (1986a) mapped one of the populations and recorded the following associates: *Acer saccharum*, *Carpinus caroliniana* var. *virginiana*, *Euonymus obovatus*, *Fagus grandifolia*, *Lindera benzoin*, *Liriodendron tulipifera*, *Osmorhiza claytoni*, *Parthenocissus inserta*, *Prenanthes alba*, *Prunus serotina*, *Quercus rubra*, *Solidago caesia*, and *Viola pensylvanica*. REPRESENTATIVE SPECIMEN: *Hiebert #401, 25 MAY 1983; Heron Rookery, S of Little Calumet; 50 m E of 450 N; NW SE Sec.27; common plant in flat bottomland forest along trail; growing in silt.* MOR.

Valerianella chenopodifolia (Pursh) DC. This species was unknown from the Lakeshore until Ken Dritz discovered it along the Little Calumet River. It has long been known from along Trail Creek southeast of Michigan City, just northeast of the Heron Rookery. REPRESENTATIVE SPECIMEN: Dritz #582, 30 APR 1988; locally abundant on the N side of the Little Calumet River in the Heron Rookery unit of the Indiana Dunes National Lakeshore, not far from 450 E Rd; NW SW SE Sec.27 T37N R5W; ca 3 mi ENE of Chesterton; *Prunus nigra* was nearby, but other associates were not recorded. MOR.

Viola rostrata Pursh This rare violet was unknown from the Lakeshore until its discovery during our spring foray in 1987. REPRESENTATIVE SPECIMEN: Klick #2779, 14 MAY 1988; locally frequent (+ 1000 plants) flowering in organic soil over glacial till and alluvium in a low wet *Fagus-Acer rubrum-saccharum* forest in Heron Rookery north of the Little Calumet River; T37N R5W SE NW SW Sec.26; with *Fagus grandifolia*, *Acer rubrum*, *Asarum canadense*, and *Panax trifolius*. MOR.

Summary

Twenty-two SPECIAL VEGETATION floristic elements have been recorded from the Heron Rookery. None of them are considered Atlantic coastal plain elements; two (nine percent) are of boreal extraction. Six (twenty-seven percent) of these SPECIAL VEGETATION floristic elements, however, are known from nowhere else in the Lakeshore. These include: *Carex hitchcockiana*, *C. prasina*, *Carya laciniosa*, *Valerianella chenopodifolia*, and *Viola rostrata*.

NATURAL AREA ASSESSMENT

As can be seen from the Natural Area Vegetation Map, this Survey Unit consists solely of Mesophytic Forest; indeed it is the largest, highest quality, and most typical Mesophytic Forest in the Indiana Dunes National Lakeshore. All of it, however, has been logged in years past, though the south half seems to have been logged at a much earlier time than most of the portion north of the Little Calumet River; and it seems to have escaped at least the intense grazing to which the northern portions have been subjected. Most of the 210 acres of the new acquisition to the east are old farmland.

During the surveys I catalogued a total of 173 native floristic elements which render a Mean Quality of 6.61 and represent a Natural Area Index of 87. There are a few additional reports, mostly from Dritz (1989), and a few from herbarium label associate lists [codified by an "R" in Table X]. When these are included in the assessment, the Index rises to 86. These figures, while high for the region and even the Lakeshore, are somewhat anemic when compared to those taken from an undisturbed forest of similar composition. Warren Woods State Park in nearby Berrien County, Michigan, for example, contains a Beech/Maple forest in which 40 acres have been ungrazed and uncut. Those forty acres have been recorded to have a Mean Quality of 6.82 and represent a Natural Area Index of 121. I suspect that the Heron Rookery was comparable before the traumas of logging and grazing.

The data used in assessing the relative Natural Area significance and integrity of this Survey Unit are provided in Table X. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from the Unit, along with the numerical rating coefficient as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk

(*) rather than a conservatism coefficient, and do not enter directly into the derivations of the Natural Area Index.

TABLE X: Summary of species upon which are calculated the various Natural Area Indices for the Heron Rookery.

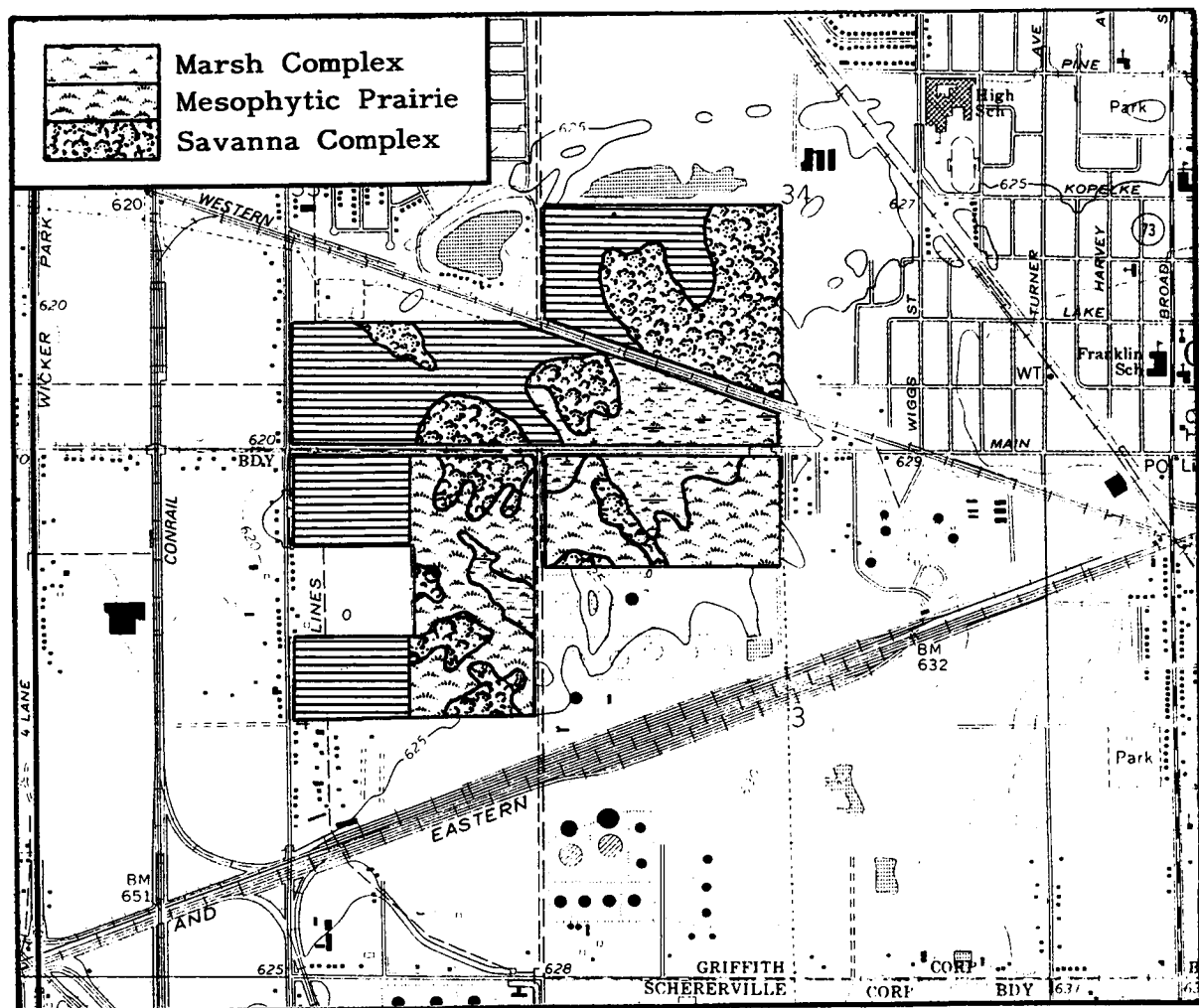
5 <i>Acer nigrum</i>	2 <i>Claytonia virginica</i>
7 <i>Acer rubrum</i>	10 <i>Collinsia verna</i>
0 <i>Acer saccharinum</i>	10 <i>Cornus florida</i>
5 <i>Acer saccharum</i>	5 <i>Crataegus coccinea</i>
7 <i>Actaea pachypoda</i>	2 <i>Crataegus mollis</i>
* <i>Alliaria officinalis</i>	1 <i>Crataegus punctata</i>
1 <i>Allium canadense</i>	0 <i>Cryptotaenia canadensis</i>
7 <i>Allium tricoccum</i>	6 <i>Cystopteris fragilis</i>
0 <i>Ambrosia trifida</i>	5 <i>Dentaria laciniata</i>
4 <i>Amphicarpa bracteata</i>	8 <i>Dicentra canadensis</i>
7 <i>Anemone quinquefolia interior</i>	6 <i>Dicentra cucullaria</i>
7 <i>Anemonella thalictroides</i>	15 <i>Dryopteris hexagonoptera</i>
5 <i>Arisaema atrorubens</i>	15 <i>Dryopteris noveboracensis</i>
5 <i>Asarum canadense</i>	10 <i>Dryopteris spinulosa intermedia</i>
15 <i>Asimina triloba</i>	5 <i>Echinocystis lobata</i>
5 <i>Aster cordifolius</i>	5 <i>Elymus riparius</i>
4 <i>Aster lateriflorus</i>	5 <i>Elymus villosus</i>
7 <i>Blephilia hirsuta</i> (R)	4 <i>Elymus virginicus</i>
15 <i>Botrychium dissectum</i>	10 <i>Epifagus virginiana</i>
6 <i>Botrychium virginianum</i>	4 <i>Equisetum hyemale affine</i>
15 <i>Brachyelytrum erectum</i>	10 <i>Erigenia bulbosa</i>
5 <i>Bromus purgans</i> (R)	5 <i>Erythronium albidum</i>
5 <i>Cardamine bulbosa</i>	8 <i>Erythronium americanum</i>
6 <i>Cardamine douglassii</i>	8 <i>Euonymus atropurpureus</i>
10 <i>Carex albursina</i>	7 <i>Euonymus obovatus</i>
2 <i>Carex amphibola turgida</i>	4 <i>Eupatorium rugosum</i>
15 <i>Carex bromoides</i>	10 <i>Fagus grandifolia</i>
10 <i>Carex communis</i>	5 <i>Festuca obtusa</i>
1 <i>Carex convoluta</i>	8 <i>Floerkea proserpinacoides</i>
10 <i>Carex gracilescens</i>	5 <i>Fraxinus americana</i>
10 <i>Carex gracillima</i>	15 <i>Fraxinus americana biltmoreana</i>
4 <i>Carex hirtifolia</i>	7 <i>Fraxinus pennsylvanica</i>
15 <i>Carex hitchcockiana</i>	2 <i>Fraxinus pennsylvanica subintegerrima</i>
15 <i>Carex intumescens</i>	1 <i>Galium aparine</i>
1 <i>Carex laxiflora</i>	4 <i>Galium concinnum</i>
20 <i>Carex leptoneura</i>	5 <i>Galium obtusum</i>
10 <i>Carex oligocarpa</i>	5 <i>Galium triflorum</i>
15 <i>Carex pedunculata</i>	4 <i>Geranium maculatum</i>
20 <i>Carex prasina</i>	0 <i>Geum canadense</i>
8 <i>Carpinus caroliniana virginiana</i>	1 <i>Geum laciniatum trichocarpum</i>
7 <i>Carya cordiformis</i>	* <i>Glechoma hederacea</i>
15 <i>Carya laciniata</i>	4 <i>Glyceria striata</i>
8 <i>Caulophyllum thalictroides</i>	8 <i>Gymnocladus dioica</i>
5 <i>Chaerophyllum procumbens</i>	8 <i>Hamamelis virginiana</i>
8 <i>Chelone glabra</i>	6 <i>Hepatica acutiloba</i>
0 <i>Circaea quadrisulcata canadensis</i>	5 <i>Heracleum maximum</i>
* <i>Cirsium arvense</i>	5 <i>Hydrophyllum virginianum</i>

- 5 *Hystrix patula*
- 3 *Impatiens capensis*
- 6 *Impatiens pallida*
- 5 *Iris virginica shrevei*
- 8 *Isopyrum biternatum*
- 8 *Juglans cinerea*
- 3 *Laportea canadensis*
- 7 *Leersia virginica*
- 5 *Lemna minor*
- * *Ligustrum vulgare*
- 6 *Lilium michiganense*
- 7 *Lindera benzoin*
- 10 *Liriodendron tulipifera*
- 15 *Lycopodium lucidulum*
- 15 *Maianthemum canadense*
- 15 *Milium effusum*
- 20 *Mimulus alatus*
- 15 *Mitchella repens*
- 10 *Mitella diphylla*
- 8 *Onoclea sensibilis*
- 3 *Osmorhiza claytoni*
- 3 *Osmorhiza longistylis*
- 5 *Ostrya virginiana*
- 15 *Panax trifolius*
- 1 *Parthenocissus inserta* (R)
- 2 *Parthenocissus quinquefolia*
- 5 *Phlox divaricata*
- 3 *Phryma leptostachya*
- 2 *Phytolacca americana*
- 5 *Pilea pumila*
- 0 *Plantago rugelii*
- 10 *Platanus occidentalis*
- 15 *Poa alsodes*
- 5 *Podophyllum peltatum*
- 3 *Polygonatum canaliculatum*
- 7 *Polygonatum pubescens*
- 10 *Polystichum acrostichoides*
- 2 *Populus deltoides*
- 5 *Prenanthes alba* (R)
- 10 *Prenanthes altissima*
- 8 *Prenanthes crepidinea*
- 10 *Prunus nigra*
- 1 *Prunus serotina*
- 1 *Prunus virginiana*
- 8 *Quercus bicolor*
- 7 *Quercus rubra*
- 0 *Ranunculus abortivus*
- 4 *Ranunculus septentrionalis*
- 1 *Rhus radicans*
- 7 *Ribes americanum*
- 5 *Ribes cynosbati*
- * *Robinia pseudo-acacia*
- * *Rosa multiflora*
- 9 *Rosa palustris*
- 7 *Rubus idaeus strigosus*
- 2 *Rubus occidentalis*
- 3 *Rudbeckia laciniata* (R)
- * *Rumex obtusifolius*
- 1 *Sambucus canadensis*
- 10 *Sambucus pubens*
- 6 *Sanguinaria canadensis*
- 2 *Sanicula gregaria*
- 4 *Scrophularia marilandica* (R)
- 7 *Senecio aureus*
- 5 *Sicyos angulatus* (R)
- 2 *Smilacina racemosa*
- 3 *Smilax ecirrhata*
- 4 *Smilax lasioneura*
- 5 *Smilax tamnoides hispida*
- 7 *Solidago caesia*
- 6 *Solidago flexicaulis*
- 3 *Solidago gigantea*
- * *Sonchus uliginosus*
- 7 *Staphylea trifolia*
- * *Taraxacum officinale*
- 4 *Thalictrum dasycarpum*
- 5 *Thalictrum dioicum*
- 5 *Tilia americana*
- 2 *Tovara virginiana*
- 6 *Trillium flexipes*
- 8 *Trillium grandiflorum*
- 5 *Trillium recurvatum*
- 3 *Ulmus americana*
- 4 *Ulmus rubra*
- 2 *Urtica procera* (R)
- 15 *Valerianella chenopodifolia*
- 9 *Viburnum acerifolium*
- 5 *Viburnum lentago*
- 4 *Viburnum prunifolium*
- 0 *Viola papilionacea*
- 5 *Viola pensylvanica*
- 15 *Viola rostrata*
- 6 *Viola striata*
- 4 *Vitis riparia*
- 1 *Xanthoxylum americanum*

SURVEY UNIT XI: HOOSIER PRAIRIE

This Survey Unit occupies about 440 acres, nearly forty-five percent of which have been highly disturbed by cultivation, drainage, grazing, right-of-way construction, fire starvation, or various combinations of those factors. I have surveyed the area on numerous occasions over the years 1978 and 1979, at several different seasons, and always in the company of John Bacone; on one occasion we were joined by Marlin Bowles. On September 9, 1987, I surveyed the newly acquired Gaylord Tract north of the Grand Trunk Western Railroad; on this occasion I was accompanied by Elizabeth Shimp.

Unlike most of the other Lakeshore Survey Units, the Hoosier Prairie has received plenty of serious attention by local botanists and ecologists in recent years, including Dr. Robert Betz (1969), Irene Herlocker, Ed Lace, Dr. Herbert Lamp, Ray Schulenberg, Paul Strand, and Floyd Swink. John Bacone and Thomas Post continue to monitor quantitatively both the prairie itself and individual species in it. Most recently, Ken Klick has spent hundreds of hours here, and is intimately knowledgeable of the prairie and her secret haunts. Largely through the efforts of these botanists, a rather comprehensive catalogue (see Table XI) of the vascular plants currently inhabiting the prairie has been compiled.



The Survey Unit Map was superimposed to scale over a part of the U.S.G.S. Highland Quadrangle, 41087-E4-TF-024, photo-revised 1986. The Natural Area Vegetation Map was drawn with the aid of several aerial photographic series: a black & white stereo-pair set (BFJ-2V: 85 & 86) flown in September, 1958; a black & white stereo-pair (INDU 14-1 through 14-4) flown on May 8, 1984; a color stereo-pair set (79-117: 134-136) flown in May, 1979; a black & white stereo-pair set (14:1-14:4) flown in May 1984; and a color stereo-pair (8:1-8:3) flown in May, 1984.

The NIPSCO substation at the northwest portion of the prairie has received a lot of floristic attention over the last five years. Regular mowing and the disturbances resulting from maintenance vehicles have created a situation in the affected wet prairies and sedge meadow which we do not see in other portions of the prairie. Such is the habitat for *Utricularia subulata*, *Callitriche heterophylla*, *Lycopodium inundatum*, and *Rhynchospora globularis* var. *recognita*, which species are restricted to the substation area.

ANNOTATED LIST OF SPECIAL VEGETATION FLORISTIC ELEMENTS

Aster ptarmicoides (Nees) T. & G. Very rare here, this little aster is known from a dryish portion of the prairie near the center of the southern half. Bowles (1987) notes that it has not been seen since 1979.

Baptisia tinctoria var. *crebra* Fern. According to Irene Herlocker, George Bunce noted Yellow Wild Indigo at Hoosier Prairie in the mid-1970's. During a sampling period on September 8, 1978, John Bacone and I noted it in one (0.25 m²) quadrat out of thirty along Transect 35. *Baptisia leucantha* was also noted along the transect in eleven of the thirty quadrats. Yellow Wild Indigo was also recorded from a quadrat about 370 meters south of Main Street; it grew with *Aster simplex* var. *interior* and *Pyrus melanocarpa*.

Cacalia tuberosa Nutt. Known from nowhere else in the Lakeshore, this handsome plant is occasional in the better portions of the prairie. REPRESENTATIVE SPECIMEN: *Hiebert #316, 2 JUL 1982; locally scattered in sedge meadow, NE corner of Hoosier Prairie near Main St., T35N R9W NE NW Sec.3. MOR.*

Callitriche heterophylla Pursh The Large Water Starwort is known in the Lakeshore only from Hoosier Prairie, where it is found in marshes and ditches throughout. REPRESENTATIVE SPECIMEN: *Dritz #381, 11 MAY 1985; in a seasonal, water-filled depression at the base of a utility pole north of the substation at the extreme northwest part of Hoosier Prairie west of Griffith. MOR.*

Calopogon pulchellus (Salisb.) R. BR. This beautiful orchid is frequently apparent in the wetter areas of the prairie after a fire.

Carex bebbii Olney The local conservatism of this species represents a paradox here in the Chicago region. Aldrich *et al.* (1986) considered this species to be threatened in Indiana; however, in the silty loams of northern Illinois it is so frequent and resilient to disturbance as to have induced us (Swink & Wilhelm, 1979) to give it a coefficient of conservatism of 3; in retrospect, though, we should probably have given it a 7 or 8. It is known locally south of Main Street, from where was collected the following REPRESENTATIVE SPECIMEN: *Otto*

#59, 2 JUL 1982; Hoosier Prairie, 100 m south of Parking lot, in sedge meadow-prairie; common. INDU.

Carex conoidea Schkuhr This little sedge was first discovered at Hoosier Prairie by Ken Dritz, who documented its occurrence with the following REPRESENTATIVE SPECIMEN: Dritz #382, 18 MAY 1985; in a sedge meadow N of the substation at the NW corner of Hoosier Prairie, W of Griffith; with *Carex meadii* [probably *C. tetanica*], *C. lanuginosa*, *C. scoparia*, *C. suberecta*, *Eleocharis wolfii*, *E. elliptica*, *Dryopteris thelypteris* var. *pubescens*, *Eryngium yuccifolium*, *Erigeron philadelphicus*, *Houstonia caerulea*, *Senecio pauperculus* var. *balsamitae*, *Osmunda regalis* var. *spectabilis*, *Hypoxis hirsuta*, *Mentha arvensis* var. *villosa*, *Galium obtusum*, *Sisyrinchium albidum*, and *Ludwigia alternifolia*. MOR. Bowles et al. (1986a) mapped the population and note that it occurred throughout a 1000 square meter area; they listed local dominants as *Carex stricta*, *C. suberecta*, *C. lanuginosa*, and *Solidago altissima*. Ken Klick (pers. comm.) pointed out that it is found in moist prairie in other portions of the prairie as well.

Carex foenea Willd. This rare rhizomatous species of dry savanna is known locally solely on the basis of a report by Dritz (1987), who notes it from the savanna north of Main Street, east of the NIPSCO substation.

Carex laevivaginata (Kukenth.) Mack. This rare sedge is known locally only on the basis of a report by Dritz (1987) who notes that it grows in the "prairie proper" south of Main Street.

Castilleja coccinea (L.) Spreng. This strikingly attractive plant is locally common in the better portions of the prairie, particularly after a fire in the wetish sands.

Comptonia peregrina (L.) Coult. Long known from the Hoosier Prairie, this species is still represented by healthy populations. REPRESENTATIVE SPECIMEN: Otto #55, 2 JUL 1982; locally common in sedge meadow, Hoosier Prairie, 200 m S of parking lot, T35N R9W NE NE Sec.4. MOR. Welch (1953) considered local populations of this species to be boreal relicts, while Trefz (1935) suggested that it has ancestral affinities to the Atlantic coastal plain.

Corallorhiza odontorhiza (Willd.) Fern. According to Ken Klick (pers. comm.), this orchid was still alive at Hoosier Prairie in 1982.

Corydalis sempervirens (L.) Pers. This species was unknown from the Hoosier Prairie until after a prescribed fire in May of 1984. It appeared along with *Geranium bicknellii*. Swink & Wilhelm (1979) pointed out that in the Chicago Region, it occurs in sandy soil where there recently has been a fire and where it associates with *Geranium bicknellii* and *Polygonum careyi*. Bowles et al. (1985) mapped a population and listed the following associates: *Erechtites hieracifolia*, *Maianthemum canadense* [var. *interius* ?], *Pteridium aquilinum* var. *latiusculum*, *Pyrus melanocarpa*, *Quercus velutina*, *Rhus copallina* var. *latifolia*, and *Vaccinium angustifolium* var. *laevifolium*. Bowles (1987) conducted a much-expanded sampling of the population and noted 203 plants at a linear density of 1.1 plants/meter. He described its habitat as "former mesic savanna (cleared of aspen and *Quercus velutina* top-killed by fire)," and listed the following dominants and specific associates: *Apocynum androsaemifolium*, *Coreopsis tripteris*, *Geranium carolinianum*, *Erechtites hieracifolia*, *Helianthus divaricatus*, *H. mollis*, *Parthenium integrifolium*, *Polygonum careyi*, *Populus tremuloides*, *Pteridium aquilinum* var. *latiusculum*, and

Solidago altissima. Evidently the seeds of these early plants have exploited nearby areas of bare sand, which exploitation is described by the following REPRESENTATIVE SPECIMEN: Klick & Kjellmark #2792; locally frequent (50 to 100 plants) in loamy sand in former mesic Black Oak Savanna now bulldozed for a housing development; due to the disturbance, *Corydalis* is frequent in heaped soil mound on the property adjacent to Hoosier Prairie Nature Preserve (Gaylord tract); T36N R9W in center of Sec.34; with *Quercus velutina*, *Helianthus grosseserratus*, *Geranium bicknellii*, *Carex scoparia*, *Eupatorium perfoliatum*, and *Helianthus divaricatus*. MOR.

Cypripedium calceolus var. **pubescens** (Willd.) Correll According to Marlin Bowles (pers. comm.), there are about one half dozen plants within a square meter. They grow along the edge of an old savanna ridge, north of Main Street, in the Griffith section of the Survey Unit. Liz McCloskey is monitoring the population.

Cypripedium candidum Muhl. As with other prairie species, this orchid is adapted to fire, with increased flowering usually following prescribed burning. As a result of such management, the colony at Hoosier Prairie increased more than 50% in size from 16 to 28 flowering plants in the period between 1983 and 1986 (Bowles, 1987); Tom Post (personal communication) recorded 32 stems and 26 flowers in this same plot in 1988. In addition, Tom noted 49 stems in an area east of the original plot. Interestingly, the time span of this population increase included recovery from an abnormally late fire in May of 1984 that burned off flowering bud and leaf tissue, and apparently caused a short-term drop to 4 flowering plants during 1985. This decline or dormancy would be a natural response to the stress following removal of photosynthetic material during a growing-season fire.

Desmodium ciliare (Muhl.) DC. This rare little Tick Trefoil is infrequent to rare in the better portions of the prairie.

Diervilla lonicera Mill. The only record I have for this species at Hoosier Prairie is Bacone (1988). Welch (1935) considered local populations of this species to be boreal relicts.

Drosera intermedia Hayne While rare on the prairie in general, this little Sundew is locally abundant in damp peaty areas where fire has kept the duff removed, or even in old tire tracks or excavations. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Eleocharis wolfii Gray The discovery of this plant at Hoosier Prairie is another one of those incredible contributions by Ken Dritz. Who but Ken would take note of such an obscure species? New to the Chicago Region, the Hoosier Prairie populations remain the only ones we know of. Ken Klick (pers. comm.) tells me that, in addition to the original substation location, there are populations on both sides of Main Street, and that it most often is found in seasonally flooded wet prairie in association with *Calamagrostis canadensis* and *Dryopteris thelypteris* var. **pubescens**. Bowles (1987) mapped a population in "mesic sand prairie cleared of Aspen," and notes the following associates: *Aster umbellatus*, *Calamagrostis canadensis*, *Dryopteris thelypteris* var. **pubescens**, *Galium obtusum*, *Houstonia caerulea*, *Lechea tenuifolia*, *Onoclea sensibilis*, *Panicum virgatum*, *Populus deltoides*, *Rubus flagellaris*, and *Verbena hastata*. REPRESENTATIVE SPECIMEN: Dritz #355, 29 JUL 1984; a small, dense colony 15' E of the 3rd utility pole E of the SE corner of the substation on the NW edge of Hoosier Prairie, W of Griffith; with *Cyperus rivularis*, *C. strigosus*, *Eleocharis obtusa*, *Polygala sanguinea*, *Panicum agrostoides*, *Echinochloa*

crusgalli, *Poa pratensis*, *Juncus acuminatus*, *J. dudleyi*, *Rotala ramosior*, and *Hypericum mutilum*. In the Spring of 1985, the following additional associates were recorded at this site: *Erigeron philadelphicus*, *Hierochloë odorata*, *Hypoxis hirsuta*, *Houstonia caerulea*, *Veronica peregrina*, and *Saxifraga pensylvanica*. Also in early 1985, *Eleocharis wolfii* was discovered to be locally abundant on nearly all sides of the substation. MOR. Bowles *et al.* (1986a) set up permanent plots on a portion of the population, and note the following associates: *Agrostis alba*, *Eryngium yuccifolium*, *Fragaria virginiana*, *Juncus marginatus*, *J. tenuis*, *Lobelia spicata*, *Lycopus rubellus*, *Onoclea sensibilis*, *Panicum agrostoides*, and *Spartina pectinata*.

Epilobium strictum Muhl. The only record I have for this species in the Indiana Dunes National Lakeshore is Bacone (1988).

Eriophorum angustifolium Honckeney The only record I have for this species at Hoosier Prairie is Bacone (1988).

Gentiana puberula Michx. This gentian, far more frequent in the heavy soil prairies of northern Illinois, is still extant in Indiana here at Hoosier Prairie.

Gentiana saponaria L. This attractive gentian is locally frequent in the dampish swales, particularly where fire has removed the duff.

Geranium bicknellii Britt. This species, which characteristically appears with *Corydalis sempervirens* [which see] after fire (Swink & Wilhelm, 1979), appeared after the spring fire of 1984. Bowles *et al.* (1985) mapped the known locations and recorded the following associates: *Baptisia leucantha*, *Bidens frondosa*, *Erechtites hieracifolia*, *Helianthus mollis*, *Pteridium aquilinum* var. *latiusculum*, *Pyrus floribunda*, *Quercus velutina*, *Rhus copallina* var. *latifolia*, *Tradescantia ohimensis*, and *Vaccinium angustifolium* var. *laevifolium*. REPRESENTATIVE SPECIMEN: Klick #2793, 7 JUN 1988; locally frequent (+ 100 plants) flowering in loamy sand in a level, former Black Oak savanna now a housing development (Gaylord tract). Property adjacent to Hoosier Prairie Nature Preserve; T36N R9W in center of Sec.34; associates: *Quercus velutina*, *Q. alba*, *Helianthus divaricatus*, *Carex pensylvanica*, *Corydalis sempervirens*, and *Maianthemum canadense* [var. *interius*?]. MOR.

Gerardia auriculata Michx. I did not even know this species grew at Hoosier Prairie (Wilhelm, 1980), but, according to the Indiana Division of Nature Preserves' species list it has been extirpated--not just from Hoosier Prairie, but from the state of Indiana!

Habenaria clavellata (Michx.) Spreng. This orchid was unknown from Hoosier Prairie until its remarkable discovery by Ken Klick, who noted four plants growing near the *Malaxis* site (which see) and with essentially the same associates. Friesner (1936) considered local populations of this species to be boreal relicts.

Habenaria flava var. *herbiola* (R Br.) Ames & Correll This orchid was unknown from Hoosier Prairie until its discovery by Ken Klick in 1982. Bowles *et al.* (1986a) mapped the population and noted 4 genets with the following associates: *Eleocharis elliptica*, *Eryngium yuccifolium*, *Helianthus grosseserratus*, *Pycnanthemum virginianum*, *Solidago graminifolia* var. *media*, *Spartina pectinata*, and *Spiraea alba*. Bowles (1987) noted 8 genets in 1986 and cited similar associates.

Habenaria lacera (Michx.) Lodd. The only record I have for this orchid at Hoosier Prairie is from the Indiana Division of Nature Preserves' species list. I have, however, seen this species just west of Hoosier Prairie in a railroad prairie.

Lechea stricta Leggett This extremely rare *Lechea*, known to reach the southeastern edge of its range in northwestern Indiana (Hodgdon, 1938), has been reported from the Hoosier Prairie, but considering the taxonomic difficulties inherent in the genus, I have to hold the report suspect until I see a specimen.

Lilium philadelphicum var. **andinum** (Nutt.) Ker. This strikingly beautiful lily is occasional in the wetish swales in the better portions of the prairie.

Liparis loeselii (L.) Richard This orchid, often overlooked, is occasional to infrequent in thickets and in wetish swales, especially in areas where fire has removed the duff.

Lycopodium inundatum L. This species was unknown locally until it was discovered in association with *Utricularia subulata*, which see. McLaughlin (1932) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Malaxis unifolia Michx. This extremely rare orchid was first discovered in the Lakeshore in a red maple swamp forest at Pinhook Bog about ten years ago. So, who could have imagined that it would turn up *de novo* at the Hoosier Prairie? Well, that indefatigable finder of strange plants, Ken Klick, hit upon it in a young aspen thicket a couple of hundred meters west of the truck parking lot, north of Main Street. He describes the location in detail in the following REPRESENTATIVE SPECIMEN: *Klick et al.* #2777, 18 JUN 1987; SW SE SW Sec.34 T36N R9W; Hoosier Prairie Nature Preserve; extreme corner of preserve, north of Main Street and south of Grand Trunk RR; ecotone between sedge meadow/*Populus* thicket and *Quercus velutina* savanna. INDU. Ken (personal communication) provided me with details on immediate associates: *Calamagrostis canadensis*, *Gaylussacia baccata*, *Potentilla simplex*, *Eryngium yuccifolium*, *Helianthus mollis*, and *Rubus pensylvanicus*; he described the following species as general associates: *Populus tremuloides*, *Quercus velutina*, *Pteridium aquilinum* var. *latiusculum*, *Geranium bicknellii*, *Aster umbellatus*, *Aralia nudicaulis*, and *Rubus hispidus* var. *obovalis*. In 1987 Ken noted 28 plants in a 4 X 5 m plot; in 1988, Tom Post noted 25 plants in the same quadrat.

Monotropa hypopithys L. The only record I have for this species at Hoosier Prairie is from Bacone (1988).

Ophioglossum vulgatum var. **pseudopodium** (Blake) Farw. Now (1989) known to be quite frequent in the southern third of the prairie, this tiny fern was reported first by John Bacone (pers. comm.). It was later recorded at the south end of the prairie (Dritz, 1987) on June 23, 1985, where it had been rediscovered by Ken Klick.

Oxalis violacea L. This rare little Wood Sorrel is infrequent to locally occasional in the drier portions of the prairie, becoming most manifest after a fire. It is known from nowhere else in the Lakeshore. REPRESENTATIVE SPECIMEN: *Hiebert & Payton* #285, 14 MAY 1982; locally common in mesophytic prairie, Hoosier Prairie, 100 m N of Main St., across from parking lot; T36N R9W SE SE Sec.33. MOR.

Panicum boreale Nash According to Ken Dritz (pers. comm.), this rare grass grows in low prairie along the loop trail.

Pogonia ophioglossoides (L.) Ker. This exceptionally rare orchid was reported from the Hoosier Prairie in a recent communication from John Bacone. Irene Herlocker knows of two populations, both north of Main Street.

Polygonum careyi Olney This species is rare in moist sandy areas at Hoosier Prairie. Bowles (1987) indicated three adjacent colonies comprising 250 square meters, wherein he noted 82 plants; he recorded the following associates: **Apocynum androsaemifolium**, **Corydalis sempervirens**, **Erechtites hieracifolia**, **Populus tremuloides**, **Potentilla simplex**, **Pteridium aquilinum** var. **latiusculum**, **Quercus velutina**, **Silene antirrhina**, **Solidago altissima**, **Verbena urticifolia**, and **Vitis riparia**. REPRESENTATIVE SPECIMEN: *Swink s.n.*, 20 JUL 1968; *Schererville prairie, N of Lillian & Main St., Griffith*. MOR.

Polytaenia nuttallii DC. Known from nowhere else in the Lakeshore, this very rare umbellifer was first reported from the Hoosier Prairie by Betz (1969). Bowles *et al.* (1986a) mapped one population and listed the following associates: **Comandra richardsiana**, **Comptonia peregrina**, **Coreopsis tripteris**, **Dodecatheon meadia**, **Euphorbia corollata**, **Fragaria virginiana**, **Helianthus mollis**, **Phlox glaberrima** var. **interior**, **Populus deltoides**, **Potentilla simplex**, **Pteridium aquilinum** var. **latiusculum**, **Rubus hispidus** var. **obovalis**, **Salix humilis**, **Solidago altissima**, and **Sorghastrum nutans**. Bowles (1987) mapped another population and noted the following associates: **Baptisia leucantha**, **Coreopsis tripteris**, **Parthenium integrifolium**, **Populus tremuloides**, **Pteridium aquilinum** var. **latiusculum**, **Quercus velutina**, **Salix humilis**, **Solidago altissima**, **Sorghastrum nutans**, and **Spartina pectinata**. REPRESENTATIVE SPECIMEN: *Hiebert #410*, 7 JUN 1983; *T36N R9W SW SW Sec.34; Hoosier Prairie, north side of road, ca 200 m east of parking lot near nature trail; prairie, flat, sand, rare (approx. 20 plants seen)*. INDU.

Prenanthes aspera Michx. This species of mesic prairies in the southwestern sector of the Chicago region is listed as rare by Aldrich *et al.* (1986) for Indiana. It long has been known from Hoosier Prairie. REPRESENTATIVE SPECIMEN: *Hiebert & Pavlovic #489*, 14 AUG 1986; *Hoosier Prairie, south of parking lot along loop trail; rare; flat area, oak savanna; SW NW NE Sec.4 T35N R9W*. MOR.

Rhexia virginica L. This striking plant is occasional to locally frequent in the wettest sands of the better portions of the prairie, particularly in the areas which have received fire. REPRESENTATIVE SPECIMEN: *Hiebert #349*, 27 AUG 1982; *scattered in black organic prairie soil, in mesophytic Hoosier Prairie, 200 m S of Parking lot; T35N R9W NE NE Sec.4*. MOR. Parker (1936) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Rhus vernix L. The list for Hoosier Prairie Nature Preserves includes Poison Sumac, based upon a report by Ken Klick (pers. comm.), who found a single seedling.

Rhynchospora globularis var. **recognita** Gale This was discovered at Hoosier Prairie by Ken Dritz on that red-letter day, July 29, 1984, when he discovered **Eleocharis wolfii**, **Lycopodium inundatum**, and **Carex conoidea**, all of which see. Bowles *et al.* (1985) mapped this population and listed the following associates: **Aster ericoides**, **Cyperus rivularis**, **Dryopteris thelypteris** var. **pubescens**, **Eupatorium perfoliatum**, **Juncus canadensis**, **J. interior**, **Leersia oryzoides**, **Osmunda regalis** var. **spectabilis**, and **Spartina pectinata**. REPRESENTATIVE SPECIMEN: *Dritz #356*, 29 JUL 1984; *one tuft of 5 stems in a sedge meadow on the N side of the substation at the NW corner of Hoosier*

Prairie; with *Juncus marginatus*, *Rotala ramosior*, *Viola lanceolata*, *Ludwigia alternifolia*, *Houstonia caerulea*, *Alisma triviale*, *A. subcordatum*, *Senecio pauperculus* var. *balsamitae*, *Euphorbia corollata*, *Xyris torta*, *Osmunda regalis* var. *specabilis*, *Lysimachia lanceolata*, *L. terrestris*, and *Rudbeckia hirta*; added in early 1985: *Carex conoidea* and *Eleocharis wolfii*. MOR. Despite the collection of only one of five stems, the plant did not return the next year and has not been seen since; much of this area has been mowed aggressively in the last few years. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Satureja arkansana (Nutt.) Briq. This rare mint is known from one of the long-abandoned fields which now are part of the Nature Preserve. Bowles *et al.* (1986a) mapped this population and listed the following associates: *Andropogon scoparius*, *Aster ericoides*, *Coreopsis tripteris*, *Equisetum hyemale* var. *affine*, *Phlox glaberrima* var. *interior*, *Poa compressa*, *Pycnanthemum virginianum*, *Senecio pauperculus* var. *balsamitae*, *Solidago altissima*, *S. ohioensis*, *Sorghastrum nutans*, *Spartina pectinata*, and *Zizia aurea*.

Senecio plattensis Nutt. The only record I have for this species at Hoosier Prairie is from Bacone (1988).

Sisyrinchium angustifolium Mill. The only record I have for this species at Hoosier Prairie is Bacone (1988).

Sparganium americanum Nutt. The only record I have for this species at Hoosier Prairie is Bacone (1988).

Strophostyles leiosperma (T. & G.) Piper The Smooth Wild Bean is rare in the old field south of the parking lot. According to Ken Klick, it has not been seen anywhere else on the prairie. REPRESENTATIVE SPECIMEN: *Hiebert* #360, 27 AUG 1982; found in Hoosier Prairie, 300 m south of parking area along trail; mesophytic, black soil prairie; common. INDU.

Utricularia gibba L. According to Ken Klick, this little bladderwort is still alive at Hoosier Prairie. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Utricularia subulata L. The discovery of this species at Hoosier Prairie by Ken Klick is one of the most remarkable discoveries in the modern era. He had seen this plant in the Pannes at West Beach (which see) already in the summer of 1983 but reluctantly passed it off as some sort of strange bryophyte. In 1984, he turned it up again here at Hoosier Prairie and determined it finally to be this heretofore unknown bladderwort whose usual haunt is in the warm moist sands of the Atlantic and Gulf coastal plains. REPRESENTATIVE SPECIMEN: *Hess et al.* #5994, 18 JUL 1984; Hoosier Prairie, 2 mi S of Highland, off Kennedy Ave. by electric substation; T36N R9W Sec.4; disturbed sandy site with *Lycopodium*, *Xyris*, *Juncus*, *Viola*. MOR. It grows in the sandy, organic, tire-track seeps left by the NIPSCO mowers, with *Xyris torta*, *Rhynchospora capitellata*, *Drosera intermedia*, *Viola lanceolata*, *Aletris farinosa*, *Cyperus rivularis*, *Lycopodium inundatum*, *Linum medium* var. *texanum*, *Rhexia virginica*, *Eleocharis elliptica*, *Juncus brachycephalus*, and *J. alpinus* var. *rariflorus*. Since 1984, these plants have been observed to produce only cleistogamous flowers, but in 1988 Ken Klick noted that the Hoosier Prairie populations bore numerous chasmogamous blooms. Interestingly, according to Marlin Bowles, it also associates

with curious little Hemipterans known as "toad bugs." These are bugs which even entomology texts admit resemble superficially small toads both in appearance and their hopping habit. Toad bugs (*Gelastocoris oculatus*) are rare locally, but are known also from the Pannes at West Beach, where also grows the rare *Utricularia subulata*. Ron Panzer indicated that toad bugs also are known from the alkaline shores of Clarke & Pine Nature Preserve near Gary. I wonder if we might not find *Utricularia subulata* there as well?

Viola fimbriatula Sm. Scarcely more than a pubescent phase of *V. sagittata*, this little violet is frequent in even some of the more disturbed areas of the prairie.

Xyris torta Sm. This plant is infrequent in the wettish, peaty areas of the prairie, becoming particularly apparent in areas which have been burned. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Summary

Hoosier Prairie has been shown to provide the habitat for 53 of the Indiana Dunes National Lakeshore SPECIAL VEGETATION floristic elements. Six (twelve percent) of the SPECIAL VEGETATION floristic elements known from the Hoosier Prairie were considered by Peattie (1922), Hooper (1934), McLaughlin (1932), Parker (1936), and Trefz (1935) to have ancestral affinities to the Atlantic coastal plain, while 4 (eight percent) of the SPECIAL VEGETATION floristic elements were considered by Welch (1935) to be boreal relicts.

About twenty-two percent of the SPECIAL VEGETATION floristic elements known from this Survey Unit are unknown from any other Lakeshore Survey Unit. These include: *Baptisia tinctoria* var. *crebra*, *Cacalia tuberosa*, *Callitriche heterophylla*, *Carex bebbii*, *Corydalis sempervirens*, *Eleocharis wolfii*, *Epilobium strictum*, *Gerardia auriculata*, *Lechea stricta*, *Oxalis violacea*, *Polytaenia nuttallii*, *Prenanthes aspera*, and *Strophostyles leiosperma*.

NATURAL AREA ASSESSMENT

It is implied on the Natural Area Vegetation Map that the Hoosier Prairie consists of Mesophytic prairie and Savanna Complex. That implication is cartographically expedient, but it does little to characterize the essential composition of Hoosier Prairie. The Mesophytic Prairie symbol is used in conjunction with the Savanna Complex symbol to point up the uniqueness this area has with respect to the rest of the Lakeshore plant communities. Most of Hoosier Prairie is too wet, or too sandy, or too populated by Black Oaks to be classified truly as Mesophytic Prairie. Bacone (n.d.) has done a beautiful job of circumscribing the principal communities of Hoosier Prairie, so I will not spend time here plagiarizing his concepts and circumscriptions, other than simply to reemphasize the regional uniqueness of the area.

Unlike most of the other Lakeshore Natural Areas, Hoosier Prairie is currently under the influence of a sound, rational maintenance and management plan. John Bacone has taken the initiative, furthermore, to set up sampling transects throughout the prairie in an effort to monitor and evaluate the effects of his various management techniques. Haney (1986b) recorded the demographics of canopy and shrub species to describe cohort structure and recruitment. The Indiana Division of Nature Preserves continues to monitor its management and enlarge our understanding of this magnificent prairie. Irene Herlocker and Terry

McCloskey are constantly keeping watchful eyes toward the prairie with respect to public use and access. Ken Klick has labored hundreds of hours cutting aspens and removing exotics. All in all the future of Hoosier Prairie as a vital life system appears very bright. Hoosier Prairie is a natural asset with profound midwestern significance, and a natural amenity for which the people of Indiana will one day be very grateful.

In my first report (Wilhelm, 1980), there were 323 native species known from Hoosier Prairie. Since then, much brush cutting, clearing, and prescribed burning has occurred. The number of known species currently is 475, and the number of SPECIAL VEGETATION floristic elements has nearly tripled! Over the last decade, I myself have recorded 377 native floristic elements. Their Mean Quality is 6.09, and they represent a Natural Area Index of 118. There have been another 98 reliable reports, most of them from Ken Klick (pers. comm.), Ken Dritz (1987), and Bacone (1988). When these are included in the calculations, the Index stands at 141.

In addition to these 474 taxa recorded from the Hoosier Prairie, several other taxa have been reported: *Betula papyrifera*, *Carex artitecta*, *C. eburnea*, *C. gracillima*, *C. trichocarpa*, *Cyperus dentatus*, *Eleocharis pauciflora* var. *fernaldii*, *Gerardia skinneriana*, *Luzula acuminata*, *Lycopodium complanatum* var. *flabelliforme*, *Psilocarya scirpoides*, *Scirpus purshianus*, and *Viola canadensis*. Their attribution to Hoosier Prairie, I feel, may be the result of some clerical error, or of specimen misidentification. Ken Klick has seen *Scleria verticillata* nearby on tank farm property.

The data used in assessing the relative Natural Area significance and integrity of Hoosier Prairie are provided in Table XI. The data include a present list of all the floristic elements (SPECIAL or otherwise) recorded from the park, along with the numerical rating coefficients as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient, and do not enter directly into the derivations of the Natural Area Indices. Many of the taxa listed in Table XI are followed by an "R" symbol, indicating that the taxon after which it occurs was reported on some basis other than one for which I have personal knowledge, but there is every reason to suspect that most if not all of the taxa appended by an "R" symbol are extant within the prairie. Most of these reports are from Bacone (1988); a few are from Klick *et al.* (1989).

TABLE XI: Summary of species upon which are calculated the various Natural Area Indices for Hoosier Prairie.

0 <i>Acalypha rhomboidea</i>	* <i>Alopecurus carolinianus</i> (R)
0 <i>Acer saccharinum</i> (R)	* <i>Alopecurus pratensis</i> (R)
* <i>Achillea millefolium</i>	* <i>Amaranthus retroflexus</i> (R)
8 <i>Agrimonia parviflora</i>	0 <i>Ambrosia artemisiifolia</i> <i>elatior</i>
5 <i>Agrimonia pubescens</i>	0 <i>Ambrosia trifida</i>
* <i>Agropyron repens</i>	8 <i>Amelanchier laevis</i> (R)
* <i>Agrostis alba</i>	10 <i>Amorpha canescens</i>
1 <i>Agrostis hyemalis</i>	4 <i>Amphicarpa bracteata</i>
10 <i>Aletris farinosa</i>	4 <i>Andropogon gerardii</i>
4 <i>Alisma subcordatum</i>	5 <i>Andropogon scoparius</i>
4 <i>Alisma triviale</i>	7 <i>Anemone quinquefolia interior</i>
1 <i>Allium canadense</i>	7 <i>Anemonella thalictroides</i>
* <i>Allium vineale</i>	6 <i>Antennaria neglecta</i>
6 <i>Alopecurus aequalis</i> (R)	6 <i>Antennaria plantaginifolia</i>

- 6 *Apios americana*
- 5 *Apocynum androsaemifolium*
- 4 *Apocynum cannabinum* (R)
- 2 *Apocynum sibiricum*
- 7 *Arabis lyrata*
- 8 *Aralia nudicaulis*
- 9 *Arenaria lateriflora*
- 85 *Artemisia caudata*
- 10 *Asclepias amplexicaulis*
- 10 *Asclepias hirtella*
- 4 *Asclepias incarnata*
- 0 *Asclepias syriaca*
- 10 *Asclepias tuberosa*
- 1 *Asclepias verticillata*
- * *Asparagus officinalis*
- 8 *Aster azureus*
- 5 *Aster dumosus*
- 5 *Aster ericoides*
- 4 *Aster lateriflorus* (R)
- 10 *Aster linariifolius*
- 4 *Aster novae-angliae*
- 1 *Aster pilosus*
- 10 *Aster praealtus*
- 15 *Aster ptarmicoides*
- 3 *Aster simplex*
- 3 *Aster simplex interior*
- 10 *Aster umbellatus*
- 6 *Athyrium filix-femina michauxii* (R)
- 8 *Baptisia leucantha*
- 15 *Baptisia tinctoria crebra*
- * *Barbarea vulgaris*
- * *Berberis thunbergii* (R)
- * *Betula pendula* (R)
- 5 *Bidens cernua*
- 5 *Bidens comosa*
- 8 *Bidens coronata*
- 1 *Bidens frondosa*
- 3 *Bidens polylepis* (R)
- 7 *Blephilia hirsuta* (R)
- 2 *Boehmeria cylindrica*
- 10 *Boltonia latisquama recognita*
- 6 *Botrychium virginianum* (R)
- * *Bromus inermis*
- 5 *Bromus purgans* (R)
- * *Bromus tectorum* (R)
- 6 *Bulbostylis capillaris* (R)
- 15 *Cacalia tuberosa*
- 3 *Calamagrostis canadensis*
- 5 *Calamagrostis inexpansa brevior*
- 15 *Callitriche heterophylla*
- 15 *Calopogon pulchellus*
- 5 *Caltha palustris*
- 7 *Campanula aparinoides*
- * *Capsella bursa-pastoris* (R)
- 5 *Cardamine bulbosa*
- 4 *Cardamine parviflora arenicola*
- 4 *Cardamine pensylvanica* (R)
- 7 *Carex annectens xanthocarpa* (R)
- 5 *Carex aquatilis altior*
- 3 *Carex bebbii*
- 10 *Carex bicknellii* (R)
- 8 *Carex buxbaumii*
- 2 *Carex cephalophora* (R)
- 15 *Carex conoidea*
- 10 *Carex emmonsii*
- 8 *Carex emoryi* (R)
- 20 *Carex foenea* (R)
- 6 *Carex haydenii*
- 4 *Carex hystricina* (R)
- 15 *Carex laevivaginata* (R)
- 4 *Carex lanuginosa*
- 8 *Carex lasiocarpa americana* (R)
- 5 *Carex pensylvanica*
- 10 *Carex sartwellii* (R)
- 7 *Carex scoparia*
- 8 *Carex sterilis* (R)
- 5 *Carex stricta*
- 8 *Carex suberecta* (R)
- 9 *Carex tetanica* (R)
- 3 *Carex tribuloides* (R)
- 10 *Carex vesicaria monile* (R)
- 2 *Carex vulpinoidea* (R)
- 15 *Castilleja coccinea*
- 8 *Ceanothus americanus*
- * *Centaurium pulchellum*
- 7 *Cephalanthus occidentalis* (R)
- * *Cerastium brachypodum* (R)
- * *Cerastium vulgatum*
- * *Chenopodium album* (R)
- * *Chrysanthemum leucanthemum pinnatifidum*
- * *Cichorium intybus*
- 6 *Cicuta maculata*
- * *Cirsium arvense*
- 2 *Cirsium discolor*
- 10 *Cirsium muticum*
- * *Cirsium vulgare*
- 2 *Claytonia virginica*
- 7 *Comandra richardsoniana*
- 10 *Comptonia peregrina*
- 1 *Convolvulus sepium*
- 20 *Corallorhiza odontorhiza* (R)
- 7 *Coreopsis lanceolata*
- 8 *Coreopsis palmata*
- 5 *Coreopsis tripteris*
- 5 *Cornus obliqua*
- 1 *Cornus racemosa*

- 6 *Cornus stolonifera*
- 10 *Corydalis sempervirens*
- 2 *Corylus americana*
- 2 *Crotalaria sagittalis* (R)
- 4 *Cyperus rivularis*
- 1 *Cyperus strigosus*
- 20 *Cyripedium calceolus pubescens* (R)
- 20 *Cyripedium candidum*
- * *Dactylis glomerata*
- * *Daucus carota*
- 4 *Desmodium canadense*
- 15 *Desmodium ciliare*
- 8 *Desmodium glutinosum*
- 6 *Desmodium illinoense*
- 5 *Desmodium paniculatum*
- * *Dianthus armeria* (R)
- 10 *Diervilla lonicera* (R)
- * *Digitaria ischaemum*
- * *Digitaria sanguinalis*
- 6 *Dodecatheon meadia*
- 15 *Drosera intermedia*
- 6 *Dryopteris thelypteris pubescens*
- 10 *Dulichium arundinaceum* (R)
- 0 *Echinochloa crusgalli*
- 6 *Eleocharis acicularis*
- 5 *Eleocharis calva*
- 5 *Eleocharis compressa* (R)
- 8 *Eleocharis elliptica*
- 5 *Eleocharis obtusa*
- 5 *Eleocharis smallii*
- 8 *Eleocharis tenuis verrucosa* (R)
- 20 *Eleocharis wolfii*
- 4 *Elymus virginicus* (R)
- 10 *Epilobium angustifolium*
- 3 *Epilobium coloratum*
- 3 *Epilobium glandulosum adenocaulon*
- 8 *Epilobium leptophyllum*
- 15 *Epilobium strictum* (R)
- 0 *Equisetum arvense*
- 3 *Equisetum hyemale intermedium*
- 2 *Erechtites hieracifolia*
- 0 *Erigeron canadensis*
- 4 *Erigeron philadelphicus*
- 3 *Erigeron strigosus*
- 15 *Eriophorum angustifolium* (R)
- 9 *Eryngium yuccifolium*
- 0 *Eupatorium altissimum*
- 5 *Eupatorium maculatum*
- 6 *Eupatorium perfoliatum*
- 1 *Eupatorium serotinum*
- 2 *Euphorbia corollata*
- * *Euphorbia maculata* (R)
- * *Euphorbia supina*
- 10 *Fimbristylis autumnalis mucronulata*
- 1 *Fragaria virginiana*
- 2 *Fraxinus pennsylvanica subintegerrima*
- 1 *Galium aparine* (R)
- 8 *Galium asprellum* (R)
- 7 *Galium boreale*
- 4 *Galium concinnum* (R)
- 5 *Galium obtusum*
- 8 *Galium tinctorium* (R)
- 9 *Gaylussacia baccata*
- 10 *Gentiana crinita*
- 10 *Gentiana puberula*
- 15 *Gentiana saponaria*
- 7 *Geranium bicknellii*
- 3 *Geranium carolinianum* (R)
- 15 *Gerardia auriculata* (R)
- 10 *Gerardia flava*
- 7 *Gerardia paupercula*
- 7 *Gerardia purpurea*
- 7 *Gerardia tenuifolia*
- 1 *Geum laciniatum trichocarpum* (R)
- 8 *Glyceria septentrionalis* (R)
- 4 *Glyceria striata* (R)
- * *Glycyrrhiza lepidota* (R)
- 2 *Gnaphalium obtusifolium* (R)
- 5 *Gratiola neglecta* (R)
- 15 *Habenaria clavellata* (R)
- 15 *Habenaria flava herbiola*
- 10 *Habenaria lacera*
- 5 *Helenium autumnale* (R)
- * *Helenium nudiflorum* (R)
- 10 *Helianthemum bicknellii* (R)
- 8 *Helianthemum canadense*
- 5 *Helianthus divaricatus*
- 7 *Helianthus giganteus*
- 2 *Helianthus grosseserratus*
- 8 *Helianthus laetiflorus rigidus*
- 9 *Helianthus mollis*
- 10 *Helianthus occidentalis*
- * *Helianthus petiolaris*
- * *Hemerocallis fulva* (R)
- 5 *Heracleum maximum* (R)
- 8 *Heuchera richardsonii*
- 6 *Hieracium canadense fasciculatum*
- 9 *Hierochloë odorata*
- * *Hordeum jubatum*
- 9 *Houstonia caerulea*
- 5 *Hydrophyllum virginianum* (R)
- 8 *Hypericum canadense*
- 7 *Hypericum gentianoides*
- 8 *Hypericum mutilum*
- * *Hypericum perforatum* (R)
- 8 *Hypericum virginicum fraseri*

- 10 *Hypoxis hirsuta*
 3 *Impatiens capensis*
 * *Ipomoea hederacea* (R)
 * *Iris germanica* (R)
 5 *Iris virginica shrevei*
 5 *Juglans nigra* (R)
 8 *Juncus acuminatus*
 9 *Juncus alpinus rariflorus* (R)
 10 *Juncus biflorus* (R)
 9 *Juncus brachycarpus*
 9 *Juncus brachycephalus*
 5 *Juncus bufonius* (R)
 7 *Juncus canadensis*
 4 *Juncus dudleyi*
 7 *Juncus effusus solutus* (R)
 8 *Juncus greenei* (R)
 10 *Juncus interior* (R)
 10 *Juncus marginatus*
 0 *Juncus tenuis*
 4 *Juncus torreyi*
 7 *Koeleria cristata*
 7 *Krigia biflora*
 2 *Lactuca canadensis*
 * *Lathyrus latifolius* (R)
 8 *Lathyrus palustris*
 7 *Lechea leggettii moniliformis*
 15 *Lechea stricta* (R)
 7 *Lechea tenuifolia* (R)
 7 *Lechea villosa* (R)
 5 *Leersia oryzoides*
 * *Lepidium campestre*
 0 *Lepidium virginicum*
 3 *Leptoloma cognatum* (R)
 4 *Lespedeza capitata*
 6 *Lespedeza hirta*
 6 *Liatris aspera*
 8 *Liatris cylindracea*
 6 *Liatris spicata*
 6 *Lilium michiganense*
 15 *Lilium philadelphicum andinum*
 * *Linaria vulgaris*
 6 *Lindernia anagallidea*
 5 *Lindernia dubia*
 7 *Linum medium texanum*
 * *Linum usitatissimum*
 8 *Liparis lilifolia*
 7 *Liparis loeselii*
 6 *Lithospermum canescens*
 8 *Lithospermum croceum*
 7 *Lobelia cardinalis*
 6 *Lobelia spicata*
 6 *Ludwigia alternifolia*
 5 *Ludwigia palustris americana*
 6 *Ludwigia polycarpa*
 7 *Lupinus perennis occidentalis*
 5 *Luzula multiflora* (R)
 * *Lychnis dioica* (R)
 15 *Lycopodium inundatum*
 5 *Lycopus americanus*
 10 *Lycopus rubellus*
 6 *Lycopus uniflorus*
 6 *Lycopus virginicus*
 7 *Lysimachia lanceolata*
 9 *Lysimachia quadriflora*
 8 *Lysimachia terrestris*
 9 *Lysimachia thyrsiflora*
 7 *Lythrum alatum*
 * *Lythrum salicaria*
 10 *Maianthemum canadense interius*
 20 *Malaxis unifolia*
 * *Medicago lupulina*
 * *Melilotus alba*
 * *Melilotus officinalis*
 5 *Mentha arvensis villosa*
 6 *Mimulus ringens*
 * *Mirabilis nyctaginea* (R)
 * *Mollugo verticillata*
 4 *Monarda fistulosa*
 15 *Monotropa hypopithys* (R)
 3 *Muhlenbergia frondosa*
 7 *Muhlenbergia glomerata*
 5 *Muhlenbergia mexicana*
 0 *Muhlenbergia schreberi*
 6 *Myosotis verna*
 6 *Najas flexilis* (R)
 * *Nepeta cataria*
 8 *Nyssa sylvatica* (R)
 1 *Oenothera biennis*
 10 *Oenothera pilosella*
 8 *Onoclea sensibilis*
 15 *Ophioglossum vulgatum pseudopodium*
 * *Ornithogalum umbellatum*
 6 *Osmunda cinnamomea*
 7 *Osmunda claytoniana*
 8 *Osmunda regalis spectabilis*
 0 *Oxalis europaea*
 0 *Oxalis stricta*
 15 *Oxalis violacea*
 7 *Oxypolis rigidior*
 5 *Panicum agrostoides*
 15 *Panicum boreale*
 3 *Panicum implicatum*
 6 *Panicum meridionale* (R)
 7 *Panicum oligosanthos scribnerianum*
 8 *Panicum sphaerocarpon* (R)
 9 *Panicum spretum* (R)

- 7 *Panicum villosissimum*
- 5 *Panicum virgatum*
- 7 *Parthenium integrifolium*
- 1 *Parthenocissus inserta*
- * *Pastinaca sativa*
- 10 *Pedicularis canadensis*
- 7 *Pedicularis lanceolata*
- 4 *Penstemon calycosus* (R)
- 4 *Penstemon digitalis*
- 5 *Penthorum sedoides*
- 9 *Petalostemum purpureum*
- * *Phleum pratense*
- 7 *Phlox glaberrima interior*
- * *Phlox paniculata* (R)
- 6 *Phlox pilosa*
- 3 *Physalis heterophylla*
- 4 *Physalis virginiana*
- 5 *Physostegia virginiana*
- * *Plantago lanceolata*
- * *Plantago major*
- 0 *Plantago rugelii*
- * *Plantago virginica*
- * *Poa annua*
- * *Poa compressa*
- * *Poa pratensis*
- 5 *Podophyllum peltatum*
- 15 *Pogonia ophioglossoides* (R)
- 10 *Polygala cruciata aquilonia*
- 10 *Polygala polygama obtusata* (R)
- 6 *Polygala sanguinea* (R)
- 8 *Polygala senega*
- 5 *Polygala verticillata isocycla*
- 3 *Polygonatum canaliculatum*
- 5 *Polygonum amphibium stipulaceum*
- 15 *Polygonum careyi*
- 5 *Polygonum coccineum*
- * *Polygonum cuspidatum* (R)
- 2 *Polygonum hydropiper*
- 7 *Polygonum hydropiperoides*
- 0 *Polygonum pensylvanicum laevigatum*
- * *Polygonum persicaria* (R)
- 6 *Polygonum punctatum*
- 7 *Polygonum tenue* (R)
- 15 *Polytaenia nuttallii*
- 2 *Populus deltoides*
- 6 *Populus grandidentata*
- 4 *Populus tremuloides*
- * *Portulaca oleracea*
- 9 *Potentilla arguta*
- 0 *Potentilla norvegica*
- * *Potentilla recta*
- 4 *Potentilla simplex*
- 5 *Prenanthes alba*
- 8 *Prenanthes aspera*
- 8 *Prenanthes racemosa*
- 6 *Proserpinaca palustris crebra*
- 0 *Prunella vulgaris lanceolata*
- 8 *Prunus pumila*
- 1 *Prunus serotina*
- 1 *Prunus virginiana*
- 7 *Ptelea trifoliata* (R)
- 5 *Pteridium aquilinum latiusculum*
- 8 *Pycnanthemum tenuifolium*
- 5 *Pycnanthemum virginianum*
- 9 *Pyrus floribunda*
- * *Pyrus malus* (R)
- 7 *Pyrus melanocarpa*
- 4 *Quercus alba*
- 8 *Quercus palustris*
- 6 *Quercus velutina*
- 0 *Ranunculus abortivus*
- 6 *Ranunculus fascicularis*
- 7 *Ranunculus flabellaris*
- 6 *Ranunculus pensylvanicus*
- 5 *Ranunculus recurvatus* (R)
- 6 *Ranunculus sceleratus*
- 4 *Ratibida pinnata*
- * *Rhamnus cathartica* (R)
- * *Rhamnus frangula*
- 15 *Rhexia virginica*
- 6 *Rhus copallina latifolia*
- 1 *Rhus glabra*
- 1 *Rhus radicans*
- 3 *Rhus typhina*
- 15 *Rhus vernix* (R)
- 8 *Rhynchospora capitellata*
- 20 *Rhynchospora globularis recognita*
- 7 *Ribes americanum*
- 5 *Ribes missouriense* (R)
- * *Robinia pseudo-acacia* (R)
- 5 *Rorippa islandica fernaldiana*
- 5 *Rosa carolina*
- * *Rosa multiflora*
- 9 *Rosa palustris* (R)
- 10 *Rotala ramosior* (R)
- 3 *Rubus allegheniensis*
- 4 *Rubus flagellaris*
- 9 *Rubus hispidus obovalis*
- 2 *Rubus occidentalis*
- 3 *Rubus pensylvanicus*
- 1 *Rudbeckia hirta*
- * *Rumex acetosella*
- * *Rumex crispus*
- 6 *Rumex verticillatus*
- 7 *Sagittaria brevirostra*
- 4 *Sagittaria latifolia*

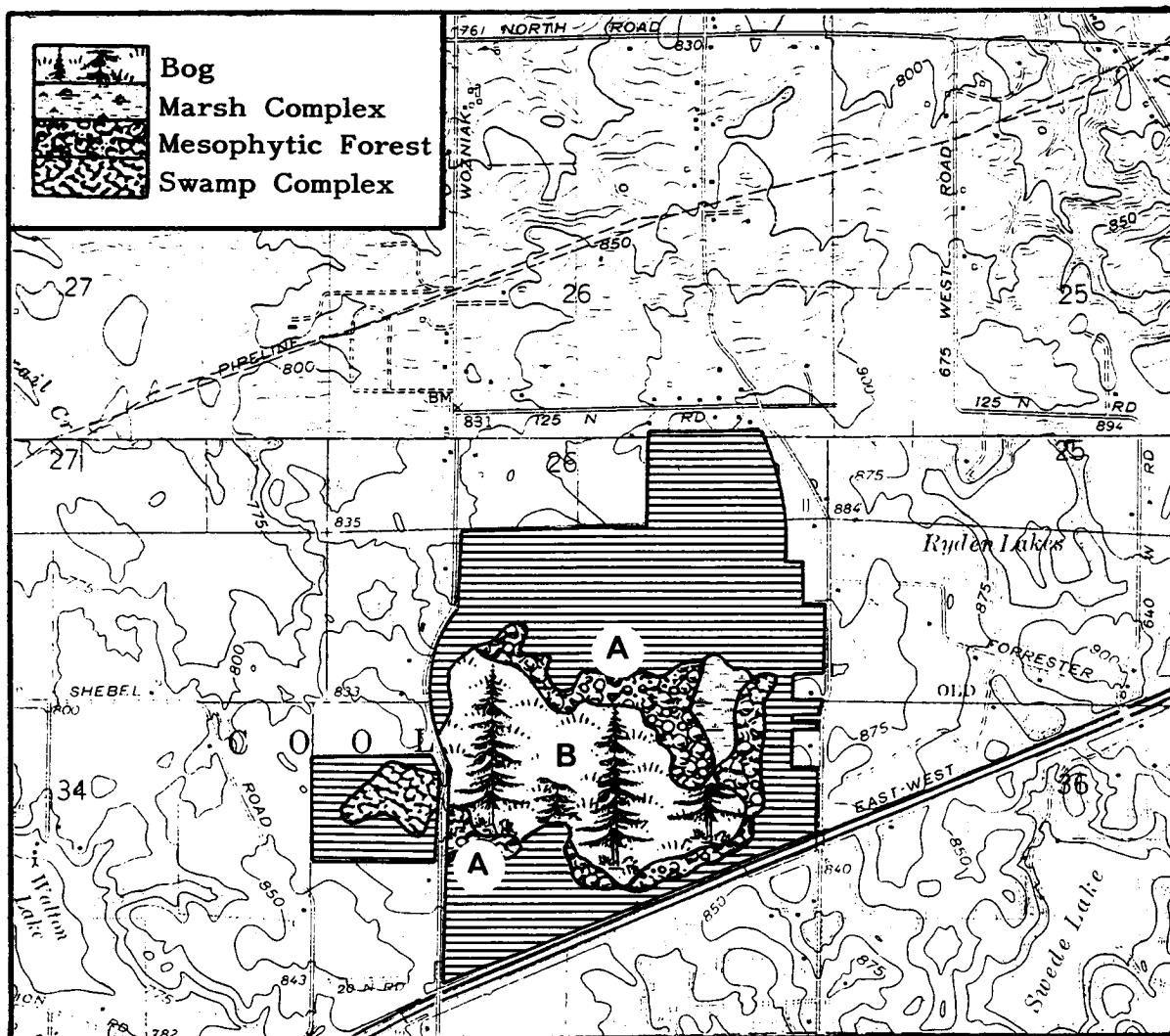
- 5 *Salix amygdaloides*
- 2 *Salix discolor*
- 7 *Salix glaucophylloides glaucophylla*
- 10 *Salix gracilis textoris*
- 6 *Salix humilis*
- 1 *Salix interior*
- 4 *Salix nigra*
- 5 *Salix rigida*
- 1 *Sambucus canadensis*
- 6 *Sanicula marilandica* (R)
- * *Saponaria officinalis*
- 6 *Sassafras albidum*
- 10 *Satureja arkansana*
- 10 *Satureja vulgaris neogaea* (R)
- 8 *Saxifraga pensylvanica*
- 6 *Scirpus acutus*
- 7 *Scirpus americanus*
- 7 *Scirpus atrovirens*
- 6 *Scirpus cyperinus*
- 4 *Scirpus lineatus* (R)
- 5 *Scirpus validus creber*
- 10 *Scleria triglomerata* (R)
- 5 *Scrophularia lanceolata*
- 5 *Scutellaria epilobiifolia*
- 5 *Scutellaria lateriflora*
- 7 *Scutellaria parvula leonardi* (R)
- 6 *Senecio pauperculus balsamitae*
- 15 *Senecio plattensis* (R)
- * *Setaria glauca*
- 2 *Silene antirrhina* (R)
- 6 *Silene stellata*
- 5 *Silphium integrifolium*
- 5 *Silphium laciniatum*
- 7 *Sisyrinchium albidum*
- 10 *Sisyrinchium angustifolium* (R)
- 7 *Sium suave*
- 2 *Smilacina racemosa*
- 5 *Smilacina stellata*
- * *Solanum carolinense* (R)
- * *Solanum dulcamara*
- 1 *Solidago altissima*
- 3 *Solidago gigantea*
- 4 *Solidago graminifolia media*
- 3 *Solidago graminifolia nuttallii*
- 5 *Solidago gymnospermoides*
- 5 *Solidago juncea*
- 5 *Solidago missouriensis fasciculata*
- 4 *Solidago nemoralis*
- 8 *Solidago ohioensis* (R)
- 7 *Solidago riddellii*
- 4 *Solidago rigida*
- 6 *Solidago rugosa*
- 7 *Solidago speciosa*
- 9 *Solidago uliginosa*
- * *Sonchus uliginosus*
- 5 *Sorghastrum nutans*
- 15 *Sparganium americanum* (R)
- 5 *Spartina pectinata*
- 4 *Sphenopholis intermedia*
- 7 *Spiraea alba*
- 9 *Spiraea tomentosa rosea*
- 7 *Spiranthes cernua*
- 9 *Sporobolus heterolepis*
- 5 *Stachys palustris homotricha*
- 5 *Stachys tenuifolia hispida*
- * *Stellaria graminea*
- 6 *Stipa spartea*
- 9 *Strophostyles leiosperma*
- * *Syringa vulgaris* (R)
- 8 *Taenidia integerrima*
- * *Taraxacum officinale* (R)
- 8 *Tephrosia virginiana*
- 3 *Teucrium canadense*
- 4 *Thalictrum dasycarpum*
- 5 *Thalictrum dioicum* (R)
- 5 *Thalictrum revolutum*
- 2 *Tradescantia ohiensis*
- * *Tragopogon pratensis* (R)
- * *Trifolium agrarium* (R)
- * *Trifolium hybridum* (R)
- * *Trifolium pratense*
- * *Trifolium repens*
- 5 *Trillium recurvatum*
- 2 *Typha angustifolia*
- 1 *Typha latifolia*
- 4 *Ulmus rubra* (R)
- 15 *Utricularia gibba* (R)
- 20 *Utricularia subulata*
- 10 *Utricularia vulgaris* (R)
- 5 *Vaccinium angustifolium laevifolium*
- 5 *Vaccinium vacillans*
- * *Verbascum blattaria* (R)
- * *Verbascum thapsus*
- 4 *Verbena hastata*
- 4 *Verbena stricta*
- 5 *Verbena urticifolia* (R)
- 5 *Vernonia fasciculata*
- 5 *Vernonia missurica*
- * *Veronica arvensis* (R)
- 1 *Veronica peregrina*
- 10 *Veronica scutellata* (R)
- * *Veronica serpyllifolia*
- 6 *Veronicastrum virginicum*
- 7 *Vicia americana*
- 15 *Viola fimbriatula*
- 7 *Viola lanceolata*

- 10 *Viola pedata lineariloba*
- 7 *Viola sagittata*
- 3 *Viola sororia*
- 4 *Vitis riparia*
- * *Wisteria macrostachya* (R)
- * *Xanthium strumarium*
- 15 *Xyris torta*
- * *Zea mays* (R)
- 7 *Zizia aurea*

SURVEY UNIT XII: PINHOOK BOG

This Survey Unit occupies a little over 580 acres, about half of which have been highly disturbed or obliterated. It was divided into two discrete Survey Areas: the Bog proper and the surrounding uplands. In addition to numerous desultory visits over the years, I made formal surveys of these areas on June 15 and 23, July 7, September 16, and October 29, 1979; April 29 and August 5, 1987; and July 16, and August 29, 1988. I was accompanied at various times during these surveys by James Aldrich, Marlin Bowles, Ken Dritz, Norm Henderson, Craig Johnson, and Elizabeth Shimp.

The Survey Unit Map was superimposed to scale over a part of the U.S.G.S. La Porte West Quadrangle, N4130-W8645/7.5, 1969. The Natural Area Vegetation Map was drawn with the aid of two aerial photographic series: a black & white photograph (BFK-1V: 105) flown in September, 1958; a color stereo-pair set (79-117: 127-129) flown in May, 1979; a color stereo-pair (7:1-7:4) flown in May, 1984; and a black & white stereo-pair (12:1-12:6 and 13:1-13:6), flown in May, 1984.



When I first addressed Pinhook Bog in 1980, little had been written about it outside of the brief discussion by Lindsey (1966)--who considered it one of the finest bogs in the State. Also at that time, we had to stop by old Mr. Jackman's house and sign his register before we could begin our descent to the bog. Since then Mr. Jackman has gone west, his house is gone, and Doug Wilcox has launched a career writing about Pinhook Bog.

Doug Wilcox's interest first arose over the fact that highway salt from a nearby storage bin drained into the southern basin and impacted profoundly five acres or so of the 90-acre peatland (Wilcox, 1979). His studies have resulted in definitive works on the effects of salt intrusion on both the vegetation and water chemistry of the impacted area (Wilcox, 1986a and 1986b), and culminated in a complete discussion on the stratigraphy of the bog and the ontogeny of the floating mat (Wilcox & Simonin, 1988).

In addition, Andrus & Wilcox (1985) pointed out that Pinhook Bog is an extremely significant natural area in Indiana insofar as the genus *Sphagnum* is concerned. Of the 28 species known from the state, more than half of them are known from Pinhook Bog. They reported that *Sphagnum papillosum* Lindb., *S. pulchrum* (Braithw.) Warnst., and *S. riparium* Angstr. are known in Indiana only from here. They also noted that *Sphagnum bartlettianum* Warnst. is known in the interior United States only from Pinhook Bog, and that otherwise it is restricted to the Southeastern coastal plain. They noted also that *S. recurvum* P. Beauv. has coastal-plain affinities.

ANNOTATED LIST OF SPECIAL VEGETATION FLORISTIC ELEMENTS

Actaea rubra (Ait.) Willd. Rare, on a south-facing mesophytic ravine along the north edge of the bog, growing with *Aster cordifolius*, *Carpinus caroliniana* var. *virginiana*, *Carya cordiformis*, *Eupatorium purpureum*, *Fagus grandifolia*, *Hypericum punctatum*, *Lindera benzoin*, *Maianthemum canadense*, *Pinus strobus*, *Trillium grandiflorum*, *T. recurvatum*, and *Viola pensylvanica*.

Andromeda glaucophylla Link. This rare little shrub is occasional in the bog. Bowles *et al.* (1986a) mapped two of these populations, and noted the following associates: *Acer rubrum*, *Carex limosa*, *Chamaedaphne calyculata* var. *angustifolia*, *Drosera rotundifolia*, *Habenaria ciliaris*, *Larix laricina*, *Pinus strobus*, *Sarracenia purpurea*, *Vaccinium corymbosum*, and *V. oxycoccos*. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #6907, 23 JUN 1979; ca 7 mi S of Michigan City, off E side of Wozniak Rd, in the Pinhook Bog. MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Aristolochia serpentaria L. This rare, easily overlooked plant was previously unknown from La Porte County, Indiana until we, on the bluffs north of the bog, collected the following REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #6940, 6 JUL 1979; ca 7 mi S of Michigan City, in the woods along the N edge of Pinhook Bog. MOR.

Bartonia virginica (L.) BSP. This inconspicuous little plant is occasional in the Hydromesophytic Swamp Forest off the west side of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #6977, 16 SEP 1979; at Pinhook Bog, just off Wozniak Road, N of the

Indiana Toll Road. MOR. Parker (1936) considered local populations of this species to be boreal relicts.

Betula populifolia Marsh. There is one small tree in a conservative portion of the bog. I have not seen it, but the specimen has many leaves acuminate-caudate enough to allow one to suspect the native species. See the discussion of this species under the Miller Unit. REPRESENTATIVE SPECIMEN: *Hess et al.* #5973, 16 JUL 1984; *Pinhook Bog, E side of Wozniak Rd., approx 8 mi S of Michigan City; with Chamaedaphne, Vaccinium, Cladium* [sic!], *Drosera, Sarracenia, and Juncus*; 3-4 m tall, 10 cm dbh, one small tree, white bark, no flowering evident. MOR.

Bidens discoidea (T. & G.) Britt. This rare member of a common genus is not infrequent in the Hydromesophytic Swamp Forest off the west side of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #6972, 16 SEP 1979; *at Pinhook Bog, just off Wozniak Rd, N of the Indiana Toll Road*. MOR. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Botrychium dissectum Spreng. Both forms (*obliquum* and *dissectum*) of this fern are occasional on the south-facing slope along the north edge of the bog.

Brasenia schreberi Gmel. This species is in a large minerotrophic pool near the east side of Wozniak Road at the west edge of the bog, wherein it grows with *Utricularia vulgaris*, *Potamogeton natans*, and *Eleocharis smallii*.

Calla palustris L. This very rare plant is actually common in the ditch off the west side of Wozniak Road and occasional in the moats on the east side of the road. Bowles *et al.* (1985) mapped and described the densities of a couple of populations of this species. REPRESENTATIVE SPECIMEN: *Wilhelm* #6852, 15 JUN 1979; *ca 3 mi N of Pinhook, just N of the Indiana Toll Road, just off the W side of Wozniak Rd*. MOR. Welch (1935) considered local populations to be boreal relicts.

Calopogon pulchellus (Salisb.) R. Br. This very attractive orchid was rare to infrequent in the bog east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Hiebert* #21, 9 JUL 1981; *Indiana Dunes National Lakeshore, along Jackman boardwalk; NE SW Sec.35 T37N R4W; rare in peat mat of acid bog; with Highbush Blueberry and cranberry*. MOR.

Carex atherodes Spreng. This sedge grows with a relative, *Carex lacustris*, along the boardwalk in the minerotrophic moat at the western edge of the bog.

Carex canescens L. This very rare sedge is common along the boardwalk in the bog east of Wozniak Road. Most of the Pinhook material is referable to the var. *subloliacea* Laestad. rather than var. *disjuncta* Fern. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #6906, 23 JUN 1979; *ca 7 mi S of Michigan City, off E side of Wozniak Rd., in the Pinhook Bog*. MOR.

Carex careyana Torr. There is a healthy population of this extremely rare sedge of beech forests on a terrace at the base of the wooded slope along the north edge of the bog.

Carex chordorrhiza L. Deam collected a specimen of this species in Pinhook Bog years before he wrote his flora, but for some reason excluded it from La Porte County when he published his flora (Deam, 1940). Apparently the plant had not been seen in Pinhook Bog since, until its remarkable rediscovery there by Ken Dritz. It is actually frequent along the

boardwalk, but it is inconspicuous when not in fruit. Bowles *et al.* (1985) mapped a population of this species and noted the following associates: *Carex lasiocarpa* var. *americana*, *C. limosa*, *C. trisperma*, *Chamaedaphne calyculata* var. *angustifolia*, *Drosera intermedia*, *D. rotundifolia*, *Habenaria ciliaris*, *Larix laricina*, *Rhus vernix*, *Rhynchospora alba*, *Sarracenia purpurea*, *Vaccinium corymbosum*, *V. macrocarpon*, and *V. oxycoccos*. REPRESENTATIVE SPECIMEN: *Dritz #57, 17 MAY 1979; in the NW portion of Pinhook Bog, with Carex limosa, C. lasiocarpa americana, C. trisperma, Menyanthes trifoliata* var. *minor, Sarracenia purpurea, Rhus vernix, Larix laricina, Acer rubrum, Chamaedaphne calyculata* var. *angustifolia, Vaccinium corymbosum, Pyrus floribunda, Andromeda glaucophylla, Drosera rotundifolia, and Vaccinium oxycoccos.* MOR.

Carex digitalis Willd. This inconspicuous sedge is infrequent in the woods just north of the bog. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6941, 6 JUL 1979; ca 7 mi S of Michigan City, in the woods along the N edge of the Pinhook Bog.* MOR.

Carex intumescens Rudge This striking sedge is occasional in the Hydromesophytic Swamp Forest off the west side of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6981, 16 SEP 1979; at Pinhook Bog, just off Wozniak Road, N of the Indiana Toll Road.* MOR.

Carex leptoneuria Fern. This species is rare in mesophytic forest along the north edge of the bog.

Carex limosa L. This delicate little sedge is frequent in the *Sphagnum* mat of the bog east of Wozniak Road. Bowles *et al.* (1986a) mapped one of these populations and noted the following associates: *Chamaedaphne calyculata* var. *angustifolia, Drosera rotundifolia, Larix laricina, Sarracenia purpurea, Sphagnum* sp., *Vaccinium macrocarpon*, and *V. oxycoccos*. REPRESENTATIVE SPECIMEN: *Swink s.n., 18 JUN 1979; near Waterford, frequent in Pinhook Bog.* MOR.

Carex oligosperma Michx. This delicate running sedge is common in the more open portions of the bog east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6908, 23 JUN 1979; ca 7 mi S of Michigan City, off E side of Wozniak Rd, in the Pinhook Bog.* MOR.

Carex seorsa Howe This gracefully tufted sedge is common in the Hydromesophytic Swamp Forest west of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm #6886, 23 JUN 1979; ca 3 mi N of Pinhook, Just N of the Indiana Toll Road, in boggy woods off the W side of Wozniak Rd.* MOR. Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Carex trisperma Dew. This delicate sedge is common in the Hydromesophytic Swamp Forest west of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm #6893, 23 JUN 1979; ca 3 mi N of Pinhook, just N of the Indiana Toll Road, in boggy woods off the W side of Wozniak Rd.* MOR.

Carya glabra (Mill.) Sweet This very rare hickory is represented by a couple of trees along the fence row north of Pinhook Bog, east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6935, 6 JUL 1979; ca 7 mi S of Michigan City, in the woods along the N edge of Pinhook Bog.* MOR.

Carya ovalis (Wang.) Sarg. This hickory is very rare locally. There are a few trees growing with the preceding hickory, to which tree it is closely related and with which there are taxonomic difficulties. REPRESENTATIVE SPECIMEN: *Wilhelm & Ware #7001, 17 OCT 1979; ca 7 mi S of Michigan City, in the woods along the N edge of Pinhook Bog, ca 500 feet E of Wozniak Rd.* MOR.

Chamaedaphne calyculata var. **angustifolia** (Ait.) Rehd. This rare shrub is common in the bog east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Hiebert #435, 14 JUN 1984; mid-boardwalk area at Pinhook Bog, SE NW Sec.35 T37N R4W; common in flat bog of Sphagnum peat.* MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Conopholis americana (L.) Wallr. Plampin (1989b) reported that about ten plants were seen up-slope in Survey Area A on May 23, 1986.

Cyperus engelmannii Steud. This rare cyperus was unknown from the Unit until its discovery by Doug Wilcox during his studies of highway salt impact on the bog. It was originally identified as *C. ferruginescens* [probably at the bog, but not yet documented] and may voucher the plant referred to by that name in Wilcox (1982). REPRESENTATIVE SPECIMEN: *Wilcox #71, 7 SEP 1982; T37N R4W NW SE Sec.35; found in Pinhook Bog, PB 30-40, on impacted transect; water saturated peat, growing with Typha angustifolia and Onoclea sensibilis in salt impacted area.* INDU.

Cypripedium acaule Ait. This rare orchid occurs by the hundreds in the bog east of Wozniak Road. Along the boardwalk it grows commonly with *Carex canescens*, *C. chordorrhiza*, *C. limosa*, *C. trisperma*, *Chamaedaphne calyculata* var. *angustifolia*, *Drosera rotundifolia*, *Larix laricina*, *Pyrus floribunda*, *Rhus vernix*, *Rhynchospora alba*, *Sarracenia purpurea*, *Vaccinium atrococcum*, *V. macrocarpon*, and *V. corymbosum*. REPRESENTATIVE SPECIMEN: *Wilhelm #6854, 15 JUN 1979; ca 3 mi N of Pinhook, just N of the Indiana Toll Road, just E of Wozniak Rd, in the Tamarack bog.* MOR.

Desmodium rotundifolium DC. This rare plant is even locally rare at the edge of dry woods on the bluff north of Pinhook Bog, east of Wozniak Road; known from nowhere else in the Lakeshore.

Drosera intermedia Hayne This little sundew is less common than the next species, with which it grows. REPRESENTATIVE SPECIMEN: *Swink #486, 25 AUG 1951; Jackman's marsh, 4 mi S of Waterford, acid bog.* F. Peattie (1922) and Hooper (1934) both considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Drosera rotundifolia L. This little sundew is locally common, particularly in the more open portions of the bog east of Wozniak Road. McLaughlin (1932) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Dryopteris hexagonoptera (Michx.) Christens. This little fern is rare in the Mesophytic Forest south of Pinhook Bog, east of Wozniak Road.

Eriophorum spissum Fern. This species is known only on the basis of the following REPRESENTATIVE SPECIMEN: *Deam #46663, 30 MAY 1929; infrequent in a Tamarack-Chamaedaphne bog ca 7 mi W of La Porte.* IND. Known from nowhere else in the Lakeshore.

Eriophorum virginicum L. This interesting sedge is frequent in the more open areas of the bog east of Wozniak Road. Buhl's specimen of **Eriophorum angustifolium**, collected September 16, 1934 and deposited in the Field Museum Herbarium, is a mis-determination of this species. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6982, 16 SEP 1979; at Pinhook Bog, just off Wozniak Road, N of the Indiana Toll Road.* MOR. Known from nowhere else in the Lakeshore.

Galium lanceolatum Torr. This rare little plant is occasional in the Mesophytic Forest south of the bog, east of Wozniak Road.

Habenaria ciliaris (L.) R. Br. This magnificent orchid is common in the bog east of Wozniak Road. Bowles *et al.* (1986a) mapped three of these populations and recorded the following associates: **Acer rubrum**, **Andromeda glaucophylla**, **Carex chordorrhiza**, **C. limosa**, **Chamaedaphne calyculata** var. **angustifolia**, **Drosera rotundifolia**, **Larix laricina**, **Rhynchospora alba**, **Sarracenia purpurea**, **Sphagnum** sp., and **Vaccinium oxycoccos**. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6974, 16 SEP 1979; at Pinhook Bog, just off Wozniak Rd, N of the Indiana Toll Road.* MOR.

Isotria verticillata (Willd.) Raf. First collected by Lyon, there have been several recent sightings of this rare orchid in the southwestern portion of the bog, east of Wozniak Road, by Dr. Delano Arvin and others. With directions from Ray Grow and Ken Dritz, Marlin Bowles and Marcy DeMauro located and mapped 12 vegetative stems of this long-celebrated orchid (Bowles *et al.* 1986a); they noted the following associates: **Carex canescens**, **Cypripedium acaule**, **Gaylussacia baccata**, **Hypericum virginicum** var. **fraseri**, **Larix laricina**, **Nyssa sylvatica**, **Pyrus** sp., **Sarracenia purpurea**, **Sphagnum** sp., **Vaccinium corymbosum**, and **V. vacillans**. Bowles (1988) reported 12 sterile stems in 1987 as well, but in somewhat different positions. REPRESENTATIVE SPECIMEN: *Bowles & DeMauro #1243, 23 JUL 1985; T37N R4W SE NE Sec.35; growing 69 m E of Wozniak Rd. and 10 m W of large crescent shaped pond; forested bog; 12 plants in peat, all sterile.* INDU.

Juncus balticus var. **littoralis** Engelm. This species is occasional in the marginal waters and moats at the west end of the bog. Both Peattie (1922) and Hooper (1934) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Lathyrus venosus Muhl. This rare pea was discovered along the eastern road shoulder of Wozniak Road by Ken Dritz on June 17, 1984. It evidently is a remnant from the fire-starved savanna languishing along the western margin of the bog; it is growing with weedy associates.

Liparis loeselii (L.) Richard This twayblade is infrequent in the Red Maple swamps in the northwest portion of the bog.

Lonicera dioica L. There is a small population on a low, wooded, southeast-facing ridge along the north margin of the bog.

Lycopodium clavatum L. There is a small colony of this plant near the base of the south-facing bluff along the north edge of the bog; it is growing in a dry-mesic savanna with **Carex laxiflora**, **Corylus americana**, **Danthonia spicata**, **Osmorhiza claytoni**, **Vaccinium vacillans**, and **Viola sororia**.

Lycopodium inundatum L. This club moss is rare at Pinhook Bog and documented by the following REPRESENTATIVE SPECIMEN: *Klick #2756, 31 JUL 1987; Pinhook Bog; NE*

SW Sec.35 T37N R4W; rare in floating mat of peaty water saturated acid bog; occurring only in young floating mat. MOR. McLaughlin (1932) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Lycopodium lucidulum Michx. This species grows in somewhat more mesophytic woods just a little east of *L. clavatum*, and in the Hydromesophytic Swamp Forest in the northwest portion of the bog.

Maianthemum canadense Desf. var. **canadense** This little plant is common in the Hydromesophytic Swamp Forest on both sides of Wozniak Road, and in the beech forest along the north bluff of the bog. **Maianthemum canadense** var. **interius** is also present, but grows in areas where Red and White Oaks are dominant. Friesner (1936) suggested that local populations of this species are boreal relicts, while Welch (1935) entertained the idea that it might have entered this area by way of Ohio.

Malaxis unifolia Michx. The Lakeshore populations here and at Hoosier Prairie may well be the only living populations in the state, this orchid was unknown from La Porte County until we secured the following REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6882, 23 JUN 1979; ca 3 mi N of Pinhook, just N of the Indiana Toll Rd, in boggy woods off the W side of Wozniak Rd. Growing with Fraxinus americana, Carex crinita, Maianthemum canadense, Woodwardia virginica, Vaccinium atrococcum, Pyrus floribunda, Acer rubrum, Ilex verticillata, Nyssa sylvatica, Larix laricina, Nemopanthus mucronata, Rhus vernix, and Quercus rubra.* MOR. Sadly, all attempts to relocate this population have failed.

Menyanthes trifoliata var. **minor** Raf. This interesting species is frequent, particularly in the more open portions of the bog east of Wozniak Road.

Mitchella repens L. This tiny plant is common in the hummocky portions of the Hydromesophytic Swamp Forest east and west of Wozniak Road and in the dry-mesic and mesophytic forests along the north bluff of the bog.

Nemopanthus mucronata (L.) Trel. This is one of the most common shrubs in the bog east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm #6853, 15 JUN 1979; ca 3 mi N of Pinhook, just N of the Indiana Toll Rd, just E of Wozniak Rd, in the Tamarack bog.* MOR. Welch (1935) considered local populations of this species to be boreal relicts.

Panax quinquefolius L. This species is rare in the Mesophytic Forest south of the bog, east of Wozniak Road.

Panicum dichotomum L. This species is occasional on the low, heath-covered peninsula which protrudes in the northeastern quadrant of the bog.

Pinus strobus L. There are several fine specimens of this handsome tree in the bog east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilcox #21, 12 MAY 1982; T37N R4W SE NW Sec.35; end of Pinhook Bog boardwalk; associates: Larix laricina, Sphagnum spp., and Vaccinium corymbosum.* INDU. Welch (1935) considered local populations of this species to be boreal relicts.

Pogonia ophioglossoides (L.) Ker. This orchid is apparently rare in the bog east of Wozniak Road, just north of the boardwalk. REPRESENTATIVE SPECIMEN: *Wilhelm &*

Dritz #6900, 23 JUN 1979; ca 7 mi S of Michigan City, off E side of Wozniak Rd, in Pinhook Bog. MOR.

Polygonum arifolium var. **pubescens** (Keller) Fern. This species is infrequent in the pools and ditches around the bog. REPRESENTATIVE SPECIMEN: *Wilcox #63, 18 AUG 1982; scattered in PB-50, on salt impacted transect in Pinhook Bog, T37N R4W NW SE Sec.35; erect to trailing, with Typha angustifolia. MOR.*

Potentilla palustris (L.) Scop. This species is occasional to locally abundant in the bog east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Fox #70, 14 JUN 1984; Pinhook Bog, along side boardwalk where it begins off Wozniak Road; SE NW Sec.35 T37N R4W; collected in flat bog in standing water. MOR.*

Prunus pensylvanica L.f. The sole record for this species at Pinhook Bog is from Table 11 in Wilcox (1982). He reported one occurrence in a quadrat 110 meters into a 230-meter transect across the bog.

Rhus vernix L. This shrub to small tree is common in the bog east and west of Wozniak Road. REPRESENTATIVE SPECIMEN: *Hess #6034, 11 SEP 1985; Pinhook Bog, E side of Wozniak Road, approx. 8 mi S of Michigan City; with Chamaedaphne, Vaccinium, Cladium [sic!], Drosera, Sarracenia, and Juncus; common shrub, scattered in bog and on margin with Acer rubrum, Pyrus, Ilex, and with white fruits. MOR.*

Rhynchospora alba (L.) Vahl This distinctive beak rush is common in the bog east of Wozniak Road, particularly around the ponds and in the more open area. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6973, 16 SEP 1979; at Pinhook Bog, just off Wozniak Road, N of the Indiana Toll Road. MOR. McLaughlin (1932) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.*

Rubus pubescens Raf. This delicate little raspberry is frequent to common in the Hydromesophytic Swamp Forest west of Wozniak Road.

Salix pedicellaris var. **hypoglauca** Fern. This willow is apparently rare in the bog east of Wozniak Road, where there are a few plants in the vicinity of *Pogonia ophioglossoides* (which see).

Salix sericea Marsh. This willow is locally frequent along the moat in the northwest portion of the bog. REPRESENTATIVE SPECIMEN: *Wilhelm & Johnson #12654, 28 MAY 1985; north of Pinhook, east of Wozniak Road, on the property of the Indiana Dunes National Lakeshore, at Pinhook Bog. MOR.*

Sanicula trifoliata Bickn. This species is occasional in the Mesophytic Forest south of the bog, east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6902, 23 JUN 1979; ca 7 mi S of Michigan City, off E side of Wozniak Rd, in Sugar Maple woods at the S edge of Pinhook Bog. MOR.*

Sarracenia purpurea L. This interesting species is frequent in the bog east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz #6903, 23 JUN 1979; ca 7 mi S of Michigan City, off E side of Wozniak Rd, in the Pinhook Bog. MOR.*

Scheuchzeria palustris var. **americana** Fern. First collected in Pinhook Bog by Deam, it has eluded the eyes of botanists since. I and others have spent too long looking for this species over the last ten years, but without success. Yet, I see no reason why it should not

still be lurking here somewhere. REPRESENTATIVE SPECIMEN: *Deam* #47796, 15 SEP 1929; in *Sphagnum*, near the center of a Tamarack bog in Sec.35, 6 mi W of La Porte. IND.

***Smilax rotundifolia* L.** This species is occasional in the uplands around the bog, east of Wozniak Road.

***Utricularia geminiscapa* Benj.** For years we all, in our provincialism, have assumed that the dense masses of bladderwort in the deep pools of Pinhook Bog were *Utricularia vulgaris*. Then enters Anton Reznicek, from Michigan. On a brief tour to Pinhook Bog on August 21, 1988, he noted matter-of-factly that these plants represented a species heretofore unknown from Indiana and the Chicago Region. He pointed out the small, submerged cleistogamous flowers. Haber (1979) described the discovery of several new populations for this species in eastern Canada, and noted that in most cases it has been overlooked because of its obscure blooms and vegetative resemblance to *U. vulgaris*. Naturally, Marlin Bowles and I attended to the matter with all deliberate speed. We found what Tony described. In all of the deep pools we searched, we found *Utricularia geminiscapa*, mostly in association with *Nuphar advena*, but where it hugged the pool edges it also grew with *Chamaedaphne calyculata* var. *angustifolia*, *Drosera intermedia*, *Rhynchospora alba*, and *Xyris caroliniana*. In another location, it grows with *Chamaedaphne calyculata* var. *angustifolia*, *Decodon verticillatus*, *Drosera intermedia*, *Nuphar advena*, and *Typha angustifolia*. Interestingly, however, the bladderworts in the marginal pools and moats of the bog were *Utricularia vulgaris*! Haber (1979) documented the acid pH ranges preferred by *U. geminiscapa*. Wilcox & Simonin (1988) noted that the pH ranges for the *Schwingmoor* at Pinhook Bog average 3.68 and that these portions of the bog have mean specific conductance values of 64 μ S, with mean calcium concentrations of 2.7 mg l⁻¹. The moat is more minerotrophic, with mean pH levels at 5.45, mean specific conductance levels at 115 μ S, and mean calcium levels at 3.8 mg l⁻¹. Though Haber (1979) noted that pH levels in the bog pools he studied run a little higher than the mat itself, they rarely exceeded 5.0. In the Chicago Region, *U. vulgaris* is found routinely in clear alkaline waters. Tony, since he did not have a formal collecting agreement with the Indiana Dunes National Lakeshore, deferred to local botanists to document his discovery. REPRESENTATIVE SPECIMEN: *Wilhelm & Bowles* #16367, 29 AUG 1988; at Pinhook Bog, in the deep pool at the end of the boardwalk, with *Nuphar advena*. MOR. Bowles (1989) mapped some of the locations where we saw this bladderwort. Haber (1979) cited a dozen or so interior locations for this plant, but listed its general range and the North Atlantic coastal plain. Indeed, Peattie (1922) considered interior populations of this species to have ancestral affinities to the Atlantic coastal plain.

***Vaccinium atrococcum* (Gray) Heller** This species, often mistaken by *gestalt* for its close relative *Vaccinium corymbosum* (which is also present and common), is frequent both in the bog and in the adjacent uplands. REPRESENTATIVE SPECIMEN: *Hess* #19, 12 MAY 1982; frequent in water saturated peat along Pinhook Bog, boardwalk, T37N R4W; with *Sphagnum*, *Pyrus melanocarpa*, *Sarracenia purpurea*, and *Larix laricina*. MOR.

***Vaccinium macrocarpon* Ait.** This species is far less common than the next one on the list, and I was remiss in not having taken a specimen to carry this through time. The taxonomic difficulties inherent in these two taxa really demand that vouchers be preserved. REPRESENTATIVE SPECIMEN: *Wilcox* #49, 5 OCT 1982; recolonizing salt impacted area, PB-90, a transect in Pinhook Bog; T37N R4W NW SE Sec.35; locally common, creeping plant, in saturated peat with *Vaccinium oxycoccos*, *Typha angustifolia*, and *Rhus vernix*. MOR.

Trefz (1935) considered local populations of this species to be boreal relicts; McLaughlin (1932), however, regarded it as having affinities to the Atlantic coastal plain.

Vaccinium oxycoccos L. This species is common nearly throughout the bog east of Wozniak Road. Bowles *et al.* (1986a) mapped a population of this species and recorded the following associates: *Acer rubrum*, *Chamaedaphne calyculata* var. *angustifolia*, *Drosera rotundifolia*, *Larix laricina*, *Pinus strobus*, *Sarracenia purpurea*, *Sphagnum* sp., *Vaccinium corymbosum*, and *V. macrocarpon*. REPRESENTATIVE SPECIMEN: *Wilhelm & Dritz* #6979, 16 SEP 1979; at Pinhook Bog, just off Wozniak Rd, N of the Indiana Toll Rd. MOR. Parker (1936) considered local populations of this species to be boreal relicts.

Viola pallens (Banks) Brainerd This little violet is frequent in the Hydromesophytic Swamp Forest west of Wozniak Road and in the northwest portion of the bog east of Wozniak Road. REPRESENTATIVE SPECIMEN: *Kjellmark* #87, 4 MAY 1988; locally frequent in small patches on saturated peat in bog somewhere in Pinhook Bog; approx. 0.25 mi SW of end of boardwalk at a compass bearing of 140 degrees; T37N R4W; associates: *Acer rubrum*, *Pinus strobus*, *Vaccinium* sp., *Chamaedaphne calyculata* var. *angustifolia*, *Sarracenia*. MOR.

Woodwardia virginica (L.) Sm. This rare fern is frequent in Pinhook Bog, on both sides of Wozniak Road. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Xyris caroliniana Walt. This species is not uncommon in open areas of the bog, but was uncollected until 1980, as documented by the following REPRESENTATIVE SPECIMEN: *Dritz* #116, 19 JUL 1980; local, NW portion of Pinhook Bog, N side of boardwalk, with *Drosera intermedia*, *Sarracenia purpurea*, *Vaccinium oxycoccos*, *Larix laricina*, *Rhynchospora alba*, *Hypericum virginicum* (s.l.), *Pyrus floribunda*, *Carex limosa*, and *Chamaedaphne calyculata* var. *angustifolia*. MOR. Bowles *et al.* (1985) recorded thirteen small colonies along the 120 m of boardwalk, two of them around the open pond at the end of the boardwalk, the others in "cyperoid openings" south of the boardwalk. It grows along the north side of the boardwalk as well. Peattie (1922) considered local populations of this species to have ancestral affinities to the Atlantic coastal plain.

Summary

Survey Unit XII has been shown to provide the habitat for at least 69 of the Indiana Dunes National Lakeshore SPECIAL VEGETATION floristic elements. Of these, I have seen all but a couple, and I have every reason to suspect that they are still extant.

Sixteen percent of the SPECIAL VEGETATION floristic elements were considered by Peattie (1922), McLaughlin (1932), and Hooper (1934) to have ancestral affinities to the Atlantic coastal plain, while Welch (1935), Parker (1936), and Friesner (1936) considered nine (thirteen percent) to be boreal relicts.

A little more than twenty-two percent (15) of the SPECIAL VEGETATION floristic elements known from this Survey Unit are found nowhere else in the Lakeshore. These include: *Andromeda glaucophylla*, *Carex careyana*, *C. chordorrhiza*, *Carya glabra*, *C. ovalis*, *Desmodium rotundifolium*, *Eriophorum spissum*, *E. virginicum*, *Isotria verticillata*,

Rhynchospora alba, *Sanicula trifoliata*, *Utricularia geminiscapa*, *Vaccinium oxycoccos*,¹ and *Xyris caroliniana*.

NATURAL AREA ASSESSMENT

Survey Unit XII consists of a large 110-acre Bog, about half of which is floating peat mat or *Schwingmoor* (Wilcox & Simonin, 1988). Along the margins of the bog basin, there are small ravines and narrow slopes of Mesophytic Forest and Savanna Complex. Some of the more grounded mat portions of the Bog can be described as Swamp Complex; there are even incipient Hydromesophytic Swamp Forests with young Beech trees along with Red Maples.

The laudations of the Bog at Pinhook have been expressed aptly by several authors, as is pointed out by Wilcox (1979). Perhaps the only blemish of profound significance is the salt intrusion episode which occurred from 1963 to 1972. This intrusion devastated about 5 acres of the Bog. Homogeneous stands of cattail responded to the disturbance and replaced the conservative bog species. The only reminder of what once was are the dead standing tamarack trees which evoke the simple, stark, bombed-out images of Borchert's *Nachkriegszeit* poetry. According to Wilcox (1986a), "*Typha angustifolia* was found as far as 130 m into the bog along the transect and was by far the most prevalent cattail species. Other prominent plant species of the impacted area were *Cephalanthus occidentalis*, *Onoclea sensibilis*, *Dryopteris thelypteris* var. *pubescens*, *Hypericum virginicum*, *Scirpus cyperinus*, *Pilea pumila*, *Panicum implicatum*, and *Solidago graminifolia* var. *nuttallii*. These and other impacted area plants were not common elsewhere in the bog, and if present at all on the unimpacted transect, they were within or adjacent to the moat." Wilcox (1982) measured exaggerated chloride levels and elevated specific conductance nearly 200 meters from the point of intrusion, and Wilcox (1986b) noted that it is "... apparent ... that the salt load from the road-salt storage operation had not dissipated by 1981, but remained held within the peat mat, showing a clearly defined gradient from south to north."

Though Wilcox (1986a) describes a secondary succession, particularly in more remote portions of the impact area, his assessment on the fate of this area remains pessimistic:

"Although the native plant community has shown favorable responses to the declining salt concentrations, there appear to be some limitations to the extent of recovery. The failure of alkalinity and pH to show significant yearly reductions in much of the impacted area does not bode well for flourishing *Sphagnum* recolonization. Even though *Sphagnum* can lower pH through cation exchange, buffered waters in the impacted zone will not allow that to occur very rapidly."

The Pinhook Bog natural area totals only 160 acres, only 45 of which comprise the buffer between the peatland and the 380 acres of highly disturbed upland in its watershed. These 45 acres are comprised of timbered slopes of Mesophytic Forest and the Savanna Complex. For the most part, these slopes are relatively poor in species quality and diversity, though certain portions do provide the habitat for several SPECIAL VEGETATION floristic elements, and there are small remnant areas along the north side which are really quite impressive. On April 29, 1987, I noted a 40" Red Oak there, and Pitcher (1987b) commented that there is the

¹See, however, the comments in Survey Unit V under *Vaccinium macrocarpon*.

"biggest oak [she's] ever seen north of Pinhook in Park woods." I also noted a 36" White Oak, a 43" Tulip Tree, and a 48" Beech.

These timbers and their relatively rich ground covers occupy a very narrow, restricted band along the sloping rim of the Bog, and by doing so, they perform a valuable function as buffer for the real heart of the Survey Unit--the Bog. Without such buffers, the silts from eroding uplands would flow freely into the Bog carrying with them excessive quantities of calcium and magnesium bicarbonates. The natural moat itself is a small example of this and appears to have been enlarged in recent years in areas near Wozniak Road. The little "lake" in the northeast corner of the Bog is surrounded by devastated slopes and in direct contact with erosive uplands. It is completely without bog vegetation. The destruction of buffers, the elimination of their attendant SPECIAL VEGETATION floristic elements aside, would sound the ecological death knell for the Bog itself. The impact on water chemistry described by Wilcox is a model or foreshadowing of what might happen with an unstanched flow of erosional sediment and the influx of mineral cations and carbonates from the surrounding till.

The Swamp Complex west of Wozniak Road, apparently largely ignored by botanists in the past, is a very valuable little Natural Area in its own right. Specifically, it can be classified as a form of Hydromesophytic Swamp Forest. This small area yielded several county records during the survey. The decision to include this small area, with its attendant buffers, as an appendage to the Survey Unit, was an eminently wise one. Inside the moat in the northwest portion of the Bog there is also a young Swamp Forest in development.

The data used in assessing the relative Natural Area significance and integrity of each Survey Area, and the Survey Unit as a whole, are provided in Table XII. The data include a presence list of all the floristic elements (SPECIAL or otherwise) recorded from each of the two Survey Areas, along with the numerical rating coefficient as given by Swink & Wilhelm (1979). Introduced taxa are preceded by an asterisk (*) rather than a rating coefficient, and do not enter directly into the derivations of the Natural Area Indices; those species listed without a tabular entry under Survey Area A or B were reported by Klick *et al.* (1989). The "R" symbol (rather than an "X" symbol), when used in Table XII, indicates a record other than one to which I personally can attest--usually a report on the basis of some earlier record, such as a herbarium specimen or personal communication. Following Table XII is a summary which calculates the various Natural Area Indices for each Survey Area, and for the Survey Unit as a whole.

TABLE XII: Summary of species upon which are calculated the various Natural Area Indices for each Survey Area, and for the Survey Unit as a whole.

A	B	
x		0 <i>Acalypha rhomboidea</i>
x	x	7 <i>Acer rubrum</i>
x		5 <i>Acer saccharum</i>
		* <i>Achillea millefolium</i>
x		7 <i>Actaea pachypoda</i>
x		10 <i>Actaea rubra</i>
x		2 <i>Agrimonia gryposepala</i>
x		8 <i>Agrimonia parviflora</i>
		* <i>Agropyron repens</i>
x		1 <i>Agrostis hyemalis</i>

A B

x		1	<i>Agrostis perennans</i>
	x	4	<i>Alisma subcordatum</i>
	x	4	<i>Alisma triviale</i>
x		7	<i>Allium tricoccum</i>
x		6	<i>Allium tricoccum burdickii</i>
	R	6	<i>Alopecurus aequalis</i>
x		0	<i>Ambrosia artemisiifolia elatior</i>
x		8	<i>Amelanchier arborea</i>
x	x	8	<i>Amelanchier laevis</i>
	x	20	<i>Andromeda glaucophylla</i>
x		5	<i>Andropogon scoparius</i>
x		7	<i>Anemone quinquefolia interior</i>
x		7	<i>Anemonella thalictroides</i>
x		6	<i>Antennaria neglecta</i>
x		6	<i>Antennaria plantaginifolia</i>
x		6	<i>Apios americana</i>
		*	<i>Arabidopsis thaliana</i>
x		8	<i>Aralia nudicaulis</i>
x		5	<i>Arisaema atrorubens</i>
x		15	<i>Aristolochia serpentaria</i>
x		5	<i>Asarum canadense</i>
x		10	<i>Asclepias amplexicaulis</i>
	x	4	<i>Asclepias incarnata</i>
x		0	<i>Asclepias syriaca</i>
x		10	<i>Asclepias tuberosa</i>
x		6	<i>Asplenium platyneuron</i>
x		5	<i>Aster cordifolius</i>
x		4	<i>Aster lateriflorus</i>
x		10	<i>Aster macrophyllus</i>
		1	<i>Aster pilosus</i>
	x	5	<i>Aster puniceus firmus</i>
x		5	<i>Aster sagittifolius</i>
x		2	<i>Aster sagittifolius drummondii</i>
x		6	<i>Athyrium filix-femina michauxii</i>
		*	<i>Barbarea vulgaris</i>
	x	15	<i>Bartonia virginica</i>
	x	10	<i>Betula populifolia</i>
	x	5	<i>Bidens comosa</i>
	x	20	<i>Bidens discoidea</i>
	x	8	<i>Bidens coronata</i>
	x	1	<i>Bidens frondosa</i>
x		7	<i>Blephilia hirsuta</i>
x		2	<i>Boehmeria cylindrica</i>
x		15	<i>Botrychium dissectum</i>
x		6	<i>Botrychium virginianum</i>
	x	15	<i>Brasenia schreberi</i>
		*	<i>Bromus inermis</i>
x		5	<i>Bromus purgans</i>
		*	<i>Bromus tectorum</i>
	x	3	<i>Calamagrostis canadensis</i>
x		15	<i>Calla palustris</i>
x		15	<i>Calopogon pulchellus</i>

A	B
x	5 <i>Caltha palustris</i>
	* <i>Capsella bursa-pastoris</i>
x	5 <i>Cardamine bulbosa</i>
x	8 <i>Carex albolutescens</i>
x	10 <i>Carex albursina</i>
	x 15 <i>Carex atherodes</i>
	x 15 <i>Carex canescens</i>
x	15 <i>Carex careyana</i>
	x 20 <i>Carex chordorrhiza</i>
	x 5 <i>Carex comosa</i>
x	1 <i>Carex convoluta</i>
	x 10 <i>Carex crinita</i>
x	20 <i>Carex digitalis</i>
x	10 <i>Carex gracillima</i>
	x 7 <i>Carex grayii</i>
x	x 15 <i>Carex intumescens</i>
x	5 <i>Carex jamesii</i>
	x 10 <i>Carex lacustris</i>
	x 4 <i>Carex lanuginosa</i>
	x 8 <i>Carex lasiocarpa americana</i>
x	1 <i>Carex laxiflora</i>
x	20 <i>Carex leptonervia</i>
	x 10 <i>Carex limosa</i>
	x 8 <i>Carex lurida</i>
	x 15 <i>Carex oligosperma</i>
x	5 <i>Carex pennsylvanica</i>
x	1 <i>Carex rosea</i>
	x 10 <i>Carex rostrata utriculata</i>
	x 20 <i>Carex seorsa</i>
x	3 <i>Carex sparganioides</i>
	x 8 <i>Carex sterilis</i>
	x 2 <i>Carex stipata</i>
	x 8 <i>Carex suberecta</i>
x	10 <i>Carex swanii</i>
	x 3 <i>Carex tribuloides</i>
	x 15 <i>Carex trisperma</i>
x	8 <i>Carpinus caroliniana virginiana</i>
x	7 <i>Carya cordiformis</i>
x	15 <i>Carya glabra</i>
x	15 <i>Carya ovalis</i>
x	5 <i>Carya ovata</i>
x	8 <i>Caulophyllum thalictroides</i>
x	6 <i>Celastrus scandens</i>
x	3 <i>Celtis occidentalis</i>
	x 7 <i>Cephalanthus occidentalis</i>
	* <i>Cerastium vulgatum</i>
	x 15 <i>Chamaedaphne calyculata angustifolia</i>
x	8 <i>Chelone glabra</i>
	* <i>Chenopodium album</i>
x	* <i>Chrysanthemum leucanthemum pinnatifidum</i>
	* <i>Cichorium intybus</i>
	x 8 <i>Cicuta bulbifera</i>

A	B	
	x	6 <i>Cicuta maculata</i>
x		0 <i>Circaea quadrisulcata canadensis</i>
x		* <i>Cirsium arvense</i>
x		* <i>Cirsium vulgare</i>
x		2 <i>Claytonia virginica</i>
x		15 <i>Conopholis americana</i>
		* <i>Convolvulus arvensis</i>
x		9 <i>Cornus alternifolia</i>
	x	10 <i>Cornus florida</i>
x		5 <i>Cornus obliqua</i>
x		1 <i>Cornus racemosa</i>
		* <i>Coronilla varia</i>
x		2 <i>Corylus americana</i>
x		5 <i>Crataegus macrosperma</i>
x		6 <i>Crataegus pruinosa</i>
x		0 <i>Cryptotaenia canadensis</i>
x	x	4 <i>Cuscuta gronovii</i>
	x	15 <i>Cyperus engelmannii</i>
	x	3 <i>Cyperus erythrorhizos</i>
	x	4 <i>Cyperus rivularis</i>
	x	20 <i>Cypripedium acaule</i>
x		6 <i>Cystopteris fragilis</i>
x		* <i>Dactylis glomerata</i>
x		5 <i>Danthonia spicata</i>
		* <i>Daucus carota</i>
	x	8 <i>Decodon verticillatus</i>
x		5 <i>Dentaria laciniata</i>
x		10 <i>Desmodium marilandicum</i>
x		10 <i>Desmodium nudiflorum</i>
x		5 <i>Desmodium paniculatum</i>
x		15 <i>Desmodium rotundifolium</i>
		* <i>Dianthus armeria</i>
x		8 <i>Dicentra canadensis</i>
x		6 <i>Dicentra cucullaria</i>
x		5 <i>Dioscorea villosa</i>
		* <i>Dipsacus sylvestris</i>
	x	15 <i>Drosera intermedia</i>
	x	15 <i>Drosera rotundifolia</i>
	x	10 <i>Dryopteris cristata</i>
x		15 <i>Dryopteris hexagonoptera</i>
x		6 <i>Dryopteris spinulosa</i>
x		10 <i>Dryopteris spinulosa intermedia</i>
	x	6 <i>Dryopteris thelypteris pubescens</i>
x		10 <i>Dulichium arundinaceum</i>
x		0 <i>Echinochloa crusgalli</i>
		* <i>Elaeagnus umbellata</i>
	x	5 <i>Eleocharis obtusa</i>
	x	8 <i>Eleocharis olivacea</i>
	x	5 <i>Eleocharis smallii</i>
x		4 <i>Elymus virginicus</i>
x		10 <i>Epifagus virginiana</i>
	x	3 <i>Epilobium coloratum</i>

A	B	
x		0 Equisetum arvense
	x	7 Equisetum fluviatile
x		* Eragrostis megastachya
x		* Eragrostis poaeoides
	x	2 Erechtites hieracifolia
x		10 Erigenia bulbosa
x		1 Erigeron annuus
x		3 Erigeron strigosus
	R	20 Eriophorum spissum
	x	20 Eriophorum virginicum
x		8 Erythronium americanum
x		7 Euonymus obovatus
	x	5 Eupatorium maculatum
	x	6 Eupatorium perfoliatum
x		7 Eupatorium purpureum
x		4 Eupatorium rugosum
x		2 Euphorbia corollata
		* Euphorbia maculata
x		10 Fagus grandifolia
x		* Festuca elatior
x		5 Festuca obtusa
		* Festuca rubra
x		8 Floerkea proserpinacoides
x		1 Fragaria virginiana
x	x	5 Fraxinus americana
	x	8 Fraxinus nigra
x		2 Fraxinus pennsylvanica subintegerrima
x		1 Galium aparine
x		7 Galium circaezans hypomalacum
x		4 Galium concinnum
x		15 Galium lanceolatum
	x	5 Galium obtusum
	x	8 Galium tinctorium
x		5 Galium triflorum
x		10 Gaultheria procumbens
x	x	9 Gaylussacia baccata
x		4 Geranium maculatum
x		10 Gerardia flava
x		0 Geum canadense
x		* Glechoma hederacea
	x	10 Glyceria canadensis
	x	8 Glyceria septentrionalis
	x	4 Glyceria striata
	x	20 Habenaria ciliaris
	R	10 Habenaria lacera
x		8 Hamamelis virginiana
x		5 Helianthus decapetalus
x		* Hemerocallis fulva
x		6 Hepatica acutiloba
		* Hieracium aurantiacum
x		6 Hieracium gronovii
		* Hieracium pratense

A B

		* <i>Hordeum jubatum</i>
x		8 <i>Hydrophyllum appendiculatum</i>
x		5 <i>Hydrophyllum virginianum</i>
	x	8 <i>Hypericum canadense</i>
		* <i>Hypericum perforatum</i>
x		4 <i>Hypericum punctatum</i>
	x	10 <i>Hypericum virginicum</i>
x		5 <i>Hystrix patula</i>
	x	9 <i>Ilex verticillata</i>
x	x	3 <i>Impatiens capensis</i>
x		6 <i>Impatiens pallida</i>
		* <i>Iris germanica</i>
	x	5 <i>Iris virginica shrevei</i>
x		8 <i>Isopyrum biternatum</i>
	R	20 <i>Isotria verticillata</i>
x		5 <i>Juglans nigra</i>
	x	9 <i>Juncus alpinus rariflorus</i>
	x	8 <i>Juncus balticus littoralis</i>
	x	7 <i>Juncus canadensis</i>
	x	7 <i>Juncus effusus solutus</i>
x		7 <i>Krigia biflora</i>
	x	10 <i>Larix laricina</i>
x		8 <i>Lathyrus venosus</i>
	x	5 <i>Leersia oryzoides</i>
x		7 <i>Leersia virginica</i>
	x	5 <i>Lemna minor</i>
		* <i>Lepidium campestre</i>
x		6 <i>Lespedeza hirta</i>
x	x	7 <i>Lindera benzoin</i>
x		8 <i>Liparis lilifolia</i>
	x	7 <i>Liparis loeselii</i>
x	x	10 <i>Liriodendron tulipifera</i>
x		4 <i>Lobelia inflata</i>
x		15 <i>Lonicera dioica</i>
x		* <i>Lonicera japonica</i>
x		* <i>Lotus corniculatus</i>
	x	5 <i>Ludwigia palustris americana</i>
x		5 <i>Luzula multiflora</i>
x		* <i>Lychnis alba</i>
x		15 <i>Lycopodium clavatum</i>
x		10 <i>Lycopodium complanatum flabelliforme</i>
	x	15 <i>Lycopodium inundatum</i>
x	x	15 <i>Lycopodium lucidulum</i>
	x	10 <i>Lycopus rubellus</i>
	x	6 <i>Lycopus uniflorus</i>
	x	9 <i>Lysimachia thyrsiflora</i>
		* <i>Maclura pomifera</i>
x	x	15 <i>Maianthemum canadense</i>
x		10 <i>Maianthemum canadense interius</i>
	x	20 <i>Malaxis unifolia</i>
x		10 <i>Medeola virginiana</i>
x		* <i>Melilotus alba</i>

A	B	
x		* Melilotus officinalis
	x	15 Menyanthes trifoliata minor
x	x	15 Mitchella repens
		* Morus alba
		* Narcissus pseudo-narcissus
	x	15 Nemopanthus mucronata
	x	7 Nuphar advena
	x	7 Nymphaea tuberosa
	x	8 Nyssa sylvatica
	x	8 Onoclea sensibilis
x		3 Osmorhiza claytoni
	x	6 Osmunda cinnamomea
	x	8 Osmunda regalis spectabilis
x		5 Ostrya virginiana
x		0 Oxalis europaea
	x	0 Oxalis stricta
x		15 Panax quinquefolius
x		1 Panicum capillare
x		10 Panicum depauperatum
x		0 Panicum dichotomiflorum
x		20 Panicum dichotomum
x		3 Panicum implicatum
x		7 Panicum latifolium
x		6 Panicum meridionale
x		4 Parietaria pensylvanica
x		2 Parthenocissus quinquefolia
	x	5 Penthorum sedoides
	x	0 Phalaris arundinacea
		* Phleum pratense
x		5 Phlox divaricata
x		2 Phytolacca americana
	x	5 Pilea pumila
	x	20 Pinus strobus
		* Plantago lanceolata
		* Plantago major
x		0 Plantago rugelii
x		* Poa compressa
		* Poa pratensis
x		5 Podophyllum peltatum
	x	15 Pogonia ophioglossoides
x		7 Polygonatum pubescens
	x	15 Polygonum arifolium pubescens
	x	5 Polygonum coccineum
	x	7 Polygonum hydropiperoides
	x	0 Polygonum pensylvanicum laevigatum
x		* Polygonum persicaria
	x	6 Polygonum punctatum
	x	10 Polygonum sagittatum
x		10 Polystichum acrostichoides
x		* Populus alba
x		2 Populus deltoides
x		6 Populus grandidentata

A B

x		4	<i>Populus tremuloides</i>
	x	7	<i>Potamogeton natans</i>
x		0	<i>Potentilla norvegica</i>
	x	15	<i>Potentilla palustris</i>
		*	<i>Potentilla recta</i>
x		4	<i>Potentilla simplex</i>
x		5	<i>Prenanthes alba</i>
x		10	<i>Prenanthes altissima</i>
x		0	<i>Prunella vulgaris lanceolata</i>
	R	5	<i>Prunus pensylvanica</i>
x		1	<i>Prunus serotina</i>
x		1	<i>Prunus virginiana</i>
x		5	<i>Pteridium aquilinum latiusculum</i>
		*	<i>Puccinellia distans</i>
	x	9	<i>Pyrus floribunda</i>
x		2	<i>Pyrus ioensis</i>
		*	<i>Pyrus malus</i>
	x	7	<i>Pyrus melanocarpa</i>
x		4	<i>Quercus alba</i>
x	x	7	<i>Quercus rubra</i>
x		6	<i>Quercus velutina</i>
x		0	<i>Ranunculus abortivus</i>
	x	7	<i>Ranunculus flabellaris</i>
	x	6	<i>Ranunculus sceleratus</i>
	x	*	<i>Rhamnus frangula</i>
x		6	<i>Rhus copallina latifolia</i>
x		1	<i>Rhus radicans</i>
x		3	<i>Rhus typhina</i>
	x	15	<i>Rhus vernix</i>
	x	15	<i>Rhynchospora alba</i>
x		5	<i>Ribes cynosbati</i>
x		5	<i>Ribes missouriense</i>
		*	<i>Robinia pseudo-acacia</i>
	x	5	<i>Rorippa islandica fernaldiana</i>
x		5	<i>Rosa blanda</i>
x		*	<i>Rosa multiflora</i>
	x	9	<i>Rosa palustris</i>
	x	9	<i>Rubus hispidus obovalis</i>
	x	7	<i>Rubus idaeus strigosus</i>
x		2	<i>Rubus occidentalis</i>
	x	15	<i>Rubus pubescens</i>
		*	<i>Rumex acetosella</i>
	x	2	<i>Rumex altissimus</i>
		*	<i>Rumex crispus</i>
x		*	<i>Rumex obtusifolius</i>
	x	6	<i>Rumex verticillatus</i>
	x	4	<i>Sagittaria latifolia</i>
	x	2	<i>Salix discolor</i>
x		*	<i>Salix fragilis</i>
	x	4	<i>Salix nigra</i>
	x	15	<i>Salix pedicellaris hypoglauca</i>
	x	5	<i>Salix rigida</i>

A	B
x	15 <i>Salix sericea</i>
x	1 <i>Sambucus canadensis</i>
x	10 <i>Sambucus pubens</i>
x	6 <i>Sanguinaria canadensis</i>
x	9 <i>Sanicula canadensis</i>
x	15 <i>Sanicula trifoliata</i>
x	* <i>Saponaria officinalis</i>
x	15 <i>Sarracenia purpurea</i>
x	6 <i>Sassafras albidum</i>
x	10 <i>Saururus cernuus</i>
R	20 <i>Scheuchzeria palustris americana</i>
x	6 <i>Scirpus cyperinus</i>
x	6 <i>Scirpus fluviatilis</i>
x	4 <i>Scrophularia marilandica</i>
x	5 <i>Scutellaria lateriflora</i>
x	7 <i>Senecio aureus</i>
x	* <i>Setaria glauca</i>
x	8 <i>Seymeria macrophylla</i>
x	7 <i>Sium suave</i>
x	2 <i>Smilacina racemosa</i>
x	5 <i>Smilacina stellata</i>
x	3 <i>Smilax ecirrhata</i>
x	15 <i>Smilax rotundifolia</i>
	* <i>Solanum carolinense</i>
x	* <i>Solanum dulcamara</i>
x	1 <i>Solidago altissima</i>
x	7 <i>Solidago caesia</i>
x	6 <i>Solidago flexicaulis</i>
x	4 <i>Solidago graminifolia media</i>
x	3 <i>Solidago graminifolia nuttallii</i>
x	5 <i>Solidago juncea</i>
x	4 <i>Solidago nemoralis</i>
x	6 <i>Solidago rugosa</i>
x	9 <i>Solidago uliginosa</i>
x	5 <i>Solidago ulmifolia</i>
	* <i>Sonchus asper</i>
	* <i>Sonchus oleraceus</i>
x	* <i>Sonchus uliginosus</i>
	* <i>Spergularia media</i>
x	7 <i>Spiraea alba</i>
x	9 <i>Spiraea tomentosa rosea</i>
x	7 <i>Spiranthes cernua</i>
x	7 <i>Staphylea trifolia</i>
x	* <i>Stellaria media</i>
x	* <i>Taraxacum officinale</i>
x	3 <i>Teucrium canadense</i>
x	5 <i>Thalictrum dioicum</i>
x	5 <i>Tilia americana</i>
x	2 <i>Tovara virginiana</i>
	* <i>Tragopogon pratensis</i>
	* <i>Trifolium dubium</i>
x	* <i>Trifolium hybridum</i>

A B

		* <i>Trifolium pratense</i>
		* <i>Trifolium repens</i>
x	6	<i>Trillium flexipes</i>
x	8	<i>Trillium grandiflorum</i>
x	5	<i>Trillium recurvatum</i>
	x	2 <i>Typha angustifolia</i>
	x	1 <i>Typha latifolia</i>
x	3	<i>Ulmus americana</i>
x	*	<i>Ulmus pumila</i>
x	4	<i>Ulmus rubra</i>
	x	2 <i>Urtica procera</i>
	x	20 <i>Utricularia geminiscapa</i>
	x	10 <i>Utricularia vulgaris</i>
x	7	<i>Uvularia grandiflora</i>
x	5	<i>Vaccinium angustifolium laevifolium</i>
	x	15 <i>Vaccinium atrococcum</i>
	x	8 <i>Vaccinium corymbosum</i>
	x	15 <i>Vaccinium macrocarpon</i>
	x	15 <i>Vaccinium oxycoccos</i>
x	5	<i>Vaccinium vacillans</i>
	*	<i>Verbascum thapsus</i>
x	5	<i>Verbena urticifolia</i>
x	*	<i>Veronica officinalis</i>
x	9	<i>Viburnum acerifolium</i>
x	5	<i>Viburnum lentago</i>
x	4	<i>Viburnum prunifolium</i>
	*	<i>Vinca minor</i>
x	2	<i>Viola affinis</i>
	x	15 <i>Viola pallens</i>
x	0	<i>Viola papilionacea</i>
x	5	<i>Viola pennsylvanica</i>
x	10	<i>Viola pubescens</i>
x	3	<i>Viola sororia</i>
x	10	<i>Vitis aestivalis</i>
x	4	<i>Vitis riparia</i>
	x	15 <i>Woodwardia virginica</i>
	x	20 <i>Xyris caroliniana</i>

Summary

Survey Area A includes the areas on the Natural Area Vegetation Map (which see) mapped as Mesophytic Forest and Savanna Complex. This area is essentially equivalent to the exposed slopes of the old morainal kettle-hole depression, which depression now is occupied by the Bog itself. The adjacent flat or merely gently sloping uplands have been cultivated or "improved" right up to the edge of the depression. The steeper slopes, which are in the majority, retain enough synecological integrity to rate as significant Natural Area, and they certainly serve as important buffer for the Bog. On these slopes I catalogued 227 native floristic elements with a Mean Quality of 6.10 representing a Natural Area Index of 92.

Survey Area B is one of the truly remarkable Natural Areas, not only for the Lakeshore, but for the entire Chicago Region. Consisting solely of either Bog or Swamp, the opportunities

for surficial topographic relief are obviously quite limited. Consequently, the diversity is predictably retarded. I catalogued only 167 native floristic elements in the entire Bog and Swamp combined, but the resultant Mean Quality of 9.17 remains the highest I have ever recorded; it represents a Natural Area Index of 119!

The Survey Unit as a whole has a Mean Quality of 7.35; though still quite high, it is a substantial drop in the overall measured quality when compared to the Bog alone. The inclusion of the buffer slopes, however, adds an additional 219 reasonably high-quality native floristic elements to the overall relationship, representing a Natural Area Index of 145. The addition of the buffer, both mathematically and synecologically, improves the overall significance of the Survey Unit--for without the buffer the Bog itself would not be in such fine condition.

VASCULAR FLORA of the INDIANA DUNES NATIONAL LAKESHORE

The flora of the Indiana Dunes National Lakeshore is a catalogue of the vascular plants known to grow or have grown within the contemporary boundaries of the Lakeshore. Currently, the total flora consists of 1419 species, of which 1131 are regarded by Swink & Wilhelm (1979) as native to the Chicago region. The catalogue excludes, for example, plants known only from the now destroyed **Goose Lake** and **Dune Park**, inasmuch as these areas are outside the Lakeshore boundaries--albeit situated between the West Beach and Dune Acres Survey Units. Several of the old **Miller** records have been excluded also, unless it can be demonstrated that they actually grew within either the Miller, Tolleston, or West Beach Units.

By this exclusiveness I mean to draw the line in such a way that the catalogue can be meaningful to people who study and use the Indiana Dunes National Lakeshore. This catalogue, then, is the universe of plants from which the **SPECIAL VEGETATION** list was compiled. It includes the site-specific reports of Lyon (1927 & 1930), Pepon (1927), and Peattie (1930); several reports from other credible literature sources, and from specimens in the Morton Arboretum herbarium, the Indiana Dunes National Lakeshore herbarium, and other herbaria; sight records from my own surveys in the area; and reports from other local botanists and floristic practitioners.

The user of this catalogue must be aware, however, that the Latin names used by various authors vary somewhat. Lyon, for example, reports that **Washingtonia claytoni** is rather common in the dunes region; and so it is, yet no such name appears in this catalogue. That is because most current authorities are using the name **Osmorhiza claytoni** for the same plant--a name which does appear in this catalogue. Another example: Lyon reports **Panicum huachucae**, **P. huachucae** var. **silvicola**, and **P. tennesseensis** as all growing within the Lakeshore; and so does this catalogue, except that they have all been "lumped" under the name **Panicum implicatum** for taxonomic reasons. To add to the confusion, some botanists now call this plant **Dichanthelium implicatum**. Perhaps even more confusing, the plant named **Muhlenbergia racemosa**, as listed in this catalogue, is not the plant to which Lyon referred by that name--herein, his plant is called **M. glomerata**, and **M. racemosa** applies to a rare adventive species which I picked up off of Lake Street in the Miller Unit; the problem here is nomenclatural rather than taxonomic. There is no fundamental right or wrong in these matters; they are botanical domestic problems which must be worked out in-house.

There is no point in attempting to justify that which seems to the layman capricious or even silly. Let it be sufficient to say that the rules governing nomenclature are strict and have changed somewhat since the 1930's, and that botanists, within the context of rules, have the option of recognizing--for any given group of related plants--numerous species within a large generic concept, or greater or fewer species within two or more narrower generic concepts. One simply must be nomenclaturally alert in order to deal with these problems. It is not the point of this catalogue to bring together all the names of plants which have been attributed to the Lakeshore and sort them into their contemporary nomenclatural niche; indeed, even the names I have chosen are not all "proper" insofar as current concepts are concerned. The names I have chosen to use are those used by Swink & Wilhelm (1979). This choice is made simply because it is the current work which treats the Chicago region flora in a comprehensive way, and they have made an attempt to deal with most of the taxonomic and

nomenclatural problems. Their taxonomic and nomenclatural philosophy is expressed in their introduction. I will assure the user of this catalogue, however, that I have made a conscientious attempt to include all of the plants that have been attributed credibly specifically to the Lakeshore, by whatever name, within the following list.

It is unfortunate, however, that certain literature sources dealing specifically with the Lakeshore have made some rather outlandish claims with respect to species presence. One source, for example, reports the following plants from various locations within the Lakeshore: *Aster acuminatus*, *Desmodium ochroleucum*, *D. strictum*, *Helianthus microcephalus*, *Hypericum ellipticum*, *Juncus brevicaudatus*, *Potamogeton alpinus* var. *tenuifolius*, *P. lateralis*, *Prenanthes trifoliolata*, *Scirpus heterochaetus*, *Scutellaria churchilliana*, *Streptopus roseus*, and others just as unlikely. Such reports are not the results of taxonomic or nomenclatural differences, but rather must have resulted from errors in plant identification. Consultation with midwestern botanical literature would have alleviated most of these problems, for it would have been discovered that the plants listed above grow nowhere near the Chicago region, much less the Indiana Dunes National Lakeshore. In this regard, I have drawn from some literature sources with great circumspection, and taken the liberty of editing their allegations with respect to the Lakeshore flora.

The following catalogue is organized alphabetically because it is intended to be used simply as a reference catalogue--not as a synoptic treatment of the vascular flora. Each name is preceded by the autecological rating coefficient as given by Swink & Wilhelm (1979), and their selections from among the many possible common names have been followed as well.¹ Native plants are rendered in **bold face type**. Adventive plants are in a standard font. Common names, where available, are in all capital letters.

- 1 *Abutilon theophrasti* VELVETLEAF, BUTTERPRINT, INDIAN MALLOW
- 0 *Acalypha rhomboidea* **THREE-SEEDED MERCURY**
- 0 *Acer negundo* **BOX ELDER**
- 5 *Acer nigrum* **BLACK MAPLE**
- 1 *Acer platanoides* **NORWAY MAPLE**
- 7 *Acer rubrum* **RED MAPLE**
- 0 *Acer saccharinum* **SILVER MAPLE**
- 5 *Acer saccharum* **SUGAR MAPLE**
- 1 *Achillea millefolium* **YARROW, MILFOIL**
- 0 *Acnida altissima* **WATER HEMP**
- 7 *Acorus calamus* **SWEET FLAG**
- 7 *Actaea pachypoda* **WHITE BANEERRY**
- 10 *Actaea rubra* **RED BANEERRY**
- 5 *Actinomeris alternifolia* **WINGSTEM**
- 15 *Adiantum pedatum* **MAIDENHAIR FERN**
- 5 *Agastache scrophulariaefolia* **PURPLE GIANT HYSSOP**
- 2 *Agrimonia gryposepala* **TALL AGRIMONY**
- 8 *Agrimonia parviflora* **SWAMP AGRIMONY**
- 5 *Agrimonia pubescens* **SOFT AGRIMONY**
- * *Agropyron cristatum* **CRESTED WHEAT GRASS**
- * *Agropyron desertorum* **CRESTED WHEAT GRASS**
- 2 *Agropyron repens* **QUACK GRASS**

¹Plant species discovered since 1979 have been assigned coefficients and their nativity determined consistent with the principles followed in Swink & Wilhelm (1979).

- * *Agropyron smithii* WESTERN WHEAT GRASS
- 8 *Agropyron trachycaulum unilaterale* SLENDER WHEAT GRASS
- 1 *Agrostis alba* REDTOP
- 1 *Agrostis hyemalis* TICKLE GRASS
- 1 *Agrostis perennans* THIN GRASS
- 5 *Agrostis scabra* ROUGH TICKLE GRASS
- 1 *Ailanthus altissima* TREE OF HEAVEN
- 0 *Ajuga reptans* CARPET BUGLE
- 10 *Aletris farinosa* COLIC ROOT
- 4 *Alisma subcordatum* COMMON WATER PLANTAIN
- 4 *Alisma triviale* LARGE-FLOWERED WATER PLANTAIN
- 3 *Alliaria officinalis* GARLIC MUSTARD
- 1 *Allium canadense* WILD ONION, WILD GARLIC
- 6 *Allium cernuum* NODDING WILD ONION
- * *Allium schoenoprasum* CHIVES
- 7 *Allium tricoccum* RED WILD LEEK
- 6 *Allium tricoccum burdickii* GREEN WILD LEEK
- 0 *Allium vineale* FIELD GARLIC
- 8 *Alnus rugosa americana* SPECKLED ALDER
- 6 *Alopecurus aequalis* SHORT-AWNED FOXTAIL
- 0 *Alopecurus carolinianus* ANNUAL FOXTAIL
- 0 *Alopecurus pratensis* MEADOW FOXTAIL
- 0 *Amaranthus albus* TUMBLEWEED
- 0 *Amaranthus graecizans* CREEPING AMARANTH
- 1 *Amaranthus hybridus* GREEN AMARANTH
- 1 *Amaranthus powellii* TALL AMARANTH
- 1 *Amaranthus retroflexus* ROUGH AMARANTH
- 0 *Ambrosia artemisiifolia elatior* COMMON RAGWEED
- 0 *Ambrosia psilostachya coronopifolia* WESTERN RAGWEED
- 0 *Ambrosia trifida* GIANT RAGWEED
- 8 *Amelanchier arborea* JUNE BERRY, SHADBUSH, SERVICE BERRY
- 9 *Amelanchier humilis* LOW SHADBLOW
- 8 *Amelanchier interior* DWARF SHADBLOW
- 8 *Amelanchier laevis* ALLEGHENY SHADBLOW
- 15 *Ammophila breviligulata* MARRAM GRASS
- 10 *Amorpha canescens* LEAD PLANT
- 4 *Amphicarpa bracteata* HOG PEANUT
- 4 *Amphicarpa bracteata comosa* HOG PEANUT
- 20 *Andromeda glaucophylla* BOG ROSEMARY
- 4 *Andropogon gerardii* BIG BLUESTEM GRASS
- 5 *Andropogon scoparius* LITTLE BLUESTEM GRASS
- 2 *Andropogon virginicus* BROOM SEDGE
- 4 *Anemone canadensis* MEADOW ANEMONE
- 2 *Anemone cylindrica* THIMBLEWEED
- 7 *Anemone quinquefolia interior* WOOD ANEMONE
- 2 *Anemone virginiana* TALL ANEMONE, THIMBLEWEED
- 7 *Anemonella thalictroides* RUE ANEMONE
- 5 *Angelica atropurpurea* GREAT ANGELICA
- 6 *Antennaria neglecta* CAT'S FOOT
- 6 *Antennaria plantaginifolia* PUSSY TOES, EVERLASTING
- 0 *Anthemis cotula* DOG FENNEL
- * *Anthriscus scandicina* CHERVIL
- 6 *Apios americana* GROUND NUT

- 20 *Aplectrum hyemale* PUTTY ROOT
- 5 *Apocynum androsaemifolium* SPREADING DOGBANE
- 4 *Apocynum cannabinum* INDIAN HEMP, DOGBANE
- 2 *Apocynum sibiricum* INDIAN HEMP, DOGBANE
- 5 *Aquilegia canadensis* WILD COLUMBINE
- * *Aquilegia vulgaris* GARDEN COLUMBINE
- 0 *Arabidopsis thaliana* MOUSE-EAR CRESS, FALSE SAND CRESS
- 10 *Arabis canadensis* SICKLE POD
- 6 *Arabis glabra* TOWER MUSTARD
- 3 *Arabis laevigata* SMOOTH BANK CRESS
- 7 *Arabis lyrata* SAND CRESS
- 15 *Aralia hispida* BRISTLY SARSAPARILLA
- 8 *Aralia nudicaulis* WILD SARSAPARILLA
- 15 *Aralia racemosa* SPIKENARD
- 3 *Arctium minus* COMMON BURDOCK
- 10 *Arctostaphylos uva-ursi coactilis* BEARBERRY
- 9 *Arenaria lateriflora* WOOD SANDWORT
- 0 *Arenaria serpyllifolia* THYME-LEAVED SANDWORT
- 10 *Arenaria stricta* STIFF SANDWORT
- 5 *Arisaema atrorubens* JACK-IN-THE-PULPIT
- 8 *Arisaema dracontium* GREEN DRAGON
- 5 *Aristida intermedia* FALSE ARROW FEATHER
- 0 *Aristida oligantha* PLAINS THREE-AWN GRASS
- 7 *Aristida purpurascens* ARROW FEATHER
- 15 *Aristida tuberculosa* BEACH THREE-AWN GRASS
- 15 *Aristolochia serpentaria* VIRGINIA SNAKEROOT
- * *Artemisia absinthium* COMMON WORMWOOD
- 5 *Artemisia caudata* BEACH WORMWOOD
- 1 *Artemisia vulgaris* MUGWORT
- 5 *Asarum canadense* WILD GINGER
- 10 *Asclepias amplexicaulis* SAND MILKWEED
- 10 *Asclepias exaltata* POKE MILKWEED
- 10 *Asclepias hirtella* TALL GREEN MILKWEED
- 4 *Asclepias incarnata* SWAMP MILKWEED
- 10 *Asclepias purpurascens* PURPLE MILKWEED
- 10 *Asclepias sullivantii* PRAIRIE MILKWEED
- 0 *Asclepias syriaca* COMMON MILKWEED
- 10 *Asclepias tuberosa* BUTTERFLY WEED
- 1 *Asclepias verticillata* WHORLED MILKWEED
- 15 *Asclepias viridiflora* SHORT GREEN MILKWEED
- 15 *Asimina triloba* PAPAW
- 1 *Asparagus officinalis* ASPARAGUS
- 6 *Asplenium platyneuron* EBONY SPLEENWORT
- 8 *Aster azureus* SKY-BLUE ASTER
- 5 *Aster cordifolius* HEART-LEAVED ASTER
- 5 *Aster dumosus* RICE BUTTON ASTER
- 5 *Aster ericoides* HEATH ASTER
- 20 *Aster furcatus* FORKED ASTER
- 10 *Aster junciformis* RUSH ASTER
- 8 *Aster laevis* SMOOTH BLUE ASTER
- 4 *Aster lateriflorus* SIDE-FLOWERING ASTER
- 10 *Aster linariifolius* FLAX-LEAVED ASTER
- 10 *Aster macrophyllus* BIG-LEAVED ASTER

- 4 Aster novae-angliae NEW ENGLAND ASTER
- 1 Aster pilosus HAIRY ASTER
- 10 Aster praealtus WILLOW ASTER
- 15 Aster ptarmicoides STIFF ASTER
- 6 Aster puniceus SWAMP ASTER
- 5 Aster puniceus firmus FEN ASTER, MARSH ASTER
- 5 Aster sagittifolius ARROW-LEAVED ASTER
- 2 Aster sagittifolius drummondii DRUMMOND'S ASTER
- 15 Aster sericeus SILKY ASTER
- 8 Aster shortii SHORT'S ASTER
- 3 Aster simplex PANICLED ASTER
- 3 Aster simplex interior MARSH ASTER
- 10 Aster umbellatus FLAT-TOP ASTER
- 5 Aster vimineus SMALL WHITE ASTER
- 6 Athyrium filix-femina michauxii LADY FERN
- 15 Athyrium thelypteroides SILVERY SPLEENWORT
- 0 Atriplex patula COMMON ORACH
- * Avena sativa OATS
- 8 Baptisia leucantha WHITE WILD INDIGO
- 1 Barbarea vulgaris YELLOW ROCKET
- 15 Bartonia virginica SCREWSTEM
- 2 Berberis thunbergii JAPANESE BARBERRY
- 15 Betula lutea YELLOW BIRCH
- 6 Betula nigra RIVER BIRCH
- 15 Betula papyrifera PAPER BIRCH
- * Betula pendula EUROPEAN BIRCH
- 10 Betula populifolia GRAY BIRCH
- 15 Betula pumila DWARF BIRCH
- 8 Bidens aristosa SWAMP MARIGOLD
- 5 Bidens cernua NODDING BUR MARIGOLD
- 5 Bidens comosa SWAMP TICKSEED
- 8 Bidens connata PURPLE-STEMMED TICKSEED
- 8 Bidens coronata tenuiloba TALL SWAMP MARIGOLD
- 20 Bidens discoidea SWAMP BEGGAR'S TICKS
- 1 Bidens frondosa COMMON BEGGAR'S TICKS
- 3 Bidens polylepis BUR MARIGOLD
- 1 Bidens vulgata TALL BEGGAR'S TICKS
- 7 Blephilia hirsuta WOOD MINT
- 2 Boehmeria cylindrica FALSE NETTLE
- 3 Boehmeria cylindrica drummondiana ROUGH FALSE NETTLE
- 10 Boltonia latisquama recognita FALSE ASTER
- 15 Botrychium dissectum CUT-LEAVED GRAPE FERN
- 20 Botrychium matricariaefolium GRAPE FERN
- 20 Botrychium multifidum intermedium LEATHERY GRAPE FERN
- 20 Botrychium simplex DWARF GRAPE FERN
- 6 Botrychium virginianum RATTLESNAKE FERN
- 15 Brachyelytrum erectum LONG-AWNED WOOD GRASS
- 15 Brasenia schreberi WATER SHIELD
- 1 Brassica kaber pinnatifida CHARLOCK
- 1 Brassica nigra BLACK MUSTARD
- 9 Bromus ciliatus FRINGED BROME
- 0 Bromus commutatus HAIRY CHESS
- 1 Bromus inermis HUNGARIAN BROME

- 0 *Bromus japonicus* JAPANESE BROME
- 15 *Bromus kalmii* PRAIRIE BROME
- 5 *Bromus purgans* WOODLAND BROME
- 0 *Bromus secalinus* CHEAT, CHESS
- 0 *Bromus squarrosus* NODDING BROME
- 0 *Bromus tectorum* DOWNY BROME
- 20 *Buchnera americana* BLUE HEARTS
- 6 *Bulbostylis capillaris* HAIR SEDGE
- 8 *Cacalia atriplicifolia* PALE INDIAN PLANTAIN
- 15 *Cacalia tuberosa* PRAIRIE INDIAN PLANTAIN
- 15 *Cakile edentula* SEA ROCKET
- 3 *Calamagrostis canadensis* BLUE JOINT GRASS
- 5 *Calamagrostis inexpansa brevior* BOG REED GRASS
- 10 *Calamovilfa longifolia* SAND REED
- 15 *Calla palustris* WATER ARUM
- 15 *Callitriche heterophylla* LARGE WATER STARWORT
- 15 *Calopogon pulchellus* GRASS PINK
- 5 *Caltha palustris* MARSH MARIGOLD
- 6 *Camassia scilloides* WILD HYACINTH
- 2 *Campanula americana* TALL BELLFLOWER
- 7 *Campanula aparinoides* MARSH BELLFLOWER
- 0 *Campanula rapunculoides* EUROPEAN BELLFLOWER
- 15 *Campanula rotundifolia* HAREBELL
- 10 *Campanula uliginosa* LARGE MARSH BELLFLOWER
- 1 *Campsis radicans* TRUMPET CREEPER
- 3 *Cannabis sativa* HEMP
- 0 *Capsella bursa-pastoris* SHEPHERD'S PURSE
- 0 *Capsella gracilis* SLENDER SHEPHERD'S PURSE
- 5 *Cardamine bulbosa* SMOOTH SPRING CRESS
- 6 *Cardamine douglassii* HAIRY SPRING CRESS
- 0 *Cardamine hirsuta* HAIRY BITTER CRESS
- 4 *Cardamine parviflora arenicola* SMALL-FLOWERED BITTER CRESS
- 4 *Cardamine pennsylvanica* PENNSYLVANIA BITTER CRESS
- 10 *Carex alata* WINGED SEDGE
- 8 *Carex albolutescens*
- 10 *Carex albursina* BROAD-LEAVED LAX SEDGE
- 2 *Carex amphibola turgida* GRAY SEDGE
- 10 *Carex annectens*
- 7 *Carex annectens xanthocarpa*
- 5 *Carex aquatilis altior* FALSE MEADOW SEDGE
- 10 *Carex artitecta*
- 15 *Carex atherodes*
- 15 *Carex aurea* GOLDEN SEDGE
- 3 *Carex bebbii* BEBB'S SEDGE
- 10 *Carex bicknellii* PRAIRIE SEDGE
- 3 *Carex brevior*
- 15 *Carex bromoides*
- 8 *Carex buxbaumii*
- 15 *Carex canescens*
- 15 *Carex careyana*
- 2 *Carex cephalophora* WOODBANK SEDGE
- 20 *Carex chordorrhiza* CORDROOT SEDGE
- 10 *Carex communis*

- 5 *Carex comosa* BRISTLY SEDGE
- 15 *Carex conoidea*
- 1 *Carex convoluta* COMMON WOOD SEDGE
- 10 *Carex crinita* FRINGED SEDGE
- 4 *Carex cristatella*
- 20 *Carex debilis rudgei*
- 20 *Carex digitalis*
- 15 *Carex eburnea*
- 10 *Carex emmonsii*
- 8 *Carex emoryi*
- 10 *Carex festucacea*
- 15 *Carex flava fertilis* YELLOW SEDGE
- 20 *Carex foenea*
- 20 *Carex folliculata*
- 15 *Carex garberi* FALSE GOLDEN SEDGE
- 10 *Carex gracilescens* SLENDER LAX SEDGE
- 10 *Carex gracillima* GRACEFUL SEDGE
- 5 *Carex granularis*
- 7 *Carex grayii* BUR SEDGE
- 6 *Carex haydenii* LONG-SCALED MEADOW SEDGE
- 4 *Carex hirsutella*
- 4 *Carex hirtifolia* HAIRY WOOD SEDGE
- 15 *Carex hitchcockiana*
- 20 *Carex howei*
- 4 *Carex hystricina* BOTTLEBRUSH SEDGE
- 10 *Carex interior*
- 15 *Carex intumescens* FALSE BUR SEDGE
- 5 *Carex jamesii* GLOSSY WOOD SEDGE
- 10 *Carex lacustris*
- 15 *Carex laevivaginata*
- 4 *Carex lanuginosa* WOOLLY SEDGE
- 8 *Carex lasiocarpa americana* NARROW-LEAVED WOOLLY SEDGE
- 15 *Carex laxiculmis* FALSE LAX SEDGE
- 1 *Carex laxiflora* LAX SEDGE
- 10 *Carex leptalea*
- 20 *Carex leptoneuria*
- 10 *Carex limosa*
- 8 *Carex lupulina* HOP SEDGE
- 8 *Carex lurida* SMOOTH BOTTLEBRUSH SEDGE
- 5 *Carex muhlenbergii* SAND SEDGE
- 5 *Carex normalis*
- 10 *Carex oligocarpa*
- 15 *Carex oligosperma*
- 15 *Carex pedunculata*
- 5 *Carex pennsylvanica* EARLY SEDGE
- 10 *Carex prairea*
- 20 *Carex prasina*
- 4 *Carex projecta*
- 1 *Carex rosea* FALSE COMMON WOOD SEDGE
- 10 *Carex rostrata utriculata* BEAKED SEDGE
- 10 *Carex sartwellii*
- 7 *Carex scoparia*
- 20 *Carex seorsa*

- 3 *Carex sparganioides*
- 10 *Carex squarrosa*
- 8 *Carex sterilis*
- 2 *Carex stipata* SOFT-STEM SEDGE
- 5 *Carex stricta* MEADOW SEDGE
- 8 *Carex suberecta*
- 20 *Carex subimpressa*
- 10 *Carex swanii* SAVANNA SEDGE
- 8 *Carex tenera*
- 9 *Carex tetanica*
- 15 *Carex tosa* EARLY SAND SEDGE
- 3 *Carex tribuloides*
- 15 *Carex trisperma*
- 10 *Carex typhina*
- 10 *Carex umbellata* HAIRY EARLY SEDGE
- 10 *Carex vesicaria monile*
- 10 *Carex virescens* SLENDER SAVANNA SEDGE
- 10 *Carex viridula* PANNE SEDGE
- 2 *Carex vulpinoidea* FOX SEDGE
- 8 *Carpinus caroliniana virginiana* BLUE BEECH
- 7 *Carya cordiformis* BITTERNUT HICKORY
- 15 *Carya glabra* PIGNUT HICKORY
- 15 *Carya laciniata* BIG SHELLBARK HICKORY
- 15 *Carya ovalis* SMALL-FRUITED HICKORY
- 5 *Carya ovata* SHAGBARK HICKORY
- 5 *Cassia fasciculata* PARTRIDGE PEA
- 7 *Cassia nictitans* WILD SENSITIVE PLANT
- * *Castanea dentata* AMERICAN CHESTNUT
- 15 *Castilleja coccinea* INDIAN PAINT BRUSH
- 1 *Catalpa speciosa* HAIRY CATALPA
- 8 *Caulophyllum thalictroides* BLUE COHOSH
- 8 *Ceanothus americanus* NEW JERSEY TEA
- 2 *Celastrus orbiculatus* ORIENTAL BITTERSWEET
- 6 *Celastrus scandens* CLIMBING BITTERSWEET
- 3 *Celtis occidentalis* HACKBERRY
- 15 *Celtis tenuifolia* DWARF HACKBERRY
- 0 *Cenchrus longispinus* SANDBUR
- 1 *Centaurea maculosa* SPOTTED KNAPWEED
- 2 *Centaurea pulchella* SHOWY CENTAURY
- 7 *Cephalanthus occidentalis* BUTTONBUSH
- 0 *Cerastium brachypodium* NODDING CHICKWEED
- 0 *Cerastium semidecandrum* SMALL MOUSE-EAR CHICKWEED
- 1 *Cerastium vulgatum* MOUSE-EAR CHICKWEED
- 5 *Ceratophyllum demersum* COONTAIL
- 10 *Cercis canadensis* REDBUD
- * *Chaenorrhinum minus* SMALL SNAPDRAGON
- 5 *Chaerophyllum procumbens* WILD CHERVIL
- 15 *Chamaedaphne calyculata angustifolia* LEATHERLEAF
- 8 *Chelone glabra* TURTLEHEAD
- 1 *Chenopodium album* LAMB'S QUARTERS
- 4 *Chenopodium boscianum* WOODLAND GOOSEFOOT
- 0 *Chenopodium botrys* JERUSALEM OAK
- 3 *Chenopodium hybridum gigantospermum* MAPLE-LEAVED GOOSEFOOT

- 4 *Chenopodium leptophyllum* NARROW-LEAVED GOOSEFOOT
- 20 *Chimaphila maculata* SPOTTED WINTERGREEN
- 20 *Chimaphila umbellata cisatlantica* PRINCE'S PINE, PIPSISSEWA
- * *Chrysanthemum balsamita* COSTMARY, MINT GERANIUM
- 1 *Chrysanthemum leucanthemum pinnatifidum* OX-EYE DAISY
- * *Chrysanthemum parthenium* FEVERFEW
- 15 *Chrysosplenium americanum* GOLDEN SAXIFRAGE
- 1 *Cichorium intybus* CHICORY
- 8 *Cicuta bulbifera* BULBLET-BEARING WATER HEMLOCK
- 6 *Cicuta maculata* WATER HEMLOCK
- 5 *Cinna arundinacea* COMMON WOOD REED
- 15 *Circaea alpina* SMALL ENCHANTER'S NIGHTSHADE
- 0 *Circaea quadrisulcata canadensis* ENCHANTER'S NIGHTSHADE
- 6 *Cirsium altissimum* TALL THISTLE
- 3 *Cirsium arvense* FIELD THISTLE
- 2 *Cirsium discolor* PASTURE THISTLE
- 10 *Cirsium muticum* SWAMP THISTLE
- 20 *Cirsium pitcheri* SAND THISTLE
- 3 *Cirsium vulgare* BULL THISTLE
- 15 *Cladium mariscoides* TWIG RUSH
- 2 *Claytonia virginica* SPRING BEAUTY
- 4 *Clematis virginiana* VIRGIN'S BOWER
- 10 *Collinsia verna* BLUE-EYED MARY
- 7 *Comandra richardsiana* FALSE TOADFLAX
- 1 *Commelina communis* COMMON DAY FLOWER
- 10 *Commelina erecta deamiana* SAVANNA DAY FLOWER
- 10 *Comptonia peregrina* SWEET FERN
- 15 *Conopholis americana* CANCER ROOT
- 3 *Convallaria majalis* LILY-OF-THE-VALLEY
- 3 *Convolvulus arvensis* FIELD BINDWEED
- 1 *Convolvulus sepium* HEDGE BINDWEED
- 15 *Coptis groenlandica* GOLDTHREAD
- 15 *Corallorhiza maculata* SPOTTED CORAL ROOT
- 20 *Corallorhiza odontorhiza* LATE CORAL ROOT
- 7 *Coreopsis lanceolata* SAND COREOPSIS
- 8 *Coreopsis palmata* PRAIRIE COREOPSIS
- 5 *Coreopsis tripteris* TALL COREOPSIS
- 8 *Corispermum hyssopifolium* COMMON BUGSEED
- 9 *Cornus alternifolia* PAGODA DOGWOOD
- 20 *Cornus canadensis* BUNCHBERRY
- 10 *Cornus florida* FLOWERING DOGWOOD
- 5 *Cornus obliqua* PALE DOGWOOD, BLUE-FRUITED DOGWOOD
- 1 *Cornus racemosa* GRAY DOGWOOD
- 15 *Cornus rugosa* SPECKLED DOGWOOD
- 6 *Cornus stolonifera* RED-OSIER DOGWOOD
- 10 *Cornus stolonifera baileyi* DUNES DOGWOOD
- 1 *Coronilla varia* CROWN VETCH
- 10 *Corydalis sempervirens* PINK CORYDALIS
- 2 *Corylus americana* AMERICAN HAZELNUT
- 5 *Crataegus calpodendron* SUGAR HAWTHORN
- 5 *Crataegus coccinea* SCARLET HAWTHORN
- 1 *Crataegus crus-galli* COCKSPUR HAWTHORN
- 5 *Crataegus macrosperma* LARGE-SEEDED HAWTHORN

- 2 *Crataegus mollis* DOWNY HAWTHORN
- 6 *Crataegus pruinosa* FROSTED HAWTHORN
- 1 *Crataegus punctata* DOTTED HAWTHORN
- 1 *Crepis capillaris* HAWK'S BEARD
- * *Crepis tectorum* HAWK'S BEARD
- 2 *Crotalaria sagittalis* RATTLEBOX
- 0 *Croton capitatus* HOGWORT
- 0 *Croton glandulosus septentrionalis* SAND CROTON
- 0 *Cryptotaenia canadensis* HONEWORT
- 8 *Cuscuta coryli* HAZEL DODDER
- 7 *Cuscuta glomerata* ROPE DODDER
- 4 *Cuscuta gronovii* COMMON DODDER
- 10 *Cuscuta pentagona* FIELD DODDER
- 7 *Cycloloma atriplicifolium* WINGED PIGWEED
- 0 *Cynoglossum officinale* HOUND'S TONGUE
- 10 *Cyperus diandrus*
- 15 *Cyperus engelmannii*
- 3 *Cyperus erythrorhizos* RED-ROOTED SEDGE
- 1 *Cyperus esculentus* CHUFA
- 2 *Cyperus ferruginescens* FRAGILE SEDGE
- 5 *Cyperus filiculmis* SAND CYPERUS
- 5 *Cyperus houghtonii* SMOOTH SAND CYPERUS
- 7 *Cyperus inflexus*
- 4 *Cyperus rivularis* BROOK SEDGE
- 5 *Cyperus schweinitzii* ROUGH SAND CYPERUS
- 1 *Cyperus strigosus*
- 20 *Cypripedium acaule* MOCCASIN FLOWER, STEMLESS LADY'S SLIPPER
- 20 *Cypripedium calceolus parviflorum* SMALL YELLOW LADY'S SLIPPER
- 20 *Cypripedium calceolus pubescens* LARGE YELLOW LADY'S SLIPPER
- 20 *Cypripedium candidum* WHITE LADY'S SLIPPER
- 20 *Cypripedium reginae* SHOWY LADY'S SLIPPER
- 6 *Cystopteris fragilis* FRAGILE FERN
- 1 *Dactylis glomerata* ORCHARD GRASS
- 5 *Danthonia spicata* POVERTY OAT GRASS
- 2 *Datura stramonium* JIMSON WEED
- 1 *Daucus carota* QUEEN ANNE'S LACE, WILD CARROT
- 8 *Decodon verticillatus* SWAMP LOOSESTRIFE
- 5 *Dentaria laciniata* TOOTHWORT, PEPPER ROOT
- 0 *Descurainia sophia* FLIXWEED
- 4 *Desmodium canadense* SHOWY TICK TREFOIL
- 15 *Desmodium ciliare* HAIRY TICK TREFOIL
- 8 *Desmodium glutinosum* POINTED TICK TREFOIL
- 6 *Desmodium illinoense* ILLINOIS TICK TREFOIL
- 10 *Desmodium marilandicum* SMALL-LEAVED TICK TREFOIL
- 10 *Desmodium nudiflorum* BARE-STEMMED TICK TREFOIL
- 5 *Desmodium paniculatum* PANICLED TICK TREFOIL
- 15 *Desmodium rotundifolium* ROUND-LEAVED TICK TREFOIL
- 10 *Desmodium sessilifolium* SESSILE-LEAVED TICK TREFOIL
- 1 *Dianthus armeria* DEPTFORD PINK
- * *Dianthus barbatus* SWEET WILLIAM
- 8 *Dicentra canadensis* SQUIRREL CORN
- 6 *Dicentra cucullaria* DUTCHMAN'S BREECHES
- 10 *Diervilla lonicera* BUSH HONEYSUCKLE, DWARF HONEYSUCKLE

- 0 *Digitaria ischaemum* SMOOTH CRAB GRASS
- 0 *Digitaria sanguinalis* HAIRY CRAB GRASS
- 5 *Dioscorea villosa* WILD YAM
- 1 *Diploaxis muralis* WALL ROCKET
- 3 *Dipsacus sylvestris* COMMON TEASEL
- 6 *Dodecatheon meadia* SHOOTING STAR
- 2 *Draba verna* VERNAL WHITLOW CRESS
- 15 *Drosera intermedia* NARROW-LEAVED SUNDEW
- 15 *Drosera rotundifolia* ROUND-LEAVED SUNDEW
- 10 *Dryopteris cristata* CRESTED SHIELD FERN
- 15 *Dryopteris hexagonoptera* BROAD BEECH FERN
- 15 *Dryopteris noveboracensis* NEW YORK FERN
- 6 *Dryopteris spinulosa* SPINULOSE SHIELD FERN
- 10 *Dryopteris spinulosa intermedia* FLORIST'S FERN
- 6 *Dryopteris thelypteris pubescens* MARSH SHIELD FERN
- 10 *Dulichium arundinaceum* POND SEDGE
- 0 *Echinochloa crusgalli* BARNYARD GRASS
- 5 *Echinocystis lobata* WILD CUCUMBER
- 1 *Echium vulgare* VIPER'S BUGLOSS
- * *Elaeagnus angustifolia* RUSSIAN OLIVE
- * *Elaeagnus umbellata* AUTUMN OLIVE
- 6 *Eleocharis acicularis* NEEDLE SPIKE RUSH
- 5 *Eleocharis calva* RED-ROOTED SPIKE RUSH
- 5 *Eleocharis compressa* FLAT-STEMMED SPIKE RUSH
- 8 *Eleocharis elliptica* GOLDEN-SEEDED SPIKE RUSH
- 9 *Eleocharis engelmannii*
- 15 *Eleocharis geniculata* PANNE SPIKE RUSH
- 8 *Eleocharis intermedia* MATTED SPIKE RUSH
- 15 *Eleocharis melanocarpa* BLACK-FRUITED SPIKE RUSH
- 20 *Eleocharis microcarpa filiculmis*
- 5 *Eleocharis obtusa* BLUNT SPIKE RUSH
- 8 *Eleocharis olivacea* LOOSE-SHEATHED SPIKE RUSH
- 5 *Eleocharis palustris major*
- 20 *Eleocharis pauciflora fernaldii*
- 15 *Eleocharis rostellata* BEAKED SPIKE RUSH
- 5 *Eleocharis smallii*
- 8 *Eleocharis tenuis verrucosa* SLENDER SPIKE RUSH
- 20 *Eleocharis wolfii*
- 0 *Eleusine indica* CROWFOOT GRASS, YARD GRASS
- 5 *Elodea canadensis* COMMON WATERWEED
- 4 *Elymus canadensis* CANADA WILD RYE
- 5 *Elymus riparius* RIVERBANK WILD RYE
- 5 *Elymus villosus* SILKY WILD RYE
- 4 *Elymus virginicus* VIRGINIA WILD RYE
- 10 *Epifagus virginiana* BEECH DROPS
- 15 *Epigaea repens glabrifolia* TRAILING ARBUTUS
- 10 *Epilobium angustifolium* FIREWEED, GREAT WILLOW HERB
- 3 *Epilobium coloratum* CINNAMON WILLOW HERB
- 3 *Epilobium glandulosum adenocaulon* NORTHERN WILLOW HERB
- 1 *Epilobium hirsutum* HAIRY WILLOW HERB
- 8 *Epilobium leptophyllum* FEN WILLOW HERB
- 15 *Epilobium strictum* DOWNY WILLOW HERB
- 2 *Epipactis helleborine* HELLEBORINE

- 0 *Equisetum arvense* HORSETAIL
- 3 *Equisetum X ferrissii*
- 7 *Equisetum fluviatile* PIPES
- 4 *Equisetum hyemale affine* TALL SCOURING RUSH
- 3 *Equisetum hyemale intermedium* SMOOTH SCOURING RUSH
- 10 *Equisetum X nelsonii*
- 9 *Equisetum variegatum* SMALL SCOURING RUSH
- 0 *Eragrostis megastachya* STINK GRASS
- 0 *Eragrostis pectinacea* SMALL LOVE GRASS
- 0 *Eragrostis poaeoides* LOW LOVE GRASS
- 3 *Eragrostis spectabilis* PURPLE LOVE GRASS
- * *Eragrostis trichodes* TALL LOVE GRASS
- 2 *Erechtites hieracifolia* FIREWEED
- 10 *Erigenia bulbosa* HARBINGER OF SPRING, SALT & PEPPER
- 1 *Erigeron annuus* ANNUAL FLEABANE
- 0 *Erigeron canadensis* HORSEWEED
- 4 *Erigeron philadelphicus* MARSH FLEABANE
- 10 *Erigeron pulchellus* ROBIN'S PLANTAIN
- 3 *Erigeron strigosus* DAISY FLEABANE
- 20 *Eriocaulon septangulare* PIPEWORT
- 15 *Eriophorum angustifolium* NARROW-LEAVED COTTON GRASS
- 20 *Eriophorum spissum* DENSE COTTON GRASS
- 20 *Eriophorum virginicum* RUSTY COTTON GRASS, LATE COTTON GRASS
- 9 *Eryngium yuccifolium* RATTLESNAKE MASTER
- 0 *Erysimum repandum* TREACLE MUSTARD
- 5 *Erythronium albidum* WHITE TROUT LILY
- 8 *Erythronium americanum* YELLOW TROUT LILY
- 0 *Euonymus alatus* WINGED EUONYMUS, BURNING BUSH
- 8 *Euonymus atropurpureus* BURNING BUSH, WAHOO
- 7 *Euonymus obovatus* RUNNING STRAWBERRY BUSH
- 0 *Eupatorium altissimum* TALL BONESET
- 20 *Eupatorium fistulosum* HOLLOW JOE PYE WEED
- 5 *Eupatorium maculatum* SPOTTED JOE PYE WEED
- 6 *Eupatorium perfoliatum* COMMON BONESET
- 7 *Eupatorium purpureum* PURPLE JOE PYE WEED
- 4 *Eupatorium rugosum* WHITE SNAKEROOT
- 1 *Eupatorium serotinum* LATE BONESET
- 20 *Eupatorium sessilifolium brittonianum* UPLAND BONESET
- 2 *Euphorbia corollata* FLOWERING SPURGE
- 0 *Euphorbia cyparissias* CYPRESS SPURGE, GRAVEYARD SPURGE
- 0 *Euphorbia dentata* TOOTHED SPURGE
- 0 *Euphorbia esula* LEAFY SPURGE
- 1 *Euphorbia maculata* NODDING SPURGE
- 15 *Euphorbia polygonifolia* SEASIDE SPURGE
- 1 *Euphorbia supina* CREEPING SPURGE
- * *Fagopyrum sagittatum* BUCKWHEAT
- 10 *Fagus grandifolia* BEECH
- 1 *Festuca elatior* MEADOW FESCUE
- 5 *Festuca obtusa* NODDING FESCUE
- 1 *Festuca ovina* SHEEP FESCUE
- 1 *Festuca rubra* RED FESCUE
- 10 *Fimbristylis autumnalis mucronulata* AUTUMN SEDGE
- 20 *Fimbristylis drummondii* CHESTNUT SEDGE

- 8 Floerkea proserpinacoides FALSE MERMAID
- 1 Fragaria virginiana WILD STRAWBERRY
- 5 Fraxinus americana WHITE ASH
- 15 Fraxinus americana biltmoreana BILTMORE'S ASH
- 8 Fraxinus nigra BLACK ASH
- 7 Fraxinus pennsylvanica RED ASH
- 2 Fraxinus pennsylvanica subintegerrima GREEN ASH
- 1 Froelichia gracilis SMALL COTTONWEED
- 20 Fuirena pumila UMBRELLA SEDGE
- 0 Galinsoga ciliata PERUVIAN DAISY
- 1 Galium aparine ANNUAL BEDSTRAW
- 8 Galium asprellum ROUGH BEDSTRAW
- 7 Galium boreale NORTHERN BEDSTRAW
- 10 Galium brevipes SHORT-STALKED BEDSTRAW
- 7 Galium circaeazans hypomalacum WILD LICORICE
- 4 Galium concinnum SHINING BEDSTRAW
- 15 Galium labradoricum BOG BEDSTRAW
- 15 Galium lanceolatum LANCE-LEAVED BEDSTRAW
- 5 Galium obtusum WILD MADDER
- 10 Galium pilosum HAIRY BEDSTRAW
- 8 Galium tinctorium STIFF BEDSTRAW
- 15 Galium trifidum SMALL BEDSTRAW
- 5 Galium triflorum SWEET-SCENTED BEDSTRAW
- 10 Gaultheria procumbens WINTERGREEN
- 9 Gaylussacia baccata HUCKLEBERRY
- 7 Gentiana andrewsii CLOSED GENTIAN
- 10 Gentiana crinita FRINGED GENTIAN
- 15 Gentiana flavida YELLOWISH GENTIAN
- 9 Gentiana procera SMALL FRINGED GENTIAN
- 10 Gentiana puberula DOWNY GENTIAN
- 15 Gentiana saponaria SOAPWORT GENTIAN
- 7 Geranium bicknellii NORTHERN CRANESBILL
- 3 Geranium carolinianum CAROLINA CRANESBILL
- 4 Geranium maculatum WILD GERANIUM
- 0 Geranium pusillum SMALL GERANIUM
- 15 Gerardia auriculata EARED FALSE FOXGLOVE
- 10 Gerardia flava SMOOTH FALSE FOXGLOVE
- 7 Gerardia pauperula PURPLE FALSE FOXGLOVE
- 8 Gerardia pedicularia ambigens CLAMMY FALSE FOXGLOVE
- 7 Gerardia purpurea PURPLE FALSE FOXGLOVE
- 7 Gerardia tenuifolia SLENDER FALSE FOXGLOVE
- 0 Geum canadense WHITE AVENS
- 1 Geum laciniatum trichocarpum ROUGH AVENS
- 1 Glechoma hederacea CREEPING CHARLIE, GROUND IVY
- 3 Gleditsia triacanthos HONEY LOCUST
- 20 Glyceria borealis NORTHERN MANNA GRASS
- 10 Glyceria canadensis RATTLESNAKE GRASS
- 20 Glyceria pallida PALE MANNA GRASS
- 8 Glyceria septentrionalis FLOATING MANNA GRASS
- 4 Glyceria striata FOWL MEADOW GRASS, FOWL MANNA GRASS
- 2 Glycyrrhiza lepidota WILD LICORICE
- 2 Gnaphalium obtusifolium OLD-FIELD BALSAM
- 20 Goodyera pubescens RATTLESNAKE PLANTAIN

- 5 *Gratiola neglecta* CLAMMY HEDGE HYSSOP
- 7 *Gratiola virginiana* ROUND-FRUITED HEDGE HYSSOP
- 20 *Habenaria ciliaris* ORANGE FRINGED ORCHID
- 15 *Habenaria clavellata* SMALL GREEN FRINGED ORCHID
- 15 *Habenaria flava* herbiola TUBERCLED ORCHID
- 20 *Habenaria hookeri* HOOKER'S ORCHID
- 10 *Habenaria hyperborea* huronensis NORTHERN FRINGED ORCHID
- 10 *Habenaria lacera* RAGGED FRINGED ORCHID
- 20 *Habenaria psycodes* PURPLE FRINGED ORCHID
- 15 *Habenaria viridis* bracteata BRACTED ORCHID
- 0 *Hackelia virginiana* STICKSEED
- 8 *Hamamelis virginiana* WITCH HAZEL
- * *Hedera helix*
- 5 *Helenium autumnale* SNEEZEWEED
- 2 *Helenium nudiflorum* PURPLE-HEADED SNEEZEWEED
- 10 *Helianthemum bicknellii* ROCKROSE
- 8 *Helianthemum canadense* COMMON ROCKROSE
- 1 *Helianthus annuus* GARDEN SUNFLOWER
- 5 *Helianthus decapetalus* PALE SUNFLOWER
- 5 *Helianthus divaricatus* WOODLAND SUNFLOWER
- 7 *Helianthus giganteus* TALL SUNFLOWER
- 2 *Helianthus grosseserratus* SAWTOOTH SUNFLOWER
- 8 *Helianthus laetiflorus* rigidus PRAIRIE SUNFLOWER
- 9 *Helianthus mollis* DOWNY SUNFLOWER
- 10 *Helianthus occidentalis* WESTERN SUNFLOWER
- 1 *Helianthus petiolaris* PETIOLED SUNFLOWER
- 5 *Helianthus strumosus* PALE-LEAVED SUNFLOWER
- 1 *Hemerocallis fulva* ORANGE DAY LILY
- 10 *Hemicarpha drummondii*²
- 9 *Hemicarpha micrantha*
- 6 *Hepatica acutiloba* SHARP-LOBED HEPATICA
- 10 *Hepatica americana* ROUND-LOBED HEPATICA
- 5 *Heracleum maximum* COW PARSNIP
- 2 *Hesperis matronalis* DAME'S ROCKET
- 8 *Heteranthera dubia* WATER STAR GRASS, MUD PLANTAIN
- 8 *Heuchera richardsonii* PRAIRIE ALUM ROOT
- 10 *Hibiscus palustris* SWAMP ROSE MALLOW
- 0 *Hibiscus trionum* FLOWER-OF-AN-HOUR
- 1 *Hieracium aurantiacum* ORANGE HAWKWEED
- 6 *Hieracium canadense fasciculatum* CANADA HAWKWEED
- 6 *Hieracium gronovii* HAIRY HAWKWEED
- 1 *Hieracium pratense* FIELD HAWKWEED
- 7 *Hieracium scabrum* ROUGH HAWKWEED
- 9 *Hierochloë odorata* VANILLA GRASS
- 2 *Holcus lanatus* VELVET GRASS
- 0 *Holosteum umbellatum* JAGGED CHICKWEED
- 1 *Hordeum jubatum* SQUIRREL-TAIL GRASS
- * *Hordeum vulgare* BARLEY

²I have no record for this species in a specific Survey Unit, but Deam (1940) reported it from the "dune area" and cited several Porter County records, so one has to assume that, unless it was confined to Goose Lake, now destroyed, it was known from somewhere within the Lakeshore.

- 9 *Houstonia caerulea* BLUEETS
- 15 *Hudsonia tomentosa* FALSE HEATHER
- 0 *Humulus japonicus* JAPANESE HOP
- 5 *Humulus lupulus* COMMON HOP VINE
- 20 *Hydrocotyle umbellata* MARSH PENNYWORT
- 8 *Hydrophyllum appendiculatum* GREAT WATERLEAF
- 5 *Hydrophyllum virginianum* VIRGINIA WATERLEAF
- 9 *Hypericum boreale* NORTHERN ST. JOHN'S WORT
- 8 *Hypericum canadense* CANADIAN ST. JOHN'S WORT
- 7 *Hypericum gentianoides* ORANGE GRASS
- 10 *Hypericum kalmianum* KALM'S ST. JOHN'S WORT
- 8 *Hypericum majus* CLASPING ST. JOHN'S WORT
- 8 *Hypericum mutilum* WEAK ST. JOHN'S WORT
- 0 *Hypericum perforatum* COMMON ST. JOHN'S WORT
- 4 *Hypericum punctatum* SPOTTED ST. JOHN'S WORT
- 10 *Hypericum virginicum* MARSH ST. JOHN'S WORT
- 8 *Hypericum virginicum fraseri* MARSH ST. JOHN'S WORT
- * *Hypochaeris radicata* CAT'S EAR
- 10 *Hypoxis hirsuta* YELLOW STAR GRASS
- 5 *Hystrix patula* BOTTLEBRUSH GRASS
- 9 *Ilex verticillata* WINTERBERRY
- 3 *Impatiens capensis* SPOTTED TOUCH-ME-NOT
- 6 *Impatiens pallida* PALE TOUCH-ME-NOT
- 0 *Inula helenium* ELECAMPAINE
- 1 *Ipomoea hederacea* IVY-LEAVED MORNING GLORY
- 1 *Ipomoea purpurea* COMMON MORNING GLORY
- * *Iris germanica* GERMAN IRIS
- 0 *Iris pseudacorus* YELLOW IRIS
- 5 *Iris virginica shrevei* BLUE FLAG
- 8 *Isopyrum biternatum* FALSE RUE ANEMONE
- 20 *Isotria verticillata* WHORLED POGONIA
- 8 *Juglans cinerea* BUTTERNUT
- 5 *Juglans nigra* BLACK WALNUT
- 8 *Juncus acuminatus* SHARP-FRUITED RUSH
- 9 *Juncus alpinus rariflorus* RICHARDSON'S RUSH
- 20 *Juncus articulatus* JOINTED RUSH
- 8 *Juncus balticus littoralis* LAKE SHORE RUSH
- 10 *Juncus biflorus* TWO-FLOWERED RUSH
- 8 *Juncus brachycarpus* SHORT-FRUITED RUSH
- 9 *Juncus brachycephalus* SHORT-HEADED RUSH
- 5 *Juncus bufonius* TOAD RUSH
- 7 *Juncus canadensis* CANADIAN RUSH, LONG-SEEDED RUSH
- 20 *Juncus diffusissimus*
- 4 *Juncus dudleyi* DUDLEY'S RUSH, MEADOW RUSH
- 7 *Juncus effusus solutus* COMMON RUSH
- 8 *Juncus greenei* GREENE'S RUSH, FALSE MEADOW RUSH
- 10 *Juncus interior* INLAND RUSH
- 10 *Juncus marginatus* GRASS-LEAVED RUSH
- 6 *Juncus nodosus* JOINT RUSH
- 20 *Juncus pelocarpus* BROWN-FRUITED RUSH
- 20 *Juncus scirpoides* ROUND-HEADED RUSH
- 0 *Juncus tenuis* PATH RUSH
- 4 *Juncus torreyi* TORREY'S RUSH, BURHEAD RUSH

- 10 *Juniperus communis depressa* COMMON JUNIPER, DUNES JUNIPER
- 2 *Juniperus virginiana crebra* EASTERN RED CEDAR
- 0 *Kochia scoparia* BURNING BUSH
- 7 *Koeleria cristata* JUNE GRASS
- 7 *Krigia biflora* FALSE DANDELION
- 6 *Krigia virginica* DWARF DANDELION
- 4 *Kuhnia eupatorioides corymbulosa* FALSE BONESET
- 4 *Lactuca biennis* TALL BLUE LETTUCE
- 2 *Lactuca canadensis* WILD LETTUCE
- 20 *Lactuca hirsuta sanguinea*
- 1 *Lactuca scariola* PRICKLY LETTUCE
- 0 *Lamium amplexicaule* DEAD NETTLE
- 0 *Lamium purpureum* PURPLE DEAD NETTLE
- 3 *Laportea canadensis* WOOD NETTLE
- 10 *Larix laricina* TAMARACK, AMERICAN LARCH
- 20 *Lathyrus japonicus glaber* BEACH PEA
- * *Lathyrus latifolius* EVERLASTING PEA
- 15 *Lathyrus ochroleucus* PALE VETCHLING
- 8 *Lathyrus palustris* MARSH VETCHLING
- 6 *Lathyrus palustris myrtifolius* MARSH VETCHLING
- 8 *Lathyrus venosus* VEINY PEA
- 7 *Lechea leggettii moniliformis* LEGGETT'S PINWEED
- 7 *Lechea minor* SMALL PINWEED
- 15 *Lechea stricta* BUSHY PINWEED
- 7 *Lechea tenuifolia* SLENDER-LEAVED PINWEED
- 7 *Lechea villosa* HAIRY PINWEED
- 5 *Leersia oryzoides* RICE CUT GRASS
- 7 *Leersia virginica* WHITE GRASS
- 5 *Lemna minor* SMALL DUCKWEED
- 7 *Lemna trisulca* FORKED DUCKWEED
- * *Leontodon leysseri* HAWKBIT
- 1 *Leonurus cardiaca* LION'S TAIL, MOTHERWORT
- 0 *Lepidium campestre* FIELD CRESS
- 0 *Lepidium densiflorum* SMALL PEPPERCRESS
- 0 *Lepidium virginicum* COMMON PEPPERCRESS
- 3 *Leptoloma cognatum* FALL WITCH GRASS
- 4 *Lespedeza capitata* ROUND-HEADED BUSH CLOVER
- 6 *Lespedeza hirta* HAIRY BUSH CLOVER
- 8 *Lespedeza intermedia* WAND-LIKE BUSH CLOVER
- 4 *Lespedeza virginica* SLENDER BUSH CLOVER
- 6 *Liatris aspera* ROUGH BLAZING STAR
- 8 *Liatris cylindracea* CYLINDRICAL BLAZING STAR
- 6 *Liatris spicata* MARSH BLAZING STAR
- 0 *Ligustrum vulgare* COMMON PRIVET
- 6 *Lilium michiganense* MICHIGAN LILY, TURK'S CAP LILY
- 15 *Lilium philadelphicum andinum* PRAIRIE LILY
- 6 *Linaria canadensis* BLUE TOADFLAX
- 1 *Linaria vulgaris* BUTTER-AND-EGGS, TOADFLAX
- 7 *Lindera benzoin* SPICEBUSH
- 6 *Lindernia anagallidea* SLENDER FALSE PIMPERNEL
- 5 *Lindernia dubia* FALSE PIMPERNEL
- 15 *Linnaea borealis americana* TWIN FLOWER
- 7 *Linum medium texanum* SMALL YELLOW FLAX

- 15 *Linum striatum* STIFF YELLOW FLAX
 - * *Linum usitatissimum* COMMON FLAX
- 15 *Linum virginianum* SLENDER YELLOW FLAX
- 8 *Liparis lilifolia* PURPLE TWAYBLADE
- 7 *Liparis loeselii* GREEN TWAYBLADE
- 10 *Liriodendron tulipifera* TULIP TREE
- 0 *Lithospermum arvense* CORN GROMWELL
- 6 *Lithospermum canescens* HOARY PUCCOON
- 8 *Lithospermum croceum* HAIRY PUCCOON
- 7 *Lobelia cardinalis* CARDINAL FLOWER
- 4 *Lobelia inflata* INDIAN TOBACCO
- 9 *Lobelia kalmii* BOG LOBELIA
- 6 *Lobelia siphilitica* GREAT BLUE LOBELIA
- 6 *Lobelia spicata* PALE SPIKED LOBELIA
 - * *Lolium multiflorum* ITALIAN RYE GRASS
- 3 *Lonicera X bella* DOWNY BUSH HONEYSUCKLE
- 15 *Lonicera dioica* RED HONEYSUCKLE
- 2 *Lonicera japonica* JAPANESE HONEYSUCKLE
- 3 *Lonicera X muendeniense* YELLOW DOWNY BUSH HONEYSUCKLE
 - * *Lonicera X muscaviensis*
- 7 *Lonicera prolifera* YELLOW HONEYSUCKLE
- 3 *Lonicera tatarica* TARTARIAN HONEYSUCKLE
- 0 *Lonicera X xylosteoides*
- 2 *Lotus corniculatus* BIRD'S FOOT TREFOIL
- 6 *Ludwigia alternifolia* SEEDBOX
- 5 *Ludwigia palustris americana* MARSH PURSLANE
- 6 *Ludwigia polycarpa* FALSE LOOSESTRIFE
- 20 *Ludwigia sphaerocarpa deamii* ROUND-FRUITED LOOSESTRIFE
 - * *Lunaria annua* HONESTY
- 7 *Lupinus perennis occidentalis* WILD LUPINE
- 5 *Luzula multiflora* COMMON WOOD RUSH
- 2 *Lychnis alba* WHITE CAMPION
 - * *Lychnis coronaria* MULLEIN PINK
 - * *Lychnis dioica* RED CAMPION
- 15 *Lycopodium clavatum* RUNNING GROUND PINE
- 10 *Lycopodium complanatum flabelliforme* TRAILING GROUND PINE
- 15 *Lycopodium inundatum* BOG CLUB MOSS
- 15 *Lycopodium lucidulum* SHINING CLUB MOSS
- 15 *Lycopodium obscurum* GROUND PINE
- 15 *Lycopodium tristachyum* GROUND CEDAR
- 5 *Lycopus americanus* COMMON WATER HOREHOUND
- 2 *Lycopus asper* ROUGH WATER HOREHOUND
- 10 *Lycopus rubellus* STALKED WATER HOREHOUND
- 6 *Lycopus uniflorus* NORTHERN BUGLE WEED
- 6 *Lycopus virginicus* BUGLE WEED
- 4 *Lysimachia ciliata* FRINGED LOOSESTRIFE
- 7 *Lysimachia lanceolata* LANCE-LEAVED LOOSESTRIFE
- 1 *Lysimachia nummularia* MONEYWORT
- 9 *Lysimachia quadriflora* NARROW-LEAVED LOOSESTRIFE
- 8 *Lysimachia terrestris* SWAMP CANDLES
- 9 *Lysimachia thyrsiflora* TUFTED LOOSESTRIFE
- 7 *Lythrum alatum* WINGED LOOSESTRIFE
- 1 *Lythrum salicaria* PURPLE LOOSESTRIFE

- 0 Maclura pomifera OSAGE ORANGE, HEDGE APPLE
- 15 Maianthemum canadense SMOOTH CANADA MAYFLOWER
- 10 Maianthemum canadense interius HAIRY CANADA MAYFLOWER
- 20 Malaxis unifolia GREEN ADDER'S MOUTH
- 0 Malva neglecta COMMON MALLOW, CHEESES
- 2 Marrubium vulgare HOREHOUND
- 0 Matricaria matricarioides PINEAPPLE WEED
- 10 Medeola virginiana INDIAN CUCUMBER
- 0 Medicago lupulina BLACK MEDICK
- 0 Medicago sativa ALFALFA
- 15 Melampyrum lineare latifolium COW WHEAT
- 3 Melilotus alba WHITE SWEET CLOVER
- 2 Melilotus officinalis YELLOW SWEET CLOVER
- 6 Menispermum canadense MOONSEED
- 5 Mentha arvensis villosa WILD MINT
- * Mentha spicata SPEARMINT
- 15 Menyanthes trifoliata minor BOGBEAN, BUCKBEAN
- 5 Mertensia virginica VIRGINIA BLUEBELLS
- 15 Miliun effusum WOOD MILLET
- 20 Mimulus alatus WINGED MONKEY FLOWER
- 6 Mimulus ringens MONKEY FLOWER
- 0 Mirabilis nyctaginea WILD FOUR O'CLOCK
- 15 Mitchella repens PARTRIDGE BERRY
- 10 Mitella diphylla BISHOP'S CAP
- 0 Mollugo verticillata CARPET WEED
- * Monarda didyma OSWEGO TEA
- 4 Monarda fistulosa WILD BERGAMOT
- 5 Monarda punctata villicaulis HORSE MINT
- 15 Monotropa hypopithys PINESAP
- 15 Monotropa uniflora INDIAN PIPE
- 1 Morus alba WHITE MULBERRY
- 15 Morus rubra RED MULBERRY
- 3 Muhlenbergia frondosa COMMON SATIN GRASS
- 7 Muhlenbergia glomerata MARSH WILD TIMOTHY
- 5 Muhlenbergia mexicana LEAFY SATIN GRASS
- 2 Muhlenbergia racemosa UPLAND WILD TIMOTHY
- 0 Muhlenbergia schreberi NIMBLEWEED
- 9 Muhlenbergia tenuiflora SLENDER SATIN GRASS
- 20 Myosotis laxa SMALL FORGET-ME-NOT
- 2 Myosotis scorpioides COMMON FORGET-ME-NOT
- 0 Myosotis stricta SMALL-FLOWERED FORGET-ME-NOT
- 6 Myosotis verna WHITE FORGET-ME-NOT
- 7 Myriophyllum exalbescens SPIKED WATER MILFOIL
- 15 Myriophyllum verticillatum pectinatum WHORLED WATER MILFOIL
- 6 Najas flexilis SLENDER NAIAD
- * Narcissus pseudo-narcissus DAFFODIL
- 2 Nasturtium officinale WATER CRESS
- 15 Nemopanthus mucronata MOUNTAIN HOLLY
- 1 Nepeta cataria CATNIP
- 7 Nuphar advena YELLOW POND LILY
- 8 Nuphar variegatum YELLOW POND LILY
- 7 Nymphaea tuberosa WHITE WATER LILY
- 8 Nyssa sylvatica BLACK GUM, SOUR GUM

- 1 *Oenothera biennis* COMMON EVENING PRIMROSE
- 3 *Oenothera laciniata* RAGGED EVENING PRIMROSE
- 15 *Oenothera perennis* SMALL SUNDROPS
- 10 *Oenothera pilosella* PRAIRIE SUNDROPS
- 7 *Oenothera rhombipetala* SAND PRIMROSE
- 15 *Oenothera tetragona longistipata* GLANDULAR SUNDROPS
- 8 *Onoclea sensibilis* SENSITIVE FERN
- 15 *Ophioglossum vulgatum pseudopodium* ADDER'S TONGUE FERN
- 5 *Opuntia humifusa* PRICKLY PEAR
- 1 *Ornithogalum umbellatum* STAR OF BETHLEHEM
- 15 *Orobanche fasciculata* CLUSTERED BROOM RAPE
- 15 *Orobanche uniflora* ONE-FLOWERED BROOM RAPE
- 20 *Oryzopsis asperifolia* ROUGH-LEAVED RICE GRASS
- 20 *Oryzopsis pungens* SHORT-HORNED RICE GRASS
- 15 *Oryzopsis racemosa* BLACK-SEEDED RICE GRASS
- 3 *Osmorhiza claytoni* HAIRY SWEET CICELY
- 3 *Osmorhiza longistylis* SMOOTH SWEET CICELY
- 6 *Osmunda cinnamomea* CINNAMON FERN
- 7 *Osmunda claytoniana* INTERRUPTED FERN
- 8 *Osmunda regalis spectabilis* ROYAL FERN
- 5 *Ostrya virginiana* HOP HORNBEAM
- 0 *Oxalis europaea* TALL WOOD SORREL
- 0 *Oxalis stricta* COMMON WOOD SORREL
- 15 *Oxalis violacea* VIOLET WOOD SORREL
- 7 *Oxyopolis rigidior* COWBANE
- 15 *Panax quinquefolius* GINSENG
- 15 *Panax trifolius* DWARF GINSENG
- 5 *Panicum agrostoides* MUNRO GRASS
- 15 *Panicum boreale* NORTHERN PANIC GRASS
- 1 *Panicum capillare* OLD WITCH GRASS
- 7 *Panicum clandestinum* DEER-TONGUE GRASS
- 10 *Panicum columbianum* HEMLOCK PANIC GRASS
- 10 *Panicum depauperatum* STARVED PANIC GRASS
- 0 *Panicum dichotomiflorum* KNEE GRASS
- 20 *Panicum dichotomum* FORKED PANIC GRASS
- 10 *Panicum flexile* WIRY PANIC GRASS
- 3 *Panicum implicatum* WOOLLY PANIC GRASS
- 7 *Panicum latifolium* BROAD-LEAVED PANIC GRASS
- 9 *Panicum lindheimeri* SMOOTH PANIC GRASS
- 15 *Panicum linearifolium* SLENDER-LEAVED PANIC GRASS
- 20 *Panicum lucidum* BOG PANIC GRASS
- 6 *Panicum meridionale* MAT PANIC GRASS
- 15 *Panicum oligosanthos* FEW-FLOWERED PANIC GRASS
- 7 *Panicum oligosanthos scribnerianum* SCRIBNER'S PANIC GRASS
- 15 *Panicum perlongum* LONG-STALKED PANIC GRASS
- 8 *Panicum sphaerocarpon* ROUND-FRUITED PANIC GRASS
- 9 *Panicum spretum* SMOOTH PANIC GRASS
- 10 *Panicum verrucosum* WARTY PANIC GRASS
- 7 *Panicum villosissimum* WHITE-HAIRED PANIC GRASS
- 9 *Panicum villosissimum pseudopubescens*
- 5 *Panicum virgatum* SWITCH GRASS
- 4 *Parietaria pensylvanica* PELLITORY
- 10 *Parnassia glauca* GRASS OF PARNASSUS

- 7 *Parthenium integrifolium* WILD QUININE, AMERICAN FEVERFEW
- 1 *Parthenocissus inserta* THICKET CREEPER
- 2 *Parthenocissus quinquefolia* VIRGINIA CREEPER
- 6 *Paspalum ciliatifolium* HAIRY LENS GRASS
- 3 *Pastinaca sativa* WILD PARSNIP
- 10 *Pedicularis canadensis* WOOD BETONY, LOUSEWORT
- 7 *Pedicularis lanceolata* SWAMP BETONY, FEN BETONY
- 15 *Peltandra virginica* ARROW ARUM
- 4 *Penstemon calycosus* SMOOTH BEARD TONGUE
- 4 *Penstemon digitalis* FOXGLOVE BEARD TONGUE
- 5 *Penthorum sedoides* DITCH STONECROP
- 9 *Petalostemum purpureum* PURPLE PRAIRIE CLOVER
- 0 *Petunia X hybrida* GARDEN PETUNIA
- 0 *Phalaris arundinacea* REED CANARY GRASS
- * *Philadelphus coronarius* MOCK ORANGE
- 1 *Phleum pratense* TIMOTHY
- 8 *Phlox bifida* CLEFT PHLOX, SAND PHLOX
- 5 *Phlox divaricata* BLUE PHLOX, WOODLAND PHLOX
- 7 *Phlox glaberrima interior* MARSH PHLOX
- 2 *Phlox paniculata* GARDEN PHLOX
- 6 *Phlox pilosa* PRAIRIE PHLOX
- 4 *Phragmites communis berlandieri* COMMON REED
- 3 *Phryma leptostachya* LOPSEED
- 3 *Physalis heterophylla* CLAMMY GROUND CHERRY
- * *Physalis pubescens* HAIRY GROUND CHERRY
- 1 *Physalis subglabrata* TALL GROUND CHERRY
- 4 *Physalis virginiana* LANCE-LEAVED GROUND CHERRY
- 8 *Physocarpus opulifolius* NINEBARK
- 5 *Physostegia virginiana* FALSE DRAGONHEAD, OBEDIENT PLANT
- 2 *Phytolacca americana* POKEWEED
- 7 *Pilea fontana* BOG CLEARWEED
- 5 *Pilea pumila* CLEARWEED
- 20 *Pinus banksiana* JACK PINE
- * *Pinus nigra* AUSTRIAN PINE
- 20 *Pinus strobus* WHITE PINE
- * *Pinus sylvestris* SCOTCH PINE
- 1 *Plantago lanceolata* ENGLISH PLANTAIN
- 0 *Plantago major* COMMON PLANTAIN
- 0 *Plantago rugelii* RED-STALKED PLANTAIN
- 0 *Plantago virginica* DWARF PLANTAIN
- 10 *Platanus occidentalis* SYCAMORE
- 15 *Poa alsodes* GROVE BLUE GRASS
- 1 *Poa annua* ANNUAL BLUE GRASS
- * *Poa bulbosa* BULBOUS BLUE GRASS
- 0 *Poa compressa* CANADA BLUE GRASS
- 15 *Poa languida* WEAK BLUE GRASS
- 20 *Poa paludigena* BOG BLUE GRASS
- 9 *Poa palustris* MARSH BLUE GRASS
- 0 *Poa pratensis* KENTUCKY BLUE GRASS
- * *Poa trivialis* ROUGH BLUE GRASS
- 5 *Podophyllum peltatum* MAY APPLE
- 15 *Pogonia ophioglossoides* SNAKE-MOUTH ORCHID
- 0 *Polanisia graveolens* CLAMMY WEED

- 5 *Polemonium reptans* JACOB'S LADDER
- 10 *Polygala cruciata aquilonia* CROSS MILKWORT
- 20 *Polygala paucifolia* FLOWERING WINTERGREEN
- 10 *Polygala polygama obtusata* PURPLE MILKWORT
- 6 *Polygala sanguinea* FIELD MILKWORT
- 8 *Polygala senega* SENECA SNAKEROOT
- 5 *Polygala verticillata isocycla* WHORLED MILKWORT
- 3 *Polygonatum canaliculatum* SMOOTH SOLOMON'S SEAL
- 7 *Polygonatum pubescens* DOWNY SOLOMON'S SEAL
- 15 *Polygonella articulata* JOINTWEED
- 5 *Polygonum amphibium stipulaceum* WATER KNOTWEED
- 15 *Polygonum arifolium pubescens* HALBERD-LEAVED TEAR-THUMB
- 0 *Polygonum aviculare* COMMON KNOTWEED
- 15 *Polygonum careyi* CAREY'S HEARTSEASE
- 0 *Polygonum cespitosum longisetum* CREEPING SMARTWEED
- 5 *Polygonum coccineum* WATER HEARTSEASE
- 0 *Polygonum convolvulus* BLACK BINDWEED
- 1 *Polygonum cuspidatum* JAPANESE KNOTWEED
- 2 *Polygonum hydropiper* WATER PEPPER
- 7 *Polygonum hydropiperoides* MILD WATER PEPPER
- 0 *Polygonum lapathifolium* HEARTSEASE
- 10 *Polygonum opelousanum adenocalyx*
- 0 *Polygonum pennsylvanicum laevigatum* PENNSYLVANIA KNOTWEED
- 0 *Polygonum persicaria* LADY'S THUMB
- 0 *Polygonum punctatum* SMARTWEED
- 10 *Polygonum sagittatum* ARROW-LEAVED TEAR-THUMB
- 2 *Polygonum scandens* CLIMBING FALSE BUCKWHEAT
- 7 *Polygonum tenue* SLENDER KNOTWEED
- 15 *Polypodium virginianum* POLYPODY
- 10 *Polystichum acrostichoides* CHRISTMAS FERN
- 15 *Polytaenia nuttallii* PRAIRIE PARSLEY
- 10 *Pontederia cordata* PICKEREL WEED
- * *Populus alba* WHITE POPLAR, SILVER POPLAR
- 20 *Populus balsamifera* BALSAM POPLAR
- 2 *Populus deltoides* EASTERN COTTONWOOD
- 6 *Populus grandidentata* LARGE-TOOTHED ASPEN
- 20 *Populus X jackii*
- * *Populus nigra italica* LOMBARDY POPLAR
- 4 *Populus tremuloides* QUAKING ASPEN
- 0 *Portulaca oleracea* PURSLANE
- 10 *Potamogeton amplifolius* LARGE-LEAVED PONDWEED
- 8 *Potamogeton diversifolius* WATERTHREAD PONDWEED
- 7 *Potamogeton foliosus* LEAFY PONDWEED
- 7 *Potamogeton gramineus* GRASS-LEAVED PONDWEED
- 7 *Potamogeton illinoensis* ILLINOIS PONDWEED
- 7 *Potamogeton natans* COMMON PONDWEED
- 7 *Potamogeton nodosus* LONG-LEAVED PONDWEED
- 6 *Potamogeton pectinatus* SAGO PONDWEED
- 15 *Potamogeton pulcher* SPOTTED PONDWEED
- 7 *Potamogeton pusillus* SMALL PONDWEED
- 9 *Potamogeton richardsonii* RICHARDSON'S PONDWEED
- 9 *Potamogeton robbinsii* FERN PONDWEED
- 8 *Potamogeton zosteriformis* FLAT-STEMMED PONDWEED

- 6 *Potentilla anserina* SILVERWEED
- 2 *Potentilla argentea* SILVERY CINQUEFOIL
- 9 *Potentilla arguta* PRAIRIE CINQUEFOIL
- 15 *Potentilla fruticosa* SHRUBBY CINQUEFOIL
- 0 *Potentilla norvegica* ROUGH CINQUEFOIL
- 15 *Potentilla palustris* MARSH CINQUEFOIL
- 1 *Potentilla recta* SULFUR CINQUEFOIL
- 4 *Potentilla simplex* COMMON CINQUEFOIL
- 5 *Prenanthes alba* WHITE LETTUCE
- 10 *Prenanthes altissima* TALL WHITE LETTUCE
- 8 *Prenanthes aspera* ROUGH WHITE LETTUCE
- 8 *Prenanthes crepidinea* GREAT WHITE LETTUCE
- 8 *Prenanthes racemosa* GLAUCOUS WHITE LETTUCE
- 6 *Proserpinaca palustris crebra* MERMAID WEED
- 1 *Prunella vulgaris* LAWN PRUNELLA
- 0 *Prunella vulgaris lanceolata* SELF HEAL
- 5 *Prunus americana* WILD PLUM
- 2 *Prunus angustifolia* CHICKASAW PLUM
- * *Prunus avium* SWEET CHERRY
- 10 *Prunus nigra* CANADA PLUM
- 5 *Prunus pensylvanica* PIN CHERRY
- 8 *Prunus pumila* SAND CHERRY
- 1 *Prunus serotina* WILD BLACK CHERRY
- 1 *Prunus virginiana* CHOKE CHERRY
- 20 *Psilocarya scirpoides* LONG-BEAKED BALD RUSH
- 7 *Ptelea trifoliata* WAFER ASH, HOP TREE
- 9 *Ptelea trifoliata mollis* DUNES HOP TREE, DOWNY WAFER ASH
- 10 *Pteretis pensylvanica* OSTRICH FERN
- 5 *Pteridium aquilinum latiusculum* BRACKEN FERN
- 1 *Puccinellia distans* ALKALI GRASS
- 8 *Pycnanthemum tenuifolium* SLENDER MOUNTAIN MINT
- 5 *Pycnanthemum virginianum* COMMON MOUNTAIN MINT
- 10 *Pyrola elliptica* LARGE-LEAVED SHINLEAF
- 15 *Pyrola rotundifolia americana* ROUND-LEAVED SHINLEAF
- 20 *Pyrola secunda* ONE-SIDED SHINLEAF
- 1 *Pyrus communis* PEAR
- 3 *Pyrus coronaria* WILD SWEET CRAB
- 9 *Pyrus floribunda* PURPLE CHOKEBERRY
- 2 *Pyrus ioensis* IOWA CRAB
- 1 *Pyrus malus* APPLE
- 7 *Pyrus melanocarpa* BLACK CHOKEBERRY
- 4 *Quercus alba* WHITE OAK
- 8 *Quercus bicolor* SWAMP WHITE OAK
- 4 *Quercus ellipsoidalis* HILL'S OAK
- 10 *Quercus imbricaria* SHINGLE OAK
- 4 *Quercus macrocarpa* BUR OAK
- 8 *Quercus palustris* PIN OAK
- 7 *Quercus rubra* RED OAK
- 6 *Quercus velutina* BLACK OAK
- 0 *Ranunculus abortivus* SMALL-FLOWERED BUTTERCUP
- 6 *Ranunculus fascicularis* EARLY BUTTERCUP
- 7 *Ranunculus flabellaris* YELLOW WATER BUTTERCUP
- 8 *Ranunculus hispidus* ROUGH BUTTERCUP

- 6 *Ranunculus pensylvanicus* BRISTLY BUTTERCUP
- 5 *Ranunculus recurvatus* HOOKED BUTTERCUP
- 6 *Ranunculus sceleratus* CURSED CROWFOOT
- 4 *Ranunculus septentrionalis* SWAMP BUTTERCUP
- 4 *Ratibida pinnata* YELLOW CONEFLOWER
- 15 *Rhamnus alnifolia* ALDER BUCKTHORN
- 1 *Rhamnus davurica nipponica* DAHURIAN BUCKTHORN
- 3 *Rhamnus cathartica* COMMON BUCKTHORN
- 3 *Rhamnus frangula* GLOSSY BUCKTHORN
- 15 *Rhexia virginica* MEADOW BEAUTY
- 9 *Rhus aromatica* FRAGRANT SUMAC
- 15 *Rhus aromatica arenaria* SAND FRAGRANT SUMAC
- 6 *Rhus copallina latifolia* SHINING SUMAC, WINGED SUMAC
- 1 *Rhus glabra* SMOOTH SUMAC
- 1 *Rhus radicans* POISON IVY
- 3 *Rhus typhina* STAGHORN SUMAC
- 15 *Rhus vernix* POISON SUMAC
- 15 *Rhynchospora alba* WHITE BEAK RUSH
- 10 *Rhynchospora capillacea* HAIR BEAK RUSH
- 8 *Rhynchospora capitellata* CLUSTERED BEAK RUSH
- 20 *Rhynchospora globularis recognita* GRASS BEAK RUSH
- 15 *Rhynchospora macrostachya* GIANT BEAK RUSH
- 7 *Ribes americanum* WILD BLACK CURRANT
- 5 *Ribes cynosbati* PRICKLY WILD GOOSEBERRY
- 20 *Ribes hirtellum* NORTHERN GOOSEBERRY
- 5 *Ribes missouriense* WILD GOOSEBERRY
- 0 *Ribes sativum* RED CURRANT
- 1 *Robinia hispida* BRISTLY LOCUST
- 3 *Robinia pseudo-acacia* BLACK LOCUST
- 2 *Robinia viscosa* CLAMMY LOCUST
- 5 *Rorippa islandica fernaldiana* SMOOTH MARSH CRESS
- 10 *Rorippa islandica hispida*
- 8 *Rorippa sessiliflora* SESSILE-FLOWERED CRESS
- 5 *Rosa blanda* EARLY WILD ROSE
- * *Rosa canina* DOG ROSE
- 5 *Rosa carolina* PASTURE ROSE
- 3 *Rosa multiflora* MULTIFLORA ROSE
- 9 *Rosa palustris* SWAMP ROSE
- 10 *Rotala ramosior* WHEELWORT
- 3 *Rubus allegheniensis* COMMON BLACKBERRY
- 4 *Rubus flagellaris* COMMON DEWBERRY
- 9 *Rubus hispidus obovalis* SWAMP DEWBERRY
- 7 *Rubus idaeus strigosus* RED RASPBERRY
- 2 *Rubus occidentalis* BLACK RASPBERRY
- 10 *Rubus odoratus* PURPLE FLOWERING RASPBERRY
- 3 *Rubus pensylvanicus* YANKEE BLACKBERRY
- 15 *Rubus pubescens* DWARF BLACKBERRY
- 1 *Rudbeckia hirta* BLACK-EYED SUSAN
- 3 *Rudbeckia laciniata* WILD GOLDEN GLOW
- 9 *Rudbeckia subtomentosa* SWEET BLACK-EYED SUSAN
- 3 *Rudbeckia triloba* BROWN-EYED SUSAN
- 10 *Ruellia humilis* HAIRY RUELLIA
- 1 *Rumex acetosella* FIELD SORREL

- 2 *Rumex altissimus* PALE DOCK
- 1 *Rumex crispus* CURLY DOCK
- 0 *Rumex obtusifolius* BITTER DOCK
- 7 *Rumex orbiculatus* GREAT WATER DOCK
- 6 *Rumex verticillatus* SWAMP DOCK
- 15 *Sabatia angularis* ROSE GENTIAN, ROSE PINK
- 7 *Sagittaria brevirostra* SHORT-BEAK ARROWHEAD
- 9 *Sagittaria graminea* GRASS-LEAVED ARROWHEAD
- 4 *Sagittaria latifolia* COMMON ARROWHEAD
- 15 *Sagittaria rigida* STIFF ARROWHEAD
- 0 *Salix alba* WHITE WILLOW
- 5 *Salix amygdaloides* PEACH-LEAVED WILLOW
- 8 *Salix bebbiana* BEAKED WILLOW
- 15 *Salix candida* HOARY WILLOW
- 2 *Salix discolor* PUSSY WILLOW
- 0 *Salix fragilis* CRACK WILLOW
- 7 *Salix glaucophylloides glaucophylla* BLUE-LEAVED WILLOW
- 10 *Salix gracilis textoris* PETIOLED WILLOW
- 6 *Salix humilis* PRAIRIE WILLOW
- 1 *Salix interior* SANDBAR WILLOW
- 15 *Salix lucida* SHINING WILLOW
- 4 *Salix nigra* BLACK WILLOW
- 15 *Salix pedicellaris hypoglauca* BOG WILLOW
- 5 *Salix rigida* HEART-LEAVED WILLOW
- 15 *Salix sericea* SILKY WILLOW
- 15 *Salix syrticola* DUNE WILLOW
- 0 *Salsola kali tenuifolia* RUSSIAN THISTLE
- 1 *Sambucus canadensis* ELDERBERRY
- 10 *Sambucus pubens* RED-BERRIED ELDER
- 6 *Samolus parviflorus* WATER PIMPERNEL, BROOKWEED
- 6 *Sanguinaria canadensis* BLOODROOT
- 9 *Sanicula canadensis* CANADIAN BLACK SNAKEROOT
- 2 *Sanicula gregaria* CLUSTERED BLACK SNAKEROOT
- 6 *Sanicula marilandica* SANICLE, BLACK SNAKEROOT
- 15 *Sanicula trifoliata* LARGE-FRUITED BLACK SNAKEROOT
- 1 *Saponaria officinalis* BOUNCING BET, SOAPWORT
- 15 *Sarracenia purpurea* PITCHER PLANT
- 6 *Sassafras albidum* SASSAFRAS
- 10 *Satureja arkansana* LOW CALAMINT
- * *Satureja hortensis* SUMMER SAVORY
- 10 *Satureja vulgaris neogaea* DOGMINT
- 10 *Saururus cernuus* LIZARD'S TAIL
- 8 *Saxifraga pensylvanica* SWAMP SAXIFRAGE
- 20 *Scheuchzeria palustris americana* ARROW GRASS
- 6 *Scirpus acutus* HARD-STEMMED BULRUSH
- 7 *Scirpus americanus* CHAIRMAKER'S RUSH
- 4 *Scirpus atrovirens* DARK GREEN RUSH
- 6 *Scirpus cyperinus* WOOL GRASS
- 6 *Scirpus fluviatilis* RIVER BULRUSH
- 20 *Scirpus hallii*
- 4 *Scirpus lineatus* RED BULRUSH
- 20 *Scirpus polyphyllus* LEAFY BULRUSH
- 20 *Scirpus purshianus* WEAK BULRUSH

- 20 *Scirpus smithii* DWARF BULRUSH
- 5 *Scirpus validus creber* GREAT BULRUSH, SOFT-STEMMED BULRUSH
- 1 *Scleranthus annuus* KNAWEEL
- 20 *Scleria pauciflora caroliniana* FEW-FLOWERED NUT RUSH
- 20 *Scleria reticularis* NETTED NUT RUSH
- 10 *Scleria triglomerata* TALL NUT RUSH
- 15 *Scleria verticillata* LOW NUT RUSH
- 5 *Scrophularia lanceolata* EARLY FIGWORT
- 4 *Scrophularia marilandica* LATE FIGWORT
- 5 *Scutellaria epilobiifolia* MARSH SKULLCAP
- 5 *Scutellaria lateriflora* MAD-DOG SKULLCAP
- 7 *Scutellaria parvula leonardi* SMALL SKULLCAP
- * *Sedum acre* WALL PEPPER
- * *Sedum album*
- 0 *Sedum sarmentosum* STRINGY STONECROP
- 20 *Selaginella rupestris* SAND CLUB MOSS
- 7 *Senecio aureus* GOLDEN RAGWORT
- 6 *Senecio pauperculus balsamitae* BALSAM RAGWORT
- 15 *Senecio plattensis* PRAIRIE RAGWORT
- 1 *Setaria faberii* GIANT FOXTAIL
- 0 *Setaria glauca* YELLOW FOXTAIL
- 0 *Setaria italica* FOXTAIL MILLET
- 1 *Setaria viridis* GREEN FOXTAIL
- 8 *Seymeria macrophylla* MULLEIN FOXGLOVE
- 5 *Sicyos angulatus* BUR CUCUMBER
- 2 *Silene antirrhina* SLEEPY CATCHFLY
- 1 *Silene armeria* SWEET WILLIAM CATCHFLY
- 0 *Silene cserei* GLAUCOUS CAMPION
- 0 *Silene cucubalus* BLADDER CAMPION
- 0 *Silene noctiflora* FOOL'S CAMPION, NIGHT-FLOWERING CAMPION
- 6 *Silene stellata* STARRY CAMPION
- 10 *Silene virginica* FIRE PINK
- 5 *Silphium integrifolium* ROSIN WEED
- 5 *Silphium laciniatum* COMPASS PLANT
- 5 *Silphium perfoliatum* CUP PLANT
- 5 *Silphium terebinthinaceum* PRAIRIE DOCK
- 0 *Sisymbrium altissimum* TUMBLE MUSTARD
- 7 *Sisyrinchium albidum* COMMON BLUE-EYED GRASS
- 10 *Sisyrinchium angustifolium* STOUT BLUE-EYED GRASS
- 15 *Sisyrinchium atlanticum* EASTERN BLUE-EYED GRASS
- 7 *Sium suave* WATER PARSNIP
- 2 *Smilacina racemosa* FEATHERY FALSE SOLOMON'S SEAL
- 5 *Smilacina stellata* STARRY FALSE SOLOMON'S SEAL
- 3 *Smilax ecirrhata* UPRIGHT CARRION FLOWER
- 4 *Smilax lasioneura* COMMON CARRION FLOWER
- 15 *Smilax rotundifolia* GREEN BRIER, CAT BRIER
- 5 *Smilax tamnoides hispida* BRISTLY GREEN BRIER
- 1 *Solanum americanum* BLACK NIGHTSHADE
- 2 *Solanum carolinense* HORSE NETTLE
- 3 *Solanum dulcamara* BITTERSWEET NIGHTSHADE
- 1 *Solidago altissima* TALL GOLDENROD
- 7 *Solidago caesia* BLUE-STEM GOLDENROD
- 6 *Solidago flexicaulis* BROAD-LEAVED GOLDENROD

- 3 *Solidago gigantea* LATE GOLDENROD
- 4 *Solidago graminifolia media* SMOOTH GRASS-LEAVED GOLDENROD
- 3 *Solidago graminifolia nuttallii* ROUGH GRASS-LEAVED GOLDENROD
- 5 *Solidago gymnospermoides* SHINY GRASS-LEAVED GOLDENROD
- 5 *Solidago juncea* EARLY GOLDENROD
- 5 *Solidago missouriensis fasciculata* MISSOURI GOLDENROD
- 4 *Solidago nemoralis* OLD FIELD GOLDENROD
- 8 *Solidago ohioensis* OHIO GOLDENROD, FEN GOLDENROD
- 8 *Solidago patula* SWAMP GOLDENROD
- 15 *Solidago racemosa gillmani* DUNE GOLDENROD
- 7 *Solidago riddellii* RIDDELL'S GOLDENROD
- 4 *Solidago rigida* STIFF GOLDENROD
- 6 *Solidago rugosa* ROUGH GOLDENROD
- 2 *Solidago sempervirens* SEASIDE GOLDENROD
- 7 *Solidago speciosa* SHOWY GOLDENROD
- 10 *Solidago tenuifolia* SLENDER-LEAVED GOLDENROD
- 9 *Solidago uliginosa* BOG GOLDENROD
- 5 *Solidago ulmifolia* ELM-LEAVED GOLDENROD
- 1 *Sonchus asper* SPINY SOW THISTLE
- 0 *Sonchus oleraceus* STORE-FRONT SOW THISTLE
- 2 *Sonchus uliginosus* COMMON SOW THISTLE
- 5 *Sorghastrum nutans* INDIAN GRASS
- 15 *Sparganium americanum* AMERICAN BUR REED
- 10 *Sparganium chlorocarpum* SIMPLE BUR REED
- 6 *Sparganium eurycarpum* COMMON BUR REED
- 5 *Spartina pectinata* PRAIRIE CORD GRASS
- 6 *Specularia perfoliata* VENUS'S LOOKING GLASS
- 1 *Spergularia media* SALT SPURREY
- 4 *Sphenopholis intermedia* SLENDER WEDGE GRASS
- 7 *Spiraea alba* MEADOWSWEET
- 9 *Spiraea tomentosa rosea* STEEPLE BUSH, HARDHACK
- 7 *Spiranthes cernua* NODDING LADIES' TRESSES
- 15 *Spiranthes lacera* SLENDER LADIES' TRESSES
- 15 *Spiranthes lucida* EARLY LADIES' TRESSES
- 7 *Spirodela polyrhiza* GREAT DUCKWEED
- 1 *Sporobolus asper* ROUGH DROPSEED
- 7 *Sporobolus cryptandrus* SAND DROPSEED
- 9 *Sporobolus heterolepis* PRAIRIE DROPSEED
- 2 *Sporobolus neglectus* SMALL RUSH GRASS
- 2 *Sporobolus vaginiflorus* SHEATHED RUSH GRASS
- 15 *Stachys hyssopifolia* HYSSOP HEDGE NETTLE
- 5 *Stachys palustris homotricha* WOUNDWORT
- 5 *Stachys tenuifolia hispida* ROUGH HEDGE NETTLE
- 7 *Staphylea trifolia* BLADDERNUT
- 1 *Stellaria graminea* STARWORT
- 8 *Stellaria longifolia* STITCHWORT, FALSE STARWORT
- 0 *Stellaria media* COMMON CHICKWEED
- 15 *Stipa avenacea* BLACK OAT GRASS
- 6 *Stipa spartea* PORCUPINE GRASS
- 7 *Strophostyles helvola* TRAILING WILD BEAN
- 9 *Strophostyles leiosperma* SMALL WILD BEAN
- 15 *Stylophorum diphyllum* CELANDINE POPPY
- 10 *Swertia caroliniensis* AMERICAN COLUMBO

- 0 *Symphoricarpos orbiculatus* CORAL BERRY, INDIAN CURRANT
- 6 *Symplocarpus foetidus* SKUNK CABBAGE
- * *Syringa vulgaris* LILAC
- 8 *Taenidia integerrima* YELLOW PIMPERNEL
- 15 *Talinum rugospermum* FAME FLOWER
 - 1 *Tanacetum vulgare* TANSY
 - 2 *Taraxacum erythrospermum* RED-SEEDED DANDELION
 - 0 *Taraxacum officinale* COMMON DANDELION
 - 8 *Tephrosia virginiana* GOAT'S RUE, HOARY PEA
 - 3 *Teucrium canadense* GERMANDER, WOOD SAGE
 - 3 *Teucrium occidentale* GERMANDER, WOOD SAGE
 - 4 *Thalictrum dasycarpum* PURPLE MEADOW RUE
 - 5 *Thalictrum dasycarpum hypoglauca* SMOOTH MEADOW RUE
 - 5 *Thalictrum dioicum* EARLY MEADOW RUE
 - 5 *Thalictrum revolutum* WAXY MEADOW RUE
 - 8 *Thaspium barbinode* HAIRY MEADOW PARSNIP
 - 7 *Thaspium trifoliatum flavum* MEADOW PARSNIP
 - 0 *Thlaspi arvense* PENNY CRESS
- 15 *Thuja occidentalis* ARBOR VITAE, EASTERN WHITE CEDAR
- 5 *Tilia americana* AMERICAN LINDEN, BASSWOOD
- 2 *Tovara virginiana* WOODLAND KNOTWEED
- 2 *Tradescantia ohienensis* SPIDERWORT
- 15 *Tradescantia subaspera* BROAD-LEAVED SPIDERWORT
 - 1 *Tragopogon major* SAND GOAT'S BEARD
 - 1 *Tragopogon pratensis* COMMON GOAT'S BEARD
- 15 *Trichostema dichotomum* BLUE CURLS
- 15 *Trientalis borealis* STARFLOWER
 - 1 *Trifolium agrarium* YELLOW HOP CLOVER
 - 0 *Trifolium arvense* RABBIT-FOOT CLOVER
 - 1 *Trifolium dubium* LITTLE HOP CLOVER
 - 1 *Trifolium hybridum* ALSIKE CLOVER
 - 1 *Trifolium pratense* RED CLOVER
 - 1 *Trifolium procumbens* LOW HOP CLOVER
 - 1 *Trifolium repens* WHITE CLOVER
- 10 *Triglochin maritima* COMMON BOG ARROW GRASS
- 20 *Trillium cernuum macranthum* NODDING TRILLIUM
 - 6 *Trillium flexipes* DECLINED TRILLIUM
 - 8 *Trillium grandiflorum* LARGE-FLOWERED TRILLIUM
 - 5 *Trillium recurvatum* RED TRILLIUM
- 2 *Triodia flava* FALSE REDTOP
- 5 *Triosteum aurantiacum* EARLY HORSE GENTIAN
- 20 *Triphora trianthophora* NODDING POGONIA
 - 7 *Triplasis purpurea* SAND GRASS
- * *Triticum aestivum* WHEAT
- 2 *Typha angustifolia* NARROW-LEAVED CATTAIL
- 1 *Typha latifolia* BROAD-LEAVED CATTAIL
- 3 *Ulmus americana* AMERICAN ELM
- 1 *Ulmus pumila* SIBERIAN ELM
- 4 *Ulmus rubra* SLIPPERY ELM
- 2 *Urtica procera* TALL NETTLE
- 20 *Utricularia cornuta* HORNED BLADDERWORT
- 20 *Utricularia geminiscapa*
- 15 *Utricularia gibba* HUMPED BLADDERWORT

- 15 *Utricularia minor* SMALL BLADDERWORT
- 20 *Utricularia purpurea* PURPLE BLADDERWORT
- 20 *Utricularia subulata* ZIGZAG BLADDERWORT
- 10 *Utricularia vulgaris* GREAT BLADDERWORT
- 7 *Uvularia grandiflora* BELLWORT
- 5 *Vaccinium angustifolium laevifolium* EARLY LOW BLUEBERRY
- 15 *Vaccinium atrococcum* DOWNY Highbush BLUEBERRY
- 8 *Vaccinium corymbosum* COMMON Highbush BLUEBERRY
- 15 *Vaccinium macrocarpon* LARGE CRANBERRY
- 15 *Vaccinium oxycoccos* SMALL CRANBERRY
- 5 *Vaccinium vacillans* LATE LOW BLUEBERRY
- 15 *Valerianella chenopodifolia* CORN SALAD
- 7 *Vallisneria americana* EEL GRASS
- 1 *Verbascum blattaria* MOTH MULLEIN
- 1 *Verbascum thapsus* COMMON MULLEIN
- 0 *Verbena bracteata* CREEPING VERVAIN
- 4 *Verbena hastata* BLUE VERVAIN
- 4 *Verbena stricta* HOARY VERVAIN
- 5 *Verbena urticifolia* WHITE VERVAIN
- 5 *Vernonia altissima* TALL IRONWEED
- 5 *Vernonia fasciculata* COMMON IRONWEED, SMOOTH IRONWEED
- 5 *Vernonia missurica* MISSOURI IRONWEED, DOWNY IRONWEED
- 0 *Veronica arvensis* CORN SPEEDWELL
- 10 *Veronica comosa* WATER SPEEDWELL
- * *Veronica officinalis* COMMON SPEEDWELL
- 1 *Veronica peregrina* PURSELANE SPEEDWELL
- 10 *Veronica scutellata* MARSH SPEEDWELL
- 1 *Veronica serpyllifolia* THYME-LEAVED SPEEDWELL
- * *Veronica verna*
- 6 *Veronicastrum virginicum* CULVER'S ROOT
- 9 *Viburnum acerifolium* MAPLE-LEAVED ARROW-WOOD
- 5 *Viburnum lentago* NANNYBERRY
- 0 *Viburnum opulus* EUROPEAN Highbush CRANBERRY
- 4 *Viburnum prunifolium* BLACK HAW
- 5 *Viburnum rafinesquianum* DOWNY ARROW-WOOD
- 10 *Viburnum recognitum* SMOOTH ARROW-WOOD
- 7 *Vicia americana* AMERICAN VETCH
- 0 *Vicia villosa* HAIRY VETCH, WINTER VETCH
- 2 *Vinca minor* PERIWINKLE
- 2 *Viola affinis* LE CONTE'S VIOLET
- 0 *Viola arvensis* FIELD PANSY
- 15 *Viola canadensis* CANADA VIOLET
- 10 *Viola conspersa* DOG VIOLET
- 6 *Viola cucullata* HOODED VIOLET
- 15 *Viola fimbriatula* SAND VIOLET
- 15 *Viola incognita forbesii* HAIRY WHITE VIOLET
- 7 *Viola lanceolata* LANCE-LEAVED VIOLET
- 5 *Viola missouriensis* MISSOURI VIOLET
- 0 *Viola odorata* SWEET VIOLET
- 15 *Viola pallens* SMOOTH WHITE VIOLET
- 0 *Viola papilionacea* COMMON BLUE VIOLET
- 10 *Viola pedata lineariloba* BIRD'S FOOT VIOLET
- 5 *Viola pensylvanica* SMOOTH YELLOW VIOLET

- 10 *Viola primulifolia* PRIMROSE VIOLET
 - 10 *Viola pubescens* DOWNY YELLOW VIOLET
 - 15 *Viola rostrata* LONG-SPURRED VIOLET
 - 7 *Viola sagittata* ARROW-LEAVED VIOLET
 - 3 *Viola sororia* HAIRY WOOD VIOLET
 - 6 *Viola striata* STRIPED WHITE VIOLET
 - 0 *Viola tricolor* PANSY VIOLET
 - 10 *Vitis aestivalis* SUMMER GRAPE
 - 15 *Vitis labrusca* FOX GRAPE
 - 4 *Vitis riparia* RIVERBANK GRAPE
 - * *Vulpia myuros* MOUSE-TAIL FESCUE
 - 6 *Vulpia octoflora tenella* SLENDER FESCUE
 - * *Wisteria macrostachya* KENTUCKY WISTERIA
 - 7 *Wolffia columbiana* COMMON WATER MEAL
 - 20 *Woodwardia areolata*
 - 15 *Woodwardia virginica* CHAIN FERN
 - 1 *Xanthium strumarium* COCKLEBUR
 - 1 *Xanthoxylum americanum* PRICKLY ASH
 - 20 *Xyris caroliniana* TALL YELLOW-EYED GRASS
 - 15 *Xyris torta* YELLOW-EYED GRASS
 - * *Yucca smalliana* ADAM'S NEEDLE
 - * *Zea mays* CORN
 - 15 *Zizania aquatica* WILD RICE
 - 7 *Zizia aurea* GOLDEN ALEXANDERS, MEADOW PARSNIP
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