

A NATURAL AREAS INVENTORY  
OF THE LOWER PENINSULA OF VIRGINIA:  
CITY OF WILLIAMSBURG  
JAMES CITY COUNTY  
YORK COUNTY

SECOND ANNUAL REPORT

COASTAL ZONE  
INFORMATION CENTER

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LOWER PENINSULA NATURAL HERITAGE INVENTORY

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## LOWER PENINSULA NATURAL HERITAGE INVENTORY

### INTRODUCTION

In January 1990, the Virginia Department of Conservation and Recreation, through its Division of Natural Heritage, was contracted by the localities of James City County, the City of Williamsburg, and York County to conduct the second year's work in a planned three-year natural areas inventory. The goal of this inventory is to systematically identify all of the localities' Natural Heritage Resources: those sites supporting unique or exemplary natural communities, rare plants and rare animals, and other significant natural features.

In October 1990, funding for the third year of the inventory was approved by the localities. Thus, funding is now assured for the completion of the inventory during 1991. This report summarizes information gained during the second year of the inventory. The study proposal specifies that the second year will be devoted to fieldwork. Indeed, the majority of the effort during 1990 centered on fieldwork. However, additional fieldwork will be conducted in the spring and summer of 1991. Therefore, additional information will be obtained in the coming months and the results presented here must be considered preliminary.

### OVERVIEW OF THE STUDY AREA

Together, the localities of James City County, the City of Williamsburg, and York County cover the majority of a large peninsula bordered on the north by the York River, on the east by Chesapeake Bay, and on the south by the James River. This area is locally known as the Lower Peninsula, or, simply, the Peninsula.

Geology. The Peninsula lies entirely within Virginia's Coastal Plain physiographic province. Here, bedrock is buried by deep layers of unconsolidated materials that eroded from the mountainous western portions of the Commonwealth and were transported to the ocean by large rivers. Although now lying above sea level, these material were deposited on the sea floor and reworked as sea level moved alternately west and east. Evidence of prehistoric sea levels includes relatively long, steep slopes (scarps) that divide the Peninsula into terraces, lower on the east and higher on the west. Four scarps are currently recognized in the Peninsula. From east to west these are the Big Bethel, Suffolk, Kingsmill, and Surry (Johnson & Berquist, 1989).

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The eastern tip of the Peninsula is covered with low-lying Pleistocene sands and gravels (Calver & Hobbs, 1963). This area now supports salt marshes, with maritime forests on the higher dune ridges.

Deposit of sands and gravels are exposed over much of the Peninsula. Although Calver & Hobbs (1963) included all of these in the Yorktown formation, which they placed in the Miocene, more recent studies have divided these deposits into three Pliocene formations and five from the Pleistocene (Johnson & Berquist, 1989). These deposits are typically acidic, but where steep-walled ravines cut through fossiliferous beds, they are circumneutral. In either case, the uplands of the Peninsula were largely forested at the time of settlement by Europeans.

The older Miocene deposits that make up the St. Mary's formation (the Eastover formation of Johnson & Berquist, 1989) are exposed in the lowlands along the James River and, to a lesser degree, York River (Calver & Hobbs, 1963). This formation includes beds of sands and clays, some of which contain fossils. Most outcrops of this formation support marshes and swamps.

Current Vegetation. The uplands of the Peninsula are largely forested. Most of the forests are composed of either hardwoods (primarily American Beech, Fagus grandifolia; Tulip Poplar Liriodendron tulipifera; and oaks Quercus spp.), or mixed pines (primarily Loblolly, Pinus taeda; Virginia, Pinus virginiana; and Shortleaf, Pinus echinata) and hardwoods. Although only a relatively small proportion of the Peninsula is currently in agriculture, most of the uplands were farmed in the past.

With steep slopes typical of the Peninsula, most stream channels are narrow, with little development of bottomland forests. Powhatan Swamp is the only extensive forested bottomland in the study area. This area supports a mixture of Bald Cypress (Taxodium distichum), Black Gum (Nyssa sylvatica), Red Maple (Acer rubrum), Sweetgum (Liquidambar styraciflua), and bottomland oaks.

Most of the wetlands in the Peninsula are marshes. Although tides are noticeable along the Chesapeake Bay's tributaries from the fall line, the York and James Rivers (and their tributaries) have sufficient flow that they remain fresh for a considerable distance downstream. As a result, the marshes on the northwest edge of the study area are bathed in freshwater while those at the southeast are inundated with saltwater. As the salinity increases downstream, the diversity of plants and animals in the marshes decreases. Along the Chickahominy River, for example, are extensive marshes whose dominants change with the seasons. In the

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early summer low, plants such as Pickerel weed (Pontederia cordata) and Duck Potato (Peltandra virginiana) dominate. By late summer, however, Wild Rice (Zizania aquatica), Beggar Ticks (Bidens sp.), and Wild Senna (Cassia fasciculata var. macroserma) dominate. Downstream, these and other freshwater species disappear and are replaced by species tolerant of increasing salinity. Big Cordgrass (Spartina cynosuroides) is the characteristic species of moderately salty stretches, while Black Needlerush (Juncus roemerianus) and Saltmarsh Cordgrass (Spartina alterniflora) grow in extensive single-species patches along Chesapeake Bay.

## VIRGINIA'S NATURAL HERITAGE PROGRAM

Virginia's Natural Heritage program is the Commonwealth's principal manager of data on rare plants and animals, unique and exemplary natural communities, and other significant natural features such as caves, champion trees, and waterfalls.

Each of these significant natural features (species, community type, and category of geological feature) is an element of natural diversity, or simply an element. Each element is assigned a rank that indicates its relative rarity on a five-point scale (1 = extremely rare; 5 = abundant; Table 1). The primary criterion for ranking elements is the number of occurrences, i.e. the number of known distinct localities or populations. Also of great importance is the number of individuals at each locality or, if a highly mobile organism, the total number of individuals. Other considerations include the condition of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of occurrences such that ranks are an index of known biological rarity. These ranks are assigned both in terms of the element's rarity within Virginia (its State or S-rank) and the element's rarity over its entire range (its Global or G-rank). Taken together these two ranks give an instant picture of the real rarity of the element. Although most species protected under state or federal endangered species laws are extremely rare, Natural Heritage rarity ranks should not be interpreted as legal designations.

The spot on the landscape that supports a particular population of a specific species or a specific stand of a given community type is an element occurrence. There are now over 4500 mapped element occurrences in Virginia. Information on the location and quality of these element occurrences are also entered into the Division's computerized databases.

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Table 1. Definition of Natural Heritage state rarity ranks. Global ranks are similar, but refer to a species' rarity throughout its range. Global ranks are denoted with a "G" followed by a character. Note that GA and GN are not used and GX means extinct. These ranks should not be interpreted as legal designations.

- S1 Extremely rare; usually 5 or fewer occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.
- S2 Very rare; usually between 5 and 20 occurrences; or with many individuals in fewer occurrences; often susceptible to becoming endangered.
- S3 Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
- S4 Common; usually >100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
- S5 Very common; demonstrably secure under present conditions.
- SA Accidental in the state.
- SH Historically known from the state, but not verified for an extended period, usually >15 years; this rank is used primarily when inventory has been attempted recently.
- SN Regularly occurring migrants; transients; seasonal, non-breeding residents. Usually no specific site can be identified with its range in the state. (Note that congregation and staging areas are monitored separately).
- SU Status uncertain, often because of low search effort or cryptic nature of the element.
- SX Apparently extirpated from the state.

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In addition to ranking each element in terms of rarity, Natural Heritage staff scientists ranks each element occurrence so that protection efforts can be aimed not only at the rarest elements, but at the best examples of each. In the case of species, an element occurrence is ranked in terms of the quality (size, vigor, etc.) of the population, the condition or naturalness of the habitat, the long-term viability of the population, and the defensibility of the occurrence. Given the intimate relationship between a natural community and its environment, communities are ranked in terms of their quality and their size.

Natural Heritage staff began conducting county natural areas inventory in order to gather information on the rare species and communities in a more thorough and systematic manner. Given that some regions of the Commonwealth face greater development pressures than others, Natural Heritage staff scientists are attempting to inventory the most highly threatened areas first.

### METHODS

The Natural Heritage staff conducts natural area inventories in five stages:

- 1) Review of aerial photographs. Aerial photographs of the entire survey area are reviewed in detail to identify Potential Natural Areas (PNAs) to be studied in the following stages. Where possible, both the oldest available photographs and the most recent ones are studied. Comparing these two sets of photographs with each other helps determine how long forests and other vegetation have been in their current condition. In addition, the photographs are compared with topographic, wetlands, and soils maps as aids to their interpretation.
- 2) Gathering existing information. Museum collections are visited by Natural Heritage staff and label information is recorded for rare species. Published and unpublished information on natural areas in the inventory area is collected and assimilated in conjunction with the review of aerial photographs. This includes gathering maps of public lands (federal, state and local) within the survey area, reviewing Natural Heritage data, consulting experts such as local naturalists, soil conservationists, foresters, and college faculty. During this stage, some PNAs are eliminated from further consideration while others are added.



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- 3) Aerial reconnaissance. Selected PNAs are studied in more detail by flying over them in a small airplane. Typically, this is done in the spring or fall, when the ground is visible through the trees. This is especially useful where no recent photographs are available or there have been major changes in the landscape due to development, conversion of natural forests to managed plantations, etc. Flying allows the quick review of many tracts that would take days to visit by car and on foot. Making a videotape of the flight allows the flight to be replayed and reanalyzed. The goal of this stage is to eliminate from consideration the sites that are no longer in a natural state and to begin prioritizing the remaining PNAs for on-the-ground survey.
- 4) Initial ground survey. There are several purposes of this stage. One is to identify and contact the landowner. A second purpose is to screen the PNAs to eliminate those that show signs of substantial disturbance that are not visible in aerial photographs or from the air. A third is to plan for the main survey of PNAs that still show potential as natural areas. Among the decisions to be made are when the survey can best be conducted, which staff scientist(s) should be involved (i.e. what is the potential for rare plants, rare animals or exemplary communities), and how much time should be budgeted for completing the survey. Where there is a need to verify the accuracy of the photo interpretation conducted during stage 1, these stages may overlap.
- 5) Thorough inventory of the PNA. At this time, detailed information is collected on the presence and status of rare species and unique or exemplary natural communities that are present, the extent of the feature(s) that make the PNA significant, and the area that needs to be protected to preserve those features. Threats and past or present disturbances are also noted. For sites found to be of statewide significance, these data are transcribed onto Natural Heritage maps and entered into the Natural Heritage databases.
- 6) Compilation of results and preparation of final report. As fieldwork is completed, Natural Heritage staff scientists review the information gathered. Based on a review of all natural heritage resources present at a site, the staff prioritizes the sites in terms of their significance and the threats facing them, develops and maps preliminary preserve boundaries, and drafts protection and management recommendations. This information is then combined into a report to the contracting locality.

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### RESULTS

The County Natural Heritage Inventory of Williamsburg City, York County and James City County is progressing on schedule. During the 1990 field season, Natural Heritage staff concentrated on conducting field surveys of the PNAs (steps 4 and 5 of the inventory). Particular emphasis was placed on rare plant surveys. Surveys were also conducted for a number of globally rare animals and natural communities. In addition, the review of additional museum records added a number of historical records to the Natural Heritage databases. During the compilation of field data, Natural Heritage staff scientists have begun to develop protection priorities and preliminary boundaries for some of the most significant PNAs. Appendix A shows which PNAs are now known to support Natural Heritage Resources.

Of the more than 90 Potential Natural Areas (PNAs) identified during the first year of the inventory (Appendix A; Figure 1), 60 were visited one or more times this year. Most of the remaining PNAs are on federal property (e.g. Colonial National Historical Park, Cheatham Annex) or have a low probability of supporting Natural Heritage Resources. Plans are being made to continue field work in 1991. In particular, field workers are on line to continue rare plant inventories and to conduct bird censuses. Highlights of the year include:

- \* Forty-eight element occurrences were documented (discovered or re-verified) in the Lower Peninsula. Twenty-six of these are plants (9 species), 14 are animals (6 species), and 8 are natural communities (3 community types).
- \* A new population of the globally rare, and listed Endangered, small-whorled pogonia (Isotria medeoloides) was discovered on the William and Mary campus. The presence of this species on public property that is already managed for its natural features helps ensure the continued existence of this species.
- \* Many new populations of shadow witch (Ponthieva racemosa) and drooping bulrush (Scirpus lineatus) were located, making these species far more common than previously believed.
- \* Freshwater tidal marshes in the northern portion of James City County are among the best examples of this community type remaining in the Middle Atlantic States. The quality of these marshes suggests that the rare invertebrates collected from this community type in the past are likely to be present, even though they were not collected this year.

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- \* Similarly, high quality salt marshes are still present along the eastern shores of York County. While no rare species are known from this community type, many common species inhabit these marshes during some portion of their lives.
- \* Healthy populations of freshwater mussels were found in scattered locations in the Lower Peninsula. To date, only one mussel species currently monitored by the Natural Heritage program has been found, healthy populations of more common species persist, despite past declines in water quality.
- \* Collateral studies on several federal properties (e.g. Cheatham Annex, Colonial National Historical Park, Yorktown Naval Weapons Station) have helped Natural Heritage scientists understand the natural history and status of several rare species and significant habitats.
- \* Two species from the Lower Peninsula that were monitored by the Natural Heritage program a year ago (few-flowered milkweed, Asclepias lanceolata and water hickory, Carya aquatica) have been found to be sufficiently common that they are no longer monitored. Current and/or historical records have been located for 20 elements that were not previously known from the Lower Peninsula (Appendix B).

### RECOMMENDATIONS

1. Continue the inventory. The work done to date has documented the existence of many Natural Heritage Resources in the Lower Peninsula. Completion of the natural areas inventory will provide the three contracting localities with the information they need to help ensure that the best sites are protected.
2. Utilize the PNAs in environmental review. The PNAs identified in this study are the areas that hold the greatest likelihood of supporting unique or exemplary natural communities and rare species. As proposed developments come before the localities, they should be compared with the PNA map provided in this report (Figure 1). The Natural Heritage staff offers their information and expertise in reviewing project proposals, especially where the proposal includes a PNA.
3. Begin to incorporate PNAs in local zoning and planning. Some of the PNAs fall within either Resource Management or Resource Protection zones defined by the contracting localities under the Chesapeake Bay Preservation Act. Many others lie outside

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PNA #	PNA NAME	STATUS*
1	Headquarters	
2	Felgates Creek & Black Swamp	
3	Penniman Spit	A
4	Beaverdam Pond	
5	Carter Creek	
6	Skimino Tributary	
7	Felgate Upland	
8	Bigler Mill Pond	
9	Skimino Creek	
10	Christensons Corner	X
11	Interchange Tributary	
12	Haring Swamp	
13	Oaktree	
14	Camp Skimino	
15	Carters Grove	CP
16	Queen Creek	
17	Wood Creek	
18	Lower Skiffes Creek	P
19	Lackey	
20	Washington Headquarters	
21	Beaverdam Creek	AP
22	Woodside Park (Newport News)	
23	Yorktown Creek	
24	York River Cliffs	
25	Ballard Creek	
26	Great Run	
27	Grafton Ponds NW	A
28	Grafton Ponds SW	AC
29	Grafton Ponds E	APC
30	Grafton Ponds SE	
31	Grafton Ponds NE	A
32	Upper Baptist Run	A
33	Harris Grove Ponds	
34	Poquoson River Mouth	
35	Acre Acres Pond	
36	Goodwin Islands	C
37	Claxton Creek	
38	Gordons Island Marsh	C
39	Shields Point	A
40	Yarmouth Island	AC

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PNA #	PNA NAME	STATUS*
41	Hog Neck - Uncles Neck	
42	Big Marsh Point	A
43	Upper Yarmouth Creek	AP
44	Colby Swamp	A
45	Gordon Creek Uplands	
46	Governors Land	
47	Powhatan Creek	AP
48	Passmore Creek	AC
49	Back River Marshes	A
50	College Woods	P
51	Kings Mill Neck East	X
52	College Creek	A
53	King Creek	
54	Upper Crab Neck	
55	Tabb West	
56	Tabb Lake	
57	Brick Kiln Creek	
58	Back Landing	
59	Long Creek	
60	Black Walnut Ridge	C
61	Plum Tree Island	C
62	Mill Creek - Diascund Creek	
63	Diascund Creek	P
64	Edwards Swamp	A
65	Bird Swamp	
66	Upper Mill Creek	
67	Chisel Run	P
68	Ware Creek	C
69	Taskinas Creek	PC
70	York River State Park	
71	Mulberry Island -- Newport News	
72	Gravel Pit Point	
73	Tutters Neck Pond	P
74	Forest Hill Park	P
75	Interchange Ridge	
76	Waller Mill Park North	
77	Waller Mill Park South	
78	Plantation Heights	P
79	Wilmington Academy	P
80	Mill Creek	

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PNA #	PNA NAME	STATUS*
81	James River Church North	X
82	James River Church South	X
83	Powell Lake	
84	Northeast Quarter Park	
85	Magruder School	P
86	Norge	X
87	War Hill	
88	Grove Creek	CP
89	Kentucky Farms South	
90	Tiger Bluffs	
91	Colonial NHP Bluffs	
92	Jamestown Festival Park	
93	Mill Creek Roadside	P
94	Mt. Pleasant Church	P

\*

Status:

- A = Rare animals present
- C = Significant natural communities present
- P = Rare plants present
- X = PNA is no longer in a sufficiently natural state for further consideration

APPENDIX B:

Natural Heritage Resources reported from  
the Lower Peninsula.

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SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<b>** AMPHIBIANS</b>					
AMBYSTOMA MABEEI	MABEE'S SALAMANDER	G4	S2?		RSC
AMBYSTOMA TIGRINUM	TIGER SALAMANDER	G5	S1		LE
HYLA GRATIOSA *	BARKING TREEFROG	G5	S3		RSC
RANA VIRGATIPES	CARPENTER FROG	G5	S3		RSC
<b>** BIRDS</b>					
HALIAEETUS LEUCOCEPHALUS *	BALD EAGLE	G3	S2S3	LE	LE
ARDEA HERODIAS *	GREAT BLUE HERON	G5	S3		
<b>** INSECTS</b>					
CICINDELLA MARGINATA *	A TIGER BEETLE	G5	S3S4		
ISCHNURA PROGNATHA	A DRAGONFLY	G4	S1		RSC
LIBELLULA AXILENA *	A DRAGONFLY	G5	S1		
<b>** MUSSELS</b>					
ANODONTA IMPLICATA *	ALEWIFE FLOATER	G5	S2		RSC
<b>** PLANTS</b>					
AESCHYNOMENE VIRGINICA	SENSITIVE JOINT-VETCH	G2	S2	C2	C
BOLTONIA ASTEROIDES *	ASTER-LIKE BOLTONIA	G5	S2S3		
CAREX LACUSTRIS	LAKE-BANK SEDGE	G5	S1		RSC
CAREX LUPULIFORMIS	FALSE HOP SEDGE	G3G4Q	S1S2		RSC
CASSIA FASCICULATA VAR MACROSPERMA *	PRAIRIE SENNA	G5T1Q	S1S2	C2	RSU
CENCHRUS INCERTUS *	COAST SANDBUR	G5	S1		
CICUTA BULBIFERA *	BULB-BEARING WATER-HEMLOCK	G5	SH		
CORNUS STOLONIFERA *	RED-OSIER DOGWOOD	G5	S1		RSC
CUSCUTA INDECORA	PRETTY DODDER	G5	S1		
CYPERUS DIANDRUS *	UMBRELLA FLATSEGE	G5	S2S3		RSC
CYPERUS HASPAN	SHEATHED FLATSEGE	G5	S2S3		RSC
ELEOCHARIS VERRUCOSA	SLENDER SPIKERUSH	G3G5Q	SU		RSU
ERIOCAULON DECANGULARE	TEN-ANGLE PIPEWORT	G5	S1		RSC
ERIOCAULON PARKERI *	PARKER'S PIPEWORT	G3	S3	3C	RSC
EUPHORBIA AMMANNOIDES	A SPURGE	G3G4	S1		RSC
FIMBRISTYLIS PERPUSILLA	HARPER'S FIMBRISTYLIS	G2	S1	C2	LE
GLYCERIA GRANDIS	AMERICAN MANNAGRASS	G5	S1		RSC
HELENIUM BREVIFOLIUM	SHORTLEAF SNEEZEWEED	G4	S1		RSC
ISOTRIA MEDEOLOIDES	SMALL WHORLED POGONIA	G2	S1	LE	LE
JUNCUS CAESARIENSIS	NEW JERSEY RUSH	G2	S2	C2	RE
LIPARIS LOESELII	LOESEL'S TWAYBLADE	G5	S2		RSC
LISTERA AUSTRALIS	SOUTHERN TWAYBLADE	G4	S2S3		RSC
LYTHRUM ALATUM	WINGED-LOOSESTRIFE	G5	S1		RSC
MALAXIS SPICATA	FLORIDA ADDER'S-MOUTH	G3G4	S2		RSC
NUPHAR SAGITTIFOLIUM	YELLOW COWLILY	G3Q	S2		RSC
OPHIOGLOSSUM VULGATUM VAR PSEUDOPODUM *	ADDER'S-TONGUE	G5T5	S1		RSC
PANICUM HIANS *	GAPING PANIC GRASS	G5	S1		RSC
PONTHIEVA RACEMOSA	SHADOW-WITCH	G4G5	S2S3		RSC
QUERCUS PRINOIDES	DWARF CHINQUAPIN OAK	G5	S2		RSC
QUERCUS SCHUMARDII	SCHUMARD OAK	G5	S2S3		RSC

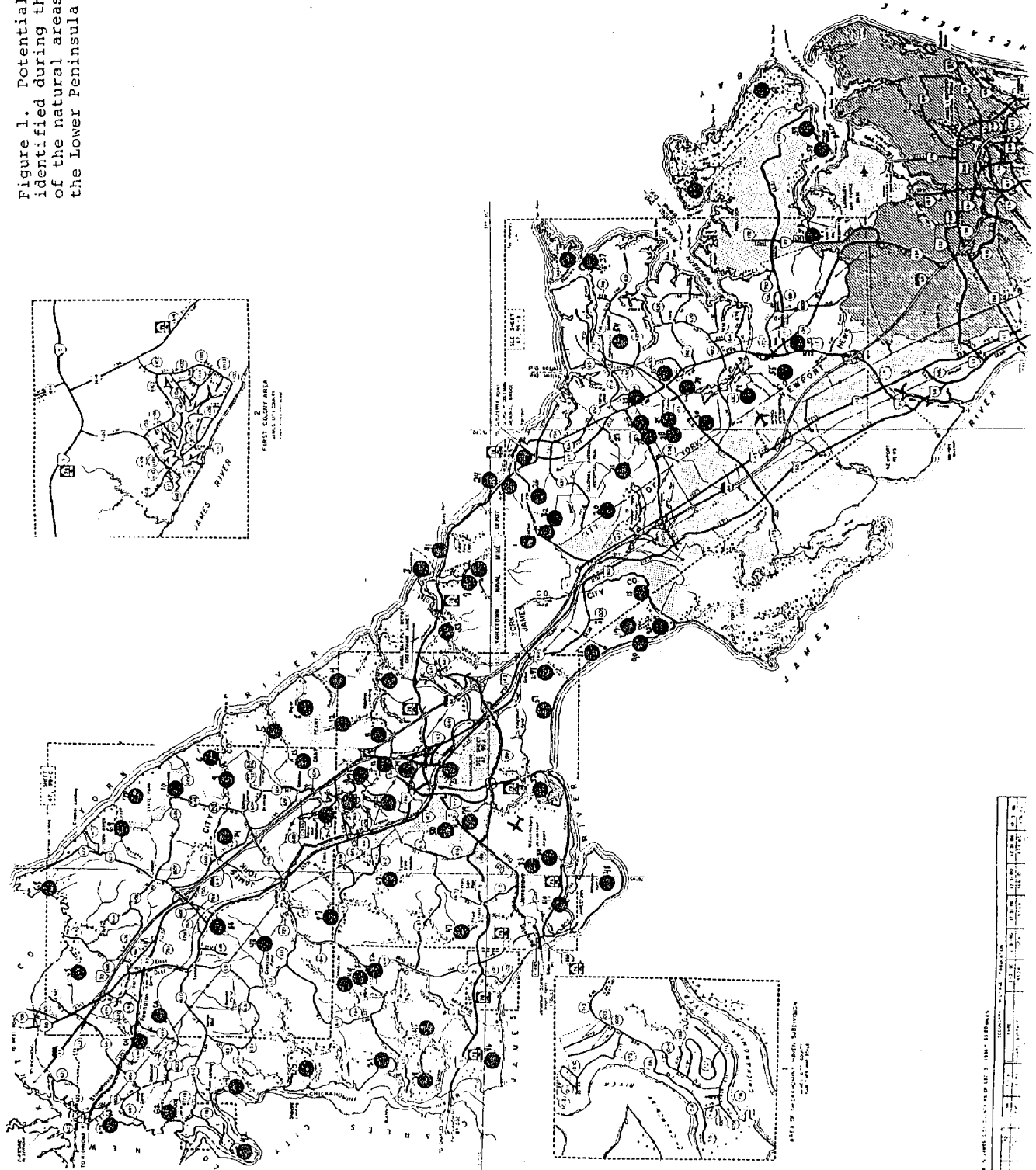


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SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
SCIRPUS LINEATUS	DROOPING BULRUSH	G4	S1S2		RSC
SCUTELLARIA INCANA	HOARY SKULLCAP	G5	S1		RSC
SOLIDAGO TORTIFOLIA	A GOLDENROD	G3G5	S1		RSC
SPIRANTHES ODORATA	SWEETSCENT LADIES'-TRESSES	G5	S1		RSC
STEWARTIA OVATA	MOUNTAIN CAMELLIA	G4	S2		RSC
TILLANDSIA USNEOIDES	SPANISH MOSS	G5	S2S3		RSC
TRIDENS STRICTUS	LONG-SPIKE FLUFF GRASS	G5	S1		RSC
TRIGLOCHIN STRIATUM	THREE-RIBBED ARROWGRASS	G5	S2		RSC
TRILLIUM PUSILLUM VAR VIRGINIANUM	VIRGINIA LEAST TRILLIUM	G3T2	S2	C2	RSC
TYPHA DOMINGENSIS *	SOUTHERN CATTAIL	G4G5	S2S3		RSC
UTRICULARIA FIBROSA	FIBROUS BLADDERWORT	G4G5	S1S2		RSC
VERBENA SCABRA *	SANDPAPER VERVAIN	G5	S2S3		RSC
WISTERIA FRUTESCENS	AMERICAN WISTERIA	G5	S1S2		RSC
XYRIS CAROLINIANA	CAROLINA YELLOW-EYED GRASS	G4G5	S1		RSC
** NATURAL COMMUNITIES					
	BRACKISH MARSH *		S5		
	COASTAL PLAIN SINKHOLE POND		S1		
	FRESHWATER TIDAL MARSH		S3S4		
	MARL RAVINE FOREST		S2S3		
	SALT MARSH *		S5		
	SOUTHERN MIXED HARDWOOD FOREST *		S3		
** OTHER ELEMENTS OF ECOLOGICAL DIVERSITY					
	CHAMPION TREE				
	HERON ROOKERY				

\* Species and communities added to this list during 1990.

Figure 1. Potential Natural Areas identified during the first year of the natural areas inventory of the Lower Peninsula



Scale	1:50,000	1:100,000	1:200,000	1:400,000	1:800,000	1:1,600,000
1 inch	1.25 miles	2.5 miles	5 miles	10 miles	20 miles	40 miles
1 centimeter	0.39 miles	0.78 miles	1.57 miles	3.14 miles	6.28 miles	12.56 miles

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